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Explanation of symbols

.	= figure not available
*	= provisional figure
x	= publication prohibited (confidential figure)
–	= nil
0 (0,0)	= less than half of unit concerned
blank	= not applicable
<	= fewer/less/smaller than
>	= more/greater than
2004–2005	= 2004 to 2005 inclusive
2004/2005	= average of 2004 up to and including 2005
2004/'05	= crop year, financial year, school year etc. beginning in 2004 and ending in 2005

Because of rounding, some totals may not correspond with the sum of the seperate figures.

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Preface

Statistics Netherlands has been publishing figures on the use of information and communication technology (ICT) by companies for two decades, and on ICT use by the general population for nearly one decade. The core of this publication consists of the research findings for the years 2004 and 2005. Furthermore, Statistics Netherlands has information available about companies classified as part of the ICT sector. This helps provide an overview of the production of ICT goods and services. There is also information available on ICT and related areas outside Statistics Netherlands. This was used in the production of this publication which describes ICT use in society in the widest possible sense.

Thanks to the cooperation with TNO and the financial support of the Ministry of Economic Affairs, this year's edition includes more data on telecommunication infrastructure than previous editions. Making a high-quality telecommunication infrastructure available at competitive prices has become the responsibility of market parties ever since the liberalisation of the telecommunication sector. Answering the question whether this market mechanism leads to a high-quality infrastructure requires more (technical) data on the available infrastructure and related services.

Furthermore, the situation in the Netherlands has been compared to that of other countries in many more respects than in the previous editions. This was made possible by the fact that studies about ICT use by companies and individuals were harmonized at the European level.

This edition is the fifth in a series that started in 2001. Statistics Netherlands wishes to make its own results on ICT available to a wider audience, as well as the results of ICT studies by other (international) research institutions. The previous editions merely had a summary in English. It was agreed with the Ministry of Economic Affairs to publish the 2005 edition entirely in English. This provides the opportunity to share the developments in the use of ICT and the work carried out by Statistics Netherlands with the international community.

The Director-General
of Statistics Netherlands

G. van der Veen

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1. In 2004 the growth rate in the Dutch ICT sector was 4.0 percent, which is substantially higher than the 1.7 percent growth rate of the total economy. Within the ICT sector, the telecommunication sector performed best with a 4.6 percent growth rate in 2004. In 2003 and 2002 the telecommunication sector also had the highest growth rate within the sector. Still, the increased growth rate of the ICT sector has not yet lead to more employment. In 2004 employment in the ICT sector fell, albeit by less than in the previous two years (see paragraph 2.2).

2. The turnover of the IT services sector was higher in the first two quarters of 2005 than in the same period of 2004. The number of vacancies in this branch of industry was also substantially higher in the first three quarters of 2005 than in the corresponding quarters of 2004. The sector telecommunications saw negative growth in the last two quarters of 2004 and the first two quarters of 2005 (see paragraph 2.2 and 2.8).

3. About a quarter of the venture capital invested in the Netherlands during 1999–2002 was invested in ICT. Internationally speaking this percentage is not very high; still the amount of venture capital invested in ICT, expressed as a percentage of the gross domestic product, is high compared to other European countries (see paragraph 2.2).

4. The number of ICT companies in the Netherlands more than doubled in the period 1995–2004. By January 2004 one in thirty companies in the Netherlands was an ICT company. However, relatively many companies in the ICT sector went bankrupt within their first three years, especially around the year 2000. So, not every new ICT company was successful (see paragraph 2.2).

ICT expenditure

5. The total investments in ICT capital fell in the years 2002 and 2003. However, this is mainly due to a decrease in the specific investments in electronic networks by companies in the telecommunication sector. The investments in ICT capital by sectors using ICT decreased far less in the years 2002 and 2003, when they constituted over 11 percent of the total investments. The investments in computers in the first three quarters of 2005 were all higher than in the corresponding quarters of 2004 (see paragraph 2.3).

6. Besides investments there is also current expenditure on ICT goods and services. This consists of intermediary use by companies and government and of household consumption of ICT goods and services. In 2004 the expenditure increased by 2.3 percent. There is a shift in ICT expenditure from ICT goods to ICT services and from intermediary use to consumption (see paragraph 2.3).

7. From an international perspective, the investments in ICT capital and the expenditure on ICT goods and services in the Netherlands are high (see paragraph 2.3).

R&D and patents

8. Over one third of the R&D expenditure of companies in the Netherlands is realised by the ICT sector. The share of the ICT services sector in R&D expenditure is small but has increased in recent years, both nationally and internationally. The R&D expenditure of the Dutch ICT services sector saw its highest growth rates around the year 2000, the boom period of the sector. This makes them seem somewhat more sensitive to economic fluctuations than the R&D expenditure of the ICT industry (see paragraph 2.4).

9. The number of patents registered at the European Patent Office has seen rapid annual increases for most countries since 1995. The number of ICT patent applications has contributed more than its fair share. Both in terms of the total number of patents, but also in terms of ICT patents, the Netherlands submit many patent applications compared to other countries (see paragraph 2.5).

Imports and exports

10. The imports and exports of ICT goods and services tripled in the period 1995–2004 in the Netherlands. However, 93 percent of ICT exports of goods in the Netherlands in 2004 consisted of re-exports. So it is not so much the Dutch ICT industry that benefits from the rise in international trade in ICT goods, but rather the Dutch trade and transport sector (see paragraph 2.6).

11. Although most of the international trade in ICT goods and services consists of trade in ICT goods, the international trade in ICT services grew faster in the period 1996–2002, especially in a number of European countries (see paragraph 2.6).

ICT employment

12. In 2004 the number of people working in the ICT professions increased somewhat on 2003. This is due to a rise in the ICT specialists employed in computer service bureaus. The number of ICT specialists employed in the rest of the economy decreased slightly in contrast with 2003, when the situation was reversed. So the concentration of ICT specialists employed in computer service bureaus in 2004 increased again. In 2004 over one third of all ICT specialists

were employed in computer service bureaus; in 1996 this was one quarter. The number of ICT specialists employed in the Netherlands is comparatively high (see paragraph 2.8).

Informatics

13. In the year 2004/’05 the number of first year students in informatics at the college and university levels increased. However, their number has not yet reached the 2000/’01 level. Internationally speaking the Netherlands has very few students of informatics (see paragraph 2.9).

Globalisation

14. Several aspects of the globalisation of the economy are addressed in *The Digital Economy*. For instance: the growth of the production and the international trade of ICT goods can only be found to a limited extent in the results of the ICT industry in the Netherlands. This can partly be explained by the fact that multinationals in this sector sometimes decide to locate the actual production of ICT goods elsewhere in the world. The rapid rise in patent applications is also an expression of growing globalisation. The imports and exports of ICT goods and services of most European countries still have some growth but this pales in comparison with China. In the period 1996–2002 the annual growth rate of the imports and exports of ICT goods in China was over 25 percent. This is partly because countries shifted their production of ICT goods to China and subsequently imported their ‘own’ products. A similar trend is manifest in the development of the IT services sector in India. The IT services sector in India has a high growth rate, which is driven by the growing export of IT services: services which were offshored to India by other countries (see paragraph 2.10).

Telecom infrastructure

15. The telecom infrastructure available in the Netherlands has become part of the market since the liberalisation of the telecommunications market. The general picture is one of convergence and therefore competition between network services that are supplied through various types of networks but offer the same services to the consumers. The traditional difference in the provision of services between the networks is disappearing. Television, radio, the internet and telephone services, they are all offered through several networks in 2005. The number of telecom service providers has also grown rapidly in recent years (see chapter 3).

16. The number of broadband connections per 100 inhabitants in the Netherlands was one of the highest in the world in January 2005. Usually the broadband connections in the Netherlands are RTV cable or ADSL through the telephone network (fixed

Key indicators of the digital economy, national, 1995–2005

	1995 1)	2001	2002	2003	2004	2005
	year-to-year volume changes in %					
ICT and the economy						
ICT investments	17.5	.	–10.5	–0.7	.	.
Intermediary consumption of ICT goods and services	14.3	.	1.9	3.5	1.4	.
Consumption of ICT goods and services	20.2	.	8.7	2.4	4.4	.
Gross value added ICT sector	13.0	.	0.8	0.6	4.0	.
of which ICT industry sector	3.7	.	–20.9	–0.8	6.5	.
ICT services sector	16.1	.	4.2	0.8	3.7	.
	number					
Companies in the ICT sector						
Total	10,640	22,660	23,845	23,920	25,235	.
Births	1,870	3,095	2,530	2,455	2,725	.
Bankruptcies	166	419	511	406	327	.
	x million euro					
R&D expenditure of the ICT sector	1,036	1,767	1,650	1,693	.	.
	number (x 1,000)					
ICT and employment						
Employed labour force working in an ICT profession	138	269	288	271	273	.
Vacancies in the ICT sector	3.7	9.0	2.2	2.4	6.0	.
Screen workers	.	4,296	4,392	4,427	4,438	.
College and university students of informatics	13.6	23.8	25.3	26.2	26.6	27.1
	number (x million)					
Telecommunication infrastructure 2)						
Fixed telephone lines: PSTN		6.6	6.3	6.1	5.9	5.9
Fixed telephone lines: ISDN	.	3.4	3.7	3.8	3.6	3.6
Mobile telephone connections	.	12.0	12.0	13.3	15.9	16.5
Broadband connections: cable		0.5	0.8	1.0	1.3	1.4
Broadband connections: ADSL		0.1	0.3	0.9	1.8	2.0
	% of total					
ICT use by households and individuals						
PC ownership 3)	.	65	69	71	80	83
Internet access 3)	.	48	55	59	70	78
Broadband access 4)	.	.	24	34	49	70
Shopping on-line 5)	.	.	20	23	28	35
	% of total number of companies					
ICT use by companies 6)						
Companies with computers	87	94	95	94	94	.
Companies with external data communication	50	86	89	88	90	.
Companies with internet access	9	84	86	87	90	.
Companies with broadband internet	.	23	40	55	70	.
Companies with a website	.	53	60	65	72	.
Electronic ordering of goods and services 7)	.	29	31	29	36	.
Electronic order reception 7)	.	29	26	20	23	.

1) For the volume changes this is the annual average volume change in the period 1996–2000. Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.
2) 2005: end of the first quarter.
3) 2005: second quarter. Other years: continuous survey. Outcomes 2004 and 2005: population aged 12 to 74. Other years: entire population.
4) As a percentage of the number of households with internet. 2005: population aged 12 to 74. Other years: population over 12. 2002: period July–December. 2005: second quarter. Other years: continuous survey.
5) In the 3 months preceding the survey by persons who have internet at home. In 2001 on-line shopping with an internet PC was observed. 2005: second quarter, population aged 12 to 74. Other year: continuous survey, entire population.
6) Companies with 10 employees or more (2001) / employed persons (2002–2004).
7) Due to changes in the questions the outcomes are not completely comparable year-to-year.

Source: Statistics Netherlands. TNO for the number of fixed lines, mobile telephone and broadband connections.

lines). In comparison with a number of other countries, the diversity of the broadband connections in the Netherlands is limited. ADSL connections in the Netherlands are cheap when compared internationally (see chapter 3).

17. The use of the telecom infrastructure in the Netherlands is intensive. For instance: the number of internet users per 100 inhabitants is very high. The spread of peripherals such as mobile telephones and digital cameras with which network services can be used increases every year. New services, such as digital radio and television are offered. So the market parties in the Netherlands seem capable of offering an adequate telecom infrastructure as well as matching services (see chapter 3).

ICT use

Companies

18. Over 90 percent of the companies used the internet by December 2004. Almost three quarters of all companies is also on the internet with a website and 70 percent of all companies use a broadband connection (see paragraph 4.1).

19. The more advanced use of the internet, such as on-line sales or complicated ICT applications such as internal and external linking of automation systems, occurs less frequently. Here there are major differences between the branches of industry and company size classes. The branches trade and repairs, the manufacturing industry and the ICT services sector turned out to use ICT intensively. The branches hotels, restaurants and construction make far less use of ICT (see paragraph 4.4).

20. Within the European context, the use of ICT of Dutch companies is comparable to that in Germany, Belgium and the UK. The Netherlands is in the group of countries that follows right behind the three Scandinavian countries (see paragraph 4.4).

21. The contribution of the ICT sector itself to the growth of the productivity in the period 1990–2002 was, internationally speaking, greater than the contribution of the sectors using ICT. The contributions of the ICT sector and of the sectors using ICT were very modest in the Netherlands when compared internationally (see paragraph 4.7).

Public sector

22. By December 2004 about half of all public services were also offered through the internet. Citizens using these on-line public services often have trouble locating the service they need. Some users are disappointed about the degree to which

the services can be completed though the internet. Basically, these users want more sophisticated services on-line. Within the EU, the Netherlands occupies a middle position in the area of providing on-line public services. Especially the number of services that can be concluded on-line is small in the Netherlands. Still a wide, advanced provision of on-line public services does not necessarily lead directly to commensurate use (see paragraph 5.1).

23. The availability of computers and internet in the classroom has grown rapidly in recent years. Compared to other countries, schools in the Netherlands do not have very good computer and internet provisions. A major obstacle for schools is the lack of proper accommodation to fit in all the ICT tools. Apart from the hardware, many schools find it hard to buy good educational software at a reasonable price. Teachers are mainly positive about the contribution of ICT in attaining educational goals (see paragraph 5.2).

24. The health sector handles a great deal of information. In theory, the use of ICT should cater to a substantial demand. However, various specific ICT applications are not yet taking off as expected. Citizens too need reliable information about health care and use the internet on a regular basis for this (see paragraph 5.3).

Households and individuals

25. In January 2005 about 78 percent of all households in the Netherlands had internet. In 70 percent of the cases this is a broadband connection. Internationally speaking these are high percentages. ADSL was the most common type of internet connection at the start of 2005 among households in the Netherlands (see paragraph 6.1).

26. Internet continues to be a medium for young people. Just about everyone under the age of 35 has experience with the internet. Over half of the internet use – expressed in the number of hours on the internet a week – is by people aged 12 to 34. By the end of 2004 there were still 3.8 million, predominantly older, people who had never dealt with the internet (see paragraph 6.2 and 6.3).

27. The diversity of internet use is not always great. About 2.2 million people use the internet for just one or two activities (see paragraph 6.2).

28. Nearly half of all people aged 12 to 74 has taken a computer course at some point. In 57 percent of the cases this was over three years before the survey, however (see paragraph 6.3).

29. In 2005 over one third of the people aged 12 to 74 who have an internet connection at home ordered something through the internet in the three months

preceding the survey. In 2002 this was true for one in five people (see paragraph 6.4).

30. Dutch households massively installed anti-virus programs (92 percent) and firewalls (62 percent) to protect their computers. Authentication such as pin codes, passwords or digital signatures is also regularly used by internet users in the Netherlands. In the Netherlands and the Scandinavian countries this level is much higher than in the other countries of the EU 15. Still many internet users in the Netherlands are plagued by spam (54 percent) and damage through viruses (32 percent) (see paragraph 6.5).

Key indicators of the digital economy, international, 2003–2005

	EU 15	EU 25	Denmark	Germany	France	Netherlands	Finland	UK	Canada	Japan	USA	South Korea
	%											
ICT and the economy												
ICT expenditure as % of GDP, 2004 1)	6.3	6.4	6.7	6.2	6.0	7.5	7.1	7.9	.	8.0	7.8	.
Share of ICT workers in total employment, 2003 2)3)	3.1	.	4.2	3.0	2.9	4.8	4.1	3.3	4.0	3.9	3.8	2.1
Share of ICT sector in R&D expenditure, private sector, 2003	.	.	31	22	31	37	64	24	39	34	35	55
Share of ICT patents in the total number of patents EPO, 2002 4)	20	19	21	15	22	33	39	25	30	24	31	.
Share of high-tech products in total exports, 2003 5)	17	18	13	15	20	19	21	21	.	23	27	.
	per 100 inhabitants											
Telecommunication infrastructure												
Fixed telephone connections (ISDN, PSTN), 2004 6)	56	52	72	66	56	59	52	61	63	51	65	48
Mobile telephone connections, 2004 6)	86	82	96	81	72	98	92	87	49	69	62	77
Broadband connections, 2005 7)	11	.	20	9	13	21	17	12	19	15	13	25
Internet hosts, 2003	5	4	23	3	4	22	24	5	10	10	56	8
Secure web servers, 2004 8)	15	.	31	16	6	22	24	34	48	15	68	2
	number											
ICT and education												
Number of students per internet connection, 2003 9)	.	.	7	18	.	9	7	5	5	9	5	5
	%											
ICT and government												
On-line public services provided, 2004 10)	49	.	47	47	50	32	67	59	.	.	.	.
ICT use companies, 2004												
Companies with internet 11)	89	90	97	94	83	88	97	87	.	.	.	.
Companies with broadband internet 11)	55	52	80	54	49	54	71	44	.	.	.	.
Companies with electronic sales	15	13	25	18	.	17	17	27	.	.	.	.
ICT use households, 2005												
Households with internet	47	43	69	60	.	71	51	56	.	.	.	.
Households with broadband internet	18	15	36	18	.	34	21	16	.	.	.	.
Households shopping on-line 12)	21	17	22	29	.	24	24	28	.	.	.	.

1) EU 15: excluding Luxembourg. EU 25: excluding Luxembourg, Cyprus and Malta.
2) As a percentage of the employed labour force.
3) South Korea and the Netherlands: 2002. EU–15: estimate.
4) Patents applications to the European Patent Office (EPO), by year of filing at the national level.
5) The EU exports do not include intra EU exports.
6) EU 15 and EU 25: 2003.
7) Situation 2005: end of first quarter.
8) Per 100,000 inhabitants. July 2004.
9) In schools where 15-year-olds are enrolled.
10) The provision of 20 selected public services that are fully available on-line.
11) France: 2003.
12) Population aged 16 to 74.

Source: Eurostat. OECD for the number of secure web servers and students per internet connection (processed by Statistics Netherlands), TNO for the number of fixed lines, mobile telephone and broadband connections, ITU for the number of internet hosts, Capgemini for the number of online government services.

1. The digital economy

1.1 Introduction

The introduction of new technology can bring about major social and economic changes. A classic example of this is the invention of the steam engine. The information and communication technology, ICT, is currently causing major changes in economic relationships and social relations. Information is increasingly digitised and distributed through networks that can easily be linked. During the sale of UMTS frequencies, telecommunications companies paid large amounts of money just for the right to be able to operate a network that enables communication services.

In 2000, the notion that all companies working with the internet are bound to make huge profits went 'bankrupt'. This put a dent in the high hopes for ICT. However, in 2005 it would seem that a proper use of ICT would be profitable after all. In the Netherlands Van Leeuwen and Van der Wiel found a positive correlation, based on Statistics Netherlands' data, between investment in ICT capital and increased productivity (Van Leeuwen and Van der Wiel, 2003).

Many other countries also struggle with the question whether it is profitable for companies and the government to invest a great deal in ICT. International studies coordinated by the Organisation for Economic Cooperation and Development (OECD) seem to answer this question with a cautious yes (OECD, 2004a). Brynjolfsson also arrives at the empirically founded conclusion that investment in ICT will not yield increased productivity right away. This is mainly because ICT investments go hand in hand with several other measures such as restructuring the organisation and retraining personnel before the company can reap the benefits in full. This is a complex process that requires more than just the purchase of ICT tools (Brynjolfsson, 2003).

In one of his essays on technological determinism and freedom of choice in organisation, information expert Batenburg remarked that it is dangerous to approach ICT as a 'black box' (Batenburg, 2003). He and others argue in favour of a careful, specific definition of ICT and the role of information technology in the economic process.
Looking back at developments in the last decade it seems that many people overestimated the speed at which existing processes changed under the influence of ICT, or at which new technology could yield profit. E-commerce is growing steadily but it has not reached the volume expected several years ago. Telecommunication companies have invested a great deal in gaining a market share through

acquisitions. This has not always been a success. The technology itself and the developments in applications and actual use, however, remain promising and therefore the subject of government policy at the national and the European level.

In the publication *The digital economy*, Statistics Netherlands wants to contribute to the quantification of the role ICT plays in the economy and society. This introductory chapter deals briefly with issues that are crucial in understanding ICT and the influence ICT has on society. Many of these issues will be addressed again in other chapters when the developments of ICT in the Netherlands are quantified, often in comparison with other countries.

The concepts used by Statistics Netherlands are partly determined by international agreements with other statistical bureaus in the European Union (EU) as laid down by Eurostat, the European bureau for statistics. Furthermore, we use the definitions and classifications of the Organisation for Economic Cooperation and Development (OECD) and the United Nations (UN). International comparison is greatly valued be many people. It is not within the scope of this first chapter to give a detailed account of all key concepts and definitions. Therefore, in this and later chapters we will refer several times to annexes at the back of this publication.

1.2 Information and communication technology

The abbreviation ICT stands for information and communication technology. The term IT (information technology) is no longer used in Europe anymore. Information technology and communication technology seem inseparable these days, but this has not always been the case.

Information technology

Information technology is technology that seeks to provide people or machines adequately of the information required to perform well. Generally, a computer is used for processing data in the production of information. The way the data has to be processed – automation – is laid down in computer programs, called software. A computer has four components: storage technology (memory), a calculation unit (processor), input (data and programs) and output (data or information). There is not really a single inventor of the computer, but the Brit Charles Babbage is generally seen as the person who described the components of the modern computer for the first time in this way. He did that in 1834.

Technology is more than technique; it also involves the know-how to apply the technique. In information technology the techniques of data gathering, recording, processing, storing, representing and transporting are combined.

Until the late 1970s, only a few people – working in mathematical centres – physically came in touch with computers. Computer programmers had to supply their computer codes on punch cards and sometimes had to wait a long time for their printed results that showed what progress they were making. Most companies only had a single or a few computers, which did not resemble the current personal computer (pc) in any way. The increased capacity of the chips and the resulting miniaturising of computers changed all this. The influence of communication technology must also be mentioned in this regard.

Communication technology

The aim of communication technology is to disseminate data or information. The following phenomena play a role in the use of communication technology: source, sender, channel, receiver and destination. The techniques used by communication technology have greatly improved over the last few decades, and new techniques continue to be added. Old forms of exchanging information across large distances, such as radio, television and fixed telephone lines have been complemented by a growing number of new forms, of which the internet is the most famous.

The rapid developments in communication technology also made the old type of computer, entirely based on information technology obsolete. The combination of information and communication technology has simplified the use of computers. For quite some time keyboards have made that computers can simply receive instructions, while accessing information through the monitor has also become common. Communication technology is at the basis of this.

Thanks to continuous miniaturisation of techniques and cheaper production methods, the computer turned up not only in the work place of people working in companies and government by the early 1980s, but also in the home. At the start, these were mainly game computers that had to be connected to the television and where the tape recorder sometimes was the storage medium. The development of faster chips made it possible to introduce the personal computer (pc) over two decades ago. The development of the pc ever since has led to the widespread availability of information and communication technology without too many financial or physical obstacles. Apart from the pc, there are now many new ICT forms, such as mobile telephones, network tools and satellite systems. There are also 'embedded' applications of computer technology in washing machines or microwave ovens – where the number of computer components is down to the bare necessities –, which means that ICT is spreading even wider. This is even truer for 'embedded' software in all kinds of machinery and equipment used in the (industrial) production process.

1.3 ICT goods and services

In cases where a product serves primarily to process data electronically and/or provide communication it is considered an ICT product. These products – which refer to tangible goods as well as services – would not have become available without ICT. In this publication, we strictly distinguish goods and services. When we talk about ICT goods, we mean hardware or its components. In this publication, we refer to the services exclusively aimed at electronic data processing (including the production of software) and/or communication, as ICT service.

Statistics Netherlands uses several goods and services classifications. They play a key role in the compilation of the National Accounts by Statistics Netherlands. In the compilation of the National Accounts, all data gathered by Statistics Netherlands about companies are included and estimates are made for those parts of the economy that are not observed. In this way, Statistics Netherlands arrives at a complete, consistent description of the Dutch economy.

Internationally, within the OECD framework, a list of ICT goods was defined based on the classification of goods used in the international trade statistics. There is no internationally accepted definition of ICT services yet.

The National Accounts currently distinguishes the following ICT goods:
Office machinery, computers and peripherals, insulated wire and cable, integrated circuits, other electronic components, transmitters, TV cameras, telephones, components of telephones, radios, televisions, other audio and video equipment, components of radios and televisions etc., equipment for measuring, checking, testing, navigating and other purposes, components of that equipment, industrial process control equipment, watches and clocks.

The National Accounts currently distinguishes the ICT services:
Postal services, post office counter services, courier services, telecommunications services, computer and related services, software consultancy and supply services, software made in one's own account.

Listing the ICT goods and services is only a starting point for the study of the ICT phenomena. The aim is to map ICT, the use society makes of ICT and the social and economic consequences involved.

1.4 Defining the ICT sector

Once the ICT goods and services are defined, the question remains what ICT companies are. In statistical surveys, companies are classified based on their main activity. Roughly speaking, the companies belonging to the ICT sector are those companies that produce ICT goods and services as their main activity. These companies may also produce other products besides ICT goods and services. On the other hand, not all ICT goods and services have to be produced by companies in the

ICT sector. Companies in the manufacturing industry may produce software, even just for their own use, as a sideline.

Standard Industrial Classification

Statistics Netherlands designed a Standard Industrial Classification (SBI) for a uniform classification of the economy. The last revision took place in 1993 (SBI93). It is a classification of all economic activities, which is the production of goods and services. The SBI design takes EU regulations into account, such as those laid down in the NACE (Nomenclature générale des Activités économiques dans les Communautés Européennes).

The SBI is used in all studies (statistics) by Statistics Netherlands in which results are broken down by economic activity. In principle, the most detailed level of the classification was designed for statistics describing the production process. Cost and the reduction of the administrative burden make that Statistics Netherlands does not collect and publish data at the lowest level for all its statistics. Confidentiality constraints may also be in the way of a more detailed publication.

Table 1.4.1 shows the SBI classes that we define as the ICT sector in this publication. This is based on the agreements reached at the OECD. However, there is a slight difference in this publication with the OECD agreements in the part on ICT services of the ICT sector. This is discussed in annex 1.

Working with activity classifications based on main activities does not provide a perfect view of the total volume of the activity studied. Therefore, we cannot include

Table 1.4.1
Definition of the ICT sector

SBI93	Characterization of the activity
ICT industry sector	
3000	Manufacture of office machinery and computers
3130	Manufacture of insulated wire and cable
3210	Manufacture of electronic components
3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
3230	Manufacture of audio and video equipment
3320	Manufacture of equipment for measuring, checking, testing, navigating and other purposes
3330	Manufacture of industrial process control equipment
ICT services sector	
6400	Post and telecommunications
7200	Computer and related activities

Source: OECD / Statistics Netherlands.

all ICT-related economic activities in this publication. For instance, the ICT department in a bank is not included in the ICT sector, whereas people working at the day-care centre in a large ICT consulting agency are included in the ICT sector.

In addition, the size of the ICT market is not identical to the turnover of the ICT sector. We see the ICT market as the virtual place where supply and demand of ICT goods and services come together. This market can be quantified by the turnover realised in ICT goods and services. The domestic ICT sector is a key market player as the provider of ICT goods and services. However, ICT goods and services may also come from non-ICT companies. Moreover, ICT goods in particular are imported on a large scale and partly marketed through domestic wholesalers.

Content sector

Opinions differ as to whether the 'content sector' should be considered part of the ICT sector. Certain companies distribute contents with the specific aim to provide services via electronic networks but they are still classified in the sector with companies who provide comparable services through the traditional channels. One example is news provided through the internet. For the time being, these activities are not seen as ICT services because the product – news – is seen as the primary criteria and not the distribution channel.

1.5 Telecom infrastructure

In the first paragraph of this chapter, we indicated that the use of new communication technology made computers easier to employ in work processes and became available as consumer electronics. Early on, the changes of the machine themselves were responsible for new revolutions in the use of computers, while from the eighties on it is increasingly the use of networks in buildings and the use of external networks. These revolutionary changes in turn led to new kinds of business management and consumer behaviour.

In this paragraph, we will look at concepts and developments used in telecom infrastructure and the services provided with them. Quantitative research data will be presented in chapter 3, entirely devoted to telecom infrastructure.

Delineating telecom infrastructure

The word 'infrastructure' produces associations with physical facilities that connect places in space. In this sense, we use telecom infrastructure in this publication: meaning all facilities linking points in space through information and communication technology. In this interpretation, we assume that the facilities are characterised by a certain immobility. Here we use a strict definition. A car is not part of the road network, and in the same way, a pc is not part of the telecom infrastructure. The telecom infrastructure is an application of ICT, as is the pc, but the two have different purposes. The telecom infrastructure is now mainly aimed at sending data and a pc mainly aims to process or gather that data before sending it. A computer may be part of the telecom infrastructure when it is an integral part of the technology chosen to operate the infrastructure (servers for example).

The telecom infrastructure as seen in this publication is in fact the total of electronic communication networks making them a modern version of the traditional rail and road networks. Via the telecom infrastructure, the data is sent electronically, but the impact is more far-reaching than the physical process alone. In fact, the telecom infrastructure creates a growing virtual world in which time and distance lose some of their meaning. This can have major social consequences, just as the arrival of the railway networks had.
In the networks of the future, the ad hoc or spontaneous networks will surely play a role. Machines will discover that they are physically close and will form temporary unique networks without the help of an operator, while there is still the possibility that contacts can be made through one of the machines with the wider electronic networks.

Electronic communication networks can have physically different layouts. There are cables transporting electrical signals and cables transporting light signals. There are the new wireless Wi-Fi, WLL and WiMax technologies which share the fact that they are wireless with older technologies such as radio and television, but which, in terms of application are an extension of existing non-wireless networks. The new wireless technology has vastly increased the telecom infrastructure. In chapter 3, we explain the advantages and disadvantages of these types of technology and quantitatively explore their actual supply and use.

Appliances at the tips of the networks

Apart from the telecom infrastructure, there are the ICT goods that use the telecom infrastructure. These are usually called peripherals and include for example telephones, mobile telephones, faxes, personal computers, printers, televisions and radios. In fact, these goods are seen as interchangeable intelligent tips of the infrastructure. Not all ICT goods belong to this category, because they also include items that cannot be connected directly to the telecom infrastructure, for instance because they are not machines by themselves (like diodes, transistors, processors and ICs).

In the chapter on telecom infrastructure, we will address the penetration of peripherals in society. This shows the scale in which the telecom infrastructure is used, and by which peripherals. The more specific use of the telecom infrastructure and their peripherals by companies, the public sector and households are discussed in chapters 4, 5 and 6.

Internet as leading technology

The internet is an abstract term for a worldwide network. Computers linked to it make use of the internet protocol. This standard protocol was developed in 1977 under the name TCP/IP (Transmission Control Protocol/Internet Protocol). TCP/IP allows linking networks.

The first network ARPANET (Advanced Research Projects Agency Network) was set up in the 1960s by the US Department of Defence as a network that would continue to operate even if parts of it would be damaged. They opted for a web structure rather than a linear structure that allows only a single route between two computers. The network expanded over the years by adding other networks. These networks are owned by the network providers or internet-backbone providers. The providers are not interested in individual internet users but in companies to whom they leave use management. Such companies are called access providers as they provide access to the services made possible by the internet. They have a vast number of fixed IP-addresses, which are assigned to clients at random per session, or permanently. Access providers providing more services than just access to the World Wide Web are called service providers. The most commonly known services are e-mail, news groups and hosting (allowing users to have their own website).

The internet protocol – that despite the different views of Europe and the USA about internet control is still monitored by national and international bodies – has increasingly become the standard by which to send data all across the world. Its success is mainly because the internet protocol is an open standard that everyone can use and develop applications for. In addition, more information is standard becoming available in digital form making it fit for spreading through the internet. One example is the digital camera. Before the digital camera, photographs had to be developed and digitized before they could be sent through the internet.

Access to the internet is easy for potential users, who only have to buy the peripherals and sign an agreement with the access provider before they can join the internet. The transport method itself is relatively simple and innovations can be introduced by changes at the edges of the networks – mainly through software.

The intensity of the use has increased, thanks to faster links. Files so big it used to be completely unthinkable that they could be sent via a network can now be sent through the internet (such as video files). In recent years, much money and effort have been invested in backbones, which link various local networks with the internet over long distances. The expectation is that the current capacity of these backbones will suffice for quite some time in processing the ever-increasing data flows.

Services via the telecom infrastructure

The quality of an electronic communication network in terms of scope, capacity, speed of transmission and (technical) reliability determines in part its usability.

Without network no telecom services. Almost all telecom services can be divided into the categories:
- making an electronic communication network available;
- providing an electronic communication service.

A reliable network can pass on information without failures, mistakes etcetera. Users must be able to rely on the fact that the information ends up in the hands of the addressee and not in the wrong hands. An adequate handling of the information flows increases the trusts in electronic networks and indirectly the use of applications. The Dutch government privatised the Post and Telecommunications (PTT) that held the state monopoly, thus opting to play no longer a role in the on-hands quality management of electronic networks, although the *Telecom Agency* (AT) as a government body monitors the continuity and availability of networks.
Companies owning a functioning electronic communication network can earn money by making it available to others as well. This kind of services is relatively new. Originally, the owner of a network was also the sole provider of services through that network. Government measures – particularly the liberalisation of the telecom market – brought about drastic changes in the past decade. This, and the role of the telecom supervisor, is discussed in chapter 3.

Once a company has access to an electronic communication network, either owning it or having a user agreement with the owner, it can provide a wide range of electronic communication services. Examples are broadcasting television programmes (analogue or digital), providing (mobile) telephone services and internet access. Making available one or more e-mail addresses is a standard service provided by most access providers for which they are paid. Hosting internet sites that are available for a fee is also a form of this kind of service. However, generating information ('content') in and of itself is not considered a telecom activity. A company that produces television productions is not a telecom company. A newspaper that can be read on the internet has or rents one telecom activity, but writing the news itself is no telecom activity (see also paragraph 1.4).
There is a strong relationship between the technical use of the network and the services that can be provided. Gathering information or e-mailing is a less advanced use of a network than multimedia applications. For the former, one can simply have an analogue modem or ISDN connection via existing telephone lines, whereas another technology is required for modern internet multimedia applications.

1.6 The influence of ICT on society

In this paragraph, we discuss various developments and concepts important for the understanding of the impact of ICT on the economy and society. Many of the concepts will be addressed again in later chapters, but in a quantitative context.

Innovation and ICT

Looking back on the last decades scientists sometimes refer to an ICT created crisis of 'Fordism'. Fordism is a metaphor for standardised goods produced on a large scale for mass consumption by using inflexible techniques. Flexibility is seen as a key characteristic of the new ways of production. Flexibility refers to the production process itself and to the organisation of the production within and outside the enterprise. By harmonising production processes through automation it has become possible to produce cheaper and qualitatively better on a smaller scale (Oerlemans, 1996).

Much has been written about the specific links between innovation and ICT. Originally, the theories mainly involved the manufacturing industries and the lifecycle of the product was seen as a method to describe product innovation. According to the theory, a product goes through several stages before it reaches a certain standardisation, where competition in quality differences, investments and serendipity are determinants of how these stages develop.

This theory is more difficult to apply to the services sector, which has become increasingly important in recent decades, also in terms of ICT application. Therefore a similar theory for the services sector was developed. Barras is the main exponent through the introduction of the 'reversed product cycle' concept, demanding an explicit services approach. He described the 'reversed product cycle' based on his studies of the developments in financial and business services (Barras, 1986 and 1990). In short, he argues that innovations in services – including ICT services – first take place in the processes and then in the products. Barras feels that technology is the determining factor in innovations. This led to criticism by others who feel that non-technological aspects do not receive enough attention and that innovation need not always lead to a product (Gallouj, 1998 and Uchupalanan, 2000).

Barras – like Oerlemans before him – noted that major companies mainly play a role in the first phases of the application of new technology such as ICT, but that they get into trouble in the later stages because of their lack of flexibility. Barras mainly pays attention to innovation started by suppliers. Other authors stress other sources of innovation such as clients and company employees.

Dutch authors like Goedvolk also described the role of ICT in innovations (Goedvolk, 1995). Goedvolk states that ICT goes through a similar evolution as all kinds of other new technologies. The first two stages are denial ('No, it is not important') and exploration ('Maybe we should have a look at it'). In a third stage, that of the replacement, people deal with the question which existing parts of the company management can be done with the new technology in the future. The point is raising efficiency without fundamental adjustments of the process.

In the fourth stage – integration – the various new technological applications are studied in context and mixed into a new coherent infrastructure. People make demands on these new technological applications in terms of fit and integration. Management can also be changed independent of this but the management does not yet have a direct relationship with the new technological infrastructure.

In the fifth stage, that of transformation, the business processes are adjusted because the new technology makes processes redundant or allows them to be carried out elsewhere. Goedvolk indicates that companies often look at the outside world during this transformation. Companies make decisions based on opportunities and risks, and are concerned about the competitiveness of the company and its environment. In this phase, the technology will lead to new products or services and it can be the reason for restructuring the network of relations with clients and suppliers.
A sixth and final stage, that of transparency, is reached when the interaction between technology and processes are grown to a point where people understand how they can use the technology even better. They experience it as normal and do not need to know everything about the technology in order to work with it. Examples are the telephone and the car.

E-business and e-commerce

The physical presence of computers does not say much about the degree of computerisation in a company. What matters is what the organisation actually does with the computers. Therefore, the question is how ICT can best be used as an instrument. The idea that there is 'one best way of management' has been dropped about thirty years ago where technology is concerned. The importance of the right non-technical innovation as complementary to technical innovation is generally acknowledged. 'Business process re-engineering' (BPR) claims that organisations must switch their set up radically with the new technology in order to survive. 'Enterprise Resource Planning' (ERP) systems aimed at material planning, stock management and production planning are software tools ('enablers') that can be used profitably only when companies are prepared to invest in BPR. The ERP systems in combination with 'workflow software' facilitate the many 'electronic business activities' created. E-business will be discussed in some detail in chapter 4. E-business seeks to create synergy between traditional – but also new – business methods and the opportunities offered by ICT in enterprises.

For a long time, there was no consensus about the definitions of e-business and e-commerce. E-business was generally defined as doing business with the help of ICT and ICT applications. E-commerce, as part of this, refers to concluding or initiating a transaction electronically: the actual buying and selling of goods and services. A distinction can be made between electronic business between companies (business-to-business or B2B) and between companies and consumers (business-to-consumer or B2C). The opinions about the definitions differed mainly about which ICT was meant. The political and media interest in e-commerce made it necessary to end the confusion. Therefore, the OECD decided to set up an international working group in 1999 to define e-commerce in a manner that was relevant for policies and statistically reliable and feasible (see Pattinson, 2000). This led to two definitions of e-commerce with the following dimensions: the network carrying e-commerce and the business processes related to e-commerce. The ‘broad’ definition concerns the purchase and sale of goods or services via computer networks in which the activity involves the actual purchase and selling and not payment and delivery. The ‘narrow’ definition only deviates in one point: the type of the network; the purchases and sales go through the internet.

Phases of e-business

The intensity of e-business is often described in the literature on the basis of phases. The phases below are taken from the Economic Information Service (EVD), a branch of the Dutch Ministry of Economic Affairs. The EVD is the government branch aiming to facilitate and stimulate international enterprise and international cooperation.

In the first phase, the information phase there is cautious communication through e-mail and intranet (an in-house application of the internet) and marketing through websites.

In the second phase, the company opens its doors for electronic interaction with its clients, employees and partners. Client applications are ‘Customer Relationship Management’ (having a process to maintain and develop relations in order to create mutual advantages) and online orders. Payment takes place in a traditional manner. An example of an employee application is ‘remote access’ (access to the company’s ICT system from elsewhere). Interactions with suppliers, buyers and other relations take place through an extranet, that is, a computer network based on the internet protocol in an organisation allowing employees, suppliers, buyers and other relations to have access, but that is kept apart from the open internet. Electronic purchases (e-procurement), for instance, is done through the internet. This is already approaching the next phase: the transaction phase.

In the last phase, the integration phase, the sales support processes such as purchasing, logistics and invoicing are computerised and linked. This process integration leads to an accessible, transparent internet, in which trade information is exchanged. The business processes computerised in the integration phase can be linked through the internet with those of clients, suppliers, buyers and partners. The latter is part of the ‘Supply Chain Management’ (integration and harmonisation of the various links in a value chain). ‘Supply Chain Management is not linked to the last phase alone, it can occur in any of the other phases distinguished by the EVD.

Motivations, consequences and risks of e-business

E-business looks like a phase in an irreversible process driven by ICT. The motivation, however, is not the same for all parties in the process chain. Cutting costs is dominant for companies, and improving customer service in order to gain the competitive edge. Retailers traditionally have an interest in personal contacts (visiting the shop). When clients no longer have to spend their money locally, retailers have to compensate by bringing in customers from elsewhere, for instance through the internet (see also Adelaar, Bouwman and Steinfield, 2004). The motivation for consumers to get involved in e-business is mainly convenience and a proper overview of the market.

E-business gradually changes the market. It looks like the position of consumers is growing stronger because it is easier to compare products and prices. The traditional distributive trades have to rethink their position because manufacturers can also sell directly to consumers or use other intermediaries (such as e-markets). It is too early to make firm statements about the consequences of e-business, with research into the issue going on.

New ways of doing business of course involve risks. A well-known trap is to confuse technology and demand from the market (technically possible but no one needs it). Management is sometimes insufficiently involved in innovation so that projects do not proceed with the speed they need to be successful.

Offshore outsourcing

Quite literally a far-reaching consequence of computerising business processes is that they can be easily transferred and managed at a distance. The use of ICT can lead to a different distribution of labour in a production and distribution chain. This may involve outsourcing services that can be carried out by the company itself to another company. The 'offshore' originated in the oil and gas extraction to indicate activities at sea. Offshore outsourcing of ICT in practice means that ICT services are shifted to another country. Several years ago, outsourcing was seen as a means to compensate for shortages in ICT personnel. Currently, it seems to transform to a serious subject on the political agenda. Since it touches on employment issues in the Netherlands, it has stimulated the unions to research the issue.

In paragraph 2.10 about 'globalisation', we will see how outsourcing ICT work touches on the globalisation of the knowledge-based economy.

Consequences for the public sector

The business sector is not the only place where people are greatly interested in the role ICT can play in improving business processes and client contacts. The arrival of the internet makes it possible for citizens to use extra search facilities for instance in legal or health issues and become a well-informed party. The government is expected to be accountable through easily accessible information on internet sites. A modern and efficient government – using ICT – must communicate with its citizens and with companies not only through traditional counters and paper forms but also via new electronic means, in part to reduce the administrative burden. Several of these aspects and government progress in these areas are discussed in chapter 5.

The digital economy

At the end of the paragraph on the influence of ICT on society, we can conclude that there are noticeable changes in society that we consider a transition toward a 'digital economy'. Changes occur in ways of conducting business, but also in the social relations between individuals and between organisations and individuals. Individuals can be the clients of organisations, but they can also be the employees who may or may not suffer from the 'digital gap' between those who can and those who cannot adjust to the application of new ICT.

1.7 Layout of the publication

The next chapter focuses on the role of ICT in the Dutch economy. We will discuss government policy on ICT, economic performance of the ICT sector, expenditure on ICT and Research and Development (R&D) of the ICT sector. Next, we will discuss how ICT knowledge in the Netherlands is converted into patents. Also the imports and exports of ICT goods and services is addressed in a separate paragraph, as is employment involving ICT and education indicating the future supply of highly-trained ICT experts on the job market. The chapter finishes with globalisation aspects, centring on the issue what the consequences are of outsourcing ICT employment to other countries for the Dutch economy.
The central issue in chapter 3 is telecom infrastructure. The infrastructure is the basis for all ICT use by the private sector, described in chapter 4. In chapter 4, we report how companies in the Netherlands deal with their internal and external data communication and how they approach e-business and e-commerce. The relations between ICT and productivity are addressed, as well as company security with regard to their ICT systems and applications.
In chapter 5, we switch to the public sector and look at how ICT is used in government, education and the health care sector.
In chapter 6, finally, we discuss the use of ICT by households. We studied ownership of consumer electronics and internet use and address the social aspects and ICT skills of the (potential) users. Also addressed in this chapter is the topic of security for the privately owned pc.

International benchmarking

This publication will include, more than the previous editions, data on developments in ICT in other countries. The aim of the international comparison, or benchmarking, is to get a well-balanced picture of the situation in the area of ICT supply and use in the Netherlands in comparison with a number of other countries. We will try to present one or more internationally comparable indicators per paragraph. The aim is to collect these indicators for a fixed group of countries. This will benefit the comparisons throughout the publication and makes it easier to draw general conclusions about the position of the Netherlands in this group of 'benchmark countries'.
The emphasis in benchmarking is on the most up-to-date situation and on comparison of the countries rather than on presenting time series for the various countries.

We made a pragmatic selection of the various indicators, that is, we chose from the available indicators. The main sources of these indicators are Eurostat (the European Statistical Bureau) and the OECD.
Eurostat publishes much of its data in its database 'New Cronos', which is available through the internet and comparable to the 'StatLine' database by Statistics Netherlands, which can also be accessed through the internet. On ICT, New Cronos has the outcomes of the harmonised surveys on the use of ICT by companies and households.
The OECD has a number of regular and single publications based on the data of its databases about the spread and use of ICT in OECD countries. The value added of the OECD is in the diversity of the indicators, and in the fact that it includes data on the major non-EU countries, such as the USA, Japan, Canada and South Korea.

In practice, a wide international comparison of EU countries is much easier to make than a global comparison. This is because the EU has a system of harmonised statistics compiled under the supervision of Eurostat. It is not always easy to find comparable data of countries outside the EU. The course of action is therefore to make a wide-ranging comparison with other EU countries and when possible compare it with a number of key countries outside the EU. The benchmark countries selected for comparison with the Netherlands all have a high level of ICT spread and use. The risk is that the Netherlands does not always show well. On the other hand, it does not seem useful to keep repeating that the Netherlands is more advanced in the area of ICT than Portugal and Estonia. In addition, the number of benchmark countries had to be limited so that the data can be presented in convenient graphs and tables.
These considerations led to the choice to include as much information as possible on the following countries: Denmark, Germany, Finland, France, the UK (all EU), the USA, Canada, Japan and South Korea. Added to this are the averages of the EU 15 and EU 25. The statistical annex to the publication in the back includes the results of all EU 15 countries individually.

2. ICT and the economy

The government policy in the area of ICT use at the national and European levels is quite intense. ICT is considered very important for the economic growth in Europe and the Netherlands. In 2004, the ICT sector contributed more than average to economic growth in the Netherlands. However, this was not yet expressed in growing employment in the ICT sector. Since 2000, the investments in ICT capital – excluding specific investments by the telecommunication sector in the ICT infrastructure – have constituted 11 to 12 percent of total investments in the Netherlands. ICT investments seem to have become a structural part of private and public sector investments. The growth of ICT expenditure in 2004 was mainly due to the growth of the consumption of ICT services. The contribution of the ICT sector to the total R&D expenditure by companies remains large. The contribution of the ICT services sector to R&D in the Netherlands has increased in recent years, although the R&D expenditure of the sector seems somewhat more sensitive to economic fluctuations than that of the ICT industry. Over the last decade, the number of patents submitted by companies and institutions increased substantially, both nationally and internationally. ICT patents made an above-average contribution to this development. The international trade in ICT goods and services is dominated, in terms of value, by the trade in ICT goods. The growth rate of the international trade in software and ICT services has increased in recent years. The large exports of ICT goods by the Netherlands in 2004 consist for almost 90 percent of re-exports, which are ICT goods not produced in the Netherlands. The number of people working in ICT increased slightly in 2004. Over one third of the ICT specialists are employed in the ICT sector, which makes the concentration of ICT specialists within the ICT sector rather dense. The number of students studying information science at the college and university levels fell in 2003/'04 and 2004/'05.

Considered in an international perspective, the Dutch ICT sector is average and consists mainly of ICT services. The R&D expenditure of the ICT sector in the Netherlands is high, as is the number of people working in ICT in the Netherlands. Compared to other countries few people are trained to be information experts in the Netherlands. The international trade in ICT goods and especially services is still growing substantially. However, the growth rates of countries like China and India are much higher than those of the European countries, Canada, Japan or the USA. The increasing globalisation of the economy is becoming tangible.

2.1 ICT and policy

At the national and European levels, government policy in the area of ICT distribution and use has been intense in recent years. At the European level there are now three action plans detailing ICT aims for a limited period of time. The Dutch government places its own emphasis within the European policy and aims for a top position in ICT use for the Netherlands within Europe.

In this paragraph, we will discuss key policy issues based on a number of major policy statements using a chronological order. In this way, we can follow the evolution of the policy aims. This shows that most issues are permanently on the political agenda and have grown increasingly detailed. Other issues become less important or change over time. Overall, we see what policy makers expect of ICT and what the obstacles are.

ICT and policy: before 2000

One of the first integral policy papers about the role of ICT in society is *De digitale delta*: *Nederland online* (EZ et al, 1999). In this paper, the Kok II government confirmed the importance of ICT for society and distinguished five pillars, which together determine the strength of the ICT basis in the Netherlands.

– the telecommunication infrastructure (pillar A);
– knowledge and innovation (pillar B);
– access and skills (pillar C);
– regulations (pillar D);
– ICT use in the public sector (pillar E).

Pillar A details the crucial role of the telecommunication infrastructure for the development of ICT use in the Netherlands. The country must have a high quality infrastructure that is dependable and affordable for the users. This requires investments and innovation by the parties involved in the production of the telecommunication infrastructure. Liberalising the telecommunication market and introducing a free market system has to guarantee a proper telecommunication infrastructure.

Pillar B provides an explanation why knowledge and innovation are necessary for an efficient and innovative use of ICT. This refers to knowledge that the ICT professionals have and – between the lines – the capacity to come up with innovative applications.

Pillar C details the importance of society's ability to absorb ICT: do individuals and companies have the opportunity to follow new developments in ICT and work with them? Education is assigned a key role in instructing people in ICT skills. Making government and cultural information available on-line is seen as a means to stimulate the use of the internet.

With pillar D, the government indicates that existing laws and regulations may not suffice for regulating behaviour in the information society. The role of the government is to equip legislation in the area of legal certainty and improving trust in the information society.

Pillar E expresses the ambition for the semi-public sector to set an example by making full use of ICT, optimising service quality. The fact that know-how and experience is scattered within the public sector is explicitly mentioned as a complication.

ICT and policy: 2000–2004

In the period 2000–2004, the European Commission formulated two eEurope action plans detailing several concrete aims in the area of ICT.

eEurope: An information society for everyone

In the action plan 2002 (EC, 2000) the three main goals were:

– a cheaper, faster, secure internet;
– investing in people and skills;
– stimulating internet use.

Some specific underlying goals were high-speed internet for students and researchers, large-scale use of the internet in education, stimulating technical and software-driven solutions for the safe data transmission through the internet, and on-line tenders for government commissions. It stated explicitly that (broadband) internet should be accessible to everyone in the European Union. Stimulating competition was seen as a good way to reach this goal although the 'market' may fail to deliver in all regions. Then there was the desire to have special websites for disabled people. After all the aim was an information society for everyone.
Electronic trade should be stimulated by gaining the consumers' trust, developing an electronic currency and increasing security of electronic trade. Finally, there are several specific goals for the application of ICT in certain sectors, such as intelligent transport systems.

The key issue of the second eEurope action plan, action plan 2005 (EC, 2002) was:
'The aim of this action plan is to create a favourable climate for private investments and new employment, increase productivity, modernise government services and provide everyone with the opportunity to participate in the worldwide information society. eEurope 2005 focuses on stimulating secure services, applications and content based on the large scale availability of broadband infrastructure.'

Apart from goals and initiatives that can easily be placed under the headings of the topics mentioned above, there are also special goals such as ICT use in small and medium-sized enterprises. There is the wish for inter-operability of networks and applications in general and within government in particular, aiming at problem-free electronic communication between governments at the pan-European level. The use of open source software and open standards is advocated and therefore stimulated. Finally, there was more emphasis on electronic access to public registers and our cultural heritage. Rich electronic content increases the use of the internet and government and the semi-public sector must set examples.

Many of these focal points can be found again in the translation of this European policy in *De rijksbrede ICT-agenda* (EZ et al, 2004a) of the Balkenende II government. Both at the European and at the national level the role of broadband internet is considered crucial. Broadband is the wheel that must drive the use and applications. This is outlined clearly in *De Breedbandnota* (EZ et al, 2004b). Broadband increases the number of applications and user friendliness for the (potential) users. Large-scale availability of broadband increases the economic base for investment for providers of broadband services and applications.

Apart from the more or less official policy papers, there are also other papers on the role of ICT in Europe during the period 2002–2004. One is *Rethinking the European ICT Agenda* (EZ et al, 2004c) showing more vision about the goals that can lift ICT use. Ten hypotheses are used to demonstrate that attention should be shifted away from ownership to the application and use of ICT. That ICT use would be stimulated tremendously if Europe could introduce standards in, for instance, electronic authentication and electronic payment. Furthermore, there is more emphasis on non-technological matters such as know-how and skills to actually use ICT in companies and at home. Developing electronic content to drive the use of broadband internet is underlined and the content industry is implicitly depicted as a potentially successful 'new' branch of industry.
Another report is *Facing the Challenge: The Lisbon strategy for growth and employment* (High Level Group, 2004), looking at the state of the Lisbon strategy of the European Union. In it, ICT plays an explicit role in driving economic growth by, for instance, developing new services. In this approach ICT is just one aspect of an integral economic and social policy that aims to increase competition by developing knowledge. This is a clear perspective, because the more specific policy papers on ICT sometimes seem to suggest that the use of ICT is an aim in itself.

ICT and policy: 2005 and beyond

The most recent policy goals at the European level are laid down in the third eEurope action plan called i2010: *A European Information Society for Growth and Employment* (EC, 2005). The policy initiatives are grouped around three key goals:
- a Common European Information space offering affordable, safe broadband communication, rich and varied content and digital services;
- ICT research and innovation at a world-class level bridging the gap between Europe and its main competitors;
- an inclusive information society stimulating high-quality and quantity government services.

At the national level the policy initiatives are detailed in the paper *Beter presteren met ICT: Vervolg Rijksbrede ICT-Agenda 2005–2006* (EZ et al, 2005c). This paper provides more detailed suggestions for the initiatives in the areas that we know quite well by now, such as the possibility for citizens and companies to supply their data only once to the government, electronic identification, high-speed internet, safety and reliability, standards, consumer protection (privacy, handling complaints) and stimulating ICT use in specific sectors such as health care, mobility, security and education.

Thread

The themes formulated in 1999 at the national level and in 2000 at the European level are still current in the policy conducted today. This paragraph opened with the five pillars of the Kok II government that, in their view, determine the strength of the ICT basis in the Netherlands. Although the paper dates back to 1999, the striking fact is that the five pillars are still as relevant today as they were then. Many of the policy goals and initiatives in the following years were a detailed working out of these pillars.

The most progress took place in the *(tele) communication structure*. Competition is pretty much 'total'. The various providers compete at three levels due to the convergence of networks, services and content. The number of providers offering telephone, internet and television is increasing. Consumers can opt for certain combinations of services, in which the underlying network is less important. Until recently users 'chose' a network because they wanted to use a particular service, and they had to take different networks for different services as the service and the network were more or less linked. In the further development of the telecommunication infrastructure the focus was much on spreading broadband internet. We have not seen the end of this development yet. Broadband is a 'moving target' dictated by the applications that are being developed. Broadband cannot be defined statically in terms of bandwidth, but rather in terms of functionality. When the applications do not all 'work', then the user has no broadband. The (market) mechanism driving the development seems to be working reasonably well so far. The process of increasing competition driving technology, applications and content has been described eloquently in *De toekomst van de elektronische communicatie* (EZ, 2005a).

In the area of the (technical) *reliability and safety* of the internet the problems are perhaps even bigger than several years ago. The 'inappropriate' use of the internet varies from unsolicited e-mail (spam), viruses and spyware to pure fraud such as phishing. This makes it problematic for large groups of users to start utilising the more advanced internet options. While the safety issues of the internet cannot be solved, they must at least become manageable. The same is true for confidence.

In the area of *knowledge and innovation* there are doubts as to whether the Netherlands get enough mileage out of the possibilities ICT offers. Worse, there are doubts whether the Netherlands is capable of getting enough mileage out of it. This debate has recently become burdened with the possible consequences of the offshoring of ICT activities (see also paragraph 2.10). If it isn't just the 'manual work' but also the 'brainwork' of ICT that is outsourced, does that harm or improve the knowledge and innovation base in the Netherlands? The Dutch government set up a group directing ICT research and innovation in 2004 in order to bring research and its application closer together and strengthen the ICT knowledge-based position of the Netherlands. This body coordinates ICT-related research and brings together the various parties (EZ et al, 2004d).

The area of *access and skills* involves opportunities for individuals and companies to participate in the information society. As far as individuals are concerned, we are talking about another ‘moving target’. At the start, the worry was whether people would want computers, internet and later broadband. Now the worry is about a more universal topic: does everyone have the required skills to actually use the possibilities on offer?

The expectations about the ICT use by companies have been adjusted over the years. The process seems to take somewhat longer than expected originally. The emphasis has shifted to non-technological changes that need to go hand in hand with ICT in order to benefit fully. There is a growing realisation that this is not a ‘plug-and-play’ operation. The fact that companies can communicate through the internet does not mean that the underlying applications in the various companies can be linked to it without any problem. The required standardisation of processes and applications is still a long way off. In addition, these are matters that the companies have to do themselves. The government can contribute substantially to e-business for instance with a breakthrough in the area of electronic identification and electronic payments. Users also realise that legal protection in e-business is not yet equal to doing business in the ‘old economy’.
Policymakers also realise that additional legislation is required about (commercial) content. This is to make sure that the producers or creators of content can rely on being paid for their work. Therefore, work must be done in the area of copyright and digital rights management.

The government wants to set a good example through successful ICT applications in the government-related sector to show what is possible. This is one motivation to elaborate on the use of ICT in the *public sector*. The domain of the public sector is ‘stretched’ to include the classical government tasks, health care, education, mobility and safety.

In conclusion

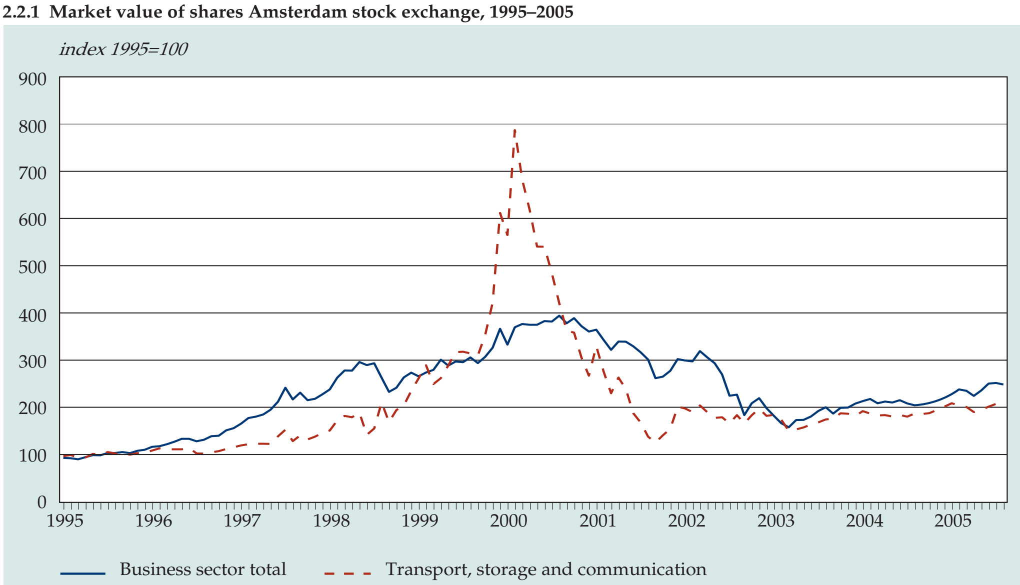
The different papers focus on slightly different issues when it comes to the influence of the use of ICT on society. The first is the wish to see returns on the enormous investments in ICT in the form of growing productivity by companies and government. This can happen in two ways. First, by doing the same things but more efficiently due to ICT, and second by doing more or new things due to ICT. It seems that between the lines the focus has shifted towards the second over the years,

a more offensive use of ICT. This is logical. After all, doing the same things more efficiently with ICT is a process that all companies go through and which is not expected to provide a competitive edge, because the companies that fail here will go bankrupt. Gains in growth and productivity by developing new products and services by using ICT and thus gaining new market positions, is a second more offensive manner. This, however, is a challenge to the sector testing its ability to 'market' knowledge and innovation, far more so than the first more defensive strategy.
Then there is the realisation that the large-scale use of ICT also leads to changes that cannot be captured in economic key figures, but that come within the domain of quality of life.

2.2 *The ICT sector*

The period 1996–2000 was a boom time for the ICT services sector. This is one reason why the ICT sector contributed more than average, during this period, to economic growth, investments and employment in the Netherlands. The telecommunication companies invested much in the period 1996–2000, mainly in setting up electronic networks, and they paid a great deal of money for UMTS-licences and take-overs of other (telecommunication) companies. However, income did not keep pace with spending in all cases. In 2000 share prices fell sharply for enterprises in general and

2.2.1 Market value of shares Amsterdam stock exchange, 1995–2005



Source: Statistics Netherlands.

telecommunication companies in particular. With hindsight, we see that the expectations about the speed with which the new technology would become profitable were too high.

In the period 2001–2003 the investments of the ICT sector dipped, employment also decreased and only the telecommunication sector made a positive contribution to the growth of the Dutch economy. In other branches of industry – the users of ICT – investments in computers and software no longer showed the high growth rates of 1996–2000. Collectively ICT investments were put on hold. In 2004 the ICT sector recovered slightly. The financial position of various telecommunication companies improved and the application and use of ICT continued to expand. The expectations about financial returns seem to be adjusted. The adjusted expectations for ICT are reflected in the development of share prices for the telecommunication companies: as of 2003, they have been going up albeit with a number of hiccups.

The ICT industry

The ICT industry is the only sector within the entire ICT sector that hardly performed any better than the economy as a whole in the period 1996–2004. Even at a time of worldwide growth in investments in and consumption of ICT goods, the Dutch ICT industry did not perform above average. Employment in the sector even decreased steadily. The share of the ICT industry in the total ICT sector has fallen over the years. Much of the required ICT goods, such as computers and peripherals, are imported because the Netherlands no longer produces them. The international trade and subsequently competition in ICT goods is many times greater than in ICT services. Compared to the market for ICT goods, the market for ICT services is in its infancy when it comes to international trade and competition. In retrospect, looking at 1996–2004, the year 2004 was above average for the ICT industry.

The Dutch ICT industry is influenced more than the ICT services sector by a number of multinationals. These enterprises belong in part to the Dutch ICT industry, and in part they are not included in the description of the Dutch economy since they have business units located in low-wage countries. Production, investments and employment are only described when they refer to companies or units located in the Netherlands. Therefore, the description of the Dutch economy does not include all costs and revenues of multinationals. This can lead to a distorted view, especially in the ICT industry. For instance, the cost of research and development (R&D) may be incurred in Dutch locations of the enterprises and are observed, whereas the benefits resulting from the R&D, the actual production of new or improved ICT goods, takes place elsewhere. The CPB, the Netherlands' Bureau for Economic Policy Analysis, addressed this issue in detail, also because the Dutch ICT industry hardly 'benefited' of the worldwide growth in the trade in ICT goods (Minne and Van der Wiel, 2004).

Table 2.2.1
The ICT sector compared to the Dutch economy, 1995–2004

	1996–2000 1)	After revision 2)		
		2002	2003*	2004*
	year-to-year volume changes in %			
Production value				
ICT industry sector 3)	6.2	–12.2	–8.7	1.4
ICT services sector	18.5	2.3	0.7	3.1
of which				
post and telecommunication	18.7	9.0	4.0	3.7
computer service bureaus	19.2	–7.5	–4.7	2.0
Total ICT sector	13.7	–2.0	–1.8	2.7
Netherlands	4.3	–0.8	–0.8	1.6
Gross value added				
ICT industry sector 3)	3.7	–20.9	–0.8	6.5
ICT services sector	16.1	4.2	0.8	3.7
of which				
post and telecommunication	15.7	14.1	3.8	4.6
computer service bureaus	18.0	–6.8	–3.5	2.5
Total ICT sector	13.0	0.8	0.6	4.0
Netherlands	3.7	0.2	0.0	1.7
Investments				
ICT industry sector 4)	9.9	–16.5	–10.8	.
ICT services sector	23.8	–41.4	–9.3	.
of which				
post and telecommunication	24.4	–44.0	–13.4	.
computer service bureaus	18.6	–23.0	13.5	.
Total ICT sector	20.7	–36.8	–9.7	.
Netherlands	5.2	–4.5	–3.5	2.9
Labour input of employed persons				
ICT industry sector 3)	0.3	–4.6	–8.1	–3.5
ICT services sector	10.9	–6.2	–5.3	–4.7
of which				
post and telecommunication	6.2	–7.8	–5.7	–6.0
computer service bureaus	16.8	–4.8	–5.0	–3.5
Total ICT sector	7.7	–5.9	–5.9	–4.4
Netherlands	2.6	–0.2	–0.9	–1.7

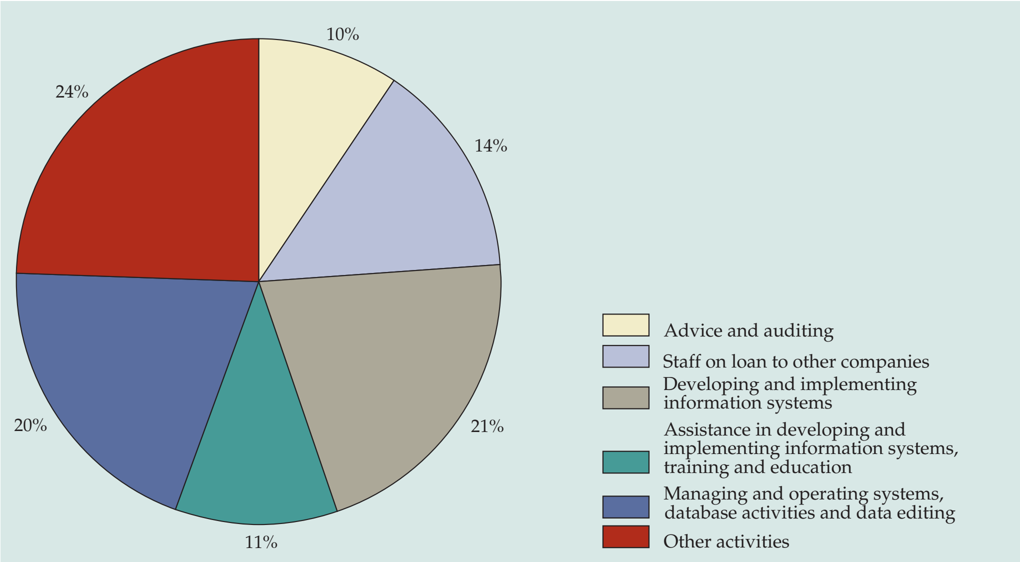
1) Average annual volume change in the period 1996–2000.
2) Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.
3) Estimated values for 2003 and 2004.
4) For investments, the ICT industry is defined as SBI 30–33. The investment data are not detailed enough to present them according to the internationally agreed definition for the ICT industry.

Source: Statistics Netherlands, National Accounts.

Computer service bureaus

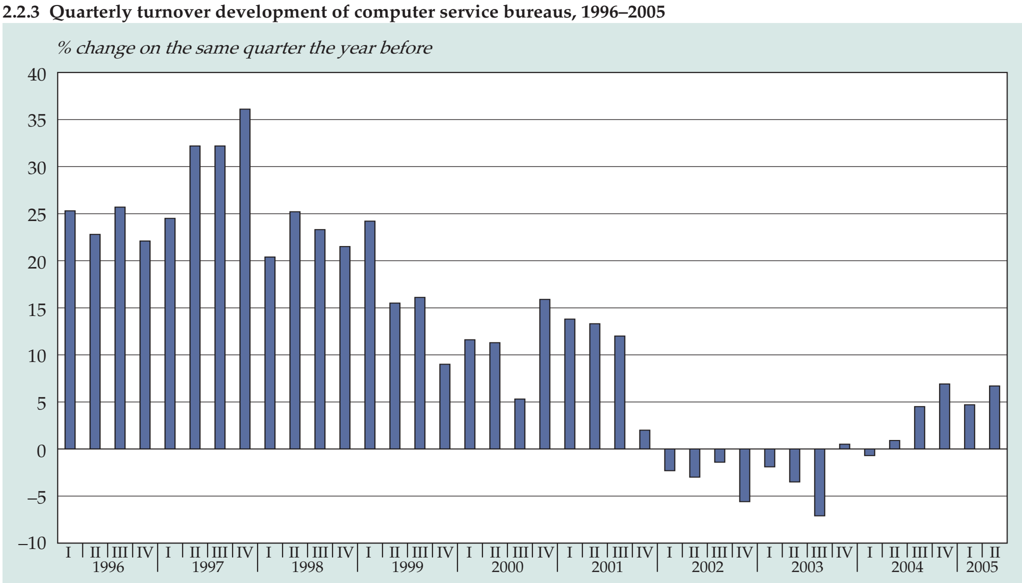
The importance of computer service bureaus in the ICT sector has increased greatly in recent years. In the period 1996–2000 it was the fastest growing of the three sectors observed within the ICT sector. The share of computer service bureaus in the total economy and employment doubled in the period 1995–2004 (see also table A2.2.1 in the statistical annex). The turnover of the sector consists mainly of developing and implementing information systems, managing and exploiting systems, advice,

2.2.2 Distribution of turnover computer service bureaus, 2003



Source: Statistics Netherlands.

2.2.3 Quarterly turnover development of computer service bureaus, 1996–2005



Source: Statistics Netherlands.

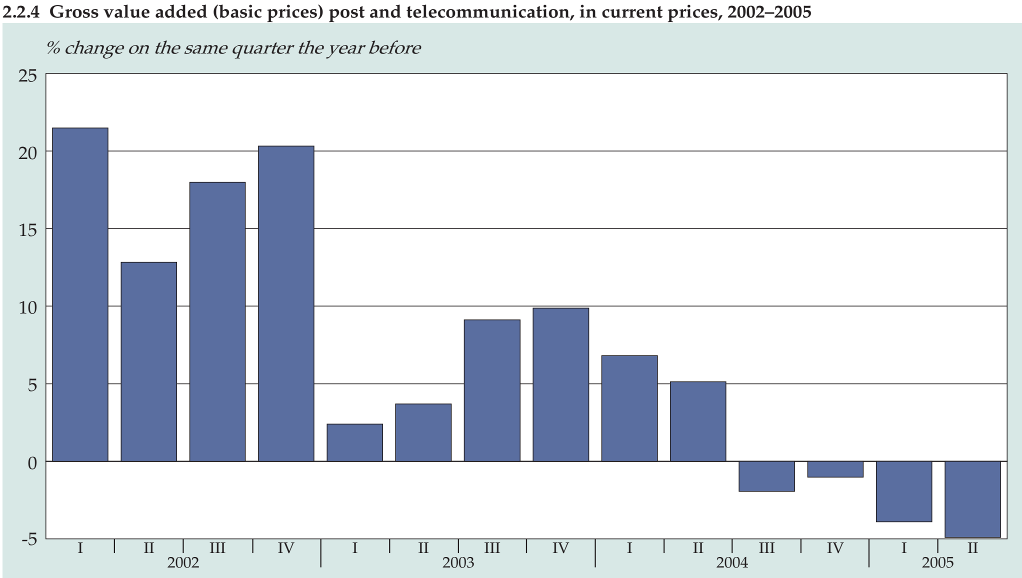
auditing and temporary placement of the bureau's own ICT experts. Most of the turnover is generated on the domestic market. The mirror image of the turnover of computer service bureaus comes from investments in software and intermediary consumption of computer services by the consumers of these services: other companies, households and the government in the Netherlands (see also paragraph 2.3).

The growth rate of computer service bureaus dipped faster than the rest of the ICT sector in 2002 and 2003. This went together with a dip in employment and investments. The 'shock' at the end of the internet hype apparently led many companies to put an end to the annually increasing expenditure on software and computer services. But in 2003 investments picked up again for the sector, and in 2004 and 2005 the turnover of computer service bureaus increased as well, albeit at a modest pace. In 2004 turnover reached the level of 2002 again, but it was still 3 percent lower than in the boom period of 2001. So far, the modest recovery in 2004 has not yet led to more employment, thus continuing the downward trend that started in 2001.

Telecommunication sector

The telecommunication sector is the only sector within the ICT sector that generated annual growth in the period 1996–2004. As is the case with computer service bureaus, employment in the sector has been falling in recent years, but in contrast with the computer service bureaus the production value and value added increased. So the

2.2.4 Gross value added (basic prices) post and telecommunication, in current prices, 2002–2005



Source: Statistics Netherlands, Quarterly National Accounts.

telecommunication sector managed to generate more production and value added with less personnel. The ratio between labour and capital is quite different in this sector than with computer service bureaus, where labour is by far the most important production factor. On a quarterly basis, the value added of the telecommunication sector fell in the last two quarters of 2004 and the first two of 2005.
It is not surprising that the telecommunication sector has been able to maintain the longest period of uninterrupted growth. The spread of communication technology in the form of mobile telephones and the internet is of a later date than that of computers and software. Furthermore, the increased data flow through these networks generates turnover for the telecommunication companies. Finally, the market for telecommunication is also mainly a consumer market and the consumers contributed much to the growth of the domestic telecommunication market (see paragraph 2.3). On the other hand, the application of ICT itself could lead to a drop in the turnover of telecommunication companies due to 'disruptive technologies'. For instance, making available free telephone connections through different, non-traditional networks and technologies at the expense of the traditional telecommunication (companies).

International

The economic importance of the ICT sector in the private sector in the Netherlands is above average when compared to other countries (see also table A2.2.2 in the statistical annex). The share of the ICT sector in the private sector has increased in all countries between 1995 and 2001. Finland is remarkable in that the share of the ICT sector in the total private sector doubled in this period from 8 to 16 percent. The share of the ICT sector in the larger countries France and Germany was average, although the ICT sector in Germany grew substantially.

Revision of the National Accounts 2001

At Statistics Netherlands, the statistics are constantly subject to change. On the one hand, this is because of new user demands, on the other hand because of changes in society. The national accounts, which describe the Dutch economy, are thoroughly revised once every five to ten years. The aim of the revision is to implement (internationally agreed) changes in concepts, classifications and definitions. The previous revision dated back to reporting year 1995. Here the new guidelines were implemented of the European System of Accounts (ESA95).
The aim of the most recent revision is primarily to refocus on statistical sources, whereby new and improved source statistics can be used. Furthermore, two key conceptual changes were implemented in the national accounts. These changes refer to the registration of interest margins of banks (FISIM) which are now attributed to users. And to the Special Purpose Entities (SPE), whose influence turns out not to be neutral for the various branches of industry, as was assumed prior to the revision.

Although it is no longer possible to make a complete comparison with the estimates for the years before the revision, we opted to place the developments in the ICT sector in a historical perspective. In the period before 2001 the developments in this sector were, after all, so substantial that the perspective on the ICT sector will not change.

In the section below we will summarize the quantitative consequences of the revision for the key sectors within the ICT sector.

Manufacture of electrical and optical equipment (SBI 30-33)
The value added at basic prices in the manufacture of electrical and optical equipment was decreased by 851 million euro compared to the estimate before the revision. The effect of FISIM for this branch of industry is 175 million euro. The remaining part of the adjustment is due to the link with the production statistics. Both production and intermediate consumption have seen substantial upward adjustments of 1,343 and 2,019 million euro respectively (excluding FISIM). On balance, however, the result is a negative adjustment of the value added. The adjustments are closely linked to changes in the international transactions in this branch of industry.
Labour input was lowered by 6.9 thousand fte jobs compared to the estimate before the revision.

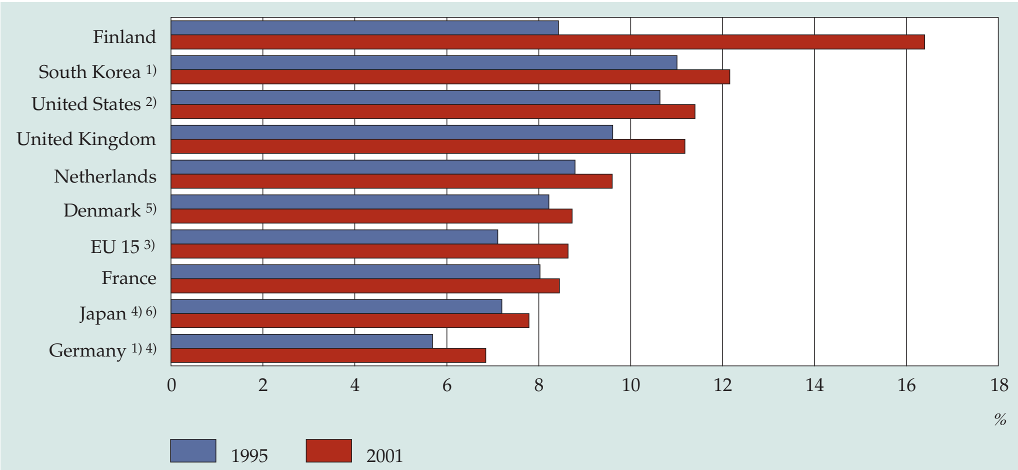
Post and telecommunications (SBI 64)
The value added at basic prices in post and telecommunications was decreased by 732 million euro compared to the estimate before the revision. The effect of FISIM for this branch of industry is 186 million euro. The main reason to change the value added is the link with the production statistics, which on balance resulted in a downward adjustment of the value added of 546 million euro. Both production and consumption in this branch of industry have seen substantial upward adjustments. The production was estimated 1,939 million euro higher than before the revision; the consumption (excluding FISIM) came out 2,485 million euro higher. About 1 billion euro is ‘debiting and crediting’ of supplying telecommunications services between the various suppliers, which occur in production and consumption. Furthermore, there is a substantial increase in costs pertaining to business services. The extra production is mainly sold to consumers. Labour input was raised by 2.8 thousand fte jobs compared to the estimate before the revision.

Computer service bureaus (SBI 72)
The value added at basic prices of computer service bureaus was increased by 399 million euro compared to the estimate before the revision. The effect of FISIM for this branch of industry is 134 million euro. The remaining part of the adjustment is due to the link with the production statistics. There are relatively many small companies in this branch of industry, which means that the new approach in compiling the production statistics has a major influence. Both production and intermediate consumption (excluding FISIM) in this branch have seen substantial upward adjustments of 2,115 and 1,582 million euro respectively. Labour input was raised by 6.9 thousand fte jobs compared to the estimate before the revision.

Source: Statistics Netherlands (CBS), National accounts - Revision 2001.

How big the ICT sector is in a country is important for several reasons. First in terms of economic growth, it is positive if the domestic ICT sector could benefit from the worldwide growth in the trade in ICT goods. This is especially true for the ICT industry operating on the international market. The market for ICT services is mainly domestic and therefore less influenced by international competition, which also limits its growth perspective. Secondly, a substantial domestic ICT sector may generate sufficient 'critical mass' to engage in structural R&D, attracting more companies or stimulating existing companies to develop in-house knowledge in the area of ICT and ICT applications. The potential for growth and the R&D intensity are influenced by how the ICT sector is set up: ICT industry versus ICT services. In general, the ICT industry contributes more to the R&D activities of a country than the ICT services sector (see paragraph 2.4). In Finland, South Korea and Japan the domestic ICT sector is dominated by the ICT industry. In France, Germany, Denmark and the Netherlands the domestic ICT sector is dominated by the ICT services sector (OECD, 2002).

2.2.5 Share of ICT sector value added in business sector value added, international, 1995 and 2001



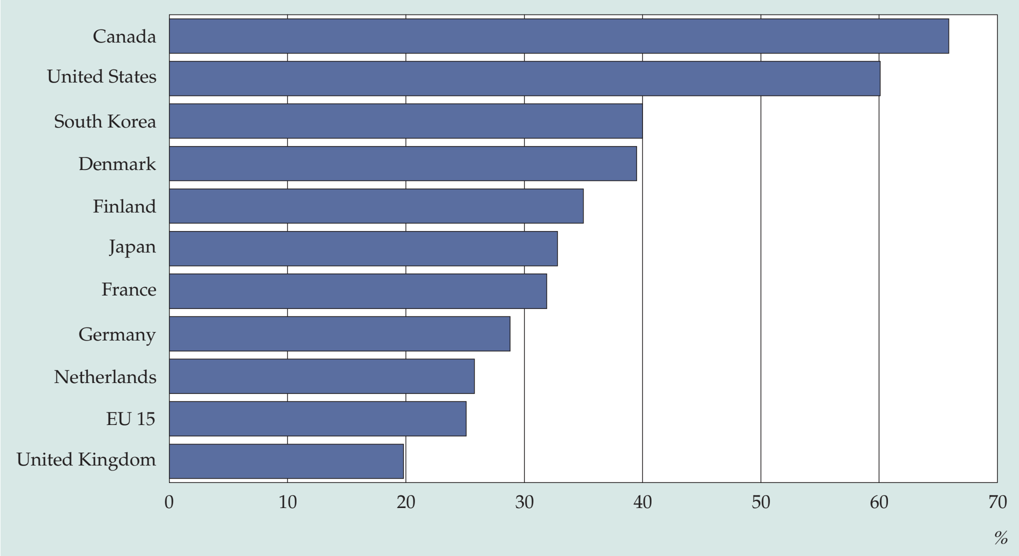
1) Rental of ICT goods is not available.
2) 1996 instead of 1995.
3) Excluding Luxembourg.
4) ICT wholesale is not available.
5) 2002 instead of 2001.
6) Includes only part of computer related activities.

Source: OECD, Information Technology Outlook 2004.

