The digital economy 2007

Explanation of symbols

.	= data not available
*	= provisional figure
x	= publication prohibited (confidential figure)
–	= nil or less than half of unit concerned
–	= (between two figures) inclusive
0 (0,0)	= less than half of unit concerned
blank	= not applicable
2005–2006	= 2005 to 2006 inclusive
2005/2006	= average of 2005 up to and including 2006
2005/'06	= crop year, financial year, school year etc. beginning in 2005 and ending in 2006
2003/'04–2005/'06	= crop year, financial year, etc. 2003/'04 to 2005/'06 inclusive

Due to rounding, some totals may not correspond with the sum of the separate figures.

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Preface

In this publication Statistics Netherlands describes how Dutch society is becoming an information society. The core is formed by the widespread use of information and communication technology (ICT).

The Netherlands is well up to speed in ICT, when compared with other trend-setting countries. The Netherlands belongs to the international top in the use of broadband, and the Dutch government performs above the EU average where ICT is concerned. E-commerce in the private sector is growing rapidly. However, the care and the education sectors do not yet make optimum use of ICT, and the ICT internet skills of the population are very average.

This publication also provides information about the use of ICT in companies and households, and about the ICT sector itself. The way in which ICT has made its entry in the public sector is highlighted as well.
The publication is not only based on figures by Statistics Netherlands, but also on figures made available by other organisations and research institutes.

This is the seventh edition in the series, and just like the previous two editions it contains extra information about the telecom infrastructure and many international comparisons. Publication is made possible again by the cooperation with TNO and financial support of the Ministry of Economic Affairs.

The information about ICT is growing each year, so we decided to make some methodological and statistical contents available on the website only (www.cbs.nl/digitale-economie). This gave us enough room to include the Capita Selecta, which includes four contributions that take a closer look at several specific topics in ICT.

The Director-General
of Statistics Netherlands

G. van der Veen

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Summary and conclusions

Current key issues in ICT are discussed in the introduction, the six statistical chapters and the Capita Selecta of this publication.

Introduction (chapter 1)

New technology can bring about major economic and social change. The classic example of this is the invention of the steam engine. The situation with ICT looks comparable, so in 'The digital economy' Statistics Netherlands seeks to quantify the role of ICT in the Dutch economy and society. In this publication we use a model that focuses on the demand and supply of ICT. In this model the ICT sector and ICT infrastructure play key roles. The chapters in this publication deal first with the relation between ICT and the economy, then with the ICT sector itself, and finally with the use of ICT in society.

ICT and the economy (chapter 2)

The Dutch economy saw a growth rate of 3 percent in 2006, which was the highest growth rate of the Dutch Gross Domestic Product (GDP) since 2000. During the first six months of 2007 the economy continued to grow, albeit at a more modest pace. The ICT sector was eager to benefit from the economic recovery which started in 2004, especially the ICT services sector. Domestic ICT investments rose to more than 13.5 billion euro in 2005. In 2006, Dutch ICT spending equalled 6.3 percent of GDP. The share of ICT services increased in the past decade at the expense of ICT goods – the same is true for household consumption.

The European ICT policy is mainly based on the 'eEurope Action Plans' of the European Commission. The current action plan focuses on ICT research and innovation, secure broadband communication and digital government services. Dutch government policy encourages ICT growth in the widest sense: the government policy is to take the Netherlands to the European top. The Netherlands is already at the top in the use of broadband.
The Dutch ICT agenda for 2006–2007 contained several new focal points: 'ICT and health', 'e-skills' and 'effective market control'. Dutch government policy also looks at the ICT sector. This sector makes a major contribution to the total private sector spending on R&D, especially by the ICT industry. R&D spending receives so much attention because R&D may lead to innovations and patents. The Netherlands applies for relatively many patents and follows right behind Finland in this area.

About 4.6 thousand students graduated in informatics in 2005/'06; this is about 5 percent of the college and university graduates in the Netherlands. Computer service bureaus sent their employees to more courses in 2005 than the private sector average, and spent twice as much on the courses.
The international trade in ICT goods and services flourished in the past decade, there was a boom in Dutch imports and exports as well as employment for ICT professionals. There is increasing globalisation in all sectors of the economy. In the ICT sector assembling and technical production are often shifted to low wage countries; offshoring of ICT services is growing rapidly. Within Europe these activities are shifted to Eastern Europe; on a global scale they are shifted to India and China.

Telecom (chapter 3)

The biggest development in telecom is undoubtedly the convergence of services. Telephone, television and the internet services used to be handled by different providers, but now these services can be bought in a single package from a single provider, using a single network. More and more consumers opt for the all-in-one packages because they are cheap and easy to use.
The telecom contributed about 2.5 percent to Dutch GDP in 2006. The contribution made by fixed telephone services is smaller because many people now only use their mobile phones. Phoning through the internet is also gaining popularity.
The Netherlands belongs to the European top in internet use. Internet use is still increasing as is shows by the spectacular rise in internet exchanges, in turn strengthened by the fast rise of broadband. However, there are relatively few fibre optic cable networks.

Digital television is gaining popularity in the Netherlands: in December 2006 over 2 million households watched digital television. This is provided in many forms: terrestrial, satellite, cable and the internet. Digital radio is also becoming more popular, but not quite as popular as digital television.

ICT use by companies (chapter 4)

The Netherlands is not at the absolute top when it comes to private sector use of ICT. Companies in Denmark, Finland and Sweden made slightly more intensive use of ICT. Companies in the Netherlands are not the earliest of early adapters in adopting ICT applications. Several years ago Dutch companies made average use of broadband internet and on-line purchases and sales in comparison with other EU countries. In 2006 Dutch companies became above average for the first time in these domains. It is now common for Dutch companies to use broadband internet and to have a website.

Therefore there is much support in the Netherlands for advanced and large scale ICT applications. The Dutch industry uses ICT for support and business processes with a focus on the production and distribution chains. The Dutch services sector focuses on marketing and on the client.

One in ten companies used open source software by December 2006, often major companies. The main reason seems to be the differences between companies in ICT skills. Between 6 and 7 percent of the companies used on-line invoicing. The increasing electronic data communication must be legally valid and reliable. In 2006 one in three companies used authentication in sending mail. Almost a third of the companies receiving orders through the internet used secure protocols. So the companies that used these security measures are not the majority.

On-line purchases and sales by companies are increasing by the year. This is true for the number of companies using online facilities and for the volume of transactions. The turnover of e-commerce in 1999 was barely 3 percent of the total turnover by companies. In 2006 this had increased to almost 11 percent.

ICT use in the public sector (chapter 5)

The Dutch government uses ICT on a large scale in its services for the population, for the business community, and within the government itself. By December 2007 over two thirds of the government services were available on-line. Dutch e-government performs above the European average. There are differences between the different layers of government: municipalities, water boards and the police are less advanced in their online services to the population than the other parts of government. Provinces, municipalities and water boards performed below average in on-line services to businesses. The on-line municipal services turned out to be most advanced in the provinces South Holland and Overijssel, while municipalities in the provinces Limburg and Zeeland lagged behind.

The education sector mainly uses ICT to make education more attractive, to enrich the learning environment, and to stimulate independent learning. The Dutch education sector lags behind that of other developed nations in various areas of ICT, for instance the shortages in personal computers, internet and software.
The care sector is also not the most advanced in ICT investments, although there was a substantial increase in investments in recent years. ICT is increasingly used for strengthening the patient's own responsibility. The focus is also on developing standards for exchanging and securing data.
In the Dutch care sector 55 percent of the people employed regularly used a computer for their work in 2006. Computers were used substantially more in health care than in social work. The same is true for the use of the internet.

ICT use by households and individuals (chapter 6)

In 2007 more than eight in ten households had internet access, three quarters through broadband. Mobile devices, such as wireless laptops, mobile phones, palmtops and gaming computer are increasingly used, especially by men. Internationally the Netherlands is a frontrunner in the availability of ICT in households. However, the Netherlands is somewhere in the European middle when it comes to ICT skills.

Communication is top of the list of activities by internet users. In 2007 over a quarter of the internet users – mainly young people – used the internet for this, e.g. through Skype or MSN Messenger. Listening to the radio or watching TV via internet is gaining in popularity. The intensity with which the internet is used is also increasing. More and more people are using search engines, look at government websites and do their shopping on-line; moreover they do so more frequently than in previous years.

In 2007 7.5 million people indicated that they had done some on-line shopping; their number has doubled in five years time. The frequency of on-line consumption is positively correlated with education level. In 2007 over half of all internet users indicated that they had looked at government websites. Dealing with the government, such as downloading forms and returning filled in documents – e.g. tax returns or looking for work at the job exchange CWI – increased in 2007.

Despite the growing intensity of internet use, many people do not pay enough attention to security, nor do they back-up files. One in five internet users in 2007 faced the negative impact of a computer virus.

On-line shopping and the retail trade (Capita Selecta)

In 2007 the Netherlands Institute for Spatial Research studied the consequences of on-line shopping for consumers, retailers and mobility. It shows that shopkeepers downtown are hard hit by on-line shopping. Male on-line shoppers in particular changed their physical shopping behaviour due to on-line shopping. They have become more price conscious and there is more substitution than with female on-line shoppers. On-line shopping also leads to extra, impulsive purchases and also to more mobility.

The use of ICT by companies (Capita Selecta)

Statistics Netherlands and the VU University of Amsterdam studied success in ICT investments. The focus was mainly on standardising ICT use and data exchange

between various business functions. The use of ICT and standardisation of ICT are positively correlated with the productivity of the company according to the study. ICT is currently mainly used in financial management. Major companies tend to use ICT more, and also to standardise more, but other aspects can change this pattern.

The effects on productivity of using broadband (Capita Selecta)

ICT can generate innovations and raise productivity in companies. The implementation of ICT tools usually costs little and yields a lot – also in terms of efficiency. It is not entirely clear if such effects can actually be measured for broadband. A study by Statistics Netherlands looks at this issue by linking several statistics. Its first results show that investments in ICT tools yield relatively more than other investments. Moreover applying new ICT technologies improves the efficiency of the use of other means of production.

Statistics through internet: exploration (Capita Selecta)

The increasing digitalisation leads to challenges and opportunities in compiling statistics. This is shown in a study commissioned by the Ministry of Economic Affairs carried out by Dialogic and the University of Utrecht. The preliminary conclusions confirm that the internet can be used as a data source. The question is if the data are fit as input for statistics. Answers are expected in the course of 2008.

Key indicators of the digital economy, national, 2002–2007

	2002	2003	2004	2005*	2006*	2007*
	% volume change on previous year					
ICT and the economy						
ICT investments	–10.5	–0.3	6.0	9.3	.	.
Intermediate consumption of ICT goods and services	1.9	0.9	1.8	2.1	4.1	.
Consumption of ICT goods and services	8.7	4.2	3.5	5.3	6.4	.
Gross value added ICT sector	0.8	4.2	2.9	2.3	4.2	.
of which ICT industry sector	–20.9	0.9	6.9	–6.4	0.7	.
ICT services sector	4.2	4.5	2.5	3.2	4.5	.
	number					
Companies in the ICT sector						
Total	23,845	23,920	25,220	24,235	27,825	.
New companies	2,530	2,455	2,730	3,450	3,360	.
Bankruptcies	447	383	289	270	203	.
	x million euro					
R&D expenditure in the ICT sector [1)]	1,650	1,693	1,464	1,534	.	.
	number (x 1,000)					
ICT and employment						
Employed labour force working in an ICT profession	288	271	273	266	248	.
Vacancies in the ICT sector	2.2	2.4	6.0	8.9	12.5	12.4
Informatics graduates from higher education [2)]	3.06	3.40	3.83	4.20	4.57	.
	number (x million)					
Telecommunication infrastructure						
Fixed telephone lines: PSTN	6.3	6.1	5.9	5.5	4.5	.
Fixed telephone lines: ISDN [3)]	1.5	1.6	1.5	1.4	1.3	.
Telephone connections via rtv cable	0.2	0.2	0.3	0.5	0.8	.
Mobile telephone connections	12.0	13.3	15.9	16.3	17.1	.
Broadband connections: cable	0.8	1.0	1.3	1.6	2.0	.
Broadband connections: ADSL	0.3	0.9	1.8	2.5	3.0	.
	% of total					
ICT use by households and individuals						
PC ownership, households [4)]	76	76	80	83	84	86
Internet access, households [4)]	63	65	71	78	80	83
Broadband access, households [4)]	15	22	34	54	66	74
Shopping on-line, individuals [5)]	40	45	52	55	61	66
	% of total number of companies					
ICT use by companies [6)]						
Companies with computers	95	94	94	100	100	.
Companies with external data communication	89	88	90	97	99	.
Companies with internet access	86	87	90	97	99	.
Companies with broadband internet	40	55	70	81	87	.
Companies with a website	60	65	72	79	80	.
Companies ordering of goods/services electronically [7)]	31	29	36	45	42	.
Companies receiving orders electronically [7)]	26	20	23	27	28	.

1) R&D carried out by own staff.
2) Graduates who have successfully completed higher professional education (vocational college) or university; 2002 = study year 2001/2002 etc.
3) The number of ISDN connections. One ISDN connection may consist of 2 or more lines. These figures differ from those in the previous edition of The Digital Economy, as they refer to the number of connections, not the number of lines.
4) Private households with at least one person aged 12–74 years.
5) Percentage of persons with an internet connection.
6) Companies with 10 or more employed persons.
7) Because of changes in questions, figures are not completely comparable over the years.

Source: Statistics Netherlands; TNO (telecommunication infrastructure).

Key indicators of the digital economy, international, 2004–2007

	EU-15	EU-27	Belgium	Denmark	Germany	Finland
	%					
ICT and economy						
ICT expenditure as % of GDP, 2006	5.6	5.7	5.9	6.0	5.7	6.0
Contributions of ICT capital to GDP growth, 2000–2005 [1)]	.	.	0.5	0.5	0.3	0.4
Share of ICT employees in total employment, 2004 [2)]	21.9	.	20.6	24.1	21.5	23.8
Share of ICT sector in R&D expenditure business sector, 2004 [3)]	.	.	26.7	34.7	24.0	69.0
	number per million inhabitants					
European ICT patent applications, 2003	33.0	26.2	24.6	35.6	55.5	123.6
	%					
ICT and education						
Share of ICT diplomas in higher education diploma, 2005 [4)]	.	4.1	3.8	3.8	4.1	4.7
	number of students per computer					
Computer intensity education of 15 year olds, 2006	.	.	7.1	5.6	11.1	6.7
	number per 100 inhabitants					
Telecommunication infrastructure						
Fixed telephone connections, 2006 [5)]	.	58	.	61	67	39
Mobile telephone connections, 2006 [6)]	.	99	.	106	103	102
Broadband connections, 2007 [7)]	.	13	.	34	21	29
	%					
Household use of multiplay, 2006 [8)]	.	20	.	38	22	8
ICT and government						
On-line public services for business, 2007 [9)]	.	85	94	87	94	77
Use of on-line public services for business, 2006 [9)]	.	63	59	87	49	93
On-line public services for citizens, 2007 [10)]	.	71	71	76	76	85
Use of on-line public services for citizens, 2006 [10)]	.	24	30	43	32	47
ICT use by companies, 2006 [11)]						
Companies with a broadband internet connection	81	78	86	80	80	91
Companies with electronic sales [12)]	18	15	18	33	24	15
Companies with electronic purchasing [13)]	34	29	43	36	52	19
Percentage of turnover generated by electronic invoices	12	11	11	22	11	15
ICT use of households and individuals, 2007						
Households with an internet connection	59	54	60	78	71	69
Households with a broadband internet connection	46	42	56	70	50	60
Persons with advanced computer skills [14)]	13	13	7	30	8	35
Persons with electronic purchases [15)]	35	30	21	56	52	48

1) Average annual contribution in percentages. Denmark, Finland, Ireland, Sweden and the United Kingdom: 2000–2003.
2) Share of the employed labour forice (see also paragraph 2.8).
3) Figures from France, Sweden, United States and Germany (only ICT-industry) are fom 2003 instead of 2004.
4) EU-27 Eurostat estimates.
5) Including ISDN and VoIP connections.
6) EU-25 instead of EU-27, and data EU-25 is 2005 instead of 2006.
7) Situation in june 2007, excluding mobile connections. EU-25 instead of EU-27, data EU-25 is 2005 instead of 2007.
8) Percentage of households with a package of at least two services from one provider, november/december.

	France	Ireland	Nether-lands	United Kingdom	Sweden	United States
	%					
ICT and economy						
ICT expenditure as % of GDP, 2006	5.4	3.8	6.3	6.5	7.3	5.4
Contributions of ICT capital to GDP growth, 2000–2005 [1)]	0.4	0.3	0.4	0.4	0.4	0.4
Share of ICT employees in total employment, 2004 [2)]	19.8	22.2	24.5	28.7	24.4	20.3
Share of ICT sector in R&D expenditure business sector, 2004 [3)]	32.2	65.4	33.1	25.0	34.9	35.5
	number per million inhabitants					
European ICT patent applications, 2003	35.4	18.8	89.2	27.8	62.3	36.3
	%					
ICT and education						
Share of ICT diplomas in higher education diploma, 2005 [4)]	4.3	2.9	3.9	5.9	3.9	4.3
	number of students per computer					
Computer intensity education of 15 year olds, 2006	.	10.0	6.7	3.6	8.3	4.3
	number per 100 inhabitants					
Telecommunication infrastructure						
Fixed telephone connections, 2006 [5)]	52	.	43	54	.	57
Mobile telephone connections, 2006 [6)]	76	.	105	112	.	75
Broadband connections, 2007 [7)]	23	.	33	24	.	21
	%					
Household use of multiplay, 2006 [8)]	20	14	32	24	21	.
ICT and government						
On-line public services for business, 2007 [9)]	93	86	86	90	89	.
Use of on-line public services for business, 2006 [9)]	66	84	70	52	80	.
On-line public services for citizens, 2007 [10)]	84	72	81	89	86	.
Use of on-line public services for citizens, 2006 [10)]	26	26	52	.	.	.
ICT use by companies, 2006 [11)]						
Companies with a broadband internet connection	.	66	87	78	87	.
Companies with electronic sales [12)]	.	31	26	29	27	.
Companies with electronic purchasing [13)]	.	54	36	49	48	.
Percentage of turnover generated by electronic invoices	.	19	11	19	14	.
ICT use of households and individuals, 2007						
Households with an internet connection	49	57	83	67	79	.
Households with a broadband internet connection	43	31	74	57	67	.
Persons with advanced computer skills [14)]	17	5	14	10	9	.
Persons with electronic purchases [15)]	35	33	55	53	53	.

9) Supply and use of 8 public service institutions.
10) Supply and use of 8 public service institutions.
11) Companies with 10 or more employed persons.
12) Electronic sales contributes for one percent or more of the total turnover of the company.
13) Electronic purchasing contributes for one percent or more of the total purchases of the company.
14) People aged between 16 to 74 using 5 or 6 internet activities.
15) People aged between 16 to 74 with on-line purchases in the past 12 months.

Source: Eurostat; OECD for ICT capital contribution to growth, ICT employees, R&D, students per computer and broadband connections, TNO for indicators on telephone connections; European Commission for multiplay; Capgemini / Eurostat for ICT and government.

1. Introduction

1.1 Preface

New technology can bring about major economic and social change. The classic example of this is the invention of the steam engine. The situation with Information and Communication Technology, ICT in short, currently produces equally wide-ranging changes in economic and social relations.

In the mid to late nineties people believed that ICT would open up endless possibilities, especially in the commercial uses of the internet. This created a bubble; the share prices of ICT companies soared and investments and employment in the ICT sector doubled. In 2000 people realised that their expectations were unrealistically high. This burst the bubble of the internet hype. People were very disappointed in the rate at which ICT changed existing social and economic processes, and in how fast the new technology could yield profits.
It is evident that ICT develops rapidly, that it has earned people a great deal of money fast, and that ICT changes existing processes. However, the conclusion in 2008 is that while e-commerce is growing steadily it has not reached the volume predicted at first. Profits in the telecom sector also developed in different ways. What did go according to plan was the rapid spread of ICT among households and companies. The use of ICT has expanded rapidly, and communication turned out the key purpose.

The views on ICT have become more balanced over the years, and the description above is not fully adequate. The ICT sector seems to be coming back and ICT companies have been performing much better since 2006. The technology, developments in applications, and the actual use of ICT are still very promising. Therefore new ICT policies are being developed nationally and at the European level.

ICT claims a key role in raising efficiency and productivity. The relationship between ICT and productivity is studied nationally and internationally. This theme is discussed in the Capita Selecta.

Statistics Netherlands seeks to quantify the role of ICT in the economy and society in *'The digital economy'*. In the series, the Dutch situation is compared with developments in other countries. The website of Statistics Netherlands (www.cbs.nl/digitale-economie) makes several additional methodological documents available. They provide a helicopter view of the relationship between ICT and society. The deal with the following topics: ICT goods and services, information and communication

technology, defining the ICT sector, the telecom infrastructure and the influence of ICT on society. The website also includes a statistical annex with detailed tables on various subjects, sorted by chapter.

The terminology used in this edition is based on international agreements with other statistical bureaus in de European Union (EU), laid down by Eurostat, (the European Bureau of Statistics) and on definitions and classifications of the Organisation for Economic Co-operation and Development (OECD) and the United Nations (UN). This makes it possible to compare the Dutch figures with data from other benchmark countries.

1.2 *Layout of the publication*

This edition consists of self-contained chapters. Chapter 2 focuses on the role ICT plays in the economy. Because the ICT sector is very sensitive to economic fluctuations, paragraph 2.1 provides an overall view of the Dutch economy in general. This provides the context in which other ICT developments take place, while ICT also helped to create the context itself. Paragraph 2.2 details the national and European policies aiming to promote the use of ICT. The third paragraph outlines how the ICT sector works, looking at developments in profits, employment and investments. Paragraph 2.4 looks at developments in the ICT expenditure by companies, government and consumers. Research and Development (R&D) in the ICT sector is highlighted in paragraph 2.5. Inventions due to R&D can be protected by patents, which are the focus in paragraph 2.6. The international trade in ICT goods and services is discussed in the next paragraph. It is important for an internationally competitive ICT sector to have a highly skilled workforce. Therefore three paragraphs deal with ICT and employment, ICT education, and private sector business courses. Chapter 2 ends with a paragraph on globalisation and the role ICT plays in it.

The focus of chapter 3 is on telecom. Paragraph 3.1 sketches a general picture of the role of the telecom sector within the Dutch economy. Paragraph 3.2 looks at the structure of the telecom sector itself. What are the main products and services, and what is their share in the value added? Paragraphs 3.3 through 3.5 highlight the main services of the telecom sector: internet, telephone, radio and television. The discussion of the internet looks specifically at the development of broadband. At the end of Chapter 3 we focus on the convergence of the various services and the consequences this has for telecom companies and consumers.

In chapters 4 through 6 follows a description of the main users of ICT. Chapter 4 details ICT use in private enterprises. After a brief review of the ICT infrastructure in the ICT use by companies in paragraph 4.1, the in-house data communication of companies is examined in paragraph 4.2. Paragraph 4.3 deals with external data

communication, which includes linking ICT systems (e.g. order processing systems) with clients and suppliers. The penetration of broadband internet and securing ICT systems are also discussed. Paragraph 4.4 sketches the role of ICT in buying and selling goods and services. The development of e-commerce and e-business in the Netherlands is compared over time and with other countries. Chapter 4 finishes with a paragraph on ICT skills and know-how, including how people learn to use ICT and hiring and training ICT specialists.

Chapter 5 shifts the focus on ICT use in the public sector. The Dutch government greatly values sophisticated ICT use in the public sector. Paragraph 5.1 looks at the performance of e-government. This is followed by a second paragraph on ICT use in education. The chapter ends with ICT and care. In all sectors mentioned, ICT could play a major role in producing efficiency gains.

Chapter 6 is about ICT use by households and individuals. After an inventory of the ICT provisions in paragraph 6.1, the focus shifts to ICT use and ICT skills. Paragraph 6.3 lists the main internet activities of Dutch internet users, as well as the diversity in their internet activities. The next paragraph deals with online shopping. This topic returns in paragraph 7.1 of the Capita Selecta. In paragraph 6.5 we sketch the use of online government services. Households and individuals run a certain risk when they use ICT. Information about this is provided in paragraph 6.6.

This edition includes a Capita Selecta section, which includes more detailed contributions about the topics discussed elsewhere in this book, or are related to them. The Captia Selecta include four paragraphs, each with an independent view. The first is contributed by the Netherlands Institute for Spatial Research and deals with online shopping and the retail trade. It looks at the consequences for consumers, retailers and mobility.
The second paragraph details some specific ICT themes such as standardising and centralising ICT and looks at what makes ICT investments successful.
The third paragraph reports the results of a study by Statistics Netherlands on the effects on productivity. This study looked at various linked statistics. The final contribution is the result of cooperation between Dialogic, the Dutch Ministry of Economic Affairs and Statistics Netherlands. It discusses an ongoing study exploring the possibilities of ICT for compiling statistics.

International benchmarking

The digital economy series includes much data on ICT developments in other countries, partly at the initiative of the Dutch Ministry of Economic Affairs. The aim of benchmarking is to provide a framework that allows international comparisons, so that the situation in the Netherlands can be considered from an international perspective. Benchmarking focuses on the most up-to-date, relevant situations rather than on presenting time series.

The main sources for these indicators are Eurostat and the OECD. Eurostat presents outcomes of the harmonised surveys on the use of ICT by companies and households in Europe. The OECD releases many regular and one-off publications on ICT use in OECD countries. The added value of the OECD lies in the greater diversity in indicators, and also in the fact that data is gathered from major non-EU countries such as the USA, Japan, Canada and South Korea.

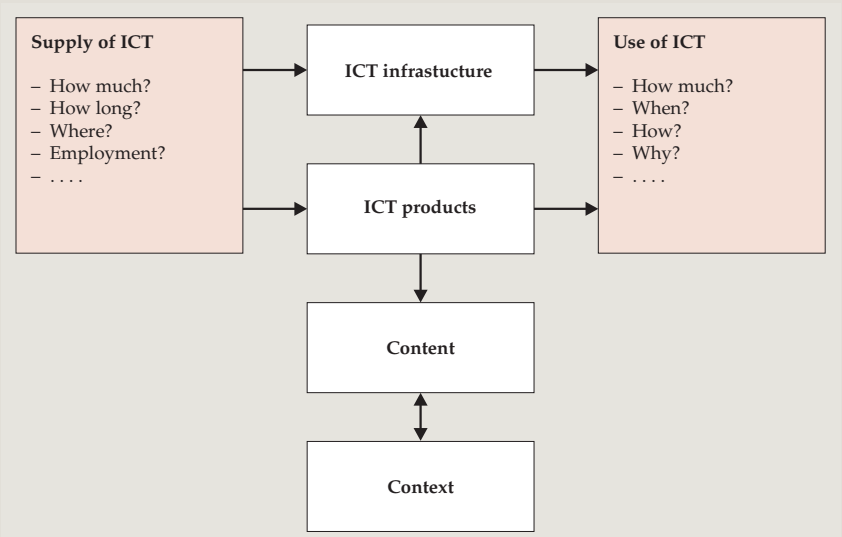
Generally speaking it is easier to make wide-ranging international comparisons between EU countries than comparisons at the world-wide level. This is because the EU has a system of harmonised statistics, compiled under the supervision of Eurostat. It is often difficult to find comparable data on countries outside the EU. Therefore we have opted for the following approach in this publication. We make a broad comparison per indicator with a number of other selected EU countries. Which ones we select depends on the comparison made. The Scandinavian countries usually come out on top, which makes that they are usually included in the graphs presented here. The selection of the benchmark countries is based on the desire to compare the Netherlands with countries where ICT is widespread and used at a sophisticated level. Therefore the Netherlands does not always come out on top. It would not be very useful to constantly compare the Netherlands with countries that are less advanced in ICT such as Portugal and Lithuania. When possible we added trendsetting countries outside the EU.

Model

In this edition we base ourselves on a model in which ICT use and supply form the core. The ICT sector and ICT infrastructure also play key roles in the model (see box). So it is hardly surprising that all these aspects are discussed in *The digital economy*. The simplified model we used is taken from a recent OECD publication (OECD, 2008), where the central issue is measuring the impact of ICT on society.
This chapter started with the claim that the views on digitalising society have become more balanced over the years. The same is true for models: the model used is still evolving and is a synthesis of older models.

Model of an information society

This model brings demand and supply together. The supply of ICT refers to the ICT sector and the use refers to companies, government and households. The model operates as a 'framework' for various ICT studies. The model can be used for researching the following questions:
- What ICT products or internet activities are relevant in the Netherlands?
- Which technologies do users use?
- What is the frequency and intensity of ICT use by the various actors?
- To what extent does the supply of ICT create employment?



1) Simplified model.

The model is broad in its setup. It includes a layer representing ICT infrastructure, involving investments and services on which the information society depends. ICT product data are also included, such as imports and exports, price and quality. Content refers to the information transferred through the electronic networks. Finally the bottom layer of the model indicates that all ICT studies must take into account the general national, social and economic developments, political aspects and other contextually relevant developments such as globalisation.

The arrows in the model not only show the impact of ICT, but also that ICT itself is impacted. It is possible to derive from the model that the impact of ICT is twofold: the impact that comes from ICT use and the impact that comes from the ICT sector itself.

Source: OECD, Measuring the impacts of ICT using official statistics, January 2008.

2. ICT and the economy

The Dutch economy continued its recovery in 2006. The gross domestic product (GDP) increased by 3 percent, which was the highest growth rate since 2000. The economy continued to grow in 2007 at a slightly more modest pace: the Dutch GDP volume was up by 2.6 percent on the previous year in the second quarter.

The current ICT policy in Europe is based on the third 'eEurope action plan', called 'i2010: A European information society for growth and employment'. The Dutch government aims for the Netherlands to reach the top in ICT use. The current Dutch ICT agenda 2006–2007 contains three new priorities: ICT and health, e-skills, and effective supervision of the market.
The ICT sector has benefited from the economic recovery since 2004. Investments, production and value added went up, especially in the ICT service sector and particularly among the computer service bureaus. The development of the ICT industry has been less dynamic.

Domestic ICT investments rose to more than 13.5 billion euro due to the economic recovery in the period 2003–2005. In 2006, Dutch expenditure on ICT was 6.3 percent of GDP. The expenditure is divided quite equally over information technology and telecommunications. There has been a shift in domestic expenditure on ICT goods and services in the past decade. The share of ICT services increased at the expense of ICT goods. Household consumption also became more important.

The ICT sector contributes extensively to R&D business expenditure in the Netherlands, with about a third of R&D expenditure by the ICT sector, mostly the ICT industry. In 2005 R&D expenditure in the ICT industry started to rise again. R&D expenditure in the ICT services sector fell, but not by as much as in 2001–2004.
The Netherlands applies for relatively many ICT patents at the European Patent Office; it comes second after Finland with most applications per million inhabitants. In Finland the focus is on telecommunications, whereas the Netherlands focuses mainly on computers and office equipment, and on consumer electronics.

The international trade in ICT goods and services grew very fast in the last decade. The value of total ICT exports (including re-exports) more than doubled in the period 1996–2006 to 63.3 billion euro. The import value of ICT goods and services also increased substantially during this period: from 26.5 to 59.5 billion euro. The balance of imports and exports of ICT goods in 2006 reached close to 2.1 billion euro, while the balance of ICT services was over 1.6 billion euro.

Employment in ICT is booming again. The number of jobs at computer service bureaus in 2006 was the highest of the last decade, and the sector had 66 vacancies per thousand jobs.

In higher education 4.6 thousand students graduated in ICT in 2005/'06. This is about 5 percent of all graduates. There were 5.6 thousand first year students of ICT in 2006/'07; in 2000/'01 there were 6.2 thousand students.

Computer service bureaus sent their employees to courses more often than the business community did on average in 2005. The computer service bureaus also spent almost twice as much per employee on courses.

Globalisation is increasing throughout the economy. For the ICT sector this means that assembling and technical production are shifted to low-wage countries while offshoring of ICT services is also gaining ground. Inside Europe this is shown by the shift of activities to Eastern Europe; worldwide India and China are on the up and up.

2.1 *The Dutch economy*

The Dutch economy continued its recovery in 2006. The gross domestic product (GDP) increased by 3.0 percent, which was the highest growth rate in six years (see table 2.1.1). For the first time this century GDP growth exceeded the average annual growth rate since 1970, which is 2.7 percent (see figure 2.1.1). Exports made a major contribution to economic growth like they did in 2005. Investments and consumption were the key drivers of the increased pace of growth. The economy continued to grow at a slightly more modest pace in the first half of 2007. In the second quarter, the Dutch GDP volume was up by 2.6 percent on the previous year.

Table 2.1.1
Developments in spending categories, 2000–2006

	2000	2001	2002	2003	2004	2005*	2006*
	year-on-year volume changes in %						
Consumer spending	3.2	2.7	1.7	0.8	0.6	0.5	2.5
Households[1)]	3.7	1.8	0.9	–0.2	1.0	0.7	–0.8
Government	1.9	4.6	3.3	2.9	–0.1	0.0	9.4
Fixed capital formation (gross)	0.6	0.2	–4.5	–1.5	–1.6	3.0	7.2
Exports of goods and services	13.5	1.9	0.9	1.5	7.9	5.9	7.0
Imports of goods and services	12.2	2.5	0.3	1.8	5.7	5.5	8.1
Gross domestic product (market prices)	3.9	1.9	0.1	0.3	2.2	1.5	3.0

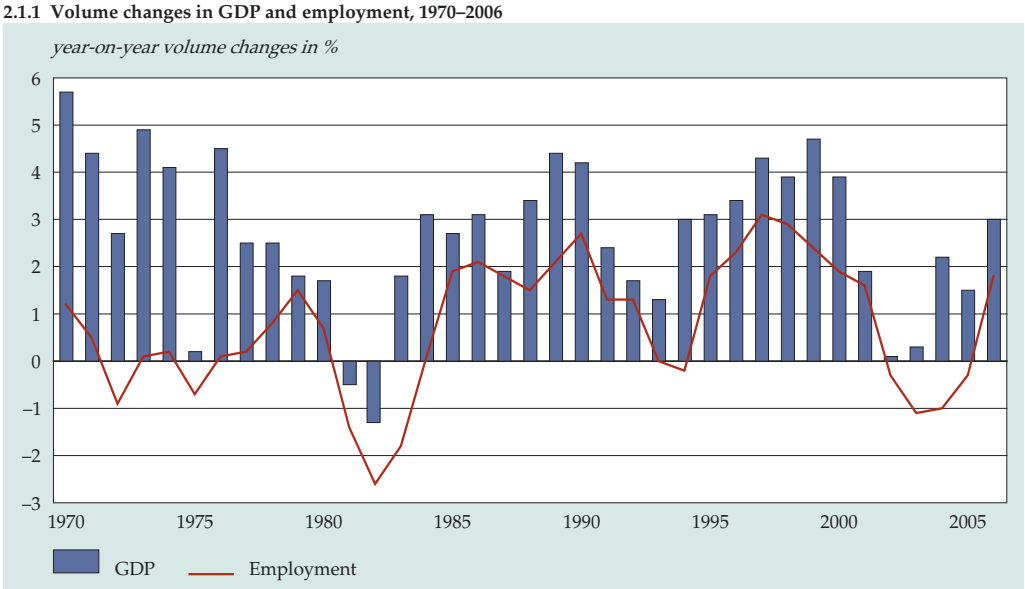
[1)] Household consumption and IZW-households.

Source: Statistics Netherlands, National accounts 2006.

The exports and investments were the pillars of economic growth in the Netherlands in 2006. About 58 percent of the economic growth in 2006 was contributed by export value (CBS, 2007a). There are some shifts compared to previous years in the volume changes of the expenditure categories. In 2004 and 2005 exports grew fastest, whereas in 2006 imports did (8.1 percent). Investments made a great leap forward in 2006 with a growth rate of 7.2 percent. Although consumer expenditure in 2006 grew faster than in the previous five years, it still lagged behind the GDP growth rate. Moreover consumption fluctuated constantly, especially government consumption which peaked in 2006. The growth of consumer expenditure was slowed down by household expenditure in the second half of 2006, but this showed a slight increase again in the first half of 2007.

Figure 2.1.1 shows the developments in GDP volume and employment since 1970. The boom periods, represented by the GDP growth rate, alternated with years of stagnation. The last boom period was at the end of the nineties. In the period 1996–2000 economic growth averaged 4.0 percent. This period of above average GDP growth was mainly due to the emergence of the ICT sector. The ICT services sector and telecom companies made major contributions to this rapid economic growth. After that period, the GDP growth rate declined to a point of virtually no economic growth in the Netherlands until 2004, partly caused by the stock market crisis at the start of the century regarding internet companies. Investments in the ICT sector plummeted and telecom companies faced huge debts due to the purchase of UMTS licences and expensive takeovers.

2.1.1 Volume changes in GDP and employment, 1970–2006



Source: Statistics Netherlands, National accounts 2006.

The higher GDP growth rate since 2004 is manifest in increasing employment after the slump. The Dutch economy seems to have been recovering ever since, although it is premature to claim a structural growth pattern. This is particularly true for employment (expressed in fulltime equivalents) which grew again in 2006 for the first time in five years.

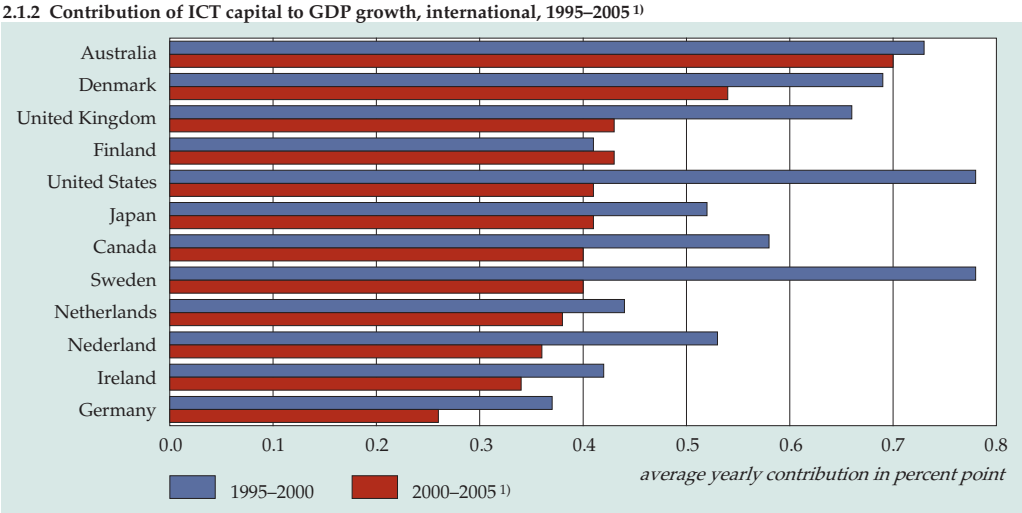
The developments in employment and labour productivity play a role in how GDP develops. Effective use of new technology, including ICT, is a major driving force for productivity growth. Due to increasing international competition caused by the enlargement of the EU, companies will have to anticipate better on new market opportunities. The development of the productivity in a country of sector increasingly determines the survival of companies and the realisation economic growth (Van Ark et al., 2006). If the GDP growth rate, as an indicator of economic growth, is higher than the increase in the employed labour force (in fulltime equivalents), productivity rises. Figure 2.1.1 shows productivity as the space between GDP (top of the bars) and the line of employment. The analyses mainly focus on productivity in the market sector. As figure 2.1.1 indicates, the growth rate of productivity may fluctuate wildly. The labour market often reacts to economic developments with some delay. Also, other production factors than labour contribute to GDP growth. We will discuss this aspect at the end of this paragraph. In recent years the Dutch economy has provided a good example of this. In 2004 economic growth in the Netherlands started to recover, but employment was still falling. This led to a considerable 4.5 percent increase in productivity in the market sector. This was halved again in 2006 due to a sharp rise in employment and decreasing the gap with GDP which was also on the increase. A sharp rise in productivity is not unusual in an economy on the mend. During economic slumps there is far less development in labour productivity.