Venture capital and ICT

About a quarter of the total amount in venture capital spent in the Netherlands in the period 1999–2002 was invested in ICT. This is the same as the EU 15 average, but substantially less than in the four countries observed outside the EU. Venture capital provides high-risk investments in young, fast growing (technology) companies (PriceWaterhouseCoopers, 2005). So even during the ICT boom, the amount of

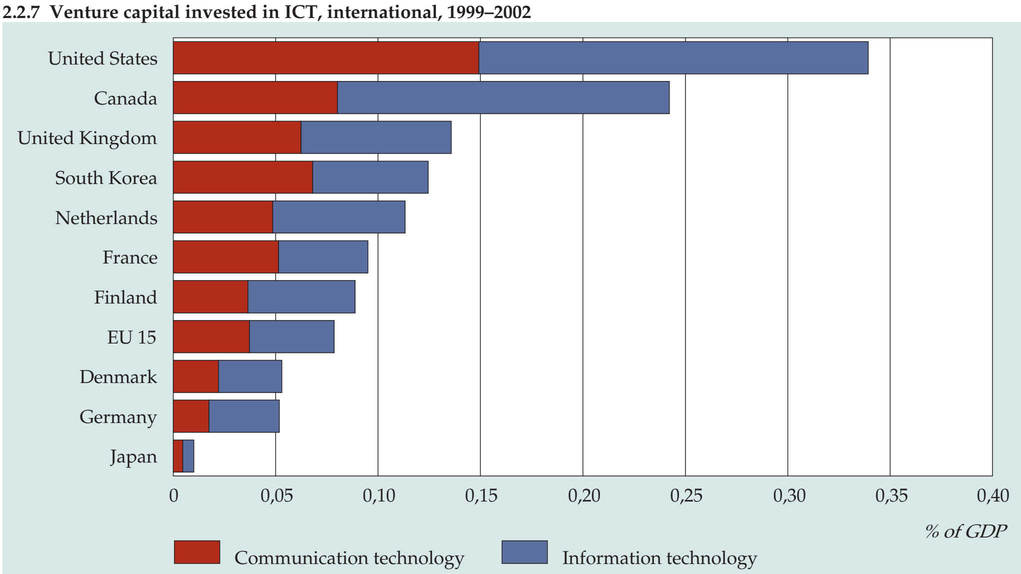
2.2.6 Venture capital investments in ICT as a percentage of all venture capital investment, international, 1999–2002



Source: OECD, Information Technology Outlook 2004.

venture capital invested in ICT in the Netherlands was modest. In other countries, investors bet more money on the same horse. For instance, in Ireland the venture capital invested in ICT was 80 percent of the total (see also table A2.2.3 of the statistical annex).

2.2.7 Venture capital invested in ICT, international, 1999–2002



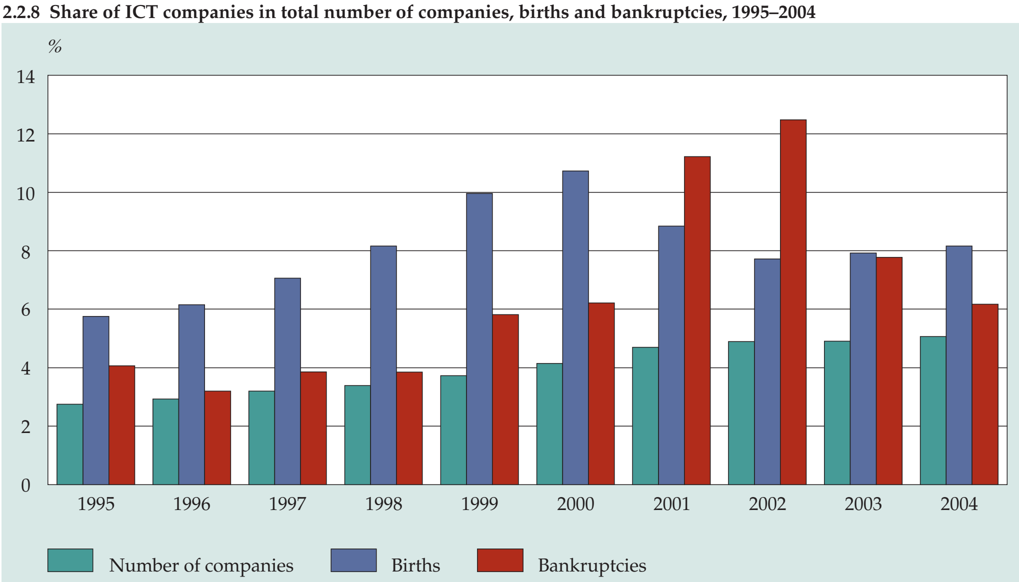
Source: OECD, Information Technology Outlook 2004.

Despite the fact that the share of the venture capital invested in ICT in the Netherlands was average, the actual amount of venture capital was great in comparison to other European countries. The investments equal 0.1 percent of GDP in value and this ranks the Netherlands well above the EU 15 average. This percentage is also higher than that of a trendsetting nation like Finland. The USA leads in the 'ranking' with venture capital invested in ICT reaching almost 0.35 percent of GDP. In the Netherlands most of the venture capital invested in ICT is late-phase financing (financing of existing enterprises) rather than early-phase financing (starter capital for new companies). Therefore, in the Netherlands the venture capital invested in ICT is something of a less than daring venture.

More companies but less employment

The economic development of the ICT sector is reflected in the development of the number of companies in the ICT sector. During 1995–2004 the share of ICT companies in the total number of newly created and bankrupted companies was greater than the share in the total number of companies in the Netherlands. There is a great deal of dynamics in the creation and demise of companies in the sector. On balance, the number of ICT companies shows a continuous growth. The development of the number of ICT companies is dominated by the development of the number of computer service bureaus. This is a relatively new branch of industry that does not require enormous amounts of starter capital for beginning entrepreneurs. This reduces the threshold for starting a company. The opposite is

2.2.8 Share of ICT companies in total number of companies, births and bankruptcies, 1995–2004



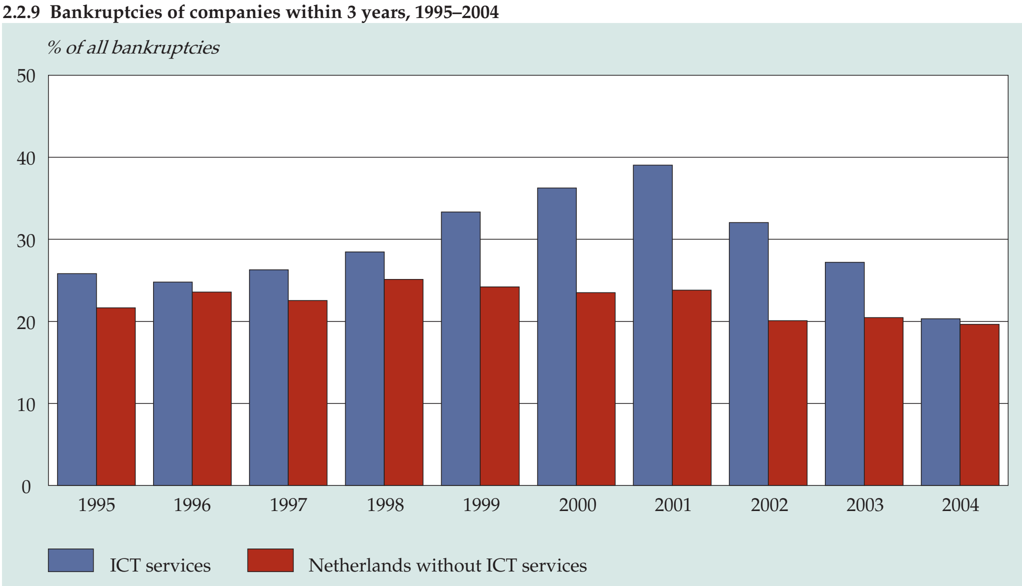
Source: Statistics Netherlands.

true for the ICT industry and for telecommunication companies. Yet the number of telecommunication companies increased substantially in the period 1995 through 2004. The steady growth of the number of companies does not mean that the employment in the ICT sector increased as well. In recent years employment in the computer service bureaus and the telecommunication sector fell. Apparently, many of the newly started companies in the ICT sector are small, so that the employment created by these companies does not compensate for job losses in the larger companies in the ICT sector.

The reversal in economic growth is also reflected in the dynamics of the number of companies in the ICT sector. In 2001 the results of the reversal are clearly visible: there were fewer new starts and more bankruptcies, both in above-average numbers. This is even more the case in 2002. After the transition year 2003, the share of company births exceeded that of bankruptcies again in 2004. The absolute number of new starts is always much greater than the number of bankruptcies. On average, for the entire period 1995–2004 the number of new starts is almost thirteen times as high as the number of bankruptcies (see also table A2.2.4 in the statistical annex).

Since the threshold for starting a company in the ICT services sector is lower than for manufacturing, not all newly started companies had an equal chance of becoming successful. In the ICT services sector there is an above average number

2.2.9 Bankruptcies of companies within 3 years, 1995–2004



Source: Statistics Netherlands.

of bankruptcies, of mainly young companies. The young companies, existing less than three years in the ICT services sector, made up about 40 percent of all bankruptcies in the record year 2001. The average for the Netherlands in 2001 was about 25 percent. At the peak of the internet hype, there were many ‘gold diggers’ in the ICT sector. The number of new companies entering the market is seen as an indicator of the openness of that market and is considered positive for competition. The new competition may be neutralised by the larger existing companies on the market through mergers or take-overs. This latter may happen because the new companies own innovations, know-how, and ideas that the larger companies don’t have and seek to purchase in this way in order to gain access to a (niche) market.

Telecommunication market

The aim of the liberalisation of the telecommunication market initiated by the government is to get more providers of telephone services, internet and the required infrastructure. The resulting competition, or increased choice for the consumers, must guarantee high-quality provisions resulting, among others, in an increased number of innovative services at competitive prices. There has been a substantial increase in the number of telecommunication companies in recent years. There is a tendency to have several service providers at the same network and to offer more services on networks that were capable of providing only one service until recently. Several companies providing telephone services use the network of the company that previously had the monopoly in the Netherlands. Companies that used to transmit only radio and TV due to their technical limitations can now offer telephone services and internet access and vice versa. The process of liberalising the telecommunication market and increasing competition via networks and services is taking place in all countries within the EU.

An indication of the level of competition is the market share of the largest provider. In most countries, this company used to have the (state) monopoly on the market. The trend in mobile phone markets, fixed telephone lines and broadband internet is one of several providers and a decreasing market share of the original main provider of these telecommunication services. A recent description of the developments of the various markets constituting telecommunication can be found in the *Marktrapportage elektronische communicatie september 2005* (TNO, 2005).

2.3 ICT expenditure

Domestic expenditure on ICT goods and services consists of:

– investments by companies and government in ICT capital;
– the intermediate consumption by companies and government;
– household consumption.

The development of domestic expenditure on ICT goods and services parallels the development of the domestic ICT sector as outlined in the previous paragraph. ICT services operate mainly on the domestic market, which means that companies, households and the government in the Netherlands use services provided by companies located in the Netherlands. Domestic expenditure and domestic production go hand in hand. Generally, the development on the demand side of the market for ICT services is equal to that of the supply side.

Annual investments in ICT capital, intermediate consumption and consumption have grown substantially in the period 1996 through 2000. In the following years the growth rate slowed down, sometimes even to the point of negative growth. Investments in ICT capital dipped, mainly due to less investment in electronic networks by telecommunication companies.

The intermediate consumption of ICT goods dipped in 2002. Only the household consumption of ICT goods and services kept growing over the years. In terms of ICT goods, this involves mobile phones, televisions, digital cameras, and of course computers. In terms of ICT services, it mainly involves the costs of the actual use of the internet and the mobile phone.

Investments in ICT capital

In the period 1996 through 2000 investments in ICT capital saw an annual growth rate of almost 18 percent. This was greatly influenced by the major investments of the telecommunication companies in providing, extending and modernising electronic networks for the internet and mobile telephone services.

After 2000, these investments dropped to a point where it largely explains the decrease in the total investment in ICT capital in the period 2001–2003. The investments in hardware and software, mainly by branches of industry using ICT, showed a different development in the years 2001–2003. The value of the investments in computers increased again in 2003. Investments in software have decreased in recent years but far less so than the investments in electronic networks.

The share of the investments in computer hardware in the total investments in ICT capital fell from 41 percent in 1995 to 34 percent in 2003, whereas the share of software in the total investments in ICT capital increased. In 1995 the investment in software per one hundred euro invested in computer hardware was 86 euro; in 2003 it was 146 euro. Software is a benchmark for advanced use of ICT. New software often means new or improved ICT applications. In that sense it is not surprising that users keep investing in ICT user applications. The decreasing share of investments in computers is enforced by the fact that computer prices increase less than software costs (or even fall).

Table 2.3.1
Investments in ICT capital, 1995–2003

	1995 [2]	After revision [1]		
		2001	2002	2003
	million euro			
Computer hardware	2,714	4,368	4,027	4,157
Software	2,332	6,570	6,291	6,074
Electronic networks	1,638	3,873	2,398	1,875
Total ICT	6,684	14,811	12,716	12,106
Total investments Netherlands	61,347	94,673	92,862	90,747
	%			
Computer hardware	41	29	32	34
Software	35	44	49	50
Electronic networks	25	26	19	15
Total ICT	100	100	100	100
% of total investments Netherlands	10.9	15.6	13.7	13.3
	year-to-year volume changes in %			
Computer hardware	12.9	.	7.3	17.3
Software	18.2	.	–5.5	–4.5
Electronic networks	21.5	.	–39.1	–20.9
Total ICT	17.5	.	–10.5	–0.7
Total investments Netherlands	5.2	.	–4.5	–3.5

1) Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.
2) Average annual volume change in the period 1996–2000.

Source: Statistics Netherlands, National Accounts.

The largest decrease was in investments in electronic networks. The share of this category in the total investments in ICT capital fell from 25 percent in 1995 to 15 percent 2003.

The share of the investments in ICT capital in the total investments in the Netherlands increased from 10.9 percent in 1995 to 13.3 percent in 2003. In 2000 it had the largest share with 16.8 percent (see also table A2.3.2 in the statistical annex).

Computer prices, after the revision

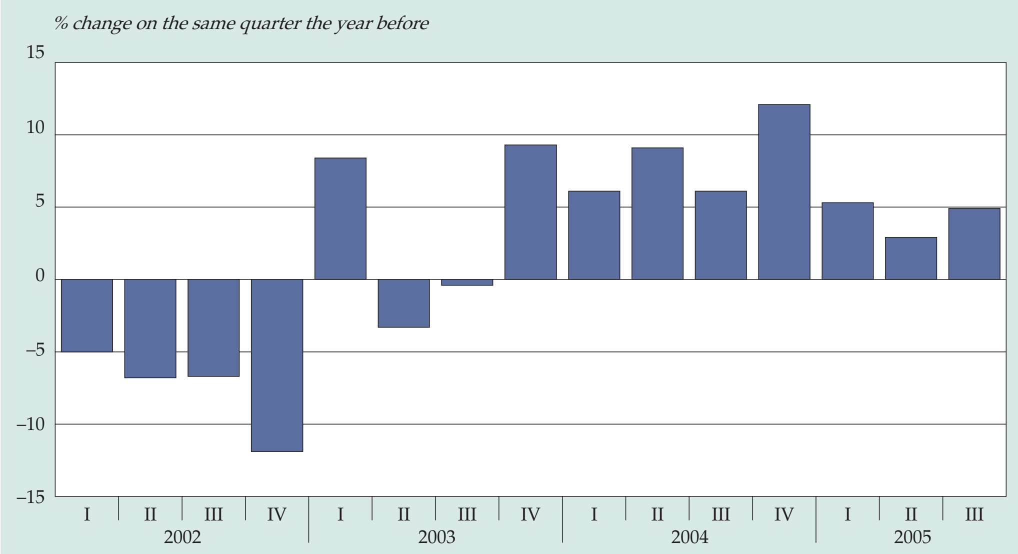
A key element in the revision of the national accounts of 2001 is the change in the way the price developments of computers are estimated. The deflator used for the figures prior to the revision was no longer considered representative for the deflation of investments. This producer price index was based on the price developments of computers and peripherals produced in the Netherlands. Importers were hardly counted, whereas many computers are imported. Therefore, in the revision of 2001, the decision was made to follow the price developments according to the US index for '*private fixed investments in computers and peripherical equipment*'. This index is included in the national accounts of the USA and is adjusted for changes in the quality of computers and peripherals. This constitutes a complex measuring problem. The development of ICT goods is characterized by the fact that people 'get more computer for the same price'.

The result of the change in method is that the originally estimated price developments of the (gross) production, imports and exports and investments in 2002 en 2003 saw a downward adjustment. The revised method for determining the price development of computers led to a raised volume change – at an identical value development. The effect on the volume changes of the gross domestic product (GDP), however, is limited: 0.1 percent point in 2002 and zero in 2003. There is a greater effect on the underlying expenditures. The volume changes of investments are upwardly adjusted both in 2002 and in 2003 with 0.5 percent points. The volume changes of international trade are also upwardly adjusted: exports by 0.4 percent points in 2002 and 1.4 percent points in 2003, and imports by 0.9 and 1.7 percent points respectively. On balance, the effect of these changes on GDP is modest.
The price index used for the deflation of household consumption already contained a correction for quality changes and remained the same during this revision.

Source: Statistics Netherlands (CBS), Revisie Nationale rekeningen: bijstellingen 2001–2004.

Looking at the growth rate of the turnover of computer service bureaus (see paragraph 2.2) it seems that there is a recovery in 2004 and 2005 of investments in software. Investments in computers have increased from the fourth quarter in 2003 through the second quarter of 2005. It is not very likely that a similar recovery will occur in the investments in electronic networks: these are specific investments by a limited number of players. This may produce great annual fluctuations in investments, which may be compounded by the type of investment: it is unnecessary to invest in the modernisation of existing networks or production of new ones every year.

2.3.1 **Gross investments in computers, current prices, 2002–2005**

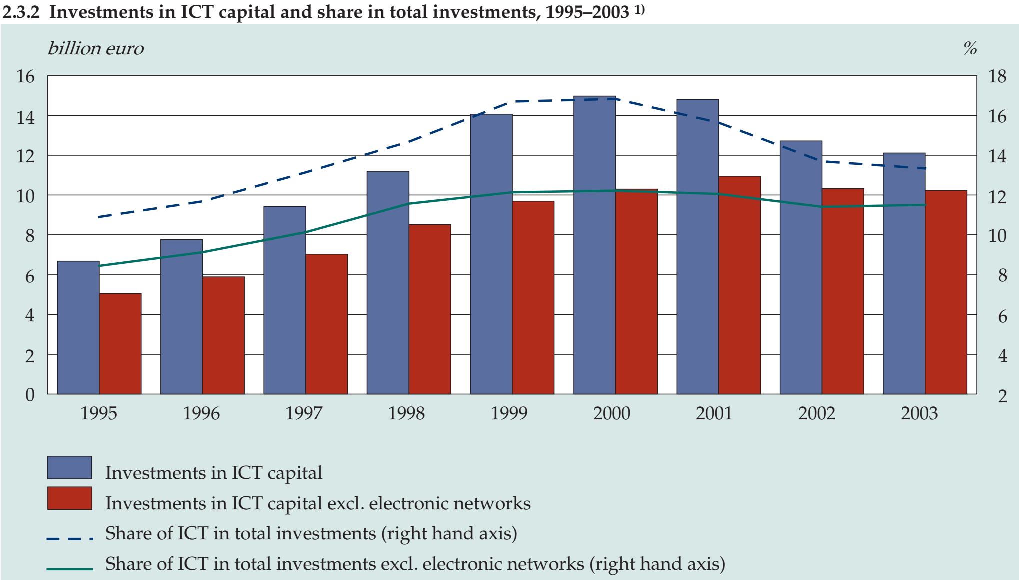


Source: Statistics Netherlands, Quarterly National Accounts.

ICT investments remain important

The highest level of the ICT investments and their share in the total investments occurred in the year 2000. If the fluctuations in the investments in electronic networks are not taken into account, the remainder is stable. Investment in ICT

2.3.2 **Investments in ICT capital and share in total investments, 1995–2003** 1)

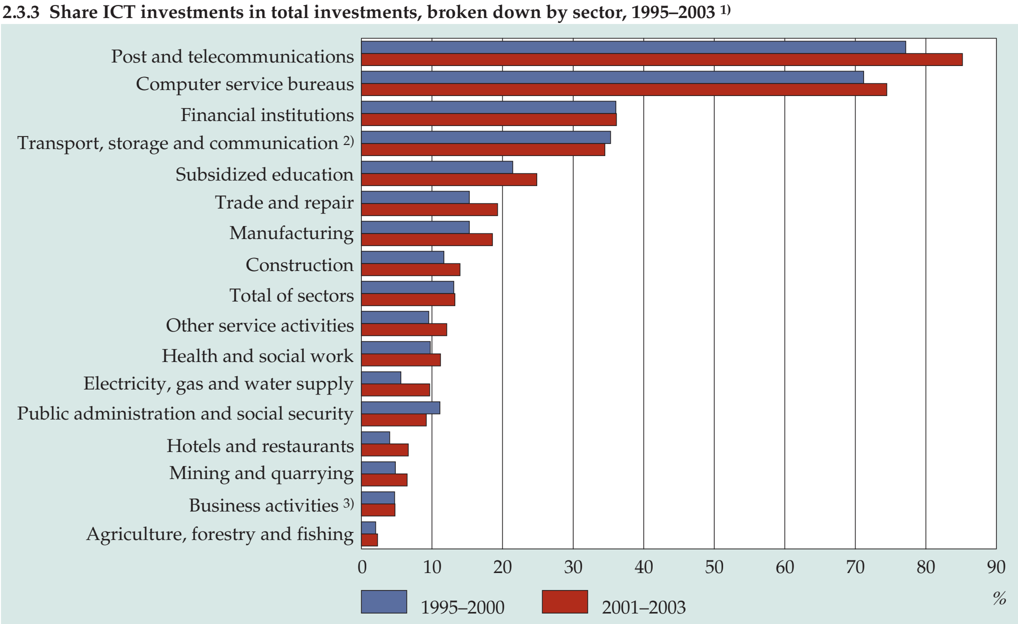


Source: Statistics Netherlands, National Accounts.

capital, excluding the investments in electronic networks, has decreased fairly little in the years after 2000. The share of these ICT investments in total investments has been about 12 percent since 2000. The dip in the investments of the large group of companies using ICT is not as great as the dip in the total investments in ICT capital. Furthermore, the share of the ICT investments excluding the electronic networks has remained stable in the years of decreasing total investments. So there were no deeper cuts in the investments in ICT capital than in investments in other capital goods, such as commercial property, machinery and means of transport.

There are great differences among the branches of industry when it comes to their share in ICT investments in their total investments. The share is huge for telecommunication companies and computer service bureaus. For these two branches, constituting the ICT services sector, the share of the ICT investments increased in the period 2001–2003 while the total investments of these branches fell. So during this period of investment cuts, these branches cut back on the investments in other capital goods rather than in the investments in ICT capital. In general, the share of ICT investments in the total investments in the period 2001–2003 did not decrease but increase for most branches of industry compared with the period 1995–2000. Government distinguishes itself as one of the very few sectors in which the share of ICT investments fell, and more sharply than others.

2.3.3 Share ICT investments in total investments, broken down by sector, 1995–2003 [1]



1) Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.
2) Including post and telecommunications.
3) Including computer service bureaus.

Source: Statistics Netherlands, National Accounts.

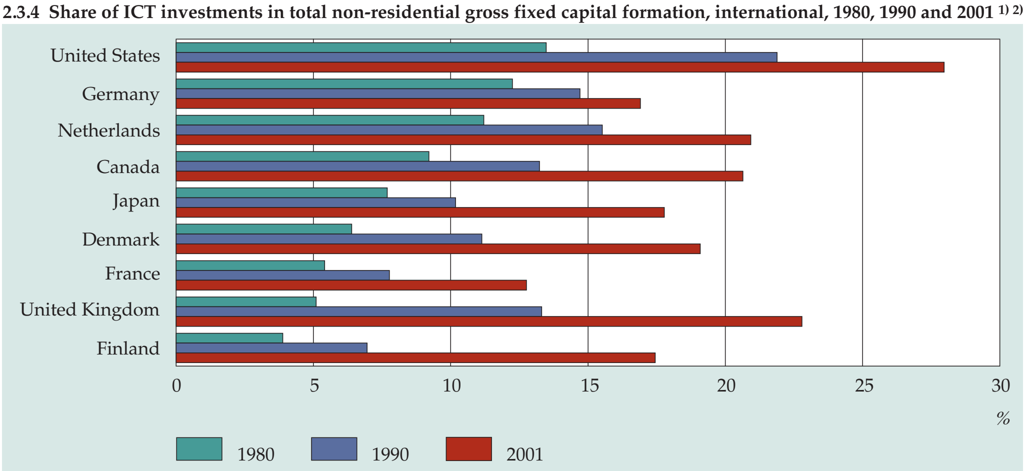
Apart from the specific investments in electronic networks, the ICT investments seem to have become a structural part of the total investments of Dutch companies. ICT investments follow the fluctuations in the investment levels, but they are certainly not the first category to be cut.

In terms of investment level, the financial institutions are the largest investors in ICT apart from the telecommunication sector. Together with the telecommunication sector they account for one third of all ICT investments in the Netherlands (see also table A2.3.1 in the statistical annex).

Share of ICT investments internationally

The international trends are the same as in the Netherlands: a large increase in the share of ICT investments in total investments. Comparison shows that the Netherlands already invested relatively much in ICT as early as 1980. The gap with other countries has closed over the years. The UK invested a great deal in ICT recently and its share of ICT investments was higher in 2001 than that of the Netherlands, whereas the gap was huge in 1980. ICT investments in Finland and Denmark also grew relatively faster than in the Netherlands. The ICT intensity of the investments was and is great in the Netherlands. It must be taken into account that the economic life of ICT investments is short in comparison with other capital goods. The ICT investments of the 1980s and '90s have evaporated by now. A country cannot invest in ICT in advance but must do so time and again in order to have the latest hardware and software. More recent investments in ICT therefore represent

2.3.4 Share of ICT investments in total non-residential gross fixed capital formation, international, 1980, 1990 and 2001 [1) 2)]



1) ICT hardware is defined here as computer and office machinery and communication equipment; software contains bought and self-constructed software. The software investments in Japan are probably underestimated due to methodological differences.

2) 2001 for France, Germany, Canada and the United States, and 2000 for all other countries.

Source: OECD, Information Technology Outlook 2004.

a later technology than ICT investments in previous years. Germany distinguishes itself by the lower ICT intensity of its investments, and limited growth in ICT investments. Expressed in percent points, the gap between the USA and most European countries observed has widened.

Intermediate use and consumption of ICT goods and services

Investments in ICT capital, per definition made by the private and public sectors, are only part of the total amount spent on ICT in the Netherlands. Besides investments, companies and the government also have expenditure on hardware maintenance, IT consultancy etc. Moreover, households spent money on ICT goods and services:

Table 2.3.2
Intermediate use and consumption of ICT goods and services, 1995–2004

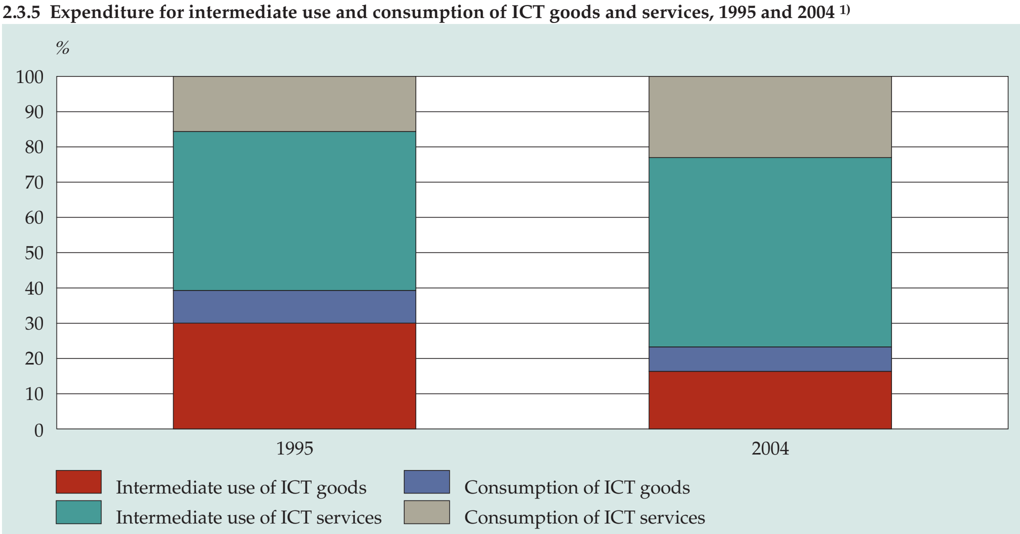
	1995 [2]	After revision [1]			
		2001	2002	2003*	2004*
	million euro				
Total ICT expenditure [3]	19,272	39,423	40,150	40,503	40,565
Intermediate use	14,475	28,585	28,307	28,442	28,414
Consumption	4,797	10,838	11,843	12,061	12,151
Total ICT goods [3]	7,570	11,414	10,764	10,038	9,452
Intermediate use	5,785	8,232	7,548	7,030	6,640
Consumption	1,785	3,182	3,216	3,008	2,812
Total ICT services	11,703	28,009	29,386	30,465	31,113
Intermediate use	8,690	20,353	20,759	21,412	21,774
Consumption	3,013	7,656	8,627	9,053	9,339
	year-to-year volume changes in %				
Total ICT expenditure [3]	15.8	.	3.7	3.2	2.3
Intermediate use	14.3	.	1.9	3.5	1.4
Consumption	20.2	.	8.7	2.4	4.4
Total ICT goods [3]	10.9	.	–1.9	2.9	1.3
Intermediate use	8.5	.	–6.0	2.6	1.0
Consumption	18.6	.	8.8	3.6	2.1
Total ICT services	18.5	.	6.0	3.3	2.7
Intermediate use	17.7	.	5.1	3.8	1.6
Consumption	21.0	.	8.6	2.0	5.1

[1] Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.
[2] Average annual volume change in the period 1996–2000.
[3] Estimated values for 2003 and 2004.

Source: Statistics Netherlands, National Accounts.

consumption. Expenditure for intermediate use and consumption in the year 2004 are double the expenditure in the year 1995. In recent years the expenditure on ICT goods and services increased, but no longer with the percentages of the period 1996–2000. The consumption of ICT goods and services has the greatest volume increase, just like before: the growth for ICT goods and services is mainly caused by the steady increase in consumption. There has been a shift in ICT expenditure away from goods and toward services and from intermediate use to consumption. In 1995 some 60 percent of ICT expenditure was on services, in 2004 it was three quarters. In 1995 one quarter of ICT expenditure consisted of household consumption, in 2004 this was almost a third.

2.3.5 Expenditure for intermediate use and consumption of ICT goods and services, 1995 and 2004 1)



1) Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.
Source: Statistics Netherlands, National Accounts.

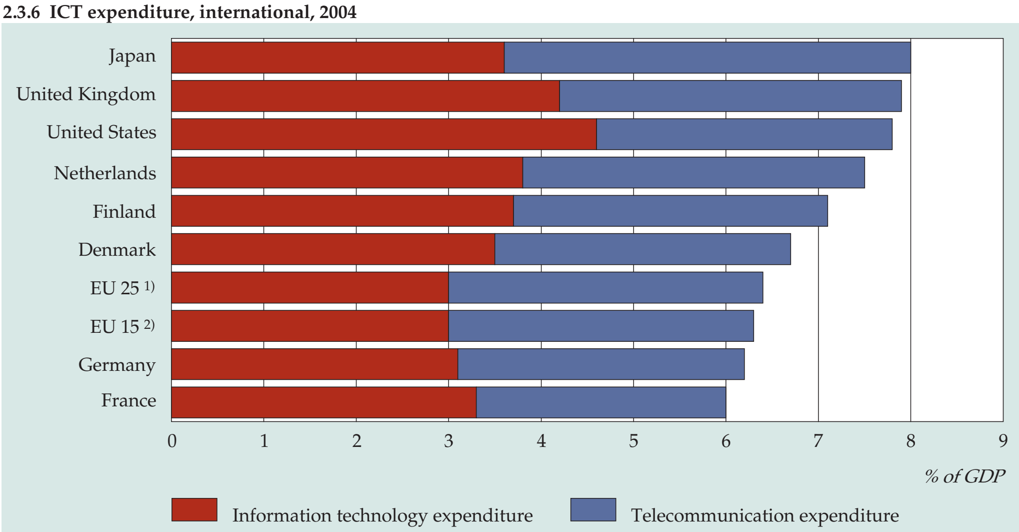
There has also been a shift in these macroeconomic totals on the expenditure side of the ICT market from expenditure for purchasing and replacing ICT goods (hardware) to expenditure for the use of these ICT goods (services). Consumer expenditure on computers is gradually becoming less important as most households that want to use computers have them. Purchases of new computers therefore are now replacements of existing computers, which can take place in a wider period. The frequency with which new computers are bought may be lower if the new generation of computers is not 'better' to the same degree as the previous generation several years ago. An illustration of the widespread ownership of computers among households is perhaps also the abolition of the '*pc-privé regeling*' (where the government and the employer paid part of the computer costs). It seems to have served the purpose for which it was created.

The growth of the telecommunication services has lasted longest. However, it is also the most recent technology. The wide distribution of mobile telephones and the internet is later than that of the computer. The growing use of the internet and mobile telephone services generates a great flow of data and communication. This leads to a growing expenditure on telecommunication services. The growing expenditure on telecommunication services goes hand in hand with a growing share of consumption in total ICT expenditure, because the market in telecommunication services is much more a consumer market than the market for computers, computer services and software.

ICT expenditure in an international perspective

In comparison with other countries, the total ICT expenditure (investments, intermediate consumption and consumption) is high in the Netherlands. In all countries except the USA and the UK, expenditure on information and communication technologies remarkably is about the same. In the USA, and to a lesser degree in the UK, expenditure on information technology dominates. In the period 2002–2004 the ICT expenditure showed a (relative) decrease. In the EU 15 the expenditure on information technology fell from an average of 3.2 to 3.0 percent of GDP. In the USA telecommunication expenditure fell from 3.4 to 3.2 percent of GDP (see also table A2.3.5 in the statistical annex).

2.3.6 ICT expenditure, international, 2004



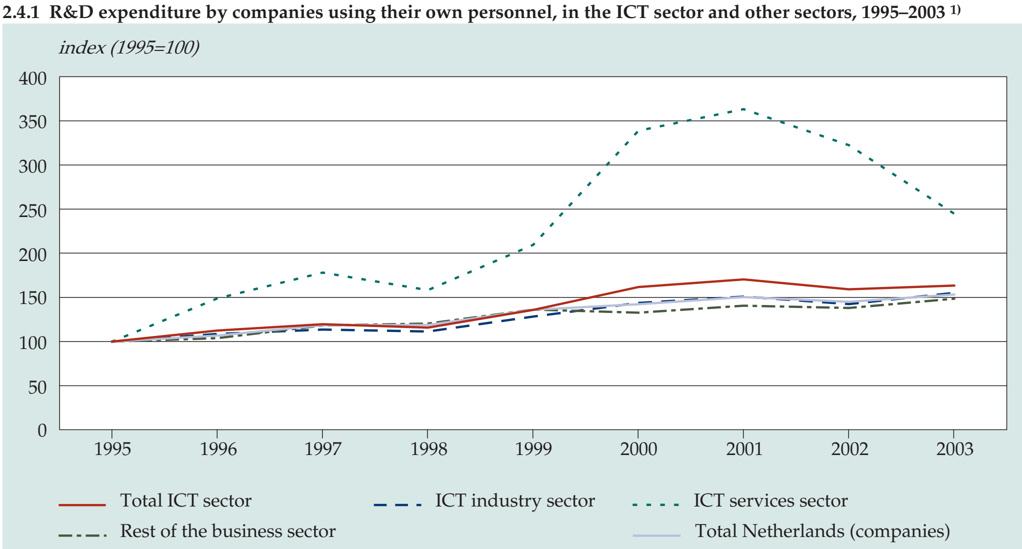
1) Excl. Cyprus and Malta.
2) Excl. Luxembourg.

Source: Eurostat, New Cronos.

2.4 *R&D expenditure of the ICT sector*

Research and development (R&D) is important in the development of knowledge. R&D may lead to innovations allowing companies to produce more efficiently or to introduce new products on the market. The innovations may be patented. Patents are a means for the 'inventor' to cash in on the economic benefits of the innovation. The most direct way is to prevent third parties from exploiting the innovation by patenting it. Indirectly, by giving a limited number of others the right to exploit the patented innovation for a fee during a defined period. In short, R&D and innovations can be turned into cash. When a country or branch of industry has a mechanism that guarantees structural R&D endeavours that regularly lead to innovations, this improves the competitive edge of that country or branch of industry. An alternative is that a company, country or branch of industry invests less in R&D and becomes more dependent on innovations by others. They sometimes have to pay for the use of these for instance by license, or the use is opened up later. In this way, they become more dependent on the indirect 'purchase' of knowledge. When a company or branch of industry marginalises its own R&D endeavours, it may lose its mechanism or infrastructure with which investments in R&D are made, knowledge is developed and transferred and innovations are realised and used for profit. R&D is not an activity that can be done at a high level after years of neglect. Expenditure on R&D is a measure for a country's or branch's ambition to do (fundamental) research.

2.4.1 R&D expenditure by companies using their own personnel, in the ICT sector and other sectors, 1995–2003 [1)]



[1)] Companies with 10 and more employees / employed persons (from 2002).

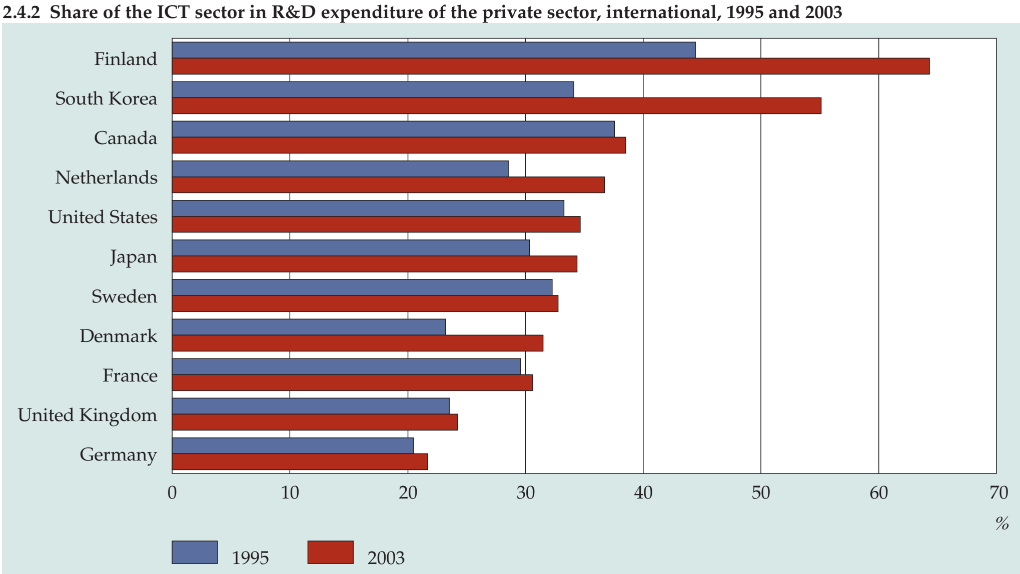
Source: Statistics Netherlands, Survey R&D and Innovation by companies.

The Dutch private sector does not spend a great deal on R&D when compared internationally. The aim of the EU to raise investments in R&D to 3 percent of GDP by 2010 is still a long way off. Both in 1995 and in 2003 the R&D expenditure of the Dutch private sector – expressed as a percentage of GDP – was below the EU 15 average. Furthermore, R&D expenditure seemed to diminish rather than increase (see table A2.4.2 in the statistical annex).

R&D expenditure ICT sector

The share of the ICT sector in the total R&D expenditure of the Dutch private sector has always been large in comparison to the size of the ICT sector itself. This share increased in the period 1995–2003 to a third in 2003. This is mostly realised by the R&D expenditure of the ICT industry. In 2003 some 86 percent of the R&D expenditure of the ICT sector was realised by the ICT industry. The share of the ICT services sector increased in recent years. The R&D expenditure of the ICT services sector and its growth is largely determined by the computer service bureaus and not by the more technological telecommunication sector. This also means that there is an increase in R&D in the area of ICT applications. The R&D expenditure of the ICT services sector is more sensitive to economic fluctuations than the R&D expenditure of the ICT industry. In the boom period of the ICT services sector, the R&D expenditure increased hugely every year in comparison with the rest of the private sector. In the years 2002 and 2003 with the economic downturn in the ICT services sector, R&D expenditure fell substantially. R&D expenditure of the ICT industry seems to have been more stable over the years and structurally at a high level (see table A2.4.1 in the statistical annex).

2.4.2 Share of the ICT sector in R&D expenditure of the private sector, international, 1995 and 2003



Source: OECD, ANBERD Database, September 2005.

About 57 percent of all R&D expenditure in the Netherlands is realised by companies, 28 percent by the universities and the remaining 15 percent by research institutes. The contribution of the ICT sector to total R&D expenditure in the Netherlands in 2003 was over 20 percent (CBS, 2005b).
The R&D of the companies in the ICT sector need not all be in ICT. Companies outside the ICT sector may also do R&D in the area of ICT. Furthermore, several universities and institutions have R&D activities in the technology field of ICT. The most recent enquiry about personnel working on R&D was in 2001 when the question was to list them by technical field. This gave the following list: three quarters of the R&D in information technology was realised by the ICT sector, one fifth by companies outside the ICT sector and about 5 percent by universities and expert centres (CBS, 2004).

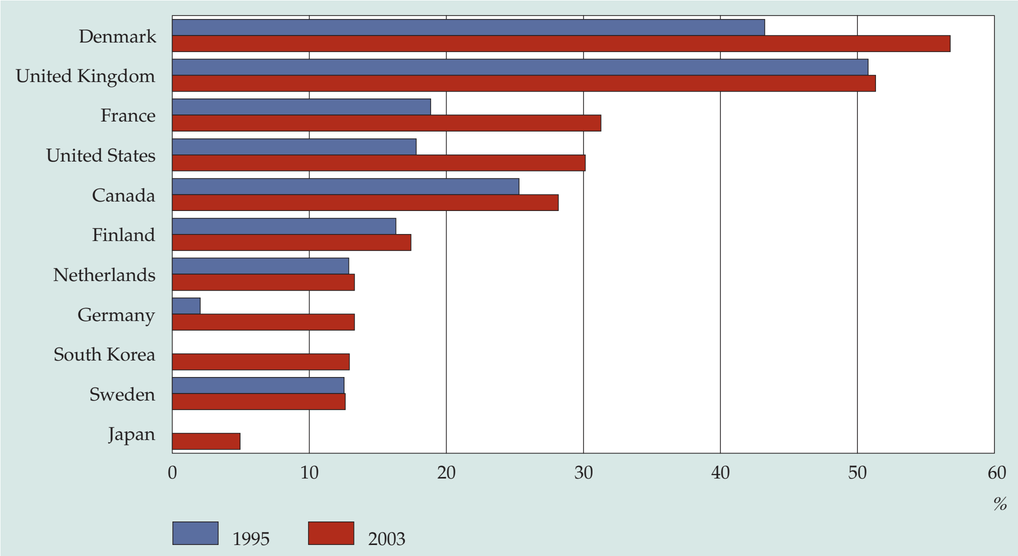
In most benchmark countries the share of the ICT sector in the total R&D expenditure of the private sector increased. This is especially true for Finland and South Korea, where the ICT sector mainly consists of the ICT industry. The relative growth of the R&D expenditure of the ICT sector in the period 1995–2003 was above average in the Netherlands. In addition, the share in the total R&D expenditure is substantially higher than in countries like Germany and the UK. This says something about the importance of the R&D expenditure of the ICT sector, as well as the R&D expenditure of different sectors. After all, various sectors can engage in R&D. In Germany total R&D expenditure is at a much higher level than in the Netherlands. The fact that the ICT sector in Germany has a modest share in total R&D expenditure means that other sectors in the economy spend substantial amounts on R&D. The other extreme is Ireland where 70 percent of the R&D expenditure is realised by the ICT sector. The R&D in Ireland is virtually identical to the R&D of its ICT sector. This is almost true in Finland and South Korea too. These are not countries where the risks are spread.

R&D expenditure increases in the ICT services sector

The trend is that R&D expenditure of the ICT services sector is gaining importance, which can also be observed internationally. In almost all countries the share of the R&D expenditure of the ICT services sector increased within the ICT sector. In Denmark and the UK over half of the R&D expenditure of the ICT sector in 2003 was realised by the ICT services sector. There is a very strong relative growth of the R&D expenditure of the ICT services sector in Germany. Again, R&D expenditure of an ICT services sector usually involves much smaller amounts than in the ICT industry. The conclusion has to be that the R&D efforts of the ICT services sector are increasing.

In figure 2.4.4 the share of the value added of the ICT sector in the domestic private sector is compared with the share of the ICT sector in the total R&D expenditure of that sector. Without exception the ICT sector is R&D intensive: the contribution of

2.4.3 Share of the ICT services sector in R&D expenditure ICT sector, international, 1995 and 2003



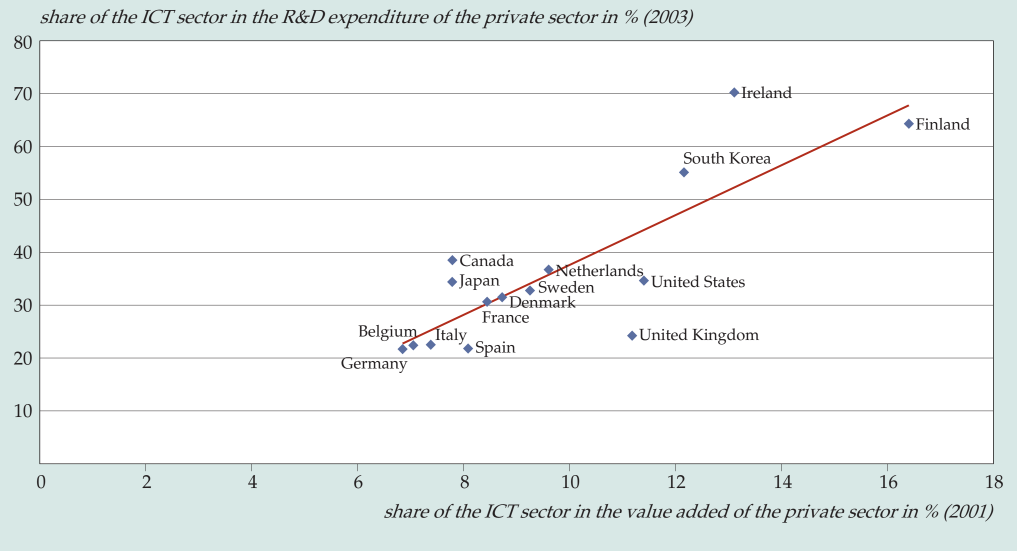
Source: OECD, ANBERD Database, September 2005.

the ICT sector to the R&D expenditure in a country is always larger than its contribution to the economy. In Ireland the ICT sector contributes more to the total R&D expenditure than expected on the basis of the size of the ICT sector. In Ireland there seem to be many 'imported' R&D efforts for which the profits end up not in the domestic ICT sector but in the, often American, parent companies. This may be an explanation for the fact that the R&D expenditure of the ICT sector in the USA is lagging behind, relatively speaking.

Not only in the Netherlands (see paragraph 2.2) but also in other countries the cost and benefits analysis by major multinationals leads to a separation of R&D activity concentrations and actual production. This leads geographically to different countries for different activities. Such decisions by the major multinationals often directly influence the statistical description of the units involved. Despite the modest share of the ICT industry in the total ICT sector in the Netherlands, the share of the ICT sector in R&D expenditure is average. R&D by the ICT industry often takes place in the Netherlands while the 'corresponding output' takes place elsewhere.

In the UK the R&D expenditure of the ICT sector is not keeping pace with the size of the ICT sector. The UK is an example of a country where over half of the R&D expenditure of the domestic ICT sector is realised by the ICT services sector: in general, this lowers the average R&D intensity of the entire ICT sector.

2.4.4 Size of the ICT sector compared to the R&D expenditure of the ICT sector, international



Source: OECD.

2.5 *ICT and patents*

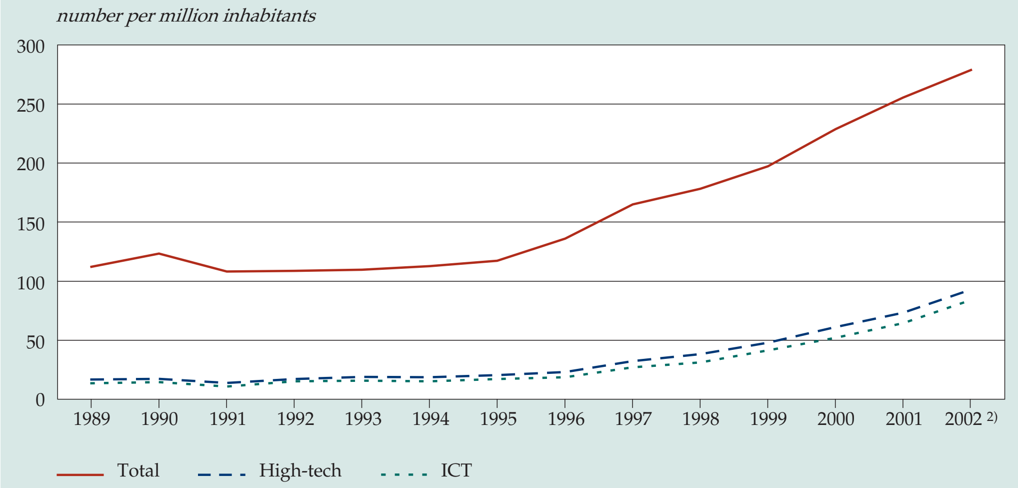
R&D by companies, discussed in the previous paragraph, may lead to innovations: new products, services or processes. When such innovations are marketed, they can be protected in an economic sense by a patent. This paragraph deals with the development of the number of patents, especially those registered in the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO).

Generally speaking, the number of patents has grown substantially in recent years. This may be part of the common European market and the growing globalisation of the economy. Specifically for ICT it is true that widespread use of this new technology has led to all kinds of findings and applications leading to patents. The number of ICT patents has contributed more than average to the increase in the total number of patents.

More patents

The globalisation of the economy can be seen in the various patent offices of the world. Dutch companies and institutions increasingly ask for European patents to protect their inventions in 28 European countries. In 2002 Dutch companies and institutions registered almost 280 European patents per million inhabitants at EPO. This is double that of 1996. The number of ICT patents increased even faster:

2.5.1 **Dutch patents filed at EPO, 1989–2002** [1)]



1) Patents filed at European Patent Office (EPO), by date of submission.
2) Provisional data.

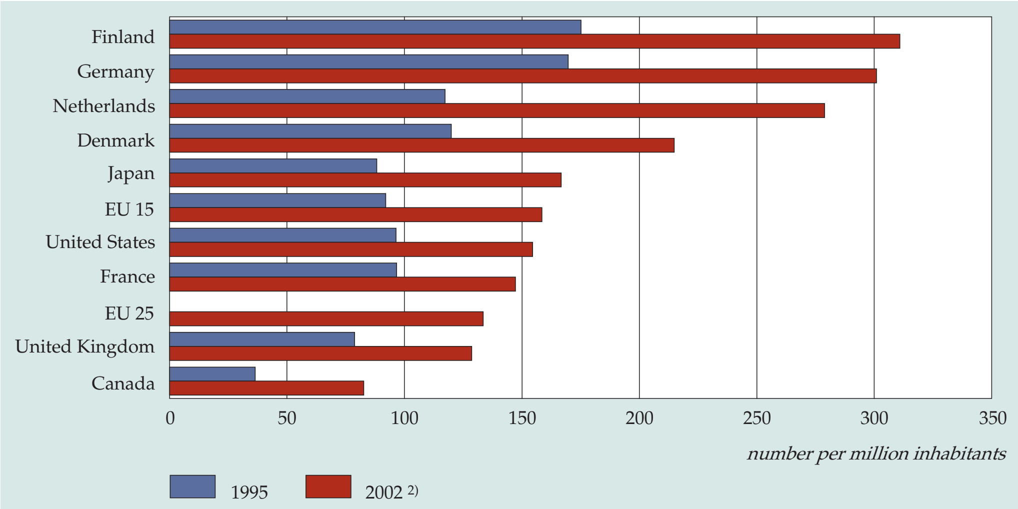
Source: Eurostat, New Cronos.

a fourfold increase from 19 per million inhabitants in 1996 to 84 in 2002. The share of ICT patents in the total number of patents has increased over the years to 30 percent in 2002. In addition, the number of high-tech patents rose fast. High-tech patents are patents involving R&D intensive products and services. There is a great overlap between ICT patents and high-tech patents: nearly all ICT patents are high-tech patents.

Finland applies for most patents in Europe

Finland and Sweden are the EU countries with the highest number of European patent applications per million inhabitants (see also table A2.5.1 in the statistical annex). These countries applied for about 310 European patents in 2002. The Netherlands scores well with almost 280 patents per million inhabitants. The growth of the number of patents in the period 1995–2002 was the largest in the Netherlands. Of the countries outside Europe, Japan and the USA apply for a fair number of European patents. The number of EPO registered patents of these countries is close to the EU 15 average. The number of patents of the USA and Japan registered for the European market is therefore much greater than the number of patents of many European countries. The UK is less active in the area of patents. In 2002 the UK applied for less than 130 patents per million inhabitants. This is below the EU 25 average. Possibly the UK is more inwardly directed. Furthermore, there are more strategies than patents alone to protect innovations from competition. Other methods are confidentiality, the complexity of the innovation or a systematic strategy to stay ahead of the competition. Applying for a patent costs time, money, and disclosure of the details of the innovation.

2.5.2 Patents filed at EPO, international, 1995 and 2002 1)



1) Patents filed at European Patent Office (EPO), by date of submission.
2) Provisional data. France: estimated data.

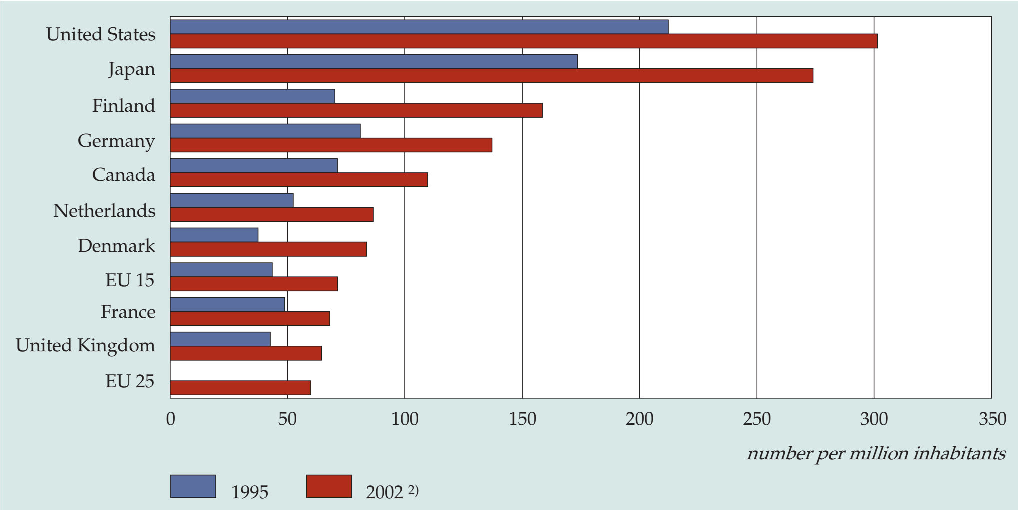
Source: Eurostat, New Cronos.

USA ahead in the domestic market

Apart from European patents, many companies and institutions from Europe also apply for American patents at the United States Patent and Trademark Office (USPTO). The USA itself has registered most patents to protect their domestic market. Japan follows as the country with the second highest number of US patents, even twice as many as Canada. Dutch companies and institutions have fewer American than European patents, namely 87 USPTO patents per million inhabitants in 2002. This is less than a third of the number of European patents in that year. So a great number of innovations are worth patenting for the European market, but not for the USA. In general, European countries have about one-half to one third the number of American patents compared to the number of their European patents. Here too Finland has registered most patents at USPTO: 159 per million inhabitants. The UK plays a modest role on this market when applying for patents is concerned: 64 per million inhabitants.

The expansion of the number of patents is vast. Both EPO and USPTO received more patent applications and granted more patents between 1995 and 2002. The growth rate in the number of patents of European countries for the US market is just as great, or greater in the cases of Denmark and Finland, than the growth rate of the number of patents at home. Then again the USA, Canada and Japan, apply for European patents at a scale that would match that of many European countries. So patents are used to gain access at the markets across the world.

2.5.3 Patents filed at USPTO, international, 1995 and 2002 [1)]



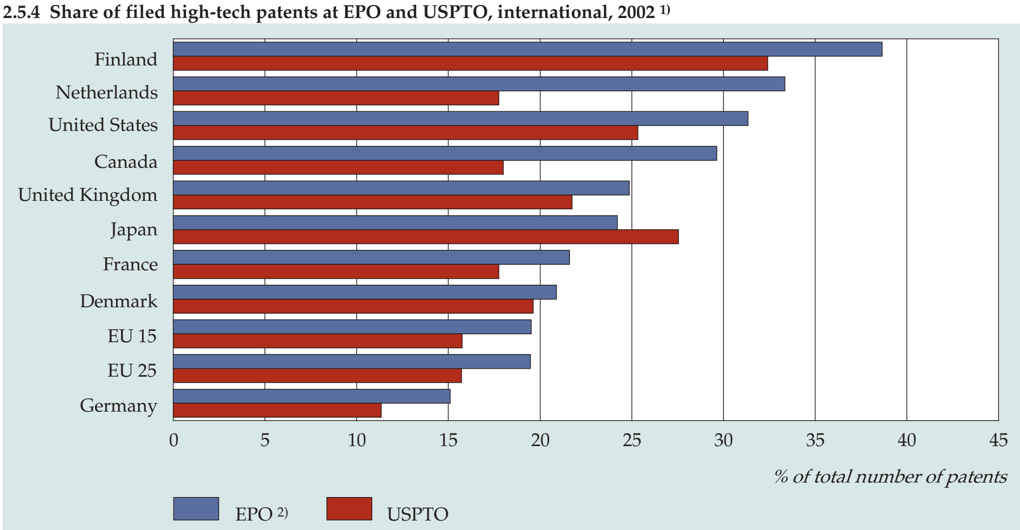
1) Patents filed at the United States Patent and Trademark Office (USPTO), by date granted.
2) France and Luxembourg: estimates.

Source: Eurostat, New Cronos.

High-tech patents

Of the patents registered at USPTO and EPO we can determine the share of the high-tech patents (see graph 2.5.4). This provides insight in the patent behaviour of the countries discussed by region or market. Only Japan has a greater share in

2.5.4 Share of filed high-tech patents at EPO and USPTO, international, 2002 [1)]



1) USPTO: France and Luxembourg: estimates.
2) EPO: provisional data. France: estimated data.

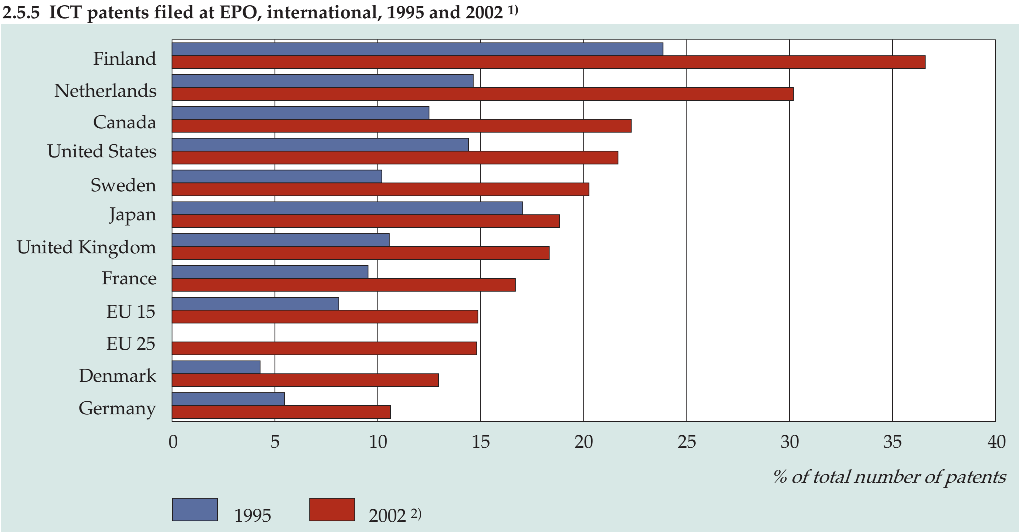
Source: Eurostat, New Cronos.

high-tech patents for the American market than for the European market. All other countries have relatively more high-tech patents for the European market. The difference is especially great for the Netherlands, since it patents far fewer high-tech innovations for the American market (18 percent) than for the European market (33 percent). In the area of high-tech innovations, the European market seems to be slightly more 'open' than the American market.
Apart from the differences in the number of high-tech patents registered at EPO and USPTO, the share of high-tech patents for the UK is great, whereas the total number of UK patents is very average. The opposite is true for Germany, which secures many innovations by patent, but has a low share in high-tech patents.

ICT patents

Finland is the country in Europe with most ICT patents. Almost 40 percent of the Finnish patents registered in 2002 were for ICT innovations. The Netherlands also has a substantial share in ICT patents with its 30 percent. From an international perspective the growth rate of Dutch ICT patents is impressive. About one fifth of the European patents by non-European countries, Canada, the USA and Japan is ICT related. So the companies and institutions from these countries find it useful to protect their ICT innovations for the European market by patents. The Danish share of ICT patents is just 13 percent, well below the EU 15 and EU 25 average. The German share in ICT patents is also low. The share of ICT patents has increased substantially for all countries except Japan where the share of ICT patents in the total number of patents remained about the same.

2.5.5 ICT patents filed at EPO, international, 1995 and 2002 1)



1) Patents filed at the European Patent Office (EPO), by submission date.
2) 2002: provisional data. France: estimated data.

Source: Eurostat, New Cronos.

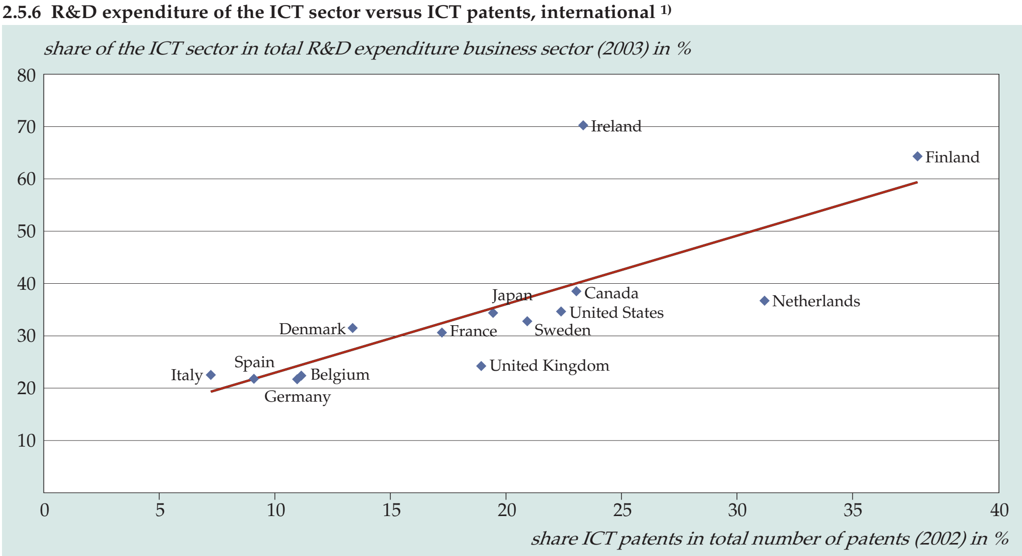
R&D and ICT

In theory the size of the ICT sector, the R&D expenditure of the ICT sector, and the number of ICT patents must have some bearing on each other. A domestic ICT sector with sufficient 'mass' offers a basis for structural R&D work. The R&D will sooner or later lead to innovations worth 'patenting'. It depends on whether the domestic ICT sector is dominated by ICT industry or ICT services. The R&D intensity of the ICT industry is generally greater than that of the ICT services sector. Furthermore, international trade in ICT goods is far greater and therefore more subject to international competition than ICT services. This may be a reason to patent.

In paragraph 2.4 we discussed that the share of the ICT sector in the R&D expenditure is greater than expected given the economic importance of the sector. R&D expenditure of the ICT sector is also not directly proportional to the number of ICT patents. The share of ICT patents lags behind that of the ICT sector in R&D expenditure. Much of the R&D expenditure of the ICT sector somehow does not lead to patents. Yet the volume of R&D expenditure of the ICT sector in a country seems to influence the number of ICT patents of that country.

Most countries hug the trend line showing in general terms that the share of the ICT sector in the R&D expenditure of a country is related to the share of ICT patents. Ireland deviates most in terms of R&D expenditure of the ICT sector: 70 percent of the R&D expenditure of the Irish companies is realised by companies from the ICT sector, while the share of Irish ICT patents is quite average. One explanation is that part of the R&D taking place in Ireland is done by companies that are part of an American enterprise. So their R&D will most likely lead to patents by an American

2.5.6 R&D expenditure of the ICT sector versus ICT patents, international [1)]



[1)] ICT patent applications to EPO, by year of filing at the national level, by IPC. 2002: preliminary figures, France: estimate.
Source: European Patent Office (ICT patents) / OECD (R&D expenditure).

enterprise (OECD, 2005b). The Netherlands and the UK deviate most in the area of ICT patents, with relatively more patents in ICT than expected on the basis of the R&D expenditure of the ICT sector. Finland has a very substantial share by the ICT sector in the R&D expenditure and in ICT patents. Moreover, the variables in Finland operate at a high level, which produces a 'critical mass' for these activities.

Finally

There are many ways to present information about patents. The 'patenting productivity' per country was investigated by Tijssen et al (NOWT, 2003). It is the number of patents divided by the number of researchers working in the country. The Netherlands scores best with 402 European patents per thousand researchers in 2000–2001 (patents granted in 2001 and the number of researchers in 2000). Their study compares seven European countries, the EU 15 and the USA, Japan and Canada. These last three countries are lowest on the list, where Canada only produces 37 patents per thousand researchers. This is not surprising because these countries apply for fewer European patents. What is remarkable is that Finland only applies for 213 patents per thousand researchers, slightly more than half the Dutch number. This means that Finland has many more researchers (relative to the total population) than the Netherlands. Not all research will necessarily lead to patents and not all companies and institutions have a culture of amassing patents.

2.6 International trade in ICT

The volume of the international trade flows in ICT goods and services is an indication of the international competition in this market. ICT goods in particular have a long 'tradition' of international competition and are increasingly produced in countries where production is cheapest. An example to illustrate this: in 1990 some 81 percent of the world-wide production of ICT goods took place in the EU 15, Japan and the USA. In 2002 this was just 61 percent. The value of the global production of ICT goods expressed in US dollars increased by almost 50 percent between 1990 and 2002. The international trade in ICT goods, however, increased even more in this period. Placing production elsewhere leads to extra trade because the markets do not necessarily shift to the same degree (OECD, 2004b).
ICT services are still primarily produced in the same (geographical) market where they are purchased, but this too is changing.

Imports and exports by the Netherlands

The increase in the international trade in ICT goods and services is also observable for the Netherlands. The value of the imports in the period 1995–2004 increased by two-and-a-half times while the value of the total exports (exports plus re-exports) increased nearly threefold in this period. Although the imports and exports of ICT services take place at a far lower level than those of ICT goods, the increase in the

Table 2.6.1
Imports and exports of ICT goods and services, 1995–2004

	1995	After revision [1]			
		2001	2002	2003*	2004*
	million euro				
Imports					
ICT goods	18,723	49,801	43,321	42,803	47,577
ICT services	1,187	5,100	4,947	5,201	5,400
Exports					
ICT goods	3,727	4,749	3,959	3,520	3,170
ICT services	1,189	6,022	5,638	5,900	6,242
Re-exports					
ICT goods	13,720	45,339	40,855	40,677	46,263
ICT services[2]	190	433	457	505	632
	%				
Composition of exports of ICT goods and services:					
ICT goods	20	8	8	7	6
ICT services	6	11	11	12	11
Re-exports	74	81	81	81	83
Total	100	100	100	100	100
Share of ICT goods and services in:					
Total imports	12.8	19.9	18.0	17.9	18.1
Total exports	3.9	5.7	5.0	4.8	4.6
Total re-exports	29.6	43.1	41.0	40.8	39.7

[1] Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.
[2] In fact only software on CD-ROM/tapes.

Source: Statistics Netherlands, National Accounts.

imports and exports of ICT services is far greater. International trade in ICT services refers to issues like the use of networks of foreign mobile phone providers for international telephone calls or hiring foreign computer service bureaus for supplying computer services. In short: the market for ICT services also faces more and more international competition. The share of the ICT services in the total export of ICT goods and services increased therefore. The balance of imports and exports of ICT services so far has been positive for the Dutch economy.

Much re-export

The Netherlands differs substantially from many other countries in the imports and exports of ICT goods, because most of the imports of ICT goods are intended for re-export. This concerns ICT goods that are not intended for the Netherlands but which are re-exported to the final country of destination without undergoing any major processing. So the share of ICT goods in the total of Dutch exports looks large at first sight. However, already in 1995 some 79 percent of the total exports of ICT goods consisted of re-exports. In 2004 this share increased to nearly 88 percent. In other words, the share of the ICT goods produced in the Netherlands in the total export of ICT goods decreased over the years.

The share of ICT goods in total Dutch re-exports is disproportionate. In 1995 some 30 percent of re-exports consisted of ICT goods. In recent years this came closer to 40 percent. Therefore, it is not the ICT industry in the Netherlands that benefits from the enormous increase in the international trade in ICT goods, but mainly the Dutch trade and transport sector.

International

In the section below, we outline the development of the international trade in ICT goods, software and ICT services. The focus is on the growth in the trade of goods and services, which indicates how dynamic these markets are. Developments are shown per market. Which countries develop most and on which markets e.g. fast growing trade of ICT goods or rather growing faster in the market of ICT services.

The value of the international trade in ICT goods is of course much greater than the value of the software and ICT services (see tables A2.6.2 through A2.6.4 in the statistical annex).

In international comparisons it is usually the total exports of countries that are compared. This gives a lopsided idea about the Dutch position since the Netherlands exports many ICT goods, but these ICT goods are usually not produced by the ICT sector in the Netherlands (see above).

ICT goods

The increasing globalisation of the production of ICT goods makes their trade flows fairly hard to interpret. Exports of ICT goods can include many re-exports, like in the Dutch situation where the hinterland is less easily accessible in geographical terms. Furthermore, the exports may not always originate from a country's 'own' ICT industry. They may have been initiated by a production unit from an American or European parent company. Therefore, a boom does not always mean that the existing ICT industry in a country has become much more competitive, it may express the positive climate attracting the industry. In both cases, there is the growth in the production, employment, investments etc. in that country. Still it can be quite different if the growth is realised by a traditional existing ICT industry or a recently 'imported' one. The latter may be a lot more sensitive to changes in the international economic climate since a foreign parent company may suddenly decide to relocate its units to another country ('win some, lose some'). This also depends on the kind of work done. An assembling plant putting together parts is much easier to relocate than a fully equipped production unit is. The development of the imports and exports of ICT goods in the USA has to be interpreted from this perspective. Imports grew faster than exports in recent years, partly because of increased imports of ICT goods by units of American parent companies abroad. In fact these are imports of ICT goods of their 'own' multinationals that relocated production from the USA to another country (see also OECD, 2004b).

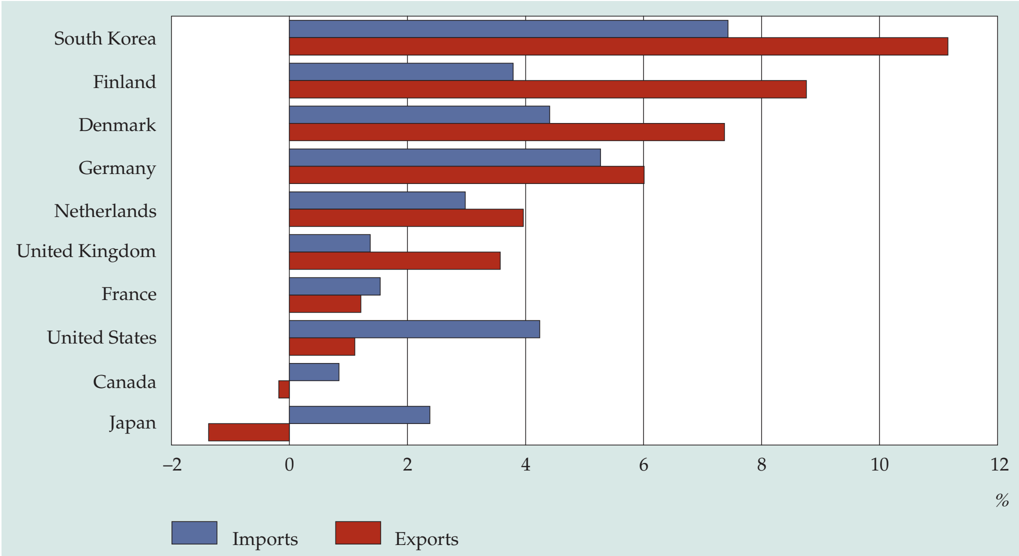
South Korea and Finland have high annual growth rates for the exports when seen from an international perspective, significantly higher than the growth rate of the imports of ICT goods. All European countries included in the graph had larger export than import increases, in contrast with the USA, Canada and Japan where exports of ICT goods fell in the period 1996–2002. Shifting production to other countries, as American companies have, leads to fewer exports from the USA (not the product but production is being exported). In the Netherlands the growth rates of imports and exports are not too far apart. This is consistent with the fact that much of the imports are re-exports: so imports and exports go hand in hand.

Software

Unlike the trade in ICT goods, it is difficult to measure the international trade in software. The trade in software that does not come in the shape of 'goods', which is increasingly the case, is only included in the traditional trade statistics to a limited degree. Software is often sold together with hardware. This makes that the hardware trade is overestimated and the software trade underestimated. The trade of one original copy of a software application, which is copied and distributed many times over in the country of destination, where income is granted through copyright, is not expressed in the traditional trade statistics. Furthermore, software is increasingly traded on-line, which is also not expressed in the trade statistics (see more examples and explanations in OECD, 2004b). These types of trade in software are expressed in the international trade in services and measured through payments made between citizens of different countries (see below).

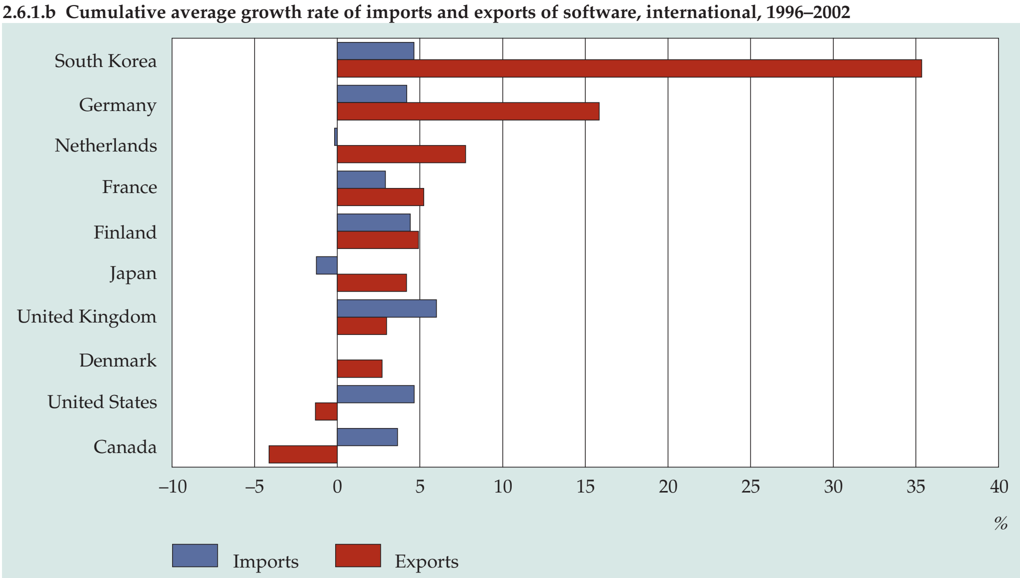
As an indication for the development of the international trade in (standard) software, we present the trade in the physical carriers of software such as CD-ROMs, which provides some indication of the developments in this area. Although this concerns small amounts in comparison with the trade value of ICT goods, there are enormous growth rates of the exports of software of countries like South Korea, Germany and the Netherlands. The Netherlands has a limited share of re-exports in the exports of software, in other words, these are exports originating from the domestic ICT sector (see also table A2.6.1 in the statistical annex). The imports of software by the USA also increased while the exports decreased. The same is true for Canada. The contrast between the developments in the USA and Canada on the one hand and most European countries on the other hand has parallels with the international trade in ICT goods mentioned earlier.

2.6.1a Cumulative average growth rate of imports and exports of ICT goods, international, 1996–2002



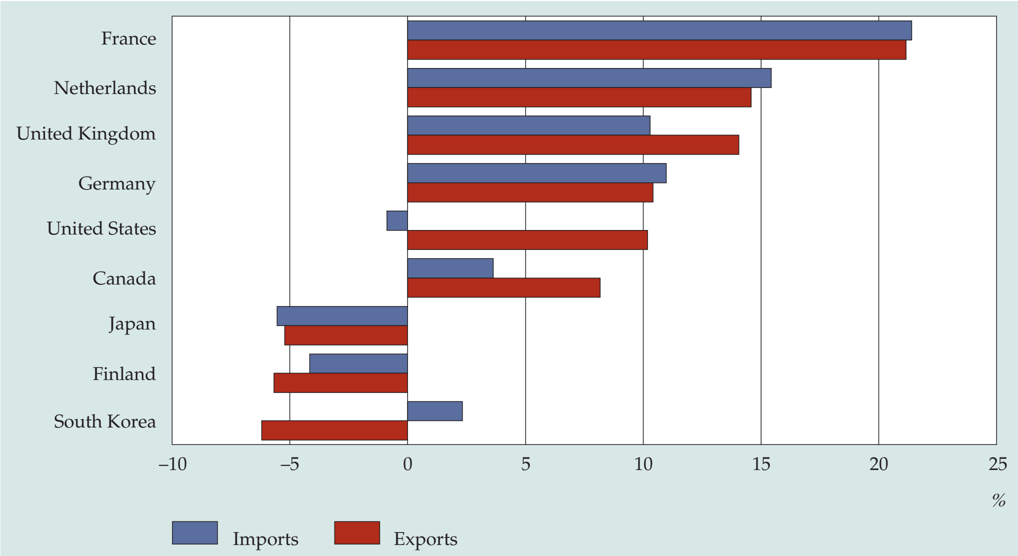
Source: OECD, Information Technology Outlook 2004.

2.6.1.b Cumulative average growth rate of imports and exports of software, international, 1996–2002



Source: OECD, Information Technology Outlook 2004.

2.6.1c Cumulative average growth rate of imports and exports of ICT services, 1996–2002



Source: OECD, Information Technology Outlook 2004.

ICT services

A third category of the international trade in ICT goods and services is the trade in ICT services, paid in part via international money flows. These money flows are registered by the National banks in the various countries and supplied to the International Monetary Fund (IMF). The registration of international payments uses a classification. As an approximation of the trade in ICT services we give the incoming and outgoing payments of a country for the categories communication services and computer services (including customized software). These are the codes 245 and 262 from the Balance of Payments Coding System (BPM5) of the IMF. The growth rate of the imports and exports of the group ICT services is higher than the trade in ICT goods and software. Countries with large export values of ICT services are Ireland, the USA, the UK and Germany (see table A2.6.4 in the statistical annex). Countries with rapidly increasing exports of ICT services are France, the Netherlands, the UK, Germany and the USA. In contrast with the exports of ICT goods and software, the exports of ICT services by the USA did increase in recent years. What is also shown is that a number of specialised hardware countries like Finland, Japan and South Korea have negative growth in the area of international trade in ICT services.

The summary is that the international trade in software and ICT services seems to be increasing, whereby France, the Netherlands and the UK manifest themselves as countries with a fast-growing trade in ICT services. Germany is an example of growth in all three markets, while Finland and South Korea mainly trade in ICT

Imports and exports of ICT goods: China

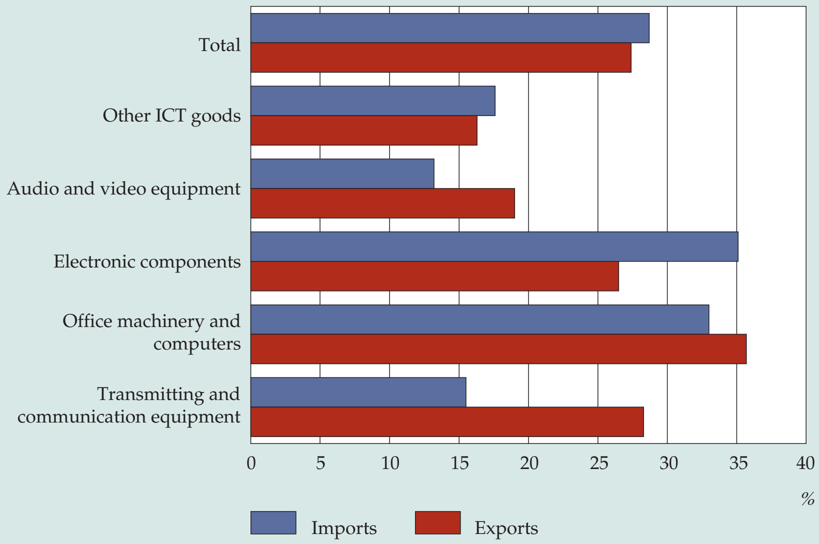
China is one of the countries that developed in terms of skills and wage costs to a major country where foreign, or multinational, companies may sell their ICT goods or outsource the production of ICT goods. Both the potentially huge domestic market and the favourable production opportunities contribute to the spectacular increase in trade with China. The economic growth in China is therefore not dependent exclusively on the growth of exports, but it can also be realised by the growth of domestic sales. There are various ways in which the economic growth and the development of skills progress:

– By foreign direct investments in China. In 2002, China was the greatest 'recipient' of foreign investment. Eight percent of the total global foreign investments in 2002 came to China. Its value was close to 53 billion USD.
– By take-overs or mergers of existing enterprises in China with foreign enterprises or units. The amount of foreign take-overs where Chinese actors were the selling party increased from 8 million USD in 1990 to 2.2 billion USD in 2000.
– By less far-reaching cooperation with foreign enterprises without drastically changing ownership relations.
– By starting entirely new foreign enterprises in China.

Furthermore, Chinese enterprises themselves – both within and outside China – also actively take part in foreign enterprises. Finally, apart from globalisation, there is also 'autonomous' economic growth.

For illustration purposes, we included the development of the trade between China and the Netherlands. Apart from the enormous increase in the trade value, the Netherlands has built up a trade deficit with China of 12 billion euro.

Cumulative average growth rate of China's imports and exports of ICT goods, 1996–2002



Source: OECD, Information Technology Outlook 2004.

The growth rates of the imports and exports of ICT goods in the period 1996–2002 are a second illustration. In figure 2.6.1a only the export growth of South Korea exceeded 10 percent. For China, this is the case for the imports and exports of all the groups of ICT goods discussed.

Dutch trade with China

	Imports	Exports	Balance
	million euro		
1970	44	36	–8
1980	247	133	–114
1985	283	368	85
1990	604	160	–444
1995	1,628	598	–1,030
2000	6,917	1,091	–5,826
2001	8,845	1,219	–7,626
2002	8,929	1,521	–7,408
2003	10,631	1,625	–9,006
2004	14,354	2,303	–12,051

Source: CBS, International trade statistics.

Source: OECD, Information Technology Outlook 2004 and Statistics Netherlands.

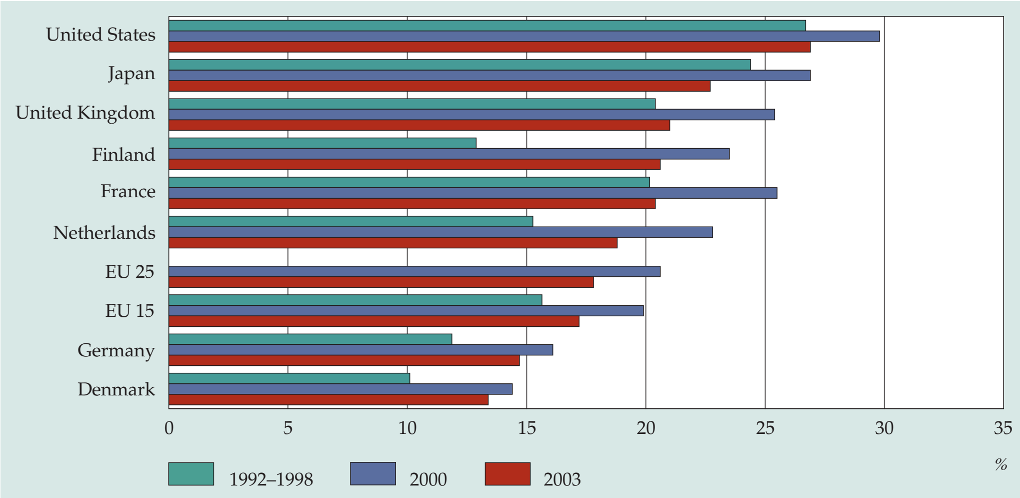
goods. The growth rates of the imports and exports of ICT goods and services of the European countries are higher than those of the USA, Canada and Japan are. The explanation may be that Europe is catching up due to the common European market: European countries increasingly trade among themselves whereas this process is already more balanced elsewhere in the world.

High-tech products

Another benchmark for demonstrating the international competitiveness of a country in R&D intensive products is the development of the share of high-tech products in total exports. The idea is that European countries and countries like the USA and Japan are competitive in know-how. This means products or production processes that cannot be copied easily by other countries, because other countries do not have the know-how to do so. Here 'other' means low-wage countries, because many countries are cheaper than Europe if the competition is merely based on labour costs. It is a 'struggle' between knowledge-intensive labour and high wages and less knowledge-intensive labour and low wages. There is much fluctuation, whereby the doom scenario for countries with a high level of labour productivity, knowledge-intensive labour and high wages is one of being overtaken by countries that developed the same knowledge level but still have lower wage costs. Preventing this is a key European policy.

The share of high-tech products in the total exports of various industrialised countries has been stable over the last decades. About 25 to 30 percent of US exports structurally consist of high-tech products. The share is lower for the European countries, although several European countries have increased their share substantially in recent years. Finland, Germany and Denmark are examples of this. The share of high-tech products in the countries of the EU 25 is on average slightly higher than that for the EU 15.
Most ICT goods are high-tech products. This explains the share of high-tech products in the year 2000, which was higher in all countries than in 2003. The trade in ICT goods was booming in 2000.

2.6.2 Share of high-tech products in total exports, international, 1992–2003 [1)]



[1)] High-tech products: products for space travel and aviation, computers, office machinery, electronics, instruments, pharmaceutics, electronic machinery and weapons. Intra-EU exports are not included in the EU exports.

Source: Eurostat, New Cronos.

2.7 *Teleworking*

A teleworker is someone who regularly works outside the company location and who has on-line access to the ICT systems of the company. The worker does not necessarily work from home. This is the definition used in the EU harmonised survey to the ICT usage of companies. This definition is wider in terms of location than people working from home. The essence is that the employee in question has access to the company's ICT system. This also narrows the definition again when compared to 'people working from home', which usually means 'someone who regularly works from home for his or her employer, using a computer'. So the demand of having access to the ICT system of the employer is not always used here.

Teleworking can save time and money, for instance by reducing commuter time and thereby mobility in general, cutting travelling costs and air pollution. Teleworking may increase possibilities of combining work and private life. There are also drawbacks, for instance when someone needs to be physically present for certain tasks, or when communication between colleagues is obstructed. In addition, there probably is a limit to the (perceived) lack of control over the employees. Despite the (theoretical) advantages of teleworking, we do not see the number of people who do telework on a regular basis increase very fast, at any rate not as fast as the spread of the necessary technical tools among the workforce. It is unclear to what extent this is due to employers or employees. Perhaps employers see teleworking still very much like a 'favour' to the employee and not so much as a potential efficiency gain.

In the previous edition of *De digitale economie* (CBS, 2005a) we saw that three to four employees in ten regularly used the pc for work at home and that one in five employees regularly use the internet for work at home. So these are people with a pc and internet at home who also use them regularly for work. Only four percent, however, meets the demand that the employee must also have on-line access to the company's ICT system in 2004. This while over eight in ten employees have ICT tools that allow them to do teleworking, namely a pc and internet access at home.

The group teleworkers in the Netherlands has a number of striking characteristics. It includes more men than women and teleworking is done primarily in the 35-45 age bracket; furthermore single, high income groups are more likely to do telework. Teleworkers are generally highly educated and often work more hours a week than employees who are not teleworking. Teleworkers often work five days a week, and on top of that work extra at home for the company. Telework seems to be characterized more as overtime than as an alternative for regular work in traditional working hours and location.

Companies and telework

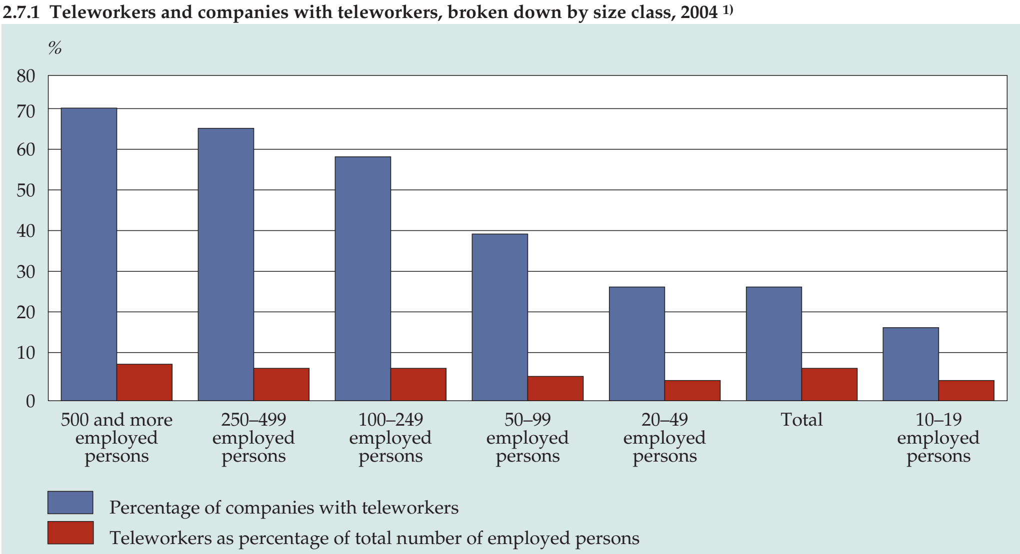
In the figures on companies, we used the definition of teleworking where the employee can also work outside the company from different places than home. According to this definition, the percentage of teleworkers in 2004 for the Netherlands is eight percent of employed labour force. In 2003 this was seven percent and in 2002 about six percent. So there is some growth.

Figure 2.7.1 shows that on average one in three companies has at least one teleworker. This means that the company 'allows' it, the job characteristics allow it and both parties have the necessary ICT tools available. Teleworkers generally work in large companies. In 72 percent of the companies with more than 500 employed persons, there are teleworkers. The smaller the company, the less people telework. There are teleworkers in less than one in five companies employing 10–19 people. This is not surprising since small companies ‘missing’ one employee is felt more than in larger companies. Furthermore, the chances that someone is eligible for teleworking are greater with larger companies.

When we look at the number of teleworkers as a percentage of the number of employed persons it turns out that teleworking occurs most in major companies. In companies employing 500 people or more nine percent of employees regularly work outside the company premises. In companies employing fewer than 50 people, only five percent of the employees are a teleworker.

In figure 2.7.2 the data on teleworkers is broken down by branch of industry. In computer service bureaus the percentage of teleworkers in 2004 exceeded 50 percent. This is also the branch where just about everyone uses computers at work. This is generally the case in business services. Much computer work increases the possibility for teleworking. In other branches of industry the percentages are lower. One explanation is that teleworking is next to impossible in branches of industry characterised by direct contact with clients, such as in hotels, restaurants or health care. Any teleworking there would be done by a manager who is not active on the work floor.

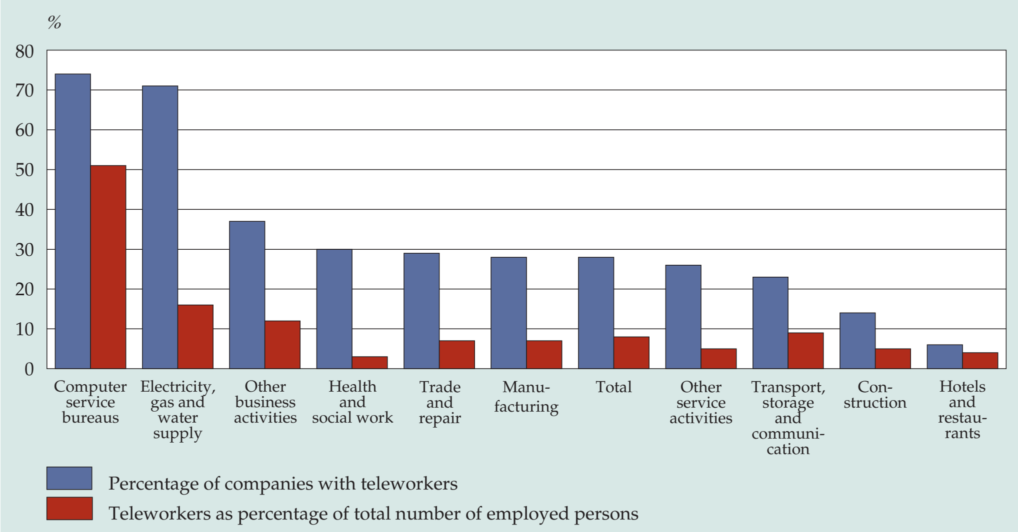
2.7.1 Teleworkers and companies with teleworkers, broken down by size class, 2004 1)



1) Companies with 10 and more employed persons.

Source: Statistics Netherlands, Survey on ICT use in enterprises 2004.

2.7.2 Teleworkers and companies with teleworkers, broken down by sector, 2004 [1)]



1) Companies with 10 and more employed persons.

Source: Statistics Netherlands, Survey on ICT use in enterprises 2004.

The expectation based on the technical developments is that more people would start teleworking. Now that the (high-speed) internet connections have become commonplace, there are no technical obstacles for accessing the company ICT systems from elsewhere.

A number of non-technical aspects seem to slow down the development of teleworking. Companies may consider it a risk to open up their ICT systems for outside users given the dangers of unauthorised access and their consequences. Furthermore, companies do not want to lose sight of their employees, or the home situation of employees may present an obstacle for working at home.

International

In order to compare the situation in the Netherlands with other European countries we looked at the percentage of companies with teleworkers. Figure 2.7.3 shows the Dutch results in an international perspective. The figures are broken down by size class.

This figure shows that teleworking does indeed take place more in companies having 250 or more employed persons. In 63 percent of these companies in the EU 15 people telework. Finland and Denmark are the front-runners in the European Union. Denmark has teleworking in over 90 percent of the major companies; Finland has it in three quarters of its major companies. The Netherlands is behind the Scandinavian countries, but above the European average. In the Southern European countries teleworking is less frequent, namely in just over 40 percent of the major companies (see table A2.7.2 in the statistical annex).

Smaller companies still have relatively little teleworking so far. In Denmark close to 40 percent employs teleworkers. This is a lot lower in the other countries. Internationally the pattern is similar to that of the Netherlands: the larger the company, the more often there is teleworking.
The average in the EU 25 is in all cases lower than in the EU 15, which indicates that teleworking is rather unusual in the ten new member states of the EU.

2.7.3 Companies with teleworkers, broken down by size class, international, 2004 [1)]

[1)] Companies with 10 and more employed persons.

Source: Eurostat, New Cronos.

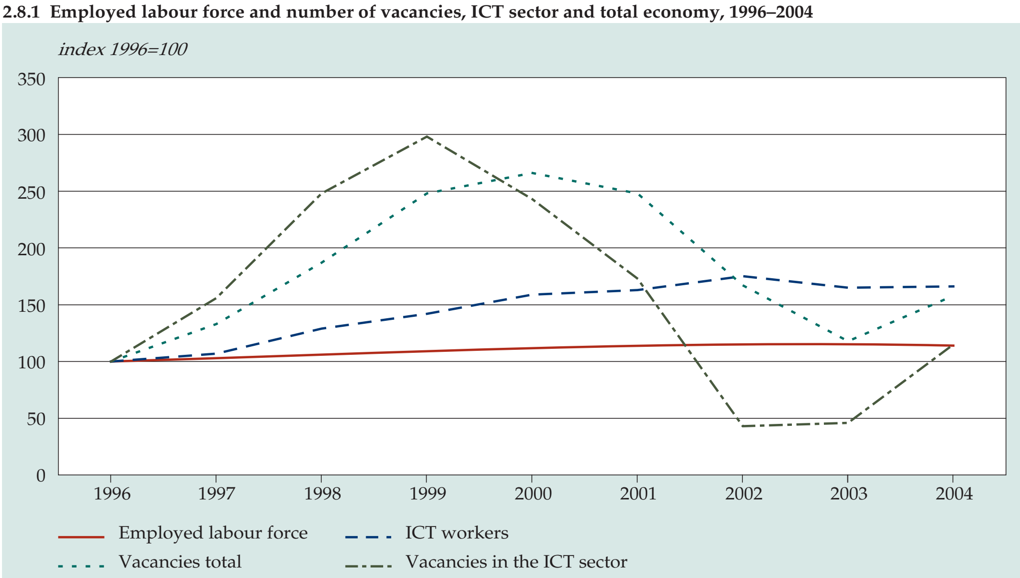
When the figures are broken down by branch of industry a similar pattern emerges. In Denmark, Finland and Sweden many branches of industry regularly have teleworking. Spanish, Greek and Portuguese enterprises in the various branches of industry only have a relatively low percentage of teleworkers. Table A2.7.1 of the statistical annex shows the figures of the various branches of industry in the EU countries.

Summarizing: teleworking is most common in Scandinavia. The Netherlands scores quite high as well: below the Scandinavian countries and above the European average. In the Southern European countries teleworking is still rather unusual.

2.8 *ICT and labour*

In 2004 slightly more people worked in an ICT profession in the Netherlands than in 2003. ICT workers are people working in an ICT job who may work in the ICT sector or outside it. The downward trend in the employment of ICT workers has been short-lived: the job market for ICT workers recovered in 2004.
There is more demand in the ICT sector for personnel, both ICT workers and other personnel. The sharp decline of the number of vacancies in the ICT sector between 2000 and 2002 has ended. The number of vacancies in the ICT sector in 2004 was above the 1996 level, which was a year in which the ICT sector faced an above average scarcity of personnel. The vacancy rate in the ICT sector also recovered: 30 vacancies per one thousand jobs in 2004. This is precisely twice as high as in the rest of the economy and more than double the 2003 figure.

2.8.1 Employed labour force and number of vacancies, ICT sector and total economy, 1996–2004



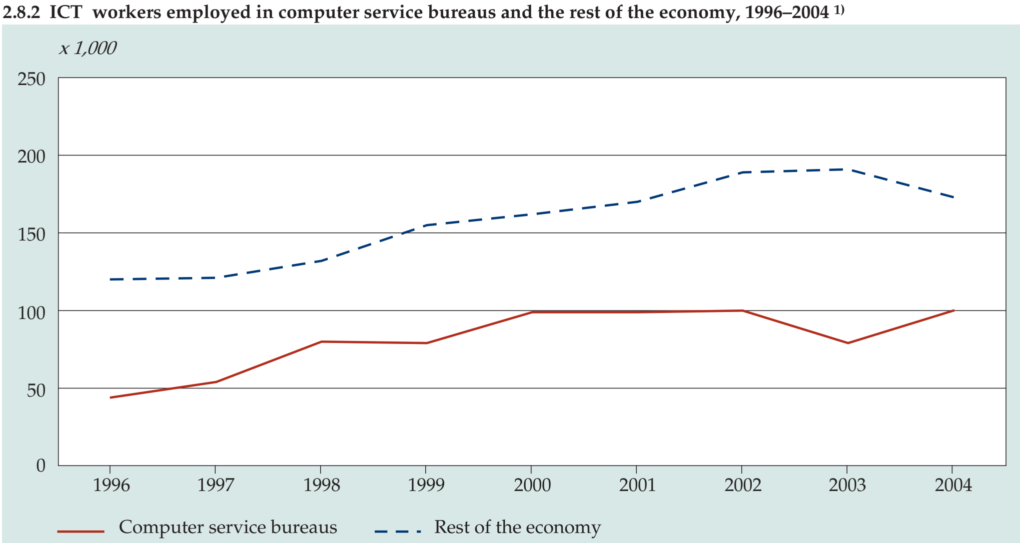
Source: Statistics Netherlands.

Computer service bureaus growing again

In 2004 the number of ICT workers employed in computer service bureaus increased again to the level of the year 2000: about 100 thousand. About one third of all ICT workers in the Netherlands work at computer service bureaus. Since the total number of ICT workers in 2004 hardly increased, this growth comes at the expense of the number of ICT workers elsewhere. The number of employed ICT workers fell especially in the sector trade and hotels, restaurants and other business services during 2004 (see table A2.8.2 in the statistical annex). When we look at the share of ICT workers in the total number of people employed in the various branches of industry, than it is logical that most ICT workers work at computer service bureaus, since over 60 percent of the people employed is an ICT worker. There are also relatively many ICT workers in financial services, about 10 percent of the employees there is in ICT. There are relatively few ICT workers in the sector agriculture, forestry and fishing and in construction: less that one percent of the employed labour force in these sectors. The number of ICT workers employed in a branch of industry, however, does not say too much about the knowledge and skills in ICT there. In the Netherlands ICT workers are concentrated in computer service bureaus, which are hired by the rest of the economy to do ICT work. Furthermore there is the possibility of offshore outsourcing ICT work (see paragraph 2.10), where ICT workers working in the Netherlands are completely out of the picture. So companies have more than one option beyond hiring in-house ICT workers to do ICT work and have access to the required know-how and skills.

In the period 1995–2004 the share of ICT workers in the total employed labour force increased from 2.7 to 3.9 percent.
Total employment in computer service bureaus in 2004 did decrease however (see paragraph 2.2). These were apparently not ICT jobs, but the jobs of people doing other work within the computer service bureaus.

2.8.2 ICT workers employed in computer service bureaus and the rest of the economy, 1996–2004 1)



1) ICT workers are defined here as SBC codes 514, 666, 714 and 914.

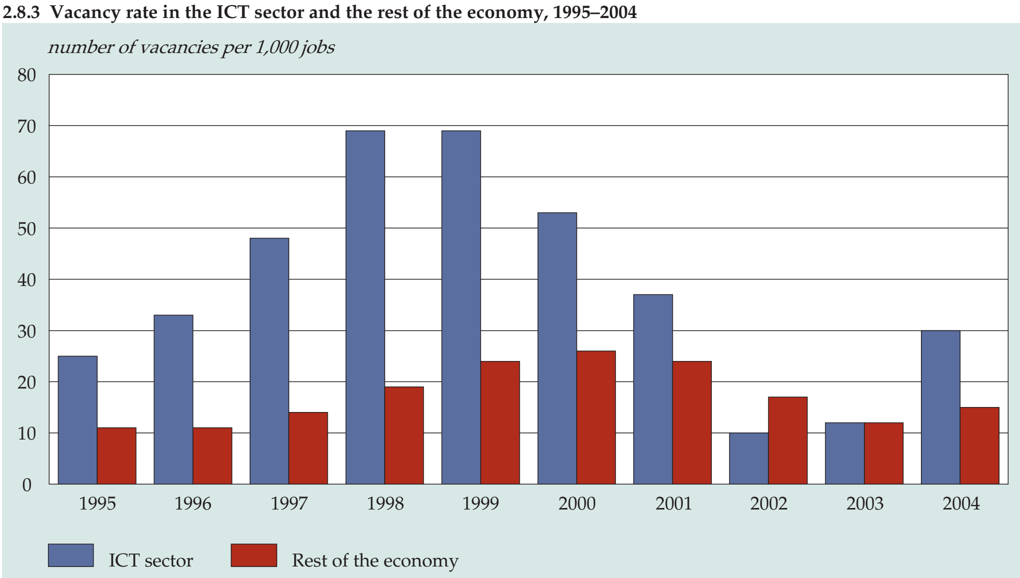
Source: Statistics Netherlands, Labour force statistics.

ICT workers often have a fulltime job (35 hours a week or more), more so than the rest of the employed labour force (see table A2.8.1 in the statistical annex). They are also somewhat younger than average. Furthermore, ICT workers are often employed rather than self-employed and relatively well educated. Over 50 percent went to college or university. In the total employed labour force this is only the case for one in three people. ICT jobs are still male dominated. While women constitute 42 percent of the employed labour force, only 11 percent work in ICT. In 2004 the ratio of people with a foreign background working in ICT was the same as in the total labour force, although ICT employees are slightly more people with a western than with a non-western background.
The differences between ICT workers employed by computer service bureaus and those working elsewhere in the economy are quite small. In computer service bureaus the average worker is younger and slightly better educated and there are slightly more male ICT workers than elsewhere.

Vacancy rate rising

The vacancy rate – the number of vacancies per thousand jobs – in the ICT sector is on the rise again. In the rest of the economy the vacancy rate is picking up as well but in the ICT sector the increase is above average. In 2002 the vacancy rate came to its lowest point at 10, while it was 17 in the rest of the economy. This was also the only year in the period under consideration that the scarcity of personnel in the rest of the economy was larger than in the ICT sector. In 2003 there had already been a slight

2.8.3 Vacancy rate in the ICT sector and the rest of the economy, 1995–2004



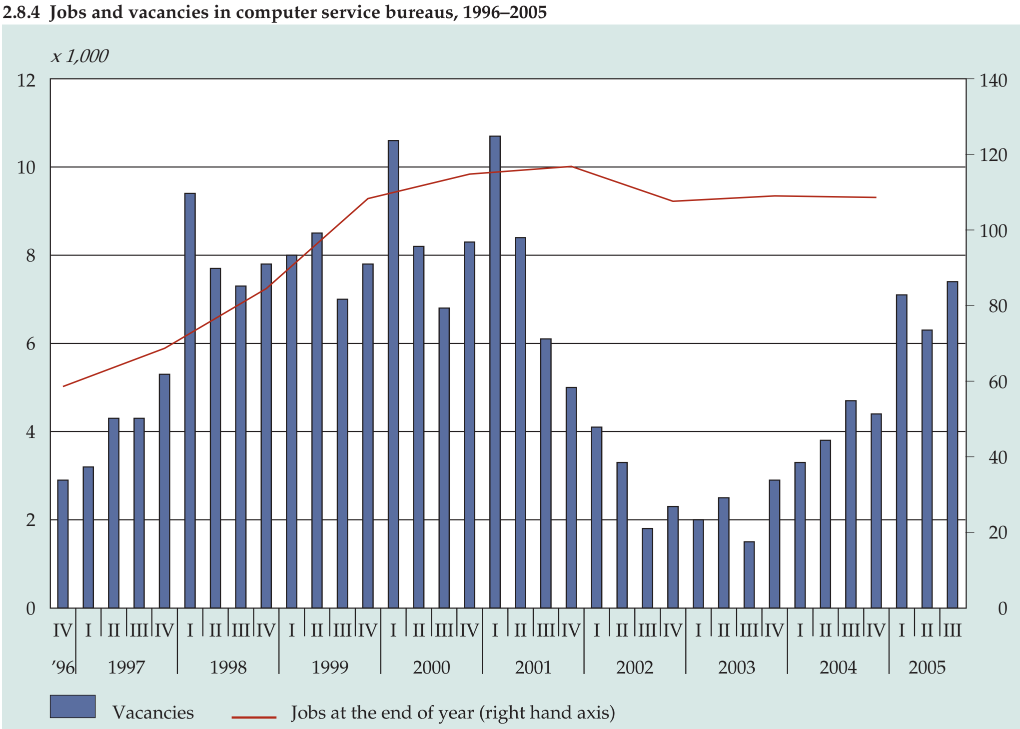
Source: Statistics Netherlands, Survey on vacancies, third quarter and Survey on employment and wages.

increase in the ICT sector. The vacancy rate was 12 in that year and the same as in the rest of the economy. In the meantime, the vacancy rate in the ICT sector has risen to 30 whereas the rest of the economy lingers at a vacancy rate of 15. Also in the first three quarters of 2005 the number of vacancies in the computer service bureaus was higher than in 2004.

Many ICT workers in the Netherlands

Internationally speaking the Netherlands has the highest percentage of employed labour force working in ICT within the group of countries used as a reference here. Since there are various job classifications used the share of ICT workers in the Netherlands is slightly different from the figures presented above. Denmark and Finland also have many ICT workers, whereas South Korea has the lowest number of ICT in its labour force. Japan and the USA stand somewhere in the middle.

2.8.4 Jobs and vacancies in computer service bureaus, 1996–2005

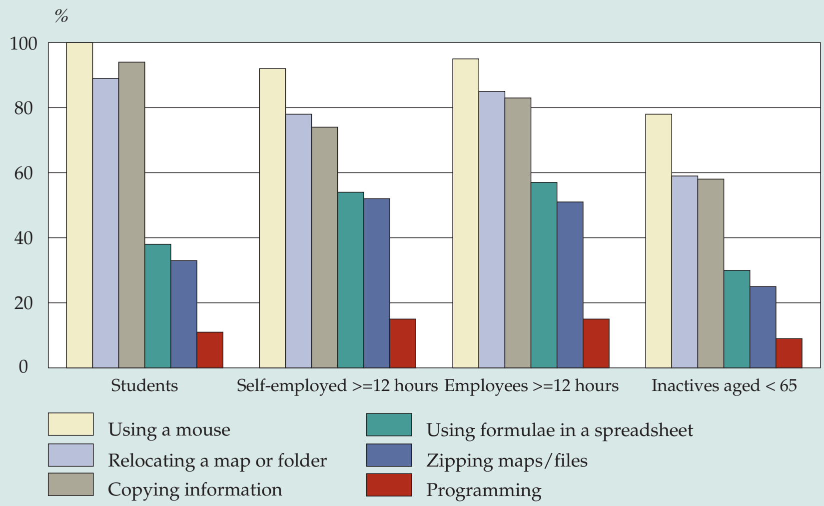


Source: Statistics Netherlands, Quarterly survey on vacancies in the business sector / Survey on employment and wages.

ICT skills among economically active and inactive people

The study '*ICT-gebruik bij personen en huishoudens 2005*' (ICT use among individuals and households) by Statistics Netherlands shows that the economically inactive people aged under 65, such as the unemployed, disabled and househusbands and housewives, less often have certain ICT skills than people who work. This may have consequences for the position of the inactive population on the labour market. Because ICT is gaining prominence on the work floor, there is the chance that it is harder for the inactive people to get a job because they lack certain digital skills. Statistics Netherlands' figures show that the inactive people have lower scores in all skills than the people who work. This is because the diversity of pc use at work is often greater than at home. The inactive people also cannot take courses through their work. The figure below shows the differences between the active and inactive populations.

ICT skills broken down by social group, 2005 [1)]

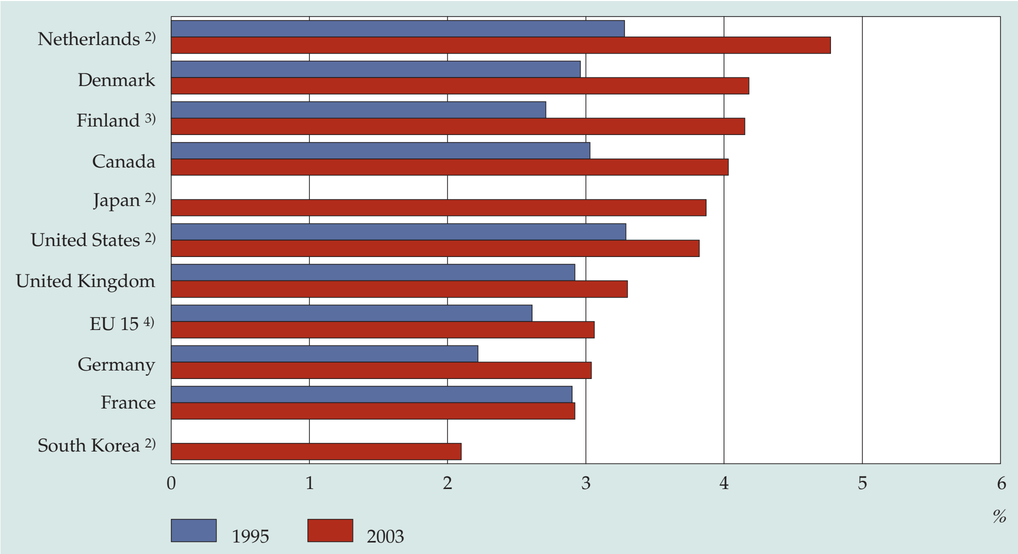


1) People aged 12–74.

Source: Statistics Netherlands, ICT use among individuals and households 2005.

The Social and Cultural Planning Office of the Netherlands (SCP) in its publication '*Verzonken technologie – ICT en de arbeidsmarkt (2005)*' has studied if people who did not work stayed behind in the area of ICT. The study shows that work mainly influences the ICT skills of older employees, because they did not acquire them at home or in school. That is why there is a greater probability for people over 40 without work to stay behind than for people of that age with work, or for young people without work. The figure above also shows that pupils and students have the skills more often than the inactive people do. Furthermore, the SCP study shows that among the inactive population, the unemployed have more digital skills than the people with disabilities or housewives and househusbands.

2.8.5 Share of ICT workers in total employed labour force, international, 1995 and 2003 1)



1) Based on the classification which is formulated in chapter 6 of OECD Information Technology Outlook 2004. See also Welsum, D. van, and G. Vickery (2004), New perspectives on ICT skills and employment, Information Economy Working Paper DSTI/ICCP/IE(2004)10, OECD.
2) 2002 instead of 2003.
3) 1997 instead of 1995.
4) Estimates.

Source: OECD, Information Technology Outlook 2004.

2.9 ICT education

The number of people working in an ICT profession has increased enormously over the last decade. Many work in the ICT sector, but many more work outside it. They have various levels of education. Some changed from different jobs, others took in-house courses to become an ICT expert, and others studied ICT at school. In the Netherlands, regular education offers qualification courses at the secondary, higher professional and university levels for specific ICT jobs. In the previous edition of this publication we published figures about these three types of education. Unfortunately, we have no new figures about the secondary level available so we will limit ourselves to the higher professional and university levels. The figures we present here do not match entirely with those published in previous years because the method of determining which types of education come under informatics has changed into one that fits in better with the international classifications.

Most information experts train at the higher professional level (hbo)

In the early nineties over 8 thousand students were registered in higher professional (hbo) for informatics and just under 6 thousand at the university. In 15 years time

Table 2.9.1
Students of informatics in higher education, 1990/'91–2004/'05

		Registered students		First-year students		Graduates [1]	
			Share of total		Share of total		Share of total
		number	%	*number*	%	*number*	%
Higher professional level	1990/'91	8,235	3.4	1,803	2.6	1,352	3.5
	1995/'96	9,113	3.4	2,087	3.1	1,705	3.3
	2000/'01	18,111	5.8	5,326	6.2	2,102	4.0
	2001/'02	19,184	6.0	5,126	6.0	2,544	4.5
	2002/'03	19,756	6.1	5,047	6.1	2,799	4.8
	2003/'04	20,013	6.0	4,780	5.5	3,093	5.2
	2004/'05	20,282	5.9	4,818	5.4	.	.
University level	1990/'91	5,535	3.0	1,024	2.8	599	3.1
	1995/'96	4,472	2.5	773	2.6	690	2.4
	2000/'01	5,665	3.4	1,424	4.3	463	2.3
	2001/'02	6,127	3.5	1,410	3.9	472	2.2
	2002/'03	6,408	3.6	1,298	3.6	561	2.6
	2003/'04	6,588	3.5	1,214	3.1	640	2.8
	2004/'05	6,783	3.4	1,259	3.1	.	.

[1] At the higher professional level: bachelor graduates. At the university level: master graduates.

Source: Statistics Netherlands, Education statistics.

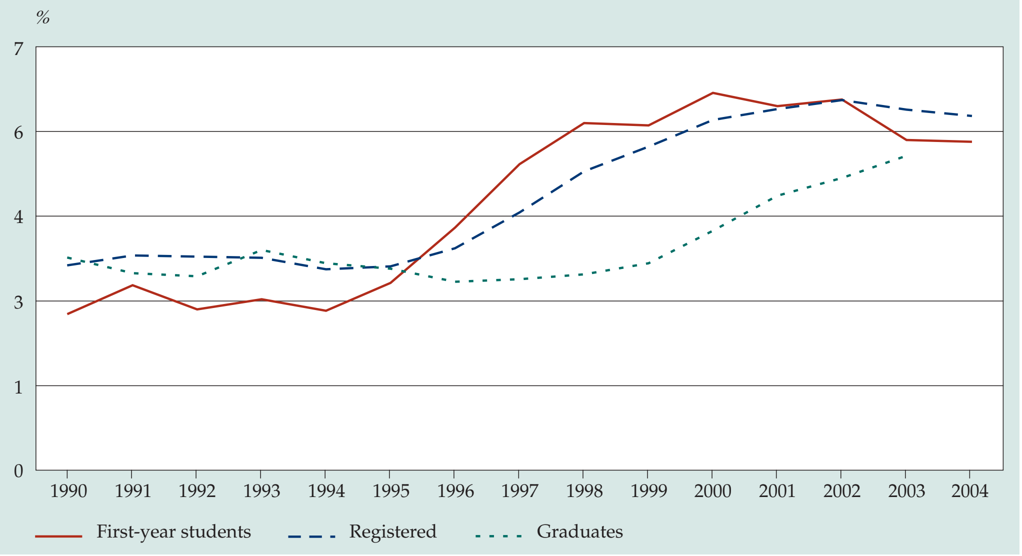
this figure multiplied by 2.5 at the hbo level whereas university still has about 7 thousand students in this field, an increase of just 20 percent on 1990/'91. The effect is due to the fact that hbo grew much faster than the universities. Also in relative terms the importance of informatics increases much faster at the hbo, where about 6 percent of the students take informatics. In university this is only 3.5 percent.

How many information experts enter the labour market? To answer this question it is interesting to look at the number of first-year students and the number of graduates. The first-year students indicate how many may enter the labour market in 4 to 6 years, and the graduates indicate how many actually enter the labour market annually. Both are approximations. Many first-year students will switch or leave without graduating. However, some graduates may continue their studies and there are always some people who will do something else after graduation.

Share of informatics students levelling off at hbo

The percentage of students in informatics among first-year students and the total number of students at hbo increased dramatically in the second half of the 1990s. Probably the hype surrounding the internet and the millennium problem contributed to this. In the first half of the nineties the share of first-year students stayed below 3 percent, and the share of graduates around 3.5 percent. In the period 1995–2003 we see how the share of graduates lags 4 to 5 years behind the share of first-year students. Since 1996/'97 the share of first-year students in informatics increased rapidly whereas the share of graduates started to increase by 2000/'01. In absolute terms there are always fewer graduates because students drop out. Since the share of first-year students in informatics fell after 2000/'01 the share of graduates is likely to decrease in the years to come.

2.9.1 Students of informatics at the higher professional level (hbo), 1990/'91–2004/'05

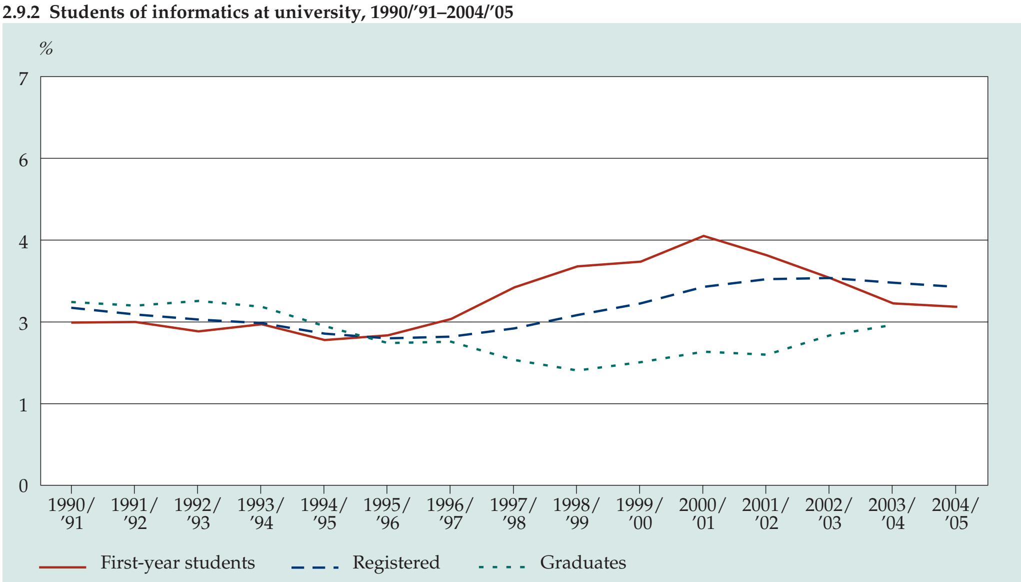


Source: Statistics Netherlands, Education statistics.

Study of informatics at university level

While the total number of students in hbo grew from 240 thousand in 1990/'91 to about 350 thousand in 2004/'05, the number of university students increased from 180 thousand to 200 thousand students during that same time. In one period the number of university students fell; in 1998/'99 there were some 160 thousand university students. So the absolute increase in the number of students in informatics at university lags well behind that at the hbo. Also relatively speaking is informatics not quite so popular in the universities. The percentage of first-year students in informatics at university in 1990/'91 was just below 3 percent. This share fell, after a peak in 2000/'01 of more than 4 percent, to about 3 percent. The share of graduates is now even lower than in 1990/'91, well below 3 percent. The share of informatics graduates also increased several years after the increase in the number of first-year students in informatics but the effect is less evident than at the hbo level.

2.9.2 Students of informatics at university, 1990/'91–2004/'05



Source: Statistics Netherlands, Education statistics.

Informatics is male dominated

Currently the hbo has more female than male students: 52 percent of the students and 57 percent of the graduates are women. This is because women are more successful in finishing their studies. In informatics the share of women fell and here the difference between female students and female graduates is not as big. In 1990/'91 only 12 percent of the informatics students were female, currently the number is down to just over 7 percent.

The situation is less extreme at the universities. The female informatics students currently form 9.5 percent of the population versus 10 percent in 1990/'91. There are more women among the graduates: over 12 percent. Most university students are male, but the share of women increased from about 43 percent in 1990/'91 to nearly 50 percent. Women are now the majority among first-year students and graduates, which also means that women end their studies successfully more often at the university as well.

The Netherlands trains few informatics specialists

Internationally speaking the performance of the Netherlands in training people in the information sciences is very mediocre. The Netherlands has the lowest percentage of graduates in informatics of the countries under consideration here – lower than the averages of the EU 15 and EU 25. The growth rate of the share of informatics graduates is mediocre. However, the international data use a narrow definition of informatics: not taking into account areas in technology, which is why the figures are different from the ones above.

Table 2.9.2.
Share of female students of informatics in higher education, 1990/'91–2004/'05

		Registered students		First-year students		Graduates [1]	
		Informatics	Total	Informatics	Total	Informatics	Total
		%					
Higher professional level	1990/'91	12	47	10	50	13	49
	1995/'96	9	49	8	51	11	51
	2000/'01	8	52	8	53	9	56
	2001/'02	8	52	7	53	9	56
	2002/'03	8	52	8	53	9	57
	2003/'04	8	52	8	53	8	57
	2004/'05	7	52	8	53	.	.
University level	1990/'91	10	43	13	46	7	42
	1995/'96	9	46	9	47	13	50
	2000/'01	9	48	10	51	13	51
	2001/'02	9	49	10	51	13	52
	2002/'03	10	49	11	52	18	53
	2003/'04	10	49	12	51	12	54
	2004/'05	9	50	10	52	.	.

[1] At the higher professional level: bachelor graduates. At the university level: master graduates.

Source: Statistics Netherlands, Education statistics.

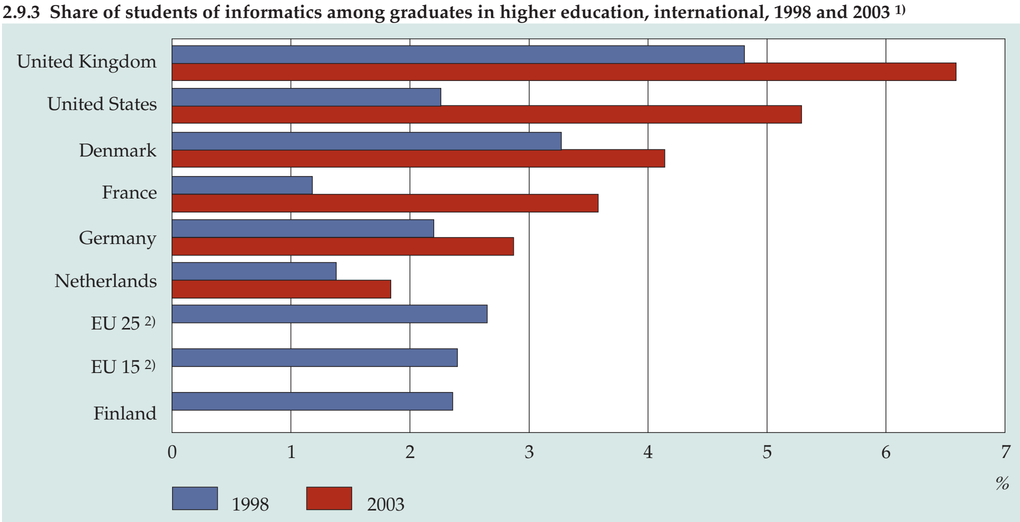
The UK leads with a share of about 7 percent informatics graduates in the total number of graduates. The USA and France too have a much higher share of informatics graduates and much higher growth rate in the period 1998–2003 than the Netherlands.

Table A2.9.1 in the statistical annex shows data on more countries, including the share of graduates in natural sciences and technology. The performance of the Netherlands in these exact sciences is also very mediocre. Of all countries for which there are figures on 2003 available, the Netherlands has the lowest score with 16 percent, and still decreasing over the last five years. The USA also has few graduates in these areas: over 18 percent. However, they 'score' much better with over 5 percent in the share of graduates in informatics.

Growth rate of ICT workers far exceeds the number of trained informatics specialists

Paragraph 2.8 discussed employment in ICT, showing that the number of ICT workers on balance increased substantially in recent years: from 165 thousand in 1996 to 280 thousand in 2004. If the education system matched the labour market, there would have been 100 thousand extra informatics graduates needed over that period. Some people working in ICT are employed at a lower or intermediate level (the programmers in table A2.8.1 in the statistical annex), but this group was

2.9.3 Share of students of informatics among graduates in higher education, international, 1998 and 2003 1)



1) Higher education: ISCED-97 level 5A, 5B and 6. Informatics: ISCED-97 field 48.
2) For EU 15 and EU 25: Eurostat estimate.

Source: Eurostat, New Cronos, Education Statistics.

reduced in recent years, on balance. The technical system analysts and system analysts work at the higher professional (hbo) level, so this is the group that should be supplemented by the recent (hbo) graduates. However, there is a substantial difference between the number of hbo graduates in informatics from 1995/’96–2003/’04 and the increase in the number of ICT workers at the hbo level in that period: 71 thousand more people employed in ICT versus 19 thousand hbo informatics graduates entering the labour market. That constitutes just over a quarter of the growth in employment. The difference is smaller at the university level with 11 thousand extra people employed in ICT, of whom about 40 percent can be recruited, in theory, from informatics graduates at the university level.

Apart from filling the new jobs on the labour market, there is demand for replacements of older people who stop working or people who take jobs elsewhere. So ICT specialists have been much in demand over the past decade: many more than could be trained. Still the jobs are filled. If we look at the immigrant population working in ICT, we see that the group increased from 12 to 16 percent in the period 1996–2004 among the employed ICT workers. Even if they all received their training abroad, the group is too small to bridge the gap between demand and supply in ICT workers. The conclusion has to be that many of the people currently employed in ICT have not studied informatics at the higher professional or university level, and must have acquired the required skills in a different way (if they have acquired those skills at all).

2.9.4 Increase in ICT workers compared to the number of graduates in informatics, 1996–2004

Source: Statistics Netherlands, Education statistics and Labour force statistics.

2.10 *Globalisation*

The expected growth rate in the volume of the world trade in 2004 is twice as high as the growth rate of the worldwide gross domestic product. The trade volume of ICT goods and services is expected to grow even faster (OECD, 2004b). The increased globalisation goes hand in hand with the shift of business activities and reallocation of production factors. New technological developments make that many service activities can be performed independent of geographical location. Moreover, production and delivery need not take place in the same location. This not only involves low-skilled jobs, but also high-skill jobs are not immune for competition from abroad.

Although Dutch people have worried about buying 'foreign goods' since the seventeenth century there is now more reason to worry than before because relocation is easier. Trade and investment flows have grown much faster than production (CPB, 2005). The importance of better indicators for the analysis of trends in globalisation increased with it. In this paragraph we discuss several studies into the kind and scope of globalisation. There is not yet much statistical information available, and therefore it is impossible to outline a comprehensive picture: official statistics to determine the actual scope of the phenomenon are not yet available. Traditionally the task of national statistical bureaus was to describe the economy within the country, so that their statistics are based on domestic companies or activity units.

Since there are no direct statistical data, we must see how useful indirect benchmarks are, such as data on trade in services and employment. At the request of the Ministry of Economic Affairs (EZ), Statistics Netherlands is studying how to improve the statistical monitoring of the relocation of business activities. The emphasis is on shifts to low-wage countries (Van Laanen, 2005).

In this edition the emphasis is on the concepts and the theoretical backgrounds playing a role in globalisation. [1)] The findings for the Netherlands are described, especially those of small and medium-sized enterprises. The second paragraph focuses specifically on shifting ICT-intensive activities. The international figures are presented, based on the studies by Van Welsum and Vickery (Van Welsum and Vickery, 2005a and 2005b). To illustrate the influence of globalisation we will end the paragraph with the development of the IT sector in India, which is a mirror image of the developments in the 'industrialized' countries.

What is globalisation?

The OECD has taken the initiative to set up a conceptual and methodological framework for gathering quantitative information on the phenomenon of globalisation. This is published in the *Handbook on Economic Globalisation Indicators* (OECD, 2005a). The OECD concluded that the term 'globalisation' is often used to describe the internationalisation of the financial markets and the markets for goods and services. However, globalisation mainly refers to a dynamic, multi-dimensional process of economic integration, where national stocks increasingly become internationally mobile, whereas the interdependence of the national economies increases. The Handbook names three main contributing forces. First, the liberalisation of capital flows, and the deregulation of financial services in particular. Second, opening up markets for trade and investments, stimulating international competition. Finally, the central role played by information and communication technology (ICT) in the economy.

The media often focus on jobs shifting to other countries, but there are also shifts of economic activities on the domestic market. National outsourcing occurs far more often than international outsourcing. Shifting business activities abroad and outsourcing has been taking place for years in industry, but now it is starting to be common in the services sector too. The main reason is that services can now be traded due to the liberalisation of trade and the rapid technological developments, mainly in ICT, and the possibility to code ICT work in programs thereby standardising them. This makes the production of many service activities much less dependent on location.
Companies can use various ways of shifting activities. A company can decide to stop the production of goods and services and buy them abroad. The company therefore decided to purchase the products from another company or from a foreign business unit. Now the company may decide to stop production in the Netherlands and to

produce the goods and services abroad by investing in the foreign business unit. The production unit actually shifts from the Netherlands to another country. Such foreign direct investments, however, do not always result in shifts: a take-over of a foreign company does not necessarily mean that existing Dutch activities have to change (CPB, 2005). Table 2.10.1 shows the shifts of business activities described by the OECD and the Dutch Ministry of Economic Affairs. In this paragraph we will use these concepts.
In table 2.10.1 we make a two-dimensional distinction in the kinds of economic activities: geographical location and legal ownership. The activities may take place in or outside the Netherlands. The company may chose to keep ownership of the activity (investment) or place the economic activity outside the company (outsourcing).

Table 2.10.1
Shifts of business activities, by geographical location and legal ownership

	Netherlands	Abroad
Outside the company	domestic outsourcing	offshore outsourcing
On the company's own account	domestic supply, insourcing	international insourcing

Source: Van Welsum and Vickery (2005a); CPB (2005).

The Dutch situation

The Ministry of Economic Affairs has recently studied the Dutch situation. The study focussed on the kind, scope and motives of shifting activities abroad by companies located in the Netherlands, and the macroeconomic effects of these shifts for the country.

The Ministry of Economic Affairs commissioned two studies to answer their questions. Bureau Berenschot focussed on the kind, scope and motives by studying companies in the Netherlands (Berenschot, 2004). The CPB (2005) focussed on the macroeconomic effects of globalisation. Furthermore, the Ministry of Economic Affairs interviewed companies and experts. The study, financed by the Ministry of Economic Affairs focussed on shifting activities abroad due to foreign direct investments (international insourcing) and on shifting activities abroad due to outsourcing activities to third parties (offshore outsourcing).

Dutch companies operate in an international environment that is becoming increasingly competitive. Shifting business activities is one possibility to cut costs and increase productivity and competitiveness. Over 60 percent of the companies in the Berenschot study named cost cutting as a decisive factor in shifting activities.

Other companies named market-related aspects (expanding markets) as the reason to shift some of their activities. A third reason is that the fiscal climate, infrastructure, and labour conditions abroad are more attractive than in the Netherlands: 14 percent of the companies name this as their reason. So far, mainly low-skilled labour is being shifted.

In the study the issue was raised whether the Netherlands is losing out compared to the low-wage countries. A production line using unskilled labour is often cheaper in a low-wage country than in the Netherlands. However, a country like the Netherlands with a highly educated, productive population is often better positioned to make high-tech products or services. Countries should specialise and play to their strengths in their activities. Theoretically, Dutch companies and consumers and therefore the Dutch economy will benefit from a growing level of prosperity in a low-wage country since it means more purchasing power to buy Dutch and other products. Dutch companies therefore have the opportunity to expand their markets. Consumers will find a better price-performance ratio and an increased choice. However, this presupposes international markets that function perfectly. In practice, it is uncertain if such positive effects are possible. Furthermore, macroeconomic advantages are no great comfort for people who suffer the consequences at the micro level.

The Ministry of Economic Affairs (EZ, 2005b) concludes that shifting business activities is painful for the people directly involved. However, when there are solid economic grounds (optimal allocation), there are advantages as well. There can be growth in the Netherlands and in the 'host countries', which in turn translates into employment. Apart from an active, offensive role of the private sector, the Ministry of Economic Affairs also sees a role for government in creating a positive business climate.

Globalisation in small and medium-sized enterprises

Globalisation was traditionally mainly for multinationals, but now small and medium-sized enterprises also increasingly have to deal with globalisation. Globalising economic activities may have several kinds of influence on small and medium-sized enterprises. Entering international markets offers some small and medium-sized enterprises opportunities for expansion and growth in their business activities. For the supply companies among the small and medium-sized enterprises in manufacturing and in services, outsourcing activities by major international companies creates opportunities. Small and medium-sized enterprises increasingly have to deal with foreign competition on the domestic market. Dutch small and medium-sized enterprises need not just be victims; they may benefit from globalisation as suppliers of the large companies.

The EIM recently finished a study centered around the question: What constitutes globalisation for small and medium-sized enterprises and what trends play a role in

Table 2.10.2
Globalisation in Dutch small and medium-sized enterprises, 2004 [1)]

	% of SMEs
Exports	18
Imports	26
Foreign direct investments [2)]	2
Cross-border cooperation:	9
Cooperation only with foreign companies	2
Cooperation with foreign and Dutch companies	7

1) Companies having 1 to 100 employed persons.
2) Share of companies that made foreign direct investments in the last three years.

Source: EIM MKB-Beleidspanel, measurement in July 2004.

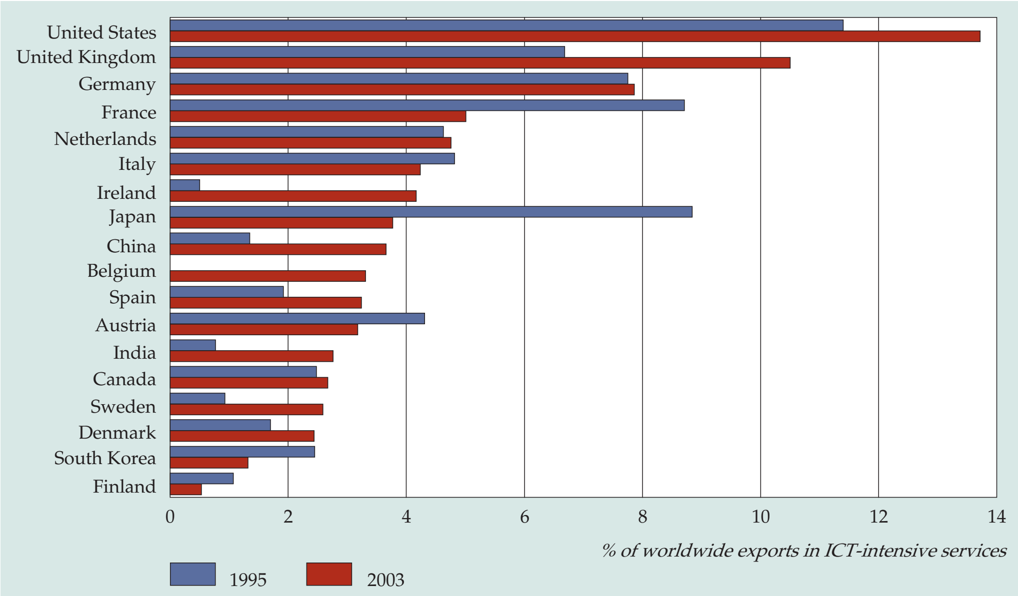
this? (EIM, 2005). In this study EIM presents the main outcomes of their literature studies, interviews with experts and an analysis of existing and new data. [2)] EIM distinguishes four types of globalisation in its report: exports, imports, foreign direct investments and cross-border cooperation. Table 2.10.2 shows that of all types of globalisation, Dutch small and medium-sized enterprises import most (about a quarter). Small and medium-sized enterprises also export relatively often (about one fifth). About 10 percent of the small and medium-sized enterprises work with foreign partners. Only a fraction of the small and medium-sized enterprises (2%) invests abroad. These shares in export activities, imports and foreign direct investments yield the Dutch small and medium-sized enterprises a position in the middle group when placed in a European perspective, according to EIM.

Shifting ICT-intensive activities: international trade in services?

After the general discussion of globalisation above, the rest of the paragraph will deal with shifting ICT-intensive activities. Recent figures by the OECD (OECD, 2004b) show that the production of ICT goods and ICT-related services are shifting to Asia. In 2002 the EU, Japan and the USA accounted for less than 65 percent of the worldwide production of ICT goods; in 1990 it was over 80 percent of total production. This share mainly fell because of the rapid growth rates in China and other Asian countries (see paragraph 2.6).
There also seems to be a shift in ICT work in the worldwide division of labour.

The ICT-producing sector became increasingly international in the last two decades. The international expansion of ICT companies according to the OECD is mainly due to the need for access to markets, growth, economic advantages of scale and access to skills and technology. The expansion mainly takes place through mergers and acquisitions of foreign companies because this provides faster access than starting a company from scratch. Competition increases this trend, because other companies

2.10.1 Share per country in total reported exports of other business services and computer and information services, international, 1995 and 2003 [1)]



[1)] Total exports of IT and ICT intensive services are calculated by adding the categories other business services and computer and information services from the balance of payments data of IMF. This information is not available for all countries in the IMF database, and for some countries the two categories are not available seperately.

Source: Van Welsum and Vickery (2005b).

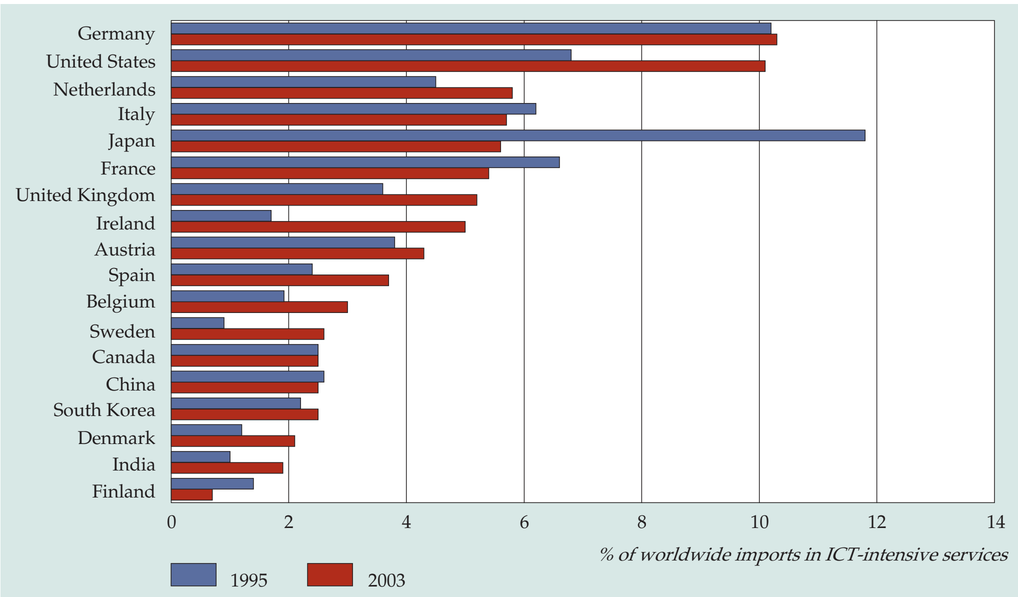
follow the 'leaders' to high quality locations where the skills are available at lower costs.

There are no reliable official data on globalisation. When there is offshoring between countries, it will result in a trade flow of services. The country that is the receiver of the offshore activities will export services, whereas the 'source country' will import these services. [3)] The balance of payments data of the International Monetary Fund (IMF) have information on imports and exports. Van Welsum and Vickery (2005a and 2005b) approached the trade in ICT work through the volume of payments of the balance of payments categories computer and information services and other business services. [4)] Worldwide, the export of these services mainly comes from the OECD countries. However, the share fell from 80.3 percent in 1995 tot 79.1 percent in 2003.

The share of Ireland among the countries reporting ICT exports to the IMF increased sharply: from 0.5 percent in 1995 to 4.2 percent in 2003. Also in the absolute sense, Ireland's exports of other business services and computer and information services increased sharply: an annual growth of 40 percent on average in the period 1995–2003 (see table A2.10.1 in the statistical annex). These growth rates are the result of the fact that Ireland is a main destination for offshore activities from the USA (especially in IT-related activities). The exports for India and China of ICT work increased sharply too. Their shares in global exports grew from 0.8 to 2.8 and 1.4 to 3.7 percent respectively. At the end of this paragraph we focus on developments in India. The growth rate in Sweden is also remarkably high (+1.7 percent point). These increases came at the expense mainly of the shares of Japan (–5.1 percent points) and France (–3.7 percent points). In France the volume of the export in other business services and computer and information services still increased slightly in the period 1995–2003 (+0.7 percent), but in Japan there was a decrease in that period in the absolute sense (–3.0 percent).

In exports there was a decrease of the share of OECD countries in the worldwide exports of ICT-intensive services. In imports the OECD countries now have a larger share: growing from 75.1 percent in 1995 to 81.1 percent in 2003. Those countries with a large share of ICT-intensive services in the worldwide export of services also have a relatively big share of these services in the total imports. Van Welsum and Vickery (2005b) also demonstrate that a large volume increase in the exports of ICT-intensive services usually goes hand in hand with a relatively large increase in the imports of such services.

2.10.2 Share per country in total reported imports of other business services and computer and information services, international, 1995 and 2003 1)



1) Total imports of IT and ICT intensive services are calculated by adding the categories other business services and computer and information services from balances of payments data of IMF. This information is not available for all countries in the the two categories are not available separately.

Source: Van Welsum and Vickery (2005b).

Also in the worldwide imports of ICT-intensive services, Ireland's share increased sharply (+3.7 percent point). The shares of the USA and Sweden also grew quite remarkably. Again, as was the case in exports, Japan had the largest dip in the share of total imports, since the imports fell in the period 1995–2003 (see table 2.10.1). Figure 2.10.2 also shows that the Netherlands in 2003 accounted for no less than 5.8 percent of the worldwide imports of ICT-intensive services.

Relocation of ICT-intensive activities: offshoring jobs

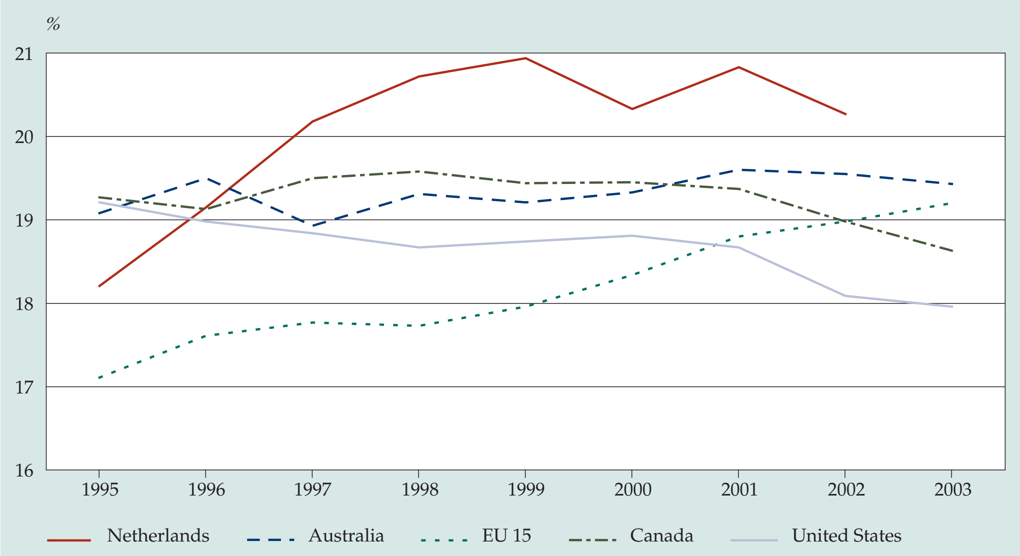
Wage costs and a lack of qualified personnel are major motives for globalisation. Van Welsum and Vickery (2005a) tried to gain insight in the potential volume of offshoring of service jobs. For this they used employment figures, particularly employment figures by kind of job. The idea is that jobs with an intensive use of ICT are potentially more likely to qualify for offshoring. After all, when ICT plays a key role in producing output, than it is likely that the output can be traded, using ICT applications. Therefore, the general characteristics of ICT also apply for this kind of work. After all, the production of the output becomes independent of location due to the low 'costs of transport'. The person who does the work can therefore also be located in another part of the world and the output can be sent or traded via ICT applications. Van Welsum and Vickery use the following selection criteria for the functions (professions) that are potentially location-independent:

- jobs expecting to use ICT intensively in producing output;
- the output can be traded and sent via ICT applications;
- the work consists mainly of explicit or codified knowledge and little or no *tacit* or implicit knowledge inside people's heads;
- the work does not require face-to-face contact.

A job list was made based on the European labour force data, and as many comparable jobs as possible were selected for Australia, Canada, the USA and South Korea. [5)]

The job classifications for the various countries are not harmonised, which means that absolute percentages are not directly comparable. However, the developments in the percentages for these countries, shown in figure 2.10.3, produce interesting insights. The share of jobs that are potentially location-independent fell in the USA, Canada and Australia in the period 1995–2003, especially after 2001. This seems a result of the offshoring of ICT-intensive services that took place in those countries, such as back office activities (where offshoring did actually take place for the potential candidates for offshoring). In the EU 15 the share increased, which is consistent with increased employment in the services sector. According to Van Welsum and Vickery some studies show that European companies offshore many of their activities within Europe. Moreover, some countries, like Ireland, are major receivers of offshoring. So far, Europe seems to be doing relatively much itself, but will this be true in the longer term? Or is Europe in a different 'phase' from the USA and are the major shifts yet to come?

2.10.3 Share of jobs with an intensive use of ICT (potentially) qualified for offshoring, international, 1995–2003



Source: Van Welsum and Vickery (2005a).

In Van Welsum and Vickery, the totals per country are analysed further by looking at developments within the sectors of the economy. In the group branches of industry where the percentage of ICT-intensive jobs exceeds 30 percent, there are many branches of industry in the services sector (computer service bureaus, financial institutions, other business services and research institutions). The share of ICT-intensive jobs is between 10 and 30 percent for most manufacturing branches of industry.

In a follow-up study (Van Welsum and Vickery, 2005b) an attempt was made to relate employment potentially threatened by offshoring to other economic and structural developments in a panel of OECD countries in the period 1996–2003. For this, developments in the labour force were linked to developments in the trade in services, and in foreign direct investments. Econometric estimates using estimators for panel data provide insight in the factors influencing the share of employment that qualifies for offshoring. The USA, Canada, Australia and the EU 15 (except Greece, Ireland, Luxembourg and Portugal) are involved in the analysis.

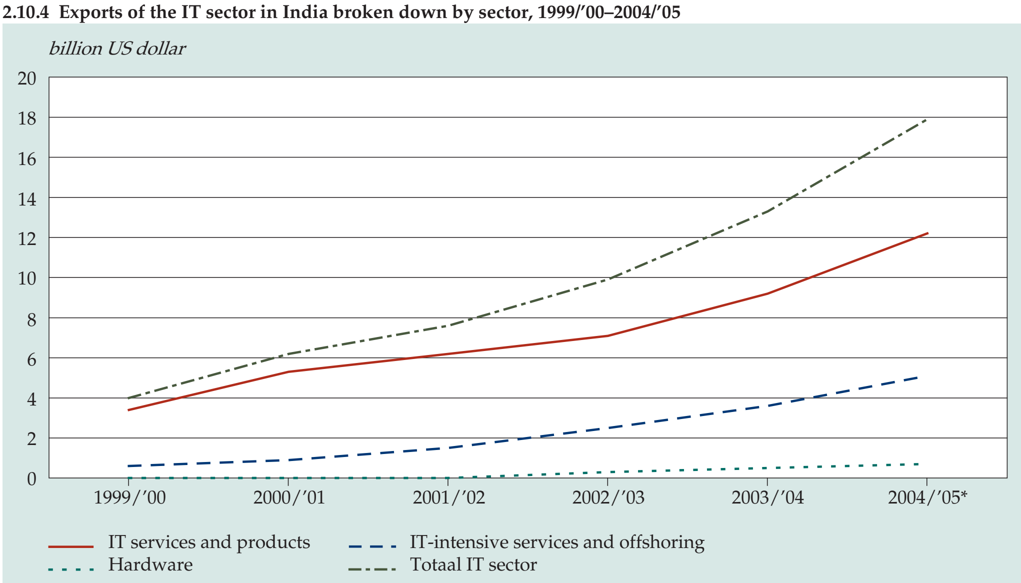
The first (preliminary) model estimates show that the exports of other business services and computer and information services make a positive and significant contribution to employment qualifying for offshoring. This suggests that more export of ICT work generally leads to an increase in the share of 'ICT-using' professions in the total labour force. This seems logical: because in order to be able to export such ICT-related services, relatively many people have to work to render these services.

For imports there is a negative effect (more imports seem to lead to a lower share of location-independent jobs), but the effect is not significant and outside the reliability margins of the model. This means that the econometric estimates provide no proof that an increase in the imports of business services and computer and information services lead to a drop in the share of employment in jobs that are potential candidates for offshoring. Foreign direct investments, finally, do have a significant positive effect on the share of jobs using relatively much ICT. In contrast to popular opinion, foreign direct investments do not directly lead to a decrease in employment in such ICT-intensive jobs in the country that is investing.
According to the model estimates, the location-independent jobs did not necessarily need to be influenced negatively in the period 1996–2003, despite increased imports and foreign direct investments. This conclusion of Van Welsum and Vickery supports the idea that offshoring services results in a process of adaptation, which may lead to high costs in the short run but with positive results compensating for the costs in the end.

Illustration: development IT sector in India

At the end of this paragraph a few figures on developments of the IT sector in India. Many countries offshore IT work to India. This yielded some economic consequences for India itself. The Indian IT industry is past the start-up phase. Figures from NASSCOM show that the total revenues resulting from the exports of India’s IT industry will come close to 18 billion dollar in 2004/’05 (14.6 billion euro),

2.10.4 Exports of the IT sector in India broken down by sector, 1999/’00–2004/’05



Source: NASSCOM.

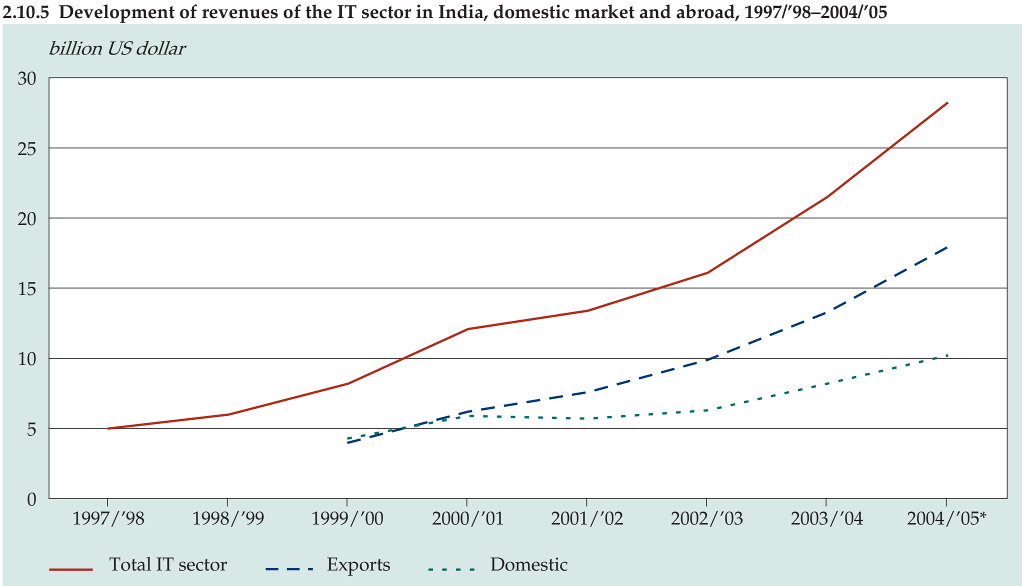
while in 1999/'00 this was only 4 billion dollar. [6] Within five years time the export revenues are expected to rise to 50 billion dollar. The sector produces 4 percent of the gross domestic product of India. In 2008 that percentage is expected to be close to 7 percent. The volume growth also results in an increase in knowledge within India. Indian companies not only work in a demand-driven way now but also offer to develop complete programs for their clients. The statistical annex includes a table with figures on developments in the IT sector in India (see table A2.10.2).

Figure 2.10.4 shows that the revenues of the IT sector in India through exports increased sharply over the last five years. The growth is almost entirely generated by the IT services: hardware is hardly exported anymore.

The sharp increase in revenues of the IT sector in India is mainly produced by exports, because production for the domestic market seems to have grown far less in the period 1997–2005, see figure 2.10.5.

The fast rising IT sector in India also has produced fast rising employment. In recent years the number of employees in the sector increased every year by a quarter. In 2003/'04 there were 813 thousand people employed in the IT sector, of whom over 30 percent worked in the IT-intensive services and offshoring, in 2001/'02 this was 20 percent.

2.10.5 Development of revenues of the IT sector in India, domestic market and abroad, 1997/'98–2004/'05



Source: NASSCOM.

Notes in the text

[1] This publication focuses on ICT-related developments in globalisation. The Statistics Netherlands (CBS) publication *Kennis en economie 2006* will also focus on other aspects of the 'Globalisation of the knowledge economy' (such as the globalisation of R&D).

[2] Here, we used the results of various surveys by EIM on the panel for small and medium sized enterprises and the European Network for Social and Economic Research (ENSR) Enterprise Survey 2003.

[3] Not all trade in services comes from offshoring, but it does produce a good approximation.

[4] Categories 7 and 9 from the services account in the balance of payments.

[5] Jobs that are potential candidates for offshoring have activities that can easily leave the country, but they must also easily enter a country because they are potentially location-independent. Incoming offshored services lead to an increase in the share of jobs that are potential candidates for offshoring. Service activities leaving the country produce a relative decrease of this share. Furthermore, an increase/decrease of the share may also be the result of an increase/decrease of the domestic demand for such activities.

[6] NASSCOM is the National Association of Software and Service Companies in India. It is a trade organisation and the Chamber of Commerce of the IT software and services sector in India. NASSCOM is a non-profit organisation (financed by the members) that seeks to promote industry and trade in software and services and progress in the software technology research
(see http://www.nasscom.org).

3. Telecom infrastructure

The available telecom infrastructure is of crucial importance for the use of ICT. The higher the quality of the infrastructure, the greater the potential use and the higher the return on investments in ICT by the users of this telecom infrastructure. The supply of this infrastructure is mainly left to the 'market'. The general picture is one of converging, and therefore competing, network services supplied through the various types of networks, but with the aim to provide the same services to the consumer. The traditional distinction between networks in terms of services offered will disappear. In 2005, television, radio, internet and telephone services were all supplied through different networks. Service providers are capable of offering new services on the electronic networks that used to be the domain of a single service provider. The number of internet applications continues to grow, as does the digitalisation of information that determines these developments.

Practically all households and companies in the Netherlands have access to broadband internet. The number of broadband connections per 100 inhabitants in the Netherlands was one of the highest in the world at the start of 2005. The broadband connections in the Netherlands are usually RTV cable or ADSL connections via the fixed telephone lines. Compared to various other countries, the diversity of broadband connections in the Netherlands is not very large. ADSL connections in the Netherlands are not expensive when looked at from an international perspective.

Internet use continues to grow. However, the threats or nuisance private individuals and companies experience with the internet may not be a positive influence on its popularity as a tool. However, so far the threats have not yet brought use to a halt.

3.1 Market steering and monitoring

Liberalisation of the telecom market

The Dutch telecom market has left the phase of government ownership and monopolies behind it with the privatisation in 1989 of the state company and the gradual lifting, under EU pressure, of the protection of the former state company from newcomers on the market. The company lost its monopoly on telephones, on data transmission, on satellite and on mobile telephone connections. Finally, in 2005 the monopoly on invoicing subscriptions for fixed telephone lines was lost.

The liberalisation of the telecom sector must eventually lead to sustainable competition with general supervision of fair competition. In 1997 the government opted for an independent monitoring of the liberalisation process, not only because of European regulations, but also for the fact that the state kept a major share in the previous state company and as a consequence the interests were not yet formally clearly separated. The monitoring is done by the Onafhankelijke Post en Telecommunicatie Autoriteit (OPTA). OPTA's tasks are laid down in the OPTA-law. OPTA is an independent authority, which, on the basis of this status, operates at some distance from the Ministry of Economic Affairs.

The new legislation on telecommunication implies a stronger focus on the relationships between the telecommunication companies and on those between companies and consumers. The Telecommunication Law in 2004 changed the system of market monitoring so that markets and measures no longer follow directly from the law. Instead, OPTA has to base itself on 'competition laws' when analysing the markets and taking measures.
In 2005 the fixed telephone network was still owned by a single company, but other companies have been allowed access to the network to provide telephone, data and rented line services. The 'wholesale market' rates require OPTA approval. OPTA may also oblige 'retail' companies that have considerable market power to charge minimum or maximum rates to the end users.
The latest review of the telecom law in 2004 no longer just deals with telephony, but also with all transport services in the area of (tele) communication, such as data transmission and cable networks. The entire electronic communication sector therefore comes under the same legal regime, fitting in with the convergence trend. OPTA does not deal with the content of services, but with how they are delivered. The key concepts are no longer telephony and rented lines, but electronic communication. To that effect, the law is worded in technology-neutral terms.

Telecom providers

Table 3.1.1 reflects the development in the number of telecom companies over the last ten years. The telecom sector is mainly composed of companies without

Table 3.1.1
Number of telecom companies broken down by business size, 1996–2005[1)]

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total	380	475	635	830	780	1,125	1,100	1,200	1,385	1,310
0 employees [2)]	230	265	370	510	435	650	665	800	940	860
1 to 5 employees	100	145	175	215	220	315	265	230	270	285
5 to 10 employees	20	20	25	25	35	55	40	40	45	45
10 to 20 employees	15	15	25	25	30	40	40	45	40	35
20 to 50 employees	10	20	25	30	25	30	40	35	40	30
50 to 100 employees	5	5	5	10	10	10	15	15	15	15
100 and more employees	5	5	10	15	25	30	30	35	35	35

1) Reference date 1 January. SBI group 642. 2005: provisional data.
2) 0 employees or people employed for less than 15 hours a week.

Source: Statistics Netherlands.

employees. These companies in particular account for the annual changes in growth rate. They are companies run by the owner, family members, temporary workers or people employed for less than 15 hours a week. Probably these companies also offer telephone services abroad. The table shows that the liberalisation process is strongly reflected in the growing number of telecom companies.

Parties seeking to be active on the market for electronic communication must register their activities with OPTA. OPTA uses the registration and the data requested to implement the Telecommunication Law. Table 3.1.2 shows the number of companies registered with OPTA per telecom activity. It is an indication; a small number of registered parties is not actually active and several parties have more than one registration. By mid 2005 344 different companies were registered according to the characterisation laid down in the revised Telecommunication Law. Table 3.1.3 shows these companies on the basis of the various combinations of activities.

Table 3.1.2
Number of telecom companies registered with OPTA, per telecom activity, 2004–2005[1)]

	2004	2005
Providing a public electronic communication network	218	249
Providing a public electronic communication service	213	267
Providing accompanying facilities	8	9
Providing qualified certificates	2	3

1) Reference date 2004 is 31 December. Reference date 2005 is 31 August.

Source: OPTA.

Table 3.1.3
Actual combinations of telecom activities, 2005[1)]

	Actual combinations						
Providing:							
a public electronic communication network	No	No	No	Yes	Yes	Yes	Yes
a public electronic communication service	No	No	Yes	No	No	Yes	Yes
accompanying facilities	No	Yes	No	No	Yes	No	Yes
qualified certificates	Yes	No	No	No	No	No	No
Number of companies	3	2	93	74	1	165	6

1) Reference date 31 August.

Source: OPTA, edited by Statistics Netherlands.

The companies registered with OPTA are usually, but not by definition, part of the telecom companies shown in table 3.1.1. OPTA also includes municipalities that registered and companies, including some store chains, which have telecom as a side activity.

Definitions from the Dutch Telecommunication Law

Public electronic communication service
A public electronic communication service is defined in the Telecommunication law as a service, usually offered at a fee, which is available to the public and which consists fully or mainly of transmitting signals via electronic communication networks, including telecommunication services and transmission services on networks used for broadcasting. A well-known example is the supply of mobile telephone services.

Public electronic communication network
A public electronic communication network is defined in the Telecommunication law as a transmission system, including switching and routing equipment and other means that enable the transmission of signals via cable, radio waves, optic or other electromagnetic ways including satellite networks, fixed and mobile landlines, electricity grids used for the transmission of signals, and networks for radio and television broadcasts, and cable television networks regardless of the kind of information transmitted. The network must also be fully or mainly used to offer public electronic communication services, including a network intended for the diffusion of programs to the public. Offering such an electronic communication network means: constructing, operating, managing it or making it available.

Source: Telecommunicatiewet.

Table 3.1.3 shows that the usual situation has companies providing a service and operating a network; in 2005 this situation occurred 171 times. Besides this, 93 companies indicated to OPTA that they would like to provide a public electronic communication service, but without operating a public electronic communication network. By definition they are service providers using the networks of others. Examples are Internet Service Providers (ISP’s) and CPS operators. CPS stands for Carrier PreSelect. CPS operators take over telephone calls from the fixed telephone lines and invoice the costs of the calls without charging the clients subscription fees. The operator of the fixed telephone lines continues to charge the subscription fees.

The activity ‘providing facilities’ means providing those facilities that enable or support services through the network, for instance the supply of decoders. Table

3.1.3 shows that only 9 companies do this, including 7 that do so in combination with the provision of services or a network.

A new activity is the provision of 'qualified certificates'. The companies providing these activities are called 'Trusted Third Parties' (TTP's). TTP's see to it that the authenticity of the sender of an electronic message is recorded. This means they can see to it that an electronic signature is legally the same as a handwritten signature. This activity is relatively new and only 3 organisations undertake it as a specialist telecom activity.

3.2 Networks

Ground cables

In the Netherlands there are an estimated 1.75 million kilometres of pipelines, mains and cables. [1] A well-know cable network is the one for electricity, which by June 2004 was almost 257 thousand kilometres long. The electricity cables used are laid on average 80 centimetres below the surface. They are unfit for adequate data communication because they are not protected against interference from their surroundings. Therefore, this network is not seen as part of the telecom infrastructure. [2]

The most well-known and most frequently used cables fit for electronic communication networks are the 'twisted-pair' and 'coax cables'. These cables are used for underground telecom and RTV cable networks. They are closer to the surface (between 30 to 60 centimetres), which makes them vulnerable to damage during excavation works. And excavation works are very common these days. A study done by the NEN, the Dutch centre of standardisation, about underground cables and mains concluded that the liberalisation of the telecom market led to a doubling of the Dutch underground telecom networks during the last five years, reaching an estimated 900 thousand kilometres (Pauwels and Wieleman, 2004). There were 10 to 20 thousand cases of damage a year. The NEN blames these incidents not so much on the limited know-how of the cable and land owners, but rather on the fact that people do not always inquire prior to the digging or that the information supplied is not sufficiently detailed or misinterpreted.

The fixed telephone network, consisting partly of glass fibre, has a total length of about 225 thousand kilometres, which is about a quarter of the length of all underground telecommunication networks (including RTV cables) in 2005. Other, smaller telecom operators own in total at least 15 thousand kilometres of telecom network. The exact length is unknown, because there is no accurate central registration of these networks, and many telecom operators use several tubes per track, which may or may not contain cables. Empty tubes can be used in cases of damage caused by digging. Broken cables can be bypassed through a previously empty tube. The use of such tubes is not transparent and makes it difficult to estimate the length of the RTV cable networks. The NEN estimates that there is at least 150 thousand kilometres.