ICT and economic growth

Empirical analyses of economic growth usually identify various ICT effects (OECD, 2004; Van Ark and Inklaar, 2005). These studies consider ICT as a force for growing labour productivity because investments in ICT increase and renew the stock of capital goods. The literature indicates that the link between ICT and growing productivity is also influenced by non-technological innovations in companies, varying from investments in education and training to organisational innovations (Brynjolfsson, 2003).

OECD figures show that investments in ICT contributed substantially to GDP growth, but that the average annual ICT investments (in percentage points) fell in most countries in the period 2000–2005, compared to the period 1995–2000 (see figure 2.1.2). The contribution ICT capital made to GDP growth rate in the period 2000–2005 fell significantly in many EU countries, but also in the USA and Japan. One major reason is that ICT investments have been low in Europe for a relatively

2.1.2 Contribution of ICT capital to GDP growth, international, 1995–2005 [1)]



1) For Denmark, Finland, Ireland, Netherlands, Sweden and the United Kingdom this is 2000–2003. For Australia and Japan it is 2000–2004.

Source: OECD, Productivity Database 2006.

long time. Some causes may be: expected low levels of return, slower adoption of new technology due to the 'first mover' advantage of the USA where employees are often quicker in the uptake of newly available ICT technologies, and market imperfections. Liberalising and deregulating markets, like the ICT intensive markets (such as ICT services), have been high on the Dutch political agenda because they may generate more flexibility and give the right impulses (Van der Wiel and Van Leeuwen, 2006).

Please note that software was only recently included in the figures on ICT capital. Software is often developed for a company's own account. Problems with measuring software at the national level are related to the way the software can be obtained, such as rent contracts, licences or as part of the hardware (OECD, 2006a).

Figure 2.1.3 shows the impact of various production factors on the GDP growth rate in the period 1995–2005. ICT capital made a relatively large contribution during this period to the GDP growth rate in Australia, the UK and the USA, as well as Denmark and Sweden. ICT provided the bulk of the capital contribution to economic growth in many countries. (ICT) Capital is not the only aspect of the GDP growth rate. Labour and multifactor productivity may also contribute to GDP. As the name suggest, several production factors play a role in multifactor productivity: labour, capital and intermediary inputs (energy, materials and services). Technological advances in production of ICT goods and services may contribute to rapid growth of the multifactor productivity in the ICT sector itself (CBS, 2006).

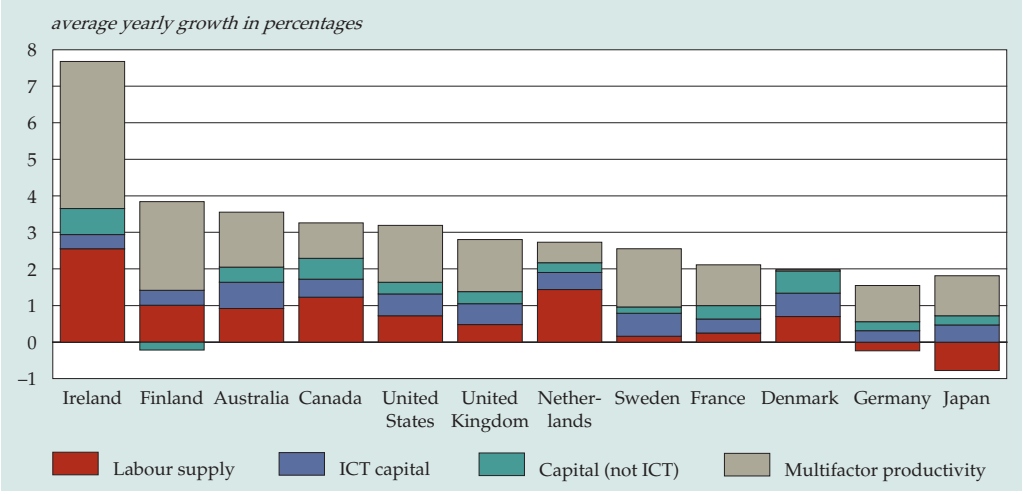
In Ireland and the Netherlands labour contributed hugely to the GDP growth rate between 1995 and 2005. In Germany and Japan labour costs were relatively high in relation to the costs of other production factors in the period 1995–2005. This is one cause of the negative contribution of labour to the GDP growth rate. In contrast, Finland struggled with relatively high capital costs (OECD, 2006a).

The multifactor productivity – expressed as an efficiently combined use of means of production – was a major source of the GDP growth rate in Ireland, Finland and the USA. Ireland and Finland host relatively many American multinationals. Further studies (Van Ark and Bartelsman, 2004) show that these companies are more productive than the local companies. The American IT sector and the service providers using IT are ahead in their productivity growth. Relatively many of these companies settled in Ireland, which made a major contribution to the multifactor productivity in that country. There was very little multifactor productivity growth in the Netherlands. In Denmark it was almost completely absent.

2.2 *ICT and policy*

ICT plays a key role in the Dutch and in the global economy. Successive governments wrote policy papers in which high quality electronic infrastructure and the wider application of ICT products and services are seen as strategic preconditions for structural economic growth and social development. ICT can help innovative

2.1.3 Contributions of productivity factors to the growth of the GDPi, international, 1995–2005 [1)]



[1)] For Denmark, Finland, Ireland, Netherlands, Sweden and the United Kingdom this is 2000–2003. For Australia and Japan this is 2000–2004.

Source: OECD, Productivity Database 2006.

production processes and raise productivity. Specific government policy may play a significant role despite the fact that diffusion of ICT in society already involves free market processes. Therefore the government promotes the integration of ICT in the economy and in society at the national and international scale. The government policies in this field are promoting competition, innovation, security and the environment. In this paragraph we discuss the policy initiatives developed at the national and at the European level.

The European agenda

The current ICT policy in Europe is based on the third 'eEurope action plan' called: i2010: A European information society for growth and employment (EC, 2005). It sets the European ICT agenda for 2006–2010. The term 'i2010' stands for European Information Society 2010: an EU-wide action plan for ICT for the period 2006–2010.
Its policy initiatives centre on three main aims:

- a common European information space, affordable and safe broadband communication, rich and varied content, and digital services;
- world-class performance in ICT research and innovation. The gap with Europe's main rivals must first be closed before this can happen;
- an information society promoting high quality government services and quality of life.

ICT know-how and innovation play a major role in realising the Lisbon ambition. The ambition was to turn Europe into the most competitive and dynamic knowledge economy of the world. In 2005 – when this turned out to be a bit too ambitious – the accent was shifted to sustainable job growth to continue existing wealth. Inside Europe the Information Society Technologies (IST) Programme is relevant in this respect, as a part of the European framework. ICT research takes up much of the space in the current proposals of the European Commission for the new (seventh) Framework programme. Other aspects also include a major ICT component, such as Nano science, Nano technology and New Production Technologies, Energy, Transport and Security, and Space Research. This is in line with the Dutch government proposals. The European Commission started a programme in 2007 to raise Competitive power and Innovation (CIP). Several programmes are combined within the CIP framework in the domains of productivity, innovation and sustainable development (EZ, 2006a).

The Dutch ICT agenda

The Dutch ICT policy is formulated in the paper *Vervolg rijksbrede ICT agenda 2006–2007: Acties voor 'Nederland in Verbinding'* (EZ, 2006a). This is the update of the paper *Beter presteren met ICT: vervolg rijksbrede ICT agenda 2005–2006* (EZ, 2005a). These documents specify the European ICT policy. The European action plans formulate ICT goals for a given period, while the Dutch government places its own emphasis, aiming primarily at a top position in European ICT use.

The ICT agenda for 2006–2007 has three new priorities compared to the previous agenda:

– *ICT and health.* This policy aims to use ICT to improve the quality and safety of care, and to keep it accessible and affordable. Due to the national electronic patient dossier (EPD) patient data will be more accessible which should prevent medical mistakes.
– *e-skills.* Citizens and companies must have the right skills to participate in the information society. Government recognizes that this is important for the productivity of companies and for the participation of citizens.
– *effective market control.* The government's ambition is to streamline legislation and supervision so that traditional telecommunications, the internet, and the media merge and existing and new companies will develop technology so that they can compete at the national and international level.

The government continued with the following ambitions from the ICT agenda for 2006–2007:

– *single supply of data.* Citizens and companies only need to provide their data once. This policy should reduce the administrative burden.
– *ICT use.* The public and private sector have to use the possibilities offered by ICT effectively in order to provide better service to their clients.
– *faster internet.* Citizens must be able to choose substantially faster internet connections and relevant services at prices that compare with the current cost level.
– *security and reliability.* Citizens and companies must be able to use stable electronic services safely.
– *standardisation.* This policy aims to use standards that facilitate easy data exchange with and within government.

The government ICT policy distinguishes the use of ICT and strengthening the ICT basis. Concerning the use of ICT three groups are distinguished in government policy: companies, semi-government and citizens. Below we will briefly discuss the specific policy for each of the three:

– *Use by the private sector companies.* This policy aims to increase productivity and innovative power by smart ICT investments and the integration of ICT applications in running the business. The government will design a program for ICT in small and medium-sized companies, focusing on the integral concept of e-business. This means a shift from the presence of companies on the internet and electronic transactions to the integration of the entire chain from supplier to buyer. The government will see to it that companies pay structural attention to new technologies and e-skills (skills of people to work with ICT). The government will also stimulate the use of open source software.
– *Use by semi-government.* The core of the issue is implementing the basic provisions for e-government. Central and local governments have agreed on a number of high priority provisions to reduce the administrative burden and provide better service.

Much work needs to be done to realise and legislate a system of basic registrations over the next few years.
– *use by citizens.* ICT offers citizens opportunities for developing and participating in the information society. For this purpose, digital networks must be accessible and provide reliable information and varied content. For education it is important to stimulate the development and roll out of interactive online learning tools. The current policy is strengthened for public broadcasting companies and public libraries, professionalizing digitalising activities, stimulating new media in the arts and small-scale social internet activities.

Strengthening the ICT basis again comprises three areas, namely communication infrastructure, ICT know-how and innovation, and ICT preconditions. The policy related to these areas is discussed below:
– *communication infrastructure.* The Netherlands has a good basis in this area. Government policy seeks to benefit and build on this position, emphasizing good market organisation and effective supervision. Government policy aims to stimulate, facilitate and regulate innovative communication infrastructure, taking down barriers for developing existing and new telecom, ICT and media companies.
– *ICT knowledge and innovation.* This refers to strengthening the citizens' and companies' knowledge about ICT and the use of advanced ICT applications. This may lead to innovations and increased productivity and help solve social problems. In the international positioning of the Netherlands as an ICT country, the Dutch ICT network must be made transparent and accessible for foreign parties.
– *ICT preconditions.* This concerns the aim to get sufficient confidence and know-how to handle ICT, which requires a properly functioning infrastructure, and policies to protect privacy and deal with cyber crime. This can be done through a security policy differentiated in 'vital' and 'less vital' domains, sharply defining the public interest and clearly showing the responsibilities of the market parties. Citizens must have the right skills as consumers and producers (of labour) in order to make optimum use of ICT. Students must be prepared for their participation in the labour market with ICT.

The *Kennisinvesteringsagenda 2006–2016* (Innovatieplatform, 2006) identifies two roles for ICT: as innovations being part of all sectors of the economy, and as research priority. The Dutch Innovatieplatform will press on with strategic choices, including ICT, but also with nanotechnology and technological top institutes so as to gain more focus and mass in research.

The ICT agenda and recent policy

The influence of the *Rijksbrede ICT agenda* is clear in recent Dutch ICT policies. A great deal of emphasis is placed on spreading broadband internet in developing telecommunication infrastructure. Broadband simply means a permanent connection

with electronic communication networks (EZ, 2005b). The main assumption in the broadband legislation by the European Commission and the Dutch government is that a healthy free market stimulates the development of networks. For this reason the free market is stimulated.
Central government recognizes that all kinds of broadband applications could help solve bottlenecks in sectors such as care and education. The ministerial paper *Breedbandnota* (EZ, 2004) includes actions to guarantee the updating of the infrastructure and large-scale use of services. The government aims to bring about continuous development of infrastructure and services. Large-scale use of broadband widens the range of applications, which has a positive effect on the economy and productivity, according to the paper.

Policy framework e-communication

E-communication and legislation in this area are developing rapidly. The telecommunication market has been liberalised, making the market accessible to all providers. Balanced competition is stimulated through legislation and regulation. The general ICT policy of the second Balkenende government was laid down in the policy paper *Nederland in verbinding: Beleidskader elektronische communicatie* (EZ, 2006b). The paper discusses the government's plans to strengthen the global position of the Netherlands in this area. The future policy on e-communication should focus on six areas:
– social dimension and position of the consumer.
The Dutch government will intensify its policy to promote ICT skills among the young and the old.
– transition to full competition.
This means adapting the current regulation frameworks so as to be able to deal more adequately with relevant developments;
– room for convergence.
The government measures seek to create more flexible use of frequencies and stimulating interoperability for digital television services.
– ICT as a pivotal point for innovation.
Policies aim to speed up and up-scale ICT innovation and realise more productivity by using ICT in small and medium-sized companies.
– intensifying security policy.
The Netherlands is becoming more and more dependent on e-communication, socially and economically. This may require extra policies to increase confidence and security.
– relationship between the environment and e-communication.
The aim is to use e-communication in helping to solve energy and environmental issues.

2.3 *The ICT sector*

The ICT sector is growing again

Until the internet bubble at the financial market burst in 2000, the Dutch ICT sector grew spectacularly, especially ICT services and investments in electronic networks.

Open standards

Much of the current government policy stimulates the most effective use of ICT options. Therefore the central government promotes the use of open standards and open source software by the government and public sectors. Open standards are publicly available specifications for dealing with a particular task (often in using hard and software). Since everyone can use an open standard it increases the compatibility between the various types of hard and software components. People or organisations can choose which software they use.
However, many standards are only accessible through a license with the copyrights holder. The national policy is laid down in the action plan Nederland open in verbinding (EZ, 2007). The bottom line is to use open standards unless it proves to be impossible.

Open standards and open source software are two different things. Open standards apply to agreed specifications of applications, services, systems and networks that work together. There should be no obstacles for ICT users and ICT providers in using these standards.
Open source software is actual software with a source code that is freely available to the licence holders. The volume of available open source applications doubles every two years. Much of the open source software is developed in Europe.

Dutch Taxonomy Project

One example of an open standard is the Dutch Taxonomy Project. This is an agreement signed by the Dutch Ministries of Finance, Justice, the Interior and Kingdom Relations and Economic Affairs and VNO-NCW, MKB-Nederland and Statistics Netherlands on the electronic exchange of financial data between the Dutch enterprises and government organisations. With the reduction of the administrative burden in mind they all agreed to start using the open standard XBRL in 2007. This means entrepreneurs can supply data simply and online from their own accounting directly or through their accountant, to the Chamber of Commerce (annual accounts), the tax authorities (profits and loss acccount, corporate tax statements) and to Statistics Netherlands (statistical data). The annual savings for Dutch companies is an estimated 350 million euro.

The ICT sector contributed more than average to the growth of the economy, investments and employment in the Netherlands during this period. Income, however, did not keep pace with expenditure, and there was a major dip after 2000. The stock market collapsed and companies in the ICT sector were worst affected. With hindsight it is clear that the expectations about the speed with which the new technology would become profitable were exaggerated (internet hype).

In the period 2001–2003 investments by the ICT sector and employment dropped. Other sectors, ICT users, were less willing to invest in computers and software. The recession lasted several years until the ICT sector started to benefit from the recovery of the Dutch economy in 2004. Investments, production and value added

went up again. The financial situation of the telecom companies improved, and the use of ICT applications expanded. The recovery was largely carried by the ICT services sector, especially computer service bureaus. They include activities like hardware and software consultancy, web hosting, maintenance and repair of computers and office equipment, network management, computer security and IT services.

The ICT sector consists of the ICT industry and ICT services (including the telecom sector). The exact delineation is agreed internationally as is shown in table 2.3.1. Below we will highlight some aspects of the ICT sector.

Table 2.3.1
Definition of the ICT sector

SBI93	Characterisation of the activity
ICT industry sector	
3000	Manufacture of office machines and computers
3130	Manufacture of isolated 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 instruments and appliances for measuring, checking and testing
3330	Manufacture of industrial process control equipment
ICT services sector	
6400	Post and telecommunication
7200	Computer service and ICT bureaus, etc.

Source: OECD / Statistics Netherlands.

The ICT industry

The Dutch ICT industry is slowly getting back on its feet. After the very negative volume changes in 2002, there has been a gradual increase in production value, value added and investments [1)]. Employment in this sector (labour volume of employees) was no longer falling in 2006, but it is too early to call this a clear case of recovery. The share of the ICT industry in production value (the value of all goods intended for sale, and receipts for services rendered) of the ICT sector fell from 26.7 percent in 2002 to 24.4 percent in 2006.

During the economic boom of the late nineties, the Dutch ICT industry did not grow any faster than the ICT services. The ICT industry showed some recovery in 2006: production value rose by 1.1 percent (see table 2.3.2). Gross value added increased marginally (0.7 percent), while labour volume stayed the same.

The image of the Dutch ICT industry is far more influenced by multinationals than the ICT services sector. The multinationals are partly outside the scope of the description of the Dutch economy, since they have units in low-wage countries. Production, investments and employment are only considered part of the domestic ICT sector when they refer to companies or units located in the Netherlands. So not all costs and returns of multinationals are expressed in the description of the Dutch economy. This could cause a bias for the ICT industry. If Dutch units pay the R&D costs they are observed in Dutch units, but the returns yielded by R&D may be cashed in by the parent company abroad, or at the actual production plant of the new or improved ICT products. The CPB studied this issue. Part of the statistically modest performance of the Dutch ICT industry may well have to be attributed to these effects (Minne and Van der Wiel, 2004).

Computer service bureaus

Computer service bureaus have become much more important within the ICT sector over the years (see table 2.3.2). In 2002, the production value of this branch fell by 7.5 percent, but then it has started to get back on its feet. In 2006, the growth rate was 8.5 percent. The turnover (production value) of the sector largely consists of developing and implementing information systems, managing and exploiting systems, advice, auditing and hiring out their own ICT personnel. Turnover is mostly generated in the domestic business market. So computer service bureaus depend on investments in software and the demand of computer services by companies, households and the government in the Netherlands.

Computer service bureaus have had huge growth rates in line with the active investment behaviour of a growing economy. The splendid performance of computer service bureaus is also expressed in the value added. The 9.1 percent growth rate in 2006 is the best in the period 2002–2006. This growth rate shows an improvement in the profitability of the computer service bureaus. The increase in the value added was originally fanned by a drop in the work force. In 2002–2004 the number of employees of computer service bureaus fell by close to 10 percent. In 2006 the labour volume saw a substantial growth rate again (+ 8.4 percent).

Telecom sector

Only the post and telecommunications branch in the ICT sector saw an annual growth of its production value in the period 2002–2006. Although the economic dip at the start of the century seemed to pass this branch by, it is now apparently facing economic stagnation. The growth of its value added has been tapering off since 2002. Although turnover and profits stayed the same in recent years, employment in post and telecommunications has declined structurally. After the peak in 2001, the labour volume fell by close to 25 percent. Telecom has realised a great deal of production and value added, which is because the sector has less personnel. The sector is also capital intensive due to the relatively high investments (purchase and sales of fixed capital formation such as buildings, machinery, installations and computers).

Table 2.3.2
The ICT sector compared with the Dutch economy, 2002–2006

	2002	2003	2004	2005*	2006*
	year-on-year volume changes in %				
Production value					
ICT industry sector [1)]	–12.2	–1.6	3.1	–4.8	1.1
ICT services sector	2.3	1.4	1.2	3.3	5.0
of which: post and telecommunication	9.0	4.5	0.6	2.5	2.8
computer service bureaus	–7.5	–3.7	2.2	4.7	8.5
Total ICT sector	–2.0	0.6	1.7	1.2	4.0
Netherlands	–0.8	–0.6	1.9	1.5	3.2
Gross value added					
ICT industry sector [1)]	–20.9	0.9	6.9	–6.4	0.7
ICT services sector	4.2	4.5	2.5	3.2	4.5
of which: post and telecommunication	14.1	8.7	2.5	2.6	1.3
computer service bureaus	–7.0	–1.2	2.4	4.2	9.1
Total ICT sector	0.8	4.2	2.9	2.3	4.2
Netherlands	0.1	0.3	2.2	1.5	3.0
Investment					
ICT industry sector [2)]	–16.5	–10.6	–7.3	8.3	.
ICT services sector	–42.1	–15.2	7.8	13.4	.
of which: post and telecommunication	–44.9	–19.4	5.5	14.8	.
computer service bureaus	–23.0	6.5	17.6	8.1	.
Total ICT sector	–37.2	–14.1	3.8	12.2	.
Netherlands	–4.5	–1.5	–1.6	3.0	7.2
Labour volume of employees					
ICT industry sector [1)]	–3.8	–7.4	–3.8	–4.1	0.0
ICT services sector	–6.3	–5.7	–2.6	0.9	4.1
of which: post and telecommunication	–8.1	–8.7	–3.4	–2.6	–1.4
computer service bureaus	–4.8	–2.9	–2.0	3.8	8.4
Total ICT sector	–5.6	–6.2	–3.0	–0.5	3.0
Netherlands	–0.3	–1.1	–1.0	–0.3	1.8

1) Estimated values for 2005 and 2006.
2) For investments, the ICT industry is defined as SB 30–33. The investment data are not detailed enough to present them according to the internationally agreed definition for the ICT industry sector.

Source: Statistics Netherlands, National Accounts 2006.

International

The share of the ICT sector in the gross value added of the Dutch private sector in 2006 was low compared to other countries with its 7.9 percent (see figure 2.3.1). Of the large European countries (Germany, France and the UK) only the French ICT sector had a lower share in the value added. The absolute front runner is Finland, where the ICT sector contributed 16 percent to the value added of the total private sector in 2006. In the period 1996–2006 South Korea was the fastest growing nation, followed closely by Finland. The importance of the ICT sector in the South Korean economy increased from 11.5 to over 14 percent. In the Netherlands the share of the ICT sector in the private sector fell slightly between 1996 and 2006. The share of the ICT sector in the UK and the USA fell sharply in this period, while Japan and France saw a slight dip.

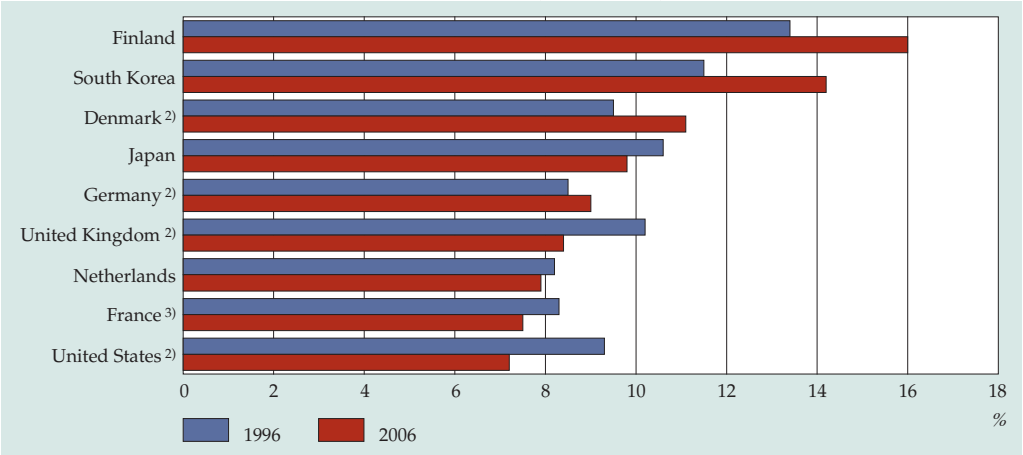
The size of the ICT sector in a country is important from an economic perspective. The international ICT market is still growing fast. The rise of the fast growing economies of China, India and parts of Eastern Europe means that world expenditure on ICT increased by 5.6 percent a year in the period 2000–2005 (OECD, 2006b). A strong domestic ICT sector offers opportunities to benefit from this growth. Currently this mainly applies to the ICT industry sector, selling ICT goods at the international market. The market for ICT services is still mainly focussed on the domestic, but this is changing. There is outsourcing and off shoring, concepts that will be discussed in paragraph 2.11 of this publication. Also, the size of the domestic ICT sector correlates positively with R&D expenditure. More R&D expenditure usually leads to stronger economic growth eventually.

So far we have only looked at the size of the ICT sector in a given country. Yet the way it is made up is also important. The domestic ICT sector in Finland, South Korea and Japan is dominated by the ICT industry. In France, Germany, Denmark and the Netherlands the ICT services sector is more important (OECD, 2002). Generally R&D intensity is higher in the ICT industry than in the ICT services sector (see also paragraph 2.5). On the other hand, the growth of the ICT sector in the last decade was mainly driven by the services.

Steady increase in the share of ICT companies

The economic significance of the ICT sector can also be shown by its company dynamics. The share of ICT companies in the total number of companies nearly doubled between 1995 and 2006 (see figure 2.3.2). The share of ICT companies

2.3.1 Share of the ICT sector in value added of bussiness sector, international, 1996 and 2006 [1)]



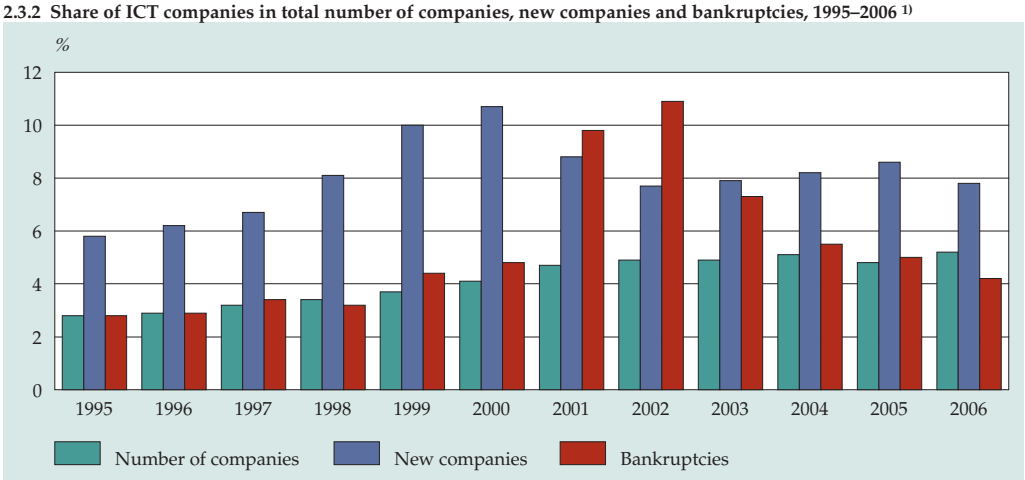
1) The sector ICT industry is defined as SIC groups 30–33. The sector ICT services here is transport, storage and communication SIC groups 60–64.
2) 2005 instead of 2006 for Denmark, Germany, United Kingdom and United States.
3) For France 2006 and 1999.

Source: OECD, National Accounts.

mainly increased between 1995 and 2001; after that the share stabilised at about 5 percent of the Dutch companies. This stable total figure, however, hides much of the underlying dynamics. The dynamics are shown by the high percentage of births and bankruptcies in the sector. The percentage of new ICT companies has shown a positive trend since 2002, apart from a slight dip in the share of ICT companies in the total number of births in 2006. The figure doesn't show that the number of births in the ICT sector nearly doubled in the past decade. The almost continuous increase in the absolute number of companies is strengthened by a decrease in bankruptcies after the economic dip at the turn of the century. The impulse of new ICT companies for economic growth is fairly modest since they often employ very few people, and the employment they create is no match for the job losses at major companies.

The development in the share of the ICT companies is a good measure of the strength of the ICT sector. Until the end of 2000 the sector flourished and the number of starting companies increased every year. This changed in 2001 and 2002. The number of births in the ICT sector fell and many more ICT companies went bankrupt. In 2003 the number of starters rose and bankruptcies of ICT companies fell. Like other sectors, the ICT sector showed a peak in the number of starters in 2005. This recent peak is caused by the economic growth, the reduced administrative burden, the relaxation and later abolition in May 2007 of the law on business locations. The absolute number of starters in the ICT sector has been much greater than the number of bankruptcies. In the period 1995–2006 twelve times as many companies started than went bankrupt.

2.3.2 Share of ICT companies in total number of companies, new companies and bankruptcies, 1995–2006 [1)]



[1)] Total of the observed groups, this excludes: Agriculture, forestry and fishing (A and B), Electricity, gas and water supply (E), Financial institutions (J), Real estate activities (SBI 70), Research and development (SBI 73), General government (L), Education (M), Health and social work activities (N), Idealistic and organised interest groups (SBI 91) and Recreational, cultural and sporting activities (SBI 92).

Source: Statistics Netherlands.

These dynamics of the Dutch business population show the major changes in 1995–2006. The number of starters rose substantially during this period, also in the ICT sector, whereas very few entrepreneurs went bankrupt.

2.4 ICT expenditure

In the previous paragraph we discussed the economic significance of the ICT sector, expressed in terms of production value, gross value added and investments. In this paragraph we look at the clients of the ICT sector.
Domestic expenditure on ICT goods and services come in three categories:
– investments of companies and government in ICT capital;
– intermediate consumption by companies and government;
– household consumption.

Domestic expenditure on ICT goods and services (the sum of expenditure and investments) only partly benefit the domestic ICT sector. ICT services mainly involve the domestic market, that is, companies, households and government in the Netherlands mainly buy services provided by companies located in the Netherlands. This is different for ICT goods. The domestic ICT industry has recently lost more of its market share to foreign imports. Many ICT goods come from abroad, so that the developments on the supply and on the demand side of the ICT market differ quite a bit.

There is an upward trend in Dutch ICT expenditure. Domestic expenditure on ICT goods and services went up in 2003 and stayed up after the brief dip between 2001 and 2003. Investments in ICT capital rose by 11 percent in the period 2003–2005 (see table 2.4.1). Later in the paragraph we will discuss intermediate use and consumption, which also rose in the period 2003–2006 (see table 2.4.2).
In 2006 Dutch expenditure on ICT was 6.3 percent of the GDP (see figure 2.4.4). Expenditure was equally divided over information technology and telecommunications. Domestic expenditure on ICT goods and services has changed in the last decade. The share of the ICT services increased at the expense of ICT goods. Household consumption became more important as well.

Investments in ICT capital

In the period 1995–2000 investments in ICT capital showed an explosive growth from 6.7 to 15.1 billion euro (CBS, 2006). This growth was based on major investments by the telecom companies in laying, expanding and modernising electronic networks for internet and mobile telephone services. After a brief recession, partly due to the decreasing investments in electronic networks, ICT investments in 2005 were close to 13.5 billion euro; a peak in the period 2002–2005 (see table 2.4.1). Investments in hardware and software, mainly by the private sector (ICT users), had a much more stable development in the period 2002–2005.

If investments in ICT capital are compared with total investments in the Netherlands, we see two remarkable things. First, the investments in ICT capital fluctuate more than in the total economy. In the late 1990s the rise was explosive, after 2000 the slump was dramatic. The economy as a whole showed a similar development, but not as pronounced. In addition, investments in ICT capital are just ahead of total investments. In 2004, total investments (volume changes) were still negative, whereas more was spent on ICT capital.

Table 2.4.1
Investments in ICT capital, 2002–2005

	2002	2003	2004	2005*
	million euro			
Computer hardware	4,027	4,277	4,292	4,474
Software	6,291	6,148	6,444	7,034
Electronic networks	2,398	1,755	1,877	2,015
Total ICT	12,716	12,180	12,613	13,523
Total investments Netherlands	92,862	92,848	92,426	96,494
	%			
Computer hardware	32	35	34	33
Software	49	50	51	52
Electronic networks	19	14	15	15
Total ICT	100	100	100	100
% of total investments Netherlands	13.7	13.1	13.6	14.0
	year-on-year volume changes in %			
Computer hardware	7.3	20.5	8.2	13.4
Software	–5.5	–3.7	3.7	7.0
Electronic networks	–39.1	–26.4	8.8	8.2
Total ICT	–10.5	–0.3	6.0	9.3
Total investments Netherlands	–4.5	–1.5	–1.6	3.0

Source: Statistics Netherlands, National accounts.

More software, less hardware

The share investments in hardware in the total investments in ICT capital fell from 41 percent in 1995 to 33 percent in 2005. Software gained ground. The share of software in investments in ICT capital went from 34 percent in 1995 to 52 percent in 2005. Software is an indicator of the sophistication of ICT use. In 1995 people invested 86 euro in software per 100 euro hardware, in 2005 this was 157 euro per

100 euro hardware. New software usually means new or improved ICT applications, which makes it a key investment opportunity for companies and other potential providers. The diminishing share of investments in hardware is partly because computers became so much cheaper in recent years. Investments in networks were at a stable level of 15 percent of the total ICT investments in 2005 compared to 29 percent in 2000 (CBS, 2006).

The current economic recovery may soon lead to more investments in computers and software. There is more uncertainty about future developments in the investments in electronic networks. These are very specific investments by a limited number of players, which may cause a great deal of fluctuation in the investments year-on-year. Also it is unnecessary to invest the same amount each year in modernising existing networks and laying new ones. There are all kinds of developments for broadband, via ADSL and coax cable (CBS, 2007a). Also, fibre optics and satellite access are now provided on a large scale.

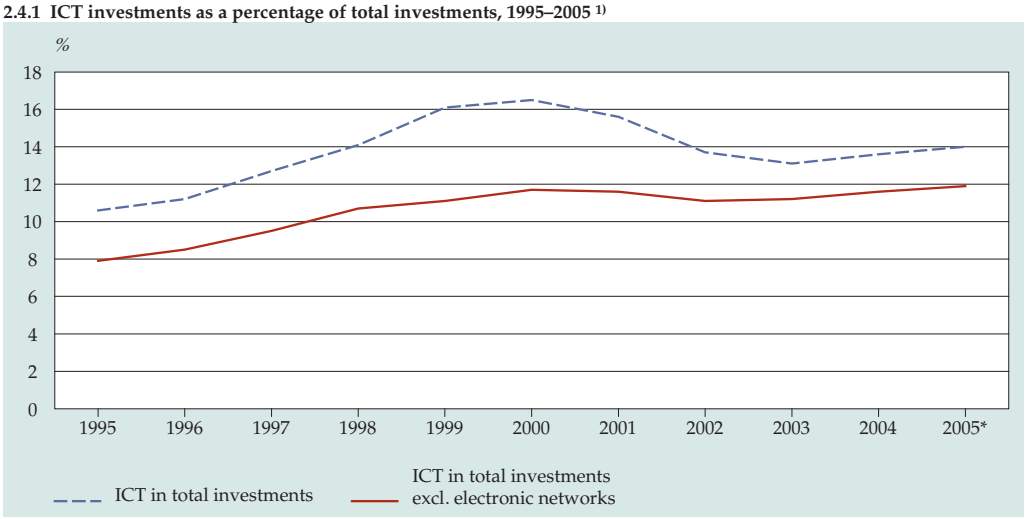
ICT investments important for the economy

The focus in the previous paragraphs was on the size and structure of investments in ICT capital. Now we will discuss the share of ICT investments in total investments in the Dutch economy. The share of ICT investments fluctuated in the period 1995–2005 (figure 2.4.1). Between 1995 and 2000 the share of ICT investments increased from 10.6 to 16.5 percent. Then it fell to 14 percent in 2005. The importance of investments in ICT has recovered somewhat since 2003.

If the wild fluctuations of the investments in electronic networks are left out of the equation we see the underlying upward trend. The peak in the share of ICT investments then shifts to 2005. Figure 2.4.1 shows that the share of ICT investments (excluding networks) in the total investments has been quite stable at between 11 and 12 percent since 2000. During the economic dip at the turn of the century the investments in ICT capital (excluding electronic networks) suffered no more than investments in other capital goods, such as business real estate, machinery and means of transport.

The shares of ICT investments in total investments differ considerably per sector. Transport, storage and communication scores highest with an almost 32 percent share in ICT investments, see figure 2.4.2. It is not surprising that it has the highest investment rate in ICT, since it includes telecom companies and computer service bureaus, in other words, most of the ICT services sector. ICT investments are the key to economic development of these branches. The manufacturing industry, trade, hotels and restaurants and repairs, construction, care and other services have above average shares in ICT investments. Lagging behind are agriculture, forestry, fishing, and extraction. The latter only spends 2.5 percent of the total investments on ICT goods and services.

2.4.1 ICT investments as a percentage of total investments, 1995–2005 [1)]

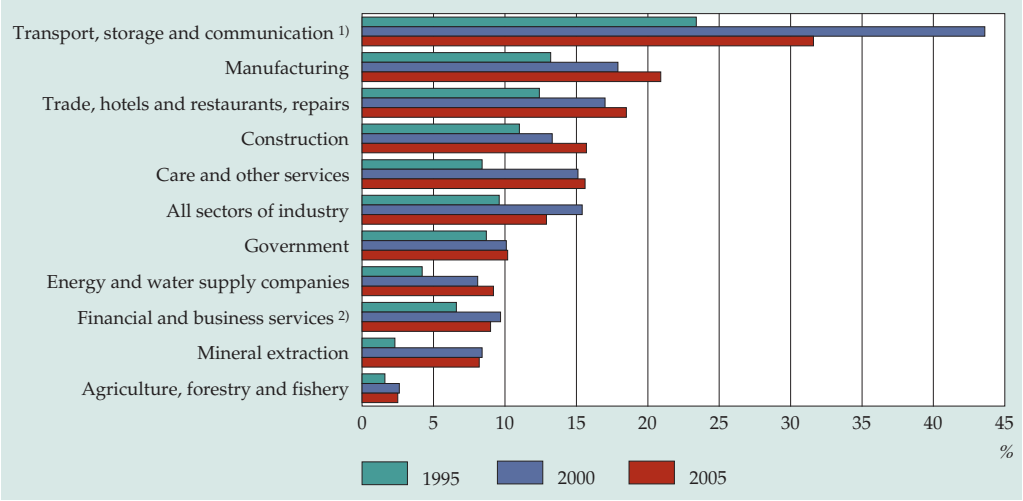


1) The figures of 2001 and later years are not completely comparable with the previous years because of a revision of National Accounts.