Twisted-pair, coax or glass fibre

Twisted-pair
The fact that 'twisted-pair' cables can be used for communication purposes is due to the fact that the insulated copper wires are twisted in pairs and coated with an insulated protective layer. This makes them less sensitive to electromagnetic interference. In telephone cables, a simpler, cheaper version of the twisted-pair cable is used. A disadvantage of the telephone cable is that they require amplification to bridge large distances, and that the cable is sensitive to interference. However, telephone cables can be used for analogue and digital signals.

Coax cable
Coaxial cables, in contracts with 'twisted-pair' cables, only have one insulated copper wire, the core, surrounded by a protective layer that protects it almost fully against electromagnetic fields. The bandwidth is wide and the ratio between signal/interference is good, which makes them useful for high-speed transmission. Thinner coax cables can be used for the transmission of electric television signals, but they are also used in small local area networks in companies. The thicker ones can bridge major distances. These cables are also used for local networks, and they can be used for broadband applications.

Glass fibre cable
When new telecom connections are laid, often glass fibre cables are used. Glass fibre cables are also used for the transmission of television via 'cable'. The outer layers of these RTV-cable networks, however, are often laid with coax cables. A glass fibre cable has several glass fibres that include crystals. There are also currently solutions with plastics rather than glass. Infrared light has a large bandwidth and is therefore quite useful in high-speed digital signal transmissions. This also makes glass fibre cables very useful for digital signals. The advantages of this kind of cables are that they are not sensitive to electromagnetic interference or lightning. The signals can be transmitted over great distances without amplification because of the low attenuation. The disadvantage of glass fibre is that the cables are expensive to buy and lay. Therefore, glass fibre is mainly used when high speeds are vital.

In total, about half a million kilometres of telecom network cannot be traced clearly. Besides the problems that the use of multiple mains, with or without cable, per track cause for a proper estimate, there are also many cables managed by companies for their own use that are outside the scope of observation.

Many municipalities have laid many kilometres of new glass fibre cables. Usually, they took that step because they expected that the existing, usually copper wire networks would not be up to speed needed for future electronic types of municipal services. Municipalities also wanted to promote the supply of broadband services in general.

The estimates above only took into account the networks themselves. When the connections from the road to the homes are also included, they add another 50 thousand kilometres in electronic network cabling. Table 3.2.1 breaks down the total length of the electronic communication networks by type, according to the NEN estimate for the year 2004.

Table 3.2.1
Length of underground electronic communication networks, 2004

	x 1,000 km
Total[1)]	950
of which	
RTV cable networks[2)]	150
Fixed telephone line networks[2)]	265
Recently laid other networks[3)]	535

1) This is an estimated figure.
2) Connections between the road and the houses are included.
3) Probably they consists partly of RTV cable networks.

Source: Pauwels and Wieleman, 2004.

Almost without exception, every home in the Netherlands can be connected to the fixed telephone line network. This is not the case for RTV cable networks. In 2003 about 97 percent of the households had the option of getting an RTV cable connection. This makes the Netherlands one of the most densely cabled countries as far as RTV cables are concerned (see also figure 3.4.4 in paragraph 3.4).

Electronic communication networks via de ether

Wireless technology uses infrared light or radio waves. The transmission rates for radio waves are relatively low compared to new technology such as ADSL. Still, this kind of technology can turn out to be a good solution in situations in which speed is not of the utmost importance, or where an underground network is difficult and expensive to construct (‘Global Positioning System’ (GPS)) or even undesirable (mobile telephones).

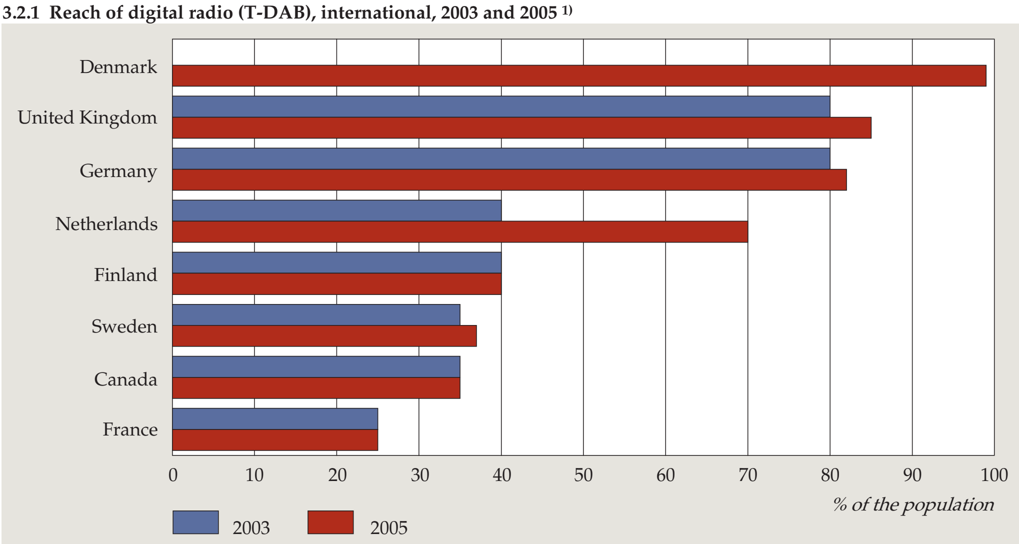
Television

There have been television broadcasts in the Netherlands since 1951. The Netherlands has 7 major transmitting stations and 7 support stations, mainly in the province of Limburg. The analogue television system has hardly changed since the introduction of colour television and teletext. A new system was developed for the realisation of digital television, DVB ('Digital Video Broadcast'). Digital television via de ether in Europe is distributed through DVB-T ('Digital Video Broadcasting Terrestrial'). Data compression technology plays a key role in DVB. Variations on this system are also applied to satellite, known as 'DVB-S(atellite)' and to the glass fibre cables of the RTV cable network companies, known as 'DVB-C(able)'. The first digital television broadcast took place in 2000. By June 2005 about 2.7 million households can receive DVB-T, especially in the Randstad area (source: Digitenne). The expectation is that DVB-T can be received throughout the Netherlands by the end of 2006.

Radio

The first AM radio broadcasts in the Netherlands date back to 1919. The audio quality of the later FM broadcasts is better because, in contrast to AM broadcasts, all audible frequencies are broadcast. FM technology allows audio frequencies up to circa 60 kHz in the modulation signal, which leaves room for services like RDS ('Radio Data System') besides the radio broadcasts. RDS allows receivers to select the strongest transmitter automatically, and it allows automatic switching to traffic updates, and the reception of text such as the name of the program. The government received 320 million euro when it gave out licenses for the use of FM frequencies in 2003.

3.2.1 Reach of digital radio (T-DAB), international, 2003 and 2005 [1]



1) 2005 describes the first quarter.

Source: WorldDAB.

A new system comparable to the system for digital television was developed for digital radio, T-DAB ('Terrestrial Digital Audio Broadcasting'). Apart from audio, it allows for more information to be sent digitally such as the name of the program, clock, traffic updates, photos and commercials. Digital radio in the Netherlands started in 2004 with the public broadcasting corporations. Commercial stations can only use T-DAB when they get assigned the necessary frequencies, which will probably take place in 2006.
According to TNO an estimated 475 million people could receive T-DAB broadcasts or a variation on T-DAB in 2004. In Denmark 99 percent of the population can receive T-DAB broadcasts. France has the lowest T-DAB reach, with 25 percent. In the Netherlands about 70 percent of the population can receive broadcasts via T-DAB as figure 3.2.1 shows.

GSM, GPRS and UMTS
The first GSM network became operational in Europe in 1991. It uses digital technology that gradually makes the many analogue wireless telephone technologies of the first generation used in Europe obsolete. The first wireless telephone in the Netherlands dates back to 1939 and was intended for cars. Many technologies followed. One advantage of GSM is that it allows coverage beyond the area covered by its own operator when the operator has an agreement with another operator to use its network ('roaming').
Apart from telephony, GSM has other applications. The most famous is 'Short Messaging Service' (SMS). Paragraph 3.4 focuses on mobile services.

According to the *Antennebureau*, the Netherlands had about 9 thousand GSM antenna installations in about 5,500 sites in 2005. About 80 percent of these sites were roofs and about 20 percent were masts. Most antenna installations are placed at between 20 and 40 meters high. The telecommunication law has specified that companies operating mobile electronic communication networks have to make their sites available to the competition at reasonable rates ('site sharing'). According to the *Antennebureau*, the number of sites is expected to grow to 11 thousand in the next few years. This is mostly caused by 'rolling out' the third generation of mobile technology such as UMTS. UMTS ('Universal Mobile Telephony System') is a radiographic broadband technology. In a band width of 5MHz it is theoretically possible to have speeds up to 10 Mbps, which allows many more new services besides the telephony.
The standards used by UMTS were supervised by the UN organisation 'International Telecom Union' (ITU). ITU deals with agreements on how to apply the radio spectre. The Dutch government received about 2.7 billion euro for licensing the use of UMTS-frequency packages in June 2000. These licences run out after 2016 when they can be issued again. To stimulate standardisation, the EU agreed to make it obligatory for at least one of the UMTS-frequency packages (licenses) sold to use the UMTS standard.

The *Antennebureau* expects that the rolling out of UMTS will cause an increase in antenna installations to 20 thousand within a few years. In places without UMTS

Frequencies: policy and implementation

The Ministry of Economic Affairs is responsible for policy development pertaining to frequency policy. The telecom agency *Agentschap Telecom*, operating for the Ministry, is responsible for carrying out the frequency policy and supervises compliance with the relevant laws and regulations. The agency provides permits to operate the frequencies. In some cases, such as remote controls, no permit is needed.

The memorandum on frequency policy (*Nota Frequentiebeleid 1995*: Kamerstukken II, 1994–1995, 24095, nr. 2) specifies the aims and purposes of the current frequency policy. Currently a new memorandum on frequency policy is being prepared at the proposal of the Frequency Policy Committee, chaired by Mr Wolffensperger. The new policy will include the following aims. The frequency policy must contribute to sustainable economic growth. It must offer more room for innovation and developing knowledge. The policy must be flexible so that it can be adapted swiftly to developments in the market and in technology. Finally, the aim is to distribute the frequencies without permits whenever possible.

The total frequency range used for radio communication goes from 9 kHz to 1,000 GHz. In the Netherlands, the frequency range is ordered in '*Het Nationaal Frequentieplan*' (NFP), which is regularly adapted. A graphic representation of the frequencies is available as a Dutch frequency spectre map 2005 in 'PDF' on the internet site of the telecom agency (www.at-ez.nl). Below, we name some frequencies that belong to topics mentioned in the text.

Analogue TV signals via the ether use the frequencies under 846 MHz. The reach of a transmitter is up to the horizon.

The frequencies for FM transmitters range between 87.5 and 108 MHz. Those of the short wave (AM) range between 5.9 and 26.1 MHz. These frequencies reach beyond the horizon. Because the signals broadcast are regularly reverberated between the ionosphere and the surface of the earth, they can reach the four corners of the world, a fact used by Radio Netherlands, the Dutch world service (Wereldomroep), that broadcasts on short wave frequencies. Medium wave radio broadcasts use frequencies between 526.5 and 1,606.5 kHz. They have a wider reach than FM, but much less than the short wave radio broadcasts. The frequencies for T-DAB are between 174 and 230 MHz (TV band III) and between 1,452 and 1,479.5 MHz (L band).

GSM is a technology for mobile communication networks based on radio waves in the frequency range from 876 to 960 MHz and 1,710 to 1,880 MHz. Satellites use frequencies over 1,500 MHz, but usually these frequencies are well above 1,500 MHz.

UMTS frequencies in the Netherlands range between 1,900 and 2,200 MHz.

Source: Agentschap Telecom.

coverage, UMTS telephones can use the available GPRS networks. GPRS ('General Packet Radio Services') is a technology applied in the GSM network somewhere between the second (GSM) and third (UMTS) generation of mobile technology. Data can be sent at rates up to 114 kbps. Third generation technology has more reliable connections and faster rates up to 384 kbps. This is 40 times faster than internet through a GSM connection. In contrast to GSM, GPRS and UMTS only use a connection when data is transmitted. Some talk about the fourth generation technology where technology integrates fixed, mobile and wireless networks into a single network.

Satellites
Communication satellites in geostationary orbit also allow setting up reliable regular connections. The use has become popular thanks to digital television services. A communication service (of the US Ministry of Defence) using satellites is GPS ('Global Positioning System'). This service is also applied in navigation equipment. Satellites are used for regular network connections, but the maximum transmission rate in 2005 was a mere 400 kbps and reception is sensitive to weather conditions.

Much research is done to improve wireless technology. Many new technologies, however, focus on short-distance data transmission which, for the time being, makes them unfit for use in large networks.

3.3 Peripherals

In this paragraph, we focus on the main types of peripherals that can be connected to the various networks, and which are needed to receive the services provided through the networks. The sequence in which they will be discussed is: radios and televisions, telephones and computers.

Radios and televisions

It is hard to imagine a modern society without radio and television. Table 3.3.1 shows that in 2004 almost all households in the Netherlands had at least one colour television. The percentage of households owning a radio matches this figure. The use of appliances related to television, such as video recorders and video cameras, has increased rapidly in recent years. In 2004 one in four households owned a video camera. About 540 thousand televisions are discarded every year in the Netherlands (source: NVMP) and about 1.2 million televisions are sold (source: Gfk Benelux Marketing Services). Research shows that the average number of televisions per household is 1.7 (Establishment Survey SKO 2004); for the Netherlands this would be an estimated 12 million sets in households alone in 2004. Chapter 6 looks into the specific use of ICT by individuals and households.

Table 3.3.1
ICT-related audio-visual equipment owned by households, 1975–2004

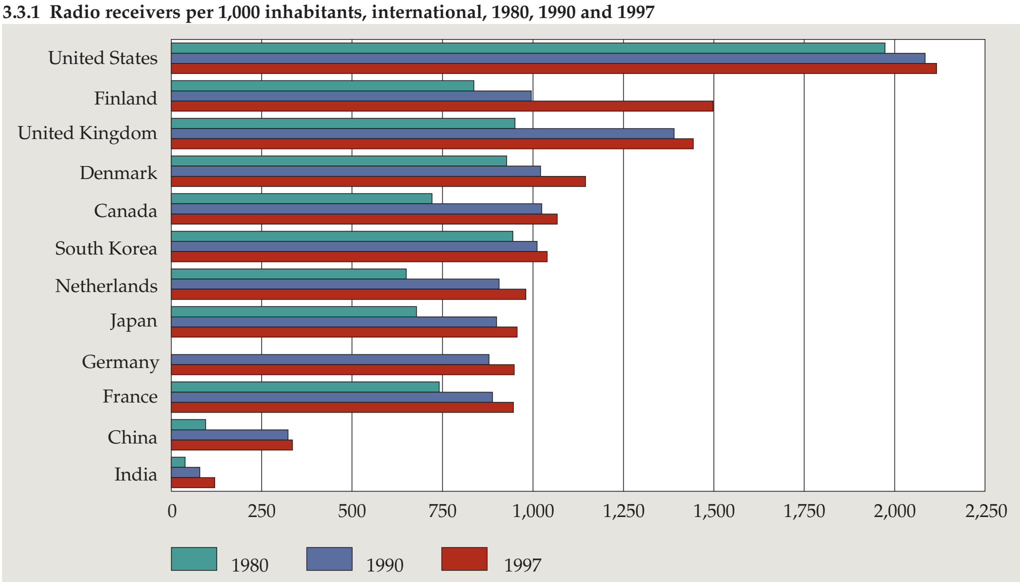
	1975	1980	1985	1990	1995	2000	2001	2002	2003	2004*
	% of households									
Radio or tuner	.	97	98	96	.	.	.	.	.	.
Black-and-white television	63	40	31	23	.	.	.	.	.	.
Colour television	35	73	87	92	97	99	99	98	98	98
Video recorder	.	2	20	45	68	79	80	81	82	80
Video camera	.	.	.	5	16	23	24	25	24	26

Source: Statistics Netherlands.

Figures 3.3.1 and 3.3.2 include international figures on radio and television ownership. The last year on which figures are available is 1997. UNESCO, which gathers the data, will do so again in 2005. The Netherlands is the European country with the smallest number of televisions, relatively speaking; in 1997 there were about 8.1 million. However, the Netherlands left France and Germany behind as far as radios are concerned.

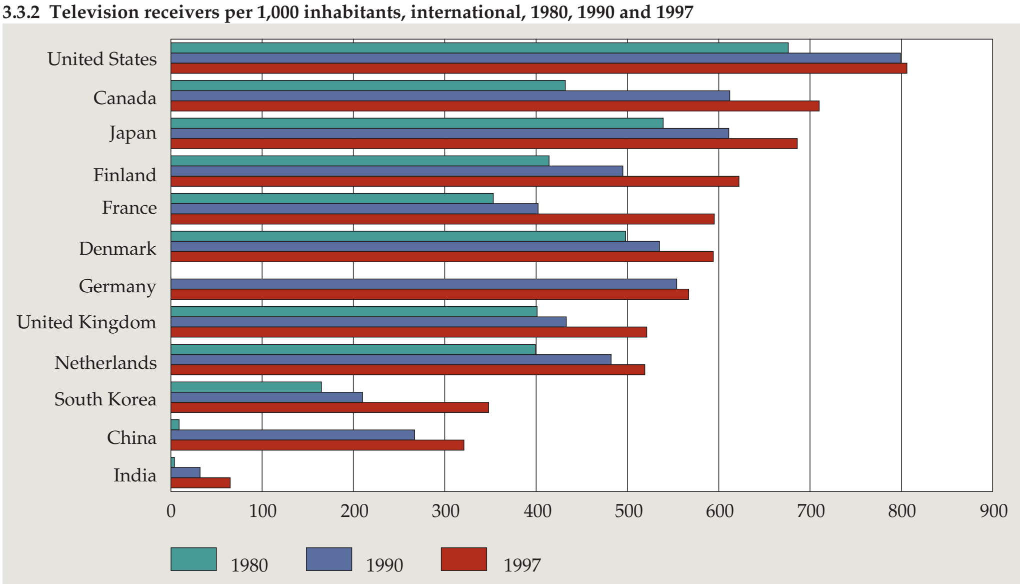
Between 1980 and 1997 the number of radios and televisions grew in all countries. China had a spectacular growth rate: the number of television sets increased from

3.3.1 Radio receivers per 1,000 inhabitants, international, 1980, 1990 and 1997



Source: UNESCO.

3.3.2 Television receivers per 1,000 inhabitants, international, 1980, 1990 and 1997



Source: UNESCO.

9 per 1,000 inhabitants in 1980 to 321 per 1,000 in 1997, whereas the number of radios went from 95 to 335 radios per 1,000 inhabitants. As a result, in 1997 China had 400 million sets, almost twice the number of sets in the USA, widely known for its television. In 1997 there were a total of 1,396 million television sets and 2,432 million radios worldwide. In 2005 the number of sets in most countries is estimated to be at least 20 to 30 percent higher than in 1997.

Fixed and mobile telephones

There is no data available on the number of fixed telephones in the Netherlands. A few decades ago the number of telephones was about the same as the number of fixed telephone connections. With the rise of the network at home and the later cheaper wireless versions (DECT) this is no longer the case. The number of fixed telephone connections, 9.5 million in the first quarter of 2005 (source: TNO), is the minimum number of traditional telephones; the actual number of sets must be millions more. In paragraph 3.4 we discuss the development of the number of fixed telephone connections as a telecom service.

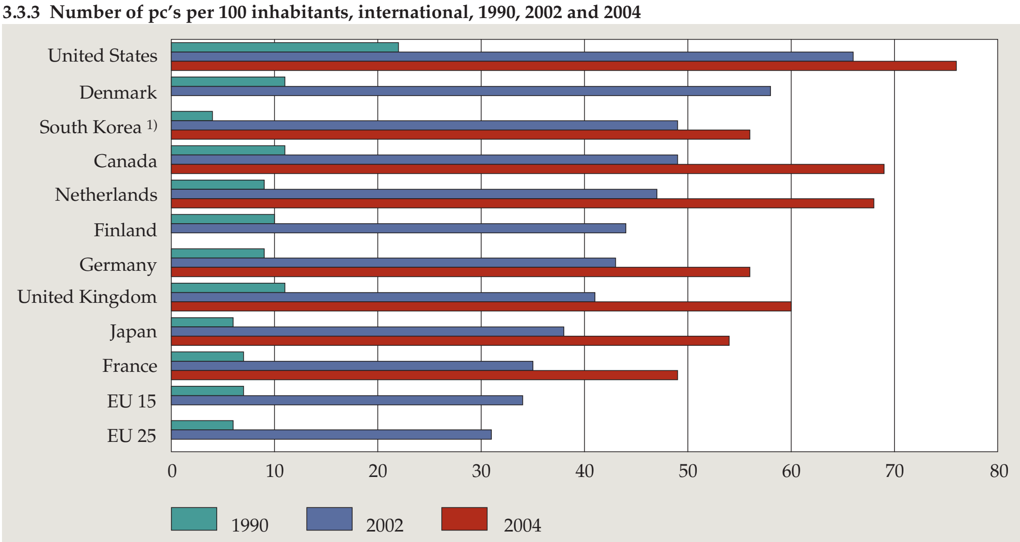
It is hard to make reliable estimates of the number of mobile telephones in the Netherlands, because of the relatively short life span of a mobile telephone. This means that many older models are no longer used. Here too it is best to use the number of active mobile telephone connections as the lower limit for the number of mobile telephones. TNO estimated that there were 16.5 million mobile telephone connections in the first quarter of 2005. The use of mobile services is discussed in paragraph 3.4.

Personal computers

The number of personal computers is still growing. Figure 3.3.3 shows that there are on average almost two pc's for every three people in the Netherlands. The Netherlands performs best of the European countries considered, which do not include the 2004 figures for Finland and Denmark. The USA is first with 76 pc's per 100 inhabitants.

Table 3.3.2 shows the total number of computers in the world, according to an overview by ITU. 2002 is the last year for which there are reliable overall figures. In 2002 there were about 577 million computers worldwide, 189 million more than in 1999. About 33 percent of the computers were in the USA and 23 percent in the EU 15. There is no fundamental change in the ratios between 1999 and 2002 in the countries shown. There is a sizable growth in the number of computers in China and India, but in absolute numbers, they possessed a modest 38.5 and 7.5 million computer respectively in 2002.

3.3.3 Number of pc's per 100 inhabitants, international, 1990, 2002 and 2004



1) 2003 instead of 2004.

Source: ITU and Computer Industry Almanac.

It is very likely that the number of computers has increased by several hundreds of millions since 2002. According to IDC, computer sales worldwide reached an estimated 47 million in the second quarter of 2005. Computer sales for 2004 as a whole came to 179 million computers according to IDC. In 2000 this number, again according to IDC, was about 132 million, of which about two thirds was for the business market. In Asia and South America the purchases are likely to be made by first time buyers, both companies and individuals, whereas in Europe and the USA

Table 3.3.2
Number of pc's worldwide, 1990, 2001 and 2002 [1)]

	1999	2001	2002
	x million		
All countries	387.5	516.2	576.6
among which			
EU 15	93.1	116.8	129.8
among which Netherlands	5.7	6.9	7.6
United States	141.0	178.0	190.0
Japan	36.3	45.6	48.7
Australia	8.0	10.0	11.1
Canada	11.1	14.2	15.3
China	17.6	27.7	38.5
India	3.3	6.0	7.5

1) Some very small countries with a relatively negligible number of pc's are excluded.

Source: ITU.

they are likely to be replacements. In the Netherlands the number of computers increased still strongly between 2002 and 2004 by no less than 45 percent to 11.1 million (source: TNO).

3.4 *Services through electronic networks*

Paragraph 2 of this chapter focused on the electronic networks themselves, and the previous paragraph focused on the peripherals using the networks, so it is time now to discuss the kind of services that can be provided through electronic networks and the use of those services. This involves the provision of public electronic communication services in the sense of the OPTA registration (see box Definitions from the Telecommunication Law). Providing a network is not discussed in this paragraph, nor are the 'facilities' and 'qualified certificates'. The supply of 'content' for distribution through electronic networks is also not included in the services through electronic networks here.

The networks described in paragraph 3.2 can be divided into three main categories: telecom networks (networks not in connection with traditional fixed telephone lines through an internet connection, including the fixed telephone lines themselves), RTV cable networks and ether networks. Below we will refer to these networks as: 'telephone', 'cable' and 'ether'. These networks can be compared with the various kinds of electronic network services on offer in the year 2005. This is done in table 3.4.1, which shows which networks are actually used to provide these services. When services cannot be used by definition through one of these three networks, this will be indicated as not applicable or 'n.a.'.

Digital versus analogue

One dichotomy that occurs several times in table 3.4.1 is that of digital versus analogue. In analogue data transmission, the data is transmitted as a continuous complex electrical current. In digital data transmission, there is discrete information; the data is first formed into packets of ones and zeros that can later be 'unwrapped' perfectly and that can be transported easily without loss of quality. The loss of quality that occurs when the information is 'cut into packets' is not visible or audible to the human eye and ear if the audiovisual information is carefully digitalized (wide bandwidth). The technology that plays a role here has been improved substantially in recent years.

Broadband and speed of transmission
In digital connections the 'bandwidth' is also used as synonymous with the maximum transmission speed a network can achieve. The term 'bandwidth' in analogue connections refers to the difference between the highest and lowest frequency used for a transmission. Transmission speed is a characteristic that belongs to sending data in digital form. Digital data consists of packages of zeros and ones. The computer reads the numbers because of the electric currents it does or does not receive. The maximum number of electric currents per second, expressed in bits, determines the speed of transmission. A copper wire can handle a maximum of a million bits per second; glass fibre can handle a million times a million.

The concept 'baud rate' is also used in describing services. The maximum number of electric currents per second is divided by 8, because 8 bits are needed to digitally send a letter or number (a signal). A speed of 4 million currents per second is abbreviated as 4 Mbps. With this speed, 500 thousand letters or numbers can be send per second without the use of compression techniques. When a signal is made up of less than 8 bits, the baud rate is greater.

Another term that is frequently used in telecom services is 'broadband connection'. In this publication, it is defined in terms of functionality rather than in terms of capacity or technology. Broadband is a connection that allows high-quality audiovisual applications and the exchange of large data files, while the connection is continuously available (Ministerie van Economische Zaken, 2004b).

One relevant question in the selection of services is how the speed of transmission is translated into the speed at which, for instance, computer files are transferred. The size of computer files is expressed in kilobytes (kB) or megabytes (MB). Because according to the definition a kilobyte has 1,024 bytes, a 4 Mbps internet connection can transfer about 488 kB (4,000,000 / (8 x 1,024)) per second. This is the maximum speed, however, which can only be reached between the receiving computer and the connection with the access provider. The actual speed depends mainly on data flows in the network and the performance of other computers in the network.

Table 3.4.1 does not take into account a number of services that are available through the internet on computers, such as watching television and listening to the radio via

Table 3.4.1
Availability of the most important network services in the Netherlands, 2005

Description of service	Peripheral	Type of network		
		Telephone	Cable	Ether
Internet access	Pc	Yes [1]	Yes[1]	Yes [1]
Internet access	Mobile telephone [2]	n/a	n/a	Yes
Internet access	Television [5]	Yes	Yes	No
Mobile services	Mobile telephone [2]	n/a	n/a	Yes
Analogue radio broadcasts	Radio	No	Yes	Yes
Digital radio broadcasts	Digital radio	No	No	Yes
Analogue television broadcasts	Television	No	Yes	Yes
Digital television broadcasts [3]	Television [5]	Yes [1]	Yes[1]	Yes [1]
Digital television broadcasts [3]	Mobile telephone [2]	n/a	n/a	Yes
Analogue telephony	Analogue telephone	Yes	No	n/a
Digital telephony	Digital telephone	Yes[1]	Yes	n/a
Digital telephony	Mobile telephone	n/a	n/a	Yes
Digital/IP telephony	Analogue telephone	Yes[1]	Yes	No
Rented lines	Various[4]	Yes	No	n/a

1) By means of extra electronic components placed between the network and the peripheral.
2) Mobile telephones use digital techniques. For the sake of convenience, the indication mobile telephone is used. Various other mobile devices for purchasing services via the ether, like Pda's, are also meant.
3) Providing digital radio broadcasts is seen here as providing a television channel without the pictures. It is an extra service that cannot be purchased separately.
4) For instance cash dispensers and pc's.
5) Almost every television set in the Netherlands is equipped for analogue signals. That is why extra electronic components placed between the network and the television set are necessary in order to utilize digital signals.

Source: Various (edited by Statistics Netherlands).

software media players. These are services provided through the internet that are not telecom services.
Watching television on the computer via a TV card (extra to the pc) is not considered something special. In fact, it prepares the pc for analogue television reception, which does not involve special services other than receiving traditional analogue television signals through the ether or cable. As soon as internet applications involve other peripherals than the pc, they are included in table 3.4.1. Recent new applications are telephony with internet technology (Voice over IP) with different telephones and watching television with internet technology via a television set. Both applications no longer require a pc as a supporting peripheral.

Next in this paragraph the supply and use of services per type of network will be discussed. The statistical information presented is mainly gathered and processed by TNO. In a box in this paragraph, we give some examples of internet applications that will not be discussed in detail, since they are seen as 'content' production and not as a telecom activity.

Examples of internet applications

Podcasting
'Podcasting' refers to collecting data files for use at a later date. They are multimedia files, or software. People can listen not only to music, but also to radio broadcasts in this way. The term is derived from the name of the physical media player ('iPod') and 'broadcasting'. The data files made available by 'podcasters' can be downloaded with software via the internet. Apart from radio broadcasts, the technology can also handle video ('vodcasting').

Blog
A 'Blog' or 'web log' is an internet site made by an individual or a company with the intention to communicate with the visitors of the site. The site shows all kinds of messages or views on issues in chronological form. The readers can react, but they cannot influence the layout of the site, in principle. That is the prerogative of the site's owner.

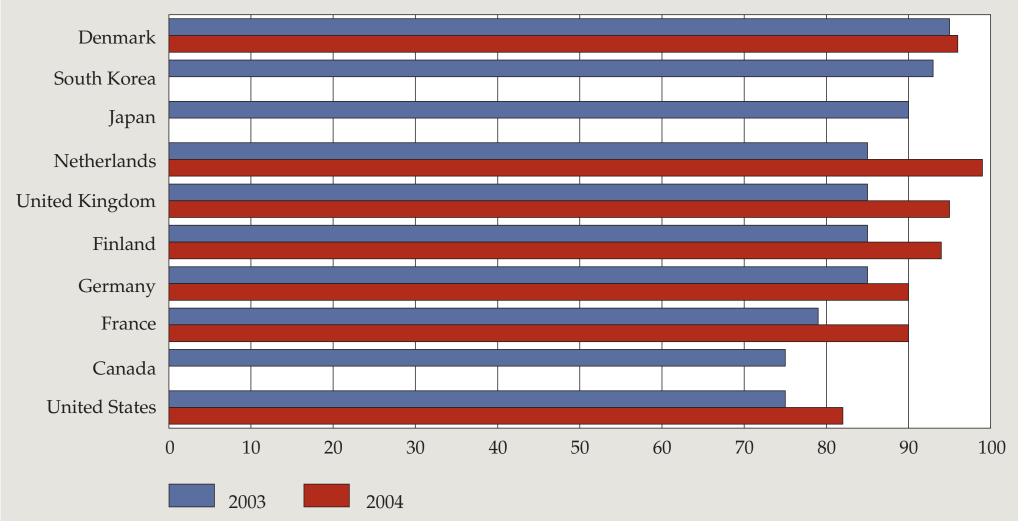
Wiki's
'Wiki's' are websites that share knowledge about one or more issues. The word is derived from the Hawaiian word for 'fast'. This 'fast' refers to the speed with which changes can be made in the website. By using the site, the quality of the information on it must improve over time. The site is open to everyone although changing it sometimes requires a registration.

Services via the telephone network

Internet access through the pc
A major service supplied through the fixed telephone connections is internet access using the computer as its peripheral. The service is provided by internet service providers, which may or may not work together with the company that keeps the network operational. The services are on offer at different rates, where the price is determined by the transmission rate. Traditionally, data transport through a telephone line took place via an analogue connection using a modem to connect the network and the pc, allowing a maximum speed of 56 kbps. Digital ISDN later offered a maximum of 128 kbps, which does not allow the use of all internet services on offer, although it is still used.

'Asymmetric Digital Subscriber Line' or ADSL provides 'internet broadband connections' on the existing copper wire telephone net. It was necessary to adapt the telephone switchboards to make ADSL available – in the Netherlands since 1999. The distance to the telephone switchboards must not exceed five kilometres.
Compression plays a key role in ADSL. The digital signals use a different frequency than the analogue signals for the telephone so that the two don't interfere.
The latest ADSL-technology (ADSL2+) allows speeds up to 20 Mbps, and the maximum distance to the telephone switchboard can be somewhat larger. It is not

3.4.1 Number of households with potential access to DSL per 100 households, international, 2003 and 2004 [1]



1) Estimated percentage of coverage.

Source: OECD, Communications Outlook 2005. Dutch data for 2004 are based on TNO.

possible to have complete coverage throughout the country with ADSL due to the locations of the telephone switchboards. Figure 3.4.1 shows the degree of penetration by DSL for the benchmark countries. ADSL is one type of DSL, using an asymmetry in the capacity to 'download' and 'upload' information. In places where DSL is on offer, it is also possible to offer ADSL, but not ADSL2+. At the start of 2006 all telephone switchboards must be ready for ADSL2+.
The figure shows that the Netherlands is one of the top countries in providing this technology. Practically all households in the Netherlands can use ADSL. All telephone switchboards in the Netherlands can accommodate ADSL. Only a small group of households lives too far from a switchboard to be able to use ADSL.

Table 3.4.2 shows how the number of ADSL connections developed in recent years. Between 2003 and 2004 the number of ADSL connections doubled, while the growth continued at a slightly slower pace in 2005.

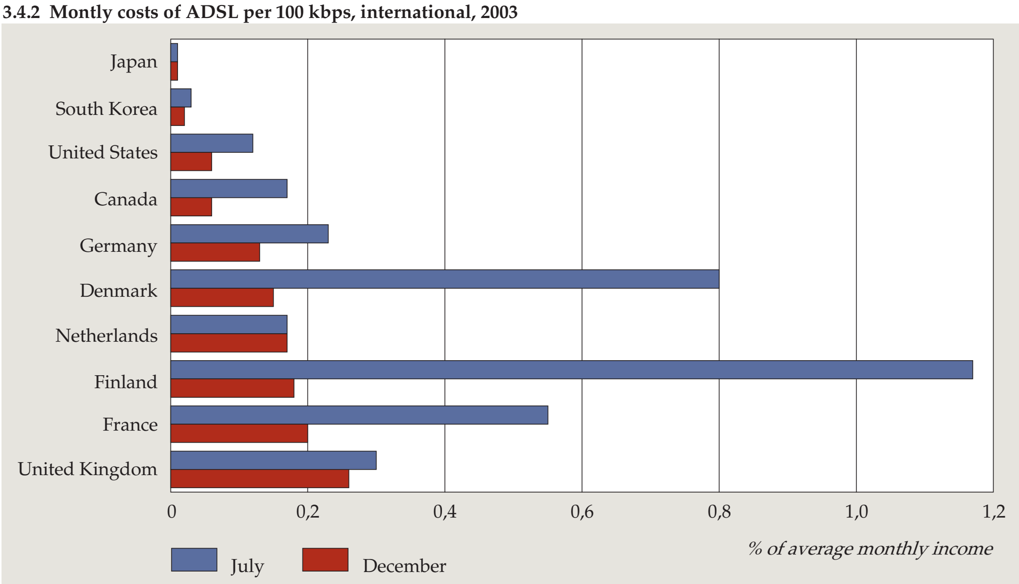
Table 3.4.2
Number of ADSL connections, 1999–2005 [1]

	1999	2000	2001	2002	2003	2004	2005
	x 1,000						
ADSL connections	0	10	145	340	944	1,841	2,024

1) Situation 2005: end of first quarter.

Source: TNO.

3.4.2 Montly costs of ADSL per 100 kbps, international, 2003



Source: ITU.

The ITU compared the rates charged in the Netherlands by providers of ADSL to other countries. For this, the ITU calculated the average price per month per (fictional) 100 kbps for an ADSL subscription in each country. In order to correct for differences in standards of living between the countries, the monthly costs are expressed as a percentage of the average monthly income in the country. The results are shown in figure 3.4.2. For the Netherlands, it shows that in 2003 an ADSL subscription with a transmission rate of 1 Mbps cost slightly less than 2 percent of an average monthly income. Between July and December 2003 the costs fell in virtually all countries studied, except in the Netherlands where the rates were already relatively low.

Internet access through television

In 2001, internet was offered on a commercial basis in the Netherlands through television sets, using the fixed telephone lines. A subscription bought consumers this service at the local telephone rates. It aimed primarily at users who did not have access to the internet because they did not own a pc. Worldwide the number of internet users via television sets in 2001 was estimated at 2 million (source: Tiboco b.v.) and the expectation was that this would increase in Europe alone to 50 million by 2003. There are no reliable figures available, but these expectations never came out. This is probably due to the availability of very attractive new, faster types of internet access and because there were only a few internet pages available. Currently, internet via the telephone on television sets is no longer offered in the

Netherlands. There have been new initiatives in which the telephone network continues to play a role. These initiatives focus on interactive television, where regular television broadcasts are enriched with interactive possibilities. In 2005 this was used on a modest scale.

Digital television broadcasts on television
Since the summer of 2005 it is possible to receive digital television on a television set using a fixed telephone connection. This involves the new ADSL2+-technology, which makes it possible to have a wider band available on a connection. This allows sending high quality video files (including television broadcasts), without a pc. There are no figures yet on the availability of this technology and the number of actual connections.

Analogue, digital and IP telephony with fixed telephones
Analogue telephony has long been the leader in commercial services offered via an electronic network: fixed telephone lines. The service first became available in the Netherlands in 1881, when the first telephone switchboard was opened in Amsterdam with a few dozen connections. Digital telephony became possible with the introduction of ISDN (Integrated Services Digital Network) in 1988. The popularity of ISDN and its possibilities started in 1995, with the rise of internet. ISDN allowed the use of several lines for sending data (speech, text and images). Both the analogue – PSTN ('Public Switched Telephone Network') – and the digital form of telephony are available throughout the Netherlands. Table 3.4.3 shows the development of the number of analogue and digital ISDN connections. The dip in the number of connections must be seen in relation to the rising popularity of mobile telephones (substitution effects) and new, faster technology for internet access, which makes that ISDN offers fewer advantages than several years ago.

Internationally, the number of fixed telephone connections per 100 inhabitants in the Netherlands is average. Figure 3.4.3 shows that Denmark, Germany and the

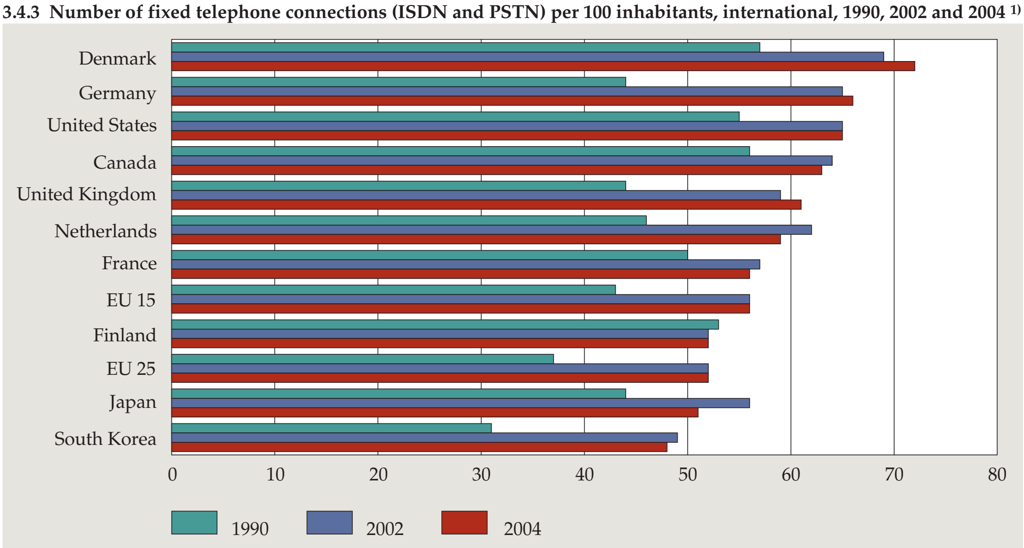
Table 3.4.3
Number of fixed telephone connections via the telephone network, 1999–2005[1)]

	1999	2000	2001	2002	2003	2004	2005
	x 1,000						
PSTN connections	7,330	6,915	6,569	6,316	6,120	5,922	5,871
ISDN connections	2,280	2,964	3,434	3,688	3,786	3,629	3,600

1) Situation 2005: end of first quarter.

Source: TNO.

3.4.3 Number of fixed telephone connections (ISDN and PSTN) per 100 inhabitants, international, 1990, 2002 and 2004 [1)]



1) Data on 2004 of EU 15 and EU 25 refer to 2003.

Source: TNO.

USA have the most fixed telephone connections among the benchmark countries, while Finland, Japan and South Korea have relatively the lowest number.
Apart from analogue and digital telephony via fixed telephone lines, there is a new way: Voice over IP (VoIP). Voice over IP is a technology that allows phoning through the internet. Voice over (A)DSL is telephony via (A)DSL connections, which has a better sound quality than the analogue service. There are already services where people can phone with an analogue telephone set, with a decoder but without a pc as a support peripheral. Voice over (A)DSL can cut phone costs. People may cancel the telephone subscription with the telecom provider of the fixed telephone lines when another provider pays for the services at wholesale prices and charges the costs in the rates for the broadband connection.
Companies can cut costs with Voice over IP through the cable since one network carries both speech and data. VoIP offers more functions than fixed telephony. This subject will be discussed later in this paragraph under cable services. There are no data on the use of Voice over IP and Voice over (A)DSL. Voice over IP requiring a pc (e.g. software application 'Messenger') is not discussed in this paragraph since it is considered an internet application on the pc.

Rented lines
Companies sometimes use 'dedicated rented lines' to connect their branches. The costs are independent of the use; the band width and capacity are specified in a rental agreement. Such rented lines are also frequently used as permanent connections, for instance for ATM's. Generally the transmission rate is 128 kbps.

Due to internet, many companies switch to internet technology for the connection of their branches. A 'Virtual Private Network' (VPN) allows companies to safely connect various locations via internet. The number of 'dedicated rented lines' was beginning to drop when ISDN arrived, but they are still popular in critical applications, because breakdowns can be fixed right away and the quality of the data transmission can be guaranteed.

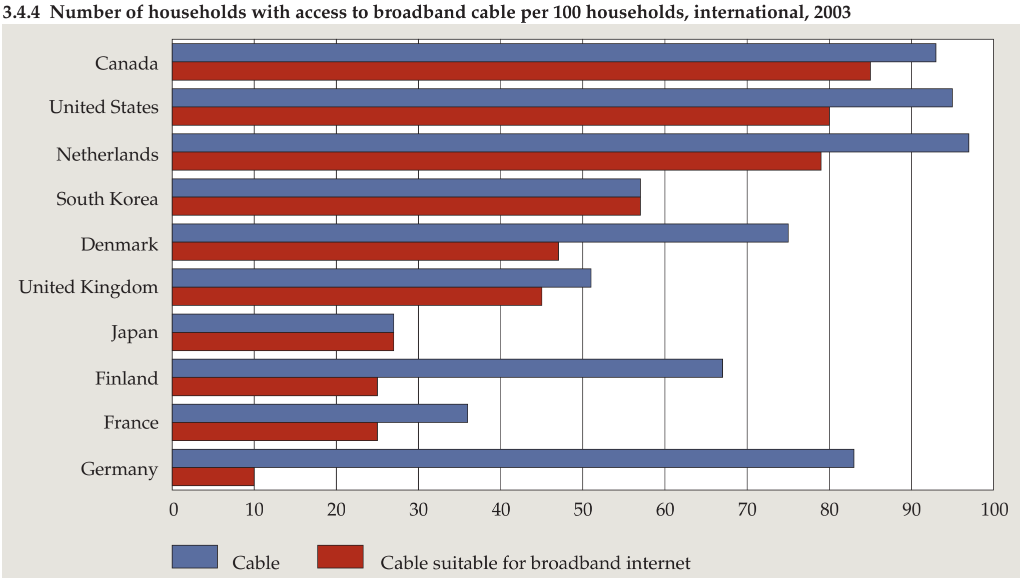
Services via the RTV cable network

Internet access through the pc

Providers of RTV cable networks have started to offer internet on a large scale. These fast connections are considered broadband connections. The first internet connections via cable were realised in 1998, several years before ADSL became available via the telephone. Table 3.4.4 shows the development of the number of internet connections via the cable compared with the number of ADSL internet connections via the telephone network. The table shows that internet via cable is no longer the dominant broadband internet connection as of 2004. A problem for further penetration is also that not all municipalities enable cable internet, since the huge investments cannot always be recovered. This is a problem especially for the smaller municipalities.

In figure 3.4.4 a comparison is made between the percentage of households potentially using broadband internet via cable and the percentage of households

3.4.4 Number of households with access to broadband cable per 100 households, international, 2003



Source: OECD, Communications Outlook 2005.

that have cable available. The figure shows that in the Netherlands in 2003 about 79 percent of the households could opt for a broadband internet connection via cable. About 18 percent of the Dutch households did have a cable connection in 2003 – the difference between the right and the left hand column – which was not yet fit for broadband. Of the benchmark countries Germany had cable widely available in 2003, but mostly not yet fit for broadband. By mid 2005 the percentage of households in the Netherlands that can have broadband internet via cable had increased to about 90 percent (source: OPTA).

Table 3.4.4 indicates that the number of broadband connections is still rising. In the first quarter of 2005 the two dominant broadband connections (cable and ADSL) accounted for almost 3.4 million connections. The difference between internet via RTV cable companies and via ADSL is that the higher transmission rates of 30 Mbps that are theoretically possible with RTV cable companies must be shared with other users, which makes speeds variable in practice. Further in this paragraph we will discuss broadband connections via the ether, but in the Netherlands this kind of internet connection is not often used.

Table 3.4.4
Number of broadband connections, 1999–2005[1)]

	1999	2000	2001	2002	2003	2004	2005
	x 1,000						
Cable connections	151	250	467	796	969	1,297	1,362
ADSL connections	0	10	145	340	944	1,841	2,024

1) Situation 2005: end of first quarter.

Source: TNO.

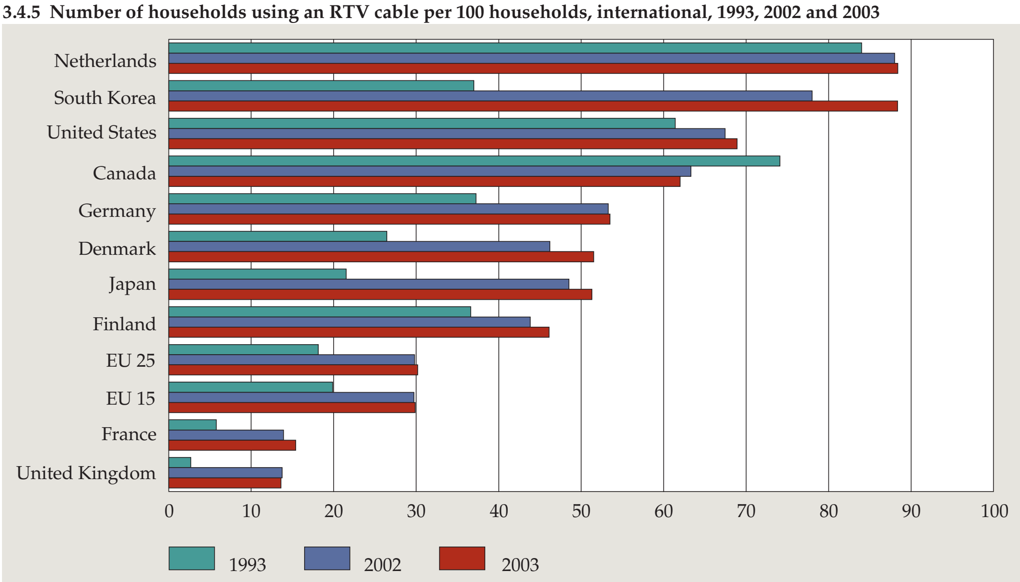
Internet access via television

Several years ago some Dutch municipalities wanted to supply free internet via the cable on television without a pc, but with a keyboard and a decoder. These plans ran into problems because of the great investments required in the cable network and because many people already had internet. Therefore, their money would be better spent on groups without internet, for instance by creating internet corners in activity centres.

In interactive television, new possibilities are considered by combining internet and watching television (via cable and telephone line); however, the number of applications is still rather small.

Analogue radio and television broadcasts
The RTV cable network gets its name from broadcasting radio and television. There is a one-to-one relationship between analogue radio and television reception and being connected to 'cable'. Also consumers who switched to a digital subscription for radio and television can keep the analogue signals as well.

3.4.5 Number of households using an RTV cable per 100 households, international, 1993, 2002 and 2003



Source: TNO.

Figure 3.4.5 shows that the Netherlands and South Korea are the two countries with the highest percentage of households using a RTV cable network connection. France and the UK have the lowest percentage of households with a cable connection of the countries under consideration. The Netherlands had a percentage of around

Table 3.4.5
Number of RTV cable connections, 1999–2005[1)]

	1999	2000	2001	2002	2003	2004	2005
	x 1,000						
RTV cable connections	6,120	6,200	6,254	6,216	6,214	6,191	6,191

1) Situation 2005: end of first quarter.

Source: TNO.

90 percent of households with a RTV cable connection for some time. Since 1994 the percentage of households using a RTV cable connection has fallen slightly, but there is no explanation for this. Perhaps households switched to new ways of receiving RTV signals (satellite and digital ether) giving up their RTV cable network connection, but there are no figures available about this.

Table 3.4.5 shows the developments in the number of connections for the Netherlands in absolute figures. The annual developments are clearly marginal.

Digital (radio) and television broadcasts
One growing phenomenon is the digital reception of radio and television via cable. Due to the more efficient technology it is now possible to use the digital signal for offering more broadcasts than was possible before with the analogue signal. Many cable network providers fit their networks for the new technology. To entice customers, they use dedicated marketing actions, reduced prices on decoders and generous offers. The number of digital channels on offer can often be extended at a fee. Some cable service providers seem to have been rather successful with their actions in 2005. We must emphasize that the number given in table 3.4.6 refers to the situation at the end of the first quarter. So the number is expected to be higher at the end of 2005.

Table 3.4.1 shows that digital radio reception is not offered as a service, meaning that it is not on offer as a separate service. Digital radio via cable is like a television channel without the image; television broadcasts are the primary product.

Table 3.4.6
Number of digital RTV cable connections, 2001–2005 1)

	2001	2002	2003	2004	2005
	x 1,000				
Digital RTV cable connections	104	101	99	116	145

1) Situation 2005: end of first quarter.

Source: TNO.

Digital/IP telephony
Apart from broadband internet access and digital television, several cable companies started to offer telephone services in 2000. The number of telephone connections via cable is relatively low compared to the number of fixed telephone

lines. At the start of 2005 the number of telephone connections via cable had increased by 14 percent to about 264 thousand. Since the end of 2004 there is telephony via cable using VoIP technology. The numbers shown in table 3.4.7 refer to VoIP and other technologies.

Table 3.4.7
Number of digital/IP telephone connections, 2000–2005[1)]

	2000	2001	2002	2003	2004	2005
	x 1,000					
Digital/IP telephone connections	160	184	197	191	232	264

1) Situation 2005: end of first quarter.

Source: TNO.

Services through the ether

Internet access through the pc
It is possible to use satellite dishes to get broadband internet connections, using the dishes intended for the reception of television. Until recently, sending information to the satellite required massive investments, which only companies could afford. Price cuts have now made two-way satellite internet feasible for private individuals. Often broadband internet via satellite is used in combination with a slower internet connection capable of sending data. The slower internet connection is also used for smaller 'downloads', since the communication by satellite is slightly slower and only has advantages in downloading huge volumes of data. In the Netherlands, broadband internet via satellite is not used very much; in 2005 the service has been extended. In the USA and Germany there is some internet via satellite: in about 1 percent of broadband connections (see also figure 3.5.6).

Another way to enable wireless broadband connections is the Wireless Local Loop (WLL) with connections in a specific limited area between a central antenna and fixed local points. The system is specifically developed to hook up company telephone switchboards in industrial parks to fixed telephone lines without laying cables. In areas that did not (used to) have broadband connections there are services specially aimed at private individuals. These have very few users compared to other broadband connections: less than 1 percent of the broadband connections in 2005 came about in this way.

Internet access and other mobile services on mobile telephones

The use of mobile services including internet is expanding rapidly. Mobile telephones are getting more functionality, enabling new services, such as limited mobile internet via WAP. WAP is short for 'Wireless Application Protocol' and shows how web applications should function on a wireless network. The protocol is comparable with the IP protocol in internet. WAP focuses on the limited possibilities of mobile telephones. The use of WAP requires a continuous telephone connection and payment is per minute of contact with a service.

With GPRS users do not pay for the connection, but for sending and downloading data. GSM and GPRS are network technologies, while WAP is an instrument used to provide services via GSM on small screens. Third generation mobile telephone technology brings the complete use of internet on mobiles much closer. In third generation technology (UMTS) payments are made per data transmission, while WAP no longer plays a role.

Mobile services are also available by inserting cards in other kinds of mobiles such as pda's ('personal digital assistant') and laptops. GPRS functionality is often added to a GSM subscription. It is not possible to phone via GPRS, but this can be remedied through an extra GSM subscription on the same mobile. Internet access is possible on a mobile telephone, but also on a laptop or pda by linking a mobile telephone to it.

The turnover of mobile services has been growing by 7 percent a year since 2001 according to EITO. In 2000 there was a growth rate of no less than 32 percent on 1999. The total volume of the mobile services in 2004 was 5.5 billion euro.

Apart from internet, there are other mobile services for the mobile telephone. The best known is probably SMS ('Short Messaging Service'), or texting. MMS ('Multimedia Messaging Service') is considered its successor. This service allows sending longer texts, photos, music and video as messages to another mobile or e-mail address. Sending can be done through the GSM network when the mobile telephone is enabled. In 2002 the number of mobile multimedia services in the Netherlands increased rapidly.

Another service worth mentioning is wireless access tot broadband internet through Wi-Fi technology ('Wireless Fidelity'). This access is provided at 'hotspots'. These are at filling stations, airports, restaurants etcetera. To use a hotspot, the user needs a wireless (Wi-Fi) card, which uses the internationally set IEEE 802.11 protocol for wireless sending of digital signals across short distances (maximum 100 meters). The service is paid per session or by subscription. Data transmissions up to a maximum of 54 Mbps are possible. Worldwide there were about 85 thousand hotspots by mid 2005 (source: Informa Telecoms & Media). About 13 thousand of these are in South Korea, 36 thousand are in Western Europe and 22 thousand in the USA. There are no exact figures on the Netherlands, but the 1 500 hotspots by mid 2005 is quite likely.

In the meantime a new technology is coming up, allowing wireless internet with higher speeds and distances of 50 kilometres from the sender (hot zones): WiMax, what stands for 'Worldwide Interoperability for Microwave Acces'.

Another new technology is Ultra Wideband (UWB), allowing extremely high speeds of up to 1 Gbps using very little energy. This technology, developed by the US Armed Forces, uses weak radio signals with a low spectral density across a very wide frequency band, including frequency bands already used by other users. Apart from telecom applications, it enables precision location and radar applications such as looking through walls. Large scale use of UWB in Europe was obstructed due to lack of the required regulations and international agreements.

Analogue radio

Analogue radio broadcasts through the ether are the origins of radio. License fees were abolished in the Netherlands, so reception is free of charge. Commercial radio stations, which mostly use the FM frequencies, can survive by selling radio commercials. In 2003 the FM frequencies were redistributed. The amounts paid then – a total of 320 million euro – now seem to obstruct the introduction of digital radio, because the companies first want to earn enough money to compensate for what they paid for the analogue form.

Digital radio

It is not possible to pick up digital radio broadcasts on traditional analogue radios. The 70 percent of the population in the Netherlands who could currently receive digital radio broadcasts through the ether require a DAB radio to actually do so (see also figure 3.2.1). The advantages of DAB are radio reception without extra noise and with CD quality. The receiver also follows the station when it changes frequency. This facilitates the use in cars. Moreover, it is possible to send extra information with the radio programs.

In the Netherlands digital radio operates on a limited scale and the frequencies still have to be (commercially) distributed. The UK has a wide supply of digital radio broadcasts. In 2004, France resisted a large scale introduction of digital radio via the ether because it is considered a rapidly aging technology. In Germany – where the sales of DAB radio's lags behind expectation – some argue that later technology allows broadcasts of three to four times as many stations via the same frequency.

In the Netherlands the commercial radio broadcast companies are not particularly enthusiastic either and do not keep pace with the wishes of the government to stimulate digital radio via the ether. There are no data on the number of people in the Netherlands who listened to the radio through a DAB radio in 2005. There is no license fee. The success of DAB is also under threat from internet services such as 'podcasting' and radio via the internet ('WEB-radio'). Another possible competitor is digital radio via the mobile telephone. An ether alternative for DAB is 'Digital Radio Mondiale' (DRM), which was developed originally for the long, medium and

Table 3.4.8
Number of digital wireless television connections, 2001–2005[1)]

	2001	2002	2003	2004	2005
	x 1,000				
Digital satellite television connections	334	428	450	550	578
Digital television connections via the ether	0	0	25	49	110

1) Situation 2005: end of first quarter.

Source: TNO.

short wave and made improvements in the sound. There are already many broadcasts in DRM format by worldwide broadcasting companies, for example *Radio Nederland Wereldomroep*.
Finally, there is satellite radio. This does not require a satellite dish. In Europe there are very few people listening to digital radio broadcasts through satellites, but this is very different in the USA where there are millions of users who bought satellite radios and subscriptions. Forrester expects over 20 million paid subscribers in the USA by 2010. The key factor for success seems to be that there are no commercials in the satellite broadcasts.

Analogue television
In the Netherlands hardly anyone uses an antenna anymore for watching television. This will become even more difficult as of 2006, because analogue broadcasts by the public broadcasting companies will no longer be transmitted through the ether. This will result in savings of up to 11 million euro. About 77 thousand households used this traditional kind of TV in 2005, mainly on camping sites or boats (source: OECD, Communications Outlook 2005).

Digital television
Table 3.4.8 shows the number of digital television connections via de ether. It distinguishes satellite and new forms of broadcasting via radio and television towers. The table shows that digital television reception in the Netherlands still mostly uses satellite. The reception of new forms of digital television via de ether with the DVB-T standard increased rapidly. The supply of broadcasts via de satellite still dominates. Compared to digital television via cable, the supply of broadcasts with the new ways through the ether lags behind. These new forms of digital ether television have the advantage of being cheap compared to buying a dish and they can be received in cars, camping sites or boats. The figures in table 3.4.8 do not include connections aimed at use on mobile telephones.

Digital television on mobile telephones
A limited number of providers in the Netherlands offered video and live television applications on the mobile phone. The video applications are highlights from sports, video clips and news broadcasts, and use UMTS that has sufficient bandwidth. They also use a variation of the DVB-T standard, namely DVB-H ('Digital Video Broadcast Handheld').

Digital telephone
Finally, there is the wireless digital telephone service. Mobile telephony is one of the most famous, dominant new technologies of the last decade. Table 3.4.9 shows the development of the number of mobile connections in the Netherlands in recent years.

Table 3.4.9
Number of mobile telephone connections, 1999–2005[1)]

	1999	2000	2001	2002	2003	2004	2005
	x million						
Mobile telephone connections	6.9	10.0	12.0	12.0	13.3	15.9	16.5

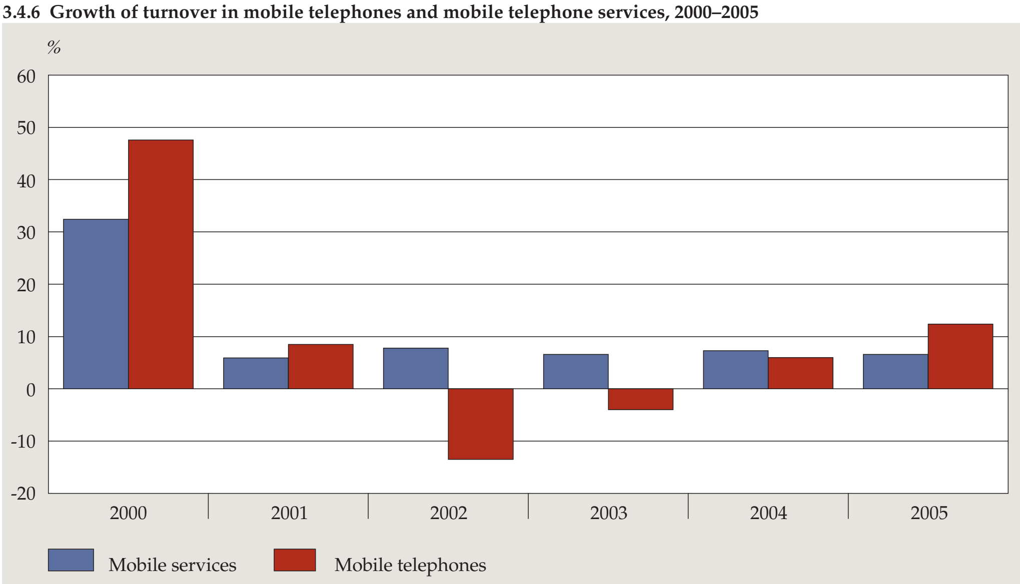
1) Situation 2005: end of first quarter.

Source: TNO.

In the first quarter of 2005 there were 16.5 million mobile telephone connections in the Netherlands, a growth of 3.6 percent compared to December 2004. The increase is due to the use of several subscriptions (business and private). In 1995 there were just 0.5 million mobile phones in the Netherlands.
The popularity and growth of mobile telephony is boosted by such new services as television and internet via the mobile phone. Texting via SMS is also very popular. In the first quarter of 2004 a total of 853 million 'SMS messages' were sent through the four largest mobile service providers in the Netherlands, 19 percent more than in the first quarter of 2003. In other countries SMS texting is even more popular. In Ireland four times as many SMS's were texted per inhabitant in the same quarter of 2004; in Germany and Denmark people also use SMS relatively more often (source: OECD, Communications Outlook 2005).

In figure 3.4.6 the growth of the number of mobile connections is compared to the developments in turnover of the mobile services.

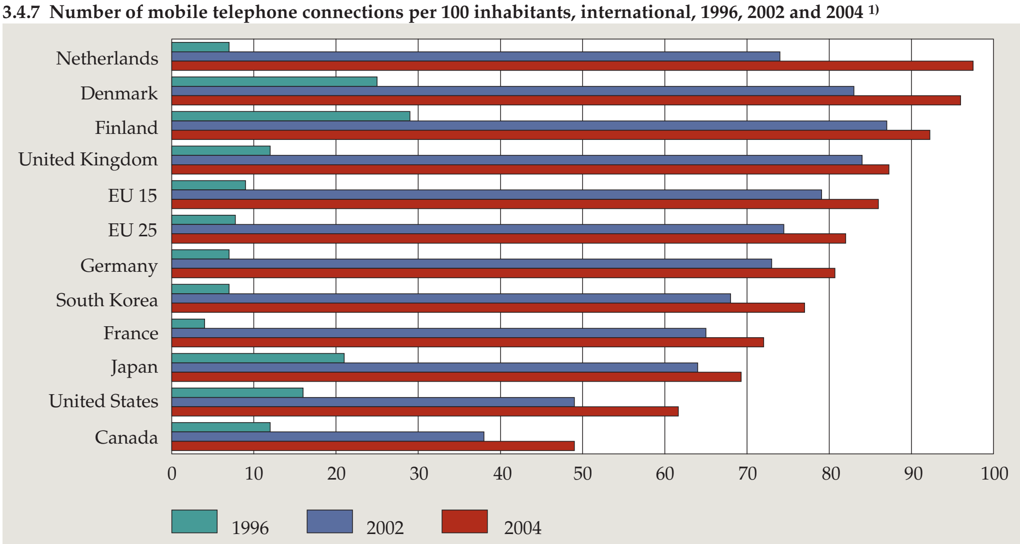
3.4.6 **Growth of turnover in mobile telephones and mobile telephone services, 2000–2005**



Source: TNO.

The number of mobile telephone connections per 100 inhabitants in the Netherlands is high. In the first quarter of 2005 it was above 100. In 2004 the Dutch figure first exceeded that of Denmark and Finland (figure 3.4.7). In the USA and Canada the

3.4.7 **Number of mobile telephone connections per 100 inhabitants, international, 1996, 2002 and 2004** [1)]

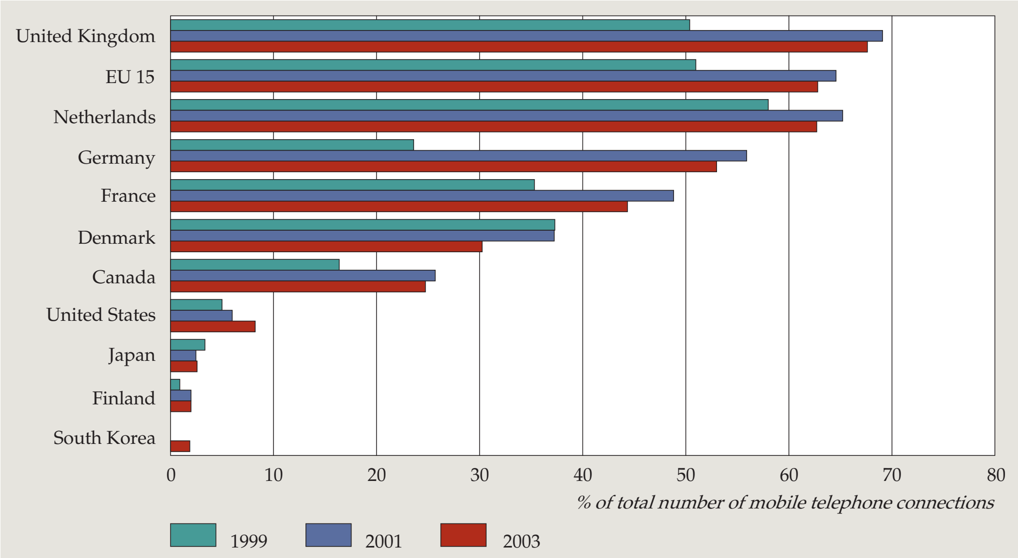


1) Data on 2004 of EU 15 and EU 25 refer to 2003.

Source: TNO.

number of mobile telephone connections is relatively low. The total number of mobile connections is still increasing in all benchmark countries; in 2004 the increase was 19 percent in the Netherlands. Together with Canada and the USA the Netherlands has one of the highest growth rates.

3.4.8 Percentage prepaid mobile telephone connections, international, 1999, 2001 and 2003



Source: OECD, Communications Outlook 2005.

Figure 3.4.8 shows that the UK and the Netherlands have relatively many prepaid connections compared to other benchmark countries, but they do not differ much from the EU 15 average. There are remarkably big differences between the benchmark countries. In the countries outside the EU and in Finland the prepaid

Triple play

For competitive reasons, many telecom providers who currently offer one telecom service would like to offer internet, telephone, radio and television as a combined package. This may have advantages for consumers because they only have to deal with a single provider, and because a total package is often cheaper than having different providers for each service. The advantage of the combination package eventually depends on the intensity of the use of the different services. One disadvantage is that the cost of the various individual services may no longer be transparent. Sometimes it may be more attractive to purchase individual custom-made services. Offering the combination package is commonly referred to as ‘triple play’.

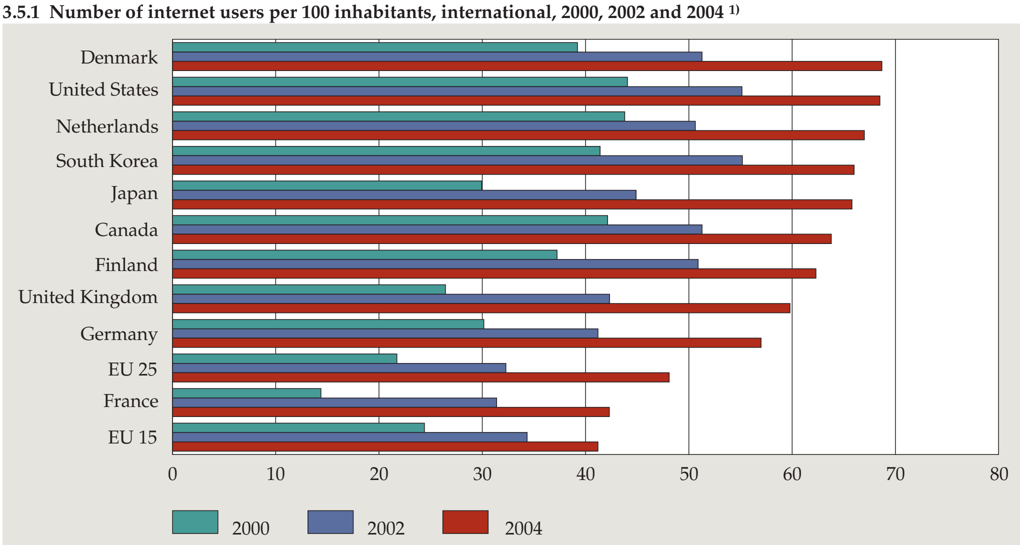
phenomenon rarely occurs. Prepaid connections give less certainty about the earnings for the services provided since they are fully dependent on how the user makes use of the connection. In 'post-paid' connections (subscriptions) the set subscription fees provide stable income; this seems more positive from the perspective of the providers.

3.5 *Internet use*

Intensity of use

Figure 3.5.1 shows the number of internet users per 100 inhabitants in the benchmark countries. In 2004 Denmark and the USA had the highest and France the lowest number of users. The number of internet users in the Netherlands in 2004 was relatively high.

3.5.1 Number of internet users per 100 inhabitants, international, 2000, 2002 and 2004 1)

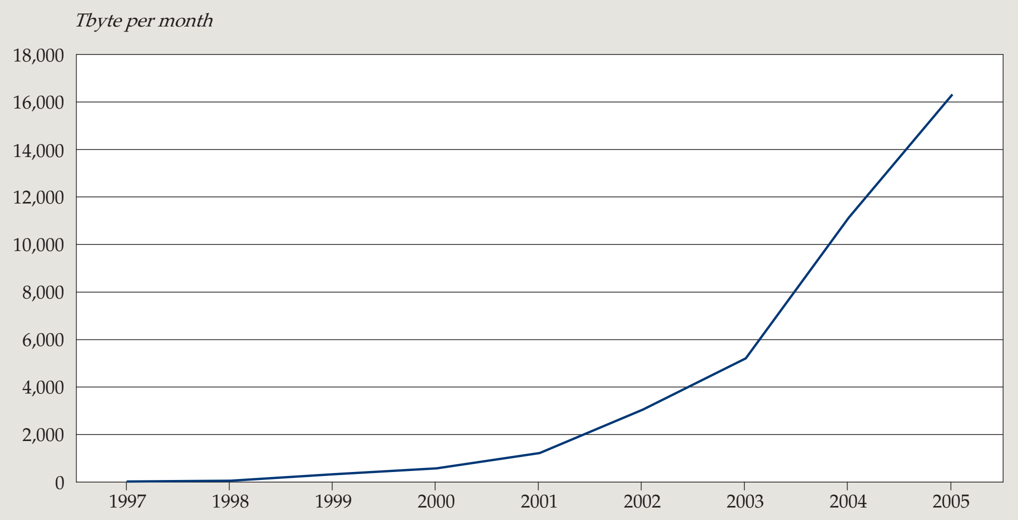


1) Data on 2004 of EU 15 and EU 25 refer to 2003.

Source: ITU and internetworldstats.

The number of users does not reveal much about the intensity of use. That requires other indicators. One of these is the monthly volume in terabyte (Tbyte) of the Amsterdam Internet Exchange (AMS-IX) as shown in figure 3.5.2. A terabyte is 1,024 gigabyte. The figure indicates the volume of the use of internet services in the Netherlands. Internet data transmissions during the first six months of 2005 went up to about 16,300 Tbyte in June; a 46 percent increase compared to December 2004. In 2004 the growth rate of the volume was higher than in 2003. This is logical, given the increased use of broadband connections and the wider range of band width, which allows the exchange of larger data files. These large data files are predominantly multimedia files (video, sound and photos).

3.5.2 Volume of internet traffic via AMS-IX in the month of December, 1997–2005 1)



1) 2005: in June.

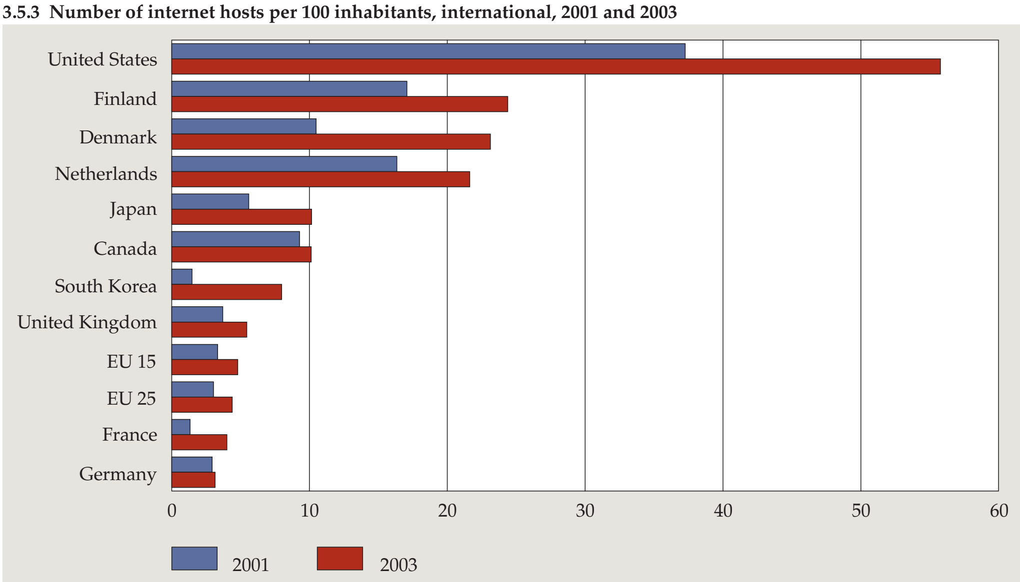
Source: AMS-IX.

Illegally exchanging files through the internet

'Peer to peer' (P2P) refers to an internet application where files can be exchanged between users without the mediation of a central computer with files. The internet network used for the P2P exchanges is maintained on the basis of equality of the users ('peer') to which users can log in. The exchanged files are often multimedia files.
In order to combat the illegal copying and circulating of multimedia files via these applications, various legal and software solutions are being developed. One is 'Digital Rights Management' (DRM). DRM is a software method that uses security measures to prevent the copying of files that can easily be distributed through the internet. This can be seen as a reaction by the private sector to the use of P2P in exchanging copyrighted material. The protected files can often be used just temporarily or on just one machine. There is a fee for this, allowing the software player to use it temporarily. This is usually also done through software (mostly through the internet).

Another indicator for the intensity of internet use is the number of internet hosts. Internet hosts are computers that are linking points on the internet with a fixed IP address. A host usually has several individual users. Figure 3.5.3 shows the benchmark countries and the number of internet hosts per 100 inhabitants. The highest number was observed in the USA and the lowest in Germany and France. The number of internet hosts per 100 inhabitants in the Netherlands in 2003 was high at 21.6, but not at the same level as in the USA, Finland and Denmark.

3.5.3 Number of internet hosts per 100 inhabitants, international, 2001 and 2003

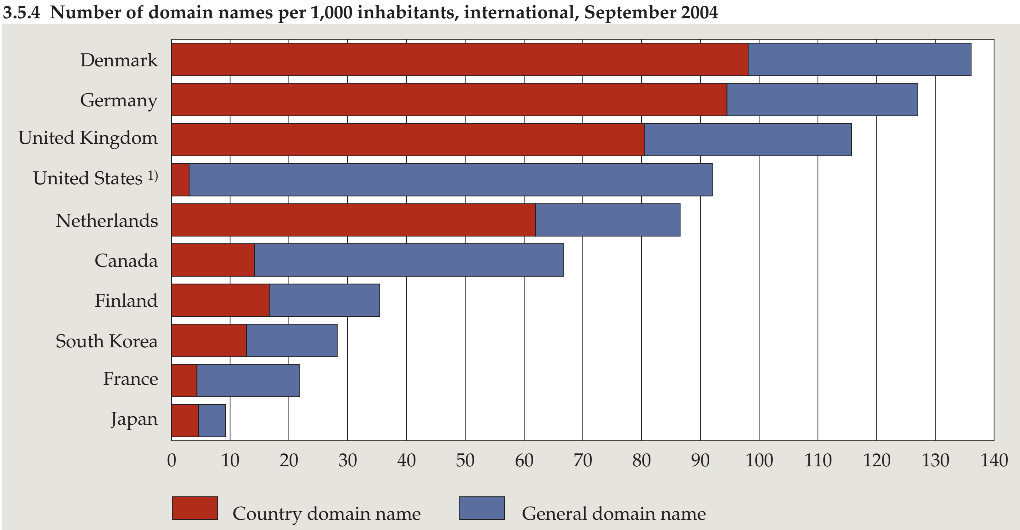


Source: ITU.

One internet application to optimize use of the internet is ‘grid computing’, in analogy with the ‘power grid’. Grid computing is a technology aiming to make computer capacity that is potentially available in a decentralized way, available via the internet to applications requiring that capacity at a given moment. The best known example is NASA project ‘SETI@Home’, where the computing power of individual computers is used via an intelligent ‘screensaver’ to trace signals of life in space. P2P applications are also a form of grid computing where the emphasis is on data rather than on computing power.

Every computer connected to the internet uses an IP address necessary for communication with other computers. An IP address consists of figures and dots. To be able to remember IP addresses more easily they are given a domain name. This is especially important when the IP address is linked to a website. When the name (or the IP address) is typed, the website linked tot the IP address is shown. In order to regulate the domain names, a special naming system was designed by the organisations managing the internet: the 'Domain Name System' (DNS). The right-hand component of the domain name (extension) consists of two or three letters. In many cases this component refers to a country. The Netherlands uses '.nl' and Germany '.de'. There are also more general extensions such as '.com' or '.org' which are not linked to countries. Registering a domain name by a company or an individual indicates the ambition to be on the internet and as such indicates the development of internet use. Worldwide there were 64 million registered domain names by mid 2004. Since the middle of 2000 this number has grown at an annual rate of about 19 percent (source: OECD, Communications Outlook 2005). Figure 3.5.4 shows the number of domain names per 1,000 inhabitants in the benchmark countries. In the Netherlands there were about 87 registered domain names per 1,000 inhabitants. In absolute numbers there are about 1 million domain names with the extension '.nl' and 400 thousand with a general domain name. Of the countries under consideration Denmark registers the greatest desire to be present on the internet with 136 domain names per 1,000 inhabitants.

3.5.4 Number of domain names per 1,000 inhabitants, international, September 2004



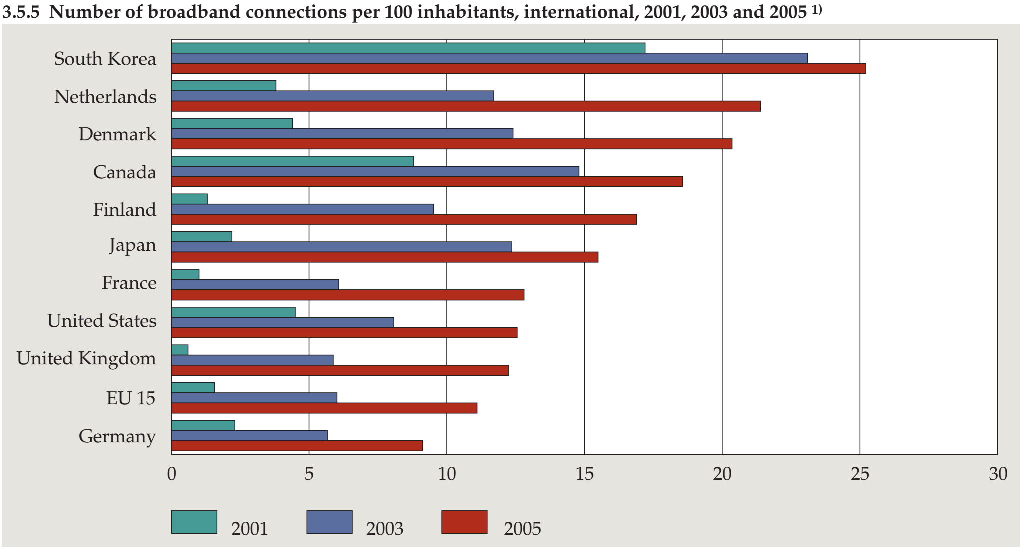
1) For the country domain name, only .us is used and not .gov, .mil or .edu. The latter 3 are included in the general domain names.

Source: OECD, Communications Outlook 2005.

The use of the various internet connections

The internet can be accessed in various ways, as was discussed in paragraph 3.4. To use all internet services it is becoming increasingly important to have a broadband rather than a dial-up connection. Figure 3.5.5 shows the development of the number of broadband connections per 100 inhabitants over the period 2001–2005. The number of broadband connections per 100 inhabitants in the Netherlands increased sharply and had reached 21 at the start of 2005. In an international perspective, the Netherlands has a very high penetration of broadband, right behind South Korea. Germany is the only benchmark country that scored below the average of the EU 15 and EU 25 countries.

3.5.5 Number of broadband connections per 100 inhabitants, international, 2001, 2003 and 2005 [1)]



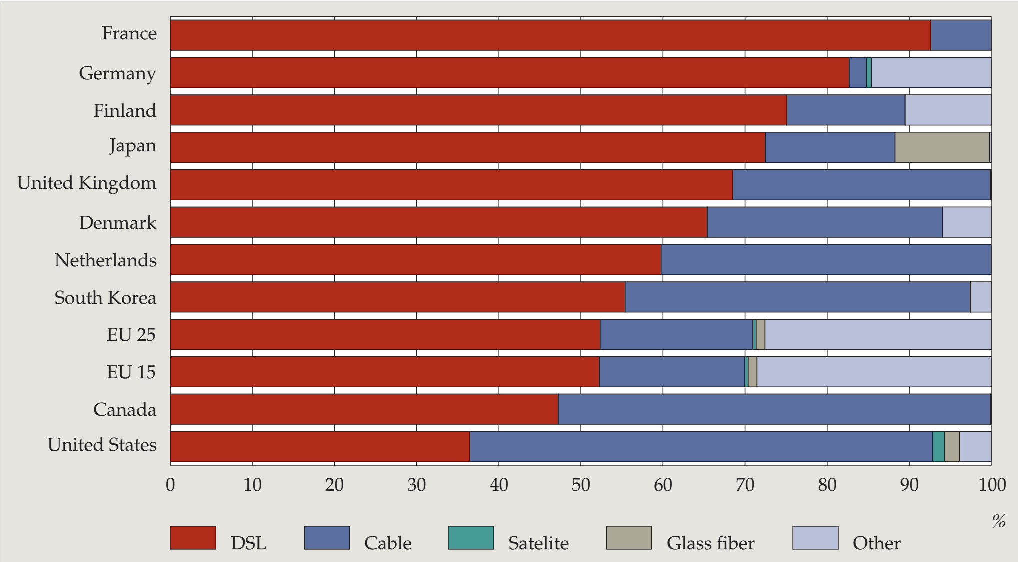
1) Situation 2005: end of first quarter.

Source: TNO.

Figure 3.5.6 provides an overview of the networks that the benchmark countries use for broadband internet access. The figures are based on subscriptions. The most common types of broadband internet in 2004 were (A)DSL and internet via cable. Japan is the only country where a substantial part of the broadband connections is through a glass fibre network ('Fibre-to-the-Home'). The telephone and cable networks also use glass fibre, but not branched straight into the homes and companies with cables.

Except for the glass fibre network in Japan, access to broadband connection other than via cable or telephone networks is rare in the Netherlands and elsewhere. A second exception is the USA, where glass fibre networks are used, and to a lesser extent broadband technology via satellite. The category 'other' is rather substantial in some countries. In this category there are rented line applications, digital radio systems (WLL) and internet through the electricity net (BPL or PLC). Broadband for mobile phones, 3G, is not taken into account in figure 3.5.6. The order of presentation of the countries in the figure is chosen according to the degree to which they use DSL.

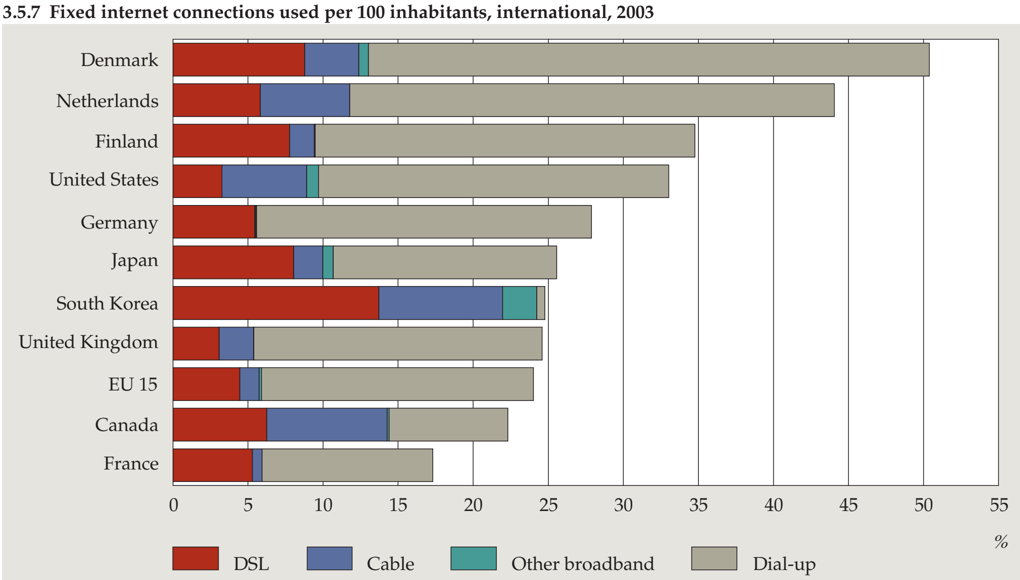
3.5.6 Networks used for broadband connections, international, 2004



Source: TNO.

In figure 3.5.7 the fixed internet connections (excluding mobile and satellite) per 100 inhabitants are categorised by kind of connection. This shows that the old-fashioned dial-up connections were still used most in 2003. The Netherlands

3.5.7 Fixed internet connections used per 100 inhabitants, international, 2003

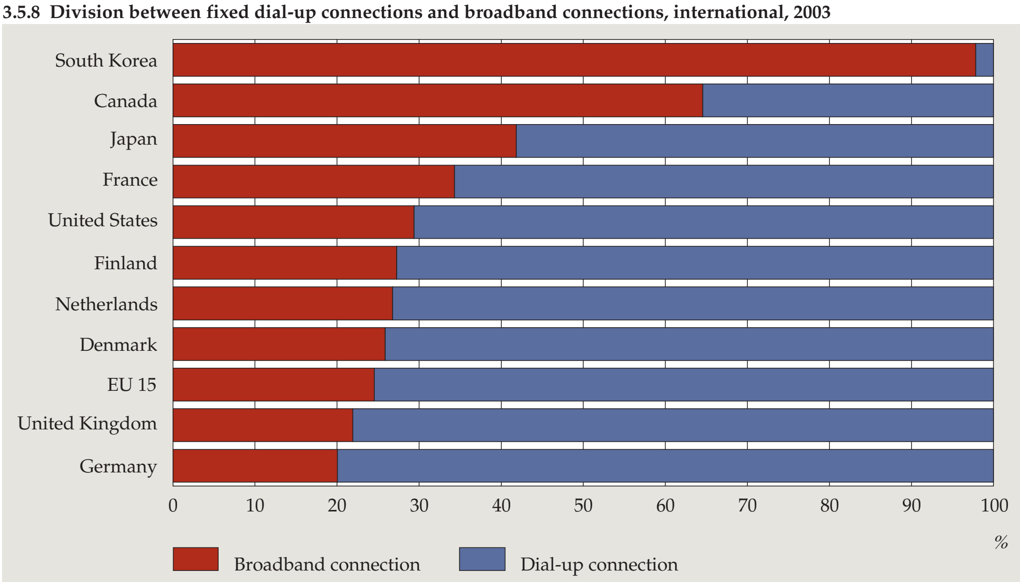


Source: OECD, Communications Outlook 2005.

compares favourably with the other countries in terms of fixed internet connections; the large number of fixed connections per 100 inhabitants in the Netherlands is mainly due to the large number of internet users dialling up. South Korea has the most broadband connections of the benchmark countries per 100 inhabitants; there is virtually no dialling up anymore in South Korea.

In figure 3.5.8 the division between fixed dialling up and broadband connections with the internet is shown for the benchmark countries. The figure provides insight in the quality of the fixed internet connections that existed in 2003. The ratio broadband versus dial-up in 2003 in the Netherlands was about the same as the average of the EU 15. France scored relatively well, but this is mainly due to the small number of dial-up connections and not to an above-average number of broadband connections.

3.5.8 Division between fixed dial-up connections and broadband connections, international, 2003

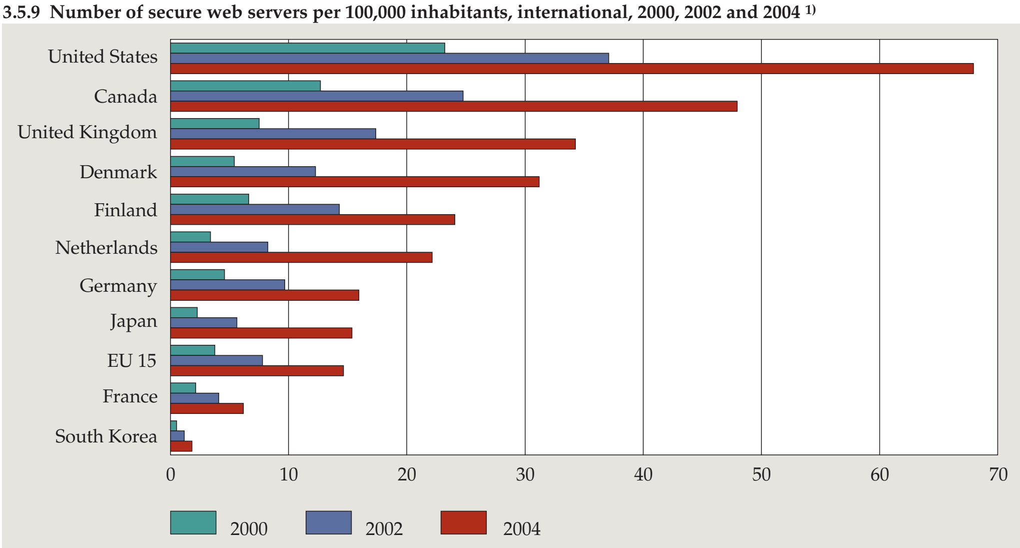


Source: OECD, Communications Outlook 2005.

Security aspects

The increasing social and economic importance of internet requires more attention for the security of the internet transmissions. 'Secure Socket Layer' (SSL) is a protocol used to protect transactions via the internet. Web servers play a key role. Web servers are computers that support how websites work. More and more web servers are protected via the SSL protocol. Secure web servers are crucial in the exchange of sensitive information, such as on-line purchases.

3.5.9 Number of secure web servers per 100,000 inhabitants, international, 2000, 2002 and 2004 [1)]



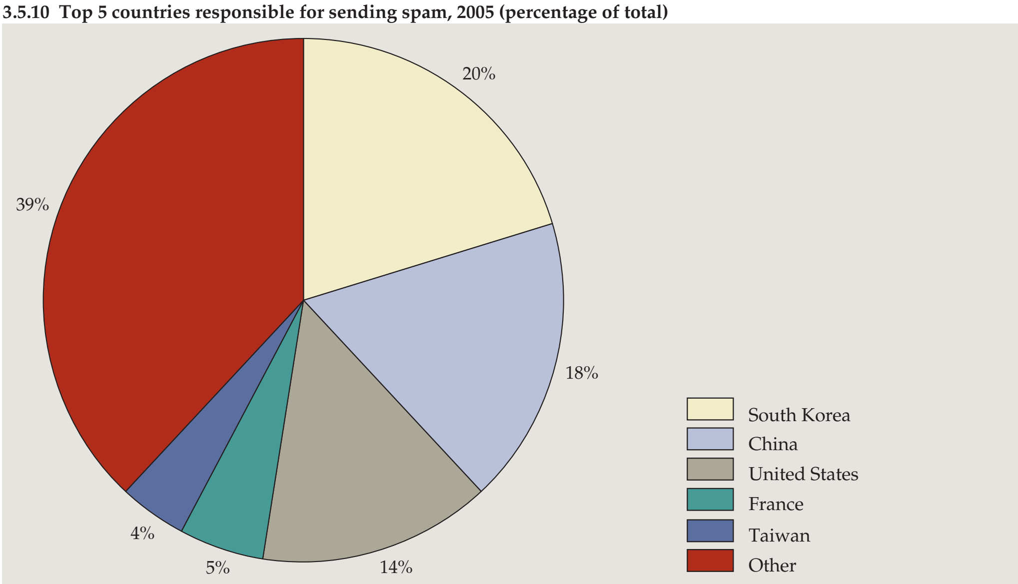
1) Measurement in July of the year concerned.

Source: OECD.

The number of secure web servers in the benchmark countries is shown in figure 3.5.9. It is corrected for the number of inhabitants and presents the situation in July of each year. The number of secure web servers per 100,000 inhabitants in July 2004 was highest in the USA (68). In Europe it was highest in the UK (34). The Netherlands is well above the EU 15 average with 22 secure web servers per 100,000 inhabitants. The period July 2003–July 2004 saw the number more than double in the Netherlands.

A phenomenon that is not so much a security issue, but a nuisance and unnecessary burden for internet data transmissions is 'spam'. Spam is unsolicited mail through the internet. The message is sent to many different e-mail addresses or to large news groups on the internet service 'Usenet'. Since the costs are negligible, spreading spam can easily be profitable. The message often has a commercial message and links to an internet address of a commercial site. The 'spammers' are usually small companies or individuals. With advanced methods the 'spammers' look for e-mail addresses that they can use for 'spam'. Unsolicited phone calls with a commercial purpose are also seen as spam. The term 'spam' comes from the canned meat product Spam.
As of May 2004, under the new Telecommunication Law, it is not permitted in the Netherlands to mail spam to private individuals. In the future there is an 'opt-in regime', where senders must be able to show that receivers have agreed to receiving commercial, charity or idealistic messages. This does not yet apply to spamming

3.5.10 Top 5 countries responsible for sending spam, 2005 (percentage of total)



Source: Commtouch.

commercial addresses. There is an 'opt-out regime': companies must be able to object easily to the use of their e-mail addresses.

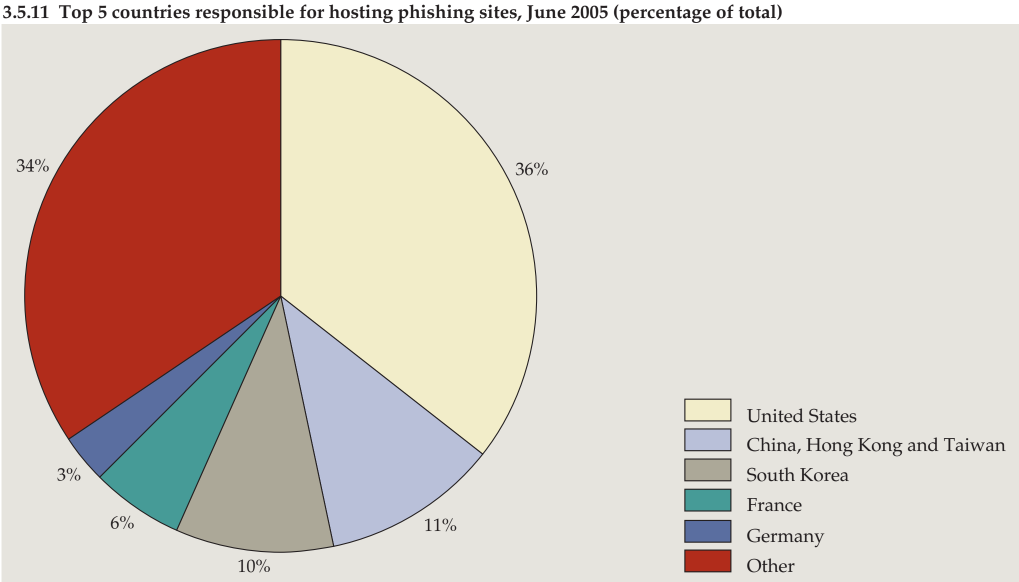
The OPTA also supervises the anti-spam enforcement. One complication is that most spam comes from Asian countries and the USA (see figure 3.5.10), where the European law does not apply. Moreover, these countries often have an 'opt-out regime' that clashes with the new European 'opt-in regime'. American and Asian companies can send spam to Europe without any sanction. The spammer is often located in the USA and uses web servers in China.
In June 2005 most spam came from South Korea and China. In 2004 the Netherlands was also still on the list of spammer countries, but by mid 2005 the Netherlands is no longer in the top 10. One reason is the prohibition of spam as of May 2004 and the active role of OPTA in the fight against spam. The number of spam runs, that is sending a great quantity of spam mails at once, has been dropping each month since spam was prohibited.

A very nasty form of spam, aimed at getting identification details of the owner of an e-mail address, is called 'phishing'. There is the criminal intent to get access to bank accounts and other information shielded by passwords. The e-mail message also often includes a link to a criminal internet site that looks much like the bona fide internet site of the service that legitimately makes use of the password.
In June 2005 over 35 percent of the phishing came from the USA; the Netherlands occupied the tenth place with 1.65 percent. In figure 3.5.11 we show a list of the

countries that spread most phishing messages. These data come from a monthly survey conducted by Websense, commissioned by the Anti-phishing Working Party (APWP). The APWP is a group of companies mainly in the USA that seeks to provide information about the phishing phenomenon and assess the prevalence of the problem.

In June 2005 the APWP found about 15 thousand phishing e-mails, over 6 thousand more than in December 2004. In June 2005 there were 74 company names used 'in vain', of which almost 91 percent came from the financial world. In over 5 percent of the cases the wrongly used name was that of an internet service provider. In 46 percent of the phishing messages in June 2005 there was a link to an internet site. On average these sites stayed in the air for about six days before they disappeared.

3.5.11 Top 5 countries responsible for hosting phishing sites, June 2005 (percentage of total)



Source: Anti-Phishing Working Group.

Another security problem is 'spy ware'. These are software programs aiming to send information on the internet use of a pc, or even data on the computer itself, to third parties. This information can be sold for commercial purposes.

'Ad ware' is a kind of spy ware that opens internet sites during a surf session on the internet without the user's permission. 'Cookies' are files left on the computer containing information about the use of a particular internet site. This can be illegal or troublesome, but does not need to be, since cookies can save user names for websites.

A general term used for this type of fraudulent software that is installed on computers without the users' consent is 'mal ware'. Generally 'infections' take place through the internet. Mal ware includes computer viruses that are sometimes harmless in their effects, but sometimes aimed at disrupting or disabling computer use. For instance: a 'Distributed Denial Of Service' (DDOS) is some sort of 'attack' on an internet site that will temporarily disable it. This can be done with software that frequently tries to connect with the site's server but never completes the connection, thus sending the server into a spin. Servers can also be overloaded in various ways so that they seize to function.
'Mass Media Viruses' are aimed at central computers used for e-mailing (mail servers). This can lead to sending e-mails without the knowledge of the owner of the e-mail address.

Another problem are the 'dialers'. These are software programs interrupting the dial-up connection with the internet provider and making another connection. The new connection is often an expensive number (an 0900-number or a foreign number), for which the caller finds the charges on the telephone bill later. A dialer can also be installed when a user switches to internet via ADSL or cable, but still has a modem in the computer linked to the telephone network. Dialers can also be used legally. They are often used as a means to pay for ring tones, games and music. The abuse takes place when a dialer does not warn that the new connection is made and what the costs are, and when no permission is obtained. By June 2005 the OPTA has listed 63 foreign telephone numbers used by illegal dialers. They are virtually all from African, South American and Asian countries. The list enables telecom providers to block the numbers on it.

So the use of e-mail and internet has its downsides. There are many measures in place to see to it that users will not become discouraged and to give them a sense that they can safely use the applications, since the abuse of sensitive data is being prevented. One example is 'DigiD'. DigiD is an initiative of the Dutch government to secure, improve and simplify its electronic services. Through DigiD, government institutions can verify the identity of clients using their electronic services. Eventually all government institutions should be linked to DigiD. The program DigiD is executed by the program bureau DigiD of the ICTU foundation and the Belastingdienst (Tax Authorities), commissioned by the Ministry of the Interior and Kingdom Relations (BZK). ICTU was founded in 2001 by BZK and the Association of Netherlands Municipalities (VNG). ICTU stands for the Dutch organisation for ICT in the public sector and aims to stimulate e-government by helping government to use ICT optimally.

Chapters 4 and 6 will provide further detail on the safety aspects of ICT for companies and individuals.

Notes in the text

1) The figures presented in this paragraph about underground networks come from a study on underground cables and lines by the Dutch centre of standardization NEN, commissioned by the Ministry of Economic Affairs (Pauwels en Wieleman, 2004).

2) This is not entirely correct, since there are some technologies allowing communication via the electricity network, such as BPL ('Broadband over Power Lines'), also called PLC ('Power Line Communication'). This technology has all kinds of complications and problems with standards and is rarely used in the Netherlands.

4. ICT use by companies

Over 90 percent of all companies used the internet by December 2004. Almost three-quarters of all companies was present on the internet with a website and 70 percent of all companies had a broadband connection. It is far less common to see the more advanced use of the internet such as on-line sales, or complex ICT applications such as linking up internal and external computer systems. There are also major differences between the branches of industry and company sizes. Trade and repairs, manufacturing and computer service bureaus are the branches using ICT most intensively, whereas hotels and restaurants and construction use ICT far less intensively.
In a European perspective, the ICT use by Dutch companies is comparable to that in Germany, Belgium and the UK; the group of countries right behind the three Scandinavian countries.
Both in the Netherlands and internationally, the more intensive use of the internet goes hand in hand with problems, mainly due to computer viruses, despite the use of more advanced security systems.
The contribution of the ICT sector itself to the growth of labour productivity in the period 1990–2002 in an international context exceeded that of the sectors using ICT. When placed in an international perspective, the contribution by the Dutch ICT sector, as well as by the sectors using ICT, to the growth of productivity was pretty average.

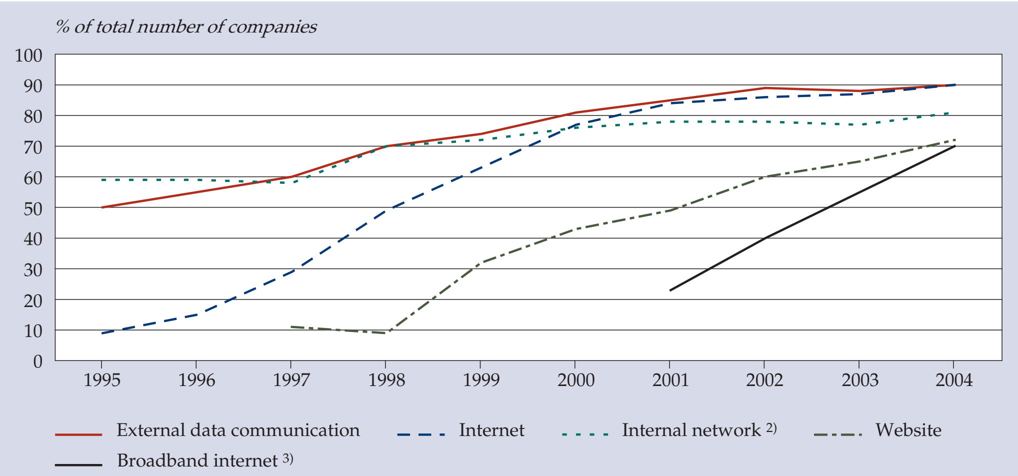
4.1 General development

Virtually all companies use computers, and have been using them for years. However, the kind and volume of use have developed greatly over the years. In companies, computer density has increased enormously, and the current computers are incomparable to the computers of the past. More and more people regularly use computers for their work. In 2004 some 56 percent of the employed labour force used computers regularly at work. A growing number of these computers is connected to the internet. In 2004 some 40 percent of the employed labour force regularly used the internet at work.
In 1995 over half of all companies linked their computers into an internal network. Due to the arrival of internet technology, which hugely expanded options for communication between computers, this share increased to over 80 percent. Here too the current networks of linked computers are incomparable to the local networks of the past. One example is the possibility of having an intranet.

Likewise external data communication – that is communication between computers of one company with computers of another company – is not a recent development: already in 1995 half of all companies could use this option. However, the form of the external data communication has changed dramatically. In the 1990s these were mainly 1-to-n networks that were not necessarily profitable for all companies. These were replaced by the internet or internet technology based networks. Internet is a n-to-n network and the cost/benefit analysis for (small) companies to use this network is positive much faster than with the older 1-to-n networks. There has been a spectacular increase in the number of companies using external data communication, closing in on 90 percent by December 2004. External data communication makes use of the internet in virtually all cases. There is a steady decrease in the number of companies with an internet or an internet technology based network, including EDI via internet, that still use other networks.

What is recent is the massive 'presence' of companies on the internet. Most companies with internet access are present on the internet with a website. These range from a website with basic information about the company to a website on which people can order and pay for products. This process of not being on the internet to the massive presence took place between 1998 and 2004. Even more recent is the growing number of companies that uses broadband for external data communication. The applications of external data communication are becoming more advanced, and the use more intensive, which makes a larger bandwidth necessary. Most companies used broadband internet by December 2004, a process that occurred within four years.

4.1.1 Developments in ICT use by companies, 1995–2004 1)



1) Companies with 10 and more employees (1995–2001) / employed persons (2002–2004).
2) For 2002 an interpolation is used.
3) Broadband internet is defined here as ADSL, cable and other fixed internet connections with a large bandwidth.

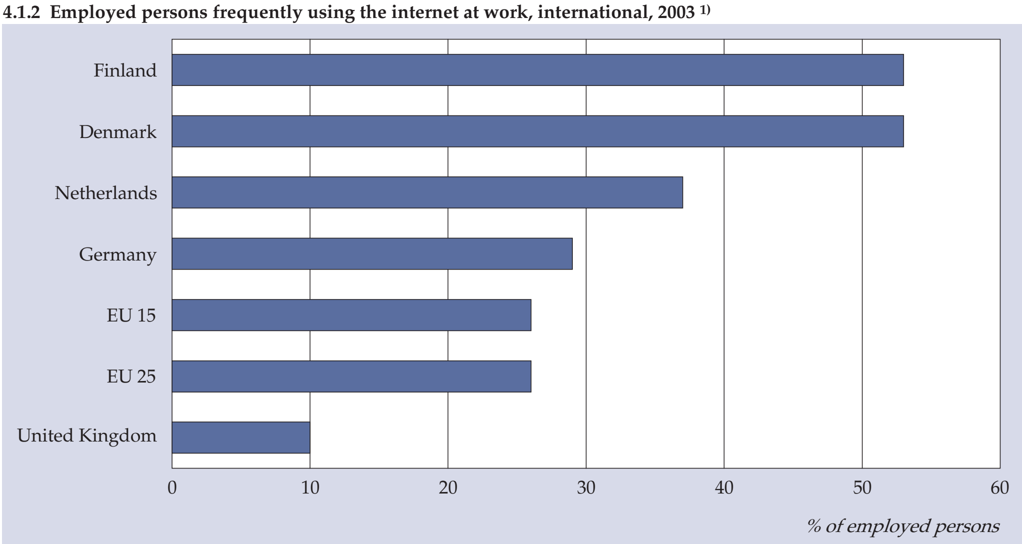
Source: Statistics Netherlands, Survey on ICT Use in Enterprises.

By the end of 2004 there were more companies with internet, or more generally with external data communication, than there were companies with an internal network. So it is not always the case that companies first get their internal data communication organised before they go on-line.

Internet at work

The 'mass' of the work done in digitalised form or stored digitally, has increased enormously. This is expressed by the huge number of people using computers at work and the degree to which these computers are linked. The same holds true for the number of people who are involved in this work and who are potentially linked to each other. In figure 4.1.2 this is illustrated in an international context by the number of people employed who use the internet regularly at work and thus have access to the internet at work or at their own work place. There are still major differences between the countries. In Finland and Denmark over half of the employed labour force regularly uses the internet at work. This is twice as high as the EU 15 and EU 25 averages. The UK has a remarkably low score, given that the country 'scores' high in ICT use in other areas.

4.1.2 Employed persons frequently using the internet at work, international, 2003 [1)]



1) Companies with 10 and more employed persons.

Source: Eurostat, New Cronos.

Survey on ICT use in enterprises

The survey on ICT use in enterprises used to be known as the Automation Survey until the end of 2001. It is a sample survey among companies, which Statistics Netherlands has conducted annually since 1987. The rapid developments of ICT in the past two decades made it necessary to update the questions on a regular basis. In the first few years the questions pertained to automation cost, automation personnel and computer ownership. In recent years the emphasis has shifted to the use of external networks such as the internet. The results of the study on a given year refer to the situation at the end of that year; so the figures on 2004 refer to the situation in December 2004.
Only companies employing 10 or more people are observed. In 2002 the threshold was 5 employees. Until the end of 2001 companies were classified on the basis of the number of employees. The change from 'employees' to 'employed persons' make that the results of the 2001 survey are not completely comparable with the 2002 and 2003 results. The influence of these changes is relatively big for companies employing between 10 and 19 people: the lower limit of the population described.
As of 2003 the population described in the survey consists of companies employing 10 people or more in the branches of industry Manufacturing, Electricity, gas and water supply, Construction, Trade and repair, Hotels and restaurants, Transport, storage and communication, Business services, Health and social work and Other services (see also the appendix on concepts and definitions used).

In 2003 the ICT use in the Financial sector became part of a separate survey and is observed with a partially different questionnaire. It is no longer part of the general survey on ICT use in enterprises.

Both surveys are part of the EU harmonized surveys on ICT use in enterprises.

4.2 *Internal data communication*

Communication within a company may be supported by ICT by means of a network of interlinked computers (LAN). The users of the network have access to centrally stored information. Over 80 percent of the companies has such a local area network. For large companies the share is almost 100 percent, versus three-quarters for the smallest companies.

Intranet

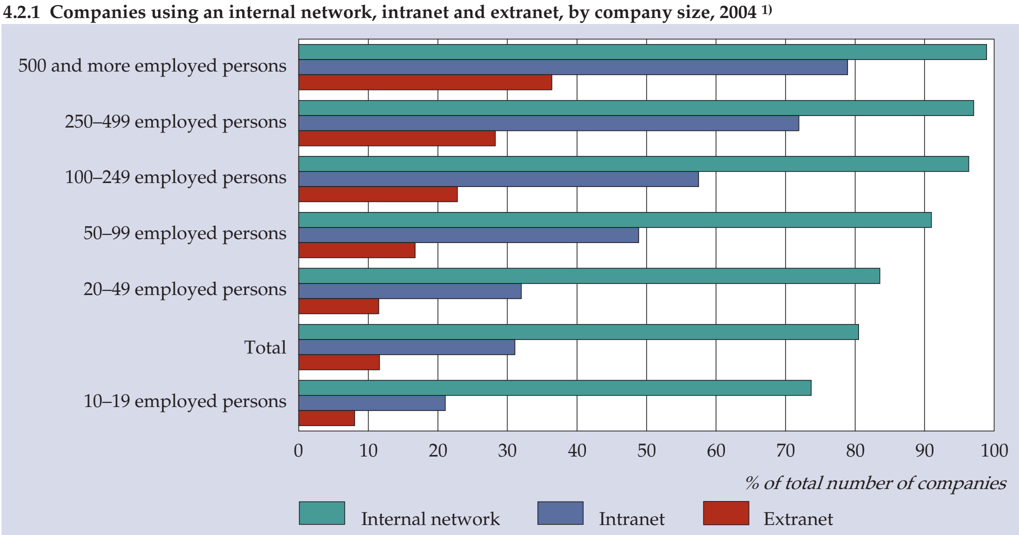
An intranet is an internal network based on internet technology on which information can be presented in a form comparable to a website, and in-company services can be offered. In terms of functionality, an intranet is comparable with the 'real' internet, but the use is limited to company employees. Evidently, larger companies will decide to create an intranet more easily than smaller companies do.

The communication within a large company tends to be more complex than within a smaller one, so larger companies will more often decide positively on supporting the transparency and communication of the organisation via an intranet than smaller companies. Moreover, an intranet requires a lot more maintenance than a simple internal network. In smaller companies the maintenance and support weigh more heavily on the available work force than in a larger company. Almost a third of the companies find it useful to have an intranet: close to 80 percent among the largest companies, and just over 20 percent for the smallest. So the difference in the use of an intranet between large and small companies is much bigger than in the use of a simpler form of internal network (a LAN).

Extranet

An extranet is an intranet where a limited number of 'others' is allowed access to the intranet of the company concerned. This can be handy for regular customers, suppliers or others who are closely involved with the company. About 12 percent of all companies use this option. Here too the rate increases with company size. Less than 10 percent of the smallest companies use an extranet, versus over one third of the largest companies. The branches of industry that make the least use of internal data communication are construction and hotels and restaurants. About 12 percent of the companies also have a wireless internal network (see also table A4.2.1 in the statistical annex).

4.2.1 Companies using an internal network, intranet and extranet, by company size, 2004 1)



1) Companies with 10 and more employed persons.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

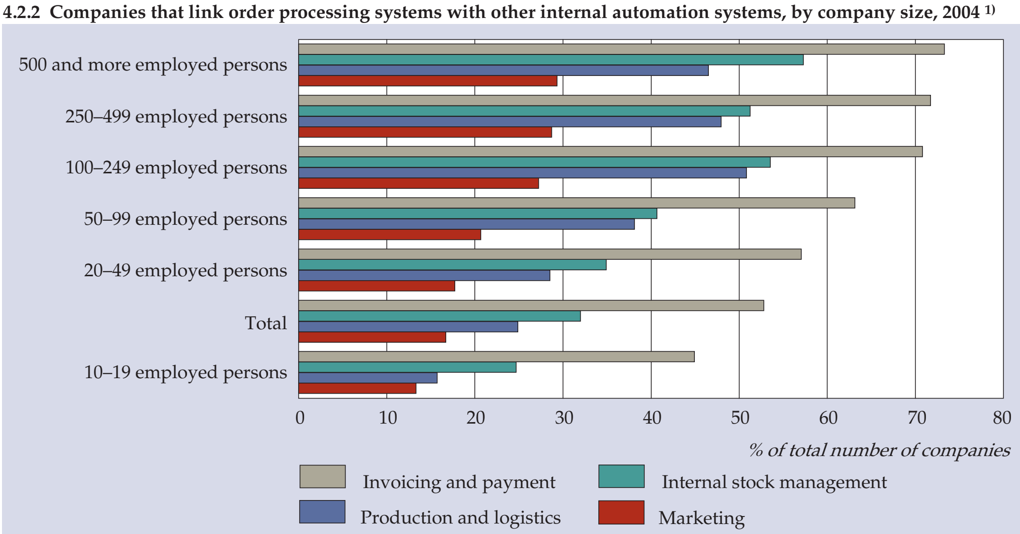
Internal links of computer systems

Another form of internal data communication is linking various computer systems within a company. How does ICT support the orders a company received, the invoicing, stock management and production and logistics? Are these separate systems or are they integrated?

Over 60 percent of the companies report using a computerized system to process purchase or sales orders. The order processing system is usually linked to an invoicing and payment system. Following this, the order processing system is most frequently linked to a stock management system, albeit less often than with invoicing and payments. Nearly one in three companies link it to a system for production and logistics planning. Order processing is linked the least often to a marketing system. The emphasis seems to be on settling the 'must-settle' matters in an efficient way, such as invoicing and payments, replenishing stocks and, to a lesser degree, planning. It is less common to have a more 'offensive' use of ICT for meeting potential wishes of clients or winning new customers. This may not be equally important for all companies, whereas invoicing and payments always are important for all companies.

A clear pattern emerges for the size classes as far as the presence of linked computer systems within the companies is concerned: the smaller the company, the lower the presence. Manufacturing and trade and repairs make the most intensive use of linked computer systems among the large companies. Within manufacturing there often is a link between the order processing system and the system for logistics and

4.2.2 Companies that link order processing systems with other internal automation systems, by company size, 2004 [1]



[1] Companies with 10 and more employed persons.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

planning. It is rather important for trade and repairs to have a link with the system for internal stock management. The energy and water supply companies and computer service bureaus have their order processing systems linked more often than other branches of industry to a marketing system (see also table A4.2.2 in the statistical annex).

4.3 *External data communication*

Virtually all companies use external data communication, for which they use the internet and usually broadband internet: 70 percent of all companies had broadband in December 2004. Table 4.3.1 shows that many companies report more than one connection. Apparently, the older internet access by analogue modem or ISDN is not stopped right away once a company gets a broadband connection. The growth in the number of broadband connections is dominated by the growth of ADSL.

With the exception of hotels and restaurants (49 percent), the majority of companies in all branches of industry have broadband. For industry groups as advertising companies, computer service bureaus, advisory agencies and the like, the percentage of companies with broadband internet is around 90 percent. Given the kind of work these companies do, this is not surprising: they have products that can be produced and distributed in digital form, while communication with clients is often through the internet. This is different for the 'make industry'. In the industry

Table 4.3.1
Companies by type of internet connection, 2001–2004[1)]

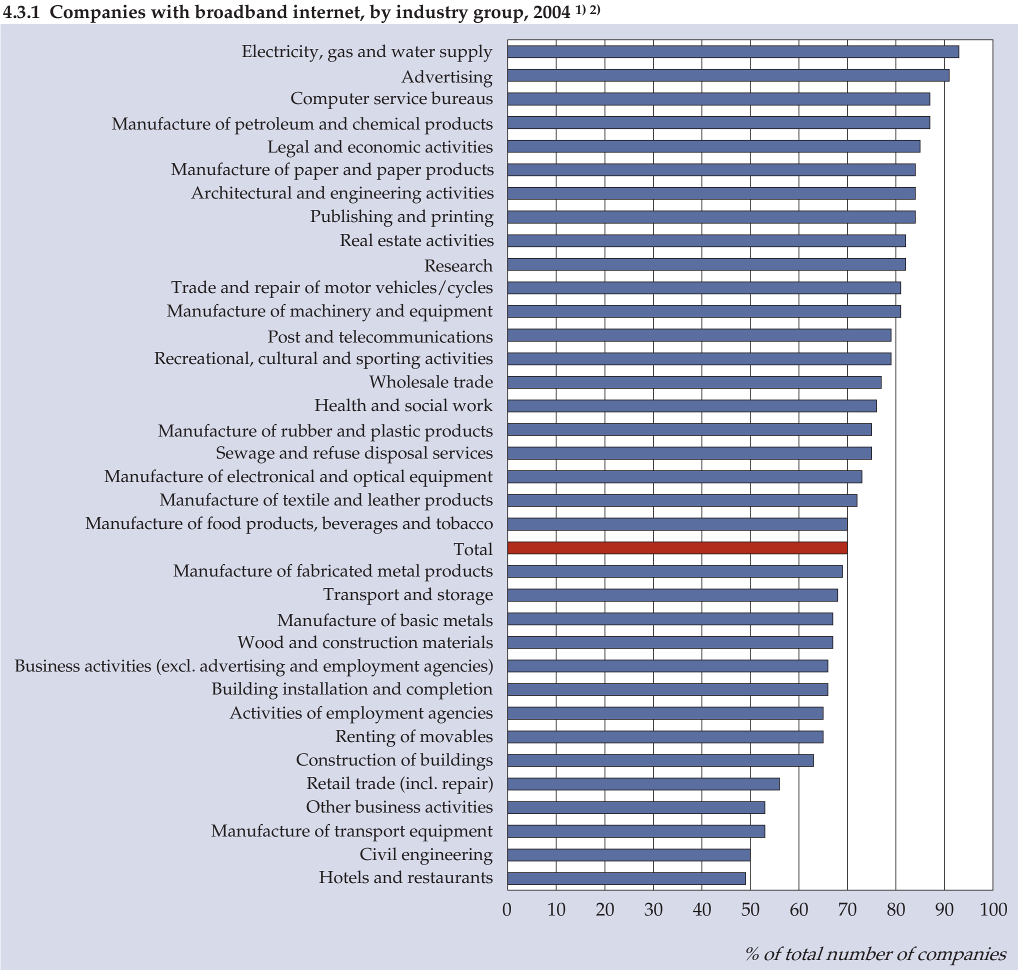
	2001	2002	2003	2004
	% of total number of companies			
Type of internet connection				
Analogue	25	23	17	10
ISDN	47	43	36	24
Broadband[2)]	23	40	55	70
among which				
cable	5	4	6	6
ADSL	9	28	44	61
Wireless	.	4	4	4
Fastest type of fixed internet connection				
No internet	17	14	12	10
Analogue	16	12	8	4
ISDN	44	34	24	15
Cable	4	3	5	5
ADSL	9	28	43	57
Broadband (other, unknown)[2)]	11	9	7	8

1) Companies with 10 and more employees (1995–2001) / employed persons (2002–2004).
2) Including 'other internet connections'.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises.

groups where the percentage of broadband internet is below 70 percent, there are relatively many industry groups from the ‘make industry’, such as the manufacture of transport equipment and sectors in construction and the metal industry. These are not capital investments though. Usually these are ADSL connections and one may assume that getting the connection is a low threshold decision for the average company. Nevertheless, the same pattern emerges: the smaller the company, the smaller the chance it has a broadband connection (see also table A4.4.3 in the statistical annex).

4.3.1 Companies with broadband internet, by industry group, 2004 1) 2)



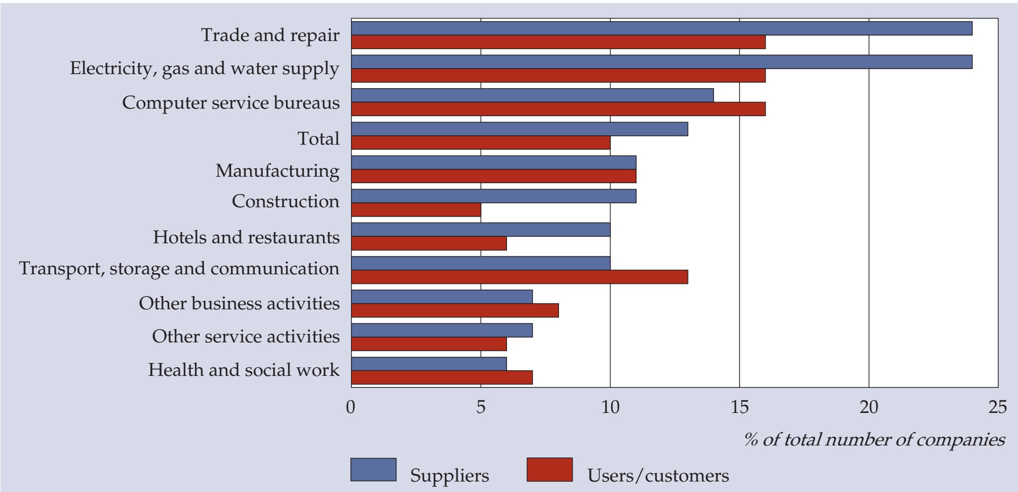
1) Companies with 10 and more employed persons.
2) Broadband internet is defined here as ADSL, cable and other fixed internet connections with a large bandwidth.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

External links of computer systems

A more advanced application of external data communication is the link of the company's own systems with those of suppliers, clients and buyers. This takes more than going on-line or communicating via the internet. These applications require decisions on how data are exchanged and which business processes are involved. By December 2004 some 13 percent of all companies had their order processing systems linked to the system of their suppliers. About 10 percent of the companies had their order processing systems linked to the system of their customers. Major companies regularly have their order processing system linked to the system of their suppliers. Such links occur most often in trade and repairs. This is not surprising given the turnover speed of the goods and the importance of efficient stock management in these branches. Stock management is also crucial for hotels and restaurants. This branch has many products with a limited life, and deliveries are often seasonal. For most branches the processes with suppliers are more often computerised than the processes with clients and buyers.

4.3.2 Companies that link order processing systems with automation systems of suppliers or customers, by branch of industry, 2004 [1)]



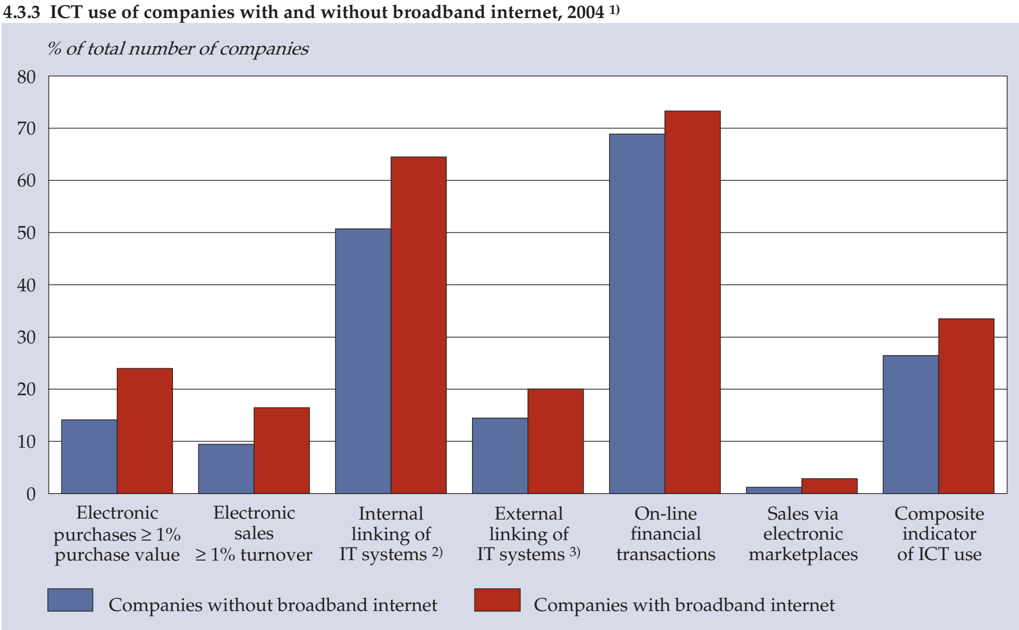
1) Companies with 10 and more employed persons.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

Broadband and ICT use

Despite the fact that getting a broadband internet connection does not constitute a great investment, having a broadband connection is definitely an indicator for the intensity of ICT use by companies. Figure 4.3.3 shows how companies with broadband internet and companies with a slower internet connection use six selected activities. These are the same six activities used in paragraph 4.4 to build a composite indicator for ICT use by industry groups (see also box 'European e-Business Readiness Index'). The companies with broadband internet scored more often on all activities than the companies with a slower internet connection. The difference for general activities, such as on-line financial transactions, is not so big. There is a much greater difference between the two for the more specific activities in external data communication, such as electronic purchases and sales and the external linking of computer systems. But companies with broadband also use internally linked automation systems more frequently than companies without broadband, while this is an activity that is not within the scope of external data communication. We may conclude that using or not using broadband internet may be related to some extent to the specific use of it for external data communication, but it is also a measure for the general way these companies use ICT.

4.3.3 ICT use of companies with and without broadband internet, 2004 1)



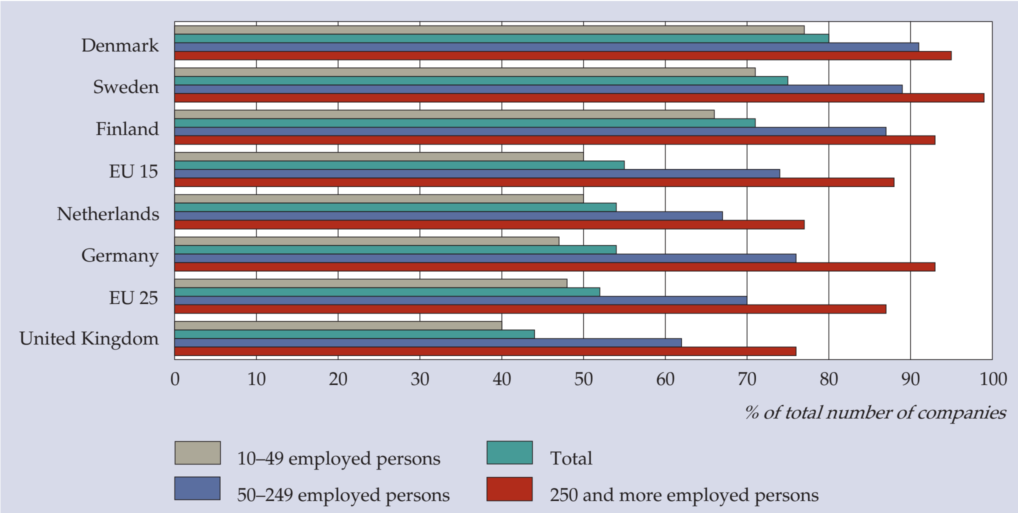
1) Companies with 10 and more employed persons.
2) Automation system for order processing is linked to one or more of the following internal IT systems: internal stock management, invoicing and payment systems, production and logistics planning systems and marketing systems.
3) Automation system for order processing is linked to IT systems of external customers/suppliers.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

International

The number of Dutch companies with broadband internet is average in a European context. Figure 4.3.4 is 'sorted' by highest total number of companies with broadband internet. The use of broadband by the major Dutch companies lags behind that of the other countries. There is very little difference in broadband use between larger and smaller companies in the Netherlands compared to other countries. The fact that Dutch companies as a whole have a broadband connection more often than companies in Germany and the UK do, is completely due to companies with 10 to 49 employed persons. The fact that larger companies have broadband internet more often than small companies is true in all countries.

4.3.4 Companies with broadband internet, by company size, international, 2003 1)



1) Companies with 10 and more employed persons.

Source: Eurostat, New Cronos.

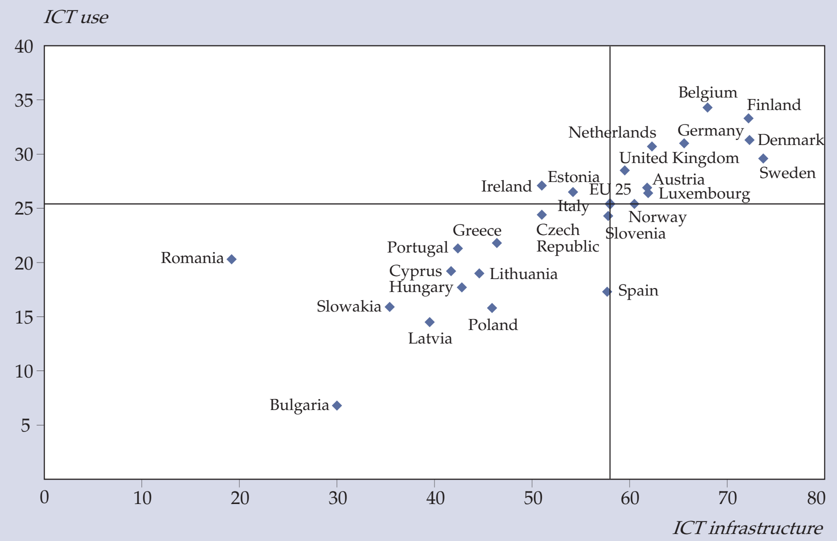
European e-Business Readiness Index

For the second year in a row the European Commission compiled the 'European e-Business Readiness Index'. The index describes the relation between two composite indicators on ICT use in companies: the ICT infrastructure present and the actual use of the infrastructure.
Both composite indicators are calculated on the basis of six basic indicators, where the underlying data are expressed as a percentage of the total number of companies or people employed. By weighing these basic indicators, the two composite indicators can be calculated. The result is always between 0 and 100.

The six basic indicators that make up the two composite indicators are:
– for ICT infrastructure: *(1) companies with internet, (2) companies with a website, (3) companies with at least two ICT security measures in place, (4) employed persons who use a computer, (5) companies with broadband internet, (6) companies with a LAN and an intranet/extranet.*

– for ICT use: *(1) companies with more than 1 percent of the total purchase value via electronic networks, (2) companies with more than 1 percent of the total turnover via electronic networks, (3) companies linking IT systems for order processing or purchases automatically with other internal IT systems, (4) companies linking their own IT systems automatically with the IT systems of suppliers or buyers outside their own enterprise group, (5) companies using the internet for financial transactions, (6) companies selling products to other companies through specialized electronic market places.*

European e-Business Readiness Index 2004 [1)]



1) The data of Italy and Estonia came out the same.

The calculation is tested to see how sensitive it is to the weighting factors used and to leaving out one of the underlying indicators. This sometimes leads to a change in the ranking of countries, but not to major changes in ranking. Therefore the method used turns out to be quite robust. The figure shows the calculated index for the 26 participating countries for the year 2004, where all basic indicators were assigned the same weight. The underlying data are derived from the harmonized survey on ICT use in companies, which is conducted annually in the EU countries and refers to the situation on 1 January 2004 or to the calendar year 2003.
The figure shows a clear relationship between having ICT tools and their application. The point where the two lines cross is the average of the EU 25 (excluding France and Malta). Dutch companies are among the European front-runners where the use of ICT is concerned, but not at the absolute top. Spain has remarkably little intensive use of the ICT infrastructure present whereas Romania uses the infrastructure present remarkably intensively. The new member states are in the company of the southern European member states where the use of ICT is concerned, but well behind the other member states of the EU 15.

Source: The 2005 European e-Business Readiness Index, European Commission DG Joint Research Centre (2005).

4.4 E-commerce and e-business

Where are the Dutch companies in terms of ICT use? We used two approaches to answer that question. One is to classify individual companies by highest development phase of ICT use, distinguishing the following stages: information, transaction and communication.
The other approach is to use two composite indicators to compare the available ICT infrastructure and the actual use of it. This second approach is used within the EU to compare countries in a compressed way (see box 'European e-Business Readiness Index'). The approach combines meso-level figures into these two indicators.
In this paragraph we use both approaches in comparing the ICT use between industry groups and size classes in the Netherlands.

Development phase in ICT use

When companies are classified by 'highest' development phase of ICT use, a pattern emerges of where most companies 'give up'. A pattern of the differences between branches of industry and large and small companies emerges too. In this approach the companies are classified according to the following phases of ICT use:

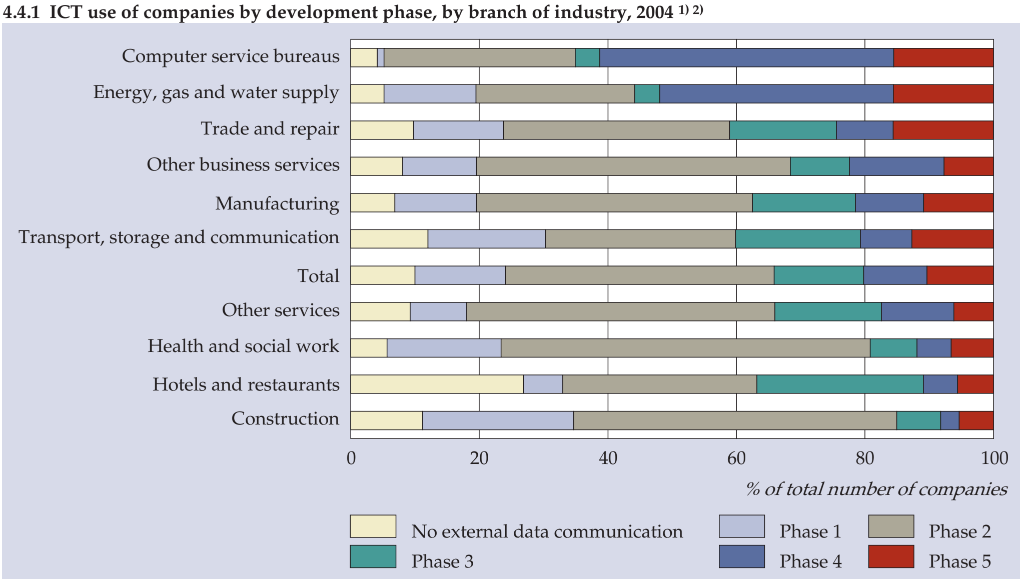
- no external data communication (phase 0);
- external data communication, no website, sales, electronic product delivery or on-line after sales service (phase 1);
- website (phase 2);
- electronic sales (phase 3);
- electronic product delivery and/or after sales service (phase 4);
- linking the company's order processing system with that of buyers/clients (phase 5).

Two thirds of the companies does not go further than the presence on the internet via a website (phase 2). About 14 percent of the companies allows for ordering products on-line (phase 3). Ten percent of the companies delivers products electronically and/or provides electronic after sales service (phase 4). Phase 5, linking the company's own order processing system with that of buyers/clients is reached by 10 percent of the companies.

The approach of the companies by development phase is done from a sales perspective. It presupposes a certain logic. Phase 1 concerns companies that only use external data communication. These companies make use of facilities on offer by others, but do not have their own facilities on the internet. These companies may have electronic purchasing. Companies with a website only offer information via the internet. Companies offering electronic sales offer the facility of electronic transactions. Companies delivering products electronically and/or providing electronic after sales service, communicate with others via the internet. Companies who linked their computer system with that of clients/buyers have certain business processes between their own company and a third party automated. Each phase is more or less a next step in supporting business processes by the use of external data communication. Companies without external data communication are included for the sake of completeness. Despite the logic or step-by-step logic in the automation process of companies it is not so that a company can only reach phase 4 once it has successfully completed the three previous phases. There are companies that offer electronic sales without having their own website. In the approach we chose, this is 'allowed'.

When we look at these development phases by company size, the pattern is unambiguous: the larger the company, the more advanced their use of ICT. The differences are larger by branch of industry. Two thirds of the computer service bureaus have electronic sales, on-line delivery and/or customer support, or link their computer systems with those of their buyers/clients. This industry group has the know-how to do this and the right products for it. On the other side of the spectrum, there are the branches hotels and restaurants and construction. About 85 percent of the construction companies apparently need no more than just a website on the internet. A third of the construction companies has no internet or uses it passively. In hotels and restaurants many companies reach the stage of electronic

4.4.1 ICT use of companies by development phase, by branch of industry, 2004 1) 2)



1) Companies with 10 and more employed persons.
2) Phase 1: external data communication, no website, sales, electronic product supply or on-line after sales service.
Phase 2: website.
Phase 3: electronic sales.
Phase 4: electronic product supply and/or after sales service.
Phase 5: linking the company's order processing system with that of buyers/customers.

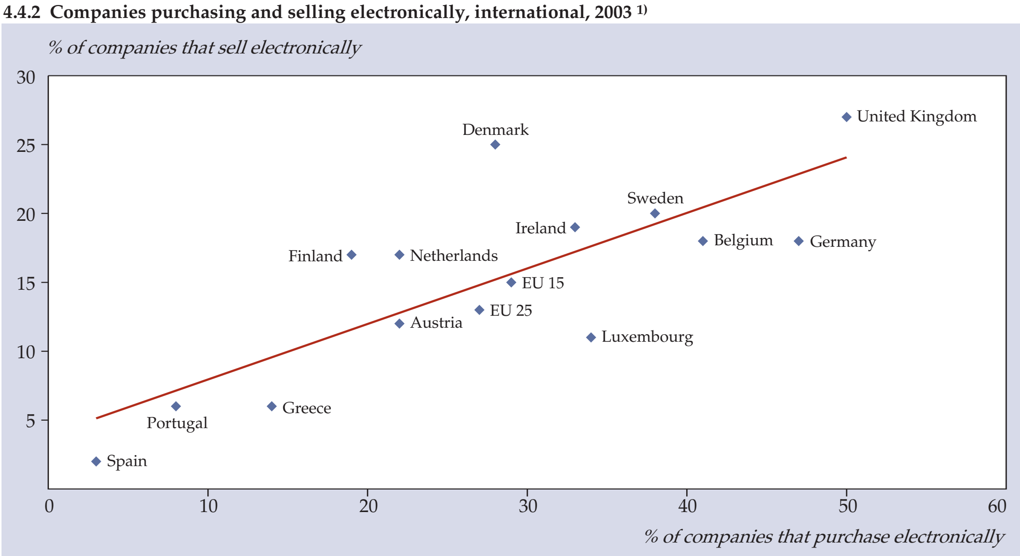
Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

sales, but that is where it ends. Differences in ICT use seem to be based more on branch of industry than on company size. This is quite logical. Naturally, know-how and skills play a major role, as does 'seeing' the possibilities ICT has to offer. There are also differences in culture between, for instance, construction and computer service bureaus in the way they approach ICT. In addition, the network of suppliers and clients in which a branch of industry operates may not have the same demands on its ICT use. It would not be rational to expect the same investments in and use of ICT for each branch of industry. However, the 'breaking point' in how advanced the ICT use of Dutch companies was, by December 2004 was having a website (see also table A4.4.1 in the statistical annex).

Electronic purchases and sales

One specific use of electronic networks is purchases and sales of goods and services via these networks: on-line placing and receiving orders. Both in the Netherlands and in all other countries discussed, purchasing via electronic networks is more common than selling. Purchasing is easier because it just makes use of facilities created by others. In contrast, it requires a certain effort before a company can offer the possibility of placing orders electronically. There are great differences between countries in this specific use of electronic networks. The UK is an example of a country without outstanding general business use of ICT, but which excels in electronic purchases and sales. The opposite is true for Finland: a widespread, intensive use of ICT by companies, but not in the specific area of electronic purchases and sales. The position of the Dutch companies is comparable with that of

4.4.2 Companies purchasing and selling electronically, international, 2003 1)



1) Companies with 10 and more employed persons.
Source: Eurostat, New Cronos.

Finland. Compared to the EU 15 average, the Netherlands and the Scandinavian countries have companies using electronic networks more often for sales in comparison with the use for purchasing. In Germany, for instance, the electronic networks are used more often for purchasing goods and services. Per branch of industry and company size, the pattern of the electronic purchases and sales for the various countries is comparable. The trade and the hotels and restaurants make much use of electronic sales. Larger companies more often have electronic purchases and sales than smaller companies do, and construction lags behind all other branches of industry in all countries (see also table A4.4.2 in the statistical annex).

E-Business Readiness Index

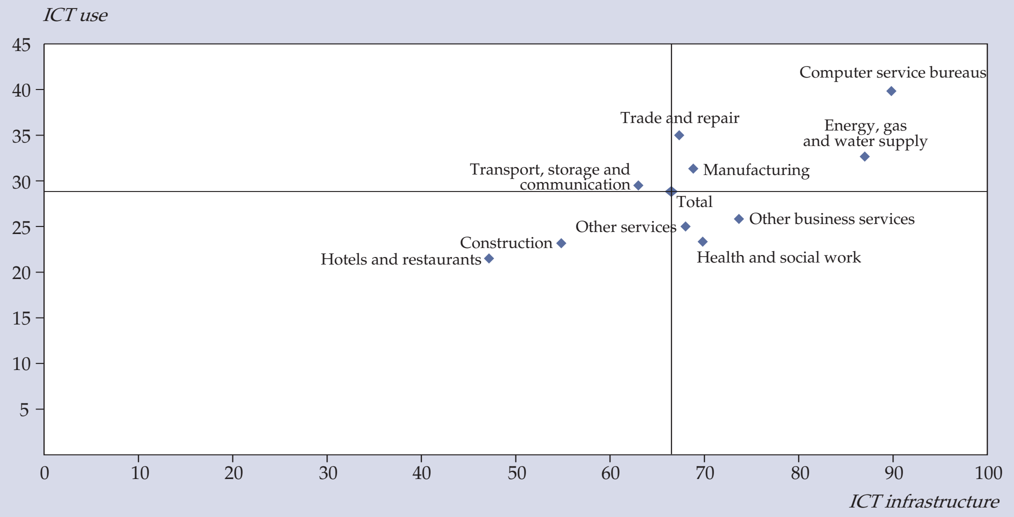
A condensed way of comparing the ICT use by countries or branches of industry is by using composite indicators. The approach used within Europe to compare countries on this point is applied here to the branches of industry and company sizes in the Netherlands. The underlying indicators are shown in tables A4.4.3 (ICT infrastructure) and A4.4.4 (ICT use) in the statistical annex, revealing per branch of industry and company size if and where it lags behind. Figure 4.4.3 shows the outcomes for the various branches of industry.

The ICT infrastructure is most common and most intensively used within the branch of industry of computer service bureaus. Within the branches of industry manufacturing, trade and repairs and transport, storage and communication the ICT infrastructure is less common but it is used intensively. Within health and social work activities and other business services ICT infrastructure is fairly common, but the use of these tools is below the average of the branches of industry discussed. The hotels and restaurants and construction lag behind the other branches of industry in both areas.

One remarkable fact on company size is that companies with 100–249, 250–499 and over 500 employed persons are not very different in ICT infrastructure and ICT use. The threshold in terms of ICT infrastructure and use in company size seems to be around 100 employed persons (see also tables A4.4.3 and A4.4.4 in the statistical annex).

One must be aware that the underlying idea behind this presentation is not that all branches of industry must eventually end up with the same score. There are various good reasons why the optimum of the available ICT infrastructure and use need not be the same for all branches of industry. For instance, the sorts of goods and services produced, the structure of the branch of industry, and the demands suppliers and clients have where ICT use is concerned. Furthermore, not all business processes in all branches of industry or company sizes are equally important. It was shown above that stock management seems more important for hotels and restaurants and trade than for business services, for example. In the end, investments in ICT obey the laws of business economics, where the costs and benefits must balance. The balance may be quite different for the various branches of industry and company sizes.

4.4.3 ICT infrastructure and ICT use, by branch of industry, 2004 1)



1) Companies with 10 and more employed persons.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

ICT, business processes and organisation

The purchase of ICT tools does not necessarily lead to a direct increase in the company's productivity. Or, more subtly put: companies that seem to use ICT at a comparable scale at first sight may show different rates of productivity growth. In general, the idea is that besides purchasing ICT tools, the company needs to take additional measures to optimize the yield of the use of ICT. This is the point where most differences in the productivity growth rates occur. To illustrate what else may play a role in raising a company's productivity besides the necessary ICT tools themselves, we can use an integration matrix. The underlying idea with the matrix is that the yield of the use of ICT will increase as the standardisation of the business processes increases within the company and between the company and its clients or suppliers.

Integration matrix ICT, business processes and organisation

Layer of architecture	*Level of standardisation*			
	Department	Business Unit	Company	Chain
Business	17	18	19	20
Process	13	14	15	16
Information	9	10	11	12
E-business applications	5	6	7	8
ICT infrastructure	1	2	3	4

One dimension of the integration matrix is the layer of architecture. The highest level is the business layer, which includes the internal and external organisation structure and communication of the organisation as a whole. Examples are the mission, the organisation structure or the business strategy. The process layer describes specific business activities such as the sales process or production planning. The information layer describes the required information to support the business processes. These include customer information and data on stock levels. The application layer describes software packages required to meet the organisation's needs for information. These are, for instance, software packages for e-procurement and salary records. The infrastructure layer describes the required hardware, data storage method and structure and the protocols for data transport between computers to support e-business applications and business activities.
The second dimension of the integration matrix is the organisation level in which matters are standardized within a company. This ranges from standardisation within a company department to the highest level possible: the standardisation between the company and the clients and/or suppliers (the chain).
In this approach we can only speak of a certain degree of integration at a layer of architecture when integration at that level has already been completed in the underlying layers. The higher the level of standardisation in all layers, the higher the yield of ICT use for a company.

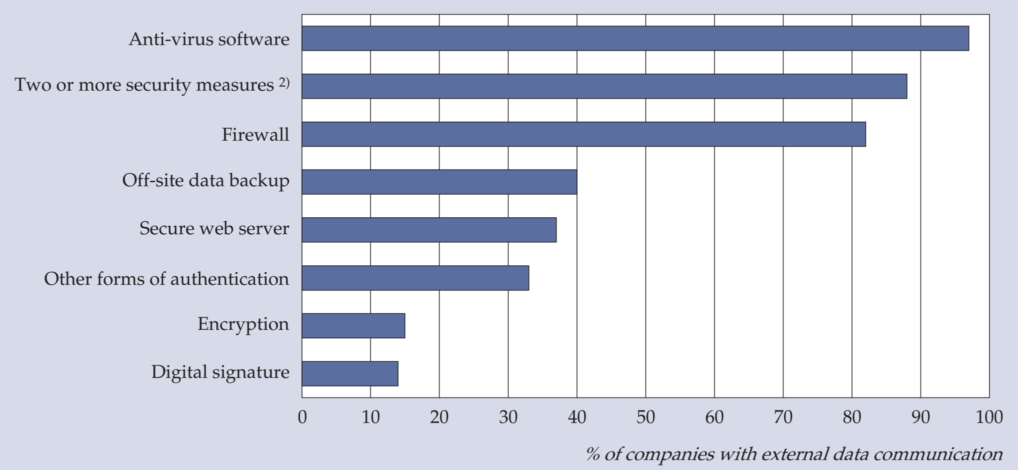
Statistics Netherlands and the VU are conducting a study to test this hypothesis empirically.

Source: X.J. de Graaf, 2004. Theory and planning (draft).

4.5 Security

Dutch companies seem aware that ICT use and external data communication must go hand in hand with preventive security measures to minimize loss and abuse of their data. The most common measure taken is installing anti-virus software. Almost all companies (97 percent) using the internet have such software. Another common measure is installing a firewall. A firewall protects the company's ICT system against outside attempts to enter it. Other, more specific security measures are less common. In communicating with others, 15 percent of the companies use encryption. This is securing information during data transmission by way of a secret code known only to the sender and receiver. Another 15 percent of the companies use a digital signature in data transmission between companies and others, and one third of the companies use other forms of authentication such as a code or password. Authentication is used to check whom we are dealing with. The previous edition of *The digital economy* (CBS, 2005a) showed that the more intensive users of electronic networks also take more security measures. Yet these intensive users have more security problems despite their above-average security measures than the simpler users of electronic networks. Here too a comparison with a highway comes to mind: more traffic, more accidents. This also seems true internationally.

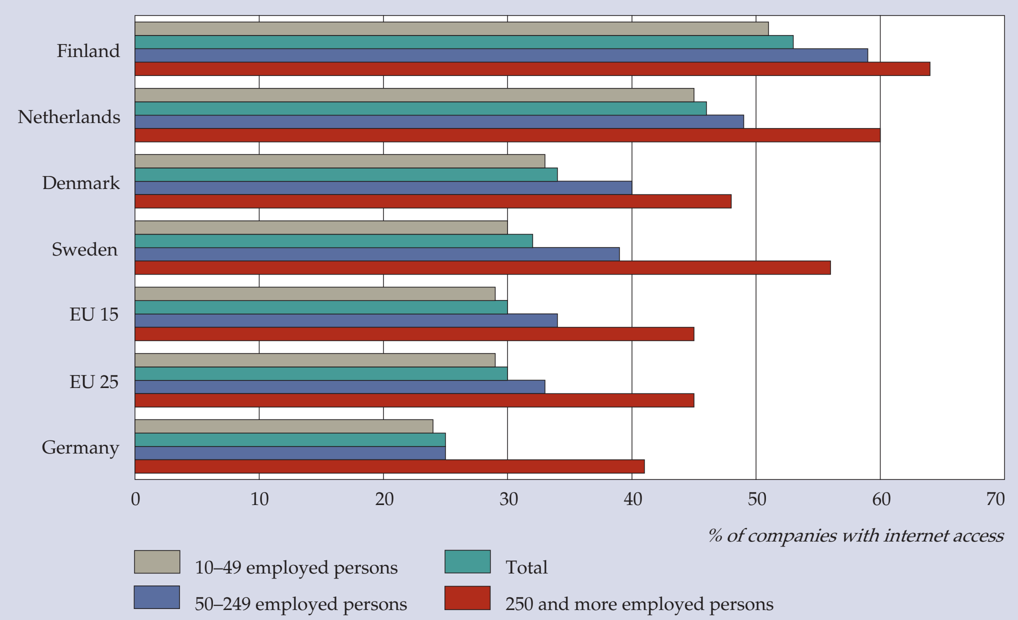
4.5.1 Companies taking ICT security measures, 2004 1)



1) Companies with 10 and more employed persons.
2) Two or more of the following security measures: anti-virus software, firewall, secure web server, off-site data backup, authentication, encryption.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

4.5.2 Companies that experienced ICT security problems, by company size, international, 2003 1) 2)



1) Companies with 10 and more employed persons.
2) One of the following security problems in the 12 months preceding the survey: virus attack, unauthorized access to ICT systems and blackmail.

Source: Eurostat, New Cronos.

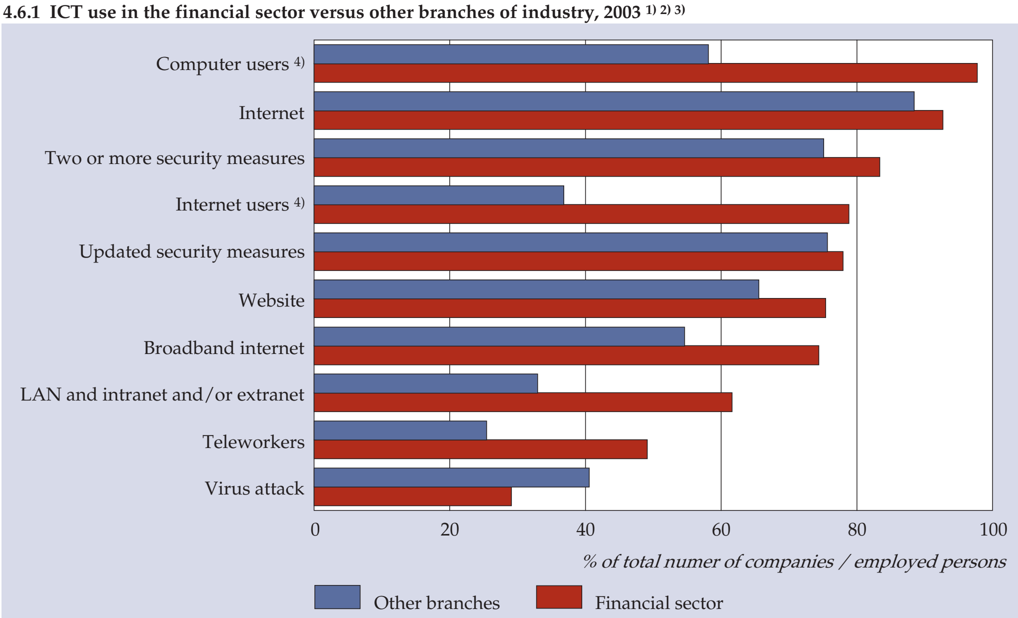
International

In a European context, in all countries under discussion, the larger companies have more problems with ICT security than smaller companies do, even though the larger companies generally take more preventive security measures. The ICT infrastructure, however, is more common and the use more intensive and diverse. On balance these more intensive users – in this example the larger companies – must deal with more security problems than the less intensive users. At the country level, companies in countries with above-average ICT use, such as Finland and the Netherlands, have more security problems. This seems to indicate that a more intense and more advanced use of electronic networks will inevitably go hand in hand with more damage or nuisance, despite security measures.

4.6 *ICT use in the financial sector*

Of all branches of industry, the financial sector may well have the greatest opportunities to employ ICT in everyday work. Much of the work in the financial sector consists of processing, managing and providing information. The importance of ICT for the financial sector was already manifest by the fact that this sector has

4.6.1 ICT use in the financial sector versus other branches of industry, 2003 [1) 2) 3)]



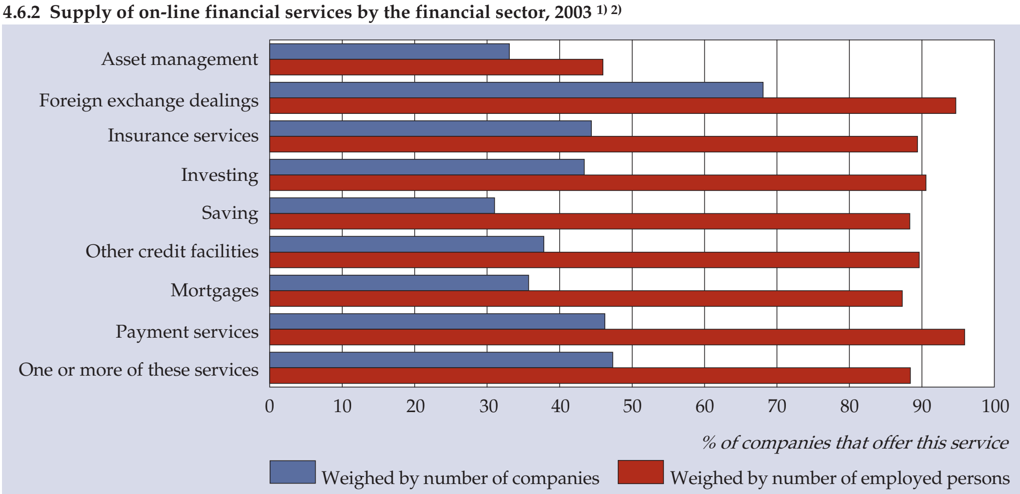
1) Financial sector: SBI groups 65.12, 65.22, 66.02, 66.03, 67.12, 67.13 and 67.2.
2) Other branches of industry: SBI groups D, F, G, 55.1, 55.2, I, K, 92.1 and 92.2.
3) Companies with 10 and more employed persons.
4) Percentage of the number of employed persons.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises / financial sector 2003.

invested most in ICT over the years – apart from the telecommunication sector, which is a special case (see paragraph 2.3). Another illustration of the possibilities ICT has to offer for this sector is on-line banking. Users of this service largely punch in their own orders, taking over part of the banks' work.
The figures on the financial sector here refer to major banks and insurance companies, but also to financial intermediaries between clients and large financial institutions.

Using ICT tools in the financial sector is different from that in the other branches of industry. The share of employed persons in the financial sector using a computer at work linked to the internet is considerable greater than in the other branches of industry. In addition, internal networks and broadband connections are far more common in the financial sector than in the other branches of industry. Almost half of the companies in the financial sector have teleworking, that is, employees who regularly work outside the workplace, but who do have access to the employer's ICT system.
The only thing in which the other branches of industry score higher than the financial sector is in the number of attacks with computer viruses. This is noteworthy since we discussed above that the likelihood of virus attacks becomes greater as companies use the internet more intensively (CBS, 2005a). Since the financial sector is an intensive user of the internet it would seem that the security measures in this sector are more adequate than in the average branch of industry.

4.6.2 Supply of on-line financial services by the financial sector, 2003 1) 2)



1) On-line services only refer to the services shown in the figure above.
2) Financial sector: companies with 10 and more employed persons in SBI groups 65.12, 65.22, 66.02, 66.03, 67.12, 67.13 and 67.2.

Source: Statistics Netherlands, Survey on ICT use in the financial sector 2003.

In figure 4.6.2 we indicate for a selected number of financial services to what extent they are offered on-line. This is done as a percentage of the number of companies actually offering the service (on-line or otherwise), because not all services are offered by all companies in the financial sector. Financial intermediaries, for instance, offer insurances but no payment services. Here it turns out that almost half of the institutions that offer payment services also do so on-line and over a third of the mortgage suppliers offer mortgages on-line. The on-line service here refers to the possibility to conclude a transaction on-line, or to at least start it up on-line. So it must be more than just providing information about the service in question.
Apart from the number of companies offering a given service on-line, the on-line services are also weighted with the number of people employed by the companies. The consequence is that larger companies weigh more 'heavily' than the smaller. The underlying idea is that it makes a difference for the range of a given on-line service whether it is offered by a smaller company with a limited number of clients or users or by a major company with many clients or users. Weighted with the number of employees it turns out that nearly 100 percent of the employees of companies offering payment services work for companies who do so on-line. About 87 percent of the people employed by mortgage lenders works for companies who also offer mortgages on-line. So the major companies are the ones offering financial services on-line. If employment is an indication for the number of clients, this means that almost all clients can use on-line payment services.

The analysis of the results of the study showed that the major financial institutions usually offer their own on-line services. This is far less common with financial intermediaries, which, in terms of structure is another industry group with many more small to medium-sized companies offering the financial products of several banks and insurance companies. This is quite logical. The banks and insurance companies – whose primary role is to offer financial products - have a recognized brand name and image and are much easier to access than the more anonymous intermediaries. To what extent the financial institutions are taking over the role of the intermediaries is not clear from these figures. What is clear is that the internet has greatly expanded the possibilities for banks and insurance companies to do so. Those who offer financial products can use the internet to provide detailed information about their financial products to their potential clients and offer the possibility for concluding transactions.

4.7 ICT and productivity

We have highlighted the importance of ICT and its applications in various parts of this publication. So far, we have mainly done so in the form of descriptive statistics, such as the increases in supply, use, imports and exports of ICT goods and services. In this paragraph we will deal with the question what the actual contribution is of

Table 4.7.1
Summary of most important productivity measures

	Single-factor productivity for ...		Multi-factor productivity (MFP) for ...	
	labour	capital	capital and labour	capital, labour, intermediate inputs (energy, materials, services)
Output measure				
Gross output	labour productivity (gross output based)	capital productivity (gross output based)	capital-labour MFP (gross output based)	KLEMS multi-factor productivity [1)]
Value added	labour productivity (value added based)	capital productivity (value added based)	capital-labour MFP (value added based)	–

[1)] KLEMS: Capital (K), labour (L), energy (E), materials (M) and services (S).

Source: OECD (2001), Productivity Manual.

ICT to economic growth at the macro-economic level. Furthermore, we will discuss to what extent anything can be said at the company level about the influence of the use of ICT on performance.

For starters, the concept ‘productivity’ can be defined in various ways. The *Productivity manual* (OECD, 2001) outlines the major ways to measure productivity (see also table 4.7.1). The choice of using a particular way of measuring productivity depends on the aim and often the availability of the data. A first category is measuring productivity based on one single production or input factor or on more than one production factor. In the first case, one output measure is related to one single input measure. With multi-factor productivity (MFP) one output measure is related to a bunch of inputs. A second category, which is particularly useful for studies at the branch of industry or company level, concerns the productivity measures based on gross output and productivity measures using the value added concept to describe changes in output.

Economic impact of ICT

Innovation, ICT, human capital and (innovative) entrepreneurship are four key determinants of productivity (Donselaar a.o., 2003). In this paragraph we primarily highlight the role of ICT. In the late 1990s people assumed ICT played a key role in the robust economic growth at the time. It was the time when the concept ‘new economy’ was introduced. This expresses the influence ICT has on the economic process and the change ICT made in the way markets operate. What remains a puzzle is why companies and countries differ so much in their ability to productively use the opportunities ICT has to offer (Van Leeuwen and Van der Wiel, 2004). What must play a role is that ICT is a breakthrough technology that makes new production methods possible. But, as Brynjolfsson and Hitt (Brynjolfsson and Hitt, 2003) indicate: actually using these opportunities requires additional investments such as new working methods, changes in the organisation and redesigning the business processes.

As far as the economic impact of ICT is concerned, there are three effects that can be distinguished (OECD, 2004a). First the effect of ICT as a capital good: investments in ICT contribute to capital deepening (more capital per labour unit). The relative price decreases in ICT goods make that the investments in ICT capital increase and that other investment goods and labour are substituted (Van Leeuwen and Van der Wiel, 2003a and 2003b). This leads to increased productivity: the same output can be generated with less labour or more output can be generated with the same labour input.

A second effect results from the fact that a fast technological progress in the production of ICT goods and services can contribute to a rapid growth in the multi-factor productivity in the ICT sector itself.

The third and final effect results from the fact that an increase in the use of ICT can help companies increase their efficiency and with it their multi-factor productivity. An increase in ICT use can also contribute to network effects, such as lower transaction costs and more rapid innovation, which increases the multi-factor productivity of the entire economy.

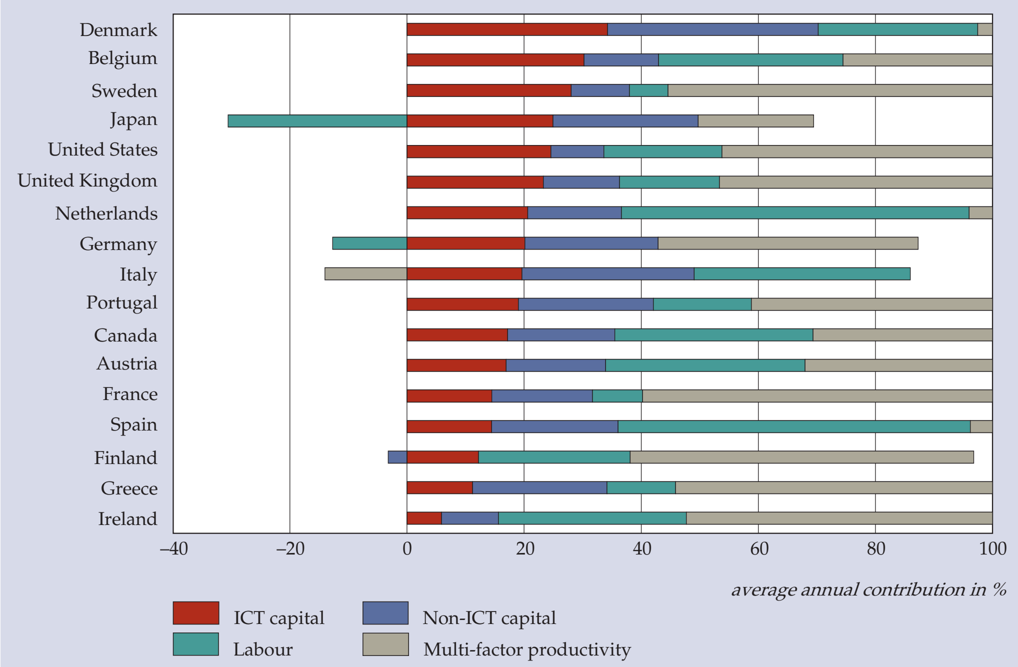
Each of these effects can be measured and studied at various levels of aggregation. In the OECD study (OECD, 2004a) this was done at the: (1) macro-economic level (2) sector or branch of industry level and (3) the company level. In this paragraph we opted for the same approach.