Source: Statistics Netherlands, National accounts.

Figure 2.4.2. shows that the share of ICT investments in the total rose in the past decade. Transport, storage and communication leads with a growth rate of more than 8 percent points between 1995 and 2005, despite the dip between 2000 and 2005. Extraction is also above average in this period (+5.9 percent point). Except for specific investments in electronic networks, the ICT investments now form a structural part of the total investments of Dutch companies.

2.4.2 ICT investments as a percentage of total investments, by sector of industry, 1995, 2000 and 2005



1) Including post and telecommunication.
2) Including computer service bureaus.

Source: Statistics Netherlands, National accounts.

The Netherlands in the middle internationally

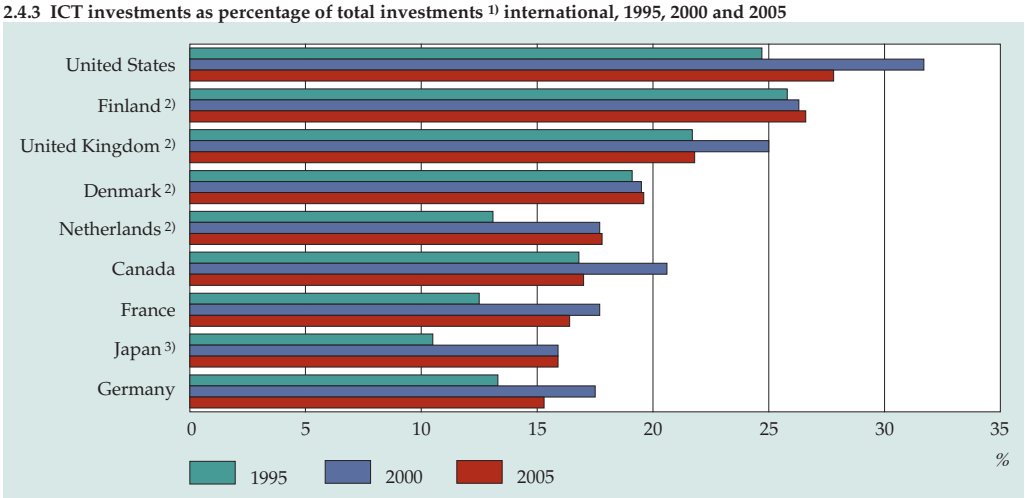
Internationally, the share of ICT investments in total investments in the period 1995–2000 saw rapid growth, followed by stagnation in 2000–2005. The Netherlands, Denmark and Japan hardly saw their share of ICT investments change. Although the Netherlands lags behind the USA, Finland and the UK, it has bridged the gap with most countries in the past decade.

Internationally, the ICT intensity of the investments in the Netherlands is average. In 1980 there was a very different situation where the Netherlands and Germany were among the top, right behind the USA (CBS, 2006). The economic lifecycle of ICT investments is short compared to other capital goods, so investments in ICT from the eighties and nineties have evaporated. In the current competitive world economy continuous investments in ICT are needed so as to have the latest hardware and software.

Intermediary use and consumption of ICT goods and services

The investments in ICT capital by companies and government form part of the total amount spent on ICT in the Netherlands. This includes expenditure by companies and government on hardware maintenance and IT consultancy, in other words intermediary use, as well as household consumption. Total ICT expenditure (intermediary use and consumption) in 2006 were up by almost 3 billion euro on 2002 (Table 2.4.2). Expenditure on ICT goods stayed at about the same level between 2002 and 2006. Growth in ICT expenditure was entirely due to the ICT services in the period 2002–2006. The share of ICT services in expenditure (in euros) went from 73 percent in 2002 to over 75 percent in 2006.

2.4.3 ICT investments as percentage of total investments [1] international, 1995, 2000 and 2005



1) International fixed capital creation, excluding dwellings.
2) 2003 instead of 2005 for Denmark, Finland, Netherlands and the United Kingdom.
3) 2004 instead of 2005 for Japan.

Source: OECD, Productivity Database.

The volume changes in 2002–2006 show that expenditure on ICT services is growing. Services went up mainly because of the popularity of the telecom services. The growing use of the internet and mobile phones, mainly by consumers, generates an enormous data flow. This leads to more expenditure on telecom services. The volume changes for ICT goods fluctuated wildly between 2002 and 2006. Household expenditure on ICT goods (consumer electronics, mobile phones, televisions, digital cameras and computers) recovered in 2006. In absolute terms expenditure on ICT services in this period grew by close to 1 billion euro.

Table 2.4.2
Intermediate consumption and consumption of ICT goods and services, 2002–2006

	2002	2003	2004	2005*	2006*
	million euro (current prices)				
Total ICT expenditure [1)]	40,543	40,765	41,286	41,707	43,108
Intermediate consumption	28,700	28,483	28,922	29,303	30,392
Consumption	11,843	12,282	12,364	12,404	12,716
Total ICT goods [1)]	10,764	10,284	10,633	10,347	10,488
Intermediate consumption	7,548	7,168	7,561	7,315	7,282
Consumption	3,216	3,116	3,072	3,032	3,206
Total ICT services	29,779	30,481	30,653	31,360	32,620
Intermediate consumption	21,152	21,315	21,361	21,988	23,110
Consumption	8,627	9,166	9,292	9,372	9,510
	year-on-year volume changes in %				
Total ICT expenditure [1)]	3.7	1.8	2.3	3.1	4.8
Intermediate consumption	1.9	0.9	1.8	2.1	4.1
Consumption	8.7	4.2	3.5	5.3	6.4
Total ICT goods [1)]	–1.9	1.3	7.9	3.0	6.6
Intermediate consumption	–6.0	–1.1	7.0	0.0	3.2
Consumption	8.8	7.0	9.8	10.4	14.7
Total ICT services	6.0	2.0	0.4	3.1	4.2
Intermediate consumption	5.1	1.5	0.0	2.9	4.4
Consumption	8.6	3.2	1.4	3.6	3.7

[1)] Estimated values for 2005 and 2006.

Source: Statistics Netherlands, National accounts.

ICT expenditure compared internationally

The indicator 'ICT expenditure as a percentage of GDP' reflects the effects of ICT on economic growth. Expenditure includes investments, intermediary use and consumption in hardware, software and services. The data refer to the market as a whole.

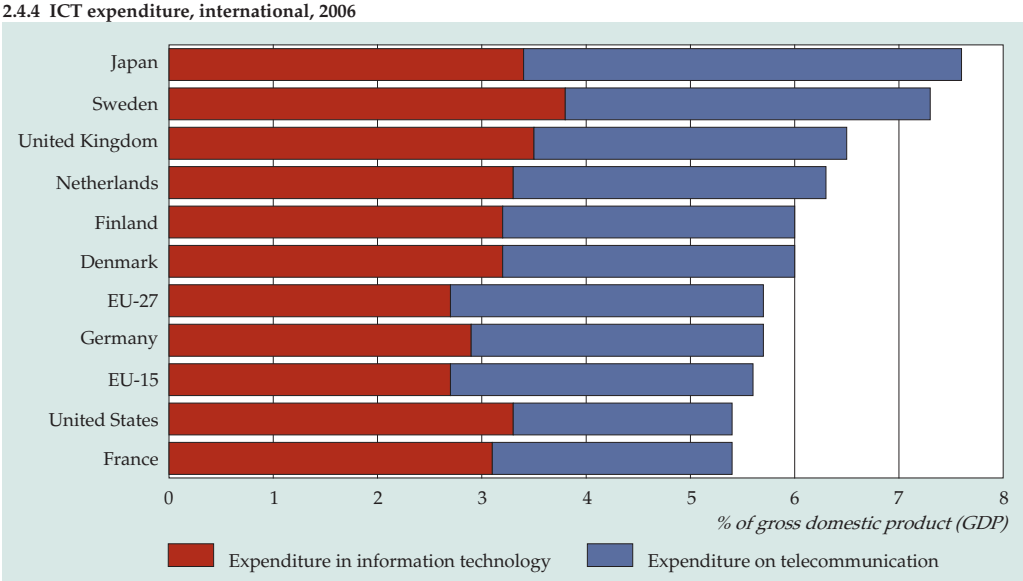
In 2006 Dutch ICT expenditure made up 6.3 percent of GDP. Since the turn of the century expenditure has shown a stable pattern (CBS, 2006). In the late nineties investments in ICT capital grew substantially each year. As discussed earlier growth was influenced by major investments of the telecom companies in laying, expanding and modernising electronic networks for internet, mobile telephones etc. After 2000 such investments fell, slowing down total ICT expenditure.

At the international level Dutch ICT expenditure is high, as a percentage of GDP. The Netherlands scored higher than the average of the EU-27 member states, which was 5.7 percent in 2006. Only Japan, Sweden and the UK had higher percentages of ICT expenditure (see figure 2.4.4). The ratio between expenditure on information technology (hardware, software and other services) and on telecom (means of communication and services) in 2006 was about the same in most countries. Exceptions were France, the USA and Japan. In the first two countries the share of information technology was much higher, whereas ICT expenditure in Japan was mainly on telecommunications.

2.5 *R&D expenditure and the ICT sector*

Research and development (R&D) is important in creating and transferring knowledge. R&D may lead to innovations that make it possible for companies to

2.4.4 ICT expenditure, international, 2006



Source: Eurostat, Information Society Statistics.

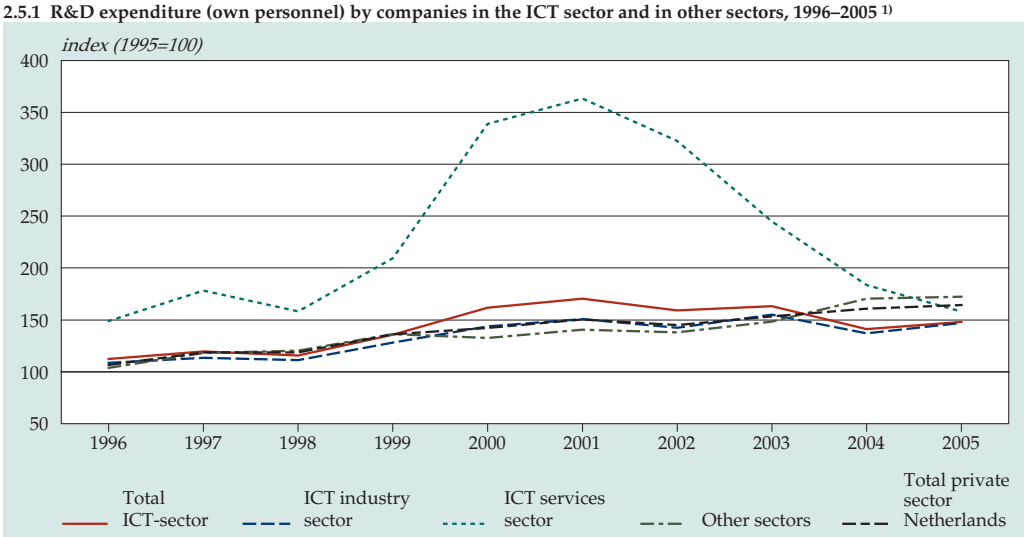
work more efficiently (process innovation) or to market new products (product innovation). Such innovations can be patented. Paragraph 2.6 provides information about ICT patents.
More deployment of R&D personnel or more R&D-expenditure in the ICT sector do not automatically lead to more innovations. Various aspects play a role in this. It requires a well-functioning innovation system with an active business climate and a proper exchange of university and research institutes, buyers and suppliers to turn R&D activities into products or services for the market. A positive business climate encourages R&D-expenditure. The aspects of location that are important for the quality of the business climate include the availability of sufficient numbers of highly qualified personnel, good international accessibility, high quality of universities and institutes, public-private sector cooperation, and high quality clusters of learning (Buck Consultants International, 2004; CBS, 2007; Griliches, 1992; Ogawa, 1997).

R&D and innovation can generate a lot of earning potential. Many companies, universities and institutes realise innovations on the basis of their own R&D endeavours. Alternatives that are frequently used are outsourcing R&D or using the innovations of others (CBS, 2007b). People often have to pay for this, for example by buying licences, or by being able to use an innovation well after it has been released. In this way companies are more dependent on indirect 'purchases' of know-how.
There is a danger in outsourcing R&D in the long run though, because companies found it very hard to successfully restart R&D after years of neglect. A company or institute needs a 'critical mass' in modern equipment and qualified personnel to guarantee R&D activities at a sufficient level. The ministries of Education and Economic Affairs have tried to extend Dutch innovation by introducing 'ICTRegie'. ICTRegie works on strengthening the ICT knowledge infrastructure, unifying the strategic management of ICT research and innovation and improving cooperation between companies, universities and research institutes.

R&D expenditure by the ICT sector

R&D expenditure in the ICT sector has been growing at a faster pace than R&D-expenditure in the private sector as a whole since the nineties (see figure 2.5.1). The Dutch ICT industry is specialised in know-how rather than in physical production. The focus of Dutch multinationals is on R&D and management in the Netherlands and the production based on it abroad. Developing ICT goods demands a great deal of investment in R&D. Much technical research is required to develop basic electronics such as chips and semiconductors. R&D intensity gets lower with assembled equipment. R&D activities are mainly in-company, especially strategic R&D (CPB, 2004).
R&D expenditure of the ICT services sector seems to be more sensitive to economic fluctuations than R&D expenditure in the ICT industry. When the ICT services sector boomed, R&D expenditure increased by more than the R&D expenditure of

2.5.1 R&D expenditure (own personnel) by companies in the ICT sector and in other sectors, 1996–2005 [1)]



[1)] Companies with 10 or more employees (1996–2001)/ employed persons (2002–2005).

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

the private sector as a whole. In 2002 and 2003, when the ICT sector faced recession, R&D expenditure slumped. R&D expenditure of the ICT industry seems to be more stable over the years and structurally at a high level.

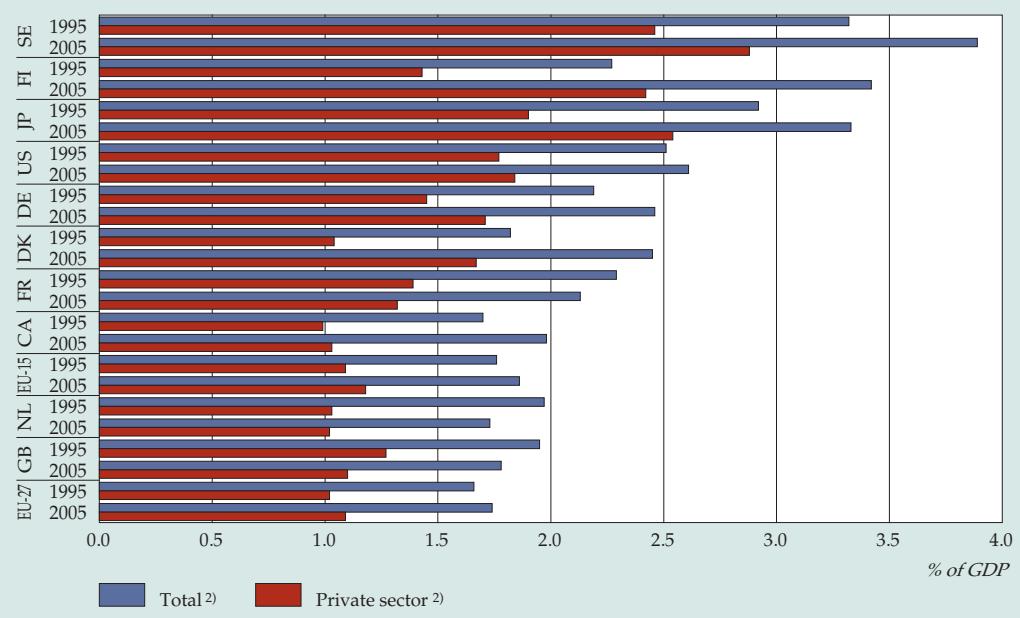
Modest R&D expenditure in the Netherlands

In the Netherlands, R&D expenditure traditionally was more than 2 percent of GDP. In the early nineties expenditure fell below this level. This downward trend continued after 2000 in the Netherlands in contrast to the international trend. Both private and public sector investments fell, a decline already starting in the public sector in 1990. International private financing has gained a great deal of influence in the total investment in Dutch R&D (OCW, 2007).

In 2005 R&D expenditure in the Netherlands was 1.73 percent of GDP, as compared to 1.78 percent in 2004. The Netherlands, along with the UK and France, were among the few countries where the R&D intensity diminished in the period 1995–2005 (figure 2.5.2). The percentage of R&D expenditure of the Netherlands was also slightly below the average of the EU-15. First within Europe were Sweden and Finland with R&D expenditure reaching 3.9 and 3.4 percent of GDP respectively.

This diminished Dutch R&D expenditure may well affect the competitive edge of the Netherlands. Lagging behind internationally means that it will be hard to get or keep top scientists, which has a negative influence on business activity. However, one should be careful in drawing conclusions, because the relatively low total R&D expenditure in the Netherlands is partly explained by how the Dutch sector is

2.5.2 R&D total and private sector, international, 1995 and 2005 [1)]



1) R&D total comprises the gross R&D expenditures of a country. R&D of the private sector comprises the gross R&D expenditures of the provate sector.
2) 2006 instead of 2005 for Finland and the United States.

Source: OECD / Statistics Netherlands.

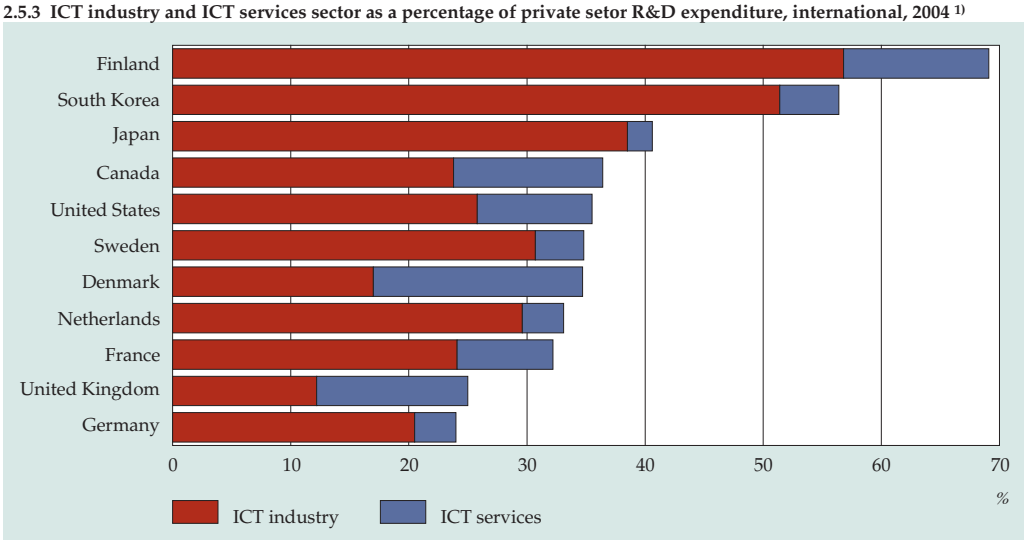
structured and how it develops. A relatively large share of GDP in the Netherlands is determined by sectors with a small R&D component. The 'intrinsic' trailing behind in R&D (that is after adjusting for the effect of the sector structure) of the Dutch private sector compared to the average of the OECD countries has changed little since 1995.

The share of the private sector in the total R&D of a country is about 65–70 percent internationally when the OECD countries are taken as the basis. The Netherlands, with a 58 percent share of private sector R&D, falls below this average. 14 percent of the other R&D expenditure was done by research institutes and the remaining 28 percent came from universities (CBS, 2007e). The absolute top in 2005 was Japan, where 76 percent of the R&D is done by the private sector.

Most R&D expenditure in the ICT industry

The Dutch ICT sector has greatly contributed to total private sector expenditure on R&D since the nineties. In 2004 the sector accounted for a third of total private sector expenditure on R&D (figure 2.5.3). The ICT sector is more R&D-intensive than the average branch. In the Netherlands over 89 percent of the R&D expenditure of the ICT sector is done by the ICT industry. International comparisons show that the ICT industry in most other countries also accounts for most of the R&D expenditure.

2.5.3 ICT industry and ICT services sector as a percentage of private setor R&D expenditure, international, 2004 [1)]



[1)] 2003 instead of 2004 for France, Japan, Sweden, United States and Germany (only ICT industry).

Source: OECD, STAN-database.

Exceptions are Denmark and the UK, where the ICT services sector does most of the R&D expenditure.

The share of the ICT services sector in Dutch R&D expenditure rose slightly in recent years. The growth is mainly due to computer service bureaus and not the more technological telecom sector. So in recent years R&D has also become more intense in ICT applications. R&D by the companies in the ICT sector does not necessarily involve ICT only, as it may include such things as marketing. Companies outside the ICT sector may well be researching and developing in ICT, and universities and other institutes may also carry out ICT-related R&D.

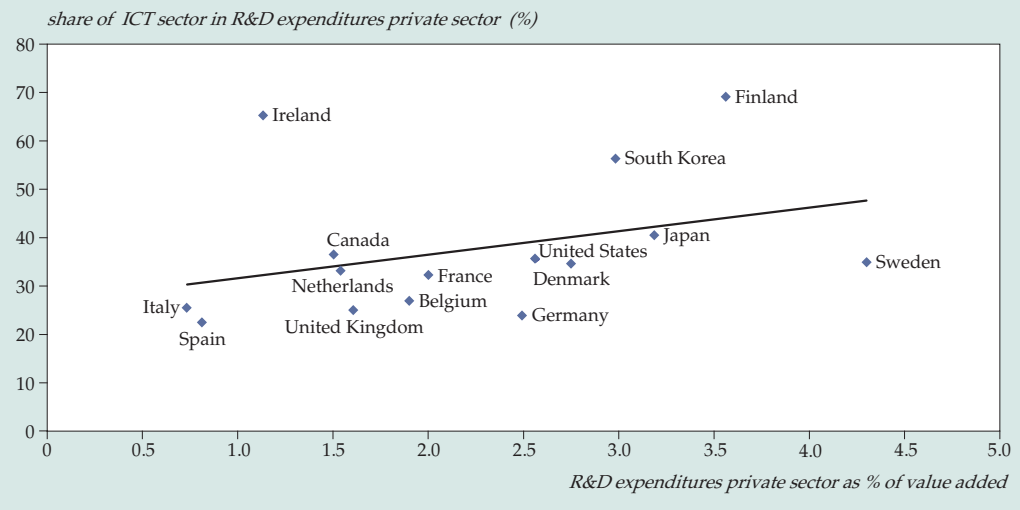
Finland and Ireland: substantial share of the ICT sector in R&D expenditure

Figure 2.5.4 plots the share of the ICT sector in R&D expenditure of the domestic private sector against the share of R&D expenditure in the value added of the domestic private sector. The ICT sector is an R&D intensive sector: the contribution of the ICT sector to R&D expenditure in all countries considered was well above 20 percent of the total commercial R&D.

Although there are differences between the selected benchmark countries, the two variables correlate. The trend line shows the average ratio of the variables for the selected countries. Four countries stand out in this figure since they are far from the trend line: Ireland, Finland, Sweden and Germany.

In Ireland the ICT sector contributed more to the total R&D expenditure than expected based on the R&D intensity of its private sector. In Ireland much R&D is 'imported' and the returns of this R&D do not always come back to the domestic

2.5.4 R&D intensity private sector versus R&D expenditureof the ICT sector, international, 2004 [1)]



[1)] 2003 instead of 2004 for France, Japan, Sweden, United States and Germany (only ICT industry).

Source: OECD, STAN-database en MSTI 2007-1.

ICT sector or related sectors. One explanation is that many foreign, mostly American ICT companies are located in Ireland. The R&D in such cases is partly imported and does not benefit the domestic ICT sector.
This figure requires some explanation. Due to the rise of multinational enterprises, the location where R&D activities take place is increasingly separated from where production is located. Decisions by large multinationals influence the statistical description of the ICT sector. This may explain the relatively modest R&D expenditure by the ICT sector in the USA.

2.6 *ICT and patents*

The research and development, discussed in the previous paragraph, may lead to innovations and inventions. These inventions can be protected by patents. The main patent offices in the world are: the European Patent Office (EPO), the United States Patent and Trademark Office (USPTO) and the Japanese patent office. In this year's edition we focus on European patents (see The Digital Economy 2006 for more information on US and Japanese patents).
Eurostat, the statistical bureau of the EU, publishes data on patent applications. They look at the year in which the first patent application was made anywhere in the world. These figures only become known after several years, because it takes time to do all the research before a patent can be granted. Moreover, the patent has to be classified in a category, before the patent can be assigned to a discipline. The most recent figures refer to 2004. These are still preliminary figures, which will need to be

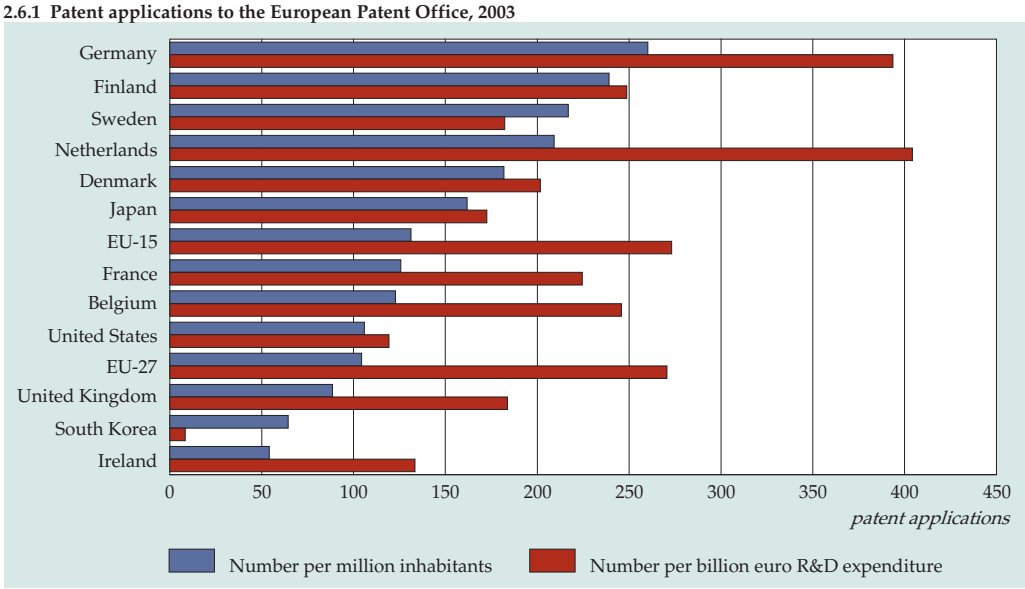
adjusted later. Two of the graphs show figures on 2003, because they are final [2)]. The figures on patent applications are a good indicator of the patents granted eventually, they are just slightly higher than the figures of the patents granted. This is because applying for a patent is expensive, so patent applications are usually only made when the applicants are almost sure that the patent will be granted.

Many Dutch patent applications

In 2003 Germany applied for most European patents of the countries considered: 260 per million inhabitants. The Netherlands, Sweden and Finland also applied for more than 200. France, Belgium, Ireland and the UK were below the EU-15 average of 130 patents per million inhabitants in 2003. In European patent applications the figure for Japan was just over and the figure for the USA well under the EU-15 average. Both countries did apply for very many patents in the USA. In 2001, which are the most recent estimates published, applicants from the USA were granted 352 American patents (USPTO) per million inhabitants and 310 to the Japanese.

In terms of patents per billion euro spent on R&D, Germany and the Netherlands stand out. Both countries applied for about 400 patents per billion euro of R&D expenditure. The figure must be interpreted with care. R&D expenditure usually does not lead to patents within the same year. There are countries which spent relatively little on R&D, who perhaps by coincidence applied for more patents in 2003 changing the ratio. The average of the EU-15, of about 273 patents per billion R&D spent, is in third place in figure 2.6.1. Some countries that are not shown in the graph have a higher ratio: e.g. Italy and Malta. Even Finland is below the EU-15

2.6.1 Patent applications to the European Patent Office, 2003



Source: Eurostat.

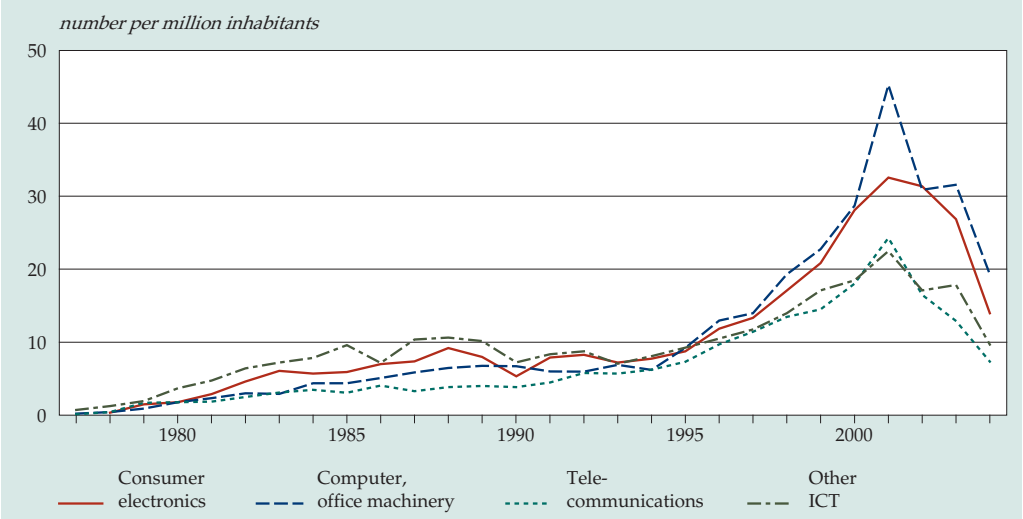
average. It must be said that different countries – and companies – have different cultures in applying for patents. Sometimes it is wiser not to apply for a patent and keep the invention a secret.

Dutch ICT patents no longer reach 2004 level

Many patent applications have to do with ICT. This share grew for the Netherlands from 13 percent in 1977 to 44 percent in 2001, and then fell to 37 percent in 2003. The ICT patents can be divided into the following groups: consumer electronics, computers and office equipment, telecommunication, and other ICT. The last group includes measuring equipment, traffic control systems and semiconductors. The Dutch ICT patent applications show that the peak was a few years ago, in 2001, together with the internet hype. In 2001 a total of almost 125 ICT patent applications per million inhabitants were made, in 2003 there were less than 90 and for 2004 the preliminary figure is well over 50. This last figure does not say much because it is a preliminary figure that may be much higher a year from now [3)]. Many countries in the EU had 2001 as their top year in ICT patent applications, for some it was 2000 and for Finland it was 1999. Several mainly new member states had their top year in 2003. The top is far less extreme for all other countries than it was in the Netherlands. Only Finland, Sweden and Switzerland had similar developments albeit in a less extreme form.

Most Dutch ICT patent applications were in computers and office equipment. In 2001 the top was 45 patents per million inhabitants, in 2002 this came down to 31.

2.6.2 Dutch ICT patent applications to the European Patent Office, 1977–2004 [1)]



[1)] 2004 provisional figures.

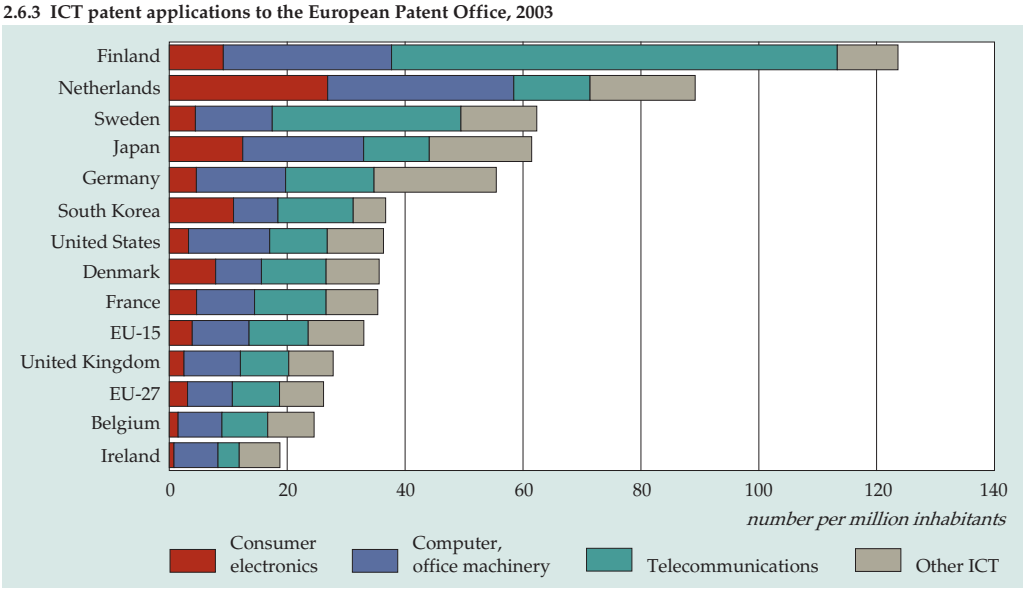
Source: Eurostat.

The next most important group is consumer electronics, with almost 33 patents per million inhabitants in 2001. The third group is telecommunication, where some 24 patent applications were made per million inhabitants in 2001. The patent applications grew considerably: between 1977 and 2001 the number of applications per million inhabitants increased by an average of 22 percent a year. There has been a decrease since 2001. Of the European countries, Finland, Ireland and Spain also had growth rates of 20 percent between the early eighties and 2001.

Finland holds many telecom patents

Compared to inhabitants of other countries the Dutch apply for relatively many ICT patents. Of the countries selected only the Fins perform better. The most patent applications, relatively speaking, in consumer electronics and 'computers and office equipment' came from the Netherlands. Finland is well ahead in telecommunications, with more than twice as many patent applications as number two, Sweden. Germany, with most patent applications overall, only comes in fifth place in ICT patents, after Finland, the Netherlands, Sweden and Japan. The total number for the EU is a rather low: 26 ICT patents per million inhabitants. Finland has almost five times as many. The UK is below the EU-15 in ICT as well as in the total number of applications; apparently patents are not considered as important in the UK as in most other western countries of the EU. Also in US patents (USPTO) granted and in patent applications in Europe, the USA and Japan (triadic patents), the number for the UK is lower than the average of the EU-15 per million inhabitants. In triadic patents the number for the UK is even below that of the EU-27.

2.6.3 ICT patent applications to the European Patent Office, 2003



Source: Eurostat.

2.7 *International trade in ICT*

The international trade flows in ICT goods and services give an indication of the international competition in these markets. ICT goods have been part of the international trade flows much longer than ICT services. ICT goods are being produced on a large scale in countries where wages and costs are lowest. In 1996 about 71 percent of the global production of ICT goods was realised in OECD countries. In 2006 this had fallen to 57 percent.

In 2006 the export of ICT goods reached a record high, expressed in US dollars. This was due to increased demand for electronic components, audio and video equipment. The OECD imports also reached a high because of increased demand for these products. The trade in ICT goods did not grow as robustly in 2006 as it did in the previous years. The share of ICT goods in the total commodity trade was 13.4 percent in 2006, a fraction more than the share of 13.2 percent in 1996 (OECD, 2006). After the recovery in 2003–2004, the trade in ICT goods (in volume) has been falling since 2005, due in part by the rapid rise in the price of raw materials and ICT equipment becoming cheaper and cheaper.

As a consequence of the rapid technological developments in ICT, services can increasingly be traded and many ICT services can be provided from distant locations when no direct personal contact is required. Although the OECD countries are responsible for most of the international trade in ICT services, these activities are rapidly growing in many other countries. In 2005, India and China already accounted for 6.5 percent of the export and 5 percent of the import in 2005 (OECD, 2006).

Imports and exports by the Netherlands

The Netherlands has clearly benefited in the last decade from the blossoming international trade in ICT goods and services. The value of the total ICT exports (including re-exports) almost tripled in the period 1996–2006: from 25.1 to 69.9 billion euro (Table 2.7.1). The import value of ICT goods and services in ten years increased partly because of rising prices: from 26.5 to 66.6 billion euro. Although the import and export volume of ICT services is much smaller than that of ICT goods, ICT services also show sharp increases. The international trade in ICT services consists of hiring foreign computer service bureaus to supply computer services (offshoring and outsourcing; see also paragraph 2.11), or the use of networks of foreign (mobile) telephone providers for handling international calls. International competition, mainly due to outsourcing and offshoring, is also rising in the ICT services market. Given these developments, the share of the ICT services in the total imports and exports of ICT goods and services is likely to rise further. The Dutch trade surplus of imports and exports of ICT services (including re-exports) was over 1.6 billion euro for the Netherlands in 2006. In 1996, ICT services still came

Table 2.7.1
Imports and exports of ICT goods and services, 1996–2006

	1996	2002	2003	2004	2005*	2006*
	million euro (current prices)					
imports						
ICT goods	23,820	48,956	48,995	54,103	57,200	60,312
ICT services	2,696	4,947	5,201	5,397	5,968	6,314
total ICT imports NL	26,516	53,903	54,196	59,500	63,168	66,626
total imports NL	173,789	268,112	270,538	289,894	314,832	351,595
exports						
ICT goods	5,014	6,092	5,492	5,700	5,609	5,783
ICT services	2,630	5,638	6,016	6,383	6,757	7,377
total ICT exports NL	7,644	11,730	11,508	12,083	12,366	13,160
total exports NL	190,674	298,450	300,498	326,111	355,326	391,346
re-exports						
ICT goods	17,298	43,548	42,883	48,286	53,109	56,207
ICT services [1)]	162	457	439	566	592	579
total ICT re-exports NL	17,460	44,005	43,322	48,852	53,701	56,786
total re-exports NL	46,845	89,696	93,563	106,276	118,210	133,919
total ICT goods exports	22,312	49,640	48,375	53,986	58,718	61,990
total ICT exports (goods, services and re-exports)	25,104	55,735	54,830	60,935	66,067	69,946
	%					
Composition of exports of ICT goods and services:						
ICT goods	20	11	10	9	8	8
ICT services	10	10	11	10	10	11
re-exports	70	79	79	80	81	81
total	100	100	100	100	100	100
Share of ICT goods and services in:						
total imports	15.3	20.1	20.0	20.5	20.1	18.9
total exports	4.0	3.9	3.8	3.7	3.5	3.4
total re-exports	37.3	49.1	46.3	46.0	45.4	42.4

[1)] In fact only software on CD-ROM/tapes.