Capital deepening

Investments in capital goods play a key role in the growth of labour productivity. Investments increase and renew the existing stock in capital goods and make it possible to use new technologies in the production process (Pilat, 2005). There has been a robust growth in the investments in ICT goods and services in recent years as a result of the relative price decreases, but also, and especially, because of the increased user options.

The contribution of ICT investments to economic growth, according to the study by Pilat (Pilat, 2005), is positive for all countries shown in figure 4.7.1, and varies from 0.35 to 0.80 percent points (see also table A4.7.1 in the statistical annex). The average annual growth of the gross domestic product (GDP) varies strongly between

4.7.1 Contribution of input factors to growth of gross domestic product (GDP), international, 1995–2003 [1)]



1) Italy: 1995–2001. France, Japan, Spain: 1995–2002.

Source: OECD, Productivity database, September 2005.

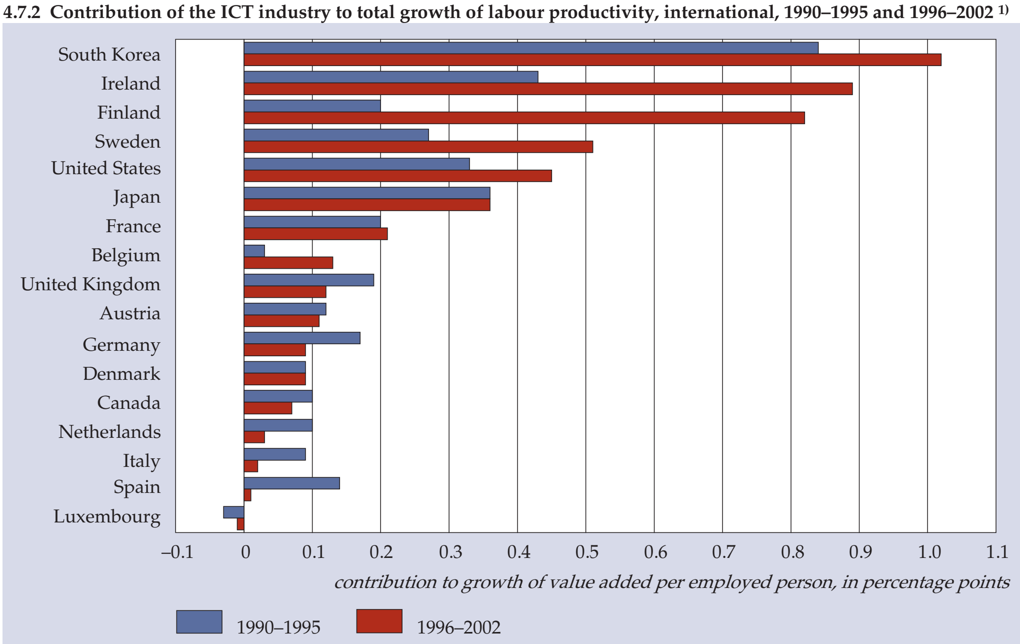
countries, as does the contribution of the various input factors. For instance: in the Netherlands and Spain over half of GDP growth results from an increase in labour involved. Given the low growth of the multi-factor productivity in the two countries, this would mainly be an increase in low-skilled labour. Demographic developments in the Netherlands (ageing population and less young people) limit the possibilities for extra use for labour (Donselaar a.o., 2003). Over the next years GDP growth in the Netherlands will have to be realized by increasing labour productivity. [2)] In Sweden, Ireland, Finland and Greece most of the GDP growth cannot be explained by the extra use of the primary production factors labour and capital, but it is the result of a huge growth of the multi-factor productivity.

ICT industry and productivity

The rapid technological progress in the production of ICT goods has led to the growth of the multi-factor productivity of many countries (Pilat, 2005). This can be the result of using more qualified personnel and new technology, due to which the output of the combination of labour and capital has grown more than the input of the individual components. In addition, changes in organisation contribute to a better streamlining of the business processes, and with that a more effective use of labour and capital. Innovation, finally, leads to better quality, higher value products made with the same use of capital and labour, and innovation leads to new production processes and the more effective use of the production factors. Because multi-factor productivity is measured as a residue of the productivity growth, which cannot be attributed directly to one of the primary input factors, it is difficult to determine the exact contribution of each of these individual factors.

Despite the fact that the ICT industry is relatively small in most OECD countries, the sector can make a major contribution to increasing productivity as this sector is growing much faster than the rest of the economy. Figure 4.7.2 shows that in some countries the ICT industry has made a major contribution to the growth of labour productivity. [3] For the Netherlands, the contribution in the 1990s decreased to 0.03 percent points in the period 1996–2001, of the 0.77 percent total labour productivity growth in this period (see also table A4.7.2 in the statistical annex). The Netherlands also belongs to the group of countries where the contribution of the ICT industry to the growth of labour productivity in the period 1990–1995 was greater than in the years after that. Ireland, Finland and Sweden, on the other hand, had the greatest contribution of the ICT industry to the growth of labour productivity in the second half of the 1990s.

4.7.2 Contribution of the ICT industry to total growth of labour productivity, international, 1990–1995 and 1996–2002 [1]



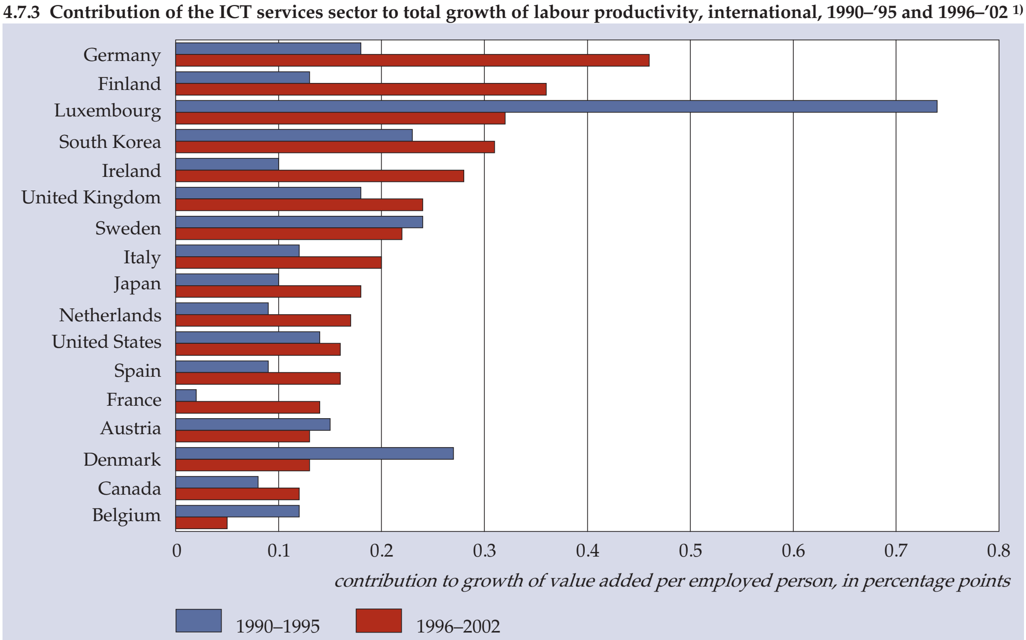
[1] For 1990-1995, Germany: 1991–1995. France, Italy: 1992–1995. South Korea: 1993–1995.
For 1996–2002: Sweden 1996–1998. South Korea, Spain: 1996–1999. Ireland, Norway, Switzerland: 1996–2000.
France, Germany, Japan, Netherlands, United Kingdom, United States: 1996–2001.

Source: Pilat and Wölfl (2004), based on OECD STAN database.

ICT services and productivity

The contribution for the ICT services sector to labour productivity growth in the period 1990–1995 and 1996–2002 is shown in figure 4.7.3. The great contributions of the ICT services sector come mainly from the telecommunication sector, according to Pilat and Wölfl (Pilat and Wölfl, 2004). The rise of the computer service bureaus has contributed too. The contribution of the ICT services sector in the Netherlands increased rapidly in the 1990s from 0.09 percent points in the first half to 0.17 percent points in the period 1996–2002. This means that in the period 1996–2002 almost a quarter of the total growth of labour productivity in the Netherlands was realized within the ICT services sector. Apart from Ireland, Finland and Sweden, the contribution of the ICT services sector to the growth of the labour productivity in the 1990s in the European countries discussed was greater than that of the ICT industry. Especially in Germany, the influence of the ICT services sector on labour productivity has been very positive.

4.7.3 Contribution of the ICT services sector to total growth of labour productivity, international, 1990–'95 and 1996–'02 [1)]



1) For 1990-1995, Germany: 1991–1995. France, Italy: 1992–1995. South Korea: 1993–1995.
For 1996-2002: Sweden 1996–1998. South Korea, Spain: 1996–1999. Ireland, Norway, Switzerland: 1996–2000.
France, Germany, Japan, Netherlands, United Kingdom, United States: 1996–2001.

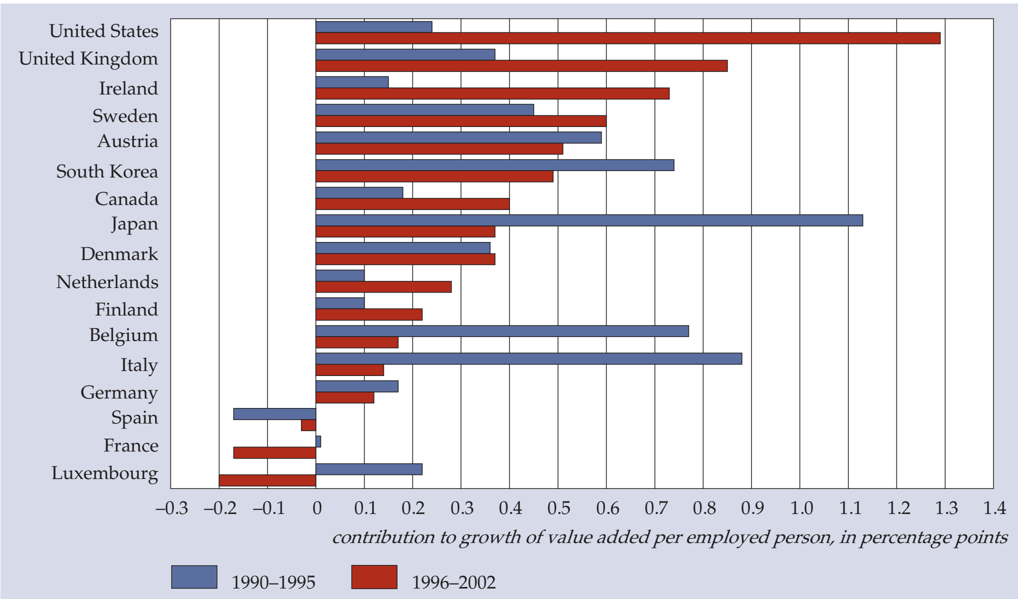
Source: Pilat and Wölfl (2004), based on OECD STAN database.

Productivity of the sectors using ICT

In many countries the ICT sector makes a positive contribution to the increase in productivity. At least as important is the question if the sectors using ICT 'benefit' from these new ICT applications. Figure 4.7.4 shows the contribution of the ICT-using services sector to total labour productivity increase. [4)] Use of ICT applications can have different effects on multi-factor productivity according to Pilat (Pilat, 2005). Companies using ICT applications can increase their markets share at the expense of less productive companies, which makes productivity for the economy as a whole go up. Moreover, using ICT gives some companies the opportunity to innovate, increase their product range, standardize their services, or better meet customer demands. Moreover, ICT can decrease the inefficient use of capital and labour, for instance by improving stock management. Finally, the diffusion of ICT helps by setting up ICT networks, which in turn lead to spillover effects.

For the Netherlands we saw that the contribution of the ICT-using services sector to the growth of labour productivity almost tripled in the 1990s: from 0.10 percent points in 1990–1995 to 0.28 percent points in 1996–2002. However, it is small compared to the other countries mentioned here and to the contribution made by much smaller sectors such as the ICT industry and ICT services sector itself.

4.7.4 Contribution of the ICT-using services sector to total growth of labour productivity, international, 1990–1995 and 1996–2002 [1)]



[1)] For 1990–1995, Germany: 1991–1995. France, Italy: 1992–1995. South Korea: 1993–1995.
For 1996–2002: Sweden 1996–1998. South Korea, Spain: 1996–1999. Ireland, Norway, Switzerland: 1996–2000.
France, Germany, Japan, Netherlands, United Kingdom, United States: 1996–2001.

Source: Pilat and Wölfl (2004), based on OECD STAN database.

ICT and company performance

Figure 4.7.4 shows that, at the branch of industry level, not all countries show convincing growth in the contribution of the sectors using ICT to total productivity growth. For many countries the studies based on data at the company level, however, do indicate a positive effect of ICT use on productivity (see for example OECD, 2004a). At the branch of industry or macro levels, these effects are not as easily seen. Pilat (Pilat, 2005) indicates that the conditions are apparently met insufficiently to see what the ICT investments yielded at the branch of industry level. For instance, the ICT infrastructure may not be fully in order, or not enough has been invested in the necessary additional renewal (in organisation, skills and innovation). Developments at the branch of industry level are after all the result of the developments of the various individual companies and the balance of companies with good and unsatisfactory yields.

A study by Hempell a.o. (Hempell a.o., 2004) on ICT, innovation and company performance in the services sector compares the results for Germany and the Netherlands. Although the study is limited to two countries, there are some interesting conclusions to be made. It can be proved for both countries that a more intensive use of ICT capital has made a positive contribution to labour productivity in the service companies. Furthermore, the productivity of ICT can be increased when ICT-using companies themselves engage in innovative activities. According to Hempell e.a., this indicates the spillover effects of ICT. This complementary effect in itself does not seem to occur for non-ICT capital.

The main issue of the study is the question whether companies that innovate, benefit more from ICT investments than other companies do. Here the study not only looks at companies with technological innovation, that is companies that marketed new or much improved products or started using new or much improved production processes. It also looks at companies that implemented non-technological innovations, that is changes in strategy, management, organisation or marketing strategy.

To answer this question an extended Cobb-Douglas production function was used. This production function is estimated for a panel of nearly one thousand companies from the services sector in the period 1994–1999. The dependent variable is value added. The explanatory variables are not only the use of labour, ICT capital and other capital, but also innovation. The assumption is that innovation not only has a direct effect on the productivity of a company, but also an indirect effect via influencing the marginal productivity of the stock of ICT and other capital (see formula 1 and 2 in Hempel a.o., 2004).

Table A4.7.3 in the statistical annex includes the main findings for the Netherlands. The contributions to value added of all three inputs (labour, ICT capital and other capital) are all positive and significant. Moreover, the study shows that ICT use and innovation are complementary: the coefficients of the indirect contributions of innovation are also positive and significant. It turns out that the total direct contribution of ICT to the value added of permanently innovating companies is about twice as much as that of companies that do not innovate permanently. For non-ICT capital there is no such complementary: structural innovation even leads to a decrease of the marginal productivity of non-ICT capital. ICT turns out to be a special kind of capital given the strong relationship with innovation. [5)]

Conclusion

The different studies gathered by the OECD (OECD, 2004a) show that the effects found at the company level cannot be found directly at the macroeconomic or branch of industry levels. In general, there is a positive effect of ICT use on the individual company performance. Results of positive effects by ICT use at the level of branches of industry or the total economy are less evident, however. The available data does not allow conclusions that branches of industry using ICT have a higher or faster increase in productivity than the average. According to the OECD there are various reasons for this.

Aggregating the results of individual companies and branches of industry distorts the view on the actual influence ICT. After all, the influence of ICT may depend on factors and policy changes that may differ from one branch of industry to another. Effects in time at the total level depend on the developments, spread, adaptation costs and possibilities of improving productivity by ICT in the various branches of industry. In the USA and Australia it is possible to demonstrate the clearly positive influence of ICT use at the level of the total economy. Given the fact that the USA is one of the front-runners, this is an indication that the advantages of ICT use can be demonstrated empirically after some time. Other factors that may play a role are the differences between countries in measuring output, especially in the services sector, but also differences between countries in general. Added to this is that measuring immaterial advantages such as improved quality, variation and ease is hard to begin with (Brynjolfsson and Hitt, 2003).

To reap the fruits of the ICT investments, additional investments and changes are required, for instance in human capital, changes in organisation and in innovation. ICT-related changes are part and parcel of the search and experimentation process according to the OECD. Some companies are more successful in this and grow, while others ‘fail’ and disappear.

Notes in the text

1) In this paragraph we will mainly discuss studies by others, which may or may not be based on Statistics Netherlands data, that offer insight in the relationship between ICT and productivity. Statistics Netherlands wants to further study

productivity developments and the role that ICT and innovations play here, using Statistics Netherlands data on ICT use by companies, innovation by companies and production and investment data of these companies. The results will be published in a later edition of *The digital economy*.

2) The level of labour productivity per hour worked is traditionally high in the Netherlands compared to other OECD countries. The growth of Dutch labour productivity, however, lags behind the EU and OECD average.

3) Figure 4.7.2 shows the contribution of the ICT industry to the growth of labour productivity. Reason for this is that there is no data available for all countries about the capital input per sector. For countries for which data about capital input is available, the contribution of the ICT producing sector to the multi-factor productivity is substantial (see Pilat and Wölfl, 2004).

4) ICT-intensive services are defined as wholesale and retail trade (50–52), financial services (65–67) and business services (71, 73–74).

5) The direct contribution of innovation during the entire period, according to the model estimates, was positive, but not significant. This is true for technological and non-technological innovation.

5. ICT use in the public sector

In December 2004 about half of all government services were also provided through the internet. Citizens using these on-line government services regularly have problems finding the right government services. Certain users are disappointed about the extent to which services can be concluded via the internet and in fact want more on-line service. Within the EU, the Netherlands occupies a middle position in on-line government services. The number of services that can be concluded from start to finish on-line is limited in the Netherlands. However, a widespread and advanced provision of on-line government services does not directly generate widespread and advanced use.

There has been a spectacular increase in the availability of computers and internet in education in recent years. Compared to other countries, however, schools in the Netherlands are not well equipped with computers and internet. A major problem for schools is the lack of appropriate rooms to locate all these new ICT tools. Apart from the hardware, many schools have trouble finding good educational software at reasonable prices. Teachers are mostly positive about the contribution that the use of ICT can make to attaining the goals in education.

Health care and social work is a sector with substantial information flows. In theory, the use of ICT should fulfil a great need. Citizens want good information about health, and regularly use the internet for this purpose. Yet the popularity of a number of specific ICT applications in health care and social work is well below expectation.

5.1 E-government

The use of ICT and internet, in particular by government, can contribute to a more transparent, efficient government. This has its advantages for citizens and companies – the users of government services – and for government itself. For instance, information and services can be provided electronically via the websites of government institutions. This facilitates user access, because the users can visit sites outside institutional visiting hours once the on-line information and services they want are available 24 hours a day. This use of ICT can also cut down on staffing and time for these institutions, because individuals and companies can settle certain issues themselves.

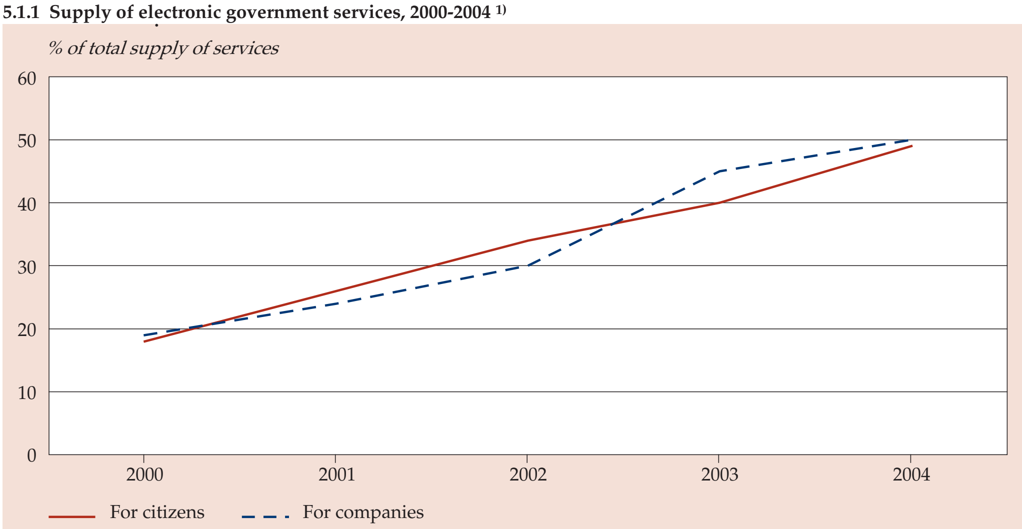
Supplying information and services electronically is one aspect of e-government. E-government also includes the influence of ICT on the internal processes of the government organisations. The communication between different institutions, and within institutions, can be improved by the use of ICT. In this publication, the focus is on the use of electronic government services and the experiences citizens have with them.

On-line government services in the Netherlands

In 1999 the Dutch government decided that at least a quarter of all government services should be available on-line by 2002 (Ministry of Economic Affairs et al, 1999). This target was reached in 2001 and e-government services for individuals and companies have been increasing steadily ever since. By December 2004 some 49 percent of the government services for individuals was also available on-line, as was 50 percent of the government business services. These developments make the 65 percent goal for government services on-line quite feasible and well within reach (Advies Overheid.nl, 2005). So in terms of quantity the process is progressing nicely. Slowly but surely the focus shifts toward the qualitative aspects of the on-line government services. Are these services used? How often? Are the users satisfied with the quality of the on-line services?

Figure 5.1.1 refers to the supply of electronic services by the Dutch government as a whole. The following layers of government and government institutions are distinguished in listing on-line government services:
- Municipalities (e.g. rent subsidy applications);
- Provinces (e.g. submitting environmental complaints);
- Water boards (e.g. for levies);
- Police (e.g. for reporting a crime electronically);
- Central government (e.g. to register a company with the Chamber of Commerce).

5.1.1 Supply of electronic government services, 2000-2004 1)



1) From 2003, the calculations have been adapted to comply with European standards.
The 2003 percentages are therefore not immediately comparable with those of previous years.

Source: Advies Overheid.nl.

User-friendliness

Apart from the quantitative supply, the report *Overheid.nl Monitor 2004/2005* also paid attention to the results of a study on the user-friendliness of government websites. This study was conducted automatically for the first time in 2004.

Table 5.1.1 shows that the user-friendliness of government websites has improved dramatically in recent years. However, note that this is not the opinion of the users, but that user-friendliness is defined here as the availability of a number of specific tools on the website that contribute to user-friendliness. In 2004 most websites had a search engine. The number of multilingual websites had increased substantially. Most websites offer a growing number of tools, for example sitemaps, which support the users by showing where they are on the site, and a section 'frequently asked questions (FAQ's)'. Not many websites of government institutions offer a link to the general government site (www.overheid.nl).

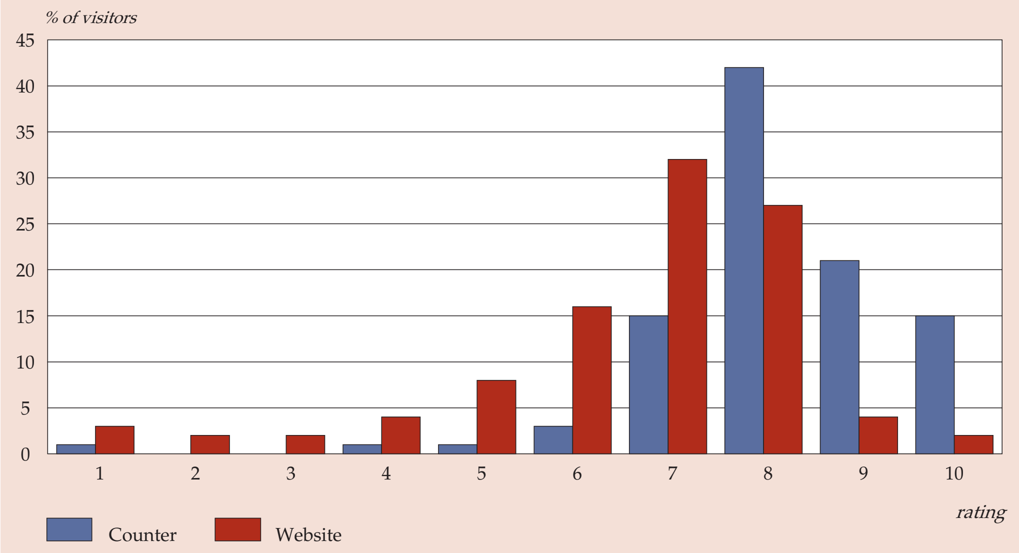
Table 5.1.1
User-friendliness of government websites, 2001–2004

	2001	2002	2003	2004
	%			
Availability of a search engine	58	73	74	83
Availability of a sitemap	29	57	50	56
Availability of a list of frequently asked questions (FAQ)	18	31	32	42
Multilingual website	26	38	39	78
Availability of a glossary or help page	28	21	29	50
Availability of a link to www.overheid.nl (general government site)	.	.	26	33
Availability of a privacy statement	.	.	.	52

Source: Overheid.nl Monitor 2004/2005.

Apart from measuring the user-friendliness of government websites by objective criteria, *Advies Overheid.nl* also studied user-friendliness as experienced by the actual users. To measure customer satisfaction about the use of electronic and physical government service points, *Advies Overheid.nl* used the 'Landelijke Servicemeter' (national service measure) for the second time in 2004. The service measure is a questionnaire that the users of a website or service point can fill out on a voluntary basis. People are asked to rate the websites on how easy it is to find and read the information, on how complete the information is and, for physical service points, how long the user had to wait and how long the matter took to process. There is very little difference between the results of the first measure in 2003 and of the second in 2004. There was a bit more appreciation for the websites: the average rating increased by 0.2 points to 6.6 (out of 10) in 2004. The rating for the physical service points remained 8.2. The user groups of the government services hardly overlap. After all, this is not a study among people wanting the same services, via the website and the physical information desk. The quality of the service is also not judged by the same criteria. However, the general conclusion is that the users of government service websites see room for improvement. In order to keep these users, it would seem worthwhile to invest even more in the quality of these on-line services. On the other hand, satisfaction among the visitors of the physical service points is so great that they may not be motivated to switch to the electronic version of the same services.

5.1.2 Appreciation of website visits and counter visits, 2004



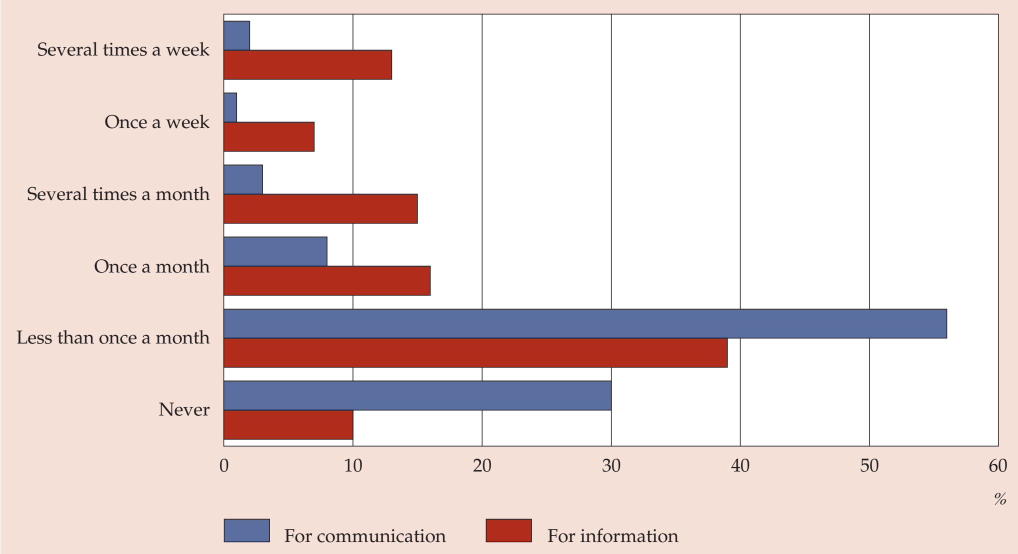
Source: Advies Overheid.nl.

E-government and citizens

In 2005 burger@overheid asked NetPanel to study the experiences citizens have with government websites. A panel of about 2,300 people was asked how frequently they visited government websites and what problems they encountered using the websites. The actual research goal was to determine how a new government service about electronic personal dossiers might take shape and how desirable it is (burger@overheid, 2005).

The study shows that many panel members never visited a government website or did so less than once a month, mostly for actually communicating with the government electronically (86 percent). When people visit a website, it is usually to

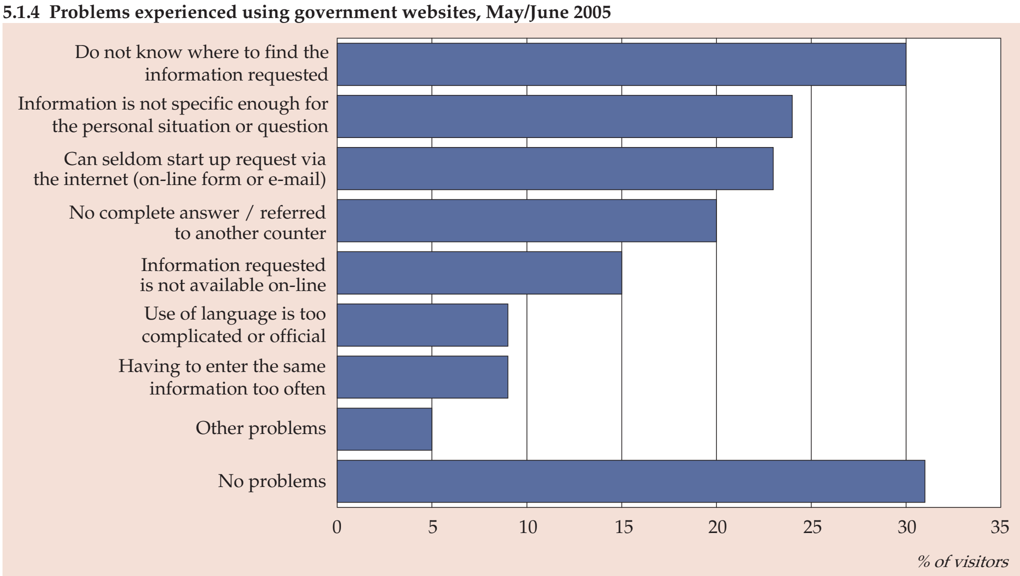
5.1.3 Visiting frequency of government websites, May/June 2005



Source: Burger@overheid, Netpanel onderzoek & Interactieve media.

find information rather than to communicate. The respondents indicated that the link set up to access government sites (www.overheid.nl) was actually used by 15 percent. This link is not systematically included on all government websites, as we mentioned earlier. Two thirds of the panel used a search engine to get to the site

5.1.4 Problems experienced using government websites, May/June 2005



Source: Burger@overheid, Netpanel onderzoek & Interactieve media.

they wanted. So the site is either insufficiently known, or the users found that they get to the site faster by using a search engine, or the users didn't know that the information or service is supplied by the government.

Once they arrive at the site, almost 70 percent of the visitors run into problems. One question by Netpanel shows that these problems pertain mainly to finding and applying the information. Furthermore, many visitors do not appreciate the fact that they cannot start up certain processes through the internet. User demand exceeds the supply in such cases. On the other hand, 31 percent of the panel has no problems when they visit a government website.

On-line public services in Europe

The European Commission has ordered a periodic study of websites to see what on-line public services are on offer in the various EU countries (Capgemini, 2005). One issue is to what extent a website can be used to complete the selected public services. The study looked at twelve services for citizens, such as applying for a passport, and eight business services, such as applying for an environmental permit.

The electronic use of the twenty services studied was categorized into the following phases:

Phase 1: The website only provides information about the service.
Phase 2: The user can download a form, but cannot submit it electronically.
Phase 3: The form can be filled out and returned electronically. So the procedure or the service can be started up electronically.
Phase 4: A service can be started up and completed electronically.

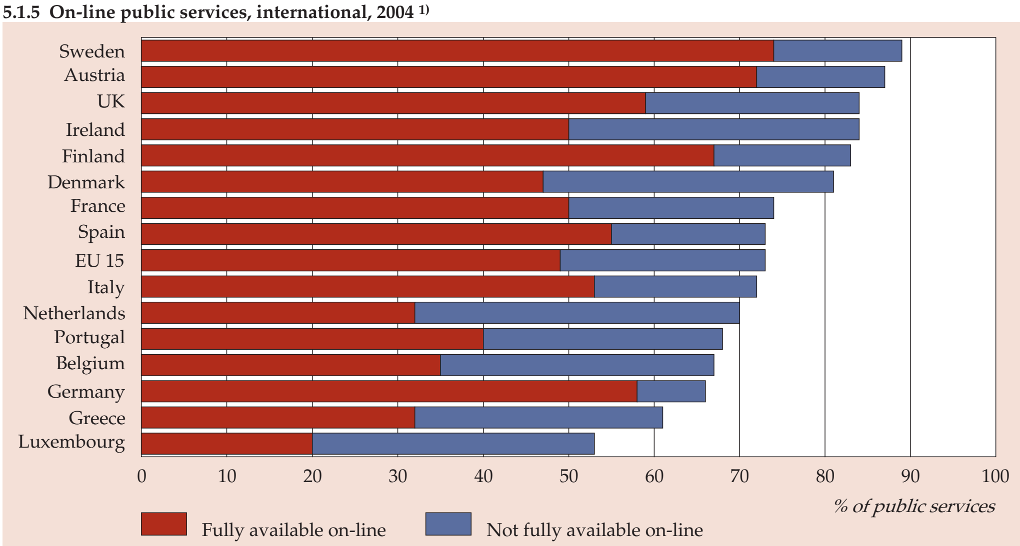
It is not possible for all services to end with phase 4. Take for instance a passport application: in principle, someone can apply for a passport electronically, but the passport itself cannot be supplied electronically. Phase 3 is the maximum feasible here. The study takes such restrictions into account and takes the ratio between actual and feasible phases for each service. In this way, it is possible to express to what extent a service can be completed electronically as a percentage.

Figure 5.1.5 presents the on-line public services available in 2004 for the EU 15 countries. In 2004 Sweden, Austria, Ireland, the United Kingdom, Finland and Denmark had a quantitatively high level of on-line services. Moreover, Sweden and Austria offered many services at the maximum level feasible on-line, thus offering all options to their appreciative users. The previous section showed that many users in the Netherlands were irritated by the fact that an on-line application and completion of a service partly has to be done off-line, because of a lack of facilities on the site. Austria is also a country that grew from a modest middle position in 2001 to one of the front-runners. The annual growth rates of the on-line services for the

15 EU countries together are falling: from 33 percent points in 2002 to 8 percent points in 2004.

The Netherlands has occupied a middle position throughout the entire period 2001–2004 within the EU 15 where on-line public services are concerned. Quantitatively in 2004 the Netherlands had 70 percent of the selected public services available on-line in one form or another (EU 15: 74 percent). There are relatively few services in the Netherlands on offer to the maximum phase that is feasible on-line.

5.1.5 On-line public services, international, 2004 [1)]



1) These are 20 selected public services studied in all countries.

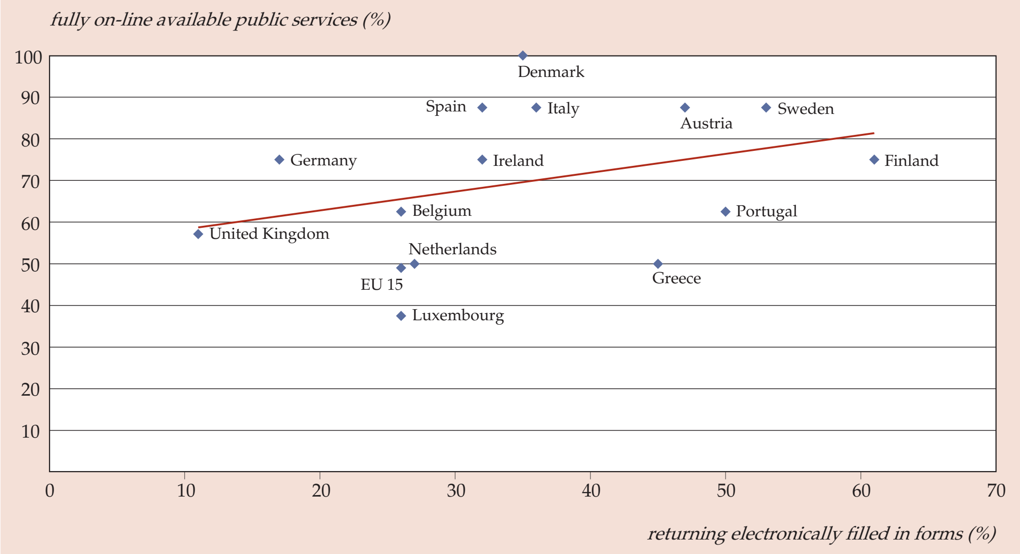
Source: Capgemini.

Use of on-line public services by companies

To what extent are the on-line public services actually used? Is it worth investing in advanced on-line services? In figure 5.1.6 the percentage of public services that are fully available on-line to companies is compared to the share of companies that returned completed forms electronically to the government institutions. This was chosen as an indicator of how advanced the use of the service by companies is: in terms of the phases distinguished in offering the services, this is phase 3.

The services offered on-line pertain to the eight selected public services for companies. The figure shows that the differences between countries are smaller for the business services fully available on-line, than for the actual use. Finland is an example of a country where a generous offer is linked to generous use. The United Kingdom, Denmark and Germany show a huge discrepancy between on-line services made available by the government and the actual use of these on-line services by companies. Greece is an example of a country where availability and use seem to develop hand in hand – albeit at a lower level than in the other countries. Of course, when a government makes some public services available on-line, it is not so that a proportional share of the users starts using it right away. It usually takes some time. The on-line use of public services is also stimulated by legislation requiring companies for example to submit their VAT declaration on-line, or by discouraging the use of the more traditional channels such as visiting a service point in person.

5.1.6 Supply and use of on-line public services by enterprises, international, 2004



Source: Capgemini / Eurostat.

5.2 *ICT and education*

This paragraph discusses the diffusion and the use of ICT in education. The general tendency shown by the data is that ICT is the least integrated in the normal curriculum in secondary education. In primary education and in vocational and adult education ICT is far more integrated.

The data presented are partly based on the results of the *ICT-onderwijsmonitor* (IVA/ITS, 2005a), which is compiled each year for the Ministry of Education, Culture and Science. Furthermore, data is used from the publication *8 jaar onderwijs*

Key figures on education

In economic terms, subsidized education represented a gross value added of 19.3 billion euro in 2004. This brings the share of the branch subsidized education in the total economy in 2004 to 4.4 percent. In 2001 this was 4.1 percent. The main cost in education is compensation of employees. In 2004 over 5 percent of total employment in the Netherlands – expressed in full-time equivalent jobs –was realized in the sector subsidized education. When the total public and private expenditure on education is added, the sum in 2003 was more than 26 billion euro. This is the equivalent of 16 hundred euro per capita.

Key figures on education, 2001–2004

	2001	2002	2003*	2004*
	million euro			
Subsidized education				
Production value	21,008	22,622	23,780	24,679
Intermediate consumption	4,586	4,931	5,155	5,332
Gross value added	16,422	17,691	18,625	19,347
Employee compensation	14,510	15,642	16,524	17,125
Investments	1,712	1,985	2,015	.
	full-time equivalent jobs (x 1,000)			
Employed persons	314	325	331	333
	%			
Share in the total economy				
Production value	5.3	5.5	5.6	5.7
Intermediate consumption	1.2	1.2	1.2	1.2
Gross value added	4.1	4.3	4.4	4.4
Employee compensation	3.6	3.8	3.9	3.9
Investments	0.4	0.5	0.5	.
Employed persons	4.7	4.9	5.0	5.2
Expenditure on education[1)]				
Total (billion euro)	23.1	24.8	26.2	.
Per capita (euro)	1,444	1,540	1,621	.
As a % of GDP	5.2	5.3	5.5	.

[1)] Expenditure on education is defined as the total public and private expenditure on households and institutions related to education. The education-related private expenditures to non-educational institutions are not included in the total. The public expenditure on households exclude subsidies for tuition fees at university. This part flows back via the households to the institutions and is therefore part of the private expenditure on institutions.

Source: Statistics Netherlands, National Accounts / Education Statistics.

en ICT (IVA/ITS, 2005b). This publication looks at the main results from the ICT education monitors of the past eight years, placing developments in education in their 'historical' perspective. The international data in this paragraph come from analyses of the PISA research files, from the year 2003 in this case. This is a study among 15-year-old students and of the schools where they receive their education, which is conducted periodically by the OECD. The main research goal is to study the skills of 15-year-olds in maths, reading, physics and problem solving. As background variables, the study on 2003 includes questions on the ICT use by the students and in their schools. The paragraph starts with an outline of the government policy on ICT and education. This is followed by a quantitative description of the state of affairs.

Background

The importance of a special policy for the use of ICT in education is decreasing. ICT has become an integral part of education, with its own structural budget, which the schools can invest in a proper ICT infrastructure pretty much as they see fit. The Ministry of Education, Culture and Science had one 'major project' for ICT in education, which has now ended. The directorate managing the project was abolished in the fall of 2005. ICT has clearly made its entrance and has produced various success stories in education.

Priorities for the near future are the use of ICT as a didactic tool, and increasing ICT skills among teaching staff, yielding key roles for the foundations *Kennisnet* and *ICT op school*. They publish much information about educational innovations with the use of ICT.

At the European level, the European Commission (EC) is very actively promoting the effective and efficient application of ICT for education and training. The EC has gained much experience in stimulating cooperation, network formation, and the exchange of best practices at the European level. There is a program in place for e-learning from 2004 to 2006, with which the EC seeks to contribute to a society with lifelong-learning and education for everyone.
In the next section, we give a quantitative description of the actual use of ICT in Dutch education, placed in an international perspective.

Computers and the internet

The annual ICT education monitor presents the results of the study about the diffusion and use of ICT in the education sector. Three education sectors are discussed:

– *primary education* consisting of elementary education, special elementary education and regional expert centres
– *secondary education* consisting of vmbo, havo and vwo
– the sector *vocational and adult education*

Number of pupils and students

There are more than 3.5 million people receiving education in the Netherlands. 1.6 million children are in elementary education, 900 thousand are in secondary education. Another 500 thousand people are in secondary vocational and in adult education. And finally, there are over 500 thousand students in higher professional and university education. There has hardly been an increase in the total number of pupils and students in the period 2000/'01–2004/'05 (+2.3 percent), but the number of students in higher education saw a substantial increase. There are almost 14 percent more students now than there were in 2000/'01. However, elementary education remains the sector where most children are being educated.

Pupils and students in education, 2000/'01–2004/'05

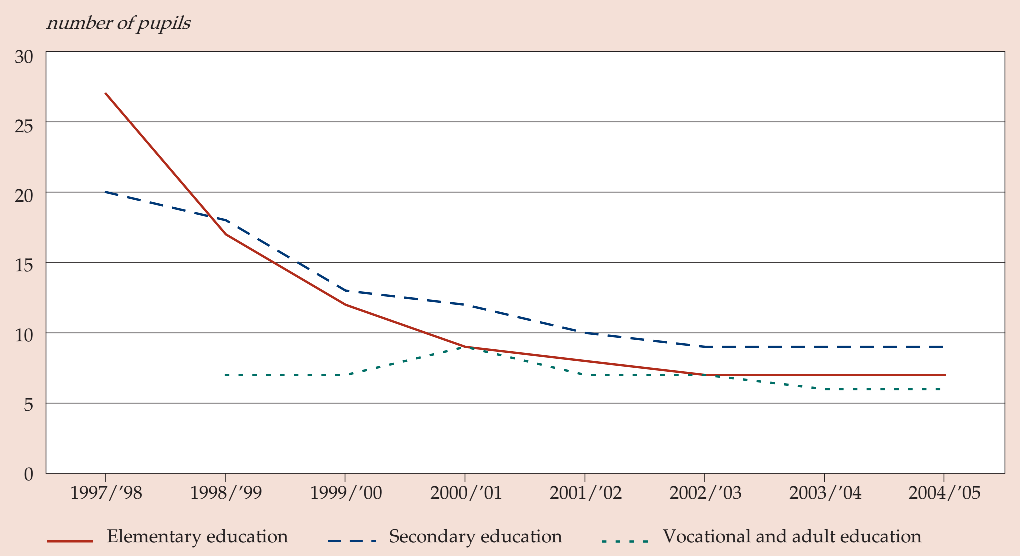
	2000/'01	2001/'02	2002/'03	2003/'04	2004/'05
	number (x 1,000)				
Total pupils and students	3,446	3,485	3,506	3,540	3,567
Primary education	1,598	1,604	1,602	1,599	1,599
Elementary education	1,547	1,552	1,550	1,548	1,549
Special elementary education	52	52	52	52	50
Secondary education	894	904	914	925	938
Joint years 1 and 2	390	390	398	401	403
Vwo, havo year 3 and higher	251	255	262	271	282
Vbo, mavo and vmbo years 3 and 4	222	229	230	228	226
Special secondary education and practical instruction	30	31	23	25	26
Vocational and adult education	476	483	489	492	487
Secondary vocational education	452	463	473	479	474
Secondary general adult education	24	21	16	14	13
Higher education	477	493	501	523	543
Higher professional	313	322	323	336	346
University	167	174	180	190	199

Source: Statistics Netherlands, Education Statistics.

Higher professional education and university education are not included in this study.

Figure 5.2.1 shows how many computers there are in the different school types and how this has changed. Currently there is one computer per seven pupils in elementary education. In the sector vocational and adult education, this is one computer per six students. Secondary education lags behind a little with one computer per nine students. These ratios have not really changed over the last three

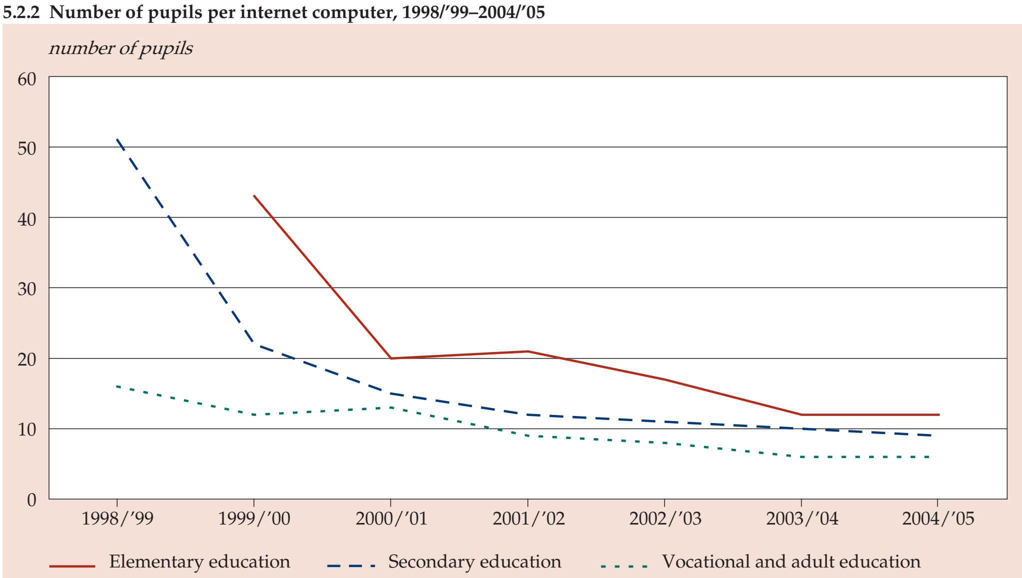
5.2.1 Number of pupils per computer, 1997/'98–2004/'05



Source: IVA/ITS, 8 jaar onderwijs en ICT.

years. Eight years ago, the situation in elementary education and secondary education was very different. In the school year 1997/'98 there was one computer per 27 pupils in elementary education and one computer per 20 students in secondary education.

5.2.2 Number of pupils per internet computer, 1998/'99–2004/'05

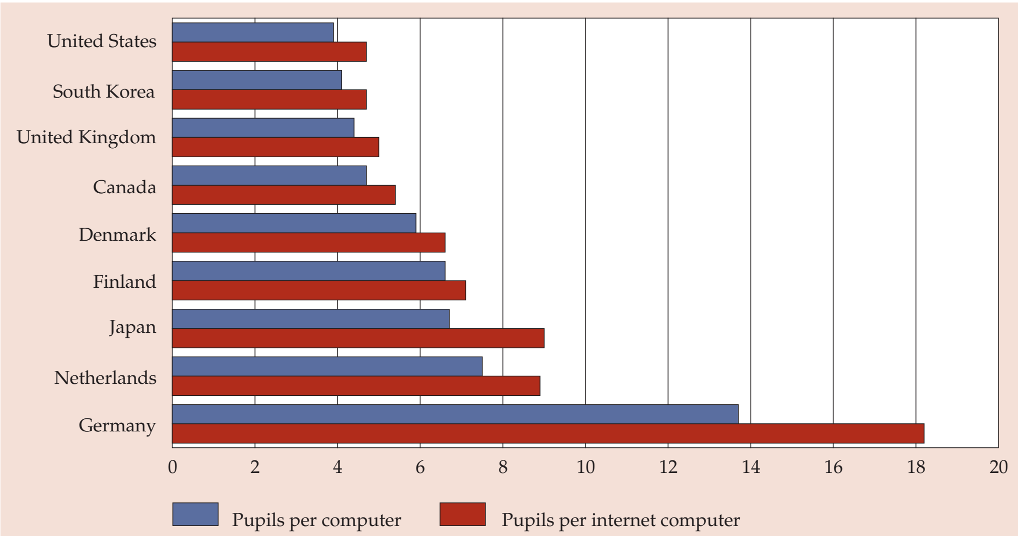


Source: IVA/ITS, 8 jaar onderwijs en ICT.

The number of students/pupils with internet access has been quite stable in recent years. In the sector vocational and adult education and in secondary education, almost every computer has internet access (see figure 5.2.2). In elementary education just over half of the computers has internet (one computer with internet access per 12 pupils). In the school year 1998/’99 there was just one internet computer per 51 students in secondary education. There was a similar situation in elementary education: in 1999/’00 only one computer per 43 pupils had internet access.

Internationally, the Netherlands is no front-runner in this area. In the USA, Canada, South Korea and the UK, the schools where the 15-year-olds receive their education have so many computers that there are fewer than five students per computer. The ratio in the Netherlands is seven to eight students per computer (see figure 5.2.3). The German situation, however, is worse with almost fourteen students per computer. The number of computers with internet access is always slightly lower than the total number of computers. On average, 15-year-olds in the Netherlands share one internet computer with about nine students. In the USA and South Korea, this is less than five, but in Germany 18 students have to share one internet computer.

5.2.3 Number of pupils per computer and internet computer at schools where 15-year-olds are educated, international, 2003

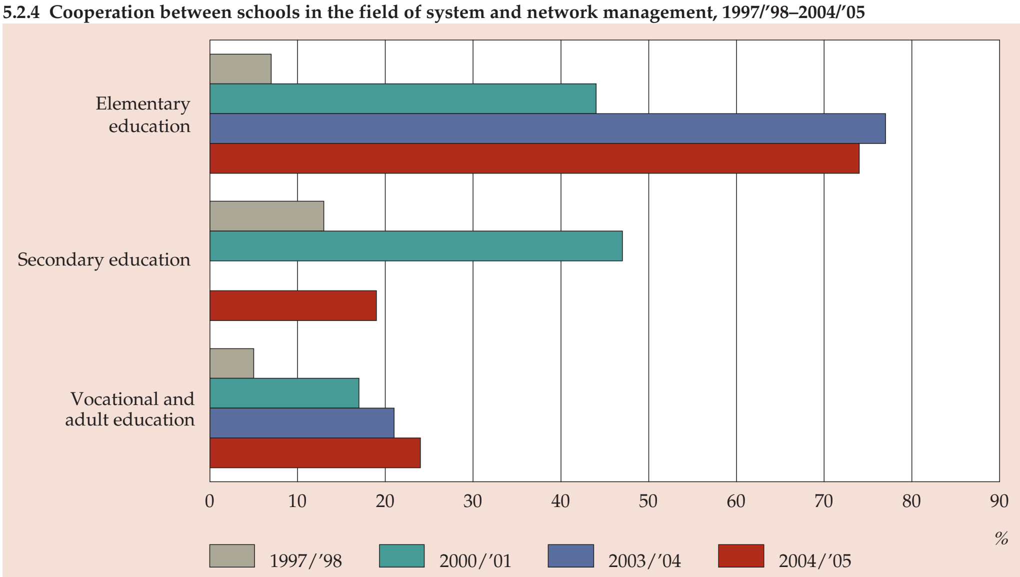


Source: OECD, PISA research (edited by Statistics Netherlands).

Cooperation

The introduction of ICT in education often creates problems for schools. To solve these problems, it may be useful to cooperate with other schools. One of the issues where schools often cooperate is in system and network management. In elementary education, about three quarters of the schools cooperated in this area during the school year 2004/'05. As relatively small schools, they often lack the expertise and capacity. There is less cooperation in secondary education and in the sector vocational and adult education, which is to be expected. These schools are larger, which reduces the need for cooperation. In elementary education, there has been a substantial increase in cooperation over the years: in 1997/'98 just seven percent of these schools cooperated with system or network management. The increase is caused in part by the fact that more schools got more advanced ICT provisions.

5.2.4 Cooperation between schools in the field of system and network management, 1997/'98–2004/'05



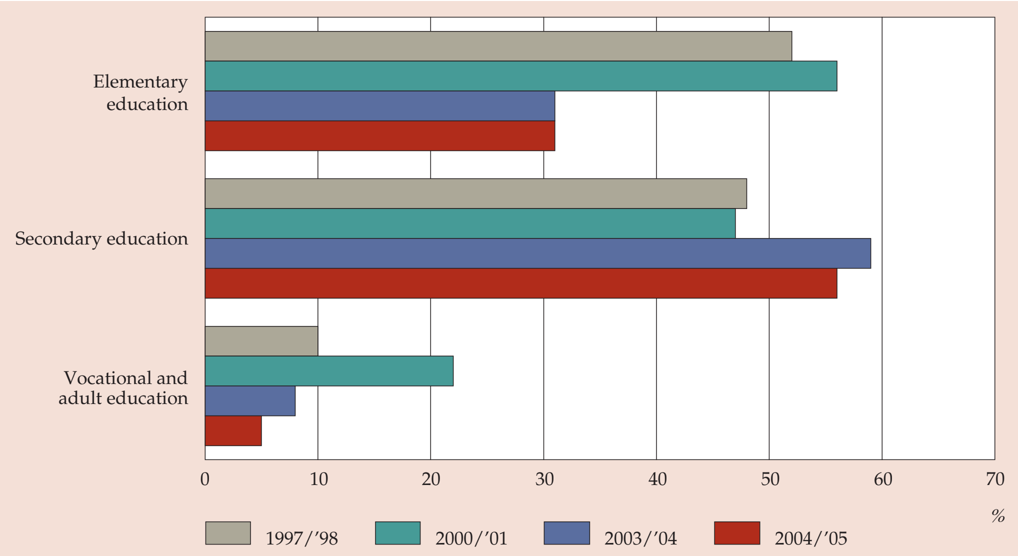
Source: IVA/ITS, 8 jaar onderwijs en ICT.

Schools also cooperate in other areas of ICT (see table A5.2.2 in the statistical annex). About one third of the schools cooperate in buying programs. Another aspect is exchanging ideas on how to use ICT. In elementary education and in vocational and adult education, three quarters of the schools cooperate in this area, as does over one third of the secondary schools. Another area is the improvement of skills, where two thirds of the elementary schools cooperate. In general, the elementary schools cooperate most often, followed by the sector vocational and adult education. In secondary education, there is less cooperation with other schools.

Bottlenecks

One of the major problems schools encounter with ICT in education, is the availability of appropriate space for all these computers. In elementary education, this problem is less of a bottleneck than five years ago, but over 30 percent of the schools mention the problem. In secondary education this is a problem for many more schools: 56 percent in the school year 2004/'05. Five years earlier, it was less of a bottleneck, but even then, 47 percent reported it. The problem is pretty much solved in vocational and adult education. Only 5 percent of the schools in this sector lack adequate space.

5.2.5 Schools encoutering a lack of appropriate rooms for computers, 1997/'98–2004/'05



Source: IVA/ITS, 8 jaar onderwijs en ICT.

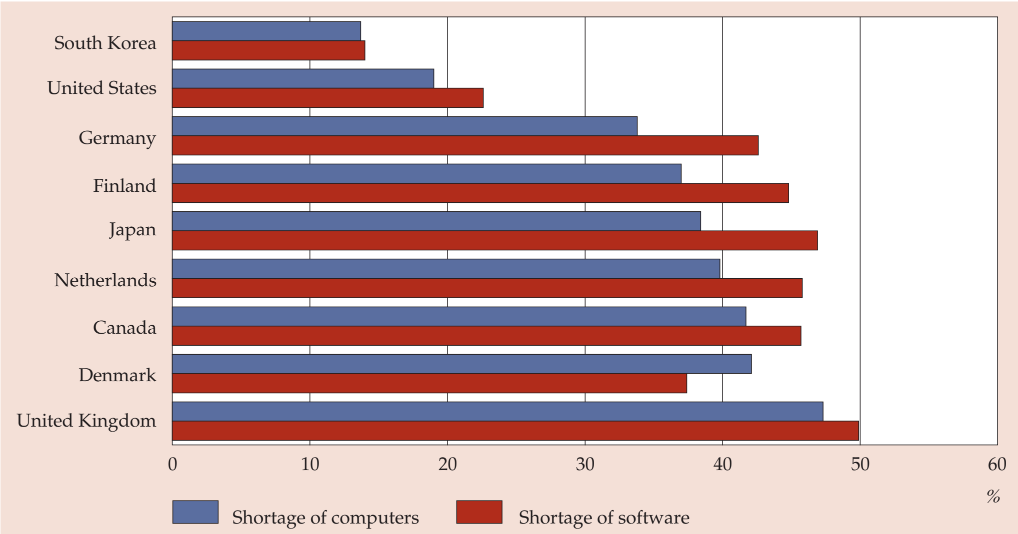
Another bottleneck is the number and the quality of the available computers (see table A5.2.3 in the statistical annex). There is a sizeable decrease in the number of schools that report these issues. There is only an increase in the number of schools in secondary education that see the number of computers as a bottleneck. This is not surprising, since figure 5.2.1 shows that the number of students per computer here is the highest of the three school types discussed. In secondary education 42 percent of the schools report the number of computers as a bottleneck, against 32 percent five years earlier.

Internationally, the Netherlands occupies a middle position when it comes to schools that have a fairly sizeable to sizeable lack of computers or software (figure 5.2.6). Canada and Japan hardly differ from the Netherlands in this area, but in

South Korea and the USA, schools do not face this problem of shortages to the same extent. German schools do not report that they lack computers more often than in other countries, while they have fewer computers available on average. Almost all countries report a lack of software more often than a lack of computers.

Whether or not something is considered a bottleneck has to do with a scarcity of means, but also with the school's ambition level where ICT use is concerned. When a school sees many ways to usefully apply ICT and wants to proceed with them, they are much more inclined to experience a scarcity of means or lack of skills as a bottleneck.

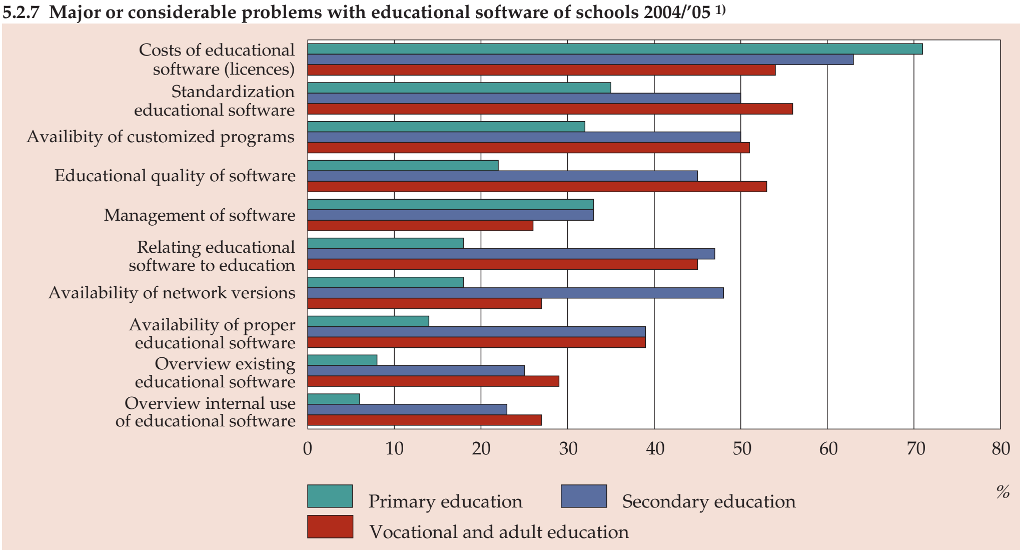
5.2.6 Fifteen-year-old students in schools who are impeded fairly/considerably by a shortage of ICT tools, international, 2003



Source: OECD, PISA research (edited by Statistics Netherlands).

In the IVA/ITS study, schools were asked what the bottlenecks were in educational software. The main problem turns out to be the costs of software and licences: over 70 percent of the schools in primary education see it as a bottleneck (see figure 5.2.7). In secondary education 63 percent and in the sector vocational and adult education 54 percent of the schools experience problems. Standardisation, customized software, and the educational quality of the software are often problematic. Relatively few schools have lost sight of the educational software used. In primary education, this is just 6 percent, whereas in secondary education and in vocational and adult education it is well above 20 percent. This may have to do with the size of the school: smaller schools can more easily keep track.

5.2.7 Major or considerable problems with educational software of schools 2004/'05 1)



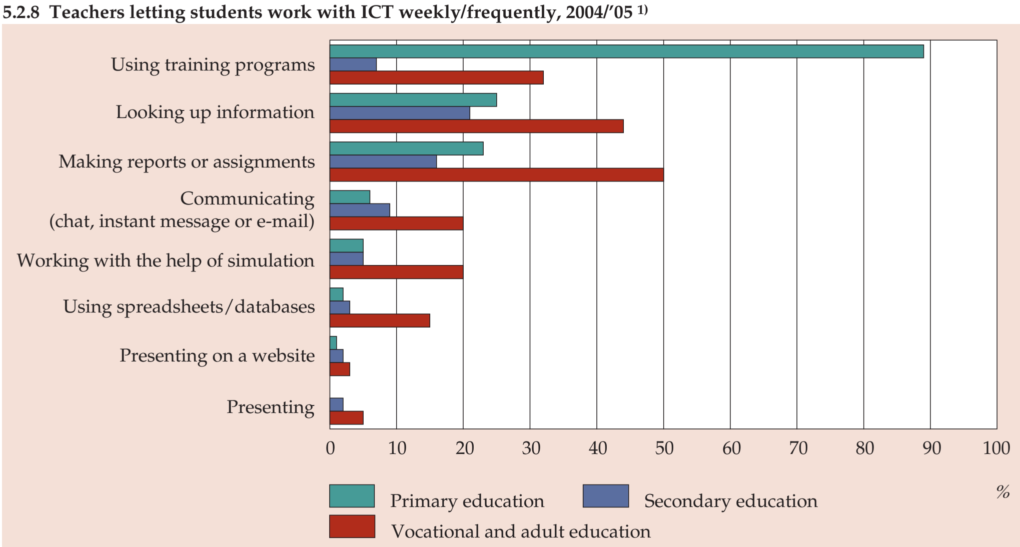
1) According to ICT supervisors.

Source: IVA/ITS, ICT-onderwijsmonitor studiejaar 2004/2005.

What pupils and students do with computers

In primary education, computers are mainly used to practise skills. Almost 90 percent of the teachers give pupils skills to practise on the computer on a daily or weekly basis. The most frequent uses of the computer in this sector are 'looking up

5.2.8 Teachers letting students work with ICT weekly/frequently, 2004/'05 1)



1) Primary education, vocational and adult education: weekly; secondary education: frequently.

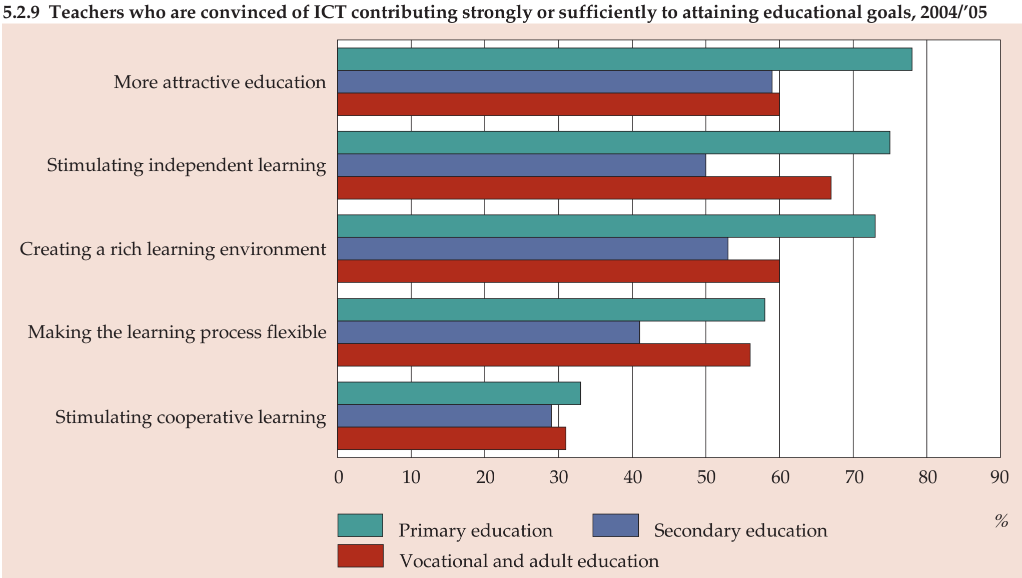
Source: IVA/ITS, ICT-onderwijsmonitor studiejaar 2004/2005.

information' and 'writing reports or assignments': over 20 percent of the teachers give their pupils such assignments on a weekly basis. In secondary education, working with computers is the least intensive. The main task assigned here is 'looking up information' (21 percent), followed by 'writing reports and assignments' (16 percent). In the sector vocational and adult education, the computer is used more often. The most common task is 'writing reports or assignments' (50 percent), followed by 'looking up information' (44 percent) and practising skills (32 percent).
The IVA/ITS study does show that computers are often used in secondary education for occasional tasks such as making a presentation (45 percent). In addition, most of the teachers in secondary education occasionally assign all other tasks discussed above to their students.

ICT and goals in education

Apart from data on such matters as the availability of computers and software, bottlenecks in ICT, and the ICT-supported tasks students can do, there is also data available on the role ICT plays in attaining various goals in education. ICT is now an integral part of society and therefore of education, but does ICT contribute to the realisation of goals in education? Most teachers feel computers play a positive role, especially in primary education. Over 70 percent of the teachers said that ICT makes a major or substantial contribution to making education more attractive, to stimulating independent studying, and to creating an enriched environment (see figure 5.2.9). Next after primary education, it is the teachers in the sector vocational

5.2.9 Teachers who are convinced of ICT contributing strongly or sufficiently to attaining educational goals, 2004/'05



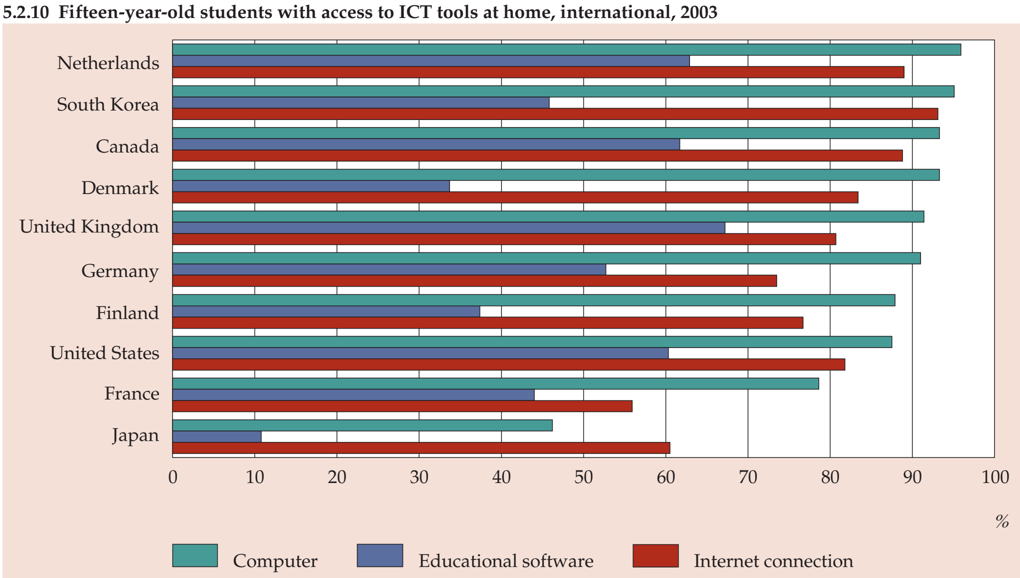
Source: IVA/ITS, ICT-onderwijsmonitor studiejaar 2004/2005.

and adult education who are most convinced of the positive contribution ICT makes to attaining goals in education. In secondary education this is the case to a lesser extent, but here too over half of all teachers feel that ICT contributes strongly or substantially to the three goals specified above. About 30 percent of the teachers in all three sectors feel that ICT makes a positive contribution to another, less obvious, goal like 'stimulating learning together'. Although a computer can be seen as an individual tool, there are uses in education that stimulate cooperation among students, according to their teachers.

Computers at home

It is important for the development of ICT skills that pupils have a computer available at home. In the Netherlands, pupils and students relatively often have ICT tools at home. Almost all students aged 15 in the Netherlands have access to a computer at home (95 percent).This is the highest percentage of the countries selected, whereas earlier (figure 5.2.3) the number of computers in schools lagged behind the numbers in the same countries. The low percentages of Japan in this area are striking. Whereas at least 80 percent of the students have access to a computer at home in all countries considered here, this is only 46 percent in Japan. Japan also has relatively few computers in schools, as was shown in figure 5.2.3. However, Japan has a far more widespread mobile internet than all other countries. This also explains the difference between the fairly large group of students who have internet at home, but no computer. In all other countries, the group of students who have a computer available is larger than the group of students who have internet at home.

5.2.10 Fifteen-year-old students with access to ICT tools at home, international, 2003



Source: OECD, PISA research (edited by Statistics Netherlands).

There are great differences between countries in the availability of educational software at home. Front-runners here are the students from the United Kingdom (67 percent), whereas just 34 percent of the students in Denmark have it available. It was to be expected that the share in Japan would be low (11 percent), because few students have computers at home. The Netherlands does well, since over 60 percent of the students have access to educational software at home. This may compensate for the fact that students have to make due with fewer computers in school. There are probably cultural differences between the countries in terms of what the students are expected to do for school (homework etc.).

5.3 ICT and care

Health care and social work in the Netherlands are not only important for the public health of the nation, but also for the economy. In recent years, expenditure on care has seen a structural increase, which is expected to continue as the population ages. Health care and social work is a sector which records, processes and exchanges quite a lot of information: not only within health care and social work (for instance information from a patient to a GP and from the GP to a specialist), but also with other parties involved, such as health insurers. The volume of information that must be managed is likely to increase in the future. Health care and social work is also a complicated sector in terms of logistics. ICT is seen as a tool to support this process. Furthermore, health care and social work requires a great deal of knowledge: it is important to know about state of the art treatments, drugs, equipment and so on.
Finally, there is the consumer who wants information on health. Consumers often use the internet to find information, which may be quite risky without proper explanation. So it is important to have reliable information out on the internet.

ICT use in health care and social work

There are computers in 96 percent of all health care and social institutions and almost 94 percent of all institutions have external data communication available. These percentages are comparable to those of the other branches of industry. In general, the availability of ICT tools and their use within health care and social work is as least as high as in other branches, keeping in mind that not all applications are equally important to all sectors or company sizes. The fact that health care and social work institutions communicate slightly more often via the internet with government institutions mainly says something about government involvement with the sector. In electronic purchases, a process in health care and social work that is quite comparable to that in many other branches, the sector health care and social work certainly does not lag behind. Health care and social work institutions take the same security measures in ICT. The degree to which this happens is above the total average of all branches of industry: 92 percent has installed anti-virus software (the average is 87 percent) and 80 percent has a firewall against intruders (the average is 74 percent).

Key figures on care

In 2004 the branch health care and social work employed 811 thousand people, which is close to 13 percent of the total labour volume in the Netherlands. The share of the branch health care and social work in the total economy is close to 9 percent and exceeds that of many other branches, such as construction or transport, storage and communication. The expenditure on care has increased to almost 57 billion euro or 12.5 percent of GDP.
Furthermore, care is characterized by a relatively low value added per person employed – in comparison with the total economy – and low annual investments per employee. The share of wage costs in the value added for the total economy is below 60 percent: in care three quarters of the value added consists of wage costs. There are many capital goods and technology in hospitals, including equipment with an ICT content (embedded software), such as MRI scanners. In many parts of care, though, labour is the main input.

Key figures health care and social work, 2001–2004

	2001	2002	2003*	2004*
	million euro			
Branch of industry health care and social work				
Production value	41,920	47,187	50,697	52,818
Intermediate consumption	11,623	12,547	13,355	13,793
Gross value added	30,297	34,640	37,342	39,025
Employee compensation	22,995	25,592	27,924	29,174
Investments	2,772	2,681	2,588	.
	full-time equivalent jobs (x 1,000)			
Employed persons	713	758	796	811
	%			
Share in the total economy				
Production value	4.9	5.4	5.7	5.8
Intermediate consumption	2.6	2.8	2.9	2.9
Gross value added	7.6	8.4	8.8	9.0
Employee compensation	10.1	10.7	11.3	11.7
Investments	2.9	2.9	2.9	.
Employed persons	10.7	11.4	12.1	12.6
Expenditure on care [1]				
Total (billion euro)	47.1	53.0	57.4	59.8
Per capita (euro)	2,938	3,281	3,536	3,677
As a % of GDP	10.5	11.4	12.0	12.2

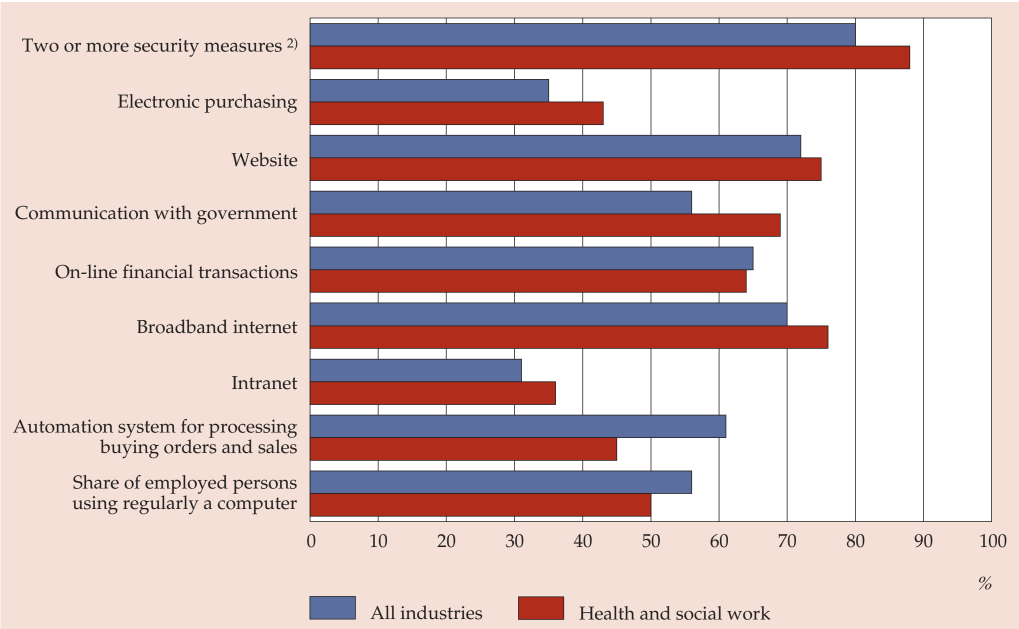
[1] The expenditure on care is defined as the total of the income generated by the activities of the companies and institutions involved. The expenditure on care is higher than the production value of the branch of industry health care and social work, because there are also companies and institutions outside this branch that provide care (for instance pharmacists).

Source: Statistics Netherlands, National Accounts / Care Accounts.

However, health care and social work lags behind other branches in the use of computer systems for processing purchasing and sales orders. There may be a problem in the perception of sales that causes the low score in the availability of systems to process purchasing and sales orders in health care and social work. In this sector, it is fairly unusual to place an order first. Patients often have to be treated right away. Moreover, an order or sale is usually called an appointment or consultation.

Half of the people employed in the sector health care and social work regularly use a computer at work. These people can be reached via ICT or, to put it differently, are (potentially) connected to an ICT network. This gives an indication of the volume of ICT work that can be optimized. The average number of people working with a computer is higher in the other branches of industry though.
In the period 1995–1999, health care and social work institutions, like the other branches, invested a greater share of their investments in ICT-related assets, such as computers, software and network appliances. After 1999 the share of investment in ICT decreased slightly; in health care and social work from 12 to 11 percent (see also paragraph 2.3). However, the investments per person employed in health care and

5.3.1 Use of ICT tools in health and social work activities and other industries, 2004 [1)]



1) Companies with 10 and more employed persons.
2) Two or more of the following security measures: anti-virus software, firewall, secured webserver, off-site data back-up, authentication means, encryption.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

social work are low, which shows up in the ICT investments per person employed: in the sector health care and social work, this comes down to 3 to 4 thousand euro per person employed. The average for all branches of industry together is 15 thousand euro. The number of ICT experts employed in health care and social work is 0.8 percent of the total number of people employed in the sector. For all branches of industry together, the share of ICT experts employed is 3.9 percent. So the number of ICT experts working in health care and social work does not compare favourably with the other branches (see also table A2.8.2 in the statistical annex).

Policy and advice

One issue in the government policy on ICT is 'streamlining' the processes of providing and processing information in health care and social work. Since this is a major, growing economic sector, even small gains in efficiency may yield major savings in terms of money.

At the European level, it is clear that health care is an information-intensive sector, which makes it a good candidate for the use of information and communication technology. eHealth therefore plays a key role in the eEurope strategy of the European Union (EC, 2004). The eHealth systems support care consumers – patients and healthy citizens – in accessing medical information quickly and easily. eHealth also supports care workers by making information widely available of best practices and results of clinical treatments, and by providing fast and easy access to electronic medical dossiers when and where needed.
The Netherlands aims to set up an Electronic Patient File (EPD). This requires a safe ICT environment in which the institutions can efficiently communicate via a national infrastructure and exchange crucial patient data.

The first steps in this direction are planned for 2006, when an electronic medication dossier (EMD) and an electronic observation dossier by GP's (EWD) will be set up. The EMD is a system that allows all authorized GP's and nursing staff to look electronically at a patient's medication dossier from any location. The dossier lists which medication (hospital) pharmacists gave to the patient in the past.
The EWD by GP's allows electronic access to the patient's dossier made by the patient's regular GP, from any GP practice in the country, and allows the GP consulted to provide feedback to the patient's regular GP.

Public health

The Dutch Council for Public Health and Health Care (RVZ) distinguishes in its advice (RVZ, 2002) three clusters for eHealth applications:
– E-care: including e-diagnosis, e-consultation, e-therapy and e-care.
– E-care support: including e-quality, e-administration, e-management, e-commerce and e-logistics.
– E-public health: e-prevention, e-health (care) information.

According to the RVZ advice, eHealth may improve the quality of care (fast and efficient exchange of patient data) and efficiency gains in care (adequate data exchange can prevent unnecessary duplication of examinations). Negatives may be insufficient quality, fraud, breaches of privacy and confidentiality.

Hasman and Jonker (Hasman and Jonker, 2005) correctly state that much depends on the willingness of care providers to record the data. Entering data in an information system often takes more time than writing it on paper. However, there are indications that, in the end, entering data electronically saves time. Information systems can support health care and social work, but they also change the work of care providers and other staff and influence relations between the different groups in the organisation. In order to be accepted, information systems must therefore yield clear advantages for care providers right away.

Hasman and Jonker mainly pay attention to the provision of information for the primary process (patient care). Quality control, logistics, financial processes and policy development all depend on the availability of these data. The role of ICT has changed its focus toward primary process and now sees the administrative and financial-economic functions as derived from the primary process.

Innovation and care providers

When we look beyond ICT, at the diffusion of improved working methods in general, than it turns out to be slower than what is generally considered desirable in health care and social work, according to the RVZ (RVZ, 2005). Speeding it up would not only improve the health care and social work for patients, but also save costs at the macro level, according to the RVZ. The primary responsibility for a speedy implementation lies with the care providers and the institutions themselves. But, apparently, intrinsic stimuli are not enough motivation, and it takes stimuli from the outside world to get the care providers into implementing innovation. Financial stimuli play a key role in speeding up the process. Patients/clients and insurers will have ways to make care providers implement proven improvements if they get the right instruments, such as adequate information. One government task is to see to the provision of adequate information.

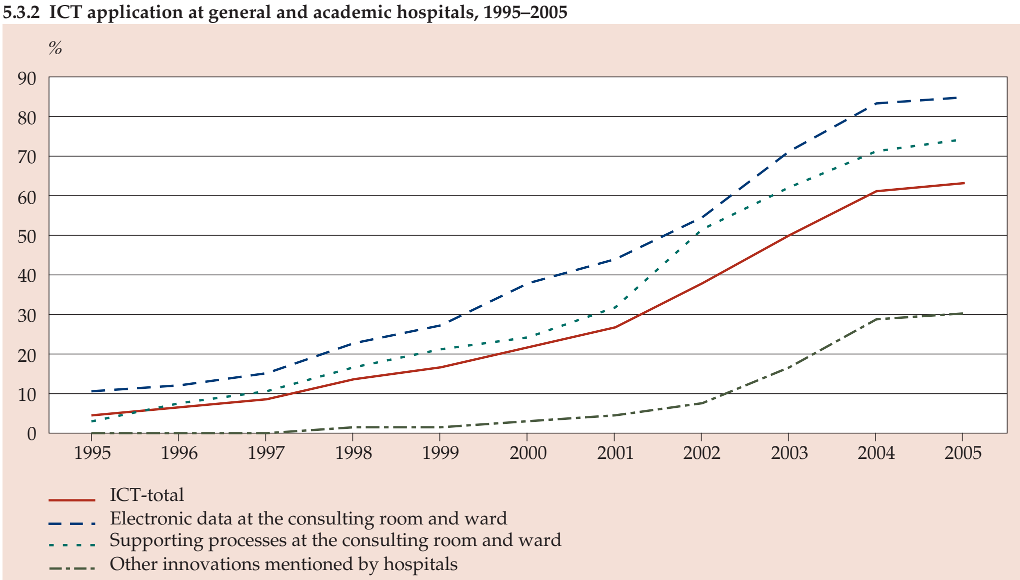
In its advice, the RVZ (RVZ, 2005) deals with working methods proven to improve care, either by raising the quality of care and/or by saving costs. This concerns the primary process: patient care. The background study for the advice includes a contribution from Blank and Van Hulst (Blank and Van Hulst, 2005) with an empirical analysis on the diffusion of innovations in Dutch hospitals.

The empirical analysis is based on a survey among all general and academic hospitals in the Netherlands. It excludes non-affiliated hospitals and independent treatment centres. There are no open-ended questions in the questionnaire: the hospital is asked to indicate whether a given innovation is available and since when (year). The hospitals could add innovations to the list of pre-specified innovations provided. Out of a total of 98, a representative group of 64 hospitals (65 percent) responded.

Blank and Van Hulst distinguish seven main types of innovation:
(1) multi-disciplinary diagnostics and treatment (on the basis of 14 innovations), (2) technical quality (14 innovations), (3) nursing consultations (13 innovations), (4) chain care (11 innovations), (5) logistical optimalisation of existing health care and social work (5 innovations), (6) care shifted from hospitals (4 innovations) and (7) ICT (3 innovations).
The degree of implementation of the innovations differs per main type. In 1995 an average of 5 to 20 percent of the underlying innovations was implemented. The expected percentages for 2005 are between 25 and 80 percent. Figure 5.3.2 shows, for instance, that in 1995 less than 5 percent of the hospitals had applied one of the ICT innovations named in the questionnaire [1)]. In 2005 this is expected to be over 60 percent of the hospitals.

Innovations play a part in determining what means (personnel, material) is required to realize a certain production. Innovations may lead to savings. The introduction of innovations will not immediately lead to more productivity. Some innovations are mainly intended to improve the quality and may require more means in the short term, which are not immediately reflected in quality improvement. The first

5.3.2 ICT application at general and academic hospitals, 1995–2005



Source: Blank and van Hulst, 2005.

estimates by Blank and Van Hulst indicate that most of the seven types of innovations distinguished influence productivity. Significant positive effects can be expected from chain care and logistics. Chain care will probably contribute to a shift of part of the care away from the hospitals, thus reducing the means required by hospitals. Logistically speaking, innovations may contribute to operating patients faster, so that they can leave the hospital faster. [2)] According to a recent study by TNT Post Groep (TPG, 2004), this may lead to major savings, by improving not only patient but also goods and pharma logistics.
Multidisciplinary diagnostics and care placed outside hospitals will in first instance lead to lower productivity. In the end, these two categories mainly influence the quality of care, but at first, they require extra means.

No statistically significant connection was found for technical quality, nursing consultations and ICT. So ICT does not make a positive contribution to productivity either. Blank and Van Hulst note that their data refer to the period to the end of 2002. It was in 2002 that many process-supporting ICT innovations were implemented. Perhaps training, investment and introduction costs undercut any positive effect, and perhaps the situation will change in the long run for ICT.

Care consumers: use of the internet

The European Commission seeks to measure and benchmark the developments of the European information society. Within this framework, the project SIBIS (Statistical Indicators Benchmarking the Information Society) was launched. The aim of the project was to develop a set of key indicators and test them. Surveys were conducted in 2002 in the EU, Switzerland and the USA. SIBIS (SIBIS, 2003) contains the major findings for security, e-commerce, e-work, e-government and e-health. For e-health in particular, the researchers looked at the use of the internet as a source of health-related information. In 2002 almost 20 percent of the EU 15 population aged over 15 report that they have looked up health-related information on the internet in the previous 12 months. Half of the group (10 percent of the total respondents) have even looked in the previous four weeks. The percentages for the Netherlands are slightly higher: 31 percent in the previous 12 months and 15 percent in the previous four weeks. The information often met their needs (the percentages for all countries are over 80 percent). Over half of the internet users looking for health-related information, do so to become more informed about their own general health. Looking for a second opinion on a medical diagnosis was mentioned by almost half of the people looking for information. Information supplied by universities, self-help groups, hospitals and professional medical societies are considered quite dependable. This is far less so for information supplied by pharmaceutical companies and private health insurers.

For the Netherlands, the Council for Public Health and Health Care (RVZ) commissioned its fifth study on the use of the internet in relation to health and health care in November 2004. The study, carried out by Flycatcher, was a representative sample survey among internet users. There were 2,241 respondents. The main results are published in Rijen (Rijen, 2005). Note that the study was conducted among internet users and not among the population as a whole. This means that in the sample survey women, young people and highly educated people are overrepresented.

The study shows that a third of the internet users look up information on health and/or health care several times a year. Less than a quarter never used the internet for this purpose. An increasing number of internet users look up information about their complaints before visiting their GP. The percentage of people who often do so was 16 percent in 2003 and doubled to 33 percent in 2004.

Based on these and other results (about the wish to communicate via the internet or e-mail with the specialist or GP, order medicines via the internet, or look at medical data on the internet), Rijen concludes (Rijen, 2005) that many internet users are interested in health and health care. The percentage of 'informed patients' is increasing, as is the percentage of people who want to decide for themselves what treatment or examinations they will undergo. Increasingly, people discuss options with their doctors based on information obtained elsewhere. The easier people can get information and the more people know about best practices, the greater the chances are that people will confront their doctors with this.

Conclusion

The general use of ICT tools in health care and social work is not lower than in other branches of industry. However, investments in ICT and the number of ICT experts employed are lower in health care and social work than elsewhere. The sector consists of many different parties, which makes the use of ICT both logical and complex. Apart from the general use of ICT, the focus in health care and social work is on specific applications, such as the electronic patient dossier. This is a controversial issue, when it comes to security and the privacy protection of such data. This requires more than just the use of ICT.

Statistics Netherlands understands how important accurate figures are in monitoring developments in the sector. Therefore, the strategic project Zorg (Care) started in 2001. Its aim was to construct a fully consistent overview of health care and social work statistics. The overview consists of financial flows, health care and social work providers, the users of health care and social work and the health and welfare of the population. This will increase our insight in the developments in and influence of innovations in health care and social work, including the use of ICT.

Notes in the text

1) The percentage for ICT innovations is the average of the three underlying types: electronic data in the consultation room and on the ward, process-supporting

ICT in the consultation room and on the ward and other innovations mentioned by the hospital. This percentage indicates the percentage of the maximum technology implemented.

2) In their study, Blank and Van Hulst opt for a productivity standard that is easy to calculate: production is the ratio between production volume and the volume of the means used. The production volume is determined as the sum of all patients dismissed and deceased with the average duration of nursing as the weighting factor. Statistics Netherlands has recently started to apply this weighting method in its health care statistics, where the patients dismissed are categorized in a large number of diagnosis and age groups. The volume of the means used follows from the wage costs (deflated by average wage costs per full-time job) and the material costs (deflated by the consumer price index). The capital costs are not taken into consideration here.

6. Personal and household ICT

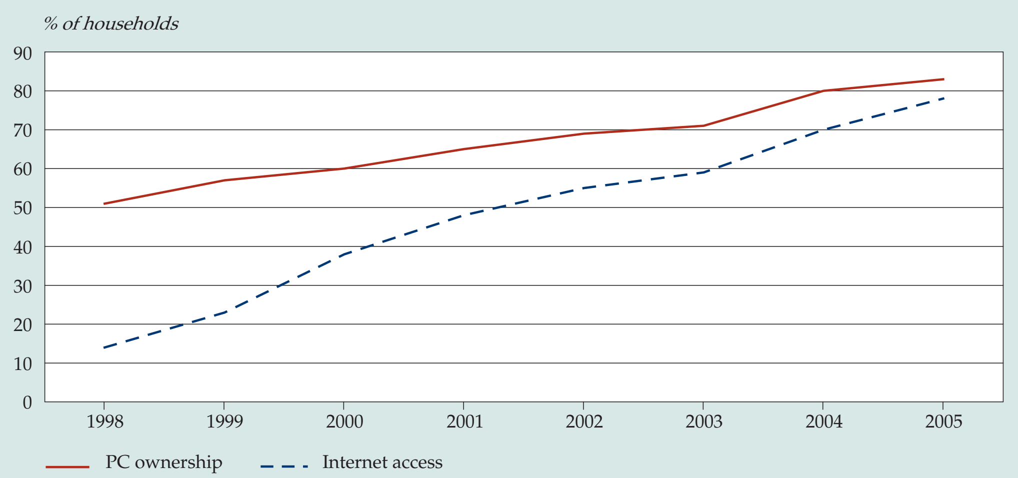
More than three-quarters of households in the Netherlands have access to the internet from home. Seventy percent of these households have a broadband connection. In spite of this wide availability, nearly four million people have never used the internet at all, most of them because they are not interested in internet activities. Around 2.5 million people use the internet for only two or three different activities. For some, these are elementary activities, such as sending e-mail and random surfing. A larger group of more intensive users, however, carries out more diverse and more advanced activities: downloading software, for instance, is reported by one quarter of users, and both the number of people buying on-line and the average amount they spend are increasing every year. The main reasons people give for not buying on-line are fear of breaches in security, confidentiality and privacy; this in spite of the fact that people who do shop through the internet do not have particularly bad experiences in these respects. Nearly half the population – including many older people – have had some form of computer training or taken a computer course. For more than half of them, the most recent training was completed more than three years prior to the survey. Although nearly all households had installed anti-virus software or a firewall in 2005, one third of them had been affected by computer viruses in 2005.
From an international point of view, internet access and broadband connections at home are very high in the Netherlands. As far as shopping through the internet is concerned, the Netherlands ranks in the middle group.

6.1 Hardware and internet connections

This section examines pc ownership, internet access and the type of internet connections of households and persons. The annual growth in pc ownership and internet access by households is illustrated in figure 6.1.1. It shows that 83 percent of households had at least one pc and 78 percent had access to the internet in 2005.

In 1998 over half of Dutch households had a pc, while only 15 percent had access to the internet. This means that internet access has grown faster than pc ownership in recent years. Home access to the internet grew most rapidly in 1999 and 2000 and its growth fell slightly subsequently. The kink in figure 6.1.1 for 2003 is caused by the change in the survey population: in 2004 (and 2005) the figures refer to the population aged 12 to 74, while before that the survey referred to the entire population. [1] The growth in pc ownership and internet access in 2004 was therefore partly caused by the exclusion of the group aged 75 and older. Pc ownership and internet access in this group is considerably lower than in the population aged 12

6.1.1 PC ownership and internet access by households, 1998–2005 1)



1) Results for 2005 are based on a survey conducted in the second quarter of 2005, the results for other years are based on a continuous survey. Results for 2004 and 2005 refer to the population aged 12 to 74 years, results for other years refer to the entire population.

Source: Statistics Netherlands, POLS (population aged 12 years and older)/ICT survey 2005 (population aged 12 to 74 years).

to 74. The relationship between pc ownership, internet access and age is examined further on in this chapter.

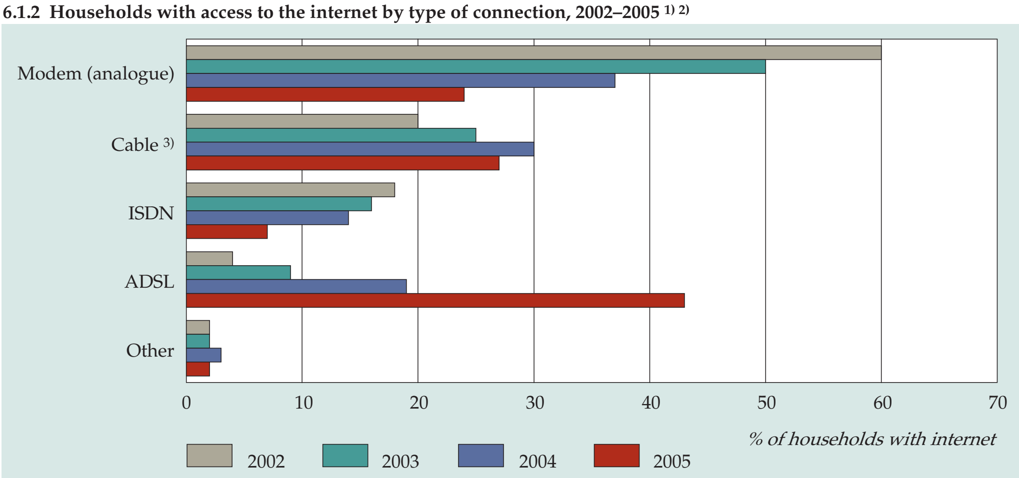
Figure 6.1.1 further shows that around 2000, internet access mainly increased for households who already had a computer, and less for households who had neither a computer nor access to the internet. This growth seems to have stopped in 2002, however, and in 2005 nearly every household with a pc also has access to the internet. From now on, growth in internet access will be determined by households who buy a computer and access the internet for the first time, and will be more difficult to realize.
Although internet access at home is still growing, the growth rates seem to indicate that 'complete coverage' will not be realised within the next few years. Further on in this chapter, we shall see that older people in particular have no interest in ICT and that this group has remained stable in this respect in recent years. The proportion of over-60s with internet access is therefore lower than average. On the other hand, nearly every child born after 2006 will be born into a household with internet access. Coverage thus suffers from a 'generation effect'.

The third section of this chapter will look into the correlation between pc ownership and internet access by various background characteristics of the individuals and households concerned. Relevant information in this respect is presented in tables A6.3.1 and A6.3.2 in the statistical annex.

Type of internet connection

Approximately 70 percent of the households with an internet connection had a broadband connection (ADSL or cable) in 2005; nearly one quarter still used a traditional analogue modem to gain access to the internet. This proportion has diminished in recent years in favour of broadband users. As already mentioned in Chapter 3, ISDN has become less popular. ADSL was by far the most popular type of internet connection for Dutch households in 2005.

6.1.2 Households with access to the internet by type of connection, 2002–2005 [1) 2)]



1) 2002 is based on the period July-December, 2005 on the second quarter and the other years are based on a continuous survey. 2002–2004 refer to the population aged 12 years and older. 2005 refers to the population aged 12 to 74 years.
2) More than one answer possible.
3) In 2005 cable and UMTS.

Source: Statistics Netherlands, POLS (population aged 12 years and older)/ICT survey 2005 (population aged 12 to 74 years).

Table A6.1.1 in the statistical annex breaks down the types of internet connection by various background characteristics. It shows that households in the province of Zeeland are least likely to have a dial-up internet connection. Around three-quarters of households with an internet subscription in this province have a cable connection; this is the equivalent of 90 percent of households with a broadband connection. One third of households with internet in the province of Friesland still use a dial-up connection. The proportion of ADSL connections was highest in the province of Zuid-Holland, where over half of households with internet have an ADSL connection. In addition to regional background characteristics, households and personal characteristics are also included in table A6.1.1. These show that ADSL is most popular among people with higher education, while cable connections are more common for people with a lower educational level.

Nearly all households (93 percent) with an internet subscription use a desktop computer to access the internet, although 27 percent (sometimes) use a laptop. Some people also use a mobile phone (12 percent) or palmtop (3 percent) for internet access. A number of households use more than one type of hardware to access the internet.

Chapter 3 already looked at the presence of ICT-related audiovisual equipment in Dutch households. Changes in Statistics Netherlands' ICT survey methods mean that comparable results are not available for 2005, although the 2005 ICT survey did contain similar questions. More information can be found in table 6.1.1 below. The table shows that 8 percent of households have a palmtop, 30 percent have a laptop and 91 percent have at least one mobile phone. As the variety of ICT hardware that households can use to access the internet is increasing, internet applications must be – or must be made – suitable for these devices.

Table 6.1.1
Household ownership of ICT equipment, 2005 [1]

	% of households
TV	98
Mobile phone	91
PC/desktop	83
Laptop	30
Games computer	25
Palmtop	8

[1] More than one answer possible.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

International perspective

Figure 6.1.3 places internet access and broadband connection rates in the Netherlands in an international perspective. It shows that home access to the internet is higher in the Netherlands than anywhere else in Europe. [2] In 2004 71 percent of Dutch households had access to the internet and 34 percent had this access through a broadband connection. Only in Denmark is broadband access higher. Denmark and the Netherlands are way ahead of the other EU countries in the figure.

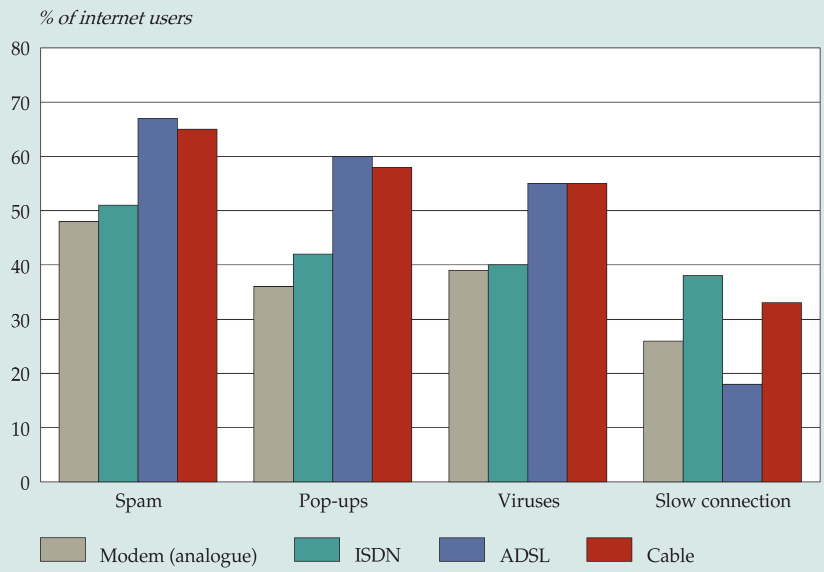
Internet: pros and cons

At the request of the Dutch Ministry of Economic Affairs, Dialogic set up a monitor to measure differences in internet use between narrowband and broadband users. In this context, narrowband users have a dial-up connection via an analogue modem or ISDN; broadband users have a connection via cable or ADSL. The monitor revealed large differences. For example, around 70 percent of broadband users access the internet several times a day, while for people with an analogue connection this is only 12 percent. More than half of people with a dial-up connection only access the internet once a day.

More than 80 percent of internet users use a search engine. There is hardly any difference in this respect between broadband and dial-up subscribers. There is a difference between the two groups in other internet activities, such as downloading audiovisual fragments. About 40 percent of broadband users do this, compared with 5 to 10 percent of narrowband users. This was to be expected as downloading pictures and music takes a long time with a slow connection, and sometimes even requires a broadband connection.

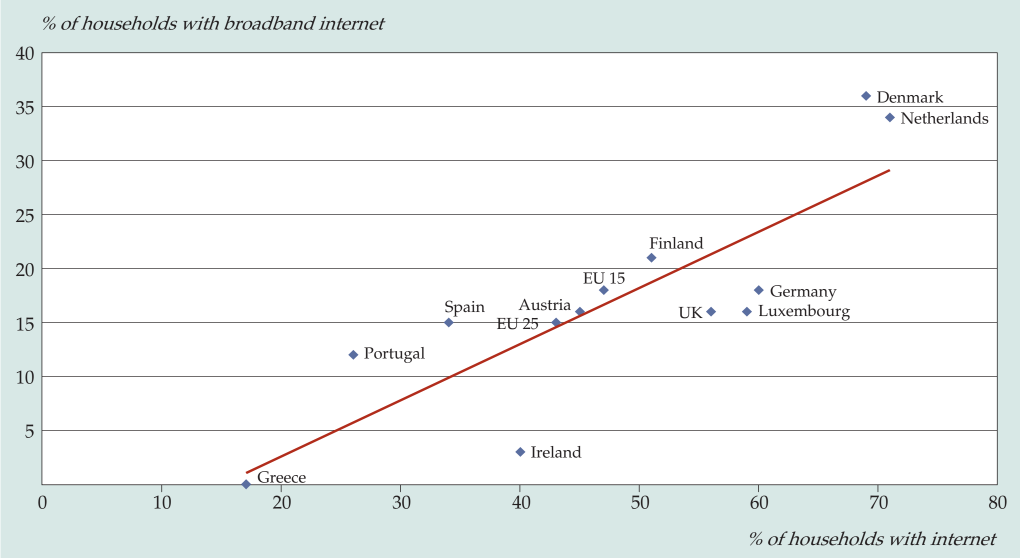
Disadvantages of internet use include spam, pop-ups and viruses: between 55 and 70 percent of broadband internet users are affected by these, compared with 35 to 50 percent of dial-up users. A large part of the latter group gets annoyed by the slow speed of the internet connection; a surprisingly large part of those who access the internet via cable also do so.

Annoyances of internet users by type of connection, 2004/2005



Source: Breedband en de Gebruiker 2004/2005, Dialogic (2005).

6.1.3 **Access to the internet and broadband internet, international, 2004**



Source: Eurostat, New Cronos.

6.2 *Internet use*

Although the intensity of internet use has increased in recent years, the differences between population groups are substantial. This section looks at this conclusion in more depth.

One indicator for the intensity of internet use is the average amount of time per week someone spends using the internet. In 2004 this was 7.3 hours a week, up from 5.9 hours in 2002. This time includes hours at home and at other locations. As the number of people using the internet has also increased, the volume of internet use – in terms of person-hours per week – rose to an average 66 million hours in 2004.

Naturally, not all groups of users contribute equally to this volume of internet use. Nearly half of the total average weekly volume in 2004 was realised by users aged 25 to 45, and people with broadband connections accounted for two-thirds of the volume. Within the broadband connections, cable users spent less time on the internet in 2004 than in 2002. For ADSL connections, this drop was even sharper: within this group, the average weekly number of hours spent on the internet fell from 15.2 in 2002 to 10.4 in 2004. Although this apparently contradicts the picture of increasing intensity of internet use, it is the result of a very substantial rise in the number of ADSL connections. Added to this, ADSL probably attracted 'heavy users' in the first instance, while people who switched to ADSL later were 'more average' users. The increased availability of ADSL and competition on the ADSL market may have speeded this process up: ADSL has become much cheaper in recent years, so

Table 6.2.1
Volume of individual internet use, by background variables, 2002–2004[1)]

	Number of persons			Average number of hours on the internet per internet user			Weekly volume			Distribution of weekly volume		
	2002	2003	2004	2002	2003	2004	2002	2003	2004	2002	2003	2004
	x million			*hours per week*			*x million hours*			*%*		
Total	7.9	8.4	9.0	5.9	6.5	7.3	46	55	66	100	100	100
Age												
12–17 years	1.0	1.0	1.1	5.2	6.4	7.6	5	7	8	11	12	13
18–24 years	1.1	1.2	1.2	6.6	8.1	8.8	7	9	11	16	17	16
25–34 years	1.8	1.8	1.9	6.3	7.3	8.5	12	14	16	25	25	24
35–44 years	1.8	1.9	2.0	5.9	6.5	7.2	11	12	15	23	22	22
45–54 years	1.3	1.4	1.6	5.7	5.9	6.8	8	8	11	16	16	16
55–64 years	0.7	0.7	0.9	4.9	4.7	5.0	3	3	5	7	6	7
65 years and older	0.2	0.3	0.3	4.6	3.2	3.7	1	1	1	2	2	2
Type of internet connection at home [2)]												
Analogue	3.7	3.3	2.4	4.5	4.4	4.4	16	14	11	35	27	16
ISDN	1.3	1.3	1.2	5.2	6.2	6.4	7	8	7	15	14	11
Cable	1.6	2.1	2.7	9.3	9.1	9.1	15	19	24	32	35	37
ADSL	0.3	0.8	1.8	15.2	11.6	10.4	5	9	19	10	17	29
Other/don't know	0.1	0.2	0.3	6.7	7.0	6.7	1	1	2	2	2	3
Only used internet elsewhere [3)]	0.9	0.8	0.7	3.3	3.9	4.3	3	3	3	6	6	5
Sex												
Men	4.4	4.6	4.9	7.0	7.7	8.6	31	35	42	67	65	64
Women	3.5	3.8	4.1	4.4	5.1	5.8	15	19	24	33	35	36
Level of education												
Primary	1.0	1.1	.	5.2	6.1	.	5	7	.	11	12	.
Lower secondary	0.7	0.8	.	5.1	6.1	.	4	5	.	8	9	.
Intermediate secondary	0.8	0.9	.	5.6	6.5	.	5	6	.	10	10	.
Advanced/senior secondary	3.0	3.1	.	5.6	6.2	.	17	19	.	36	36	.
Higher professional/university	2.4	2.4	.	6.8	7.3	.	16	18	.	35	33	.

1) The table is based on the reported average number of hours spent on the internet per week of internet users aged 12 years and older who used the internet in the month preceding the continuous survey, regardless of location and purpose. The hours include time spent on sending e-mail, but not data exchange. The 2002 figures are based on the period July–December.
2) The hours spent on the internet are not necessarily spent at home. The type of internet connection is given here as a background variable to make the differences in volume visible between users with broadband and with narrowband internet.
3) These are people with no internet connection at home, who did use the internet. The other categories are all people with an internet connection at home.

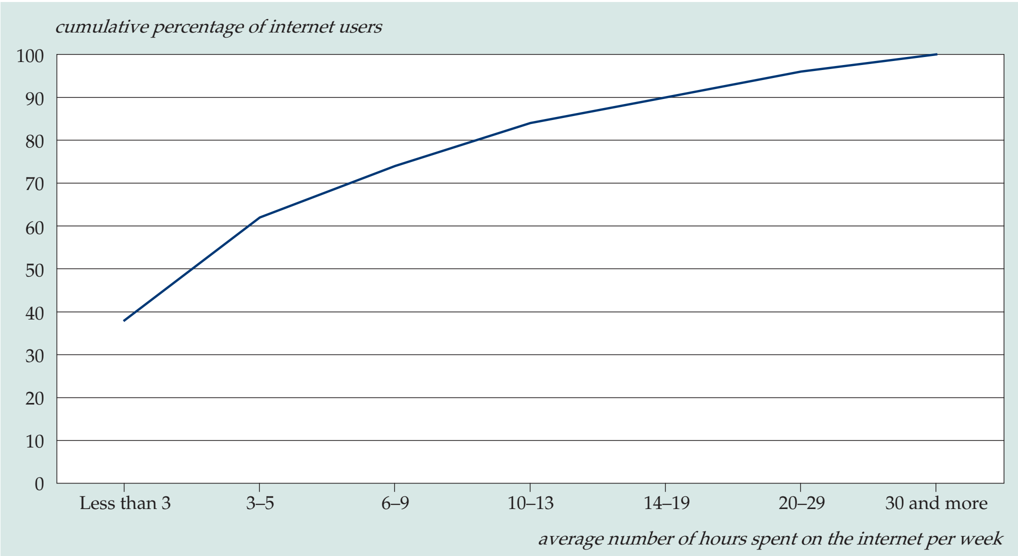
Source: Statistics Netherlands, POLS (population aged 12 years and older).

that more and more 'non-heavy' internet users have switched from a dial-up connection to ADSL. The choice between a dial-up and an ADSL connection is more and more being made in favour of ADSL. 3)

Men account for a larger share of internet use than women do. This is because more men than women use the internet and because they spend more time per week using it. Lastly, individuals with lower educational levels (primary education, junior vocational training) contribute relatively little to the volume of internet use. This is mainly because there are fewer users with lower than with higher educational levels.

Although internet users spent an average seven hours a week on the internet in 2004, most people use it less intensively: 60 percent of internet users spend less than five hours a week on the internet, and a quarter spends less than one hour a week. Figure 6.2.1 shows the corresponding cumulative distribution.

6.2.1 Cumulative distribution of internet users by weekly number of hours spent on the internet, 2004



Source: Statistics Netherlands, POLS (population aged 12 years and older).

Internet activities

Statistics Netherlands has surveyed the activities people carry out on the internet. The various activities are clustered in table 6.2.2 in the categories 'communication', 'information and entertainment' and 'transactions'.

Nearly everyone who uses the internet uses it to send and receive e-mail. A considerably smaller percentage chats via the internet. The age group 12 to 17 years contains mainly people who chat, but few e-mailers. This group may send few e-mails because they contact friends through chatting on the internet, and have less need for e-mail. For adults the opposite is true: few people who chat and many e-mailers; e-mail and chatting thus seem to work like communicating vessels.

People use the internet mainly to find information on goods and services. About half of them play or download games, pictures or music. More advanced activities, such as downloading software, are also a regular occurrence. Lastly, some households (16 percent) sell goods on-line, but more (38 percent) purchase goods and services. E-commerce is examined in more detail in the following paragraph.

Figure 6.2.2 places a number of household internet activities in an international perspective, such as sending e-mail and searching for information about products and services. In 2004 the number of people in the Netherlands carrying out these activities is higher than average in the EU. Denmark tops the list, although Finland leads the field for downloading games and music. In Germany, surprisingly, searching for information on goods and services is more common than sending e-mail. Below we shall see that many households in Germany use the internet to shop on-line, which may account for the high rate of searches for information about goods and services.

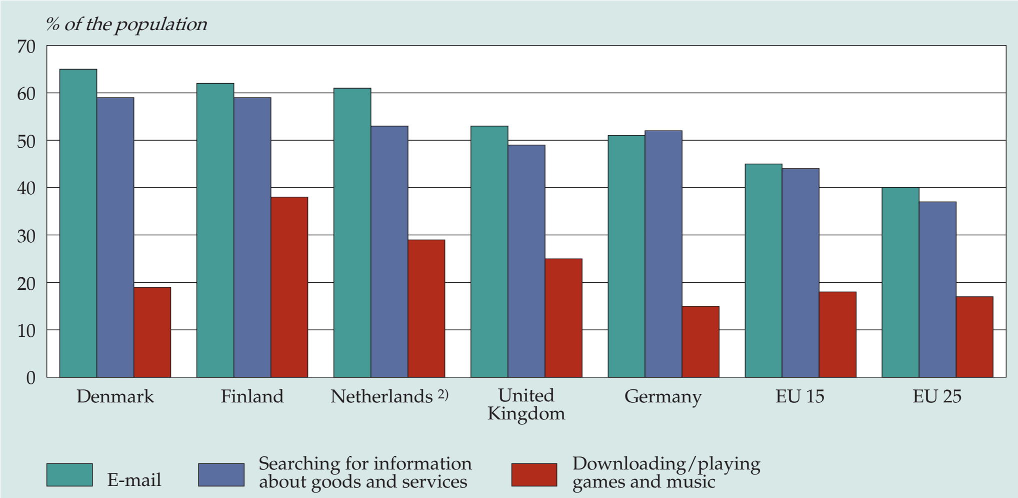
Table 6.2.2
Use of the internet for communication, information and entertainment, and transactions, 2005 [1)]

	% of internet users
Communication	
E-mail	86
Phoning via the internet	6
Others, e.g. chatting	38
Information and entertainment	
Searching for information about goods and services	81
Playing or downloading games, pictures and music	48
Using on-line travel services	46
Downloading or reading newspapers or newsletters	33
Downloading software	26
Listening to the radio or watching TV	24
Jobs searches and applications	18
Transactions	
On-line banking	55
Buying or ordering goods or services on-line	38
Selling goods or services on-line	16
Other financial services, e.g. buying shares	4

1) Population aged 12 to 74 years who used the internet in the month preceding the survey; more than one answer possible.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

6.2.2 **Internet activities, international, 2004** [1)]



1) In the three months preceding the survey.
2) In the month preceding the survey.

Source: Eurostat (population aged 12 to 74 years).

Diversity and sophistication of internet use

Although more people are using the internet and are using it more intensively, a large group still only uses it for one or two activities; for example only to send e-mail and browse. Table 6.2.3 counts the number of different internet activities per person. In Statistics Netherlands' survey, people could report 14 activities. These were: (1) sending/receiving e-mail, (2) posting in a chat room, (3) browsing; searching for specific information about: (4) education and courses, (5) topical affairs and news, (6) health, (7) commercial products and services, (8) work and vacancies, (9) government sites, (10) others; downloading software: (11) games, (12) music and (13) other software; and (14) on-line shopping.

One million people used the internet for only one specific activity, and nearly two and half million carried out only two or three different activities. On average, internet users perform five different internet activities, [4)] but four different activities is the most common.

The table shows that the average age of the group increases as the diversity in internet uses decreases. The number of hours spent on the internet is – logically – closely related to the number of activities: the fewer the activities, the less time spent on-line. For example, a person who carries out two internet activities spends less than four hours a week on the internet.

The older the internet users are, the less time they spend on the internet and vice versa. The correlation between internet use and age reveals a digital divide that goes

Table 6.2.3
Diversity of internet activities, 2004

Number of internet activities [1]	Number of internet users	Average number of internet hours	Average age of internet users
	x million	*hours per week* [2]	*years*
1	1.0	2.3	41
2	1.2	3.7	40
3	1.2	4.5	38
4	1.3	5.9	37
5	1.2	8.0	37
6	1.0	9.3	34
7	0.8	10.5	34
8	0.6	12.1	34
9	0.3	12.9	30
10	0.2	18.3	30
11 or more	0.2	20.1	30

[1] Internet activities by internet users in the four weeks preceding the survey, i.e.: e-mail, chatting, browsing, looking for specific information, including information about education/training, topical issues and news, government, health, commercial products and services, jobs and vacancies, others, free downloading of software, incl. music, games and other software, and on-line shopping.
[2] The number of internet users for whom the hours spent on the internet are known, may deviate (marginally) from the number of users for whom the number of activities or age is known; because of possible differences in response rates the values of the columns belong to the first column; the other columns are all in accordance with each other.

Source: Statistics Netherlands, POLS (population aged 12 years and older).

further than only the difference in ICT ownership between young and old people. Paragraph 6.3 looks more closely at this digital divide.

In addition to the diversity in what the internet is used for, the levels of how advanced on-line activities are also differs. Users can limit themselves to relatively simple activities such as browsing and sending e-mail; indeed over 2.4 million people in the Netherlands do just that. Some 6.5 million people carry out more complex activities such as downloading software, posting messages in chat rooms and shopping on-line.
The most advanced internet users are in the age group 12 to 24 years, the least advanced users in the group older than 54 years. This can partly be explained by the fact that many young people chat and download music through the internet, and partly by the fact that older people are less inclined to shop on-line (although, as we shall see below, they do spend more than average on-line). The table further shows that advanced internet users spend on average twice as long per week on the internet than less advanced users.

Table 6.2.4
Advancedness of internet use by age, 2004 1)

	Simple	Advanced
	% of internet users	
Total	27	73
Age		
12–17 years	14	86
18–24 years	14	86
25–34 years	22	78
35–44 years	26	74
45–54 years	33	67
55–64 years	45	55
65 years and older	61	39
	hours a week	
Average number of hours spent on the internet	3.9	8.7

1) People who only use e-mail or browse are 'simple' users; people who download software, chat via the internet or shop on-line are 'advanced' users.

Source: Statistics Netherlands, POLS (population aged 12 years and older).

In many areas, it emerges that there are large differences in the extent to which various population groups use the internet. Although this is partly caused by differences in spheres of interest, it is also the result of varying levels of ICT skills in the population (section 6.3 looks further into ICT skills). Of course, not everybody has to use the internet, but for internet service providers and for the government it is important to know which groups in society cannot be reached through the internet.

Shifting channels

Information and communication technology is making it possible to exchange information through more and more channels. Whether substitution – when one channel replaces another – results in more or less information being exchanged, or whether the exchange becomes better or worse, is a different issue. Whatever the case, the new media offer on-line news and may thus replace the old media.

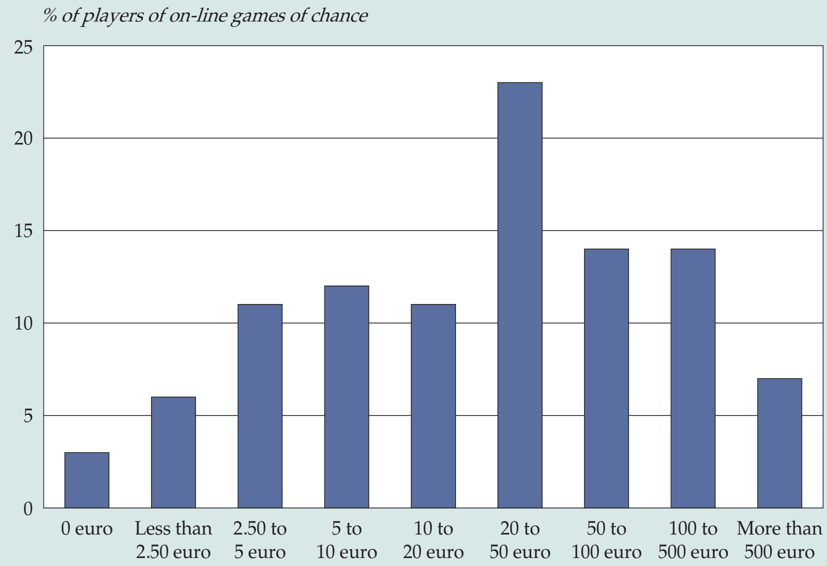
Households in which people keep up with the news on-line (54 percent) are less likely than average to subscribe to a newspaper (46 percent). Conversely, households that do not use the internet to follow the news (46 percent) are more likely to read newspapers (54 percent). These results may indicate shifts in media use, although no causal relation can be proven.

On-line games of chance

At the request of the Netherlands' gaming control board (*College van toezicht op de kansspelen*), 'Motivaction' conducted a study of the participation of the Dutch population in on-line games of chance. Although on-line games of chance are against the law, around 10 percent of internet users play them. [1] In over half of these games users have to pay to play.
The study revealed that 9 percent of people who played on-line games of chance did so daily, 19 percent played once a week and the majority played less frequently. Nearly one quarter of on-line players spend between 20 and 50 euro a year on on-line games of chance; more than a third of players spend more.

The study confronted on-line players of games of chance with a number of propositions about spending time and money on these games and zoomed in on the effects on work and studies. It turns out that 4 percent of on-line players have a serious problem and a quarter potentially have a problem; the latter group spent more time or money on on-lime games of chance than they had intended to, while the former group had run up debts, had trouble sleeping or experienced problems with their work or studies. Lastly, 70 percent of on-line players of games of chance are recreational players.

Amounts spent on on-line games of chance, 2004



Source: Kansspelen via nieuwe media 2004, Motivaction, 2004.

Note in the text

1) These are persons aged 18 to 55 who had played on-line games of chance in the 12 months directly preceding the study. The study included the following on-line games: casino games, bingo, scratch lotteries, and slot and fruit machines.

Not only has the number of newspaper subscriptions fallen, the population also makes less use of the postal services. The publication *Netwerken in cijfers 2004* (TNO, 2004) contains the results of a survey in which most of the population indicate that e-mail has led to a less frequent use of traditional mail services.

Summing up, we can say that part of the population makes limited use of the internet. Elementary activities such as sending e-mail, searching for specific information and browsing are the maximum they carry out. At the same time, it is clear that the majority of internet users do use the internet for a variety of activities. This may be a stage in the adoption process, in which more and more people will gradually make use of more and more possibilities of the internet. However, this process will not take a random course, as it is the older age groups who will lag behind.
The publication *Surfende senioren* (SCP, 2004) asks the questions whether it is necessary for all older people to use the internet, and whether it will become more difficult for them to participate in society if they do not. The publication points out that more and more provisions are (only) accessible through the internet. In the following section, we shall see that many older people have no interest at all in ICT, although the more highly educated older people do use the internet.

6.3 The digital divide

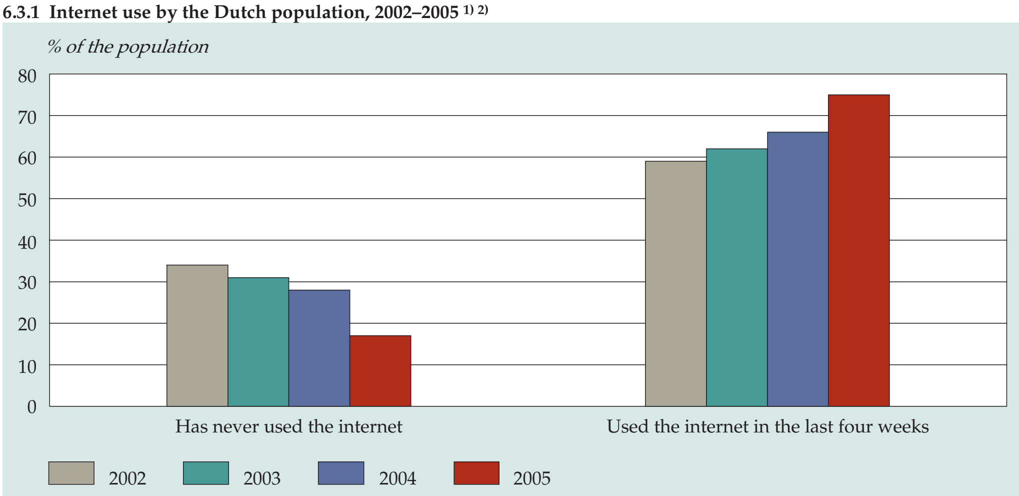
This section looks at the ICT skills of the Dutch population. Although this was also subject of section 2.8, that section examined them in the context of employment and focused on professional ICT skills of the active labour force. This section looks mainly into how people use ICT at home. Before looking at new perspectives in this section, let us look at the *digital divide*.

Internet 'virgins'

Twenty-eight percent of the Dutch population – nearly four million people – had never been on the internet in 2004. In 2005 this had dropped to 17 percent of the population, although the population in this respect had been narrowed to 12 to 74 year-olds, compared with everyone over twelve prior to that. This flatters the percentage in 2005: if the over-75s had been included, the percentage of the population with no internet experience would be higher.

The fact that part of the population has absolutely no internet experience at all, justifies the use of the term *digital divide*. If the lack of internet experience is systematically encountered in one specific group, we can speak of a social divide in ICT use. Older people are behind other groups in society in the area of ownership or access to ICT devices. Moreover, in the last section it became clear that most older

6.3.1 Internet use by the Dutch population, 2002–2005 [1) 2)]



1) Results for 2002 are based on July–December only. Results for 2005 are based on a survey conducted in the second quarter of 2005, the results for other years are based on a continuous survey.
2) 2005: population aged 12 years and older; 2002–2004: population aged 12 to 74 years.

Source: Statistics Netherlands, POLS (population aged 12 years and older)/ICT survey 2005 (population aged 12 to 74 years).

people use the internet for less advanced activities and less diverse purposes than other groups in the population.

Most people who do not have internet at home do not want it. Table 6.3.1 sums up the other reasons given by the population for not having internet at home. Nearly 20 percent say it costs too much, and 11 percent say that a lack of knowledge or skills is the reason.

Various background characteristics of persons and households correlate to access to and use of the internet. In the statistical annex to chapter 6, table A6.3.1 breaks down pc ownership and internet access by a number of background characteristics. Among other things, the table shows that internet access is highest in the provinces of Flevoland and Utrecht and lowest in the province of Zeeland. In addition, more men than women and more highly educated than less educated people own a pc and have access to the internet.

The relationship between internet experience and various background variables gives the following picture: people who have never used the internet can be found among single people, one-parent families, people from non-urban communities, people without work and people who are not in any form of education rather than among couples, people in urban communities, people in employment and students

Table 6.3.1
Reasons for not having an internet connection at home, 2005 [1)]

	% of people without internet
Does not want internet, not interested, not useful	65
Too expensive (hardware, installation, telephone or subscription charges)	19
Can access the internet elsewhere	12
Insufficient knowledge or skills	11
Worried about privacy and/or security	2
Physical limitations	1
Other	23

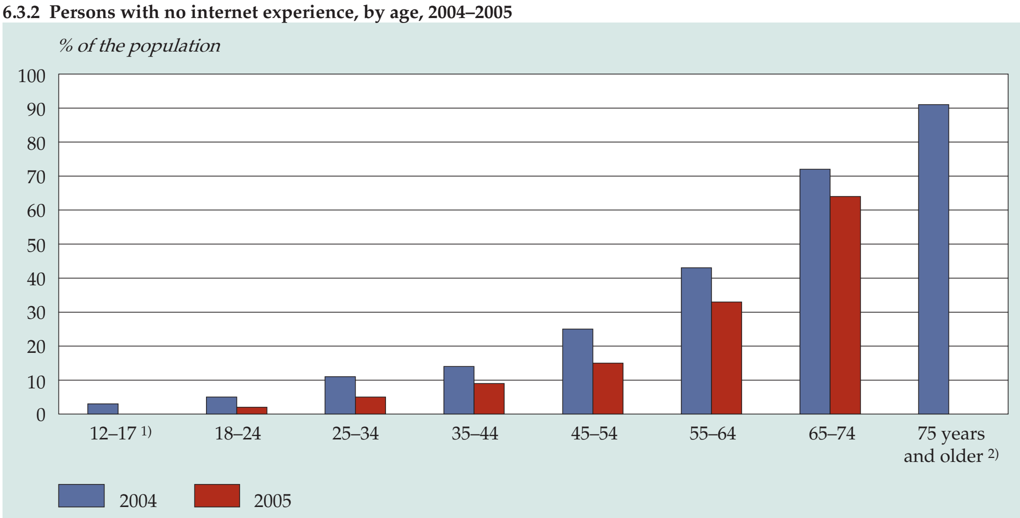
1) Population aged 12 to 74 years with no access to the internet at home; more than one answer possible.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

(CBS, 2005a). As figure 6.3.2 shows, whether or not people use the internet depends most strongly on their age.

The percentage of people with internet experience declines as older population groups are examined. Broken down by educational level, half of more highly educated over-65s do have experience on the internet, while among those with lower educational levels this is considerably less. In other age categories, too, educational level correlates strongly with internet experience. This makes it clear

6.3.2 Persons with no internet experience, by age, 2004–2005



1) The value of the category '12–17 years' in 2005 is 0 percent.
2) Persons aged 75 years and older were not included in the survey in 2005.

Source: Statistics Netherlands, POLS (population aged 12 years and older)/ICT survey 2005 (population aged 12 to 74 years).

that the digital divide is not present for all older age groups, but that higher ages do play a role in the use of pc and the internet.

Table A6.3.2 in the statistical annex gives absolute population numbers per age category without internet experience. It shows that in 2004 around 1.7 million over-65s had no internet experience; in the group of 18 to 24 year-olds this is less than 70 thousand.

Lastly and quite interestingly, about one in ten people who report having no internet experience do have access to the internet at home (CBS, 2005a). Presumably, someone else in the household does use the internet. So although these people are not completely isolated, they simply ignore the internet. This is another illustration of the lack of interest in the internet.

Internet outside the home

A small group of people in the Netherlands, some 250 thousand people, only use the internet outside their own home. The fact that this group is only small was to be expected, as most people who want to have access to the internet will have taken the necessary measures at home. It even turns out that most of the people who only use the internet away from home do have access to the internet at home, which makes it more of a challenge to find out why they only use it away from home. Part of the explanation may lie in the design of Statistics Netherlands' survey. The survey asks respondents about access to the internet in the month preceding the survey. It may have been the case that this small group normally uses the internet at home, but incidentally did not do so in the period concerned. However, this is hardly a satisfactory explanation; probably a large part of this group does not use the internet for a wide range of purposes and only uses it for simple activities. For example, people who only send e-mail and only do this at work. However, part of the group does use the internet in a diverse and advanced way, and this requires an alternative explanation. Table 6.3.2 presents a number of possible reasons.

Surprisingly, a large part of the group who uses the internet only outside their own home have a slow connection, although there are also people with a broadband connection. The group further comprises more women than men, and notably mainly divorced and unmarried people. However, it is difficult to interpret how this is connected with these results.
People who only use the internet outside their own home do this mainly at work or at the homes of relatives, neighbours and friends. They spend an average 4 hours a week on the internet, while those who use the internet at home are on-line for 7.7 hours a week.
The percentage of people shopping on-line is larger among people who use the internet at home than in the group who use the internet only outside their home. The

same applies to the percentage of people visiting chat rooms. People who use the internet only outside their own home mainly use it to search for specific information. People who use the internet both at home and elsewhere use it at work or at the homes of relatives, neighbours and friends. Students often use it at their place of education. Table A6.3.3 in the statistical annex to chapter 6 presents an international overview of the extent to which people use the internet at work. This reveals that relatively many people in Portugal use the internet at work, and in the Netherlands, too, the percentage of people accessing the internet at work is higher than in average in the EU. On the one hand, this provides information about internet use at work; on the other hand, people may use the internet at work because they cannot do so at home.

Table 6.3.2
People who only use the internet outside their own home compared with people who use the internet both at home and elsewhere, 2004 [1)]

	Accesses the internet only elsewhere	Accesses the internet at home (and elsewhere)
	% of internet users [2)]	
	3	97
	% of total in this group	
Sex		
Men	42	55
Women	58	45
Has an analogue connection at home	48	29
Internet activity		
Purchased a product on-line recently	10	33
Searched for specific information	72	86
Sent/received e-mail	61	84
Browsed	27	41
Chatted	10	27
	hours per week	
Average number of hours on the internet	3.9	7.7

1) In the month preceding the continuous survey.
2) Aged 12 years and older.

Source: Statistics Netherlands, POLS (population aged 12 years and older).

ICT skills

ICT skills are skills that enable people to use ICT hardware and software. These skills have become more relevant in recent years, as ICT applications are playing an increasingly important role in society.

Most people use computers and the internet at home, at work or at school and in this way have become proficient in ICT use.
Table 6.3.3 presents information on people who have taken a computer course of at least 3 hours. This shows that nearly half of the population have received some form of instruction regarding computers, although for 57 percent of them this had been completed more than 3 years prior to the survey. The number of people who have never had any form of computer education is largest among the 12 to 17 year-olds.

Table 6.3.3
People who have had some form of computer training or done a computer course, 2005[1)]

	% of the population
Total	46
Age	
12–17 years	27
18–24 years	48
25–34 years	52
35–44 years	53
45–54 years	54
55–64 years	45
65–74 years	29
	% of those with training
When was the most recent course/training?	
In the last 3 months	10
Between 3 months and 1 year ago	11
Between 1 and 3 years ago	22
Longer than 3 years ago	57

1) Percentage of the population aged 12 to 74 years who have ever had computer training for at least 3 hours.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

ICT skills can be divided into computer and internet skills. They vary from being able to use a mouse to being able to design a website. Table 6.3.4 gives information on the extent of skills among 12 to 74 year-olds.[5)] Many restrict themselves to carrying out a few simple computer activities. The ‘turning point’ occurs at being able to ‘use simple formulas in a spreadsheet’; this is the first of three surveyed computer skills that only a minority of users are able to accomplish.
As far as internet skills are concerned, most people can use search engines and e-mail programmes. Other internet activities require ICT skills that only a minority say they have. The results confirm the picture in the previous section: part of the population uses ICT for elementary activities that (only) require basic skills.

Table 6.3.4
Computer and internet skills, 2005[1)]

	% of the population
Computer skills	
Can use a mouse	86
Can copy or move a file or folder	73
Can copy or paste information in a document	71
Can use simple formulas in a spreadsheet	44
Can condense folders or files	39
Can write a computer program	12
Internet skills	
Can use a search engine	79
Can send an e-mail with an attachment	69
Can post messages in chat rooms, news groups or message boards	20
Can use the internet for phone calls	16
Can design a webpage	14
Can share folders with other users to exchange music, films, etc.	6

1) Population aged 12 to 74 years, more than one answer possible.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

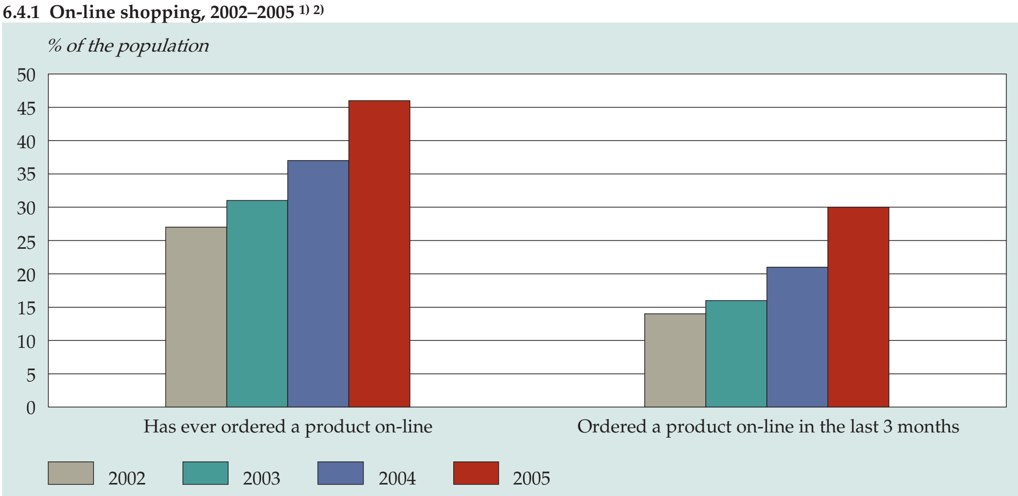
In summary, it can be stated that the primary digital divide is reflected in the difference in pc ownership and internet access between mainly the older and the younger generations. There is a second divide within the group who do use the internet, namely with respect to the intensity, diversity and sophistication of internet use. This difference is also visible between older and younger internet users.

6.4 *On-line shopping*

On-line shopping, or e-shopping, includes the purchase or ordering of goods or services through the internet. On-line shopping is a form of e-commerce. This section describes on-line shopping and various related subjects, for example, types of goods ands services bought on-line, amounts spent and reasons for not shopping on-line. Furthermore, the Netherlands is compared with other EU countries in this respect.

Specialists call the market for on-line shopping the Business-to-Consumer market (B2C market). It includes only private purchases from various locations. Looking up product information or finding them by accident and then buying or ordering them through traditional channels – so-called off-line shopping – is not included in the B2C market. By this definition, nearly half of the population shopped on-line at least once in 2005. Nearly one third of the population had done so recently, i.e. in the three months directly preceding the survey.

6.4.1 On-line shopping, 2002–2005 [1) 2)]



1) Results for 2002 are based on July–December only. Results for 2005 are based on a survey conducted in the second quarter of 2005, the results for other years are based on a continuous survey.
2) 2005: population aged 12 years and older; 2002–2004: population aged 12 to 74 years.

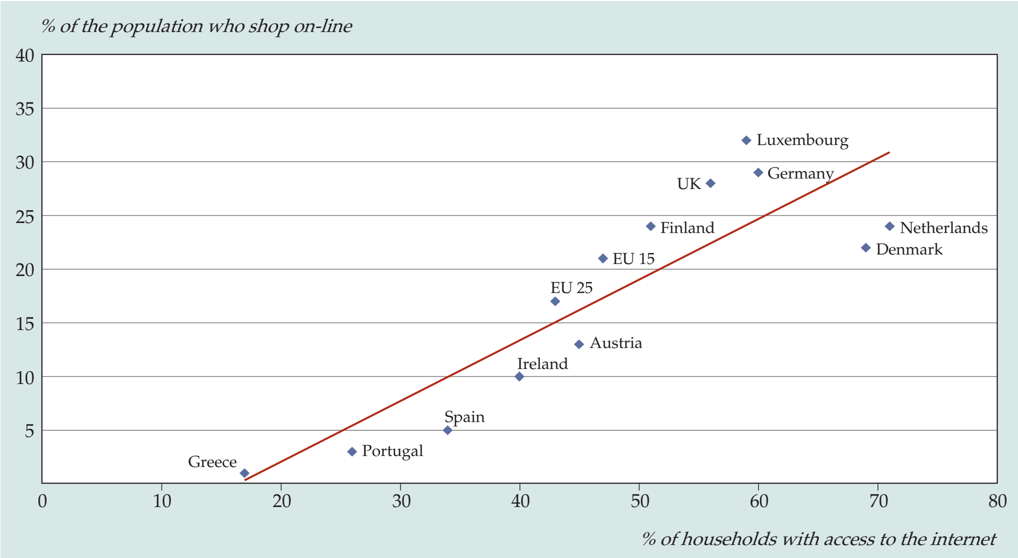
Source: Statistics Netherlands, POLS (population aged 12 years and older)/ICT survey 2005 (population aged 12 to 74 years).

About 65 percent of people who had bought a product or service on-line had done so recently; in 2002 this was still only 51 percent. This would seem to indicate a rise in the purchase frequency per person, which is also reflected by the fact that the group who had purchased goods and services on-line recently grew more strongly than the group that had ever bought anything on-line. Table A6.4.1 of the statistical annex presents on-line shopping in the Netherlands by various personal and household background variables. This shows that the province of Zeeland has the lowest percentage of e-shoppers, and the province of Utrecht the highest. It also shows that the percentage of people who shop on-line is higher among higher educated than among less educated people.

International perspective

Relatively speaking, the number of people who shop on-line in the Netherlands is higher than the EU average. Only in Luxembourg, Germany and the United Kingdom is the percentage higher. Figure 6.4.2 illustrates this; it compares on-line shopping by the public with internet access of households, assuming that in a country where more households have access to the internet, more people will be able to shop on-line. This is not necessarily the case, however, as can be seen for the Netherlands and Denmark. Although more people than average shop on-line, this percentage is lower than ‘expected’ in view of the large number of households with internet access.

6.4.2 On-line shopping, international, 2004



Source: Eurostat (population aged 12 to 74 years).

Why people do not shop on-line

Reasons internet users give for not shopping on-line are listed in table 6.4.1. Most people prefer to shop traditionally. They are hesitant about buying products and services on-line, as they perceive risks in the area of security, privacy and confidentiality. A surprisingly large number of people also indicate that reasons other than those specified in the survey play a part.

Table 6.4.1
Reasons not to shop on-line, 2005 1)

	% of non-shoppers
Prefers to shop 'traditionally'	65
Doesn't find it necessary	38
Doesn't think it is safe, prefers not to submit credit card information via the internet	35
Is concerned about privacy, prefers not to submit personal information via the internet	28
Has doubts about delivery, returning goods or handling of complaints	22
Has too little experience, doesn't know how to shop on-line	14
Does not have a credit card which can be used to pay on the internet	9
It is difficult to have the goods sent to home address	3
Thinks it is too expensive	2
Internet connection is too slow	2
Thinks delivery time is too long	1
Other reason	53

1) Percentage of people aged 12 to 74 years with internet experience who have never shopped on-line or shopped on-line more than one year previously; more than one answer possible.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

On-line shopping: what and how much?

More than one third of all on-line shoppers report having booked a travel ticket or holiday through the internet in 2005. Buying books and magazines on-line is also very popular. The composition of goods bought on-line has remained stable in recent years.

Table 6.4.2
On-line purchases by category, 2002–2005 [1]

	2002	2003	2004	2005
	% of on-line shoppers [2]			
Travel, holidays, accommodation	30	33	37	35
Literature (books, magazines)	33	31	29	31
Clothes, sports items	23	24	24	28
Hardware, electronic equipment [3]	16	18	17	26
Tickets for events	18	20	21	22
Videos, DVDs, music [4]	24	23	24	21
Software	10	12	12	15
Shares, financial services, insurance	9	8	9	5
Groceries	7	3	4	4
Other	22	26	29	26

[1] 2002–2004: population aged 12 years and older; 2005: population aged 12 to 74 years. In 2005 the survey was held in the second quarter and the purchases concerned were made in the preceding twelve months. 2002 refers only to the period July–December.
[2] Purchases in the 3 months preceding the continuous survey.
[3] In 2005 these were two separate categories.
[4] In 2005 this was the category ‘film, music’.

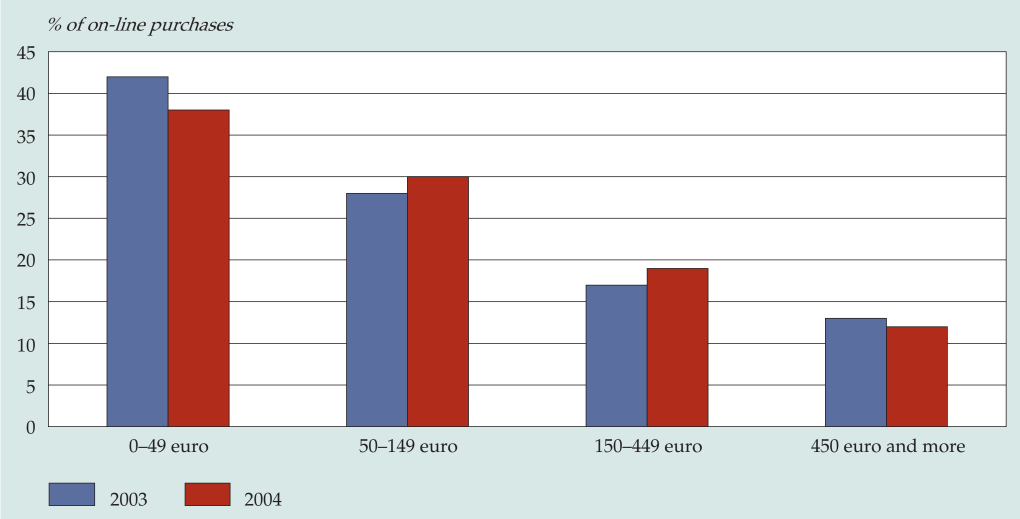
Source: Statistics Netherlands, POLS (population aged 12 years and older).

Further analysis of the figures shows that men mainly buy videos, DVDs, music, hardware and software, electronics, financial services and insurance through the internet. Women buy mainly clothes (CBS, 2005a).

The average amount buyers spend per transaction rose from 242 euro in 2002 to 294 euro in 2004. The products purchased contributed varyingly to this average: books and magazines cost relatively little and restrain the average, while spending on holidays pushes it upwards.
The amount spent on-line has a positive correlation with age. Among other things, this is caused by the relationship between age and on-line holiday bookings: the share of older people who book holidays on-line is higher than average. The amount is also connected to sex and household composition: men spend more than women do, and childless couples spend more than single people and single-parent families (CBS, 2005a).

In figure 6.4.3 the amounts spent are divided into categories. The figures show that most items purchased cost less than 50 euro. This may be the purchase of one or more books, CDs, DVDs or videos.

6.4.3 Average amount spent on on-line purchases, 2003–2004 [1)]



1) The amounts refer to the most recent on-line purchase; this may have comprised more than one product.

Source: Statistics Netherlands, POLS (population aged 12 years and older).

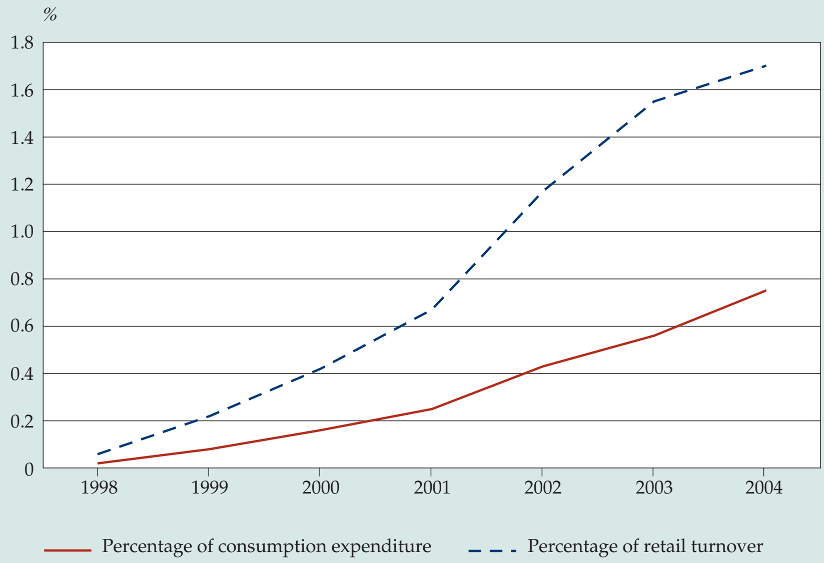
Consumer-to-Consumer (or C2C) trade also makes up part of on-line shopping: C2C transactions are purchases by a consumer from another consumer, through an auction or marketplace site. It is not known exactly how much of total on-line spending these transactions account for.
Nearly one quarter of on-line shoppers provided credit card information for an on-line purchase in 2002. In 2004 this had risen to 29 percent of on-line shoppers. Table 6.4.1 showed that 35 percent of non-shoppers give the requirement of providing credit card information as a reason not to buy on-line. The percentage of shoppers paying with a credit card is not very large among those who do shop on-line. Section 6.5 looks more closely at security aspects of internet use, such as viruses and authentication.

Turnover of Business-to-Consumer (B2C) e-commerce

Total on-line consumer spending by households is rising. Statistic Netherlands has estimated the amount by relating on-line shopping by consumers to on-line sales by companies to consumers. This gives an annual turnover of between 1,600 and 1,900 million euro in the period 2003–2004.

According to *Blauw Research and Thuiswinkel.org* the B2C annual turnover was 1,680 million euro in 2004. Blauw Research uses a different research method, but the results correspond with those of Statistics Netherlands. On-line consumer spending rose further to more than one billion euro in the first six months of 2005, according tot Blauw. The increase in B2C turnover in recent years is the result of a continual increase in the number of on-line buyers, the number of orders per buyer and the amount spent per order.
How much does total B2C turnover contribute to the Dutch economy? Comparing the time series of on-line consumer spending according to Blauw with total consumer spending of households – 225 billion in 2004 – results in a share of just over 0.7 percent. Compared with the turnover of retail sales in the Netherlands – 80 billion euro in 2004 – it accounts for 1.7 percent. So, although the role of the internet as a retail channel is growing, the data show on-line shopping to be of little macroeconomic relevance.
However, e-commerce may be very important for one individual company, for example if a large part of its total turnover is generated via on-line sales. There is no doubt that the internet as a channel is very relevant: product and price information have become more widely available and many consumers search the internet for what to buy, and then go out and buy it traditionally in a shop. For now, interaction is more important than the actual transaction.

Share of e-commerce turnover in consumption expenditure and retail turnover, 1998–2004



Source: Statistics Netherlands, Thuiswinkel.org/Blauw Research.

Problems with on-line shopping

What is the experience of people who have ordered products and services on-line? In addition to problems with payment there are other difficulties; they are summed up in table 6.4.3. The problem reported most often was that the delivery was later than promised; some 13 percent of on-line shoppers report this problem. Around 6 percent report problems with finding information about product guarantees. Overall, though, the experiences of on-line shoppers are not so bad. This is not unimportant, as good experiences will lower the threshold for buying items through the internet more often. The actual experiences of shoppers do not correspond to the 'prejudices' that non-shoppers have with respect to on-line shopping (see table 6.4.1).

Table 6.4.3
Problems encountered by on-line shoppers, 2005 1)

	% of on-line shoppers
Delivery took longer than indicated	13
Difficulty finding information about guarantees	6
Doubts about payment security	6
Wrong goods delivered	4
Damaged goods delivered	3
Delivery charges were higher than indicated	2
Overall price was higher than indicated	2
Difficulties placing complaints and/or receiving refund	2
Unsatisfied with handling of complaints	2
Other problem	3

1) Population aged 12 to 74 years who purchased or ordered goods on–line in the 12 months preceding the survey. More than one answer possible.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

6.5 *Security aspects*

This section examines security aspects of ICT and preventive measures that internet users take in this respect. It looks for example at the extent to which people are affected by computer viruses. Chapter 3 already looked at spam and viruses in general, which are usually taken together under the term 'malware'.

Many internet users receive spam and viruses: more than half the population received spam in 2005 and one third reports having been affected by a computer virus. Just over one third of internet users report having had no on-line security problems.

Table 6.5.1
Internet use: security and security problems, 2005

	% of internet users [1]
Security	
Anti-virus programme	92
Firewall via hardware or software	62
Neither of above	5
On-line confirmation by means of password, pin code or digital signature (authentication)	62
	% [2]
Update of anti-virus programme or firewall	84
	% [3]
Security problems	
Spam	54
Computer virus resulting in loss of information or time	32
Misuse of personal information submitted via the internet	2
Credit card fraud or other financial problem	1
Other security problem	4
No security problems	36

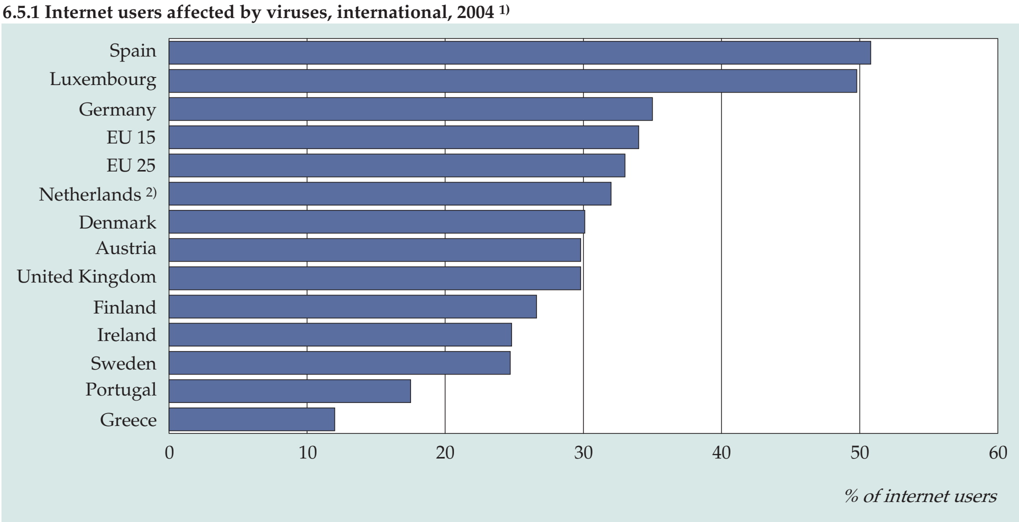
1) Aged 12 to 74 years, who had these features in the 3 months preceding the survey.
2) Percentage of internet users who had updated these features in the 3 months preceding the survey.
3) Percentage of internet users who had been affected by these problems in the 12 months preceding the survey.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

Nearly everyone accessing the internet uses anti-virus software or a firewall. In spite of this, viruses still affect Dutch internet users, although the percentage affected is slightly lower than average in the EU 15 and the EU 25. Germany has relatively most users affected by viruses, while Greece has the smallest percentage.

Authentication is also a way to increase safety on the internet. Authentication entails confirming user 'identity' by using a password, pin code or digital signature. Relatively many internet users in the Netherlands do this. The use of authentication is not only relevant for users; the supplier of the services must also offer this opportunity.
Summing up, we can say that viruses and spam constitute a threat to on-line security as a relatively large part of the population are affected by them in spite of measures they take to prevent this. Such activities and those going even further, such as 'phishing', undermine the public's faith in and user-friendliness of the internet.

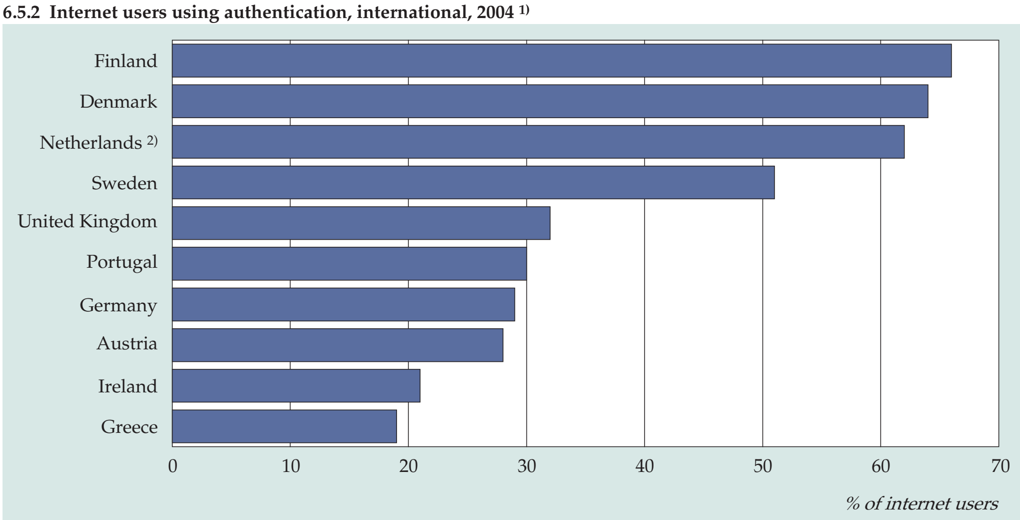
6.5.1 Internet users affected by viruses, international, 2004 [1)]



1) Internet users suffering virus effects leading to loss of information or time in the 12 months preceding the survey.
2) Second quarter 2005.

Source: Eurostat, Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

6.5.2 Internet users using authentication, international, 2004 [1)]



1) Use of a password, pin code or digital signature in the 3 months preceding the survey.
2) Measurement in the second quarter of 2005; other countries: measurement in 2004.

Source: Eurostat, Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

Notes in the text

1) In Statistics Netherlands' ICT survey, only people aged between 12 and 74 years were surveyed in 2005, while in 1998–2004 the survey included the whole population. The survey design was different in 2005: respondents were interviewed by telephone, while in previous years they were interviewed face-to-face; the sample was also smaller in 2005. The change in the method was probably the cause of the kink in the figure. By recalculating the data for 2004 to the population aged 12 to 74, the trend break is smaller. The kink moves back a year. Another implication of the survey for 2005 is that although the sample is restricted to the households of respondents aged between 12 and 75 years, these households may also comprise people older than 75 or younger than 12 years. The sample data are corrected for this by assigning them a household weight.

2) In figure 6.1.1, internet access for the Netherlands in 2004 is estimated at 70 percent. The percent point difference is caused by the fact that in the EU the population aged 16 to 74 is included, instead of 12 to 74.

3) Not all the hours spent on the internet necessarily used the connection concerned. In the table, the type of connection is considered as a personal characteristic, to see whether it could explain any differences. The hours may well have been realised at another location than at home. However, this has a negligible effect; internet use at home turns out to be most intensive. There is further no reason to suppose that the duration of internet use is higher elsewhere than at home; this even turns out to be lower (CBS, 2005).

4) This refers to five of the activity categories, including the rest category 'other activities than mentioned'. This rest category counts as one activity, but may refer to more than one.

5) Although carrying out one of the specified activities was perhaps not necessary for the respondent at the time of the survey, if the activity is not reported it is seen as an indication of poor ICT skills.

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Statistical annex

Chapter 2

Chapter 3

Chapter 4

Table A2.2.1
The ICT sector compared to the Dutch economy, 1995–2004

	1995	After revision 1)			
		2001	2002	2003*	2004*
	million euro				
Production value					
ICT industry sector 2)	10,661	15,354	13,480	12,296	12,379
ICT services sector	13,944	36,255	36,934	37,460	38,601
of which					
post and telecommunication	9,762	21,510	23,026	23,958	24,590
computer service bureaus	4,182	14,745	13,908	13,502	14,011
Total ICT sector	24,605	51,609	50,414	49,756	50,980
Netherlands	552,315	853,164	870,427	883,642	912,942
Share of ICT sector in the economy (%)	4.45	6.05	5.79	5.63	5.58
Gross value added					
ICT industry sector 2)	3,609	2,759	2,045	2,042	2,023
ICT services sector	9,068	17,454	18,680	19,235	19,816
of which					
post and telecommunication	6,408	9,241	10,906	11,592	11,838
computer service bureaus	2,660	8,213	7,774	7,643	7,978
Total ICT sector	12,678	20,213	20,725	21,277	21,839
Netherlands	281,464	397,556	414,374	425,093	435,184
Share of ICT sector in the economy (%)	4.50	5.08	5.00	5.01	5.02
Investments					
ICT industry sector 2)	719	1,213	1,016	900	.
ICT services sector	2,013	5,269	3,112	2,787	.
of which					
post and telecommunication	1,745	4,620	2,632	2,260	.
computer service bureaus	268	649	480	527	.
Total ICT sector	2,732	6,482	4,128	3,687	.
Netherlands	61,347	94,673	92,862	90,747	94,641
Share of ICT sector in the economy (%)	4.45	6.85	4.45	4.06	.
	fte jobs (x 1,000)				
Labour input of employed persons					
ICT industry sector 2)	68	65	62	57	55
ICT services sector	132	241	226	214	204
of which					
post and telecommunication	80	115	106	100	94
computer service bureaus	52	126	120	114	110
Total ICT sector	200	306	288	271	259
Netherlands	5,663	6,636	6,620	6,563	6,454
Share of ICT sector in the economy (%)	3.53	4.61	4.35	4.13	4.01

1) Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.
2) Estimated values for 2003 and 2004.
3) For investments, the ICT industry is defined as SBI 30–33. The investment data are not detailed enough to present them according to the internationally agreed definition for the ICT industry.

Source: Statistics Netherlands, National Accounts.

Table A2.2.2
Share of the ICT sector in the value added of the business sector, international, 1995 and 2001

	1995	2001
	%	
EU 15 1)	7.1	8.6
Belgium 2)	5.4	7.0
Denmark 2)	8.2	8.7
Germany 3)4)	5.7	6.8
Greece 3)4)5)	4.8	6.3
Spain	6.2	8.1
France	8.0	8.4
Ireland	.	13.1
Italy 2)	6.0	7.4
Netherlands	8.8	9.6
Austria 2)	8.2	8.7
Portugal 3)6)	7.6	8.1
Finland	8.4	16.4
Sweden	8.3	9.3
United Kingdom	9.6	11.2
Canada	6.8	7.8
Japan 4)7)	7.2	7.8
United States 6)	10.6	11.4
South Korea 3)	11.0	12.2

1) Excluding Luxembourg.
2) 2002 instead of 2001.
3) Rental of ICT goods (ISIC 7123) is not available.
4) ICT wholesale is not available.
5) Postal services included in telecommunication services.
6) 1996 instead of 1995.
7) Computer related services (ISIC 72) are partially included.

Source: OECD, Information Technology Outlook 2004.

Table A2.2.3
Venture capital invested in ICT, international, 1999–2002

	Venture capital	among which for ICT			Share of ICT venture capital in total venture capital
		total	of which invested in ...		
			communication technology	information technology	
	% of GDP				%
EU 15 [1]	0.31	0.08	0.04	0.04	25
Belgium	0.20	0.08	0.04	0.04	42
Denmark	0.13	0.05	0.02	0.03	40
Germany	0.18	0.05	0.02	0.03	29
Greece	0.08	0.03	0.02	0.02	40
Spain	0.16	0.03	0.01	0.01	17
France	0.30	0.10	0.05	0.04	32
Ireland	0.13	0.11	0.03	0.08	80
Italy	0.20	0.05	0.04	0.01	25
Netherlands	0.44	0.11	0.05	0.06	26
Austria	0.07	0.03	0.01	0.02	39
Portugal	0.10	0.03	0.02	0.01	31
Finland	0.25	0.09	0.04	0.05	35
Sweden	0.73	0.15	0.05	0.10	21
United Kingdom	0.68	0.14	0.06	0.07	20
Canada	0.37	0.24	0.08	0.16	66
Japan	0.03	0.01	0.00	0.01	33
United States	0.56	0.34	0.15	0.19	60
South Korea	0.31	0.12	0.07	0.06	40

[1] Excluding Luxembourg.

Source: OECD, Information Technology Outlook 2004.

Table A2.2.4
Number of companies in the ICT sector, 1995–2004 1)

	1995	2000	2001	2002	2003	2004
	number					
Total ICT sector						
Number of companies	10,640	19,640	22,660	23,845	23,920	25,235
Births	1,870	3,860	3,095	2,530	2,455	2,725
Bankruptcies	166	192	419	511	406	327
Ratio births/bankruptcies	11.3	20.1	7.4	5.0	6.0	8.3
of which						
ICT industry sector						
Number of companies	895	1,250	1,135	1,435	1,275	1,125
Births	50	90	75	40	45	45
Bankruptcies	11	10	17	21	20	12
Ratio births/bankruptcies	4.5	9.0	4.4	1.9	2.3	3.8
ICT services sector						
Number of companies	9,745	18,390	21,525	22,410	22,645	24,110
Births	1,820	3,770	3,020	2,490	2,410	2,680
Bankruptcies	155	182	402	490	386	315
Ratio births/bankruptcies	11.7	20.7	7.5	5.1	6.2	8.5
among which						
Computer service bureaus						
Number of companies	6,875	14,020	16,770	17,560	17,790	18,495
Births	1,390	3,190	2,615	2,100	1,940	2,255
Bankruptcies	79	104	275	349	296	215
Ratio births/bankruptcies	17.6	30.7	9.5	6.0	6.6	10.5
Telecommunication companies						
Number of companies	280	780	1,125	1,100	1,200	1,385
Births	50	270	135	205	205	160
Bankruptcies	4	8	39	29	17	15
Ratio births/bankruptcies	12.5	33.8	3.5	7.1	12.1	10.7
Total Netherlands						
Number of companies	608,090	694,085	702,285	689,625	685,775	701,685
Bankruptcies	4,783	3,579	4,329	4,963	6,386	6,648
Number of companies 2)	386,360	473,095	482,295	486,575	487,115	497,760
Births 2)	32,500	35,960	35,025	32,785	31,000	33,380
Bankruptcies 2)	4,078	3,090	3,734	4,093	5,226	5,297
Ratio births/bankruptcies	8.0	11.6	9.4	8.0	5.9	6.3

1) The ICT sector in this table is defined slightly different than in the tables and figures based on the National Accounts. It meets exactly the internationally agreed definition of the ICT sector.
2) Total of the groups observed under Births; this excludes:
Agriculture, hunting and forestry (A), Fishing (B), Electricity, gas and water supply (E), Financial intermediation (J), Real estate activities (SBI 70), Research and development (SBI 73), Public administration and social security (L), Education (M), Health and social work (N), Activities of membership organisations n.e.c. (SBI 91), Recreational, cultural and sporting activities (SBI 92).

Source: Statistics Netherlands, Demography of companies.