Bron: Statistics Netherlands, National accounts.

up with a relatively small positive margin of 96 million euro. The trade of ICT goods in 1996 showed a deficit of more than 1.5 billion euro, but a decade later this had turned into a trade surplus of almost 1.7 billion euro.

The Netherlands as a re-exporter

At first glance the import and export figures of the Netherlands (particularly of ICT goods) paint a rather distorted picture. Most ICT goods imported by the Netherlands are intended for re-exports. These are goods that undergo minimal processing in the Netherlands, such as repacking computers from containers into

boxes, and are subsequently re-exported to the final country of destination. The disadvantage of depending so much on re-exports as compared to the export of domestic products, is that the value added on products through re-exports is often considerably lower (CPB, 2007). Over 91 percent of the total exports of ICT goods in 2006 consisted of re-exports; in 1996 the share was 78 percent. In the period 1996–2006 the share of the re-exports increased at the expense of Dutch manufactured ICT goods. Re-exports are the driving force behind ICT export growth, although the increase in re-exports in 2006 (expressed in euros) was considerably lower than the annual growth in the period 2003–2005.

The share of ICT goods and services in total re-exports also shows that the Netherlands is a real transit country: in 1996 37 percent of Dutch re-exports consisted of ICT goods and services. In the period 1996–2006 this share initially increased every year. Since 2003 the percentage has been slowing down a bit but the same is true for the share of ICT goods and services in imports and exports. This leads to the somewhat curious conclusion that it is not the Dutch ICT industry that benefits from the growth of the international trade in ICT goods and services, but rather the Dutch trade and transport sector.

International

The developments in the international trade in ICT goods, software and ICT services are sketched below in the period 1996–2006. Worldwide the trade in these products grew substantially. We will show per country which market realised the highest growth, the trade in ICT goods or the market in ICT services. Note that the international trade in ICT goods is many times greater than the value of traded software and ICT services.

ICT goods

In the period 1996–2006 worldwide trade in ICT goods showed spectacular growth. The Dutch re-exports, which hardly add value to products, distorted the picture for the Netherlands. In Ireland much of the exports are generated by production units of foreign companies. Substantial growth of the trade in ICT goods or services in a country is therefore not always based on a boom period of traditionally domestic ICT companies. The growth may be caused by foreign companies moving into the country. Although production, exports and employment in the country may expand thanks to domestic companies and foreign company units, the continuity of the companies is less secure when the exports of ICT goods in a country depend mainly on foreign companies. A foreign parent company may be more willing to shift a unit to another country if the business climate is better over there.

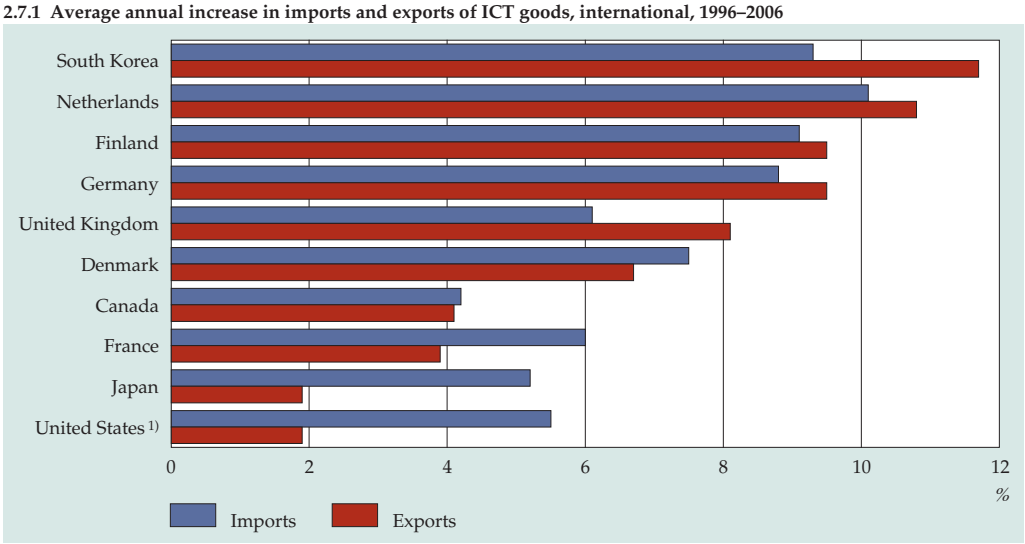
Also the rapid technological progress makes it easier to shift the production of ICT goods to countries outside Western Europe, where costs and wages are lower. Production of ICT goods has been shifted for a long time, but in recent years ICT services have also been shifted under the influence of growing international

competition. The ease with which a company can shift a unit depends on the nature of the work. Since the turn of the century many western companies have massively shifted their labour intensive and low margin production of ICT goods to China, India and Eastern European countries. This production work includes making televisions, computers, telephones and DVD players (CBS, 2007).

Exports grew spectacularly for South Korea, the Netherlands and Finland in the period 1996–2006 when compared internationally (see figure 2.7.1). South Korea (11.7 percent) and the Netherlands (10.8 percent) saw double digit average annual growth in exports. The same three countries also saw the highest import growth rate in the period 1996–2006. The simultaneous growth of imports and exports in the Netherlands is due to the fact that the imports are mainly intended for re-exports: imports and exports go hand in hand. South Korea and to a lesser extent the Netherlands and Finland saw exports increasing more rapidly than imports.

The opposite development is taking place in the USA, Japan and France where imports increased faster in recent years than exports. In the USA this can be explained by the increased imports of ICT goods from foreign units of US parent companies. In fact they are imports of ICT goods of their 'own' multinational enterprises that shifted production abroad. The once powerful Japanese electronics companies fell in the turnover ranking of ICT companies, while producers of equipment in other Asian countries are rising fast. Companies in China and India are increasing their role in ICT products and services (OECD, 2006).

2.7.1 Average annual increase in imports and exports of ICT goods, international, 1996–2006



1) 2006 instead of 1999 for the United States.

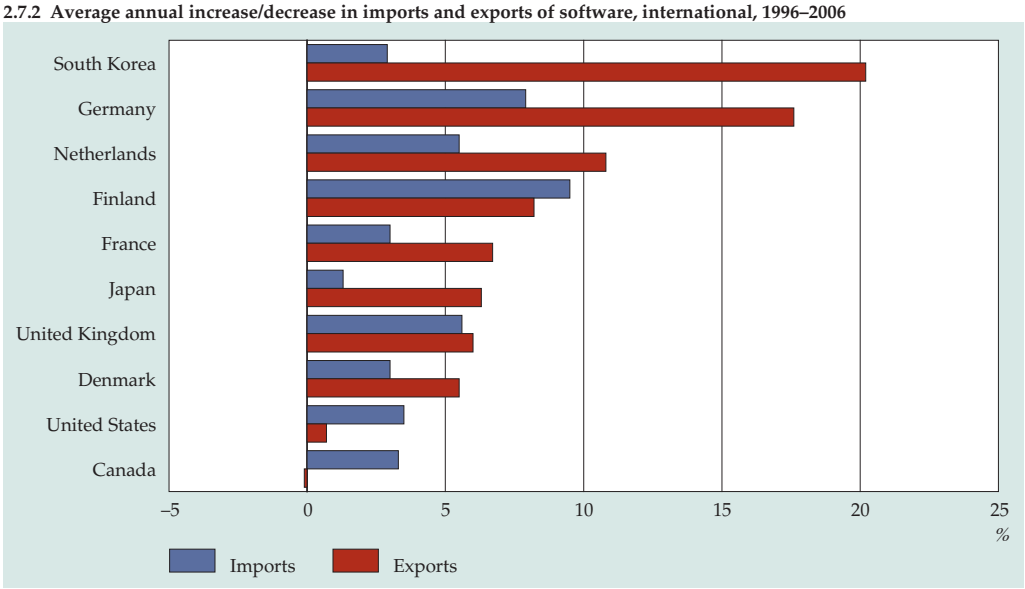
Source: OECD.

Software

In comparison with the trade in ICT goods, the global software market is rather limited. The total trade value of software is small compared to that of ICT goods, but the average annual growth of software exports is high in South Korea, Germany and the Netherlands (see figure 2.7.2). South Korea has the fastest growing exports of software: up from 27 million dollar in 1996 to 169 million dollar in 2006. This constitutes an average annual growth rate of 20 percent. South Korea declined slightly after 2004 when the exports of software reached 231 million dollar (CBS, 2007). Germany is also a major exporter. It has an average annual growth rate of just fewer than 18 percent. The Netherlands (+10.8 percent) is above average, but its growth rate in the period 1996–2006 was not as high as in 1996–2004 (+14.4 percent). The software sector hardly has any re-export. Therefore, the Dutch exports in the software branch originate from the domestic ICT sector. US software imports grew faster than exports. The growth of exports, and to a lesser extent imports, of ICT goods and software in the USA lags behind those of most European countries.

These figures on software require some explanation. Measuring the international trade in software is complex. If software does not have the character of goods, which is increasingly the case, the trade can hardly be observed in the traditional trade statistics. Software is also often sold together with hardware, which leads to an overestimation of the trade value of hardware and an underestimation of the trade in software. The traditional trade statistics also do not really know what to do with the trade of one original software application that is subsequently duplicated and

2.7.2 Average annual increase/decrease in imports and exports of software, international, 1996–2006



Source: OECD.

distributed many times over in the country of destination, guaranteeing income through copyright. The online trade in software and supplying it by downloading is not observed properly in the statistics (OECD, 2004).
To give an indication of the development of the international trade in standard software, statisticians use the trade in physical software carriers, such as CD ROMs, as their alternative.

ICT services

The ICT services market, like the software market, is much smaller than for ICT goods. To illustrate the point: in 2005 the total trade in ICT services (to and from OECD countries) reached 200 billion dollar, while the trade in ICT goods was 1 850 billion dollar. Although the trade value of ICT services was much lower, the market is growing rapidly. Figure 2.7.3 shows that the following countries saw a relatively fast growth of ICT service exports in the period 1996–2005: the Netherlands (average annual growth rate of 21.6 percent), the UK (19.1 percent) and France (18.8 percent). In contrast to the exports of ICT goods and software, the exports of ICT services of the USA did grow substantially between 1996 and 2005 (10.5 percent). A specialised hardware country like Finland lagged behind, as did Japan and South Korea, where the international trade in ICT services decreased. The Japanese economy is traditionally very closed: it has room for exports and foreign investments, but protects its national market through import restrictions et-cetera (KU Leuven, 2007). One possible explanation for the diminishing international trade in South Korea is that the exports mainly consist of computers and means of communication. This

2.7.3 Average annual increase/decrease in imports and exports of ICT services, international, 1996–2005

Source: OECD.

equipment requires software to work. Production of software saw substantial growth in the past decade.

Apart from the countries shown in figure 2.7.3, Ireland is a major producer and exporter of software and ICT services. Exports of ICT related services replaces Ireland's leading role in the exports of ICT goods. Foreign companies in IT services and software use Ireland as their base to set up export activities, stimulated by its advantageous tax climate (OECD, 2006). Countries that are expanding their international services, are also often actively working on strategies to sharpen the competitive edge of their IT and software service providers. Companies that are active in international outsourcing of services, realise that their future growth depends on the quality of the services provided and pay a great deal of attention to sensitive information and privacy.

International trade in ICT more dynamic

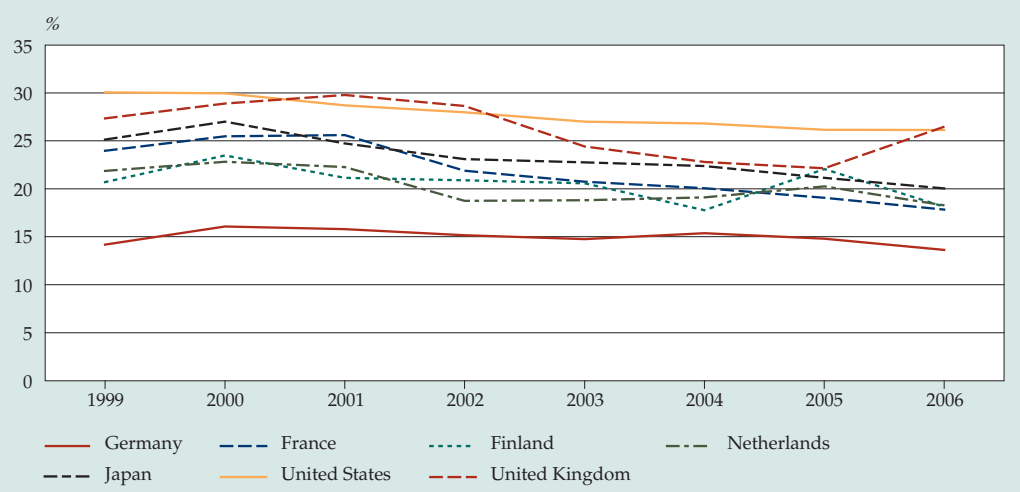
The international trade has become much more dynamic in the countries considered throughout this edition over 1996–2006. This is demonstrated by the international development of imports and exports of ICT goods, software and ICT services. Software and ICT services got double digit growth rates in some countries. The Netherlands, Germany and to a lesser extent the UK performed well on all three markets. For the Netherlands we registered several causes. For ICT goods the above-average performance is explained by the growth of re-exports. For software and ICT services there is autonomous growth caused by the domestic ICT sector. South Korea and Finland performed well in two of the three markets. The export growth of ICT goods and software in the period 1996–2006 was highest in South Korea. This explosive development is in dire contrast with the dip in the exports of ICT services since 1996.

Finally, three figures reveal that the average annual growth of imports and exports of ICT products is slightly higher among the European countries than growth in the USA, Canada and Japan. The single European market may play a role in this, as it increased trade between European countries.

High-tech products

Another indicator of the international competitive position of a country is the development of the share of high-tech products in total exports. The European countries, the USA and Japan have relatively high wages which means they have to compete in the area of know-how. The know-how is used to develop products and production processes that have great profit margins. The gap in know-how keeps low-wage countries at a distance. If competition is only based on labour costs, many countries are cheaper than most European countries. The race is on between knowledge-intensive labour and high wages versus less knowledge-intensive labour and lower wages. A great deal of effort is made in the EU to prevent the loss of the edge in know-how.

2.7.4 Share of high-tech products in total exports, international, 1999–2006 [1)]



[1)] High-tech products: products for the aircraft and aerospace industry, computers, office machines, electronics, instruments, pharmaceuticals, electrical machines, means of communication and weapons. EU exports do not include intra-EU exports.

Source: Eurostat, Science and Technology Indicators.

The share of high-tech products in total exports of the countries considered has shown a single pattern since 1999. In 2000 and 2001 the share of high-tech products in total exports peaked. In 2000 more than 25 percent of the exports of the UK, the USA, Japan and France consisted of high-tech products. This share dipped after the internet hype on the financial market. Between 2003 and 2005 only US exports still consisted for more than a quarter of high-tech products. The UK showed the greatest dip in the share of high-tech products, from 29 percent in 2000 to 23 percent in 2004.

In 2006 the UK overtook the USA as the country with the highest share in high-tech products in its exports. The share of high-tech products in Germany was structurally below the EU-27 average. The economic recovery of 2004 has not yet translated itself into a marked increase in the share of high-tech products in most countries, with possible exception of the UK. One explanation is the shift in production of computers and communication equipment to Eastern Europe, China, South Korea and other low wage countries.

2.8 *ICT and employment*

Employment increased at computer service bureaus in 2005 and 2006, while the number of vacancies also went up substantially. The shift from CBS observation to the use of fiscal wage data to calculate the job and employment figures caused a delay in making job data available. This means there are no recent details on jobs by sector available.

ICT professionals: men

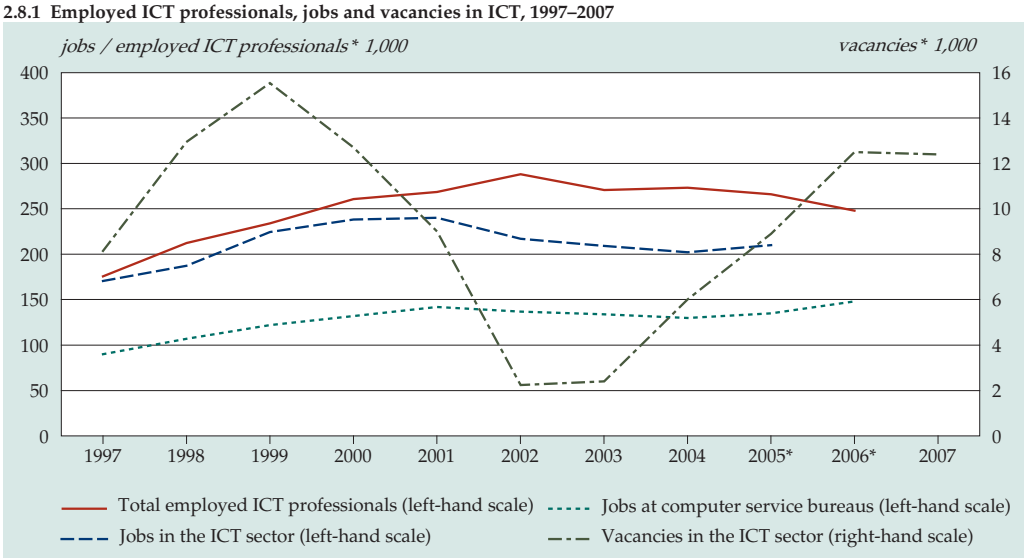
The data obtained through the labour force survey allow conclusions about the ICT professionals (see table 2.8.1 in the statistical annex). There has been a remarkable drop in numbers over the past two years: in 2006 there were about 248 thousand employed ICT professionals, whereas there were 273 thousand in 2004 [4)]. Various aspects in the profile of ICT professionals hardly changed: 88 percent are men (vs. 57 percent of the total employed labour force), they are relatively highly educated, on average somewhat younger, often working fulltime, and less often flex workers or self-employed than the total employed labour force.

About 3.5 percent of the employed labour force consists of ICT professionals (table 2.8.2 of the statistical annex). They are not spread evenly among the sectors of industry. The biggest concentration is found in business services, clearly in computer service bureaus. About 64 percent of the people working at computer service bureaus are in ICT. Financial institutions also employ many ICT professionals: 8.5 percent of their labour force. This is followed by the relatively small extraction sector where 4.8 percent is an ICT professional. Government also employs relatively many ICT professionals: 4.6 percent of its labour force.

Vacancies in the ICT sector stay high

The number of vacancies has been rising substantially across the board in the ICT sector in recent years, but the 1999 high has not been reached again. In 2008 growth seems to be levelling off. The number of jobs at computer service bureaus was the

2.8.1 Employed ICT professionals, jobs and vacancies in ICT, 1997–2007



Source: Statistics Netherlands, Labour force survey, Employment and earnings survey, Labour accounts, Vacancies survey (third quarter).

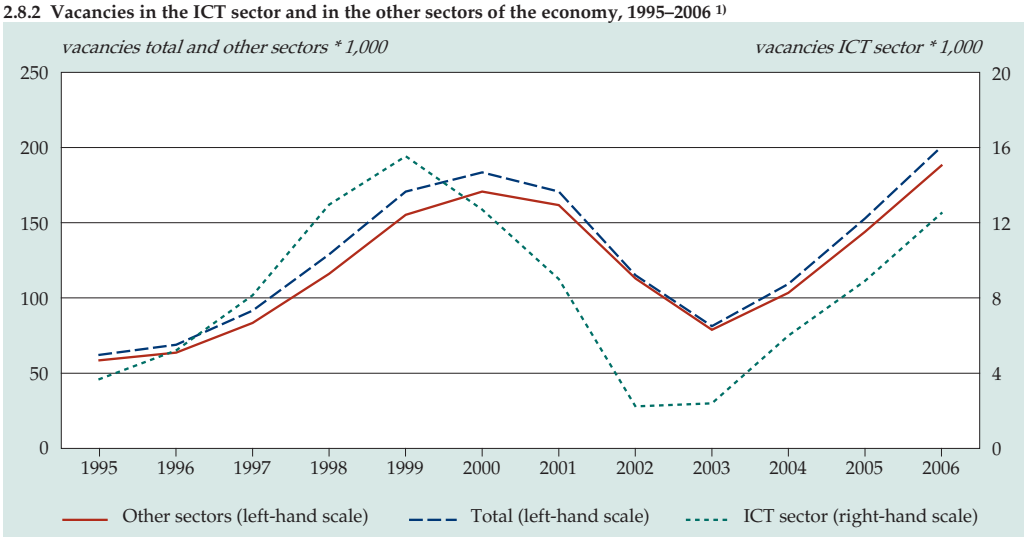
highest in a decade in 2006. The number of jobs in the ICT sector in 2006 is not yet known, but because jobs usually keep pace with the number of vacancies in the ICT sector, the number of jobs has probably also increased in 2006.

The fact that there are many vacancies in the ICT sector matches the economy as a whole, which has far more vacancies than in 2003 when there were relatively few vacancies. The trend in vacancies in the ICT sector runs parallel with that of the economy as a whole (see figure 2.8.2), but there are relatively more vacancies in the ICT sector. It is not yet possible to calculate the vacancy rate for 2007 in the ICT sector, but in 2005 it was 42 vacancies per thousand jobs, compared to 22 for the economy as a whole that year (see table 2.8.3 statistical annex). If the number of jobs was the same in 2007 as it was in 2005 the vacancy rate in 2007 in ICT would be 59 and for the economy as a whole 32.

Explosive growth of computer service bureaus in two decades

Due to changes in the way CBS classifies companies, the category computer service bureaus in 2007 is a bit different from 2006. Therefore it is hard to say if there were even more vacancies in 2007. In the new classification there were 9,100 vacancies in the fourth quarter of 2006, so the number of vacancies must have increased because in the third quarter of 2007 there were 9,300. This is a sign that they are doing alright. The yearly average of the number of jobs has been increasing again since 2004. If the vacancy rate of the computer service bureaus is calculated, it would be 66 in 2006 and 53 per thousand jobs in 2005. This is quite a bit more than for the ICT sector as a

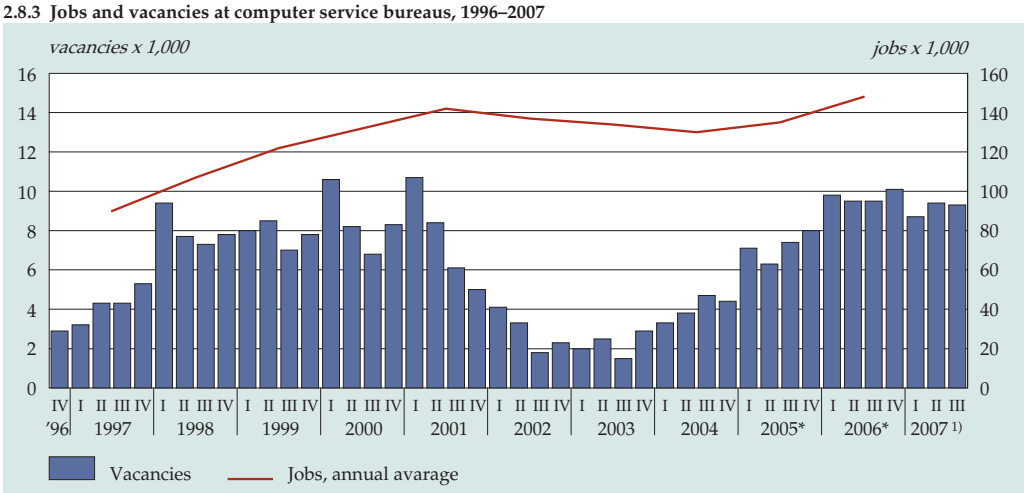
2.8.2 Vacancies in the ICT sector and in the other sectors of the economy, 1995–2006 [1)]



[1)] The ICT sector is defined as SBI groups: 30, 3130, 3210, 3220, 3230, 3320, 3330 (ICT industriy) and 6420, 72 (ICT services).

Source: Statistics Netherlands, Vacancies survey (third quarter).

2.8.3 Jobs and vacancies at computer service bureaus, 1996–2007



1) The transition to a new business register lead to a break in the figures. The figures until the fourth quarter of 2006 are before the break, the figures of 2007 are after the break. For the fourth quarter of 2006 the figures are computed in two ways: the old method gave 10,100 vacancies at computer service bureaus, the new method 9,100.

Source: Statistics Netherlands, Quarterly vacancies survey private sector, Labour accounts.

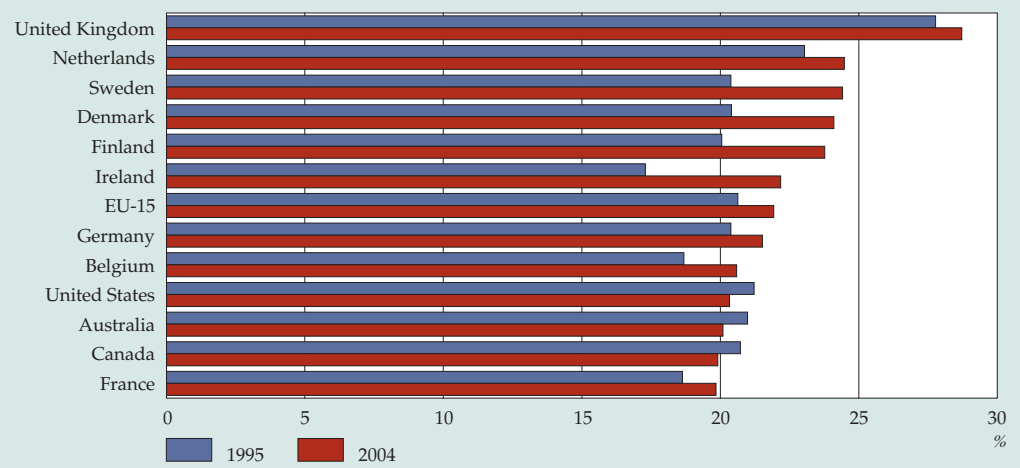
whole, which had 42 in 2005 (see table 2.8.3, statistical annex). Job numbers in the computer service bureaus grew by more than 60 percent between 1997 and 2006, which is huge for nine years. The growth rate in the period before that was even greater. In 1987 there were 28 thousand jobs, so between 1987 and 1997 the sector more than tripled. In the period 1987–2006 the sector saw a five-fold increase.

Many Dutch ICT professionals

There are various definitions for ICT professionals agreed in different international panels. The narrow definition of ICT professionals is that of ICT specialists developing, operating and maintaining ICT systems; ICT is the focus of their work. The wider definition of ICT professionals includes advanced and basic users of ICT and software tools.

'The digital economy 2006' has a figure with data on ICT professionals under the narrow definition. There are no more recent figures available, so this edition includes a figure with ICT professionals in the wider definition. The Netherlands was at the top in the narrow definition, the UK is at the top in the wider definition. In 2004 almost 29 percent of the employed labour force in the UK was an ICT professional in wider sense. In the Netherlands it was over 24 percent of the employed labour force. The UK is remarkable in that the corresponding share of the other countries presented are all between almost 20 and just over 24 percent; so the differences are not very big. The OECD has data about more countries available than we present here. The country with the least ICT professionals in the widest sense is Greece, where it is over 14 percent of the employed labour force.

2.8.4 Employed ICT professionals, as a percentage of the total employed labour force, broad definition, international, 1995 and 2004 [1)]



[1)] Broad definition of ICT professionals based on methodology described in OECD Information Technology Outlook 2004, Chapter 6. Australia, Finlandand Sweden: 1997 instead of 1995; Ireland 1999 instead of 1995 and Canada 2003 instead of 2004.

Source: OECD, Key ICT indicators.

2.9 *ICT education*

In the previous paragraph we showed that there were many vacancies in the ICT sector in 2006. In previous editions we pointed out that there are more vacancies than can be filled by the ICT graduates of Dutch colleges (*hogescholen*) and universities [5)]. The number of graduates in higher education in 2005/'06 was up on previous years. Since 1999 there has been a steady increase, more among college than among university graduates. In 2005/'06 there were 3.5 thousand informatics graduates, more than 2.5 times as many as in 1990/'91 when there were fewer than 1.4 thousand. The growth rate at the universities is less spectacular, from over 600 graduates in 1990/'91 to over a thousand in 2005/'06.

The figures can only be interpreted properly when the population structure of the Netherlands is taken into account. Most college graduates are 22 years old and most university graduates 24, so in table 2.9.1 we show the total number of 23 year-olds in the population on 1 January. The figures indicate that twice as many people graduate from higher education than 15 years ago. In the absolute sense the growth rate is less: from under 58 thousand in 1990/'91 to over 88 thousand in 2005/'06 is only one and a half times as many. This is because the number of 23 year-olds fell by a quarter during this period. The expectations are an increase in the number of 23 year-olds as of 2008 and more people in higher education, according to the Ministry of Education (Referentieraming 2007, Ministry OCW).

Table 2.9.1
Graduates from higher education, total and informatics, 1990/'91–2005/'06 [1)]

	Vocational college			University			Population aged 23	Graduates as a percentage of 23 year-olds
	Total	Informatics	Percentage informatics	Total	Informatics	Percentage informatics		
	number		*%*	*number*		*%*	*1 ,000**	*%*
1990/'91	38,660	1,360	3.5	19,110	620	3.2	250.3	23.1
1991/'92	42,430	1,390	3.3	20,740	650	3.1	252.5	25.0
1992/'93	43,880	1,410	3.2	22,590	740	3.3	264.9	25.1
1993/'94	46,660	1,700	3.6	24,710	780	3.2	257.8	27.7
1994/'95	48,870	1,680	3.4	25,360	710	2.8	245.7	30.2
1995/'96	51,180	1,700	3.3	28,290	720	2.5	231.9	34.3
1996/'97	50,510	1,580	3.1	25,400	660	2.6	212.3	35.7
1997/'98	50,090	1,580	3.2	22,170	510	2.3	203.8	35.5
1998/'99	50,130	1,630	3.3	20,490	440	2.1	194.8	36.2
1999/'00	52,230	1,790	3.4	20,250	440	2.2	193.0	37.5
2000/'01	53,140	2,110	4.0	20,420	490	2.4	191.2	38.5
2001/'02	56,060	2,550	4.5	21,300	510	2.4	194.7	39.7
2002/'03	57,970	2,810	4.8	22,140	590	2.7	194.0	41.3
2003/'04	59,620	3,110	5.2	23,770	720	3.0	200.3	41.6
2004/'05	59,230	3,330	5.6	26,190	870	3.3	197.5	43.3
2005/06*	59,310	3,500	5.9	29,060	1,070	3.7	191.8	46.1

[1)] Graduates of bachelor or masters equivalents in the fields ISCED 481: 'informatic' and 523: 'electronics and automation'.

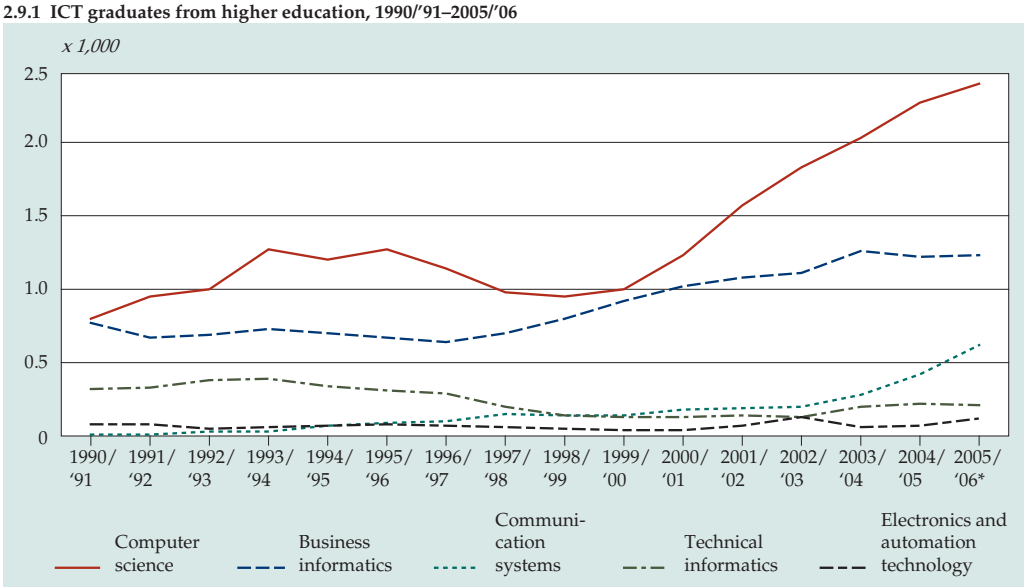
Source: Statistics Netherlands, Education and population statistics.

Five fields in informatics

For statistical purposes we distinguish five specialisations in informatics taught in higher education. Classifying specialisations in studies is complicated as new areas are added. The Netherlands recently changed to a bachelor-master system, leading to major changes in almost all studies at universities and colleges. Statistics Netherlands therefore had to reclassify these studies. The five fields are based on the course titles and the description of the contents of the various majors. The classification is adjusted each year to accommodate new areas and shifts in focus. The graphs therefore do not represent the gospel truth, since a study can change its name or content so that it is reclassified the next year.

The largest studies are informatics and information science with 2.4 thousand graduates in 2005/'06. This is twice as many as a decade ago. The smallest is electronics and computer technology, where the number of graduates fluctuates: in 2005/'06 there were about 120 in the early nineties about 80. The total number of informatics graduates increased from almost 2 thousand in 1990/'91 to over 4.5 thousand in 2005/'06.

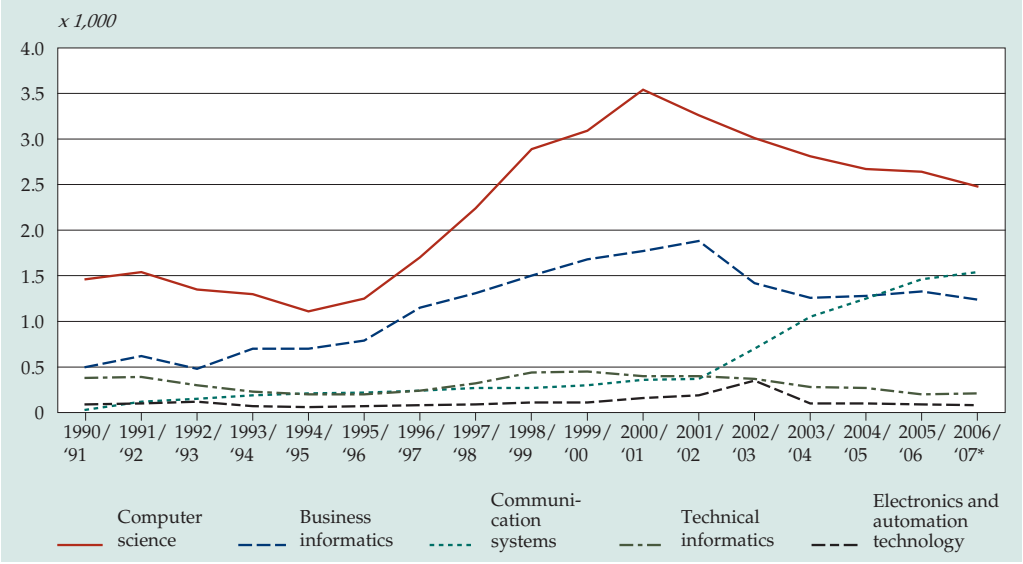
2.9.1 ICT graduates from higher education, 1990/'91–2005/'06



Source: Statistics Netherlands, Education statistics.

To get an idea of how many information experts are in the pipeline, it is interesting to look at the number of first year students. The number of first year students in informatics and information science has fallen since 2000. Business informatics has attracted less first year students in 2006/'07. Communication systems, on the other hand, expanded rapidly in recent years. The number of first year informatics students

2.9.2 First-year ICT students in higher education, 1990/'91–2006/'07



Source: Statistics Netherlands, Education statistics.

reached a peak in 2000/'01 with more than 6 thousand (the total is not shown in graph 2.9.2). The total number of first year students dropped to 5.5 thousand in 2006/'07. Here we clearly see the effects of the internet hype: when the bubble burst, the number of first year students dipped, except in communication systems.

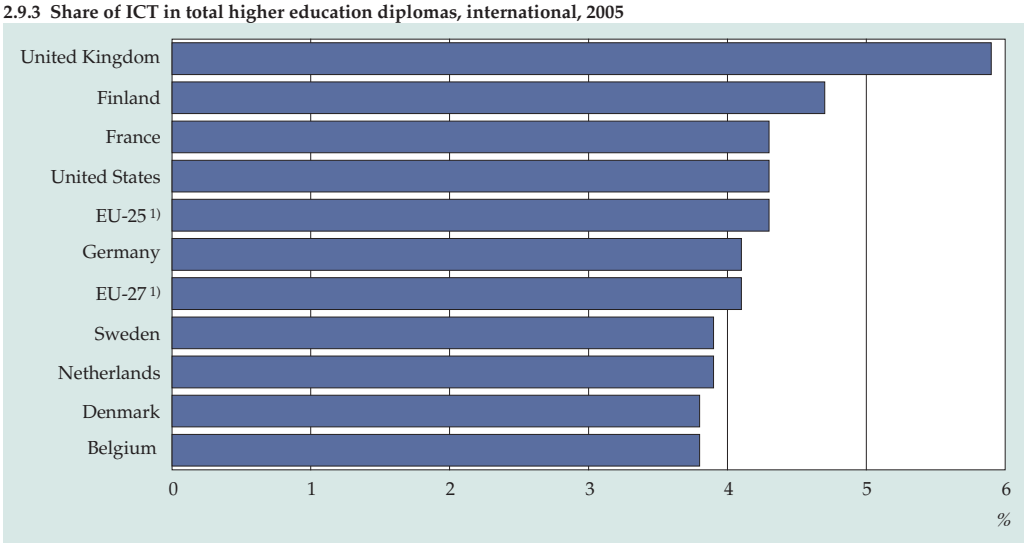
International: not in top position

The Netherlands doesn't have many ICT graduates compared to other countries. In the Netherlands less than 4 percent of the graduates studied ICT in 2005, just below the EU-27 average. This is unexpected, given the figures in table 2.9.1. The explanation has to do with different selections of exams. Eurostat includes the bachelors degree whereas the Netherlands only counts from the masters up. Eurostat does not include electronics and automation technology in ICT education. The figures are hard to interpret, since they depend greatly on the way the classification is applied (same for the Dutch figures). In the countries discussed here ICT studies were the most popular in the UK, where almost 6 percent of all graduates studied it.

2.10 *Business courses in the private sector*

Education is not finished once a student enters the labour force. Employees can improve their know-how and skills in many ways. This type of education is included in 'business courses'. There is an internationally agreed survey on business

2.9.3 Share of ICT in total higher education diplomas, international, 2005



1) Eurostat estimate.

Source: Eurostat.

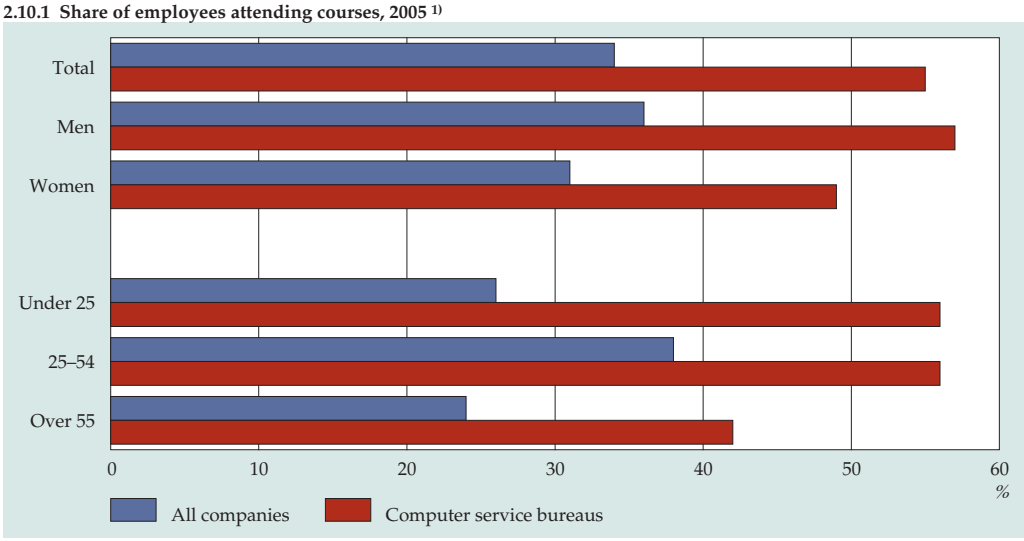
courses, held in all EU countries among private sector companies. This study takes place about every six years.
The Dutch study was held among a sample of 5,800 companies with 10 or more employees. Not included are the sectors public government, government services, social insurance, education, health and care, nor are the sector agriculture, forestry and fishing. Here 'the companies' refer only to companies with 10 or more employees. The data that became available in 2007 refer to business courses taken in 2005.

In this paragraph we will focus first on courses and studies taken up by employees in the branch computer service bureaus. This branch is compared with the private sector as a whole as observed in the study. We also look at ICT courses and the relative position they take up in the total number of courses taken per sector.

More men and fewer older employees taking courses

Two thirds of the companies let their employees take courses in 2005. This is even higher among computer service bureaus: 72 percent of the companies had their employees take courses. A third of the employees in general took a course in 2005, compared to over 55 percent of the people working at computer service bureaus. The only sector in which more employees took courses was extraction (61 percent). On average more men than women working for computer service bureaus took courses. The same was true overall in almost all companies observed. But it is not true for all sectors. For instance in 'transport, storage and communication' and in

2.10.1 Share of employees attending courses, 2005 [1)]



[1)] Companies of the sectors involved, see introduction, with 10 or more employees.

Source: Statistics Netherlands, Survey vocational training 2005.

environmental services relatively more women than men took courses. This may be because women in some sectors work in different jobs than men, which may require more or fewer courses as the case may be.

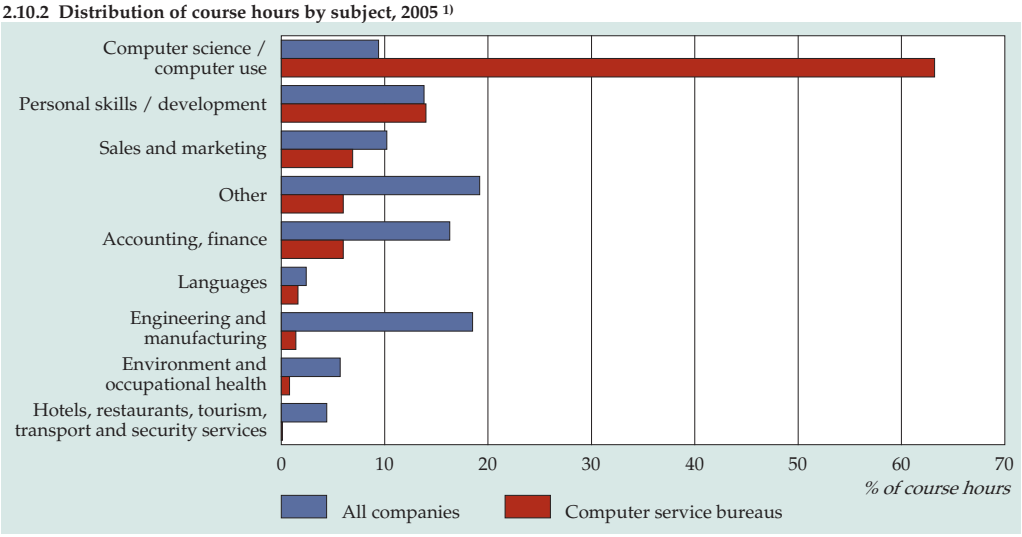
In the companies we observed, employees up to age 25 were less likely to be sent on a course than employees aged 25–55 (26 versus 38 percent). Companies invested less in the group of employees over 55: 24 percent of this group took courses. Computer service bureaus sent relatively more employees to courses, in all age brackets: about 56 percent of the younger and 25–55 year olds and about 42 percent of the employees over 55. Since rapid technological developments take place in the field it is logical that employees have to keep up by taking courses.

ICT professionals mainly take courses in ICT

Technical courses are most popular in all companies: almost 19 percent of the time spent in courses went to courses in technical, building and construction matters. This was different in computer service bureaus where most time was spent on ICT and computer skills. This category includes courses in programming, network management, electronic data processing and the use of various software packages. About 63 percent of the time spent on courses was spent on these topics.

Bookkeeping and management courses were second most popular in the business sectors we looked at: 16 percent of the hours were spent on these. Computer service bureaus had courses in personal skills as second most popular courses: 14 percent of the hours were spent on this topic, about the same as for the companies studied as a whole.

2.10.2 Distribution of course hours by subject, 2005 [1)]



[1)] Companies of the involved sectors, see introduction, with 10 or more employees.

Source: Statistics Netherlands, Survey vocational training 2005.

Higher training costs at computer service bureaus

Since computer service bureaus sent their employees to take courses more often than the private sector as a whole, this is also manifest in the costs. Computer service bureaus spent about twice as much per employee on courses. More employees in this sector took courses and while courses cost 66 euro per hour on average, the courses that people working at computer service bureaus took cost about 82 euro per hour. So computer service bureaus invested more in the know-how of their employees: across the entire sector 3.1 percent of the labour costs were spent on education (total of all companies observed: 2.2 percent). These data on costs can be shown in two ways: as an average of all companies and as an average of the companies that sent employees on a course. Table 2.10.1 shows both perspectives. If we only look at companies that sent their employees on a course, the share of labour costs spent on education is a bit higher: 3.3 percent for computer service bureaus versus 2.5 percent for all companies observed.

Table 2.10.1
Average training costs, all companies and computer service bureaus, 2005 [1)]

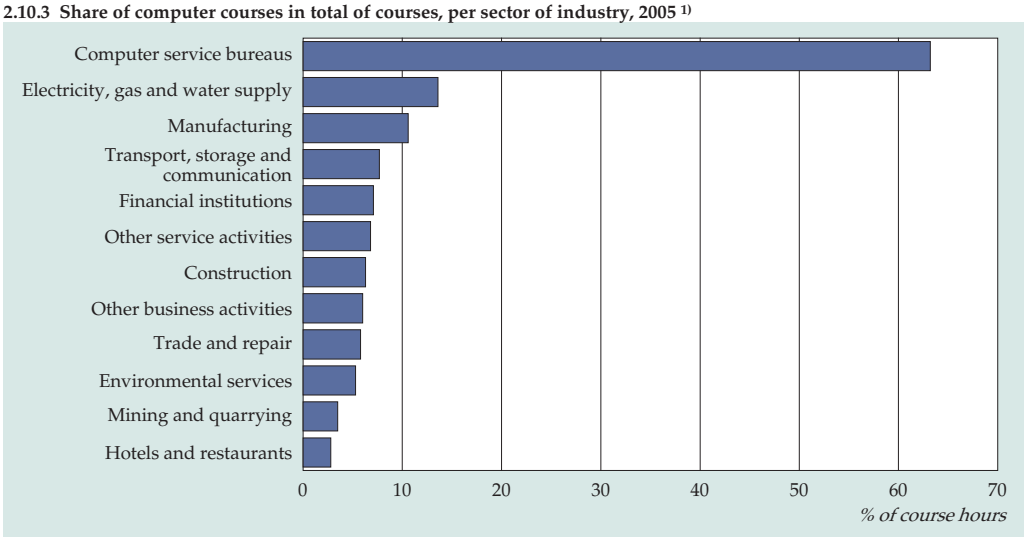
	All companies surveyed		Companies providing training	
	Total	Computer service bureaus	Total	Computer service bureaus
	euro			
Per employee	809	1,571	929	1,674
Per participant	2,360	2,853	2,360	2,853
Per hour	66	82	66	82
	% of labour costs			
Share in labour costs	2.2	3.1	2.5	3.3

Source: Statistics Netherlands, Survey on company training 2005.

Many utility company employees on ICT courses

Over 9 percent of the total course hours taken in the private business sector were spent on courses in ICT and computer skills. Energy and water companies sent their employees most often on an ICT course, after computer service bureaus: the latter spent 63 percent of the course hours on ICT courses, among utility companies it was just under 14 percent. The manufacturing industry also spent more than 10 percent of the course hours on ICT courses, other sectors spent less than 10 percent on them. Hotels and restaurants had the smallest share of ICT course hours: just 3 percent. Hotels and restaurants also sent the smallest number of employees on a course. The sector probably does not use advanced computer systems on a large scale.

2.10.3 Share of computer courses in total of courses, per sector of industry, 2005 [1)]



[1)] Companies of the involved sectors, see introduction, with 10 or more employed persons.

Source: Statistics Netherlands, Survey vocational training 2005.

2.11 *Globalisation*

In the past decade world trade boomed. The world trade in ICT goods and services grew at an even faster pace. This is due to the spectacular rise of ICT, and also to the increasing globalisation of the economy as a whole. Information and communication technologies enable internationalisation of economic processes and become ever faster and cheaper. This has led to the globalisation of trade, financial flows and the production of goods (Went, 2007). Economic globalisation means that economic processes have increasingly become intertwined, as is shown in international trade, investments and shifting economic activities (Van Witteloostuijn and Hartog, 2007). Globalisation is partly driven by the search for efficiency gains. Developing international 'sourcing' (transactions of semi-manufactured goods and service inputs) within and between companies in the same branch has changed the face of world trade. Globalisation and the international focus on efficiency gains have led to growing specialisation: some countries specialise in ICT others in different economic activities.

In this paragraph we discuss the characteristics and extent of globalisation in the ICT sector.

Location less important for ICT activities

New technological developments make producers of ICT goods and services less dependent on geographic location. The assembling and more technical production is often shifted to low wage countries, and offshoring of ICT services is rising fast.

Within Europe this is shown by a shift of activities to Eastern Europe. At the global level India and China are the rising nations. Less skilled employment has shifted there, but jobs for highly educated people are also expected to increase.
In first instance the shift mainly concerned ICT goods, but in recent years the worldwide trade on the market of ICT services has also been increasing. Globalisation is expected to play a larger role in the global economy and the ICT sector. This will have its consequences for the Dutch economy: Dutch ICT jobs will be lost.
It is hard to describe to globalisation phenomenon because its observation is not very advanced. Still, in this paragraph we will try to quantify the globalisation concept with international OECD figures. Of course, the focus will be on developments in the global ICT sector.

Outsourcing and offshoring

In the past few years outsourcing and offshoring are often mentioned in the globalisation discourse. The following definitions are generally used, even if are not always totally adequate:
Outsourcing is the contracting out of business activities to another company (which is not formally within the outsourcer's control), regardless of whether the contracting out is within or outside the country. Outsourcing is further discussed at the end of the paragraph.
Offshoring means contracting out business activities to another company abroad. The company may be one in which the outsourcer has formal control, such as in captive offshoring were there is a company unit involved. It is also possible for the outsourcer to have to formal control over the company to which the work is contracted out.

Offshoring

Offshoring originated in the 1960s when fairly basic production activities were shifted to low wage countries. Thanks to the advance in communication technology the costs of international communication could be lowered, which gave a fresh impetus to offshoring in the last decade or so. Now it is not just labour intensive production activities that are offshored, but also knowledge-intensive work. This requires a great deal of know-how and skills and insight into the in-company product with professional talent at the offshore location.
The economic offshore activities include subsidiaries or external units not directly included in the enterprise (OECD 2007a).
About 27 percent of the Dutch enterprises had shifted units abroad in 2006 (Volberda et al., 2007). Another 17 percent is considering to offshore activities. A recent study (Lewin & Couto, 2007) shows that some European countries shift a greater share of their activities abroad. Spain was particularly active in this area in 2006: 83 percent of the enterprises was engaged in offshoring or considering it. This is followed closely by Germany (82 percent), the USA (77 percent) and the UK (73 percent). The companies studied in those countries tend to be large.

The main motive for offshoring according to the major multinationals is the expected savings in costs. Small and medium-sized companies shift their activities mainly for strategical reasons, such as access to new markets.
The question is to what extent highly skilled functions are shifted abroad and what the motives are to do so. The motives that are most frequently mentioned are listed in the table below.

Motives for offshoring of highly skilled activities by Dutch companies, 2006

	%
Savings in the costs of labour	80
Access to qualified personnel	64
Business process redesign	57
Growth strategy	56
Savings in other costs	56
Improving service levels	55
Pressure from the competition	55

Source: Offshoring Research Network RSM Erasmus Universiteit, 2006.

Dutch companies usually shift product development jobs abroad. This is followed by offshoring ICT, as was stated by almost 25 percent of the multinationals and about 10 percent of the small and medium-sized businesses surveyed.
Companies shift their activities to various locations abroad. India (24 percent) is top favourite. Also popular are China (23 percent) and Western-Europe (19 percent).
Shifting part of the company abroad does not mean that a Dutch company looses much of its say. About 44 percent of Dutch companies keep control over the entire business, or stays the owner of the activities on the location abroad. However, in most cases new management and organisational skills are required to coordinate the geographically widespread networks. This is necessary to maintain a proper organisation of the value or production chain for the customers.

What is globalisation?

The OECD took the initiative to construct a conceptual and methodological framework for gathering quantitative information on the globalisation phenomenon. This work led to the *Handbook on Economic Globalisation Indicators* (OECD, 2005). In this handbook three 'forces' are named that contribute to the globalisation process.
The first is liberalising capital flow. This means limiting taxes, levies and other protective measures against the free flow of capital internationally, and deregulating financial services at the sector level creating more room for the market mechanism to operate, more private initiative and a government that takes a step back in regulations and supervision.
The second is opening up the markets for trade and investments, which stimulates international competition.
The third aspect is the central role ICT is now playing in the economy.

Relativity is a good thing in discussing the effects of globalisation. Although this process greatly influences the economy, it is not a new development. The geographic shift of production factors (capital, labour) has a long history. Due to the aspects mentioned above, the size and scale are unprecedented: e.g. the number of companies involved and the global level.

The manufacturing industry has been shifting business activities abroad and outsourced for quite a while, but the services sector has only been catching up in recent years. The main reasons are the improved possibilities to trade services due to liberalising trade and technological developments. A company that wants to shift its activities has several options. Table 2.11.1 shows the various forms of shifting business activities as used by the OECD and the Dutch Ministry of Economic Affairs. We will use the same concepts in this paragraph. In Table 2.11.1 we make a distinction between two dimensions of economic activities: the geographical location and legal ownership. The activities may take place within or outside the Netherlands. Furthermore, a company may carry out the activity (investing) or outsource it.

Table 2.11.1
Shifting business activities by location and ownership

	The Netherlands	Abroad
Outsourced	domestic outsourcing	offshore outsourcing
Insourced	domestic supply, insourcing	direct international insourcing

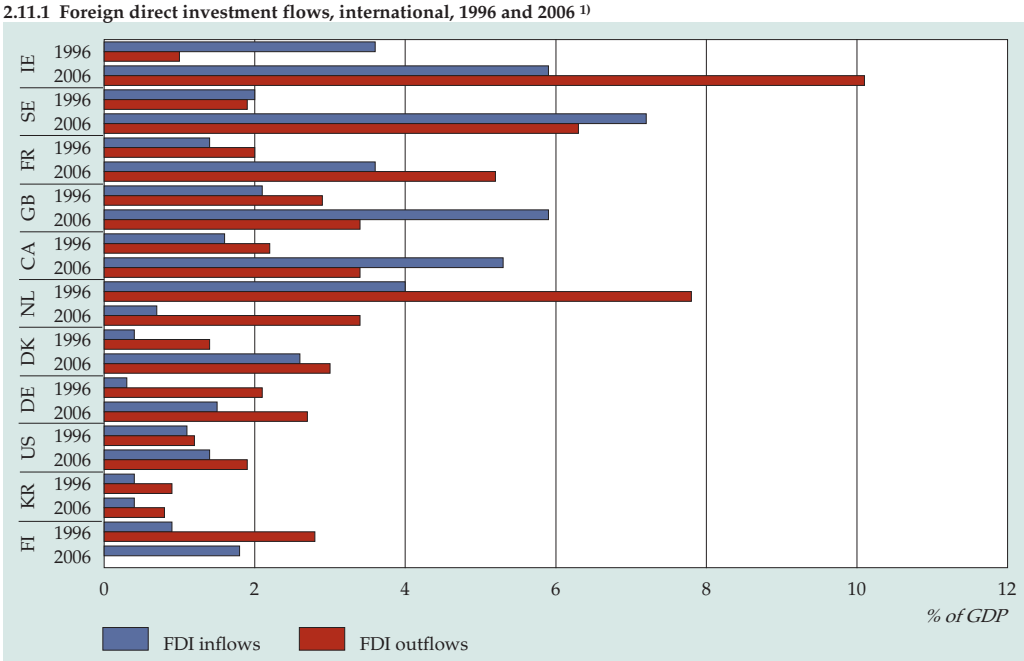
Source: Van Welsum en Vickery (2005); CPB (2005).

The Netherlands very actively involved in globalisation

Dutch companies spend a great deal of money on direct foreign investments (FDI). Direct foreign investments are defined as a long-term investment by an enterprise in a foreign company where the former gains control. Together they form a transnational company (OECD, 2007a).

Over 4 percent of GDP in 2006 was due to FDI. In the period 1996–2006 the FDI flows as a percentage of GDP fell sharply. The FDI flows into and out of the Netherlands diminished in the last decade when expressed as a percentage of GDP as is clearly shown in figure 2.11.1. This downward trend is caused in part by the sharp rise in GDP in this period.
In 1996 the outflow of direct foreign investments of the Netherlands was the highest of all countries observed. In that year almost 8 percent of GDP was invested abroad in this way. Foreign investments in the Netherlands were high at the same time. Ireland and the UK also had a relatively high inflow of FDI.

2.11.1 Foreign direct investment flows, international, 1996 and 2006 [1)]



[1)] Direct investments are trans-border investments by an investor in the home country, with the purpose a long lasting interest (at least ten percent control) in a company founded in another economy.

Source: OECD, OECD in Figures 2007.

In 2006 Sweden, Ireland and the UK mainly received foreign investments. The US ICT companies that came to Ireland recently explain this inflow to some extent. They see Ireland as an attractive location from which they can access the European market. In 2006 Ireland also had the greatest outflow. This is because of its international position as a key exporter of ICT services and software (OECD, 2006).
The outflow of FDI is a measure of how much money a country invests abroad. In this period of shifting the goods and services production to low wage countries it also says something about the contribution a country makes to the globalisation of economic activities. The inflow of FDI says something about how attractive a country is to foreign investors. So the countries that benefit from globalisation are characterised by a high influx of FDI and a much lower outflow.

The figure also shows that the volume of FDI flows differ hugely between countries, and also between 1996 and 2006. In general FDI flows recovered somewhat after the dip in 2002 and 2003. This recovery started in 2004 in the less economically developed countries in Eastern Europe and Asia, and became manifest on a world scale.
On the supply side, FDI flows are influenced by the availability of investment funds, which are sensitive to yields and share prices. On the demand side the advantages of scale and growing markets, such as the Asian market, play a key role in directing investment flows. A substantial part of FDI goes to the ICT sector (OECD, 2007a).

Europe is a key destination for the Netherlands in foreign direct investments (71% of the total in 2006) and a key region of origin (69%). The total situation of foreign direct investments in the Netherlands stayed just about the same between 2003 and 2006 (361 billion euro in 2003; 368 billion euro in 2006; CBS, 2007).
The Netherlands still has a strong investment relationship with Europe. At the world level there is a huge increase in FDI flows towards developing countries. Another major FDI trend is the shift from the manufacturing industry to services: telecom, computer and information on services and R&D activities. Investments in services in recent years are mainly aimed at efficiency. The focus is on global rationalisation of production related services ('services production'). This is seen particularly in the computer and information services and in business processes based on IT.

Globalisation in the ICT sector

ICT has a double role in the globalisation process. The rest of the paragraph describes how the ICT sector is subject to globalisation just like the other sectors of the economy. Shifting the production of ICT goods has taken place for a while, and in recent years ICT services face increasing international competition as well. ICT also has a role as the driving force behind globalisation. Rapid technological developments make it easier to shift the production of goods and services to low wage countries. In 2005 the total trade in ICT services to and from OECD countries was 200 billion dollar, while trade in ICT goods in the same year was 1,850 billion dollar. In 1996 the trade in ICT goods was still valued at 1,005 billion dollar. The trade volume in ICT services is much smaller, but the growth rate is relatively high: from 70 billion in 1996 to 200 billion dollar in 2005 (OECD, 2007b).

The importance of foreign direct investments in globalisation

In the last two decades foreign direct investments grew much faster than international trade. Multinationals are spreading their production networks over several countries on a large scale. This translates into more FDI macro-economically. The Netherlands has a special position in current globalisation: it is the host and the home country of large multinationals. Both the incoming and the outgoing FDI made up more than 70 percent of GDP in 2005. This makes the Netherlands one of the most open economies in the world, stimulated by the fact that there are relatively few obstacles for trade and investment.
Internationalising major enterprises tends to come with internationalising their suppliers and clients, which are often small and medium-sized businesses. The percentage of Dutch small and medium-sized companies with FDI abroad (3 percent) lags considerably behind that of comparable small countries, Denmark and Switzerland. The low FDI of the small and medium-sized businesses can be a sign of their limited competitive powers or of their limited ties with major Dutch companies aiming at the international market. The globalisation of the market has not yet yielded a clear trend in the development of new export products and services by small and medium-sized companies (Van Tulder and Fortanier, 2007).

With increasing globalisation the FDI flows in the Netherlands seem to become more and the international trade less important. Furthermore the way the FDI is made up seems to have changed in recent years, shifting towards up and coming markets. Furthermore services are becoming more important in the ICT sector. Between 2001 and 2003 the FDI in ICT services was almost three times that of ICT goods (UNCTAD, 2005).
Foreign mergers and takeovers are currently the main type of FDI. The ICT sector plays a key role and accounts for a fifth of all foreign mergers and takeovers. Foreign direct investments have the major advantage that allow a faster 'start' by providing access to existing production capacity, business contacts and markets.
In 1995–2005 the USA managed a 30 percent share in mergers and takeovers abroad in the ICT sector. Second is the UK with 18 percent, followed by Germany (11 percent) and the Netherlands (6 percent). The worldwide climate for FDI kept improving in 2006. The ICT sector benefited from the continued macro-economic growth, high share prices and improving profitability of products.

In the next paragraph we will give details of the trade in ICT goods and services. The emphasis is on ICT services since they have become more dynamic in recent years.

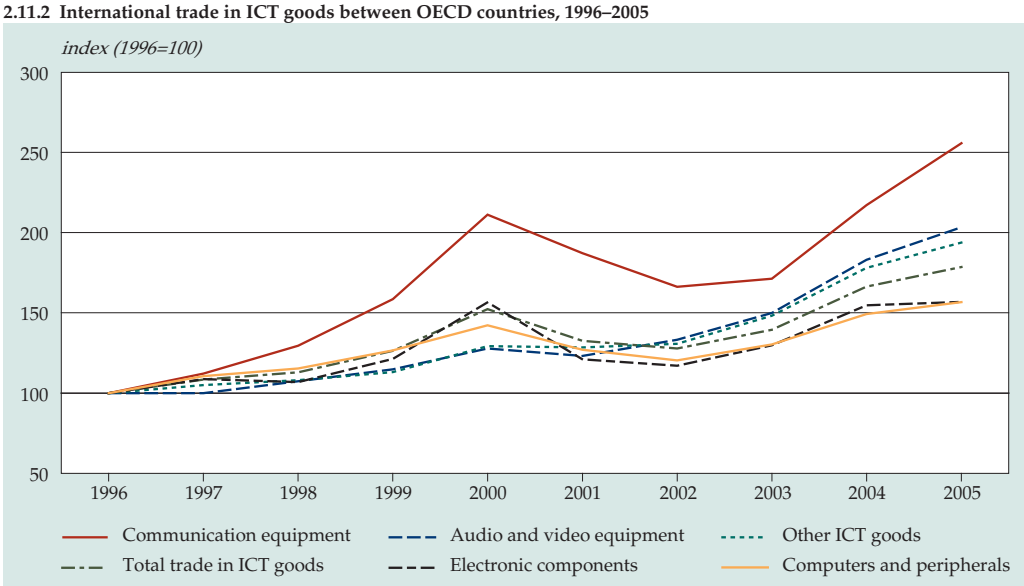
ICT goods

In the nineties, the trade in ICT goods evolved faster than the goods trade as a whole. In 2000 the trade volume of ICT goods grew at a rate of more than 20 percent, while the goods trade as a whole stayed under 10 percent. After 2000 the trade in ICT goods decreased. The internet hype in the financial market ended. In 2001 the ICT trade even fell by 13 percent. In 2003 it started to grow again and in 2005 the trade volume of ICT goods increased by 7.3 percent (OECD, 2007b).

In 2005 the share of ICT goods in the total commodity trade was highest in South Korea with 25 percent. Ireland and Hungary shared second place with 23 percent. The Netherlands followed at 21 percent, Finland at 19 percent and Japan at 18 percent. Furthermore the role of China and India in the international trade in ICT goods increased rapidly in recent years. This is a clear sign of the growing globalisation of the ICT sector.

Figure 2.11.2 shows the development of the international trade volume in ICT goods for the period 1996–2005. The categories telecom and audio and video equipment grew fastest in that period of all international ICT trade: the trade volume more than doubled. In this period the growth in the trade in electronic components, computers and peripherals lagged behind the average growth rate in the ICT goods sector (78.6 percent; average annual growth 8.7 percent).
Keep in mind that the only available figures are on trade of OECD countries. The trade flows between OECD countries and of OECD countries with non-members are taken into account, but not those between non-member states. The consequence is

2.11.2 International trade in ICT goods between OECD countries, 1996–2005



Source: OECD, ITCS database, 2007.

that some of the global trade in ICT goods and services is not observed. However, this does not change the main thrust of the story.

ICT services

The international trade in ICT services was very dynamic in the period 1996–2005. The market is not even 10 percent of the market in ICT goods, but the growth rate is much higher. In 2005 the total trade in ICT services to and from OECD countries was worth 200 billion dollar. Most of the OECD imports of ICT services (over 80 percent) came from other OECD countries in 2005. Still the influence of globalisation is there; Hong Kong and China were in the top 10 of exporters of ICT services in 2005, and they are outside the OECD.

Despite its later start the globalisation of ICT services is well on its way. The fastest growing exporters are Eastern European countries and countries outside the OECD, such as India, China and Brazil. This indicates these countries are popular places to locate offshore activities. The emphasis in these countries is on relatively low-skilled production processes and assembling activities. The trends in international investments tentatively point in the direction of offshoring highly skilled industrial and service activities. Much of the high-skilled ICT industry in 2005 consisted of digital 'content'. Online games, music and mobile content applications exceed the relatively low-tech serial production of televisions for example. New digital value chains have also become more complex due to the emergence of other (digital) distribution channels (online market places) and new intermediaries and users (such as consumers), who have started to develop their own digital content (OECD, 2006).

Many countries with substantial export growth rates in ICT services also see their imports increase rapidly. This indicates that the globalisation of services is a two way street that benefits all parties involved.

Preconditions for globalisation of services

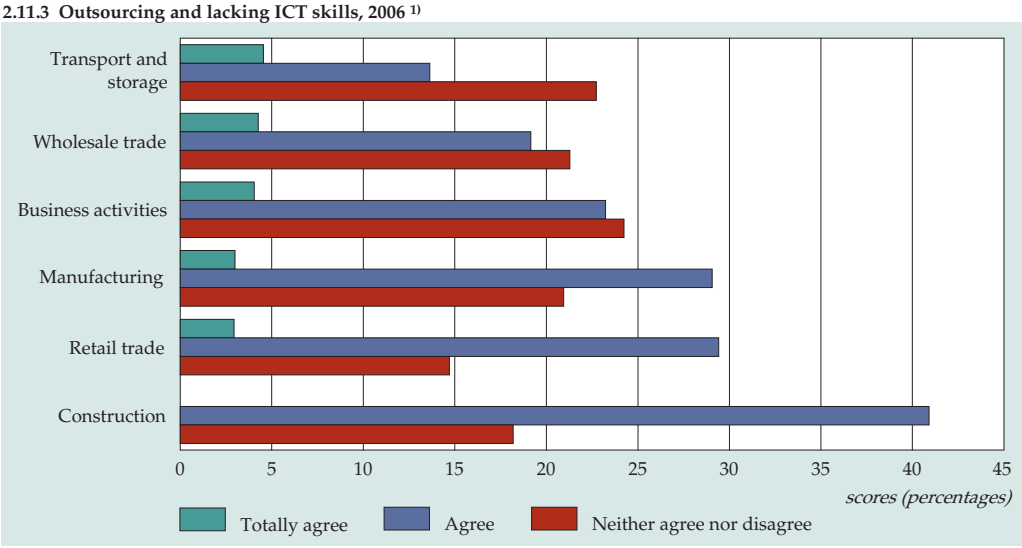
The decisions of companies if and where to relocate their activities abroad depends on several ICT-related preconditions. These are the physical infrastructure (availability and quality), prices and the ICT skills available and required. Political and economic arguments also play a key role, of course, such as macro-economic stability, the protection of intellectual ownership or copy rights and legislation in general (CBS, 2006).

The availability and quality of the ICT infrastructure play a major role in determining what the right offshore location would be for service activities. Most offshore countries have tremendous potential, but much needs to be done before they can match most OECD countries in terms of ICT infrastructure. Still the relatively low costs of production factors and the presence of sufficient numbers of highly qualified personnel are strong arguments to convince companies to shift their activities to these countries.

Outsourcing: to remedy shortages of ICT skills

Below we will discuss the fact that outsourcing may fit into a strategy of getting to use ICT skills relatively fast and without much investments and training, besides offshoring. This may be needed to get e-business and e-commerce ready on time. In ICT the most frequently outsourced services are those related to applications (to

2.11.3 Outsourcing and lacking ICT skills, 2006 [1)]



[1)] Scores in the graph relate to the proposition: 'outsourcing is important for us when ICT skills are lacking'.

Source: Statistics Netherlands, ICT use by enterprises 2006.

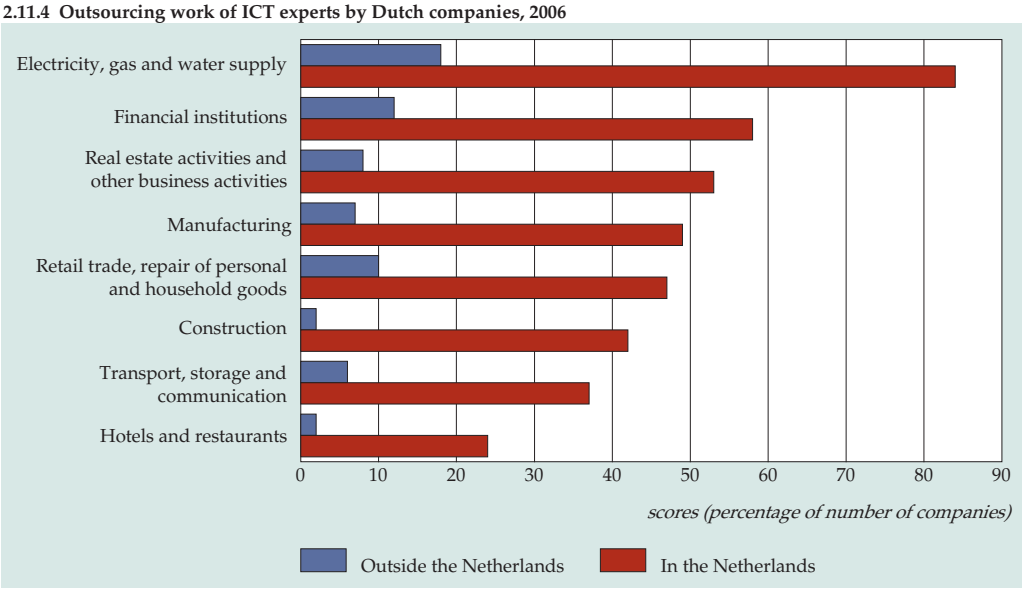
Application Service Providers). Other activities that are often outsourced are services, such as keeping salary records, hiring personnel, bookkeeping, purchasing, front-office work and many other services.

The survey on ICT use in companies held by Statistics Netherlands had a section on outsourcing in 2006 [6]. The respondents were asked to give their reaction to the following, on a five point scale: 'Outsourcing is an important way for us to remedy shortages of ICT skills' [7]. Figure 2.11.3 shows the positive scores, including the category 'neither agree nor disagree'. This category represents: outsourcing is not a particularly important means but just one of the means to remedy a shortage of ICT skills.

If all the scores are added, it turns out that outsourcing is an important means of remedying shortages of ICT skills for 40 to 50 percent of the enterprises. The highest score comes from the construction industry. The indication is that outsourcing ICT is a major economic phenomenon.

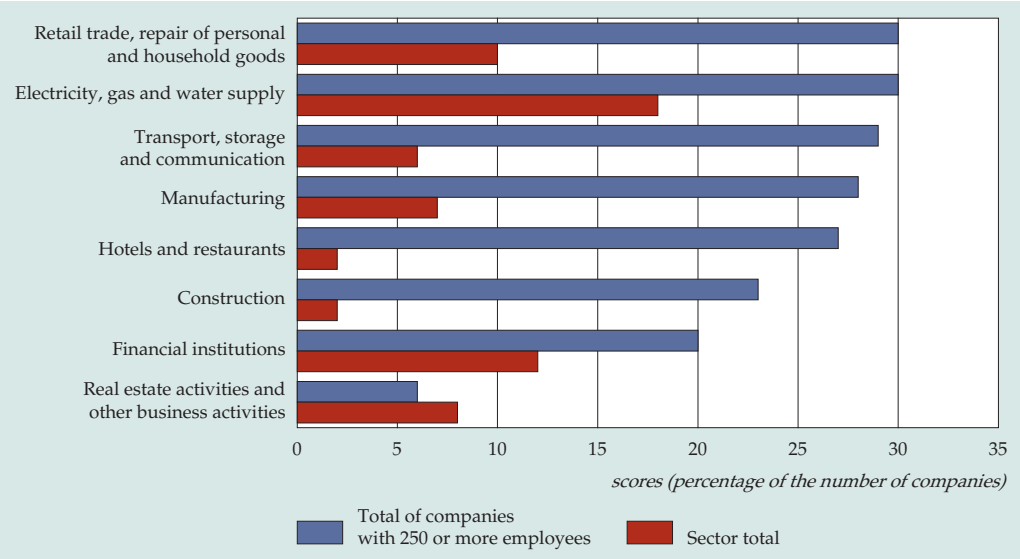
It is interesting to look at the actual outsourcing of ICT. Figure 2.11.4 provides information on this from the survey on ICT use in companies of 2006. The figure refers to all outsourced work of ICT specialists broken down by 'the work of ICT specialists' in the Netherlands and abroad. Figure 2.11.4 shows that outsourcing the work of ICT specialists' at home is much greater than outsourcing abroad. The construction industry somehow does not stand out in figure 2.11.4 in the same way it did in figure 2.11.3.

2.11.4 Outsourcing work of ICT experts by Dutch companies, 2006



Source: Statistics Netherlands, ICT use by enterprises, 2006.

2.11.5 Outsourcing work of ICT specialists in foreign countries by Dutch companies, 2006



Source: Statistics Netherlands, ICT use by enterprises, 2006.

Outsourcing ICT skills abroad shows great differences between big and small companies (see figure 2.11.5). Some 20 to 30 percent of the enterprises with 250 employees or more is involved in outsourcing 'ICT skills' abroad, depending on the economic sector they operate in.

Outsourcing: aspect of globalisation

International outsourcing of activities that require a great deal of know-how and skill is a key development in outsourcing, most recently especially of ICT services. This fits well with the process of globalisation of ICT goods and services. Due to the rapid technological improvements in ICT, the tradability of goods and services has increased, and it is now possible to supply a great many ICT goods and services from great distances when there is no need for direct personal contact (OECD, 2006). The Netherlands with its open economy participates a great deal in the outsourcing trend in the ICT industry and en services. The advantages of this depend on the ability to absorb the new knowledge developed abroad and to turn it into innovations. One bottleneck is the deficient position of the small and medium-sized businesses in the Netherlands in the innovative processes in the large international enterprises for which they act as suppliers (or could do so), especially in the European region.

What the indicators above do not show is that outsourcing ICT is not always successful. This depends in part on the strategy (type of contract) and the quality of the organisations involved. Research (Gartner, 2006) shows that one sixth of the

enterprises that outsourced their IT activities could not make any savings and that half saw their costs actually increase.

Despite the dissatisfaction, the number of outsourcing ICT functions is rising, especially the international contracts in this area. In 2005 the number of international transactions for outsourcing business processes went up by 33 percent (IDC study). In 2005 there were more service providers and business models than ever before.

How can this growth rate be explained given the dissatisfaction with the results achieved with outsourcing? The contracts seem to be smaller in recent years and for shorter periods. The average contract for IT outsourcing fell from 6.2 years in 2003 to 5.3 years in 2005. Instead of mega contracts with just one or two big outsourcing providers, many companies have switched to multi-sourcing: smaller contracts with various providers (Munro, 2007).