Table A2.3.1
Investments in ICT capital, by sector, 1995–2003

	1995 1)	After revision 2)		
		2001	2002	2003
	million euro			
Agriculture, forestry and fishing	38	79	79	78
Mining and quarrying	29	94	116	100
Manufacturing	1,009	1,702	1,512	1,447
Electricity, gas and water supply	98	145	129	145
Construction	105	248	205	183
Trade and repair	533	1,197	1,100	1,029
Hotels and restaurants	15	44	45	40
Transport, storage and communication	1,508	4,328	2,692	2,413
of which post and telecommunication	1,314	3,871	2,264	1,938
Financial intermediation	1,004	2,268	2,166	2,186
Business activities	746	1,888	1,780	1,721
of which computer service bureaus	209	483	370	379
Public administration	710	1,032	1,166	1,046
Subsidized education	80	449	476	490
Health and social work	141	316	291	294
Other service activities	166	279	279	286
Total	6,182	14,069	12,036	11,458
Undistributed audio, video and communication equipment	502	742	680	648
Total ICT investments	6,684	14,811	12,716	12,106
	year-to-year volume changes in %			
Agriculture, forestry and fishing	19.3	.	8.9	6.3
Mining and quarrying	22.9	.	29.8	–10.3
Manufacturing	10.3	.	–7.9	–1.7
Electricity, gas and water supply	6.8	.	–7.6	17.1
Construction	17.3	.	–10.9	–5.4
Trade and repair	17.6	.	–0.5	–0.4
Hotels and restaurants	24.5	.	13.6	–2.2
Transport, storage and communication	25.0	.	–38.4	–9.0
of which post and telecommunication	26.0	.	–42.6	–13.6
Financial intermediation	17.2	.	–1.4	3.9
Business activities	20.4	.	0.3	1.5
of which computer service bureaus	16.5	.	–18.8	7.3
Public administration and social security	8.2	.	19.7	–4.6
Subsidized education	23.4	.	20.0	14.5
Health and social work	19.3	.	–0.9	7.2
Other service activities	12.0	.	11.5	12.5
Total	18.0	.	–10.7	–0.7
Undistributed audio, video and communication equipment	10.0	.	–7.5	–0.3
Total ICT investments	17.5	.	–10.5	–0.7

1) Average annual volume change in the period 1996–2000.
2) Due to a revision of the National Accounts, the figures of 2001 and later are not completely comparable to those of previous years.

Source: Statistics Netherlands, National Accounts.

Table A2.3.2
Share of investments in ICT capital in total investments, 1995–2003

	1995	2000	After revision [1]		
			2001	2002	2003
	%				
Agriculture, forestry and fishing	1.6	2.5	2.2	2.2	2.4
Mining and quarrying	2.4	8.3	6.4	7.3	5.6
Manufacturing	13.2	18.0	20.3	17.5	17.9
Electricity, gas and water supply	4.1	8.1	10.2	9.5	9.3
Construction	11.1	13.4	13.1	14.0	14.8
Trade and repair	13.2	17.9	20.6	19.1	18.1
Hotels and restaurants	3.9	5.6	7.3	6.6	6.1
Transport, storage and communication	23.5	42.8	41.6	33.1	28.7
of which post and telecommunication	75.3	80.5	85.8	89.5	89.5
Financial intermediation	30.0	31.9	33.7	35.8	38.9
Business activities	3.4	5.5	4.9	4.7	4.7
of which computer service bureaus	77.8	69.8	74.4	77.1	71.9
Public administration and social security	10.1	10.4	9.6	9.5	8.5
Subsidized education	11.7	24.8	26.2	24.0	24.3
Health and social work	6.2	11.6	11.4	10.9	11.4
Other service activities	7.2	12.5	12.4	12.0	11.8
Total of industries	9.8	15.6	14.6	12.7	12.4
Netherlands	10.9	16.8	15.6	13.7	13.3

[1] Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.

Source: Statistics Netherlands, National Accounts.

Table A2.3.3
Share of ICT investments in total non-residential gross fixed capital formation, international, 1980, 1990 and 2001[1)2)]

	1980	1990	2001
	%		
Belgium	.	.	17.0
Denmark	6.4	11.1	19.1
Germany	12.2	14.7	16.9
Greece	3.9	9.3	15.7
Spain	11.5	13.2	14.8
France	5.4	7.8	12.8
Ireland	4.6	8.3	14.6
Italy	12.2	14.2	15.5
Netherlands	11.2	15.5	20.9
Austria	7.1	10.0	12.8
Portugal	6.1	10.6	11.4
Finland	3.9	7.0	17.5
Sweden	5.0	9.7	21.6
United Kingdom	5.1	13.3	22.8
Canada	9.2	13.2	20.6
Japan	7.7	10.2	17.8
United States	13.5	21.9	28.0

1) ICT hardware is defined here as computer and office machinery and communication equipment; software contains bought and self-made software. The software investments in Japan are probably underestimated due to methodological differences.
2) 2001 for France, Germany, Canada and the United States. 2000 for all other countries.

Source: OECD, Information Technology Outlook 2004.

Table A2.3.4
Intermediate use and consumption of ICT goods and services, 1995–2004

	1995 2)	After revision 1)			
		2001	2002	2003*	2004*
	million euro				
Total ICT expenditure 3)	19,272	39,423	40,150	40,503	40,565
Total ICT goods	7,570	11,414	10,764	10,038	9,452
among which					
office machinery and computers	2,410	3,824	3,546	3,208	3,048
transmitters and communication equipment	728	1,959	1,902	1,893	1,765
audio and video equipment	1,468	2,134	2,247	2,132	1,993
Total ICT services	11,703	28,009	29,386	30,465	31,113
of which					
post and telecommunication services	9,108	19,912	21,560	22,830	23,233
computer services and software	2,595	8,097	7,826	7,635	7,880
Intermediate use 3)	14,475	28,585	28,307	28,442	28,414
Total ICT goods	5,785	8,232	7,548	7,030	6,640
among which					
office machinery and computers	2,096	3,155	2,936	2,692	2,595
transmitters and communication equipment	664	1,593	1,508	1,487	1,386
audio and video equipment	255	293	330	304	281
Total ICT services	8,690	20,353	20,759	21,412	21,774
of which					
post and telecommunication services	6,193	12,579	13,299	14,151	14,264
computer services and software	2,497	7,774	7,460	7,261	7,510
Consumption	4,797	10,838	11,843	12,061	12,151
Total ICT goods	1,785	3,182	3,216	3,008	2,812
among which					
office machinery and computers	314	669	610	516	453
transmitters and communication equipment	64	366	394	406	379
audio and video equipment	1,214	1,841	1,917	1,828	1,712
Total ICT services	3,013	7,656	8,627	9,053	9,339
of which					
post and telecommunication services	2,915	7,333	8,261	8,679	8,969
computer services and software	98	323	366	374	370
	year-to-year volume changes in %				
Total ICT expenditure 3)	15.8	.	3.7	3.2	2.3
Total ICT goods	10.9	.	–1.9	2.9	1.3
among which					
office machinery and computers	11.9	.	–0.5	6.0	1.9
transmitters and communication equipment	22.1	.	–3.0	1.4	–1.4
audio and video equipment	11.6	.	9.9	2.5	3.3
Total ICT services	18.5	.	6.0	3.3	2.7
of which					
post and telecommunication services	19.1	.	10.6	5.9	3.0
computer services and software	18.0	.	–5.1	–3.9	1.7
Intermediate use 3)	14.3	.	1.9	3.5	1.4
Total ICT goods	8.5	.	–6.0	2.6	1.0
among which					
office machinery and computers	6.3	.	–3.8	5.1	2.9
transmitters and communication equipment	22.5	.	–5.6	0.5	–1.5
audio and video equipment	4.9	.	13.3	–3.0	0.7

Table A2.3.4 (end)
Intermediate use and consumption of ICT goods and services, 1995–2004

	1995 2)	After revision 1)			
		2001	2002	2003*	2004*
	year-to-year volume changes in %				
Total ICT services	17.7	.	5.1	3.8	1.6
of which					
post and telecommunication services	18.3	.	11.7	8.3	1.4
computer services and software	17.7	.	–5.7	–4.1	1.9
Consumption	20.2	.	8.7	2.4	4.4
Total ICT goods	18.6	.	8.8	3.6	2.1
among which					
office machinery and computers	41.9	.	15.2	10.5	–2.9
transmitters and communication equipment	18.0	.	8.5	5.1	–0.7
audio and video equipment	13.0	.	9.4	3.5	3.8
Total ICT services	21.0	.	8.6	2.0	5.1
of which					
post and telecommunication services	20.9	.	8.6	2.1	5.5
computer services and software	26.6	.	9.6	–0.3	–2.7

1) Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.
2) Average annual volume change in the period 1996–2000.
3) Estimated values for 2003 and 2004.

Source: Statistics Netherlands, National Accounts.

Table A2.3.5
ICT expenditures, international, 2002–2004

	Information technology expenditures			Telecommunication expenditures			Total ICT expenditures		
	2002	2003	2004	2002	2003	2004	2002	2003	2004
	% of GDP								
EU 25 [1]	.	.	3.0	.	.	3.4	.	.	6.4
EU 15 [2]	3.2	3.1	3.0	3.4	3.3	3.3	6.6	6.4	6.3
Belgium	3.1	2.9	2.9	3.6	3.5	3.5	6.7	6.4	6.4
Denmark	3.6	3.5	3.5	3.2	3.2	3.2	6.8	6.7	6.7
Germany	3.1	3.0	3.1	3.0	3.0	3.1	6.1	6.0	6.2
Greece	1.4	1.3	1.3	4.2	4.0	3.8	5.6	5.3	5.1
Spain	1.8	1.8	1.7	3.8	3.6	3.5	5.6	5.4	5.2
France	3.5	3.3	3.3	2.7	2.6	2.7	6.2	5.9	6.0
Ireland	2.3	2.0	2.1	3.6	3.3	3.3	5.9	5.3	5.4
Italy	2.1	2.0	1.9	3.3	3.3	3.4	5.4	5.3	5.3
Netherlands	4.1	3.8	3.8	3.7	3.6	3.7	7.8	7.4	7.5
Austria	3.1	3.0	3.0	3.4	3.4	3.4	6.5	6.4	6.4
Portugal	2.2	2.1	2.0	5.0	5.0	5.1	7.2	7.1	7.1
Finland	3.7	3.6	3.7	3.4	3.4	3.4	7.1	7.0	7.1
Sweden	4.9	4.5	4.4	4.3	4.3	4.3	9.2	8.8	8.7
United Kingdom	4.7	4.2	4.2	3.9	3.8	3.7	8.6	8.0	7.9
Japan	3.5	3.5	3.6	4.3	4.3	4.4	7.8	7.8	8.0
United States	4.7	4.6	4.6	3.4	3.3	3.2	8.1	7.9	7.8

[1] Excluding Luxembourg, Cyprus and Malta.
[2] Excluding Luxembourg.

Source: Eurostat, New Cronos.

Table A2.4.1
R&D expenditure with one's own personnel in the ICT sector and other sectors, 1995–2003 [1)]

	1995	1996	1997	1998	1999	2000	2001	2002	2003
	million euro								
Total ICT sector	1,036	1,165	1,239	1,199	1,407	1,677	1,767	1,650	1,693
ICT industry sector	940	1,022	1,068	1,047	1,206	1,352	1,418	1,340	1,459
ICT services sector	96	143	171	152	201	325	349	310	235
of which									
post and telecommunication	67	59	60	55	93	84	76	13	11
computer service bureaus	29	84	111	96	107	242	273	297	224
Rest of private sector	2,095	2,177	2,476	2,522	2,856	2,781	2,945	2,892	3,111
of which									
other industry	1,644	1,623	1,744	1,739	2,036	2,034	2,155	2,114	2,292
other services	263	406	517	477	565	552	574	574	604
other sectors	188	148	215	306	255	195	217	204	215
Total Netherlands (companies)	3,131	3,342	3,715	3,721	4,263	4,458	4,712	4,543	4,804
	index (1995=100)								
Total ICT sector	100	112	120	116	136	162	171	159	163
ICT industry sector	100	109	114	111	128	144	151	143	155
ICT services sector	100	149	178	158	209	339	363	323	245
of which									
post and telecommunication	100	88	90	82	139	125	114	19	16
computer service bureaus	100	290	383	331	369	833	940	1,023	772
Rest of private sector	100	104	118	120	136	133	141	138	148
of which									
other industry	100	99	106	106	124	124	131	129	139
other services	100	154	197	181	215	210	218	218	230
other sectors	100	79	114	163	136	104	115	109	114
Total Netherlands (companies)	100	107	119	119	136	142	150	145	153

[1)] Companies with 10 and more employees, from 2002 companies with 10 and more employed persons.

Source: Statistics Netherlands, Survey R&D and Innovation by companies.

Table A2.4.2
Share of the ICT sector in the R&D expenditure of the business sector, international, 1995 and 2003

	R&D expenditure business sector		1995			2003		
	1995	2003	ICT sector	ICT industry	ICT services	ICT sector	ICT industry	ICT services
	% of GDP		*% of total R&D expenditure business sector*					
EU 25	1.06	1.17	.	.	.	.	.	.
EU 15	1.12	1.25	23.4	20.8	2.7	.	.	.
Belgium	1.22	1.71	24.2	20.4	3.8	22.4	16.7	5.7
Denmark	1.05	1.75	23.2	13.2	10.0	31.5	13.6	17.9
Germany	1.49	1.78	20.5	20.0	0.4	21.7	18.8	2.9
Greece	0.14	0.20	.	.	.	.	.	.
Spain	0.39	0.60	22.7	16.1	6.6	21.8	7.7	14.0
France	1.41	1.36	29.6	24.0	5.6	30.6	21.0	9.6
Ireland	0.89	0.80	42.0	34.4	7.6	70.2	42.7	27.5
Italy	0.53	0.55	29.8	27.0	2.8	22.5	19.1	3.4
Netherlands	1.04	1.01	28.6	24.9	3.7	36.7	31.8	4.9
Portugal	0.12	0.30	.	.	.	.	.	.
Finland	1.44	2.46	44.4	37.2	7.2	64.3	53.1	11.2
Sweden	2.49	2.95	32.3	28.2	4.0	32.8	28.6	4.1
United Kingdom	1.27	1.24	23.5	11.6	11.9	24.2	11.8	12.4
Canada	1.00	1.03	37.6	28.1	9.5	38.5	27.7	10.9
Japan	1.89	2.36	30.4	30.4	0.0	34.4	32.7	1.7
United States	1.80	1.79	33.3	27.3	5.9	34.7	24.2	10.4
South Korea	1.75	2.01	34.1	34.1	0.0	55.1	48.0	7.1

Source: OECD, ANBERD Database, September 2005 and MSTI 2005–1; Statistics Netherlands, Survey R&D and Innovation by companies.

Table A2.5.1
Patent applications filed to the European Patent Office, international, 1995 and 2002[1)]

	1995			2002 [2)]		
	Total number	of which		Total number	of which	
		high-tech	ICT		high-tech	ICT
	per million inhabitants	%		*per million inhabitants*	%	
EU 25	.	.	.	134	19.5	14.8
EU 15	92	11.3	8.1	158	19.5	14.9
Belgium	94	11.5	7.7	148	18.7	10.8
Denmark	120	11.5	4.3	215	20.9	12.9
Germany	170	8.0	5.5	301	15.1	10.6
Greece	4	11.2	9.3	8	17.1	10.0
Spain	12	8.6	6.2	25	13.9	8.8
France	97	13.2	9.5	147	21.6	16.7
Ireland	37	18.4	13.7	90	29.8	22.6
Italy	46	8.8	5.2	75	9.5	7.0
Luxembourg	72	4.6	8.0	201	3.7	2.0
Netherlands	117	17.4	14.6	279	33.4	30.2
Austria	100	7.9	6.3	175	13.5	9.4
Portugal	2	1.3	0.0	4	18.8	6.1
Finland	175	25.3	23.8	311	38.6	36.6
Sweden	200	13.2	10.2	312	24.0	20.2
United Kingdom	79	15.4	10.6	129	24.9	18.3
Canada	37	17.1	12.5	83	29.6	22.3
Japan	88	22.2	17.0	167	24.2	18.8
United States	96	20.9	14.4	155	31.3	21.7

1) Patent applications to the European Patent Office (EPO), by submission date.
High-tech patents consists of the following groups of the International Patent Classification (IPC): B41J, G06, G11C, C12M, C12N, C12P, C12Q, B64, H04, H01L and H01S. ICT patents consists of the groups G06, G11 and H04.
2) Provisional data. France: estimated data.

Source: Eurostat, New Cronos.

Table A2.5.2
Patents filed to the United States Patent and Trademark Office, international, 1995 and 2002[1)]

	1995		2002 [2)]	
	Total	of which high-tech	Total	of which high-tech
	per million inhabitants	%	*per million inhabitants*	%
EU 25	.	.	60	15.7
EU 15	44	10.8	71	15.8
Belgium	40	10.0	70	12.5
Denmark	37	10.4	84	19.6
Germany	81	7.3	137	11.3
Greece	1	12.3	2	12.5
Spain	4	4.6	8	17.0
France	49	13.5	68	17.8
Ireland	15	26.8	32	25.0
Italy	19	8.5	30	14.3
Luxembourg	55	6.8	96	0.4
Netherlands	52	19.3	87	17.7
Austria	42	4.9	65	10.0
Portugal	0	26.1	1	10.1
Finland	70	17.9	159	32.4
Sweden	91	12.9	187	20.3
United Kingdom	43	14.4	65	21.7
Canada	71	8.6	110	18.0
United States	212	15.8	301	25.3
Japan	174	26.1	274	27.5

1) Patents filed to the United States Patent and Trademark Office (USPTO), by date granted.
High-tech patents consists of the following groups of the International Patent Classification (IPC): B41J, G06, G11C, C12M, C12N, C12P, C12Q, B64, H04, H01L and H01S.
2) For 2002: France and Luxembourg estimates. Ireland: provisional data.

Source: Eurostat, New Cronos.

Table A2.6.1
Imports and exports of ICT goods and services, 1995–2004

	1995	After revision [1]			
		2001	2002	2003*	2004*
	million euro				
IMPORTS					
ICT goods [2]	18,723	49,801	43,321	42,803	47,577
Office machinery and computers	11,081	25,167	22,880	23,634	26,807
Insulated wire and cable [2]	384	734	545	581	643
Electronic components	2,694	9,905	9,335	7,793	7,660
Transmitters and communication equipment	1,216	7,435	4,705	4,710	5,358
Audio and video equipment	1,853	3,781	3,469	3,778	4,665
Equipment for measuring, regulating and monitoring	1,494	2,779	2,387	2,307	2,444
ICT services [2]	1,187	5,100	4,947	5,201	5,400
Post and telecommunication services	494	2,506	2,351	2,427	2,324
Automation services/computer services [2]	385	2,033	2,053	2,194	2,433
Software on CD-ROM/tapes [2]	308	561	543	580	643
EXPORTS					
ICT goods [2]	3,727	4,749	3,959	3,520	3,170
Office machinery and computers	1,130	1,352	1,508	1,204	1,133
Insulated wire and cable [2]	299	394	272	301	311
Electronic components	1,165	1,320	722	576	674
Transmitters and communication equipment	410	59	206	186	164
Audio and video equipment	101	87	71	67	39
Equipment for measuring, regulating and monitoring	623	1,537	1,180	1,186	849
ICT services [2]	1,189	6,022	5,638	5,900	6,242
Post and telecommunication services	449	2,593	2,450	2,534	2,614
Automation services/computer services [2]	446	2,378	2,402	2,536	2,734
Software on CD-ROM/tapes [2]	294	1,051	786	830	894
RE-EXPORTS					
ICT goods [2]	13,720	45,339	40,855	40,677	46,263
Office machinery and computers	9,175	24,870	23,810	24,563	28,099
Insulated wire and cable [2]	24	298	156	175	216
Electronic components	2,029	9,921	9,500	8,048	7,967
Transmitters and communication equipment	575	5,793	2,985	3,035	3,773
Audio and video equipment	1,228	3,086	2,787	3,276	4,228
Equipment for measuring, regulating and monitoring	689	1,371	1,617	1,580	1,980
ICT services [2]	19	433	457	505	632
Software on CD-ROM/tapes [2]	19	433	457	505	632
	%				
SHARE OF ICT GOODS AND SERVICES IN:					
Total imports	12.8	19.9	18.0	17.9	18.1
Imports of goods	14.8	23.7	21.6	21.2	21.5
Imports of services	4.1	7.8	7.4	7.8	7.5
Total exports	3.9	5.5	4.9	4.7	4.5
Exports of goods	3.8	3.6	3.0	2.6	2.3
Exports of services	4.1	10.1	9.1	9.4	9.4
Total re-exports	29.6	43.1	41.0	40.8	39.7

[1] Due to a revision of the National accounts, the figures of 2001 and later are not completely comparable to those of previous years.
[2] Estimated values for 2003 and 2004.

Source: Statistics Netherlands, National Accounts.

Table A2.6.2
Imports and exports of ICT goods, international, 1996 and 2002

	Exports			Imports		
	1996	2002	average annual growth	1996	2002	average annual growth
	million USD		%	*million USD*		%
Belgium	8,463	10,561	3.8	9,534	12,713	4.9
Denmark	3,548	5,435	7.4	5,166	6,693	4.4
Germany	41,631	59,075	6.0	46,477	63,259	5.3
Greece	160	397	16.4	1,241	2,161	9.7
Spain	4,969	5,897	2.9	10,565	13,081	3.6
France	25,892	27,827	1.2	28,951	31,724	1.5
Ireland	13,271	27,198	12.7	9,302	17,726	11.3
Italy	13,046	11,278	–2.4	18,458	20,440	1.7
Luxembourg	.	1,300	.	.	1,283	.
Netherlands	25,022	31,583	4.0	25,021	29,848	3.0
Austria	3,025	6,204	12.7	5,366	7,380	5.5
Portugal	1,369	2,012	6.6	2,701	3,652	5.2
Finland	5,935	9,822	8.8	4,214	5,269	3.8
Sweden	11,164	8,783	–3.9	8,988	8,202	–1.5
United Kingdom	41,844	51,657	3.6	45,625	49,516	1.4
Canada	12,080	11,953	–0.2	23,533	24,739	0.8
Japan	103,213	95,018	–1.4	47,858	55,099	2.4
United States	124,066	132,596	1.1	148,391	190,385	4.2
South Korea	29,171	55,021	11.2	21,000	32,288	7.4

Source: OECD, Information Technology Outlook 2004.

Table A2.6.3
Imports and exports of software, international, 1996 and 2002

	Exports			Imports		
	1996	2002	avarage annual growth	1996	2002	average annual growth
	million USD		%	*million USD*		%
Belgium	173	264	7.3	323	428	4.8
Denmark	115	135	2.7	179	179	0.0
Germany	734	1,774	15.8	946	1,211	4.2
Greece	24	16	–6.5	43	69	8.2
Spain	53	202	25.0	267	415	7.6
France	428	581	5.2	980	1,165	2.9
Ireland	3,567	2,097	–8.5	636	197	–17.7
Italy	89	80	–1.8	558	882	7.9
Luxembourg	.	84	.	.	77	.
Netherlands	569	891	7.8	521	516	–0.2
Austria	213	1,080	31.1	152	339	14.3
Portugal	4	6	7.0	62	123	12.1
Finland	30	40	4.9	115	149	4.4
Sweden	87	548	35.9	266	320	3.1
United Kingdom	1,102	1,314	3.0	1,137	1,613	6.0
Canada	295	229	–4.1	829	1,028	3.7
Japan	254	325	4.2	560	519	–1.3
United States	3,087	2,850	–1.3	698	917	4.7
South Korea	27	166	35.3	438	575	4.6

Source: OECD, Information Technology Outlook 2004.

Table A2.6.4
Imports and exports of ICT services, international, 1996 and 2002

	Exports			Imports		
	1996	2002	average annual growth	1996	2002	average annual growth
	million USD		%	*million USD*		%
Belgium [1]	2,594	4,156	8.2	1,128	2,869	16.8
Germany	3,627	6,571	10.4	5,071	9,477	11.0
Greece	433	287	–6.6	133	447	22.4
Spain	1,921	3,405	10.0	1,419	2,592	10.6
France	1,091	3,452	21.2	899	2,878	21.4
Ireland	.	11,539	.	.	1,013	.
Italy	743	1,366	10.7	1,534	3,624	15.4
Netherlands	1,286	2,910	14.6	1,319	3,120	15.4
Austria	421	772	10.6	533	711	4.9
Portugal	322	324	0.1	284	402	6.0
Finland	1,043	735	–5.7	809	627	–4.2
Sweden	364	2,092	33.8	313	1,441	29.0
United Kingdom	3,350	7,375	14.1	2,611	4,699	10.3
Canada	2,070	3,316	8.2	1,772	2,196	3.6
Japan	2,601	1,885	–5.2	4,312	3,063	–5.5
United States	6,318	11,302	10.2	9,214	8,739	–0.9
South Korea	649	442	–6.2	782	898	2.3

[1] Including Luxembourg.

Source: OECD, Information Technology Outlook 2004.

Table A2.6.5
Share of high-tech products in total exports, international, 1992–2003[1)]

	1992–1998	1999	2000	2001	2002	2003
	%					
EU 25	.	19.7	20.6	20.5	18.2	17.8
EU 15	15.6	18.9	19.9	19.8	17.6	17.2
Belgium	5.8	7.9	8.7	9.0	7.5	7.4
Denmark	10.1	13.9	14.4	14.0	15.0	13.4
Germany	11.9	14.2	16.1	15.8	15.1	14.7
Greece	2.8	5.5	7.5	5.6	6.7	7.4
Spain	5.8	5.9	6.4	6.1	5.7	5.9
France	20.2	24.0	25.5	25.6	21.9	20.4
Ireland	32.8	39.4	40.5	40.8	35.3	29.9
Italy	7.4	7.5	8.5	8.5	8.2	7.1
Luxembourg	.	15.1	20.6	27.9	24.6	29.3
Netherlands	15.3	21.9	22.8	22.3	18.7	18.8
Austria	9.4	11.7	14.0	14.6	15.7	15.3
Portugal	3.5	4.3	5.5	6.8	6.2	7.4
Finland	12.9	20.7	23.5	21.1	20.9	20.6
Sweden	13.3	17.8	18.7	14.2	13.7	13.1
United Kingdom	20.4	24.4	25.4	26.4	25.5	21.0
Japan	24.4	25.1	26.9	24.7	23.0	22.7
United States	26.7	30.0	29.8	28.6	27.9	26.9

[1)] High-tech products: products for space travel and aviation, computers, office machinery, electronics, instruments, pharmaceutics, electronic machinery and weapons. Intra-EU exports are not included in the EU exports.

Source: Eurostat, New Cronos.

Table A2.7.1
Companies with teleworkers, broken down by sector, international, 2004 1)

	Total	Manu-facturing	Construc-tion	Trade and repair	Hotels and restau-rants 2)	Transport, storage and com-munica-tion	Business activities	Recrea-tional, cultural and sporting activities 3)
	%							
EU 25	16	12	7	17	7	14	27	43
EU 15	18	14	8	19	7	15	31	44
Belgium	29	26	13	27	11	20	56	49
Denmark	45	44	20	53	.	35	70	.
Germany	22	18	9	21	8	18	33	46
Greece	14	9	7	17	12	18	23	42
Spain	9	8	4	12	6	8	15	9
Ireland	24	24	12	20	11	24	41	12
Luxembourg	19	20	12	13	13	23	34	50
Netherlands	25	24	14	25	5	21	38	41
Austria	18	16	8	22	5	10	36	25
Portugal	13	11	7	15	12	20	31	15
Finland	31	30	18	.	19	32	46	58
Sweden	39	37	13	42	24	27	60	67

1) Companies with 10 and more employed persons.
2) In fact only Hotels (55.1) and Camping sites and other provision of short–stay accommodation (55.2).
3) In fact only Motion picture and video activities (99.1) and Radio and television activities (99.2).

Source: Eurostat, New Cronos.

Table A2.7.2
Companies with teleworkers, broken down by size class, international, 2004 1)

	Total	Size class (number of employed persons)		
		10–49	50–249	250 and more
	%			
EU 25	16	12	29	54
EU 15	18	13	34	63
Belgium	29	24	49	64
Denmark	45	39	70	93
Germany	22	16	40	69
Greece	14	12	25	42
Spain	9	6	19	43
Ireland	24	18	37	60
Luxembourg	19	15	28	48
Netherlands	25	20	44	70
Austria	18	15	32	62
Portugal	13	10	24	47
Finland	31	24	51	76
Sweden	39	35	56	84

1) Companies with 10 and more employed persons.

Source: Eurostat, New Cronos.

Table A2.8.1
Employed ICT workers, broken down by background characteristics, 1996–2004[1)]

	Employed ICT workers									Total employed labour force
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2004
	number (x 1,000)									
Total employed ICT workers/labour force	164	176	212	234	261	269	288	271	273	7,037
	% of total number of employed ICT workers									*% of total employed labour force*
Professional group										
Programmers	32	34	32	32	34	33	31	32	29	1
Technical systems analysts	7	6	5	5	4	3	4	5	5	0
Systems analysts	52	53	52	49	47	50	51	51	57	2
Information scientists	9	8	11	14	15	14	14	12	9	0
Job position										
Employed in a permanent position	91	91	92	94	90	91	90	89	88	84
Employed in a temporary position	3	2	2	2	2	2	2	3	3	4
Self-employed	6	6	5	4	8	7	8	8	9	12
Working hours per week										
12–19 hours per week	1	1	2	1	2	2	1	1	1	9
20–34 hours per week	8	8	8	10	9	10	11	12	13	27
35 or more hours per week	91	91	91	89	90	88	88	87	86	64
Age										
15–24	5	6	8	7	8	9	7	7	6	11
25–34	43	42	44	43	43	40	37	38	35	25
35–44	36	34	29	32	32	33	35	34	36	29
45–54	15	16	17	16	13	14	17	17	18	24
55–64	2	2	2	2	3	3	3	5	5	11
Level of education										
Primary education	1	1	1	1	2	1	1	1	0	5
Intermediate secondary education	5	5	5	5	5	4	3	3	4	7
Lower secondary education	3	2	2	1	2	3	2	2	2	13
Advanced/senior secondary education	10	10	11	11	13	13	11	16	15	9
Intermediate vocational education	28	29	26	27	27	27	27	24	24	34
Higher professional education	37	35	38	36	32	33	35	36	34	21
University	17	18	17	20	19	19	20	18	22	12
Sex										
Men	88	89	89	88	88	89	87	88	89	58
Women	12	11	11	12	12	11	13	12	11	42
Origin										
Autochthones	88	87	85	86	83	80	80	80	84	84
Western immigrants	9	9	12	10	11	13	13	13	11	9
Non-western immigrants	3	3	4	4	6	8	7	6	5	7

[1)] ICT workers are defined here as SBC codes 514, 666, 714 and 914.

Source: Statistisc Netherlands, Labour force statistics.

Table A2.8.2
Employed ICT workers, broken down by sector, 1996–2004[1)]

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2004
	x 1,000									*Share of ICT workers in total employed workers (%)*
Employed ICT workers, total	164	176	212	234	261	269	288	271	273	3.9
Agriculture, forestry and fishing	0	0	0	0	0	1	0	0	1	0.3
Mining and quarrying	1	0	0	1	0	0	0	0	0	2.7
Manufacturing	25	22	21	29	22	24	25	28	30	3.1
Electricity, gas and water supply	1	1	2	2	2	2	2	1	2	5.7
Construction	3	3	2	3	4	4	5	3	3	0.7
Hotels, restaurants, trade and repair	18	19	23	21	26	24	25	26	14	1.3
Transport, storage and communication	11	7	10	11	18	15	14	16	18	4.0
Financial and business activities	77	88	114	126	146	143	159	137	148	13.8
of which										
financial institutions	18	18	16	21	21	20	30	21	27	10.4
computer service bureaus	44	54	80	79	99	99	100	79	100	63.2
Other service activities	12	14	19	20	17	23	25	23	24	3.6
Public administration	13	16	14	14	14	21	19	21	21	1.1

1) ICT workers are defined here as SBC codes 514, 666, 714 and 914.

Source: Statistics Netherlands, Labour force statistics.

Table A2.8.3
Vacancies in the ICT sector and in the rest of the economy, 1995–2004[1)]

	ICT sector			Rest of the economy			Total		
	Vacancies	Jobs	Vacancy rate [2)]	Vacancies	Jobs	Vacancy rate [2)]	Vacancies	Jobs	Vacancy rate [2)]
	x 1,000		*number*	*x 1,000*		*number*	*x 1,000*		*number*
1995	3.7	149	25	58.6	5,529	11	62.3	5,677	11
1996	5.2	160	33	63.8	5,709	11	69.0	5,869	12
1997	8.1	171	48	83.4	5,897	14	91.6	6,067	15
1998	12.9	187	69	116.0	6,075	19	128.9	6,262	21
1999	15.5	224	69	155.2	6,470	24	170.7	6,694	26
2000	12.7	238	53	170.7	6,633	26	183.4	6,871	27
2001	9.0	240	37	161.7	6,759	24	170.7	6,999	24
2002	2.2	217	10	112.9	6,839	17	115.1	7,056	16
2003	2.4	209	12	78.9	6,786	12	81.3	6,995	12
2004	6.0	202	30	103.3	6,727	15	109.3	6,929	16

1) The ICT sector is defined here as SBI groups: 30, 3130, 3210, 3220, 3230, 3320, 3330 (ICT industry) and 6420, 72 (ICT services).
2) Vacancy rate is defined here as the number of vacancies per 1,000 jobs.

Source: Statistics Netherlands, Survey on vacancies, third quarter and Survey on employment and wages.

Table A2.8.4
Share of ICT workers in the total employed labour force, international, 1995 and 2003 [1)]

	1995	2003
	%	
EU 15 [2)]	2.6	3.1
Belgium	2.1	2.1
Denmark	3.0	4.2
Germany	2.2	3.0
Greece	2.2	2.2
Spain	2.2	2.5
France	2.9	2.9
Ireland	3.2	2.9
Italy	2.4	2.8
Luxembourg [3)]	2.9	4.2
Netherlands [3)]	3.3	4.8
Austria	2.5	3.8
Portugal	2.8	2.1
Finland [4)]	2.7	4.1
Sweden [4)]	3.9	4.7
United Kingdom	2.9	3.3
Canada	3.0	4.0
Japan [3)]	.	3.9
United States [3)]	3.3	3.8
South Korea [3)]	.	2.1

1) Based on the methodology developed in chapter 6 of Information Technology Outlook 2004. See also Van Welsum, D., and G. Vickery (2004), New perspectives on ICT skills and employment, Information Economy Working Paper DSTI/ICCP/IE(2004)10, OECD.
2) Estimate.
3) 2002 instead of 2003.
4) 1997 instead of 1995.

Source: OECD Information Technology Outlook 2004 / Statistics Netherlands, Labour force statistics.

Table A2.9.1
Students of natural sciences and technology and of informatics among graduates in higher education, international, 1998 and 2003 1)

	1998		2003	
	Natural sciences and technology	Informatics	Natural sciences and technology	Informatics
	% of graduates			
EU 25 2)	24.6	2.4	.	.
EU 15 2)	26.3	2.7	.	.
Belgium	.	.	19.3	4.2
Denmark	19.5	3.3	19.8	4.1
Germany	28.5	2.2	26.3	2.9
Greece	.	.	.	.
Spain	21.9	3.4	28.1	6.5
France	30.0	1.2	29.3	3.6
Ireland	32.0	9.5	29.3	10.6
Italy	24.2	1.0	.	.
Luxembourg	21.0	6.5	.	.
Netherlands	17.0	1.4	16.3	1.8
Austria	33.4	0.3	28.4	2.0
Portugal	17.9	1.9	19.0	1.4
Finland	26.1	2.4	.	.
Sweden	26.0	0.0	30.5	4.7
United Kingdom	26.2	4.8	25.8	6.6
Japan	21.2	.	22.1	.
United States	16.9	2.3	18.3	5.3

1) Higher education: ISCED–97 level 5A, 5B and 6. Natural sciences and technology: ISCED-97 field 4 and 5. Informatics: ISCED-97 field 48.
2) For EU 15 and EU 25: estimate of Eurostat.

Source: Eurostat, New Cronos.

Table A2.10.1
International trade in other business services and computer and information services, international, 1995 and 2003[1)]

	Exports			Imports		
	1995	2003	average annual growth	1995	2003	average annual growth
	% [2)]		%	% [2)]		%
Belgium	.	3.3	.	.	3.0	.
Denmark	1.7	2.4	12.8	1.2	2.1	14.0
Germany	7.7	7.9	8.1	10.2	10.3	6.8
Spain	1.9	3.2	15.1	2.4	3.7	12.7
France	8.7	5.0	0.7	6.6	5.4	4.1
Ireland	0.5	4.2	40.5	1.7	5.0	22.2
Italy	4.8	4.2	6.2	6.2	5.7	5.6
Netherlands	4.6	4.8	8.3	4.5	5.8	10.0
Austria	4.3	3.2	3.9	3.8	4.3	8.4
Finland	1.1	0.5	–1.3	1.4	0.7	–1.6
Sweden	0.9	2.6	22.7	0.9	2.6	21.2
United Kingdom	6.7	10.5	14.1	3.6	5.2	11.7
Canada	2.5	2.7	8.9	2.5	2.5	6.9
Japan	8.8	3.8	–3.0	11.8	5.6	–2.9
United States	11.4	13.7	10.4	6.8	10.1	12.1
South Korea	2.4	1.3	–0.1	2.2	2.5	8.5
China	1.4	3.7	22.1	2.6	2.5	6.4
India	0.8	2.8	26.6	1.0	1.9	15.8

1) Total exports/imports of IT and ICT-intensive services are calculated by adding the categories other business services and computer and information services from the balance of payments data of IMF.
2) This information is not available for all countries in the IMF database, and for some countries the two categories are not available seperately.

Source: Van Welsum and Vickery (2005b).

Table A2.10.2
The Indian IT branch, 1997/'98–2004/'05

	'97/'98	'98/'99	'99/'00	'00/'01	'01/'02	'02/'03	'03/'04	'04/'05*
	billion USD							
Revenues								
Total IT branch	5.0	6.0	8.2	12.1	13.4	16.1	21.5	28.2
Exports	.	.	4.0	6.2	7.6	9.9	13.3	17.9
Domestic	.	.	4.3	5.9	5.7	6.3	8.2	10.2
of which								
IT services and products 1)	.	.	5.3	7.8	8.7	9.9	12.8	16.5
Exports	.	.	3.4	5.3	6.2	7.1	9.2	12.2
Domestic	.	.	1.9	2.5	2.5	2.8	3.6	4.3
IT-intensive services and offshoring 2)	.	.	0.5	0.9	1.5	2.7	3.9	5.7
Exports	.	.	0.6	0.9	1.5	2.5	3.6	5.1
Domestic	.	.	0.0	0.0	0.0	0.2	0.3	0.6
Hardware 3)	.	.	2.4	3.4	3.2	3.6	4.8	6.0
Exports	.	.	0.0	0.0	0.0	0.3	0.5	0.7
Domestic	.	.	2.4	3.4	3.2	3.3	4.3	5.3
	number (x 1,000)							
Employment								
Total IT branch	.	.	.	.	522	661	813	.
among which IT-intensive services and offshoring	.	.	.	.	106	171	245	.
	change on previous book year in %							
Revenues								
Total IT branch	.	20	37	48	11	20	34	31
Exports	.	.	.	55	23	30	34	35
Domestic	.	.	.	37	–3	11	30	24
of which								
IT services and products 1)	.	.	.	47	12	14	29	29
Exports	.	.	.	56	17	15	30	33
Domestic	.	.	.	32	0	12	29	19
IT-intensive services and offshoring 2)	.	.	.	80	67	80	44	46
Exports	.	.	.	50	67	67	44	42
Domestic	.	.	.	0	0	0	50	100
Hardware 3)	.	.	.	42	–6	13	33	25
Exports	.	.	.	0	0	0	67	40
Domestic	.	.	.	42	–6	3	30	23
Employment								
Total IT branch	.	.	.	.	.	27	23	.
among which IT-intensive services and offshoring 2)	.	.	.	.	.	61	43	.

1) Pure IT products and services, such as software development.
2) For instance customer services, call-centers, data-analysis.
3) For instance desktops, notebooks, printers and the like, network equipment.

Source: NASSCOM.

Table A3.3.1
Number of radio and television sets per 1,000 inhabitants, international, 1980, 1990 and 1997

	Radio sets			Television sets		
	1980	1990	1997	1980	1990	1997
Denmark	927	1,021	1,145	498	535	594
Germany	.	878	948	.	554	567
France	741	888	946	353	402	595
Netherlands	650	906	980	399	482	519
Finland	837	995	1,498	414	495	622
United Kingdom	950	1,390	1,443	401	433	521
Canada	721	1,024	1,067	432	612	710
Japan	678	899	956	539	611	686
United States	1,973	2,084	2,116	676	799	806
South Korea	944	1,011	1,039	165	210	348
China	95	323	335	9	267	321
India	38	79	120	4	32	65

Source: Unesco.

Table A3.4.1
RTV cable and DSL facilities for households, international, 2003

	Households that ...			
	have access to RTV cable [1]	use RTV cable [2]	have access to RTV cable suitable for broadband internet [1]	have access to DSL [1]
	%			
EU 25	.	30	.	.
EU 15	.	30	.	.
Denmark	75	52	47	95
Germany	83	54	10	85
France	36	15	25	79
Netherlands	97	88	79	85
Finland	67	46	25	85
United Kingdom	51	14	45	85
Canada	93	62	85	75
Japan	27	51	27	90
United States	95	69	85	75
South Korea	57	88	57	93

[1] Source: OECD, Communications Outlook 2005.
[2] Source: TNO.

Table A3.4.2
Use of telephone, pc and internet per 100 inhabitants, international, 1990–2004

	1990	1995	2000	2001	2002	2003	2004
	number per 100 inhabitants						
Fixed telephone lines (ISDN and PSTN) [1]							
EU 25	37	44	51	52	52	52	.
EU 15	43	49	55	56	56	56	.
Denmark	57	61	71	72	69	67	72
Germany	44	51	61	63	65	66	66
France	50	56	58	57	57	57	56
Netherlands	46	52	62	62	62	61	59
Finland	53	54	55	54	52	53	52
United Kingdom	44	50	59	59	59	62	61
Canada	56	62	66	65	64	63	63
Japan	44	50	59	58	56	55	51
United States	55	60	66	67	65	67	65
South Korea	31	42	48	49	49	47	48
Mobile telephone connections [1]							
EU 25	1	5	57	68	74	82	.
EU 15	1	6	63	74	79	86	.
Denmark	3	16	63	74	83	88	96
Germany	0	5	59	68	73	77	81
France	0	2	49	61	65	66	72

Table A3.4.2 (end)
Use of telephone, pc and internet per 100 inhabitants, international, 1990–2004

	1990	1995	2000	2001	2002	2003	2004
	number per 100 inhabitants						
Netherlands	1	3	67	77	74	82	98
Finland	5	20	72	80	87	90	92
United Kingdom	2	10	73	77	84	85	87
Canada	2	9	28	35	38	39	49
Japan	1	9	53	59	64	63	69
United States	2	13	39	45	49	54	62
South Korea	0	4	58	62	68	70	77
Pc's 2)							
EU 25	6	13	25	28	31	.	.
EU 15	7	15	28	31	34	.	.
Denmark	11	27	51	54	58	.	.
Germany	9	18	34	38	43	48	56
France	7	15	30	33	35	42	49
Netherlands	9	20	39	43	47	.	68
Finland	10	23	40	42	44	.	.
United Kingdom	11	20	34	37	41	.	60
Canada	11	22	42	46	49	.	69
Japan	6	12	32	36	38	.	54
United States	22	33	57	62	66	69	76
South Korea	4	11	40	48	49	56	.
Internet users 3)							
EU 25	0	2	22	27	32	39	48
EU 15	0	2	24	29	34	41	.
Denmark	0	4	39	43	51	54	69
Germany	0	2	30	37	41	54	57
France	0	2	14	26	31	37	42
Netherlands	0	6	44	49	51	67	67
Finland	0	14	37	43	51	51	62
United Kingdom	0	2	26	33	42	58	60
Canada	0	4	42	45	51	53	64
Japan	0	2	30	38	45	50	66
United States	1	9	44	50	55	69	69
South Korea	0	1	41	52	55	61	66
Broadband connections 1)							
EU 25	.	.	.	.	.	.	9
EU 15	.	.	.	2	3	6	10
Denmark	.	.	.	4	9	12	19
Germany	.	.	.	2	4	6	8
France	.	.	.	1	2	6	11
Netherlands	.	.	.	4	7	12	19
Finland	.	.	.	1	5	10	13
United Kingdom	.	.	.	1	2	6	11
Canada	.	.	.	9	11	15	18
Japan	.	.	.	2	7	12	14
United States	.	.	.	5	7	8	12
South Korea	.	.	.	17	21	23	25

1) Source: TNO.
2) Source: ITU and Computer Industry Almanac.
3) Source: ITU and internetworldstats.

Table A4.2.1
Companies with internal data communication, by industry and company size, 2004[1)]

	Internal network	of which		
		Wireless	Intranet	Extranet
	% of total number of companies			
Total	81	12	31	12
Industry				
Manufacturing	83	12	33	11
Electricity, gas and water supply	95	12	86	32
Construction	73	7	15	5
Trade and repair	87	12	36	14
Hotels and restaurants	52	13	11	3
Transport, storage and communication	73	11	29	12
Computer and related activities	94	37	70	41
Other business activities	83	12	36	13
Health and social work activities	85	12	36	13
Other service activities	81	10	23	7
Company size				
10– 19 employed persons	74	10	21	8
20– 49 employed persons	84	11	32	11
50– 99 employed persons	91	14	49	17
100–249 employed persons	96	20	58	23
250–499 employed persons	97	22	72	28
500 and more employed persons	99	32	79	36

[1)] Companies with 10 and more employed persons.

Source: Statistics Netherlands, Survey on ICT use in Enterprises 2004.

Table A4.2.2
Companies that link their order processing system with automation systems, by industry and company size, 2004 [1)]

	Internal automation systems for ...				External automation systems for ...	
	Internal stock management	Invoicing and payment	Logistics and planning	Marketing	Suppliers	Buyers/ Customers
	% of total number of companies					
Total	32	53	25	17	13	10
Industry						
Manufacturing	43	64	41	18	11	11
Electricity, gas and water supply	57	82	53	32	24	16
Construction	11	41	12	6	11	5
Trade and repair	65	72	32	28	24	16
Hotels and restaurants	8	24	7	11	10	6
Transport, storage and communication	19	54	31	11	10	13
Computer and related activities	22	57	21	31	14	16
Other business activities	12	38	16	14	7	8
Health and social work activities	13	37	17	5	6	7
Other service activities	14	34	13	13	7	6
Company size						
10– 19 employed persons	25	45	16	13	11	8
20– 49 employed persons	35	57	29	18	15	12
50– 99 employed persons	41	63	38	21	14	13
100–249 employed persons	54	71	51	27	18	18
250–499 employed persons	51	72	48	29	20	18
500 and more employed persons	57	73	47	29	28	20

1) Companies with 10 and more employed persons.

Source: Statistics Netherlands, Survey on ICT use in Enterprises 2004.

Table A4.3.1
Companies with broadband internet connections, international, 2003 [1)]

	Total	Company size (number of employed persons)		
		10–49	50–249	250 and more
	% of total number of companies			
EU 25	52	48	70	87
EU 15	55	50	74	88
Belgium	70	67	80	89
Denmark	80	77	91	95
Germany	54	47	76	93
Greece	21	16	42	61
Spain	72	69	87	94
Ireland	32	27	40	79
Italy	51	48	74	93
Luxembourg	48	44	60	77
Netherlands	54	50	67	77
Austria	55	49	79	91
Portugal	49	43	72	90
Finland	71	66	87	93
Sweden	75	71	89	99
United Kingdom	44	40	62	76

1) Companies with 10 and more employed persons.

Source: Eurostat, New Cronos.

Table A4.4.1
ICT use of companies by development phase, 2004 [1)2)]

	No external data communication	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
	% of total number of companies					
Total	10	14	42	14	10	10
Branch of industry						
Manufacturing	7	13	43	16	11	11
Energy, gas and water supply	5	14	25	4	36	16
Construction	11	23	50	7	3	5
Trade and repair	10	14	35	17	9	16
Hotels and restaurants	27	6	30	26	5	6
Transport, storage and communication	12	18	30	19	8	13
Computer service bureaus	4	1	30	4	46	16
Other business services	8	11	49	9	15	8
Health and social work	6	18	57	7	5	7
Other services	9	9	48	17	11	6
Company size						
10– 19 employed persons	14	17	39	13	9	8
20– 49 employed persons	7	13	44	15	9	12
50– 99 employed persons	5	10	44	15	13	13
250–499 employed persons	2	5	47	14	13	18
100–249 employed persons	2	7	45	13	15	18
500 and more employed persons	1	4	53	8	13	20

1) Companies with 10 and more employed persons.
2) Phase 1: external data communication, no website, sales, electronic product supply or on-line after sales service.
Phase 2: website.
Phase 3: electronic sales.
Phase 4: electronic product supply and/or after sales service.
Phase 5: linking the company's order processing system with that of buyers/customers.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

Table A4.4.2
Companies purchasing and selling electronically, by branch of industry and company size, international, 2003[1)]

	EU 25	EU 15	Belgium	Denmark	Germany	Greece	Spain	Ireland	Luxembourg	Netherlands	Austria	Portugal	Finland	Sweden	United Kingdom
	% of total number of companies														
PURCHASING															
Total	27	29	41	28	47	14	3	33	34	22	22	8	19	38	50
Branch of industry															
Manufacturing	21	23	42	22	44	9	2	36	30	20	17	6	.	34	51
Construction	17	19	27	21	32	13	1	20	23	13	15	3	14	32	49
Trade and repair	28	32	38	32	50	16	6	31	34	22	22	12	24	42	48
Hotels and restaurants [2)]	25	26	46	.	44	14	2	31	34	28	37	5	29	44	24
Transport, storage and communication	24	26	37	23	38	16	3	35	35	19	11	4	.	28	51
Business services	40	43	60	42	59	18	6	39	51	28	33	17	24	47	62
Company size															
10– 49 employed persons	25	27	38	27	44	13	3	32	32	20	21	6	18	37	47
50–249 employed persons	34	39	50	32	58	20	3	35	39	26	23	15	19	45	61
250 and more employed persons	45	50	61	.	61	24	6	51	56	39	34	22	32	57	73
SELLING															
Total	13	15	18	25	18	6	2	19	11	17	12	6	17	20	27
Branch of industry															
Manufacturing	15	16	21	27	20	3	3	21	9	19	11	7	20	25	40
Construction	4	4	6	16	6	2	0	9	3	6	3	1	.	7	11
Trade and repair	16	18	20	30	23	3	3	16	15	20	13	6	20	24	32
Hotels and restaurants [2)]	27	27	33	.	42	36	14	44	30	47	41	44	55	55	11
Transport, storage and communication	13	14	19	25	13	6	3	25	16	19	11	6	20	16	32
Business services	11	12	14	20	11	1	1	11	7	14	6	11	13	16	21
Company size															
10– 49 employed persons	12	13	16	24	15	5	2	16	9	15	10	5	15	18	24
50–249 employed persons	19	22	25	31	25	10	6	24	15	22	18	9	25	28	36
250 and more employed persons	29	32	35	.	30	12	14	37	16	35	31	20	34	46	46

1) Companies with 10 and more employed persons.
2) Refers to Hotels (55.1) and Camping sites and other provision of short–stay accommodation (55.2) only.

Source: Eurostat, New Cronos.

Table A4.4.3
Basic indicators of the composite indicator ICT infrastructure, by branch of industry and company size, 2004 [1)]

	Internet	Website	ICT security meas-ures [2)]	Broad-band internet [3)]	Intranet [4)]	Compu-ter use [5)]	Composite indicator ICT infra-structure
	% of total number of companies					*% of employed persons*	*indicator*
Total	90	72	80	70	31	56	67
Branch of industry							
Manufacturing	93	76	85	73	33	53	69
Energy, gas and water supply	95	82	95	93	86	71	87
Construction	89	62	71	62	15	30	55
Trade and repair	89	70	81	70	36	58	67
Hotels and restaurants	72	64	57	49	11	30	47
Transport, storage and communication	88	62	73	68	29	58	63
Computer service bureaus	96	93	96	87	70	97	90
Other business services	92	78	84	77	36	75	74
Health and social work	94	75	88	76	36	50	70
Other services	90	81	82	72	23	60	68
Company size							
10– 19 employed persons	86	64	72	62	21	49	59
20– 49 employed persons	92	77	83	74	32	49	68
50– 99 employed persons	95	81	90	80	49	50	74
100–249 employed persons	98	88	94	90	58	57	81
250–499 employed persons	98	90	96	92	72	59	85
500 and more employed persons	98	93	98	95	79	61	87

1) Companies with 10 and more employed persons.
2) Two or more of the following security measures: anti-virus software, firewall, secure web server, off-site data backup, authentication, encryption.
3) Broadband internet is defined here as ADSL, cable and other fixed internet connections with a large bandwidth.
4) In effect a LAN and an intranet and/or extranet.
5) Percentage of employed persons that regularly uses a computer at work.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

Table A4.4.4
Basic indicators of the composite indicator ICT use, by branch of industry and company size, 2004[1)]

	Electronic purchases ≥ 1% purchase value	Elektronic sales ≥ 1% turnover	Internal linking of IT systems[2)]	External linking of IT systems[3)]	On-line financial trans-actions	Sales via electronic market-places	Composite indicator ICT use
	% of total number of companies						*indicator*
Total	19	13	57	17	65	2	29
Branch of industry							
Manufacturing	17	18	68	15	68	2	31
Electricity, gas and water supply	17	9	86	26	51	7	33
Construction	15	3	43	12	65	1	23
Trade and repair	21	16	80	29	61	3	35
Hotels and restaurants	11	20	29	13	53	3	22
Transport, storage and communication	15	21	57	15	66	3	30
Computer service bureaus	56	20	66	21	71	5	40
Other business services	23	10	40	11	70	1	26
Health and social work	21	5	39	11	64	0	23
Other services	22	11	36	10	68	3	25
Company size							
10– 19 employed persons	19	12	50	14	64	2	27
20– 49 employed persons	17	12	60	19	64	2	29
50– 99 employed persons	23	20	67	18	66	2	33
100–249 employed persons	25	21	75	26	71	3	37
250–499 employed persons	28	21	74	27	67	3	37
500 and more employed persons	35	19	77	33	65	5	39

1) Companies with 10 and more employed persons.
2) Automation system for order processing is linked to one or more of the following internal IT systems: internal stock mangement, invoicing and payment systems, production and logistics planning systems and marketing systems.
3) Automation system for order processing is linked to IT systems of external customers/suppliers.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

Table A4.5.1
Companies with ICT security measures, by branch of industry and company size, 2004 [1]

	Two or more security meas-ures [2]	Anti-virus software	Firewall	Secure web server	Off-site data backup	Digital signa-ture	Other authen-tication mecha-nisms	Encryp-tion
	% of companies with external data communication							
Total	88	97	82	37	40	14	33	15
Branch of industry								
Manufacturing	91	98	85	39	39	13	32	14
Electricity, gas and water supply	100	100	100	61	71	36	50	29
Construction	80	97	69	21	30	14	28	8
Trade and repair	89	96	82	39	44	17	35	16
Hotels and restaurants	77	98	72	20	22	9	19	3
Transport, storage and communication	83	96	78	32	35	11	27	14
Computer service bureaus	100	100	99	73	62	17	51	40
Other business services	92	98	88	45	46	14	38	20
Health and social work	94	98	85	35	41	13	40	22
Other services	90	96	84	42	42	9	37	10
Company size								
10– 19 employed persons	84	96	77	30	35	11	26	9
20– 49 employed persons	90	97	82	38	43	17	36	16
50– 99 employed persons	94	98	91	49	44	15	40	20
100–249 employed persons	96	98	94	52	52	17	51	33
250–499 employed persons	99	99	98	61	58	19	53	43
500 and more employed persons	100	100	99	69	64	21	63	52

[1] Companies with 10 and more employed persons.
[2] Two or more of the following security measures: anti-virus software, firewall, secure web server, off-site data backup, authentication mechanisms, encryption.

Source: Statistics Netherlands, Survey on ICT Use in Enterprises 2004.

Table A4.7.1
Contribution of input factors to growth of gross domestic product (GDP), international, 1995–2003[1)]

	Average annual growth GDP	Contribution input factors to GDP growth			
		Labour	ICT capital	Non-ICT capital	Multi-factor productivity
	%	*average annual contribution in percentage points*			
Belgium	2.05	0.65	0.62	0.26	0.52
Denmark	1.97	0.54	0.67	0.71	0.05
Germany	1.41	–0.24	0.38	0.43	0.84
Greece	3.67	0.43	0.41	0.84	1.99
Spain	3.60	2.16	0.52	0.78	0.14
France	2.50	0.21	0.36	0.43	1.49
Ireland	7.76	2.49	0.46	0.76	4.06
Italy	1.49	0.76	0.41	0.61	–0.29
Netherlands	2.43	1.44	0.50	0.39	0.10
Austria	2.05	0.70	0.35	0.35	0.66
Portugal	2.48	0.42	0.47	0.57	1.02
Finland	3.58	0.99	0.47	–0.12	2.25
Sweden	2.55	0.17	0.72	0.25	1.42
United Kingdom	2.73	0.47	0.64	0.35	1.27
Canada	3.43	1.16	0.59	0.63	1.05
Japan	0.89	–0.70	0.57	0.57	0.45
United States	3.24	0.65	0.80	0.29	1.50

[1)] Italy: 1995–2001. France, Japan, Spain: 1995–2002.

Source: OECD, Productivity database, September 2005.

Table A4.7.2
Contribution to growth of labour productivity, by branch of industry, international, 1990–1995 and 1996–2001[1)]

	Total economy (01–99)	of which				
		ICT industry (30–33)	ICT services (64+72)	ICT-using services (50–52, 65, 66–67, 71, 73–74)	Other	Residual [4)]
	contribution to growth of value added per employed person in percentage points					
Period 1990–1995 [2)]						
Belgium	1.90	0.03	0.12	0.77	0.92	0.06
Denmark	1.99	0.09	0.27	0.36	1.34	–0.07
Germany	2.11	0.17	0.18	0.17	1.79	–0.21
Greece	1.22	0.14	0.09	–0.17	0.83	0.33
Spain	1.13	0.20	0.02	0.01	0.89	0.01
France	2.39	0.43	0.10	0.15	1.87	–0.16
Ireland	2.83	0.09	0.12	0.88	1.56	0.18
Italy	2.08	–0.03	0.74	0.22	0.87	0.28
Netherlands	0.63	0.10	0.09	0.10	0.52	–0.19
Austria	2.32	0.12	0.15	0.59	1.38	0.09
Finland	2.65	0.20	0.13	0.10	2.39	–0.18
Sweden	2.95	0.27	0.24	0.45	1.95	0.05
United Kingdom	2.20	0.19	0.18	0.37	1.63	–0.17
Canada	1.11	0.10	0.08	0.18	0.87	–0.11
Japan	1.36	0.36	0.10	1.13	–0.30	0.08
United States	1.12	0.33	0.14	0.24	0.34	0.05
South Korea	4.94	0.84	0.23	0.74	3.10	0.03
Period 1996–2002 [3)]						
Belgium	0.78	0.13	0.05	0.17	0.43	0.05
Denmark	1.45	0.09	0.13	0.37	0.76	0.09
Germany	1.38	0.09	0.46	0.12	0.63	0.08
Greece	0.28	0.01	0.16	–0.03	0.32	–0.18
Spain	1.00	0.21	0.14	–0.17	0.76	0.07
France	3.76	0.89	0.28	0.73	1.93	–0.07
Ireland	0.56	0.02	0.20	0.14	0.19	0.02
Italy	0.51	–0.01	0.32	–0.20	0.14	0.25
Netherlands	0.77	0.03	0.17	0.28	0.33	–0.04
Austria	1.73	0.11	0.13	0.51	0.87	0.11
Finland	2.02	0.82	0.36	0.22	0.72	–0.09
Sweden	2.67	0.51	0.22	0.60	1.14	0.19
United Kingdom	1.08	0.12	0.24	0.85	0.15	–0.28
Canada	1.65	0.07	0.12	0.40	0.96	0.09
Japan	1.41	0.36	0.18	0.37	0.42	0.08
United States	1.74	0.45	0.16	1.29	0.27	–0.42
South Korea	4.07	1.02	0.31	0.49	2.42	–0.17

1) The corresponding ISIC codes have been shown below the names of the branches.
2) Germany: 1991–95. France, Italy: 1992–95.South Korea: 1993–95.
3) Sweden: 1996–98. South Korea, Spain: 1996–99. Ireland, Norway: 1996–2000. France, Germany, Japan, Netherlands, United Kingdom, United States: 1996–2001.
4) Originating from changes in weights.

Source: OECD STAN database, estimates for Ireland, Sweden and Switzerland based on data from Van Ark et al. (2002), see Pilat and Wölfl (2004).

Table A4.7.3
Estimated production functions of enterprises in the services sector, 1994–1999 [1)]

Production inputs	Estimated production funtions (value added)	
	(1) Technological innovation [2)]	(2) Non–technological innovation[3)]
Constant	3.904	4.935
	(0.267)	(0.299)
Labour	0.506	0.464
	(0.047)	(0.049)
ICT capital	0.041	0.034
	(0.009)	(0.011)
Non-ICT capital	0.268	0.162
	(0.035)	(0.038)
ICT / Innovation[4)]	0.047	0.040
	(0.014)	(0.016)
Non-ICT / Innovation[5)]	–0.022	–
	(0.056)	–
Innovation	0.146	0.036
	(0.421)	(0.080)
R-squared	0.835	0.830
Number of enterprises	972	972

Note: Heteroscedasticity consistent standard errors are reported in parenthesis.

1) It concerns an extended Cobb-Douglas production function with two kinds of capital (ICT and non-ICT) and innovation as inputs. The output variable is value added at constant prices.
2) The value of the dummy variable Innovation is one (=1) if an enterprise in the period 1994–1996 as well as in the period 1996–1998 implemented product and/or proces innovations.
3) The value of the dummy variable Innovation is one (=1) if an enterprise in the period 1994–1996 as well as in the period 1996–1998 implemented non-technological innovations.
4) The variable ICT / Innovation is a measure for the 'extra' contribution of ICT capital to the output in a situation of permanent innovation (innovation dummy =1).
5) As footnote 4, but then referring to non-ICT capital.

Source: Hempel a.o. (2004).

Table A5.1.1
On-line services for citizens and businesses by the public sector, 2000–2004 1)

	Services for citizens					Services for businesses				
	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
	% of all public services									
Total	18	26	34	40	49	19	24	30	44	50
Municipalities	13	17	25	36	45	11	12	17	42	44
Provinces	0	0	20	31	37	0	4	21	22	19
Water boards	13	28	38	40	52	13	27	38	40	52
Police	5	8	31	29	49	6	10	36	26	46
Central government	32	48	53	51	59	45	55	55	60	65

1) From 2003 onward, the method of measurement is harmonized with European standards. Because of this, results from 2003 and later are not fully comparable with those from previous years.

Source: Advies Overheid.nl.

Table A5.1.2
On-line availability of public services, international, October 2001 and October 2004 1)

	October 2001		October 2004	
	Total	of which fully available on-line	Total	of which fully available on-line
	% of public services			
EU 15	.	.	73	49
Belgium	23	0	67	35
Denmark	59	32	81	47
Germany	40	20	66	47
Greece	39	11	61	32
Spain	50	30	73	55
France	49	25	74	50
Ireland	68	22	84	50
Italy	39	15	72	53
Luxembourg	15	5	53	20
Netherlands	37	5	70	32
Austria	40	15	87	72
Portugal	51	32	68	40
Finland	66	33	83	67
Sweden	61	28	89	74
United Kingdom	50	24	84	59

1) These are 20 selected public services studied in all countries.

Source: Capgemini in commission of the European Commission.

Table A5.1.3
Companies communicating with government via internet, by purpose, international, 2004[1)]

	To obtain information	To obtain forms	To return filled in forms	Full electronic case handling
	% of total number of companies			
EU 15	43	40	26	15
EU 25	45	41	29	16
Belgium	49	42	26	14
Denmark [2)]	62	54	35	30
Germany	34	28	17	5
Greece	61	58	45	.
Spain	48	45	32	23
Ireland	60	54	32	6
Italy	51	51	36	25
Luxembourg	64	63	26	10
Netherlands	43	39	27	12
Austria	53	68	47	40
Portugal	51	47	50	41
Finland	88	84	61	25
Sweden	90	87	53	17
United Kingdom	31	27	11	1

1) Companies with 10 and more employed persons.
2) 2003 instead of 2004.

Source: Eurostat, New Cronos.

Table A5.2.1
Pupils per computer and internet computer in schools where 15–year-olds are educated, international, 2003

	Pupils per computer	Pupils per internet computer
	number	
EU 25	.	.
EU 15	.	.
Belgium	7.5	11.0
Denmark	5.9	6.6
Germany	13.7	18.2
Greece	13.9	21.0
Spain	11.7	14.6
Ireland	9.1	12.9
Italy	7.2	10.1
Luxembourg	5.3	6.1
Netherlands	7.5	8.9
Austria	5.0	5.6
Portugal	14.4	23.0
Finland	6.6	7.1
Sweden	5.7	6.2
United Kingdom	4.4	5.0
Canada	4.7	5.4
Japan	6.7	9.0
United States	3.9	4.7
South Korea	4.1	4.7

Source: OECD, PISA research (edited by Statistics Netherlands).

Table A5.2.2
Cooperation between schools in the field of ICT, 1997/'98–2004/'05

	1997/'98	2000/'01	2003/'04	2004/'05
	%			
Primary education				
Joint system and network management	7	44	77	74
Purchase of software	.	38	39	36
Exchange of ideas about using ICT	31	.	85	77
Advance of expertise	.	.	76	68
Secondary education				
Joint system and network management	13	47	.	19
Purchase of software	.	23	.	31
Exchange of ideas about using ICT	38	58	.	38
Advance of expertise	31	42	.	25
Vocational and adult education				
Joint system and network management	5	17	21	24
Purchase of software	.	26	51	39
Exchange of ideas about using ICT	43	83	86	76
Advance of expertise	24	49	53	56

Source: IVA/ITS, 8 jaar onderwijs en ICT.

Table A5.2.3
Schools encountering problems when introducing ICT, 1997/'98–2004/'05

	1997/'98	2000/'01	2003/'04	2004/'05
	%			
Primary education				
Quality of computers	61	61	16	18
Number of computers	56	47	16	18
Appropiate rooms for computers	52	56	31	31
Secondary education				
Quality of computers	65	17	20	24
Number of computers	55	32	37	42
Appropiate rooms for computers	48	47	59	56
Vocational and adult education				
Quality of computers	50	8	15	2
Number of computers	30	22	13	5
Appropiate rooms for computers	10	22	8	5

Source: IVA/ITS, 8 jaar onderwijs en ICT.

Table A6.1.1
Type of internet connection, by background characteristics, 2005 [1]

	Analogue modem	ISDN	ADSL	Cable [2]	Other
	% of households with internet connection				
Total	24	7	43	27	5
Province					
Zeeland	14	6	9	72	3
Zuid-Holland	20	6	51	23	4
Noord-Holland	22	11	42	27	7
Utrecht	22	7	45	25	6
Flevoland	23	11	47	21	2
Limburg	25	4	34	36	5
Noord-Brabant	26	7	36	33	5
Drenthe	26	8	44	25	2
Groningen	26	3	45	24	6
Overijssel	29	5	38	27	4
Gelderland	29	6	46	18	5
Friesland	34	6	35	25	3
Household size					
1 person	32	6	43	21	6
2 persons	29	8	38	25	4
3 persons	17	6	46	30	6
4 persons	16	6	46	33	4
5 persons or more	16	10	45	30	5
	% of persons with internet connection				
Total	21	7	43	29	5
Sex					
Men	20	6	46	29	4
Women	22	8	41	28	6
Level of education					
Primary	15	6	39	34	9
Lower secondary	25	7	36	31	3
Intermediate secondary	16	6	46	31	8
Advanced/senior secondary	20	7	43	30	4
Higher professional/university	25	8	48	23	3

1) Households and population based on persons aged 12 to 74 years.
2) Including UMTS.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

Table A6.3.1
PC ownership and internet access, by background characteristics, 2005 [1)]

	PC ownership	Internet access
	% of households	
Total	83	78
Province		
Flevoland	90	85
Utrecht	88	83
Drenthe	88	81
Noord-Holland	83	79
Overijssel	81	79
Zuid-Holland	83	78
Gelderland	83	78
Limburg	82	78
Groningen	88	78
Friesland	83	77
Noord-Brabant	80	76
Zeeland	84	74
Household size		
1 person	69	62
2 persons	81	76
3 persons	94	89
4 persons	96	94
5 persons or more	97	93
	% of persons	
Total	87	83
Sex		
Men	89	84
Women	86	81
Level of education		
Primary	71	66
Lower secondary	78	71
Intermediate secondary	89	85
Advanced/senior secondary	92	88
Higher professional/university	95	92

[1)] Households and population based on persons aged 12 to 74 years.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

Table A6.3.2
Persons who have never used the internet, by age, 2003–2004

	2003	2004
	x million	
Total (population aged 12 years and older)	4.3	3.8
of whom		
12–17 years	0.1	0.0
18–24 years	0.1	0.1
25–34 years	0.3	0.3
35–44 years	0.5	0.4
45–54 years	0.7	0.6
55–64 years	0.9	0.8
65 years or older	1.7	1.7

Source: Statistics Netherlands, POLS (population aged 12 years and older).

Table A6.3.3
Internet users who use the internet at work, international, 2004 [1)]

	% of the population
EU 25	41
EU 15	42
Denmark	70
Germany	30
Greece	45
Spain	44
Ireland	44
Italy	47
Luxembourg	41
Netherlands	47
Austria	47
Portugal	50
Finland	53
Sweden	45
United Kingdom	47

1) Internet users are people who accessed the internet in the 3 months preceding the survey. The percentages given here reflect the percentages of users who used the internet at work (and possibly also elsewhere, e.g. at home).

Source: Eurostat, New Cronos.

Table A6.4.1
On-line shopping, by background characteristics, 2005 [1)]

	Total	Less than 3 months ago	3 months to one year ago	More than one year ago
	% of households with internet connection			
Total	55	37	13	5
Province				
Utrecht	62	43	15	4
Flevoland	61	36	15	10
Groningen	59	45	11	4
Noord-Holland	58	40	13	5
Zuid-Holland	57	38	13	6
Overijssel	56	32	20	4
Gelderland	55	37	12	5
Friesland	54	37	13	4
Limburg	52	32	15	4
Drenthe	51	36	13	2
Noord-Brabant	48	34	10	5
Zeeland	47	29	9	9
Household size				
1 person	56	40	12	4
2 persons	52	34	12	6
3 persons	58	37	16	5
4 persons	58	40	13	5
5 persons or more	56	37	13	5
	% of persons with internet connection			
Total	53	35	13	5
Sex				
Men	60	41	13	6
Women	47	30	13	4
Level of education				
Primary	31	16	11	3
Lower secondary	37	23	10	3
Intermediate secondary	40	26	11	4
Advanced/senior secondary	58	39	13	5
Higher professional/university	72	49	16	7

1) Households and population based on persons aged 12 to 74 years.

Source: Statistics Netherlands, ICT survey 2005 (population aged 12 to 74 years).

Concepts and definitions used

Some key concepts and definitions used in this publication are explained briefly below.

Basic price

The basic price is the amount receivable by the producer of goods or services after the sale of the product. Trade and transport costs (e.g. shipping costs), product-related taxes (e.g. VAT) and product-related subsidies (e.g. export subsidies) are not taken into account.

Branches of industry

Most tables and figures in this publication include data broken down by branch of industry:

Branches of industry

Description in table	Description and code SBI 93
Agriculture, forestry and fishing	Agriculture, hunting and forestry (01, 02)
	Fishing (05)
Mining and quarrying	Mining and quarrying (10–14)
Manufacturing	Manufacturing (15–37)
Electricity, gas and water supply	Electricity, gas and water supply (40, 41)
Construction	Construction (45)
Trade, hotels, restaurants and repair	–
of which	
Trade and repair	Trade and repair of motor vehicles/cycles; retail sale of automotive fuel (50)
	Wholesale trade and commission trade (51)
	Retail trade, repair of personal and household goods (52)
Hotels and restaurants	Hotels and restaurants (55)
Transport, storage and communication	Transport, storage and communication (60–64)
Financial institutions	Financial institutions (65–67)
Business activities	–
of which	
Computer service bureaus	Computer and related activities (72)
Other business activities	Real estate activities (70)
	Renting of movables (71)
	Research and development (73)
	Other business activities (74)
General government	Public administration and defence; compulsary social security (75)
Subsidized education	Education (80 excl. 80.4)
Health and social work activities	Health and social work activities (85)
Other service activities [1]	–
of which	
Sewage and refuse disposal services	Sewage and refuse disposal, sanitation and similar activities (90)
Other service activities n.e.c.	Recreational, cultural and sporting activities (92)
	Other service activities n.e.c. (80.4, 91, 93)

[1] In the Survey on ICT use in Enterprises, the SBI groups 80.4 and 91 are excluded from this branch of industry.

Apart from the abbreviated names used in the tables and figures, they are also specified by their SBI codes and full names.

Broadband

High-quality communication connections with the internet such as cable, ADSL and other kinds of DSL connections. In addition, the rented and leased lines with high-speed transmission are included, as is UMTS (mobile broadband).

Business-to-Business market

The market for electronic shopping where companies sell goods and services to other companies.

Business-to-Consumer market

The market for electronic shopping where companies sell goods and services to consumers (individuals and households).

Capital goods

Capital goods are goods and services used to produce other goods and which have a life span of more than one year.

Care chain

Succession of various kinds of care provided by various care providers to the patient/client where the care providers together see to a smooth process.

Care taken out of hospital

Hospital care given outside the hospital, often at home.

Consumer-to-Consumer market

The market for electronic shopping where consumers (individuals and households) sell goods and services to other consumers.

Dutch residents with a foreign background

Residents of the Netherlands with at least one parent who was born abroad. Residents who are born abroad themselves are considered first generation. Residents born in the Netherlands who have one or both parents born abroad are second generation.

There is a distinction by country of origin. The country where someone is born is his or her country of origin. When someone is born in the Netherlands, the mother's country of birth is used. If the mother is Dutch born, then the father's country of birth is considered the country of origin.

The category 'western' refers to people with a foreign background originating from Europe (excluding Turkey), North America, Oceania, Japan and Indonesia (including the former Dutch East Indies).

The category 'non-western' refers to people originating from Turkey, Africa, South America and Asia except Indonesia and Japan. The latter two generally have a different social and economic position, and mainly include people born in the former Dutch East Indies and employees of Japanese companies and their families.

E-commerce

The definition agreed at the OECD of e-commerce is: the sale or purchase of goods or services through electronic networks, irregardless of delivery and payment methods. Excluding orders by telephone, fax or conventional e-mail.

EDI

Electronic Data Interchange; exchanging electronic data in a prearranged format. An EDI-network (such as EDIFACT or Ainsi 12x) is a closed network, i.e. not accessible to the public, often used in the trade between companies and involving a set-up with a modem and telephone line.

Electronic shopping

On-line purchase of goods or services by consumers. Electronic shopping is a form of e-commerce.

Employed labour force

All people working at least twelve hours a week (employees, self-employed, people working in the family business). The figures usually refer to the employed labour force aged 15-64.

EPO (European Patent Office)

The EPO grants patents for the countries that signed the European Patents Treaty. On 1 September 2004 these were Austria, Belgium, Bulgaria, Switzerland, Cyprus, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, United Kingdom, Greece, Hungary, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, the Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia and Turkey. The region for which a patent is applied can be extended on request with the countries Albania, Croatia, Lithuania, Latvia and the Former Yugoslav Republic of Macedonia.

Exports

Exports refer to goods and services sold abroad by a resident of this country. The exports of goods refer to goods supplied abroad from the economic territory of the Netherlands. When trade and transport margins up to the Dutch border are included, this is known as 'free on board' (f.o.b.). Exports also include expenditure by foreign tourists in the Netherlands, people living close to the border and diplomats.

External data communication

The possibility of communication between one or more computers from one company and computers of others.

Fixed capital formation

Fixed capital formation includes produced material or immaterial assets that are used for more than one year in the production process. It includes for instance the balance of purchases and sales of computer programs and large databases. Expenditure by telecom companies in 2000 to get an UMTS licence is not considered such an investment. Just like land, an UMTS licence is not actually produced, nor will it show wear and tear in the production process. Therefore, the expenditure is not included in the (operating) costs of companies nor part of the value added. The UMTS licences are seen by the National accounts as sales of immaterial, not produced government assets to the private sector. The yield is included in the government's balance of net lending/net borrowing on the reference year.

Flexible labour relationship

Labour contract for less than one year and/or a contract where the period is not specified.

Gross value added and gross domestic product (GDP)

Gross value added against basic prices per branch of industry is equal to the difference between production (at basic prices) and intermediate use (purchase prices). The sum of the gross value added per branch of industry is the gross value added of the total economy (the gross domestic product, at basic prices). Gross here means that depreciations are not subtracted from the value added. Economic growth is the percentage volume growth of the gross domestic product.

High-tech patents

High-tech patents are defined as the following groups of the International Patent Classification (IPC): B41J, G06, G11C, C12M, C12N, C12P, C12Q, B64, H04, H01L and H01S.

High-tech products

High-tech products are R&D-intensive products: for space travel and aviation, computers, office machinery, electronics, instruments, pharmaceutics, electronic machinery and weapons.

ICT capital

ICT capital (goods) are ICT goods and services used to produce other goods, and which have a life of more than one year in the production process. The most important examples are computers and software.

ICT expenditure

ICT expenditure is expenditure on ICT goods and services consisting of investments by companies and government in ICT capital, the intermediate use of ICT goods and services by enterprises and the government and consumption of ICT goods and services by households.

ICT market

The ICT market is, in the abstract sense, the total of demand and supply of ICT goods and services. The volume of the market can be expressed as the total turnover of ICT goods and services in a given period. The total turnover of the ICT sector is an indication of the volume of the ICT market.

ICT patents

ICT patents are defined as codes G06, G11 and H04 of the International Patent Classification (IPC).

ICT sector

The definition of the ICT sector here is in line with the OECD definition (OECD, 2000). It is based on the following concepts:

The sector ICT industry must produce products that:

– are meant to process information and to communicate, including audio-visual means;
– use electronic processing technology to observe, measure, reproduce and check information about physical phenomena and processes.

The sector ICT services must provide services that:

– are meant to support the process of electronic information processing and communication.

In terms of ISIC Rev.3.1 this leads to the following classification:

Internationally agreed definition of the ICT sector

ISIC Rev. 3.1 code	
ICT industry sector	
3000	Manufacture of office, accounting and computing machinery
3130	Manufacture of insulated wire and cable
3210	Manufacture of electronic components
3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
3230	Manufacture of audio and video equipment
3312	Manufacture of equipment for measuring, checking, testing, navigating and other purposes
3313	Manufacture of industrial process control equipment
ICT services sector	
5151	Wholesale of computers, computer peripheral equipment and software
5152	Wholesale of electronic and telecommunications parts and equipment
7123	Renting of office machinery and equipment (including computers)
6420	Telecommunications
7200	Computer and related activities

Source: OECD.

The definition used in this publication of the ICT sector is slightly different. There are no data on groups 5151 and 5152 and 7123 because the national accounts are not sufficiently detailed in this area. Telecommunication is observed together with post and courier services for confidentiality reasons (see also table 1.4.1 in chapter 1).

ICT workers

ICT workers are the occupations Programmers (514), Technical systems analysts (666), Systems analysts (714) and Informatics experts (914) from the Standard Classification of Occupations.

Imports

Imports refer to goods and services sold abroad to a resident of this country. The imports of goods refer to goods for residents that were brought from abroad to the economic territory of the Netherlands. When trade and transport margins up to the border of the exporting country are included, this is known as 'free on board' (f.o.b.).

The imports of services refer to expenditure by Dutch companies abroad, such as transport costs, banking costs and business travel. Paying for software produced by foreign companies is also considered as importing services.
In government, the imports refer to expenditure abroad by embassies. The imports by households consist of consumer goods and direct consumer expenditure by Dutch tourists, people living close to the border, diplomats and the military abroad.

Informatics studies

In this publication, informatics in higher education is determined on the basis of the international classification of education (ISCED). It includes *Informatics (ISCED 481)* and *Electronics and automation (ISCED 523)*. The international data (graph 2.9.3 and table A2.9.1 in the annex) only refer to *Informatics (ISCED 481 = ISCED 48)*.

Intermediate use

Intermediate use (consumption) includes all products used in the production process in the reporting period. These may be raw materials, semi-manufactured goods and fuels, or services such as communication services, cleaning services and services of external accountants. The intermediate use is valued at purchase prices, excluding deductible VAT.

Internet users

People using the internet. In this publication, internet users are limited to people aged over 12, when reporting on 2002–2004, unless specified otherwise. In reports on 2005 these are people aged 12–74.

Jobs

A position occupied by an employed person. An employed person may have more than one job at a time. In that case, someone has a main job and a job on the side. In this publication, the jobs are usually main jobs.

Labour volume

The labour volume consists of the number of jobs in a given year expressed in full-time equivalent jobs. The full-time equivalent of an employee's job is determined by dividing the contractual annual working hours of the actual job by the contractual annual working hours of a full-time job. The full-time equivalent of a self-employed person's job is determined by dividing the usual weekly working hours by the average working hours of the self-employed working 37 hours a week or more.

Market price

The market price is the price paid by the consumer for a given product. The amount includes product related taxes and subsidies and trade and transport costs.

Offshoring

Outsourcing work abroad.

Phishing

A form of internet fraud aimed at obtaining valuable identification data of the owner of the e-mail address spammed. The criminal intent is to access banking accounts or other password-protected matters.

Production

The production includes the value of all goods intended for sale (also the unsold goods) and receipts for services rendered. Production also includes products with a market equivalent produced for the company's own use, such as in-company investments such as software developed within the company for the company's own use. The production is valued at basic prices. The basic price is what the producer actually gets, that is excluding trade and transport margins by others and excluding the balance of product-related taxes (including VAT) and product-related subsidies.

Re-exports

All goods intended for use or consumption outside the Netherlands. These are goods originally imported in the Netherlands that leave the country virtually unchanged. The ownership of these goods must be transferred to a Dutch resident. If not, the goods are considered transit goods.

Self-employed

Statistics Netherlands uses two definitions. In both, the family members working in the family business are also considered self-employed.

People who do not receive a wage or salary but who work for their own risk in their profession or company, or who work in a family business. This is the definition used in the Labour accounts.

People who work in their practice or company, or in their partner's or parents' practice or company. This definition is used in the Labour force survey.

Spam

Unsolicited e-mail message, often spread in massive quantities to different e-mail addresses. The message often contains a commercial and a link to a commercial internet address.

Teleworkers

For individuals (in the POLS survey):

The POLS survey defines teleworkers as people who work for an employer at home or at a distance, using a computer link with the employer. The group of teleworkers is limited because the question about telework is only asked if people have a pc at home and use that pc mostly for work. So people who do their work elsewhere are not included, nor are people who use their pc at home mainly for private matters and to a lesser extent for work.

For companies (in the survey ICT use by enterprises):

A teleworker here is an employee who regularly works outside the company premises, but who does have access to the company's ICT systems.

Turnover

Turnover is the total revenue from the goods and services sold at market prices.

Vacancies

An unfilled place of employment that a company or institution is looking to fill with someone from inside or outside, who can start working in the job fairly soon.

Vacancy rate

The number of vacancies per 1,000 jobs (main jobs or jobs on the side).

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