Notes in the text

1) One of the most important figures in the national accounts is the volume growth of the gross domestic product. The volume changes of other national accounts units, such as production value, consumption and investments, play a key role in many areas.
2) The figures Eurostat no longer labels 'preliminary' or 'estimate' are sometimes changed again in practice anyway. In this paragraph we show figures of November 2007.
3) The breakdown into categories is a complex matter, and the figures are such that the preliminary figures on 2004 in figure 2.6.2 will probably be adjusted upward. This is the reason why we opted for 2003 figures in figures 2.6.1 and 2.6.3.
4) This does not seem in line with other CBS figures; it may have been caused by the fact that the labour force survey is a sample survey.
5) Informatics is also taught at the secondary level at the mbo; unfortunately there were no detailed figures available when this paragraph was written.
6) The mailing file of 1,139 enterprises encompasses a wide range of enterprises from various sectors (excluding banks). The response was 481 enterprises.
7) The five point scale was: 1. disagree strongly, 2. disagree, 3. (blank, but interpreted as neither agreeing nor disagreeing), 4. agree, 5. agree strongly.

3. Telecom

The Dutch telecom sector contributes about 2.5 percent to the gross domestic product. Although the labour volume fell in recent years, turnover and gross value added remained constant. Mobile telephony generates much of the turnover of telecom companies, while the turnover generated by fixed landlines is falling rapidly. The internet is becoming more and more important for the sector.
The Netherlands belongs to the European top where internet use is concerned, and the use of the internet is still on the increase. This is shown by the spectacular rise in the volume of internet traffic. The increase was accelerated by the rapid rise of broadband. From an international perspective, the Netherlands has relatively many broadband connections. There are relatively few connections through glass fibre cables for high speed internet on the other hand.
The number of fixed landlines in the Netherlands has been steadily decreasing for several years. The number of connections in 2007 was only half of the number in the year 2000. More and more people only use their mobile telephone, and internet telephony (VoIP) is becoming more popular.

Digital television is gaining popularity, with 2.1 million households watching digital television by the end of 2006. There is much variety in the way people receive digital television: via the ether, satellite, cable and the internet. Digital radio is also gaining popularity, but most people still listen to their analogue radio.
The most important development in telecom is undoubtedly the convergence of services. Whereas telephone, television and the internet used to be supplied by different providers and networks, these services are now increasingly supplied by a single provider through a single network. More and more consumers opt for such all-in-one packages.

3.1 The role of the telecom sector within the economy

In this paragraph we will discuss several economic aspects of the telecom sector and compare the sector's performance with that of the Dutch economy as a whole. In this chapter telecom means the physical infrastructure (e.g. telephone cables, GSM masts), and mobile and fixed telephone, internet, radio and television services. The telecom sector includes telephone companies, internet providers and cable companies distributing radio and television signals.
Below we present figures on the sector 'post and telecommunication' because figures on the telecom sector alone cannot be published by Statistics Netherlands for confidentiality reasons. Since telecom is by far the largest part of 'post and telecommunication', the figures provide a good description of the situation in the telecom sector.

When a company in the Netherlands wishes to trade in electronic communication, it must register with OPTA, the independent post and telecommunication authority. The number of registrations with OPTA has been on the increase for several years. In 2007 the number also went up, see table 3.1.1. [1] The number of providers of public electronic communication networks increased by 12 percent on 2006. The number of providers of electronic communication services even increased by 20 percent in one year, and is now twice as big as in 2004.

Table 3.1.1
OPTA registered telecom providers, by activity, 2004–2007 [1]

	2004	2005	2006	2007
Providing a public electronic communication network	218	253	302	338
Providing a public electronic communication service	213	281	362	433
Providing related facilities	8	9	11	11
Providing qualified certificates	2	3	4	4

[1] Survey date: 31 December.

Source: OPTA.

Table 3.1.2
Key figures sector post and telecommunication, 2001–2006 [1]

	2001	2002	2003	2004	2005*	2006*
	million euro					
Post and telecommunication sector						
Net turnover	20,912	22,981	23,000	22,703	22,919	.
Gross value added (basic prices)	9,241	10,906	12,101	12,244	12,231	12,049
Pre-tax results	–10,809	–10,379	2,859	4,419	4,236	.
Fixed capital formation	4,620	2,632	2,098	2,218	2,540	.
	full-time equivalents (1,000)*					
Labour input of employed persons	115.5	106.2	96.9	93.7	91.3	90.0
	%					
Share in the total economy						
Gross value added (basic prices)	2.32	2.63	2.85	2.80	2.71	2.54
Fixed capital formation	4.88	2.83	2.26	2.40	2.63	.
Labour input of employed persons	1.74	1.60	1.48	1.45	1.41	1.37

[1] SIC'93 code 64 (Post and telecommunication).

Source: Statistics Netherlands, National Accounts.

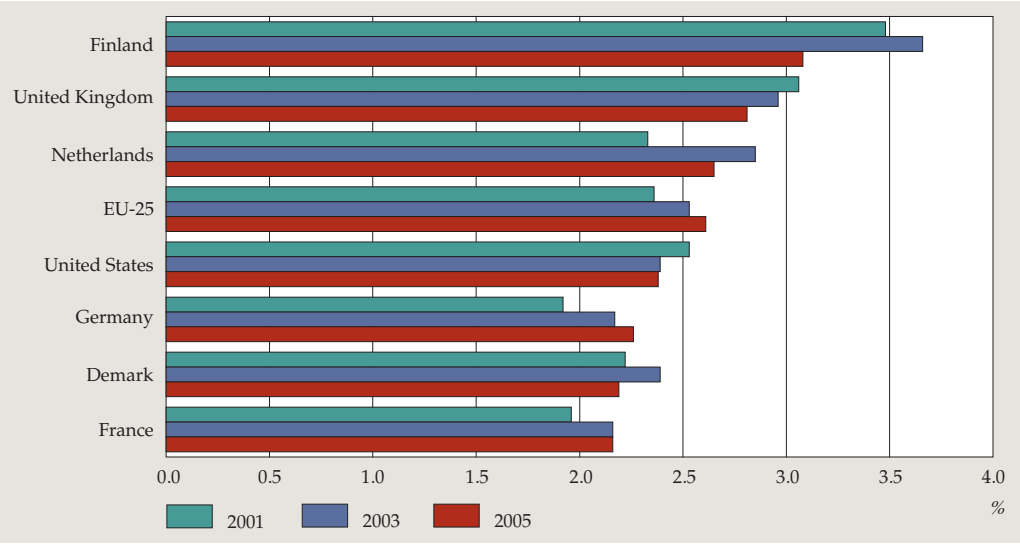
Table 3.1.2 shows several key figures of the sector post and telecommunication and compares them with the Dutch economy as a whole. In 2006 the sector generated a gross value added of 12.0 billion euro. This means the sector produced 2.5 percent of the total value added in the Netherlands. In 2005 this was 2.7 percent. Compared to the benchmark countries (figure 3.1.1) the relative size of the sector in the Netherlands is above average but not as big as in Finland (3.1 percent).

In 2006 the post and telecom sector employed 90 thousand fte [2)] compared to 116 thousand in 2001. So employment fell by 22 percent in five years. Despite this the value added in the sector stayed up.

The pre-tax results of the sector in 2005 were about 4.2 billion euro. This amount must be offset against the major losses suffered by telecom companies in the years before (up to 10.8 billion in 2001). The losses were mainly due to the high costs of borrowing for the construction of infrastructure and for buying UMTS licences. The operating result, the result from production activities such as the sales of goods and services, was positive.

Investments in the post and telecom sector in 1999 and 2000 were three times as high as in 1995. In 2001, after the dotcom bubble burst, investments collapsed. In 2004 and 2005 a recovery started and in 2005 investments were up by almost 15 percent on the previous year.

3.1.1 Share of value added of the post and telecommunication sector in the economy as a whole, international, 2001, 2003 en 2005



Source: EU-KLEMS.

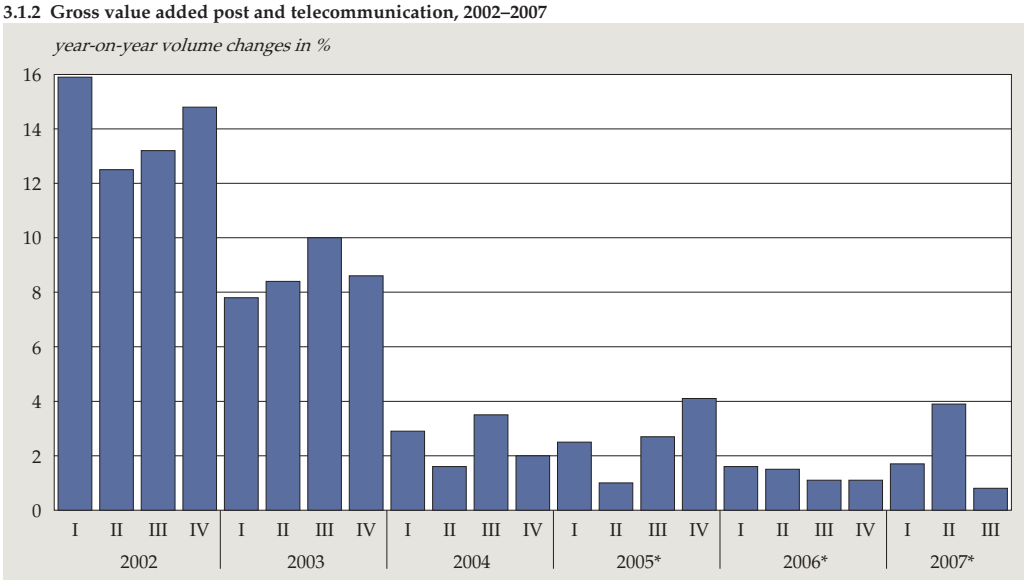
Right before the year 2000 the telecom sector saw stupendous growth. Modern technology such as mobile telephones and the internet – up to then used mainly by companies and major institutes – became massively popular among consumers. This development caused a boom. There were growth rates of around 20 percent for several years. These growth rates continued even after the dotcom bubble burst in 2000. Figure 3.1.2 shows the quarterly developments after 2002. In 2002 and 2003 the sector grew fast as well, but since 2004 the growth rate has been limited due to the saturation of the market and the resulting competition and price wars.

3.2 *The structure of the telecom sector*

This paragraph deals with the turnover generated by the individual telecom sector services, such as telephone, television and internet services. It is no longer easy to discuss the services individually since the rise of multiplay, where several services are offered in a single package, and since technical developments blur the lines between the services (e.g. internet telephony). This convergence will be discussed in paragraph 3.6. The technical developments will be discussed in paragraphs on the internet (3.3), telephone (3.4) and radio and television (3.5).

Figure 3.2.1 shows how turnover of the telecom companies in the Netherlands is generated, and which share of the turnover is determined by fixed telecommunication, mobile telecommunication and internet providing. Turnover from the exploitation of

3.1.2 Gross value added post and telecommunication, 2002–2007



Source: Statistics Netherlands, Quarterly accounts.

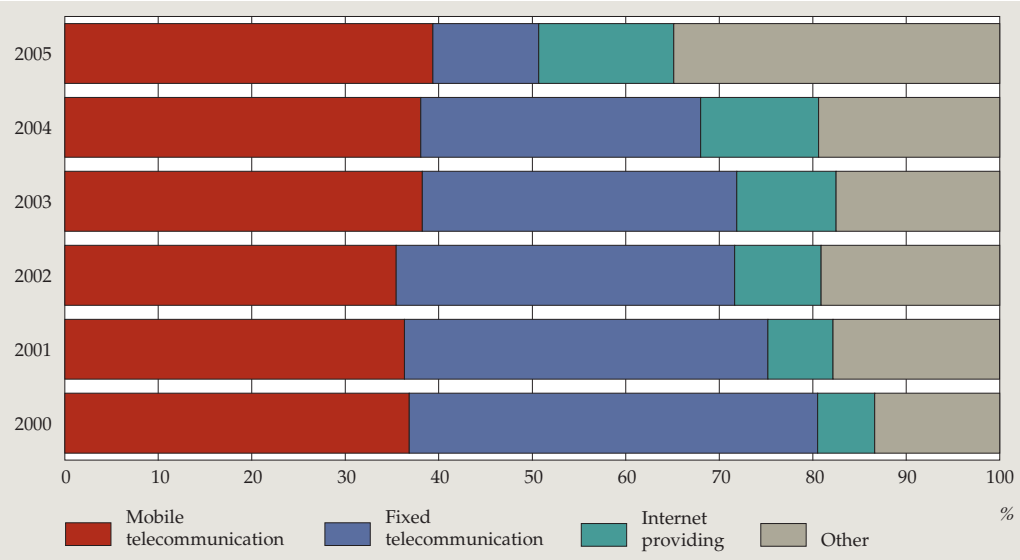
cable networks for radio and television and interconnecting services (providing access to one's own network to other telecom operators) is recorded in the category 'other'.

These blurred lines between the various services make it difficult to come up with a good analysis of the data. For example, it is not clear if respondents considered internet telephony as 'fixed telecommunication' or as 'internet providing'.

Almost 40 percent of the total turnover in the telecom branch is generated by mobile telecommunication (mobile telephone and mobile data services, such as SMS and mobile internet). This share was stable in the period 2000–2005.

Turnover from internet providing is growing fast. In 2005 14 percent of the turnover came from the internet, in 2000 this was a mere 6 percent. The widespread use of the internet must be playing a major role in this.
The most significant drop in turnover was in fixed landlines. The share had already dropped by more than 10 percent point in the period 2000–2004. In 2005 it was further reduced by another 15 percent point so that the share of fixed telecommunication in 2005 was just 11 percent of the total turnover. This must be due to the rise of telephony through the rtv cable, internet telephony and the increasing number of households that only use the mobile phone (see paragraph 3.4). Moreover providers of fixed telephone services reduced their prices to compete with these alternatives.

3.2.1 Net turnover telecom sector, relative share of different services, 2000–2005



Source: Statistics Netherlands, Production statistics Telecommunication companies.

Limited growth in mobile telecommunication

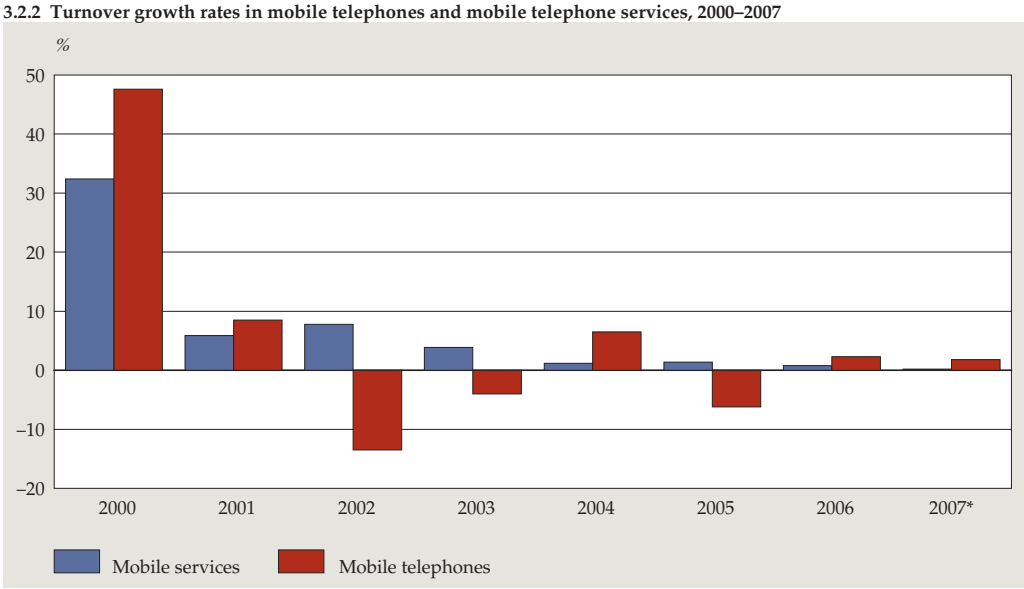
Figure 3.2.2 shows developments in the mobile telephone market. This market saw a modest growth in 2007. Turnover growth rates in mobile services have been modest for several years: in 2007 just 0.2 percent. This is dwarfed by the boom around the year 2000. The turnover in mobile telephones fluctuates from one year to the next, but has not grown on balance since 2001.

About 73 percent of the turnover from mobile services in the summer of 2007 was generated by 'speech services' (OPTA, 2007); by the summer of 2006 this was 77 percent. The other turnover consists of data services, such as mobile internet and SMS messages. The turnover from 'non-speech services' increased by more than 30 percent from 2006 to 2007. By the summer of 2007 almost 17 percent of the turnover came from 'non-speech services'. Figures from OPTA show a more robust growth of the total turnover than the figures of the EITO, on which figure 3.2.2 is based.

3.3 *Internet*

Paragraphs 3.3 through 3.5 detail the use of the services provided by the telecom sector in the areas of telephone, internet, radio and television. Sometimes it is impossible to distinguish the various services unambiguously due to developments, such as internet telephony. This could be considered an internet application.

3.2.2 Turnover growth rates in mobile telephones and mobile telephone services, 2000–2007



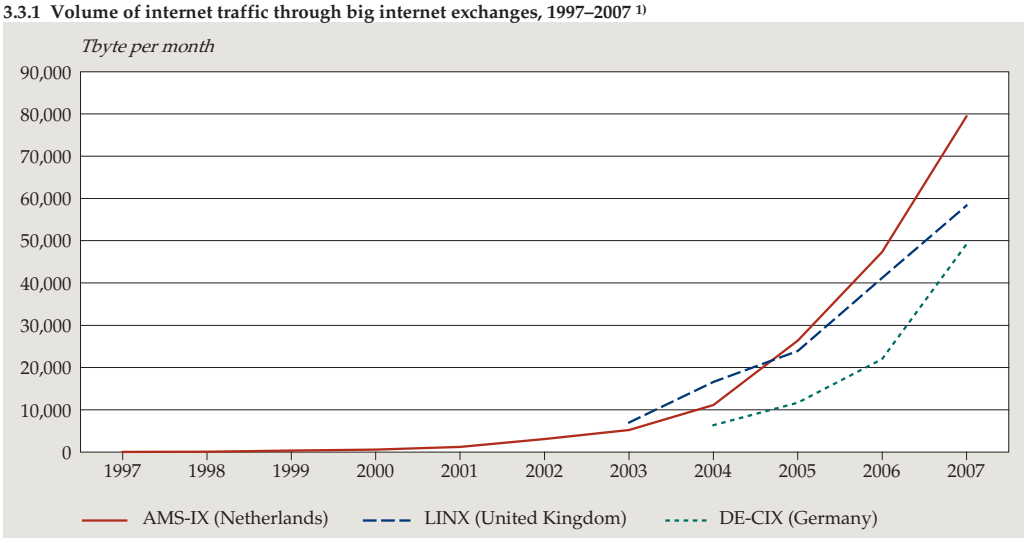
Source: EITO.

However, we opted to classify the services by 'end product' rather than by underlying method or technology. In other words, internet telephony is discussed in the paragraph on telephone services even though the underlying technology is internet. The first paragraph deals with the internet. Paragraphs 3.4 and 3.5 will deal with telephone, radio and television.

The volume of internet traffic has rapidly increased in recent years. Figure 3.3.1 shows the monthly internet flow via the Amsterdam Internet Exchange (AMS-IX). An Internet Exchange is a kind of national interchange where the lines of the various Dutch internet service providers and the lines to other countries meet. The AMS-IX is the biggest internet exchange in the world.

The volume of data passing through the AMS-IX indicates the total data volume sent through the internet in the Netherlands. In December 2007 close to 80 thousand Terabyte was registered at the AMS-IX. One Terabyte is approximately a thousand Gigabyte. Compare this to the 47 thousand Terabyte that passed through in December 2006. The flow increased by almost 70 percent in a single year. There was an 80 percent increase from 2005 to 2006. There is no end in sight yet for the sharp increases that have been taking place for several years.
To put these enormous figures into perspective: in December 2007 more than 6 times the contents of a normal DVD passed through the AMS-IX each second.
The figure also shows the volume of internet traffic flowing through two other major internet exchanges in London (LINX) and Frankfurt (DE-CIX). These exchanges are also growing spectacularly.

3.3.1 Volume of internet traffic through big internet exchanges, 1997–2007 [1)]



[1)] Flow in December, only LINX 2007: flow in October 2007.

Source: AMS-IX; Minnesota Internet Traffic Studies (MINTS), University of Minnesota.

Various reasons could explain this rapid increase. More and more consumers have broadband. The maximum speeds of these connections keep increasing. Modern applications, such as streaming media (sending sound or videos through the internet in real-time) and peer-to-peer traffic (exchanging files between users), require a great deal of bandwidth. Streaming video and audio represented about 14 percent of internet traffic in 2006. The use of web browsers and e-mail is still dominant: over half of internet traffic comes from these applications (AMS-IX, 2006).

Types of internet connections

This overview is not meant to be exhaustive. It is an explanation of the terminology and abbreviations used in the text.

Fixed lines:
Dial-up connection (max. 128 kbit/s). Here an analogue or ISDN modem is used to contact an internet provider through a telephone connection.

Asymmetric digital subscriber line, ADSL (max. 8 Mbit/s download, 1 Mbit/s upload). Internet with ADSL goes through a telephone line to a neighbourhood switchboard, where it is processed by an internet provider. The ADSL signal on the telephone line is placed in a separate frequency band, so that telephone and internet can be used side by side at the same time. The term 'asymmetric' refers to the difference in upload and download speed. One problem with the use of the telephone line in this manner is that the maximum speed attainable deteriorates as the copper wire becomes longer. So the internet speed depends on the users' proximity to the neighbourhood switchboard.

Symmetric digital subscriber line, SDSL (max. 2.3 Mbit/s download, 2.3 Mbit/s upload). This technology is comparable to ADSL, but with an equal download and upload capacity. While users in households often download much more than they make content available to others, businesses often do the reverse. Connections with more upload than download speed are not available in the Netherlands.

ADSL 2, ADSL 2+ (max. 25 Mbit/s download, 1.3 Mbit/s upload). This is a new type of ADSL with faster download speeds.

Very high bit rate digital subscriber line, VDSL, VDSL2 (max. 52 tot 100 Mbit/s download, 13 Mbit/s upload). This is the next generation DSL connection that is not yet on offer. The speed is obtained by using copper only between the home and the street level. After this the signal is transported through glass fibre cable. Expanding 'glass fibre' in the connections between street station and neighbourhood switchboard is planned for 2008 and beyond. VDSL will probably be on the market by then.

Cable internet (max. 35 Mbit/s). The internet flows go side-by-side with radio and television signals through the rtv cable. With the current technology it is possible to transport 35 Mbit/s over the rtv-coax cable, but upgrading the systems may allow higher speeds.

Satellite internet (max. 4 Mbit/s). The internet flows are received through a satellite dish from a satellite in orbit. This technology is more expensive than the other types of internet connections, but it is often the only option in sparsely populated areas.

Glass fibre (up to 100 Mbit/s). Glass fibre cables to or even into the home or office, no longer using telephone or rtv cable. Internet comes in directly through fast glass fibre cables. There are two popular methods. Glass fibre cables to individual homes: Fibre to the Home (FttH) often requires much work laying the cables in the home or office, so this method is mainly used when new dwellings are built. An alternative is using glass fibre up to the outer edge of the building: Fibre to the Building (FttB). Internet traffic is then transported into the home through a local area network (LAN) or classic telephone cable.

Mobile connections:
General Packet Radio Service, GPRS (max. 58 kbit/s download, 29 kbit/s upload). Internet flows are transported through the GSM network, the network for mobile telephones. Also known as 2.5G.

Universal Mobile Telecommunications System, UMTS (max. 2 Mbit/s). Also known as 3G (3rd generation mobile network). Internet flows are transmitted and received through the network of UMTS antennas. See paragraph 3.4.

High-Speed Downlink Packet Access, HSDPA (max. 7.2 Mbit/s). Also known as 3.5G. Internet flows are transmitted and received through the network of UMTS antennas. The use of new technology makes higher speeds possible.

WiFi (max. 54Mbit/s). These connections are used as wireless internet at home or near hotspots (antennas in busy places like stations). The range is limited: signals can be received within 30 metres with a regular antenna.

Broadband

The Dutch Ministry of Economic Affairs defines broadband as 'a connection allowing high quality video and audio application and the exchange of large data files, where the connection is permanently available'. The OECD uses a more quantitative definition in its international statistics: broadband connections are connections with the internet with a total transmission capacity (the sum of the up and download speed) of at least 256 kbit/s.

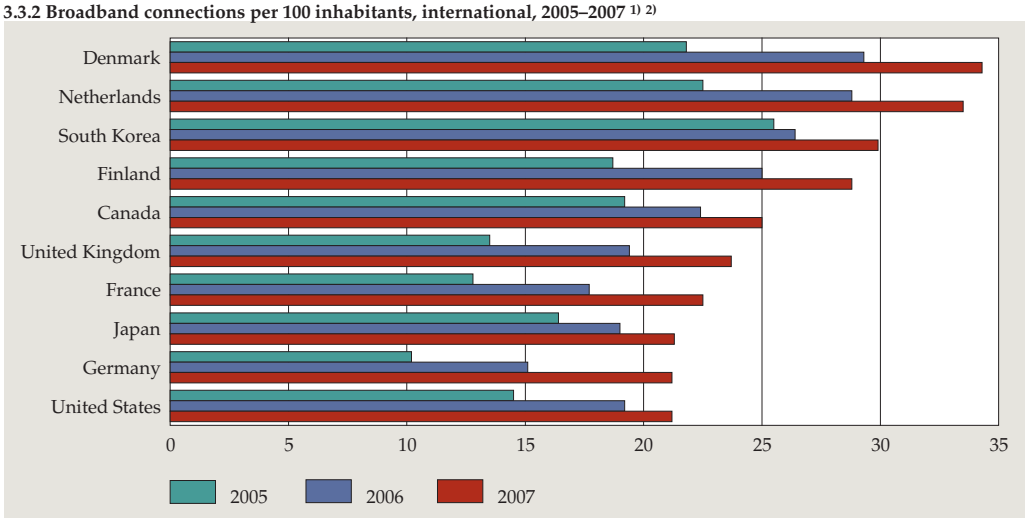
These broadband definitions cover most modern fixed internet connections, such as ADSL or cable internet, but not dial-up connections through landlines. Mobile internet via UMTS does come under these definitions. However, the figures in the rest of this paragraph do not include mobile connections. The number of UMTS connections in the Netherlands in 2006 came to about 1.2 million (TNO, 2007a), see also the box on mobile broadband below.

Households now make less use of the 'old' dial-up connections. Broadband is used more instead, partly because subscriptions are becoming cheaper. Figure 3.3.2 shows the number of broadband connections per 100 inhabitants in the Netherlands and several benchmark countries. The Netherlands had the second highest number of broadband connections per 100 inhabitants (33.5) by June 2007, right behind Denmark. South Korea was overtaken after years of being the frontrunner by Denmark and the Netherlands in the first six months of 2006.

Almost all households in the Netherlands could get broadband in 2007. The coverage of ADSL is about 99 percent (KPN, 2007). In just a few years time, all neighbourhood switchboards have been fitted out for ADSL. At the start of 2001 only 32 percent of the households could get ADSL. The coverage of ADSL2+, required for services like television through the internet (see paragraph 3.5), is just 57 percent in 2007, about the same as in 2006. This coverage will probably not be extended, but replaced directly by VDSL.

Figure 3.3.3 shows and international comparison of the technologies used to access broadband in January 2007. This refers to fixed rather than mobile broadband connections. In the Netherlands people mainly use ADSL (61 percent) and internet via rtv cable (38 percent). However, there are big differences between countries. Many households in the Netherlands receive television and radio on rtv cable, therefore the percentage of households with broadband via de cable is rather high in the Netherlands. In less densely 'cabled' countries, like France, this type of

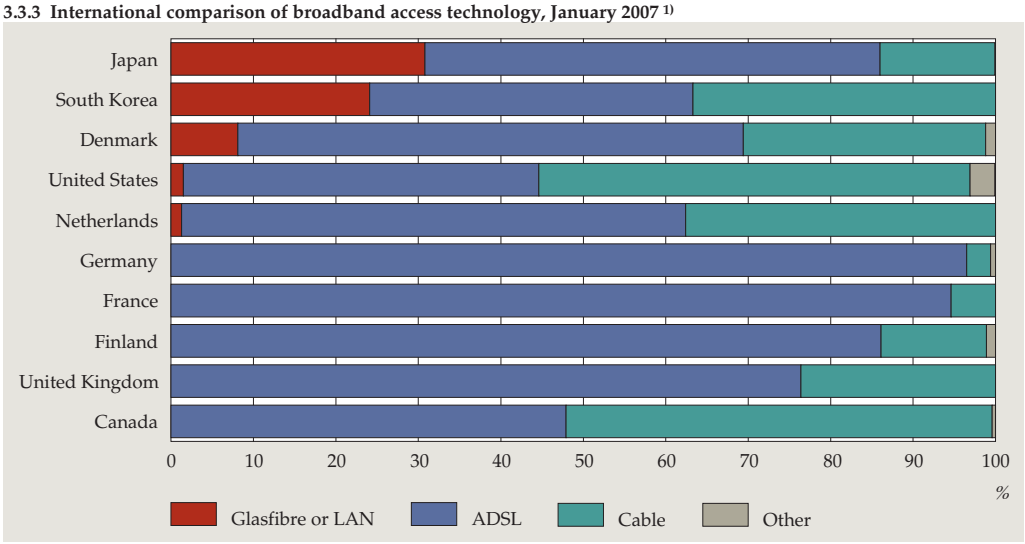
3.3.2 Broadband connections per 100 inhabitants, international, 2005–2007 [1) 2)]



[1)] Situation in June.
[2)] Excluding mobile connections.

Source: TNO.

3.3.3 International comparison of broadband access technology, January 2007 [1)]



[1)] Excluding mobile connections.

Source: TNO.

broadband access is far less popular. In Japan and South Korea, people make more use of high-speed glass fibre connections. In Japan over 30 percent of the broadband internet connections is through glass fibre from the home. In the Netherlands this is just 1 percent.

Several other countries have constructed glass fibre networks on a large scale, which begs the question if the Dutch market has failed. Several local governments have made plans to install their own glass fibre network. Studies carried out by the CPB (CPB, 2005) show, however, that companies have sufficient incentives to keep investing in broadband, partly because of the specific regulation of the access to the connector network.

Mobile broadband

The possibilities of using broadband internet outside the home are growing fast. Mobile telephones and laptop computers can now access the internet through UMTS or Wi-Fi hotspots.

UMTS

The coverage of UMTS and/or HSDPA of the major providers is now more than 90 percent of the Netherlands. In 2006 there were 1.2 million UMTS connections in the Netherlands (TNO, 2007a). However, although these connections provide access to mobile broadband

internet the owners of a UMTS device do not always actually use this function. More about the use of UMTS can be found in paragraph 3.4.

Wi-Fi hotspots
There is a growing number of wireless hotspots (antennas with a small range, often placed in busy places such as stations or airports). The density of hotspots in the Netherlands in 2006 is average in comparison with other countries, see the table below. The table shows the number of hotspots per 100,000 inhabitants. This says nothing about the geographical density of hotspots.

WiFi hotspots, 2005 and 2006

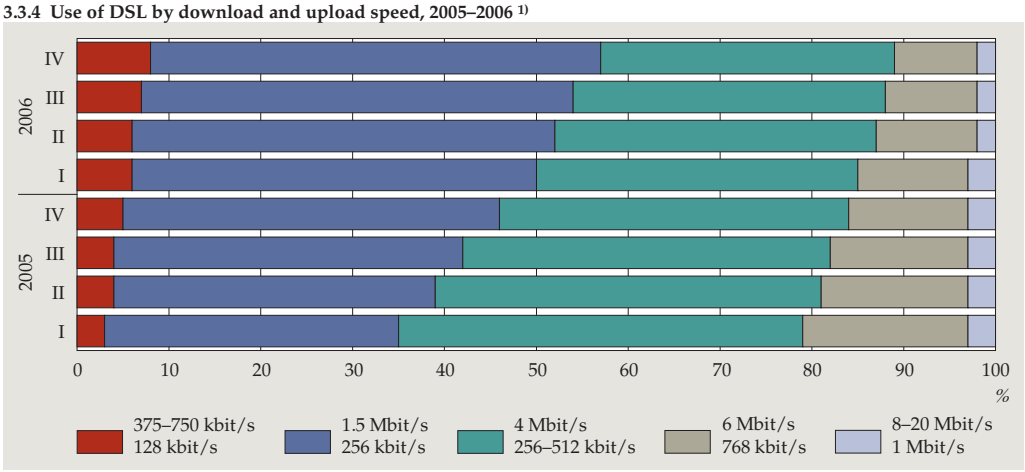
	2005	2006
	per 100,000 inhabitants	
United Kingdom	17	18
France	15	17
Germany	10	12
Netherlands	11	12
Sweden	9	10
United States	8	9
Japan	5	8
Canada	4	5

Source: Ofcom.

The average speed of a broadband ADSL internet connection has decreased in recent years, see figure 3.3.4. This does not mean that existing broadband connections have become slower; just that a relative shift from higher to lower speeds has occurred. People who change from a dial-up connection to broadband often opt for a starter package with fairly low download speeds. People using ADSL often opt to keep the same speed (by downgrading and paying a lower rate) when providers up the speeds. Two things are important here. This trend is logical given the activities of the internet users (see paragraph 6.3). Internet users mainly use applications like email, looking up information and internet banking. These applications do not require high download speeds. Secondly, the 'new' broadband internet users from 2005 and 2006 are probably not early adopters. Therefore it is safe to assume that they will not opt for the fastest or very best. They are more likely to opt for a cheap starter package.

The most popular speed in the last quarter of 2006 was a subscription with 1.5 Mbit/s download and 256 kbit/s upload capacity. In the first quarter of 2005 the most popular speed was 4 Mbit/s down.

3.3.4 Use of DSL by download and upload speed, 2005–2006 [1)]



Key: The speeds given are download speed; upload speed.

[1)] These are only the speeds of DSL connections through the fixed KPN network. Speeds of connections via rtv cable or other networks are not included.

Source: TNO based on KPN figures.

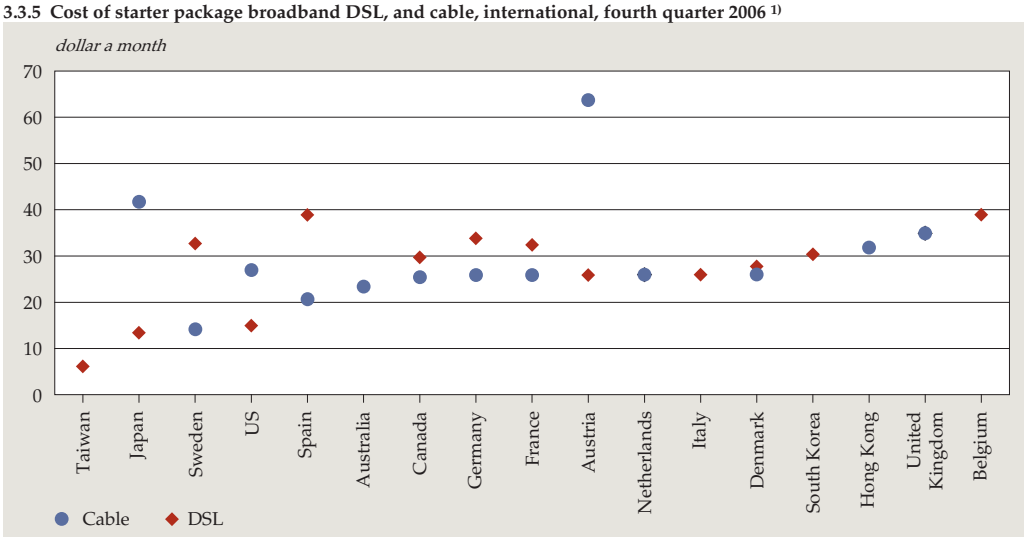
Costs of a broadband connection

Figure 3.3.5 shows how much starter packages cost for DSL broadband and broadband internet through rtv cable in the Netherlands and several benchmark countries. The rates are converted into US dollars to allow for comparison. 'Starter package' may mean different things in different countries in terms of speed, download limits and extra services offered. In the Netherlands broadband subscriptions have been upgraded several times in recent years. The consumer gets a higher speed at the same price. They can also downgrade the subscription and pay less for the old lower speed.

Dutch rates are average in comparison with the benchmark countries in figure 3.3.5. In the fourth quarter of 2006, a broadband internet starter package via cable in the Netherlands costs as much as a DSL connection: 25.94 dollar a month. There are huge differences between countries: a DSL connection in Taiwan cost just over 6 dollars a month in December 2006, while people in the UK paid close to 35 dollars a month.

The rates for broadband via DSL or rtv cable are about the same in the Netherlands. This is not the case everywhere. In Austria people pay twice as much for cable internet as for a DSL connection.

3.3.5 Cost of starter package broadband DSL, and cable, international, fourth quarter 2006 [1)]



[1)] The countries are ranked by the lowest possible rate for DSL or cable internet in that country.

Source: Point-topic.

3.4 *Telephone*

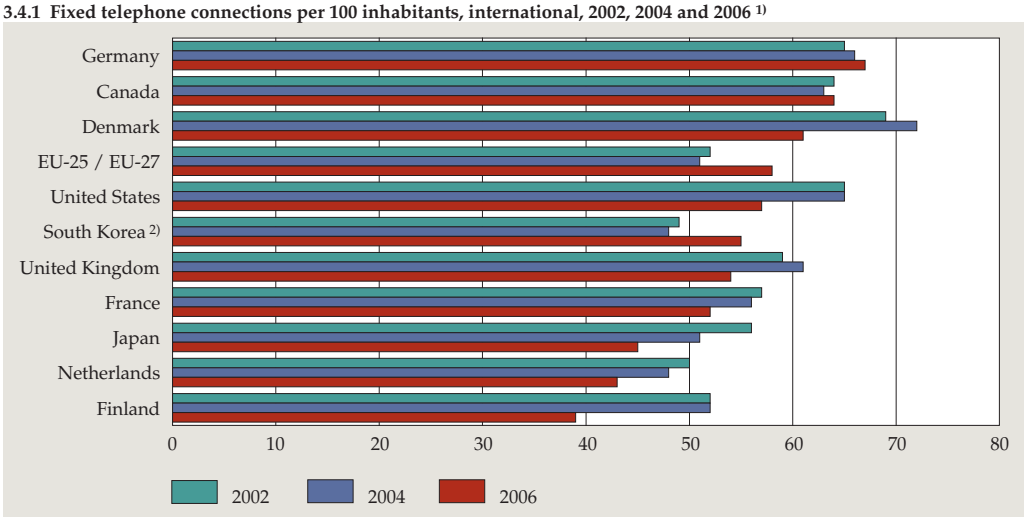
The telephone market is changing. The number of traditional analogue telephone connections or landlines is falling in favour of alternatives, such as telephony via rtv cable, mobile telephones and internet telephony. The first figures presented in this paragraph are about landlines, including up and coming telecom technology, such as internet telephony. Next we will address mobile telecommunication.

Fixed landlines

Almost all households in the Netherlands can be hooked up to the fixed telephone network, known as the KPN network. This network has national coverage and used to have close to 10 million telephone connections (including ISDN). After a long period of steady growth, the decline set in for the number of fixed telephone connections. Figure 3.4.1 shows the number of connections per 100 inhabitants in the Netherlands and the benchmark countries.

With 43 connections per 100 inhabitants in 2006, the number of fixed telephone connections in the Netherlands is now below the EU average. A similar trend occurs in the benchmark countries, possibly because more and more households are giving up their subscription and only use their mobile phone. The number of Dutch households that only used a mobile telephone increased to 17 percent at the start of 2007 as opposed to 12 percent in 2004 (TNO, 2006a, 2007b).

3.4.1 Fixed telephone connections per 100 inhabitants, international, 2002, 2004 and 2006 [1)]



1) Including ISDN and VoIP connections.
2) 2005 instead of 2006.

Source: TNO.

Internet telephony

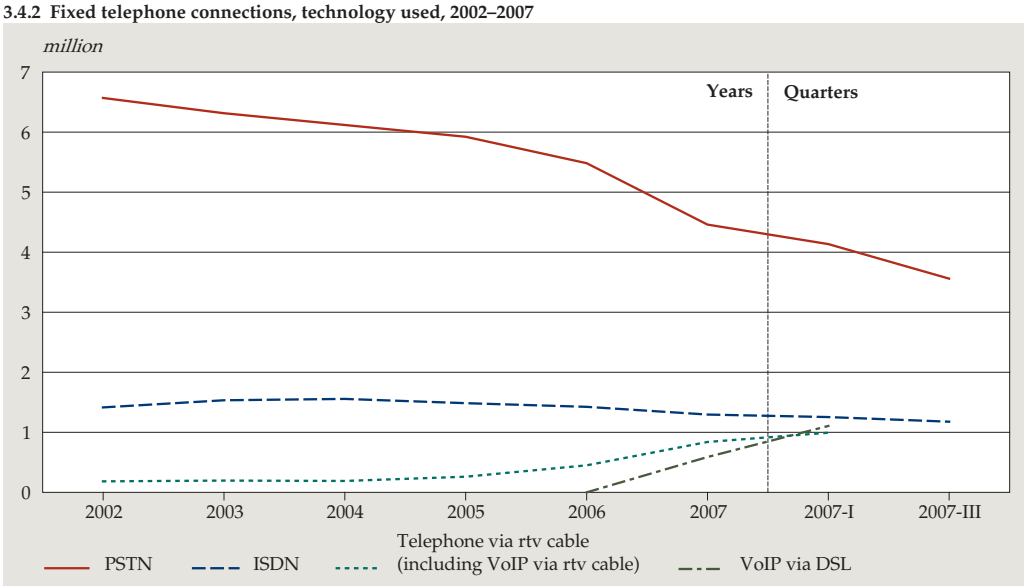
A relatively new technology is telephony via internet or other IP-based networks, such as a company intranet. The new technology is known under several other names, like Voice over Internet Protocol (VoIP) or IP-telephony. Although subtle differences in definition exist, all deal with internet telephony where a telephone call is turned into digital data packages. These data packages are sent through the internet in the same way as the data packages containing email or web pages.

Internet telephony has several advantages. The main advantage for consumers is the price: internet telephony is often cheaper than telephony using a regular fixed telephone connection. A phone call with someone who also uses internet telephony is often completely free.

The advantages for companies are that the connections are cheaper and more easily maintained. The company just has one communication infrastructure to maintain, which can handle speech and data services. [3)] It is also relatively simple to connect the telephone switchboards of two locations through the internet. Moreover it offers extra possibilities for teleworking.

Although the technology was developed several years ago, consumers only started to use it widely in 2005. This is probably due to extensive advertising campaigns by the providers, and the fact that the necessary peripherals such as internet routers with an analogue telephone port and special IP telephones are now widely available in shops.

3.4.2 Fixed telephone connections, technology used, 2002–2007



Source: TNO, KPN.

IP telephony has been used by telecom operators for quite a while to cut cost with expensive lines abroad or via satellite. The connection between consumer and telecom company is analogue, but the part between the telecom company in the Netherlands and the foreign counterpart is digitalised without the consumer being aware of it. The recent 'digitalising' mainly occurs in the endpoints of the network, namely between the telephone switchboards and the individual connections in households or companies.

Figure 3.4.2 shows the increase in telephony via rtv cable and (A)DSL lines. VoIP over DSL increased rapidly in recent years. In the first quarter of 2007 there were 588

Telephony via the computer

Using a computer to make phone calls has become popular in recent years. A headset or microphone is linked to the computer. The computer digitalises and sends the call through the internet connection of the computer. This requires special software on the computer (a 'softphone') and sometimes a special telephone provider that can link the internet and the regular telephone networks.
A distinction is made between 'PC-to-PC-calls' and 'PSTN-terminating-calls'. In the first both callers call through their computers, often for free. In the second someone uses a computer to call a regular phone, which usually costs money.
This differs from the VoIP discussed elsewhere in the book, where a regular telephone is connected to a modem or internet router, and there is no need for a computer.

thousand VoIP DSL connections and close to 1 million VoIP connections via rtv cable. The same figure also shows the spectacular decline in the number of regular analogue (PSTN) telephone connections. In the third quarter of 2007 the number of connections reached 3.6 million, less than half of the 2001 figure.

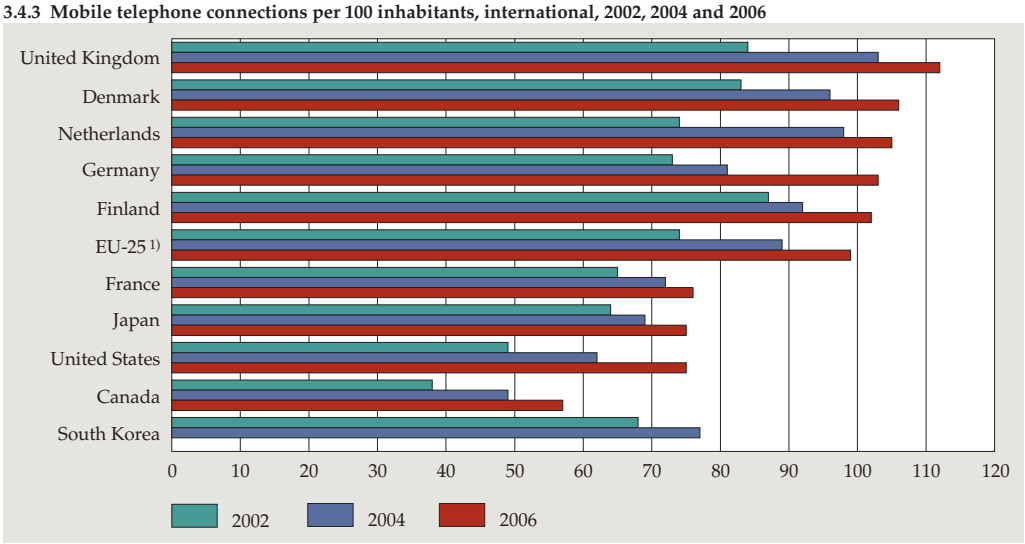
In 2006 about 20 percent of the companies with 50 or more employees used internet telephony (Telecommagazine, 2006). About 60 percent of these companies used internet telephony within their own location. Also about 60 percent used internet telephony between locations. Only 17 percent indicated they used it for teleworking.

Mobile phones

The number of mobile phone connections rose rapidly in the Netherlands in the period 1995–2000. After stabilising temporarily in 2001 and 2002, the number is growing again. In the first quarter of 2007 there were about 17.3 million connections (prepaid and subscriptions), which represents a 6.2 percent increase on the fourth quarter of 2005. This growth rate was realised despite the market saturation, as the total number of mobile connections exceeds the number of inhabitants in the Netherlands. Some people own two mobile telephones, one for work and one for private matters. Also included are other devices with a SIM card, such as laptops with UMTS mobile broadband internet.

Placed in an international perspective, the Netherlands has relatively many mobile telephone connections. Figure 3.4.3 shows the number of connections per 100

3.4.3 Mobile telephone connections per 100 inhabitants, international, 2002, 2004 and 2006



1) 2005 instead of 2006.

Source: TNO.

inhabitants for several benchmark countries. The Netherlands has 105 mobile connections per 100 inhabitants in 2006. Only Denmark and the UK have more. All benchmark countries still show an increase. Several large economies, such as the United States and Japan, remarkably only have about 75 mobile telephone connections per 100 inhabitants.

The mobile telephone network in the Netherlands has almost complete national coverage. In September 2007 there were 14,654 GSM antennas across the country. GSM is the most common mobile telephony standard. The year before there were 16,478 antennas, so there has been an 11 percent decrease. This is due to the integration of the networks of two providers (Antennebureau, 2007).
Although the number of GSM antennas falls, the number of UMTS antennas increased. UMTS is the successor of GSM. In September 2007 8,374 antennas were registered; an annual increase of 66 percent. The introduction of UMTS allows broadband internet access via mobile phones as well as broadband-based services like 'video phoning'.

The rise of 3G

Mobile telephones and services now often use third generation networks (3G). These are networks that make use of UMTS and HSDPA technology, the successors to the second generation GSM networks. After the government auctioned the licences in 2000, the UMTS and HSDPA networks were rolled out. The large providers now cover over 90 percent of the Netherlands.

In Japan over half of all mobile connections took place through 3G-networks in 2006, see table (Ofcom, 2007). Japan is way ahead of other countries. The use of 3G in the Netherlands was just 7 percent. Hoewever, the growth rate of 3G was robust in all countries shown.

3G connections, 2005 and 2006

	2005	2006
	% of total mobile connections	
Japan	32	53
Sweden	7	16
United Kingdom	7	11
France	4	10
Germany	3	7
Netherlands	2	7
United States	2	4
Canada	0	1

Source: Ofcom.

3.5 Television and radio

Traditional analogue radio and television

1951 saw the first (analogue) television broadcast in the Netherlands. To receive television people had to place a huge antenna on the roof and pick up signals from the air. In the 1960s, the first households were connected to rtv cable. 'Cable' gave better sound and picture quality than ether and more channels. Cable is still the most common way to receive television. In 2004 88 percent of the Dutch households had an rtv connection available, making the Netherlands one of the most densely cabled countries in Europe. In France and the UK, the percentage of cable connections is much lower (about 15 percent). The coverage of the cable network plays a major role in this: many households simply cannot get cable. South Korea is the only other benchmark country with a higher percentage than the Netherlands (91 percent). In The Digital Economy 2006 (CBS, 2006, p. 112) we included an international comparison of the use of rtv cable. No new figures were available yet when we wrote this edition.

Although analogue terrestrial television is a thing of the past (analogue broadcasting ended on 11 December 2006), analogue radio is still very popular. Think of the many car radios and mobile radio receivers (not only the old transistor radios, but also modern mobile telephones with radio). A major problem is the scarcity of frequencies for terrestrial FM stations. The number of stations that can broadcast is smaller than the number that wants to broadcast. Therefore government auctions off frequencies for considerable sums of money.

Analogue television signals are transmitted via rtv cable, often together with analogue radio stations. Although cable offers more room for radio stations than the air waves, there is scarcity here as well.
The use of analogue signals has its disadvantages. Disturbances in the signal are quite clear, occurring as noise, 'snow' or ghosting effects. This problem occurs mainly in analogue terrestrial signals, although loss of quality also occurs in analogue cable television.
Another problem is the limited amount of space available for stations. Only a few air frequencies (or frequency bands) can be used to transmit radio or television. Only a limited number of stations can use rtv cable to broadcast.

These problems occur to a lesser degree in digital television and radio. We will discuss digital television and radio below, including various options for receiving them.

Digital television

In digital television images are not transmitted as a continuous analogue signal but as discrete data packages. This requires less bandwidth because digital data can be compressed, which means more digital television channels can broadcast through the same transport medium. Within the bandwidth of one analogue channel 4 to 5

digital channels can transmit, while the quality remains the same. [4] Another option is to have high resolution signals such as HDTV, instead of more stations. See box 'Extra options with digital television'.
The standard for digital television signals in Europe is Digital Video Broadcasting (DVB). There are other variations beside this internationally agreed standard. The USA has ATSC and Japan ISDB as their own standards for digital television.
Digital subscriptions often cost the same as analogue television. People often have to pay extra for extra stations, or stations in HDTV, and they have to buy a special digital receiver and a 'smart card'.
In 2007 households can receive digital television terrestrial via classic rtv cable, via satellite or through the internet. Below we sketch the possibilities and differences between these methods and show figures about their use when possible.

Terrestrial digital television

Terrestrial digital television is the successor to watching television with a classic analogue TV antenna. A huge antenna on the roof used to be required for a decent reception, whereas with digital television a small antenna of about 20 cm inside the home will do. Reception depends on the available bandwidth, but can now rival DVD quality. This is better than an analogue antenna could hope to offer. People with an analogue antenna could only receive the channels *Nederland 1, 2 and 3*, plus some regional stations in much of the Netherlands. With terrestrial digital television they can receive more stations, including the commercial Dutch language stations.

Terrestrial digital television is also known as DVB-T (Digital Video Broadcasting – Terrestrial). In 2007 it is available almost everywhere in the Netherlands. The rest of the rollout will take place in 2008 after which the whole country will be covered. Given the expected national coverage and the limited number of households receiving analogue television with an old antenna, the analogue television broadcasts ended on 11 December 2006. This makes the Netherlands one of the first European countries to only broadcast digital television. The digital versions of *Nederland 1, 2 and 3* and the regional stations are available for free since the analogue signal was stopped. However, consumers have to buy a digital decoder and a proper antenna. Radio broadcasts will remain available in analogue form for a while.

At the end of 2006 there were 265 thousand terrestrial digital television subscribers in the Netherlands, compared to 184 thousand the year before.

Digital television via satellite

Besides cable television and terrestrial television people can receive television via satellite, which generally allows for the reception of many more stations. The disadvantages are that the dish must be placed on the outside of the home, which is not always possible or allowed, and that the dish must have a direct 'line-of-sight' with the satellite.

Mobile television

Watching television in the train or in a traffic jam became possible in 2007. Regular television broadcasts can be watched on a mobile telephone or PDA. Most people use the UMTS network for this. The image is sent to the handheld devices through an internet connection set up through the UMTS antennas.
Another option is to send a single TV signal, similar to digital terrestrial television, where the signal is specially adapted for small handhelds. New standards have been developed for this purpose, such as DVB-H (Digital Video Broadcasting – Handheld) and DMB (Digital Multimedia Broadcasting).
With UMTS the information is sent to each individual user, which generates much data flow. DVB-H and DMB are broadcasting techniques which air one signal that is picked up by each mobile.

Satellite broadcasts by Dutch stations could only be received digitally in 2007. Nearly all foreign satellite stations switched to digital technology in recent years as well. There is little difference between analogue and digital television reception with a satellite dish and receiver in terms of required infrastructure. Consumers who own a satellite dish can simply switch to digital television; usually it just requires another receiver.
Digital television through satellite is broadcast with DVB-S standard (Digital Video Broadcasting – Satellite). These satellites cover an enormous area. One satellite can broadcast to an entire continent. In principle the coverage in satellite reception is 100 percent if there is 'line-of-sight' with the satellite.

In 2006 some 700 thousand households watched digital television via satellite in the Netherlands. In 2005 there were 670 thousand, and it was the most popular way to receive digital television in 2005. In 2006 digital television via cable started growing fast.

Digital television via cable

In digital television via cable, the digital television signals enter the house through an rtv cable. People only need a digital decoder, also known as a tuner or 'set-top-box'. This converts the digital signal to a format fit for regular TV sets. No extra antennas or dishes are required. The standard for digital television via rtv cable is called DVB-C (Digital Video Broadcasting – Cable). In comparison with analogue cable television it is possible to broadcast more channels and/or a higher definition.
The disadvantage of this method is that, in contrast to analogue television via cable, only one set can be hooked up to the digital tuner. However, sets without an extra digital receiver can still receive the regular analogue cable signal transmitted with the digital signal.
The number of households with digital television via cable more than doubled between 2005 and 2006. By the end of 2006 there were 1.0 million digital cable television connections.

Digital television via internet (IPTV)

A fourth option is to receive digital television via the internet, also known as IPTV (Internet Protocol television). It is possible to use a DSL line with sufficient capacity to transmit an entire television channel with high quality. One advantage of this form of digital television is that only the channel the user tunes in to has to be transmitted. The other types of broadcasting transmit all stations at once, and have the television set itself filter out a single channel. So the scarcity in frequencies plays no role in this technology; in theory the number of stations is unlimited.

A hitch may be that the internet connection must be fast enough for this kind of broadcasting. ADSL2 is usually recommended, but not every household in the Netherlands can get ADSL2, see also paragraph 3.3.

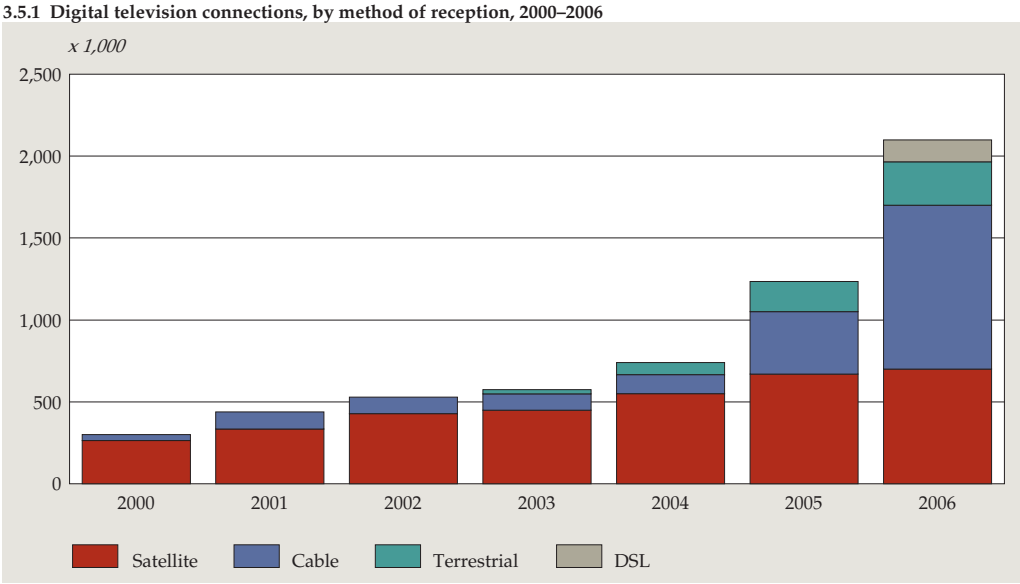
In 2005 one company in the Netherlands started to broadcast live football via IPTV, and from April 2006 onward 'regular' Dutch television is transmitted this way. By the end of 2006 there were 133 thousand people who subscribed to IPTV services, making it the least used method.

This type of digital television should not be confused with watching TV on a PC with a special television card, where the signal still enters the home via rtv cable, or with downloading films or programs from the internet.

The rise of digital television

Figure 3.5.1 shows the development of the use of digital television broken down by type of reception: terrestrial, satellite, cable, or DSL connection. Satellite had the most digital connections in 2005, but this changed in 2006 where rtv cable has most connections. Watching terrestrial digital television is also gaining popularity. In

3.5.1 Digital television connections, by method of reception, 2000–2006



Source: TNO.

total there were more than 2.1 million digital television connections at the end of 2006, about 70 percent more than at the end of 2005.

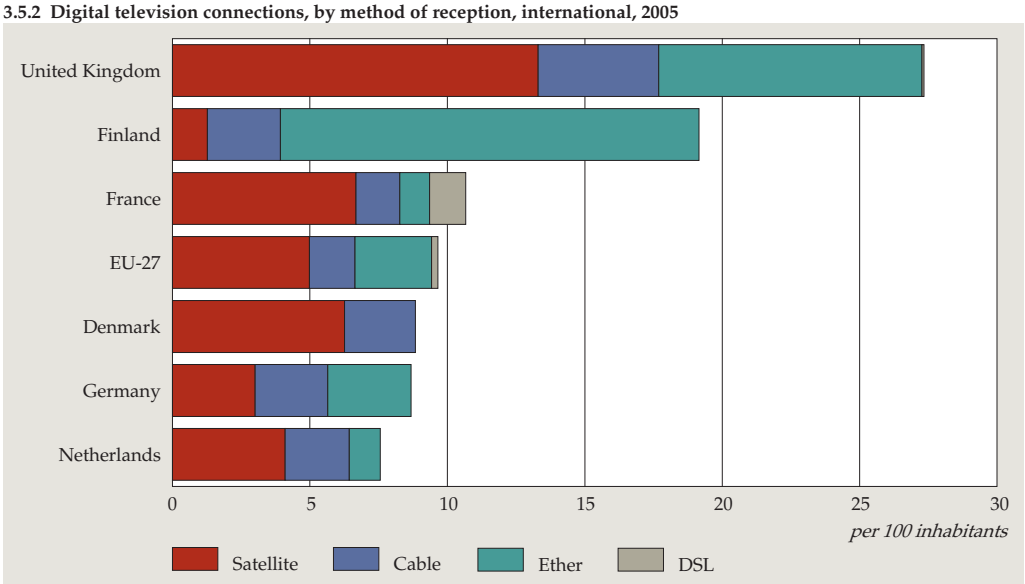
In 2005 the number of digital television connections in the Netherlands was below the EU average, see figure 3.5.2. Since the number of connections doubled in 2006, this situation may well have changed. However, there were no data on all countries for 2006 available yet at the time of writing this publication.

There are major differences in the use of the different types of reception between countries. In the UK, people prefer satellite; in Finland, digital television is mainly terrestrial. In Germany, cable, satellite and terrestrial are equally popular whereas IPTV only had a substantial number of subscribers in France in 2005.

Digital radio

A digital radio signal is transmitted in small digital data packages just like a digital television signal. The same advantages apply as with digital television: better signal quality (especially compared to analogue terrestrial radio) and the possibility of broadcasting more channels within a limited frequency range. It is also possible to send extra information with the signal, which can be used to update the navigation system in the car with traffic warnings or for sending images. The radio receiver can show these images on a display or screen. Listening to digital radio requires a digital radio receiver.

3.5.2 Digital television connections, by method of reception, international, 2005



Source: European Commission.

Extra options with digital television

Apart from advantages such as a better picture quality and more channels, digital television also has several other options than analogue television; for example:

Pay per view/per channel
It is easy to send a coded signal with digital television, enabling pay TV. The users can chose which channels or packages they want to buy. The provider supplies the user with a smart card that must be placed in the digital receiver, which then decodes the channels for which the viewer pays. Video-on-demand and paying for specific programs is another option.

Interactivity
Digital television provides many interactive options, either in combination with the internet or not. There is always an updated digital guide available. Interaction with live broadcasts is possible, such as voting in a quiz or show.
It is no longer necessary to watch a program at the time it is broadcast. It can be watched at the consumers' convenience through IPTV or services like 'Uitzendinggemist'. Such services place the programs entirely or partially in an archive.

HDTV
High Definition Television (HDTV) is a standard for television broadcasts with a higher resolution than the regular broadcasts use. The large plasma and LCD television screens drive the demand for this, since regular broadcasts show up blurred or 'blocked'. The greater bandwidth needed for HDTV became available when digital television was introduced.

A standard for digital radio used in many countries is DAB (Digital Audio Broadcast). In 2007 public broadcasting in the Netherlands used terrestrial DAB (T-DAB). Commercial radio stations are waiting for the government to allocate frequencies, which is expected in 2008. T-DAB can be seen as the successor to 'FM'. In the Netherlands T-DAB stations cover about 70 percent of the population, mainly in the Randstad and North Brabant. There are no figures on the actual number of people listening to the radio via T-DAB.

Apart from DAB it is also possible to receive DVB-T radio. The radio transmissions are sent along with television signals in this technology. Figures about coverage and use of DVB-T are show in the section on digital television.

An altogether different standard is DRM (Digital Radio Mondiale). [5)] This can be seen as the digital equivalent of shortwave. The advantage of shortwave is that the transmitter covers a much wider area than an FM transmitter. Disadvantages of shortwave technology are more interference and a lesser sound quality. Digital signals can reduce the interference, so that a transmission of reasonable quality over more than 1,000 km can be achieved. In 2007, the *Wereldomroep* was the only Dutch radio station transmitting using DRM.

Digital radio via the internet

Users can listen to 'streams' on the internet; both 'live streams' (direct copies of transmissions of terrestrial or cable broadcasts) as well as a great many internet-only broadcasts. The worldwide character of the internet makes it possible to listen to radio stations from all over the world. There is no scarcity of frequencies, because only the selected channel is sent through the internet connection.

Furthermore, the internet provides the option to listen to the various programs at any time. While high quality television via the internet requires a very fast internet connection, this is not the case for digital radio, where a starter broadband subscription is usually enough.

3.6 Convergence

In the past, each service had its own unique transmission method. One institution or company had the monopoly on the service. Speech went through a PTT telephone line, and television through the cable of the local cable company. Two major changes took place in recent years. There is no longer a state company monopolising telephone services, since other companies can also use the telephone cable infrastructure. And major new technologies came on the market, such as mobile telephones and the internet. The emergence of the internet made new ways of providing service possible. For instance, what used to be different services can now be sent jointly via Internet Protocol (IP) and a single infrastructure. This led to the convergence of services.

In 2007 many telecom companies offered services bundles via a single distribution method. A company can now use the rtv cable to supply television, internet and telephone services. Sometimes these services are offered in a single package through different distribution methods, such as internet and telephone via an ADSL line plus terrestrial television, or a combination of fixed and mobile telephone services.

Households state ease and the lower costs as the main reasons why they opted for a combined package (EIM, 2006). Another advantage is having a single infrastructure (one box instead of a separate modem and telephone switchboard) and one helpdesk.

The disadvantage of having a single distribution method for all services is that when the line goes down, all services go down with it. This can be problematic for companies. It may not be a disaster when email is down for a while, but when a company is cut off from telephone and the internet (email), this is a severe disruption of communication. The recent developments increase the vulnerability of the telecom infrastructure, see box 'tele-vulnerability'.

Tele-vulnerability

Telecommunication is vulnerable. Networks can break down through technical or natural causes, but also through human failure, crime or attacks. Is this taken into account? It looks like many scenarios for calamities and disasters assume that telecommunications will do alright or that breakdowns can be solved through alternative services.
Tele-vulnerability may lead to considerable damage and suffering. Ironically the vulnerability is due to the increased options telecommunication now offers. Developments such as convergence [1)] and technical divergence [2)] are developing at a rapid pace, and telecom services have become more independent from the telecom infrastructure. The classic example is telephony which is no longer linked directly with the network. Having no direct links between services and infrastructure makes it harder to see the dependencies. Until a few years ago a telephone would always work, regardless of electricity supply, and it was safe to assume that the service would only be interrupted if the fixed telephone network faced a major breakdown. Nowadays the telephone may be connected to an ADSL connection, via Webvox, to an ISDN line or a cable modem on the TV-cable. In all cases the users are dependent on the electricity network.

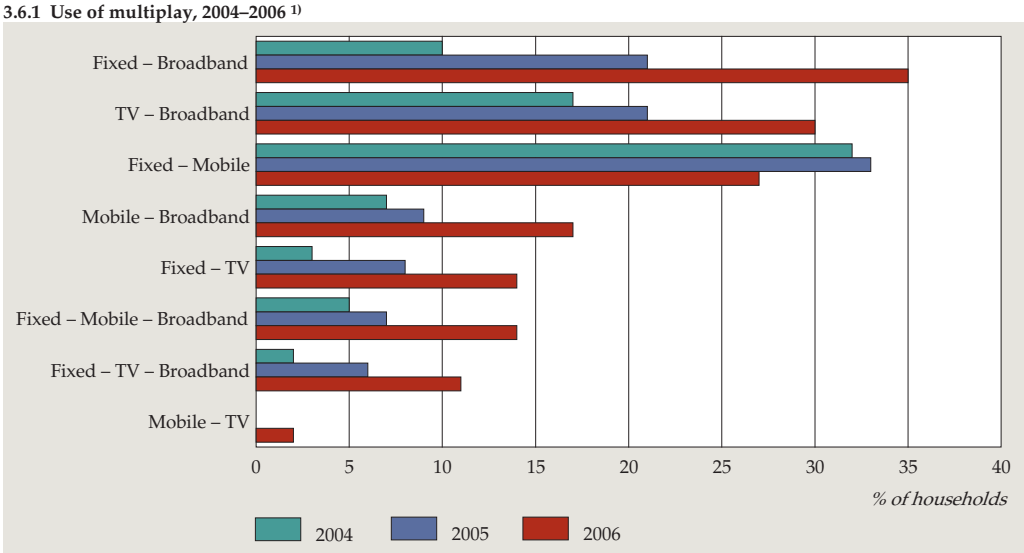
Another form of vulnerability are the cyber attacks by hackers. There are many examples, for instance in January 2008 a Boeing 787 was hacked. This is a plane where passengers will have internet. The FAA gave out a warning about this, because internet might make it possible to connect to the Boeings control, navigation and communication system. This is a plane that will only be ready by the end of 2008 but it shows that tele-vulnerability is already taken into account during construction.

1) Convergence: the possibility that different types of infrastructure can carry similar types of services.
2) Technical divergence: the option that a service can be carried through different types of infrastructure.

The advantage for telecom companies is that they can offer a wider product range at lower costs due to the advantages of scale. Classic cable companies, which used to supply television and radio, can now add telephone services. To counter the loss of clients, telephone companies now offer television services.
Changing providers is relatively simple these days. OPTA regulations, e.g. keeping one's own telephone number, made it easier to change mobile telephone providers. Switching internet or radio and television providers is also more common and gradually becoming more simple. Switching internet providers used to take weeks, leaving the client without any internet at all. These days it can be done in a day.

Figure 3.6.1 shows the purchase of different services from a single provider ('multiplay'). Various market parties are getting involved. 2006 saw a sharp rise in the use of multiplay. The most common combination of services in 2006 was a fixed telephone connection plus broadband internet (35 percent of the households). In 2005 the most common combination was fixed and mobile telephone services.

3.6.1 Use of multiplay, 2004–2006 [1)]

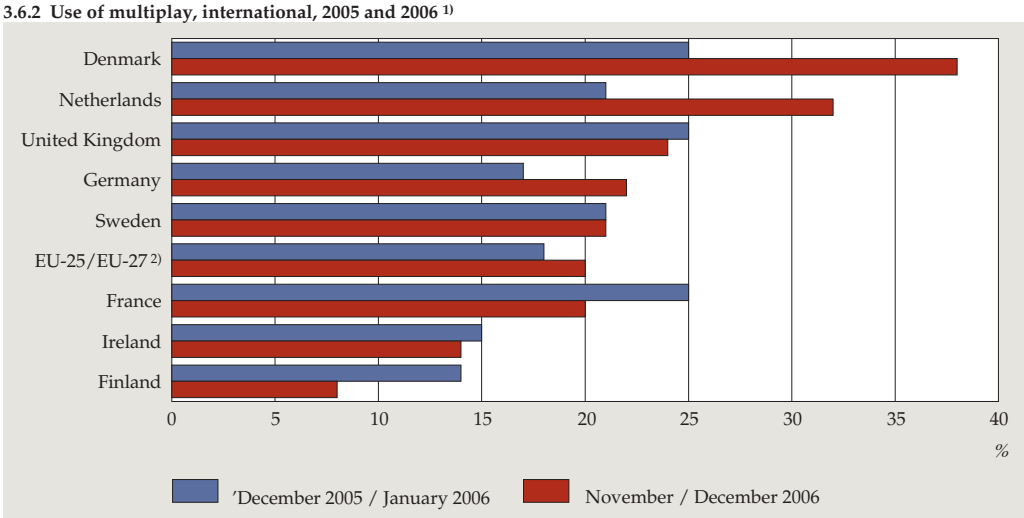


[1)] Percentage of households that purchases these services from a single provider. The term 'fixed' here means telephone via a fixed land line (including VoIP), 'mobile' stands for a mobile telephone connection. 'Broadband' stands for a fixed or wireless broadband internet connection. Combinations not mentioned here hardly occurred in 2004 and 2005 (<1 percent of the households).

N.B. Households with a combination of three services from a single provider are counted in the groups with two of these services. Therefore the total of some years is more then 100 percent.

Source: OPTA, EIM.

3.6.2 Use of multiplay, international, 2005 and 2006 [1)]



[1)] Share of households purchasing at least two services in one package from a single provider.
[2)] EU-25 for the figure of December 2005 / January 2006 and EU-27 for the figure of November / December 2006.

Source: European Commission, 'E-communications Household Survey', Special Eurobarometer 249 & 274.

Technical convergence of services: All-IP

Technically speaking the differences between the various services are disappearing. Telephone, radio and television signals can all be sent digitally through the internet with Internet Protocol (IP). The term 'All-IP' is often used: all services offered are transmitted in the form of IP packages.
The type of cable used to send IP packages is no longer relevant. All services can be sent through twisted-pair copper cable (used just for telephone calls before), or coax cable (used just for television signals before) or new glass fibre cables. Although the technology used to transmit information may be different, the consumer experiences little difference.

A study by the European Commission (EC, 2006 and 2007) shows major differences within the EU in the use of multiplay, see figure 3.6.2. The percentage of the households that purchased at least two services in a single package averages 20 percent in the EU as a whole. The Netherlands was just above this average in 2005, while the Netherlands and Denmark were the top users of service bundles in 2006. The use of multiplay remarkably decreased in several countries in 2006.
The percentage for the Netherlands is lower than the percentages in figure 3.6.1. The difference may be caused by the fact that the European Commission study only asked about the purchase of service bundles in one contract at a single rate. People are not included if they buy their mobile and fixed telephone connections from a single provider with two separate contracts and accounts.

Notes in the text

1) This is an indication; a limited number of parties with registrations is not active, while other parties have several registrations (e.g. for individual business units or activities).
2) This concerns labour volume: the number of jobs in a year converted to fulltime equivalents.
3) Sometimes old faxes, modems, elevators and alarm systems require an analogue line so that several infrastructures are required within a company anyway.
4) When DVB-T is applied. See Dialogic, 2005.
5) Not to be confused with Digital Rights Management, a technology to protect digital rights, such as copyrights on digital music files.

4. ICT use by companies

Most companies in the Netherlands have broadband internet and a website. Advanced, large-scale ICT applications are therefore widely supported. There are major differences between companies in advanced applications, and some are likely to remain. For instance: it is quite unlikely that selling on-line will be embraced by all companies.
In this chapter we describe several ICT applications with very different intensities of use between large and small companies, and between sectors. The decision to invest in technology or an ICT application is after all a matter of business economics, where the cost-benefit analysis will not turn out the same for all companies.

In manufacturing, the use of ICT to support business processes is concentrated on the production and distribution chain, and in services on marketing and the client. By December 2006, order processing systems of companies in the manufacturing industry and in the sector trade and repairs were linked more often to computer systems for stock control and production and logistics planning than in business services. Delivery of goods in time is crucial for the first two sectors. A similar difference is found in the use of ERP and CRM software: ERP software is used more in manufacturing and in trade and repairs; and CRM software is used more in business services. These differences can be explained quite easily, as they show a rational use of ICT in different companies.

One in ten companies used open source software by December 2006, mainly large companies. The difference here seems to be lacking or possessing the skills to work with open source software. Some 6 to 7 percent of the companies used electronic invoicing.
Electronic data communication must be legitimate and reliable, especially since it is increasing so much. Therefore one in three companies used authentication in sending mails in 2006. Almost a third of the companies receiving their orders through the internet used secure protocols. So, neither of the two security measures were used by a majority of the companies.

Online purchases and sales by companies are still increasing each year, both in terms of the number of companies using these facilities and in the volume of the transactions. Turnover of e-commerce in 1999 was just over 3 percent of the total turnover of the companies. In 2006 this had gone up to almost 11 percent.

Internationally speaking, the use of ICT by companies in the Netherlands is not among the absolute top. Companies in the north of Europe, like Denmark, Finland and Sweden, made even more intensive use of ICT. Nor were companies in the Netherlands the earliest adopters of the various ICT applications. The use of broadband internet and online purchases and sales were very average several years ago compared to the rest of the EU. But in 2006 Dutch companies were well above average in their use.

4.1 ICT infrastructure and use

The use of ICT in the business sector was common by December 2006. Almost all companies worked with at least basic ICT. This process took place within a single decade. Companies no longer differ in whether or not they use ICT, but in the way they use ICT.
One has to take into account that not all companies have to be equally advanced in their ICT use. The decision to invest in ICT is ultimately a matter of business economics. It may well be rational for a small company not to spend a lot of time and money on setting up and maintaining an intranet, while the opposite may be true for a large company. A large company with many suppliers may reap the benefits from investing in advanced computer systems that communicate online with computer systems of their suppliers, while a small company with few suppliers may not. So the requirements for companies differ.

The increasingly advanced use of ICT starts with the widespread adoption of the necessary ICT within and outside the business sector. This sounds so logical that it may be considered self-evident that people sometimes underestimate the correlation between the adoption of ICT and developing or using advanced ICT applications. It is important for developers of ICT applications to have many potential users; in fact this defines the size of the (domestic) market. This factor helps to determine if it is profitable to invest in the development of an ICT application. For users, the number of other people using an ICT application often determines its usefulness. Phoning through the internet is a prime example. The more people do so, the more useful it is for the individual user to join (network effect). The same

Survey on ICT use and e-commerce in enterprises

The survey on ICT use by enterprises is an annual sample survey among enterprises employing ten people or more that has been conducted by Statistics Netherlands since 1987. The rapid developments in ICT over the last two decades meant that the content of the survey was regularly updated. During the first years the questions focused on automation costs, computer personnel and computer ownership. In recent years the focus has shifted to the use of external networks, such as the internet. The results for a given year refer to the situation in December. The conclusions drawn in this paragraph, using this source, therefore refer to the situation at the start of 2007, so it is not the annual average for 2006. The survey on the use of ICT by enterprises became part of the EU harmonised surveys on the use of ICT by enterprises in 2001, from which many of the comparisons in this chapter derive.

It is difficult to make long time series of comparable data because of the rapid changes in the penetration and use of ICT. The international comparison has therefore become a key benchmark for the situation in the Netherlands.

principle holds for countless other ICT applications and illustrates the importance of the use of standards in electronic data communication.

All companies use the internet

Almost all companies in the Netherlands had access to the internet in December 2006. Almost 90 percent of the companies had broadband access. In 1995 barely ten percent of the companies had internet, and broadband internet was a rarity.

There are no longer differences in internet access between sectors and between large and small companies. This means that small companies have closed the gap with the larger companies. In the past, large companies were always well ahead of smaller companies. So although small companies were slower to embrace the internet, they ended up at the same level as large companies.

The use of broadband internet varied between 84 percent for companies employing 10–19 people to 98 percent for the largest companies (500 or more employees). The use of broadband internet varies from 'only' 82 percent of the construction companies to 92 percent of the energy and water companies and financial institutions. Most companies in all sectors and groups distinguished now have broadband internet. This is important because it makes advanced internet applications possible on a large scale.

Eight in ten companies have a website

About 80 percent of the companies in 2006 had a website. Their presence on the internet varied from 76 percent for the smallest companies to 94 percent for the biggest companies and from 71 percent for construction companies to 93 percent for energy and water companies.

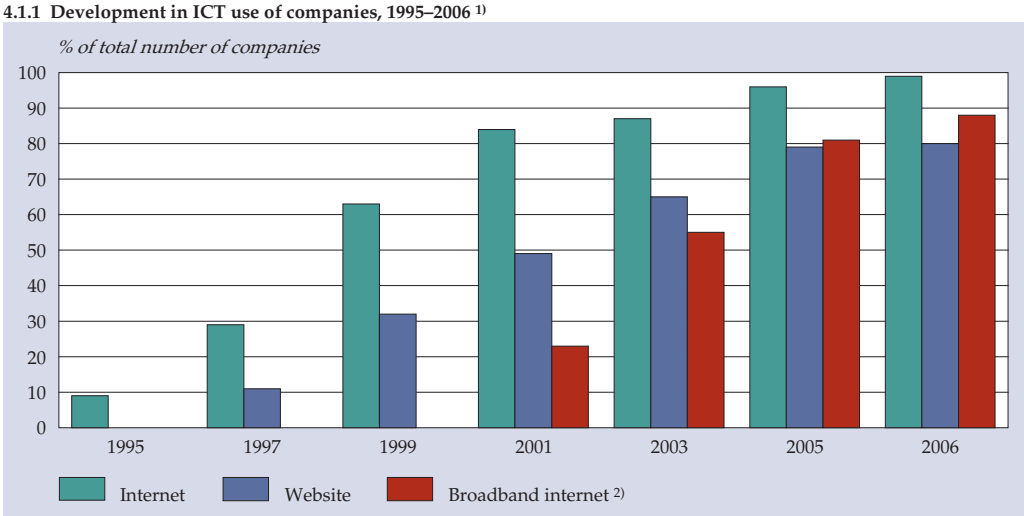
The decision to create a website is different than the decision to implement broadband internet. Creating a website costs more time and money and must be managed in the phase that follows. So a relatively high percentage of small companies do not present themselves with a website: a quarter of the companies with 10–19 employees had no website while among companies with 20–49 employees this was still close to 20 percent. Maybe these companies don't feel the need, or lack the skills or means to construct and maintain a website. However, many potential clients look for information about companies on the internet, so if a company is not on the internet a potential client will miss it.

The sectors differ in terms of having websites; from not quite two thirds of the companies in de sectors food, beverages and tobacco (63 percent), retail trade and repairs (63 percent) and transport (64 percent) to almost 100 percent for architects and engineers (95 percent), computer service bureaus (96 percent) and electrical engineering (97 percent). So having a website is influenced by the type and position of a company in the production and distribution chain.

The transport sector, and specifically road transport and food, beverages and tobacco are not directly in touch with consumers. They have different channels to

get clients or they have many regular clients so that a website is less likely to meet a need. Culture and the desirable image of a sector also have their influence. Creative sectors, such as architects and engineers, computer service bureaus and advertising agencies apparently all consider a website a must, so they are almost all on the internet.

4.1.1 Development in ICT use of companies, 1995–2006 [1)]



1) Companies with 10 or more employees (1995–2001) / employed persons (2002–2006).
2) Broadband internet is defined here as ADSL, cable and other fixed internet connections with a large bandwidth.

Source: Statistics Netherlands, ICT use by enterprises / IT survey.

So by December 2006 companies were hooked to the internet en masse, and mostly via broadband internet. Many companies were also present on the internet with a website. The facilities offered by a website vary from electronic sign post to online sales and payment for products. The overwhelming majority has recognised the importance of being on the internet. So there seems to be a critical mass for large-scale, advanced use of the internet in the Netherlands.
Detailed figures on the use of (broadband) internet and on having a website can be found in the statistical annex at www.cbs.nl/digitale-economie.

International average

International comparisons show that the Netherlands was far from an early adaptor in the massive spread of ICT. This process generally went much smoother in Sweden, Denmark and Finland. Keeping in mind that the size of the market of ICT users influences the development and actual use of ICT applications, the rate at which ICT spread within the Dutch business world was very average. However, the number of potential users is now quite substantial so it is no longer an impediment for the development and actual use of ICT applications and using the many

advantages of large-scale ICT applications. This chapter focuses on the question if this is indeed supported by an advanced use of ICT by companies in the Netherlands.

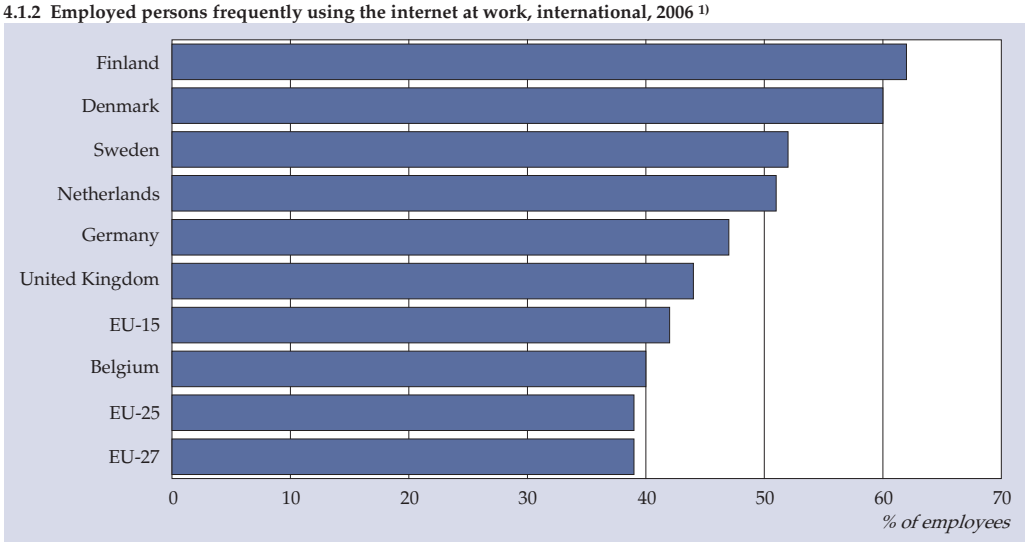
The rapid technological developments in ICT give rise to some critical consideration of the advantages thought to be had by a rapid spread of ICT within society, or in this case within the business sector. Being at the forefront may well become a hindrance, which is known as the dialectics of progress. Being one of the first to use a new technology or application may mean that one can be overtaken by companies that get involved at a later stage and can start with improved versions of the technology or application. Always wanting to keep up may not be feasible financially.

Internet at work widely accepted by companies

The number of employees who use the internet regularly at work – in the Netherlands slightly over half – is an illustration that the internet was used on a very large scale in 2006. In 2002 only a third of employees regularly used the internet at work. This says something about the growing recognition that the internet is a useful source of information and a tool on the job. It also illustrates that more and more companies, currently close to 90 percent, approved of the use of the internet by some or all of their employees.

The greatest number of employees using the internet on the job is found in financial institutions and business services. The smallest number is found in the sectors construction and hotels and restaurants. These numbers have to do with the type of

4.1.2 Employed persons frequently using the internet at work, international, 2006 [1)]



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

Source: Eurostat.

The top 15 ranking e-readiness in 2007

Ranking 2007 (69 countries)	Ranking 2006 (68 countries)	Country	Ranking E-readiness 2007 (scale 1–10)	Ranking E-readiness 2006 (scale 1–10)
1	1	Denmark	8.88	9.00
2	2	United States	8.85	8.88
2	4	Sweden	8.85	8.74
4	10	Hong Kong	8.72	8.36
5	3	Switzerland	8.61	8.81
6	13	Singapore	8.60	8.24
7	5	United Kingdom	8.59	8.64
8	6	Netherlands	8.50	8.60
9	8	Australia	8.46	8.50
10	7	Finland	8.43	8.55
11	14	Austria	8.39	8.19
12	11	Norway	8.35	8.35
13	9	Canada	8.30	8.37
14	14	New Zeeland	8.19	8.19
15	20	Bermuda	8.15	7.81

The 2007 e-readiness rankings

In the annual ranking of the Economist Intelligence Unit (EIU), the research unit of *The Economist*, close to 100 indicators are divided into six categories. These are not just purely technical indicators, such as the number of computer users or broadband connections, but also data on the general economic and political climate of the countries included.
The six categories are: (1) connectivity and technology infrastructure (weight: 20 percent); (2) business environment (weight: 15 percent); (3) social and cultural environment (weight: 15 percent); (4) legal and policy environment (weight: 15 percent); government policy and vision (weight: 15 percent); and (6) use of ICT by companies, citizens and government (weight: 25 percent).

The top 15 of the world looks as follows:
The Netherlands ranks eight in the total of 69 countries. A year ago the Netherlands occupied the sixth place. First in 2007 and 2006 is Denmark. The US is the first of the non-European countries in terms of 'e-readiness'.

The total score is calculated with government vision and policy on digital developments weighting in more heavily than before. Countries with governments active in these areas, such as Singapore, therefore received a higher score than last year. Several western countries dropped a bit in their ranking because of it. But there are no radical shifts, since the basic elements constituting e-readiness do not change within a year.

In the categories distinguished here, the Netherlands stands out in 'government policy and vision' and in the 'use by citizens, companies and government'. Where the Netherlands lags behind most in the total score is the category 'social and cultural aspects'. This category includes indicators for the level of education of the population, as well as entrepreneurship and innovation.

Source: The 2007 e-readiness rankings, Economist Intelligence Unit and IBM Institute for Business Value, 2007.

work people do in these sectors. There are no great differences between large and small companies. So internet access on the job is not the exclusive privilege of the people working for large companies.
An above average number of employees regularly use the internet on the job in the Netherlands – compared with the EU. The Netherlands comes in fourth place, after the Scandinavian countries, and well above the EU-15 and EU-25 averages.

4.2 *Internal data communication*

One of the applications of ICT is for internal company communication. Virtually all large companies use an internal network as an elementary provision. One in five small companies (10–19 employees) did not have an internal network at the end of 2006, apparently because they don't see the need.

Wireless applications are often used but mainly by large companies (over 500 employees), of which 40 percent has a wireless internal network. These wireless networks are often used side by side with fixed internal networks. The main advantages of a wireless network are flexibility and mobility. An employee does not have to be hooked up with cables in order to work on the computer and access the company network.

Intranet often used in services

Intranet is a provision to communicate and provide information within a company. It is based on internet technology, but it is only accessible to company employees. The provision is more advanced than an internal network and requires more maintenance: it must be updated regularly to remain useful as an application. This means of communication is mainly used in large companies, varying in use from 21 percent of companies with 10–19 employees to 81 percent of companies with 500 or more employees. It is easy to explain the difference.
It is easier to share information and to communicate in a small company than in a large company. So large companies need an intranet more and they get more benefit out of it. The also have more means available to invest in the setup and maintenance of an intranet.

Relatively more companies in the services sector use intranet than in the sectors manufacturing industry, construction and hotels and restaurants. This is due to the differences in the kind of production processes. The production process and the products themselves in the services sector are often digital, and most employees work on a computer every day. The use of intranet provides more benefits in such circumstances. This is one more illustration of the fact that the levels of sophistication do not have to be the same for all companies and sectors. One in three companies of all companies put together had an intranet by the end of 2006, that is not the majority of companies by a long shot.

Extranet not common

An extranet is part of an intranet made accessible to people outside the company, such as regular clients or suppliers. The use of an extranet is far from common: 13 percent of all companies used it in 2006, varying from 8 percent among small companies to 43 percent among large companies. Detailed figures on the use of internal networks, intranet and extranet can be found in the statistical annex to this publication on www.cbs.nl/digitale-economie.

Linking invoicing and payment systems now common

Not only relatively basic applications such as local networks, intranet or extranet are used, but also more advanced applications such as linking various computer systems within a company. In 2006 nearly two thirds of all companies had an ICT system for processing purchasing and sales orders. Over 90 percent of the companies had this system linked with another computer system. The most common link was between invoicing and payment systems: almost 90 percent of the companies with an order processing system had it linked with an invoicing system.

Over one in three companies linked the order processing system to a system for production and logistics planning. Less than a quarter of the companies with an order processing system had it linked to a system for automatic stock management of raw materials and semi-manufactured goods. The latter is a fairly advanced application, signalling that the stocks of raw materials and semi-manufactured goods have reached a critical level and need to be re-ordered.

In general, large companies have more advanced integrated applications than small companies. The percentage of companies with an order processing system varied in 2006 from 57 percent among small companies to more than 75 percent of the large companies. The same is true for the integration of other internal ICT systems, albeit on a smaller scale. Linking stock management and the production and logistics systems is least common among small companies.

The most common in all sectors is linking an order processing system and an invoicing system where an invoice is generated when an order is placed. There are greater differences between sectors when it comes to linking other internal computer systems. Right after energy and water companies come the sectors manufacturing industry and transport, storage and communication in linking order processing systems and production and logistics systems; these are linked remarkably more often than in business services and financial institutions. It is crucial for the manufacturing industry to replenish their raw materials and semi-manufactured goods on time. This is underlined by the fact that it is common in manufacturing to link the order processing system and a computerised system to replenish stocks. This is also common in trade and repairs, where on time delivery and the availability of goods is crucial. This has apparently led to investments in computer systems that support this.

Table 4.2.1
Companies linking their order processing system to other in-house computer systems, 2006 [1)]

	One or more in-house links	Link with invoicing and payment systems	Link with stock management of raw materials and semi-manufactured goods system	Link with production and logistics systems
	% of companies with an order processing system			
Total	91	88	22	35
Sector of industry				
Manufacturing	93	90	30	56
Electricity gas and water supply	97	97	46	65
Construction	94	94	6	22
Trade and repair	91	87	38	36
Hotels and restaurants	80	75	9	18
Transport, storage and communication	90	88	9	42
Financial institutions	83	80	10	15
Business services	90	88	10	23
Health, education, welfare	93	86	18	30
Other services	86	82	9	26
Company size				
10– 19 employed persons	90	87	18	23
20– 49 employed persons	90	87	21	35
50– 99 employed persons	94	91	30	52
100–249 employed persons	94	92	36	61
250–499 employed persons	93	90	29	60
500 and more employed persons	94	90	32	60

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

Source: Statistics Netherlands, ICT use by enterprises 2006.

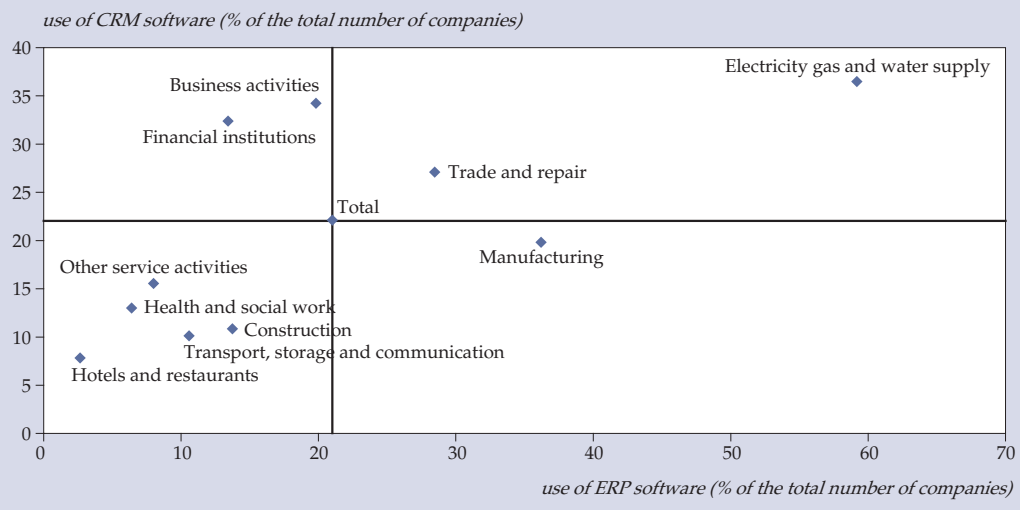
Use of ERP and CRM software

The use of software for enterprise resource planning (ERP) and customer relationship management (CRM) is rather common, but not among the majority of companies. ERP is software that integrates data of various units within the company, such as planning, purchasing, logistics and production. CRM is software supporting company-wide storage and distributing customer data; for instance CRM seeks to increase the sales opportunities of the company by basing marketing strategies on analysing individual client data.

So ERP focuses mainly on integrating data of the production and distribution process. This involves the purchasing process 'back in the chain'. CRM focuses mainly on sales and marketing and looks 'forward in the chain'. So in the company's perspective, the information gathered and processed is different.

There are substantial differences in the use of ERP and CRM between the different sectors. One in five companies made use of ERP and CRM software by December

4.2.1 Use of ERP and CRM software, by sector of industry, 2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprises 2006.

2006. Manufacturing made more use of ERP software (36 percent) and less of CRM software (20 percent). The same is true for trade and repairs, where ERP was used more than CRM software. This is consistent with what we wrote earlier, as these sectors emphasize supporting business processes in production and distribution process.

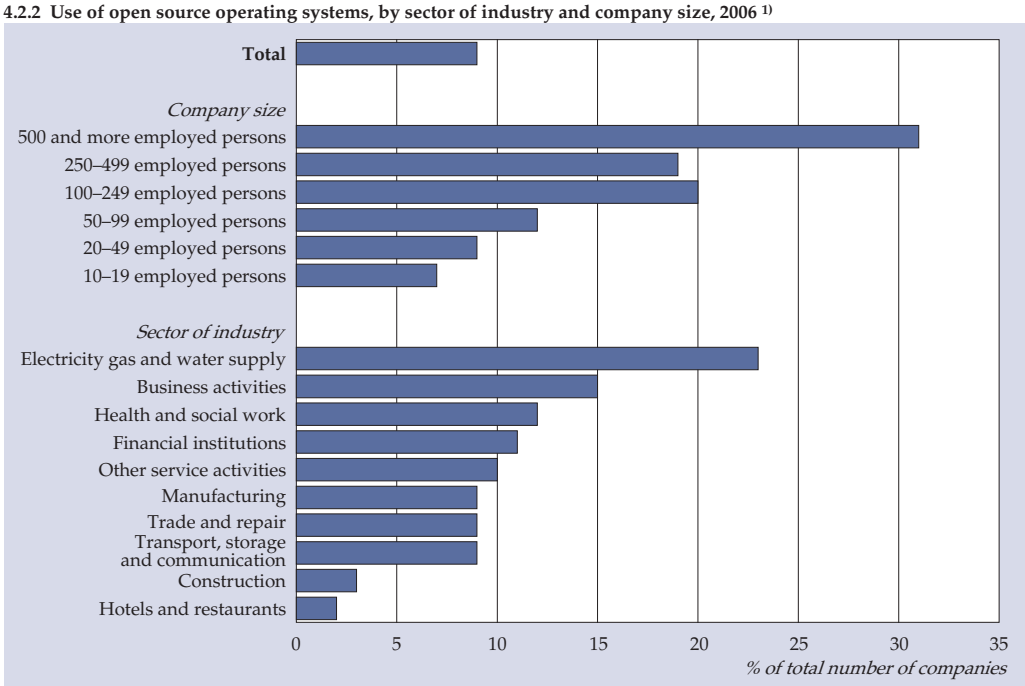
The use of CRM software dominated in business services and financial institutions. So these sectors invested in setting up client data for direct marketing strategies. Marketing is very important in these sectors with large but partly unknown potential numbers of clients. Over 80 percent of the companies used CRM software to store and distribute customer data. Almost two thirds of the companies actually analysed the data: so it was actively used.

Open source software mainly among major companies

The use of open source software is encouraged by government. One reason is to make users of ICT less dependent collectively on the products of a limited number of major suppliers. Another reason is that it will lead eventually to the creation of standards and applications developed by many people together, which can stand the test with software developed by the major commercial suppliers.

What is open source software? In the various definitions the following aspects are always mentioned: (1) the source code of the software is freely available, (2) everyone can add to it or improve it (3) everyone can distribute the software.

4.2.2 Use of open source operating systems, by sector of industry and company size, 2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprises 2006.

Open source software is not necessarily free. A supplier of open source software can ask money for the product. Well-known open source software products are the Linux operating system, the Firefox web browser, the Star Office and Open Office word processing packages, the MySQL database and the Apache webserver software. The source code of open source software can be accessed and improved by everyone. Often communities of online developers work on the set up, extension or improvement of the software. Large groups of people can develop the product, making rapid developments and improvement of the software possible. The user does not have to depend on the original supplier for improvements and enhancements, as is the case with commercial software. Companies also pay no licence fees when they use open source software. A user may, however, agree to other licences but these usually do not cost money. There will be costs to tailor the software to the users needs, and for maintenance and management, but this is also the case with regular software. A strategic consideration to use open source software is to widen the options for the various applications. A user is not stuck with the limitations that come with a regular software supplier (unlock). Another advantage is lower costs, important mainly for small and medium-sized businesses. However, working with open source software requires different skills. Skills that are not always available in small companies. It turns out that the small companies were not the major users of open source software in 2006 (EC, 2007).

Of course open source software has its disadvantages. Damages caused by the use of the software cannot be recouped from the developer, while this can be done when buying a standard software package.

One in ten companies use open source operating software

Nine percent of the companies in the Netherlands reported using open source operating software in 2006. This doesn't include open source software in ordinary user applications. The companies also do not necessarily operate entirely with open source operating software.

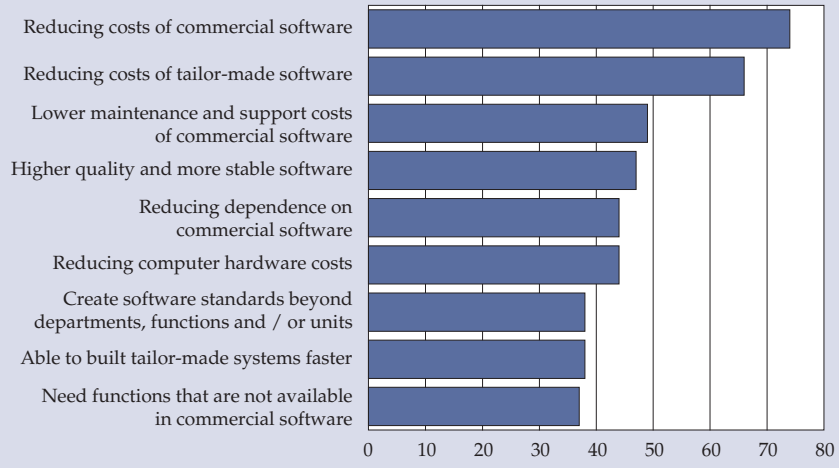
Small companies usually make less use of open source operating software than large companies. Open source operating software is mainly used in the services sector (business services and financial institutions) and less often in the manufacturing industry or trade en repairs. In the business sector, open source operating software

Why open software?

A survey among 512 medium-sized and large US companies asking their motives for using open source software resulted in the following picture.

The main motives were saving costs, quality, and user options. Almost half of the companies indicated that open source software provides better quality and more stability than commercial software. Over a third, surprisingly, stated that open source software gave them the opportunity to help create overall standards within the company. The most strategic motive was to be less dependent on commercial software suppliers, which was mentioned by over 40 percent of the respondents.

Reasons companies gave for using open source software, 2006



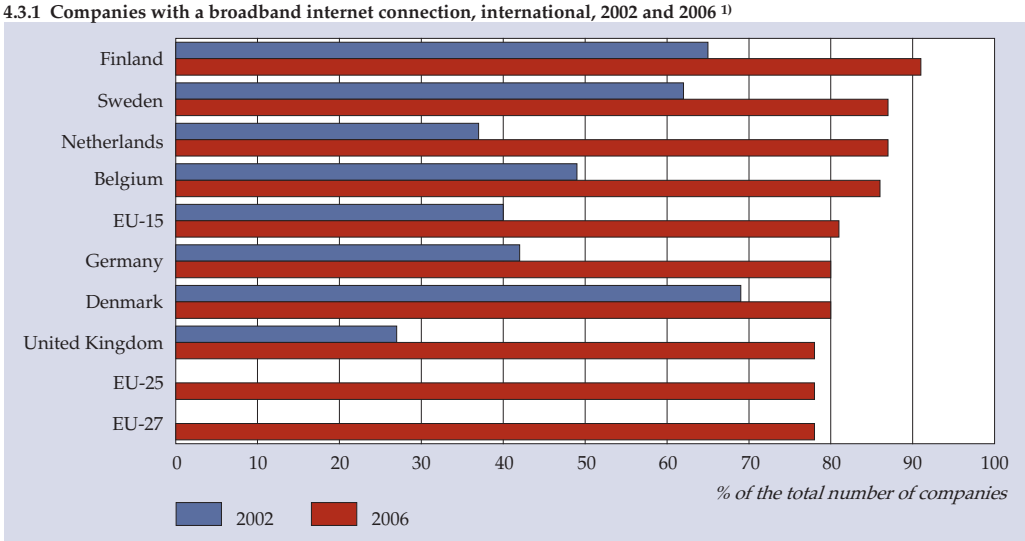
Source: Optaros, 2005. The growth of Open Source Software in Organizations. Optaros research report. www.optaros.com

was most commonly used by computer service bureaus, telecom and research and development. This indicated that general as well as ICT knowledge play a key role in the choice for open source operating software. Gaining know-how and experience with the use of open source software may also have determined its actual use.

4.3 *External data communication*

One step further than the use of ICT within a company is the use of ICT for communication with others (external data communication). We mentioned earlier that almost all companies in the Netherlands have internet access. This makes the internet the dominant electronic network for companies and the rest of society for all kinds of applications. Most companies have broadband internet, which facilitates the use of advanced applications requiring some bandwidth. For instance, broadband allows users to download information in large files, to use audio or video files on websites, and to make large quantities of information available. The internet is also used for on-line purchases and sales (e-commerce) with or without the option to pay online. Such facilities can be offered and used more easily as the available bandwidth increases. Figure 4.3.1 illustrates that broadband internet was widespread among companies in the Netherlands by December 2006. In 2002 the Netherlands was not among the top, like the Scandinavian countries, but in the end got to the same level. However, it lacks the experience with large scale broadband applications for the same length of time. After all, in 2002 only a third of the companies had broadband internet, which at the time was below the average of the EU-15.

4.3.1 Companies with a broadband internet connection, international, 2002 and 2006 [1)]



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

Source: Eurostat.

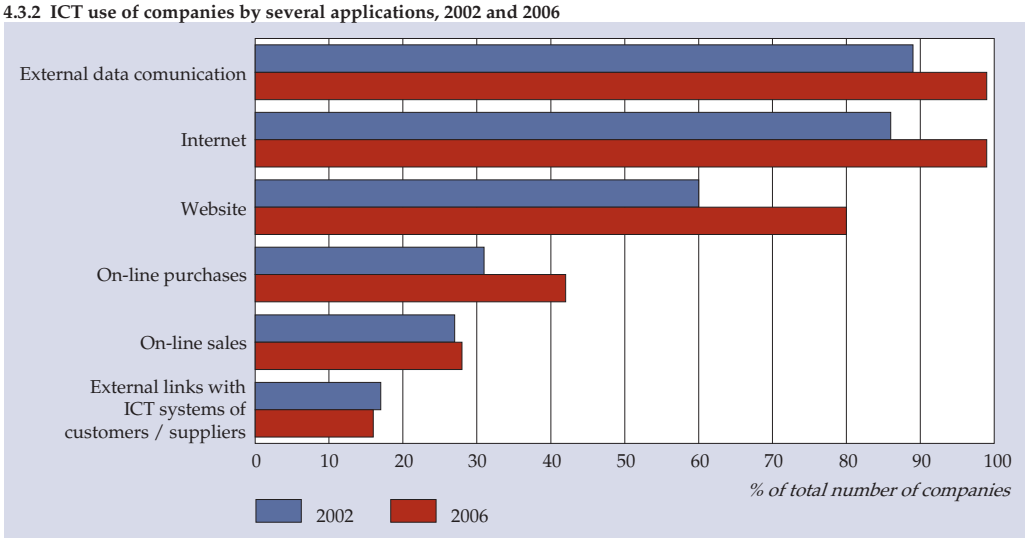
Intensity of ICT use up

Figure 4.3.2 uses a limited number of indicators to illustrate the development of the use of ICT in the Dutch business sector. In the Netherlands companies already used electronic data communication in the nineties. This was mainly done with 1-on-1 networks or 1-on-n networks; a company could communicate with one other company or with more companies. The latter could not necessarily communicate among themselves. Internet technology made n-on-n networks possible; and when an individual user has access to the internet, he or she can communicate with all other internet users and vice versa. So within a decade almost all companies in the Netherlands hooked up.

At first this was often as passive users, using the facilities offered by others rather then providing facilities of their own. However, by December 2006 most companies provided their own facilities on the internet (website), which made the network immeasurably more useful.

The facilities on offer vary widely. For example, in December 2006 people could order online in less than a third of the companies with internet online. Getting information through the internet was very common. An even more advanced application is linking one's own computer systems with those of others. This is still in its first stages. The general trend is that advanced use of internet network is on the up as is the number of users. It must be said that not all applications will necessarily be adopted by all companies. This probably won't be the case with external links, for example.

4.3.2 ICT use of companies by several applications, 2002 and 2006



1) Companies with 10 or more employed persons.

Source: Statistics Netherlands, ICT use by enterprises 2006.

Few companies with external links

Linking an order processing system with a computer system of a client or supplier is not as common as linking internal computer systems. This may be because linking systems within a company is easier, both technically and in terms of organisation. It doesn't require negotiations and deals with external parties. In some companies or sectors the production and distribution process is such that working closely with suppliers is mutually beneficial. Then it may be a good idea to invest in a common computer system, or in an application that enables online communication.

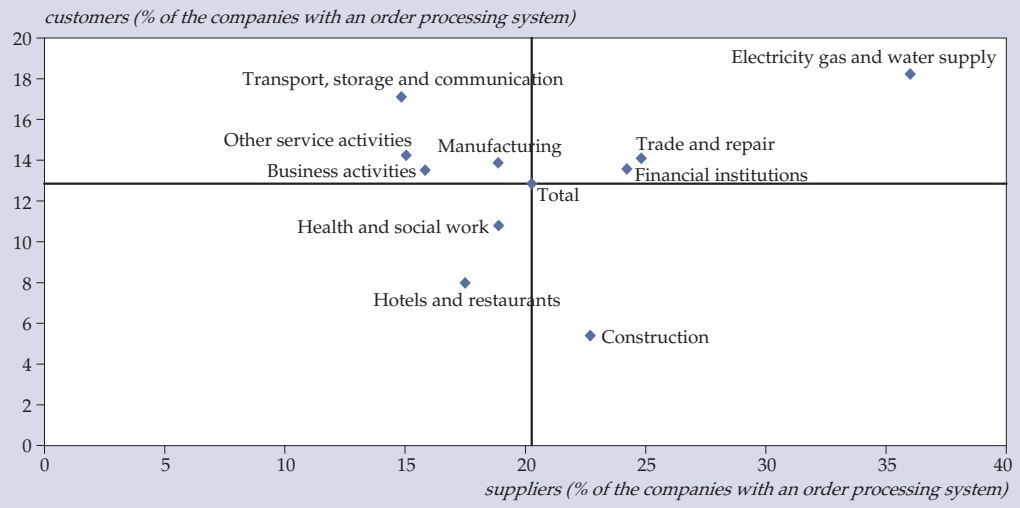
Figure 4.3.3 shows that a link with suppliers (20 percent) is more common among companies than a link with client systems (13 percent). There are some differences between the sectors on this point. The emphasis in construction is on linking with systems of suppliers, while in business and other services and in transport, storage and communication the emphasis is on linking with client systems. The energy and water companies, the financial institutions and trade and repairs are above average in both.

In figure 4.3.3 the share of companies with external links is expressed as a percentage of the number of companies with order processing systems. It concerned about two thirds of all companies. So the total number of companies with external links is still rather small (see also figure 4.3.2).

On-line invoices

New software systems make it easier to keep client data and use it for marketing, or to coordinate planning, production and logistics better. Another new development

4.3.3 Companies whose order processing system is linked to ICT systems of suppliers or customers, 2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprises 2006.

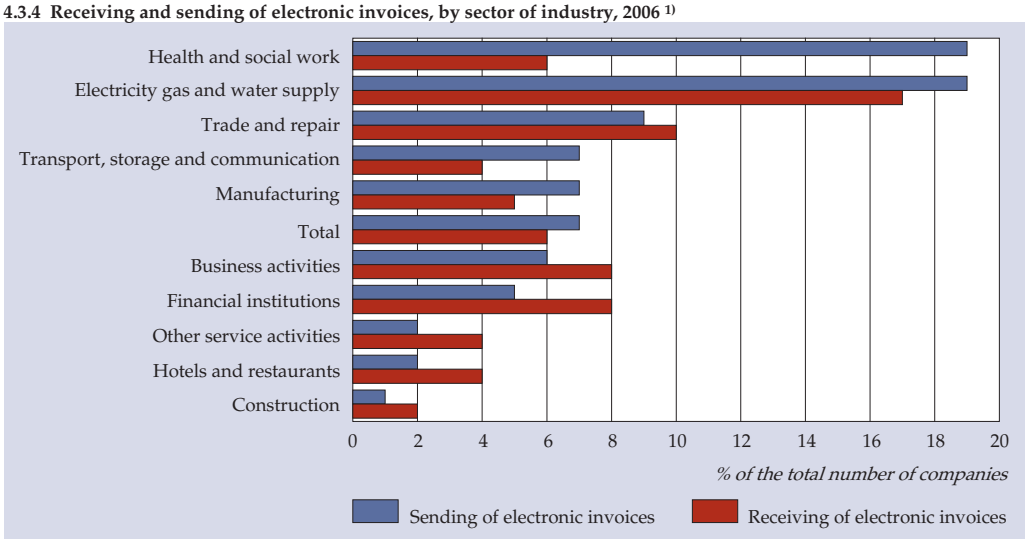
is e-invoicing, where invoices are not only sent and received on-line, but also processed electronically.
In 2006 about 7 percent of the companies sent their invoices on-line; 6 percent of the companies received them (and could process them on-line). The larger the company, the larger the share that could send and receive invoices on-line.

Figure 4.3.4 shows that some sectors distinguish themselves mainly by sending invoices, such as in health care and social work and in transport, storage and communication. Business services, financial institutions, and hotels and restaurants and construction received more on-line invoices than they sent out themselves.
Using on-line invoices depends on the place of an individual company in the production and distribution chain, the frequency of payment and the number of regular suppliers or clients. A habit of paying regular clients or suppliers frequently makes it a sensible decision to switch to on-line invoices. Trade and repairs are different in the way they send and receive on-line invoices. It seems to be an example of a distribution chain with frequent deliveries of goods and services and subsequent payments between producer, wholesale and retail trade.

Secure on-line communication

As the use of electronic networks and the number of advanced applications, such as on-line buying and selling, on-line payment and invoicing increases, security also becomes more important. The use of anti-virus software and a firewall is common among companies (CBS, 2006). Secure on-line communication with others, however,

4.3.4 Receiving and sending of electronic invoices, by sector of industry, 2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprises 2006.

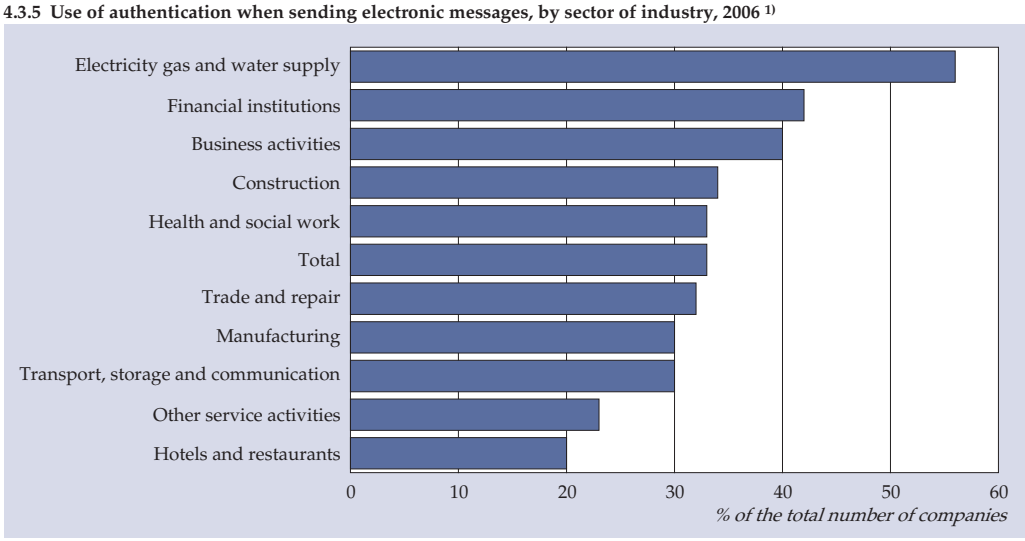
requires stringent measures. Parties who buy or sell through the internet, and who pay and exchange information must be able to trust that these deals are legally valid and reliable, just like in the non-virtual world. Further developments in on-line business depend on the successes in these areas. The internet still seems to have an image problem as far as security and reliability goes. There must be some technical solutions. And companies must be willing to actually implement measures to make on-line data exchanges more reliable. In the survey we asked companies if they used the following two security measures; (1) authentication when sending mails (2) secure protocols when receiving orders through the internet.

Authentication

Authentication is about guaranteeing the identity of the sender, so the receiver of the message knows who it is from, and also that the sender has the authority to do what he or she is doing. This is important for the legal validity of the on-line transactions or information provided. The most well-known example of an authentication is the digital signature. By December 2006 one in three companies indicated that they used such means of authentication. The share varied from 31 percent among small companies (10–19 employees) to 44 percent among large companies (over 500 employees). Authentication was used most by, energy and water companies, business services and financial institutions.

The other services sector and hotels and restaurants were a bit behind in this area. Apart from the energy and water companies there wasn't a single sector where the majority of companies indicated they used authentication in sending mails.

4.3.5 Use of authentication when sending electronic messages, by sector of industry, 2006 [1)]



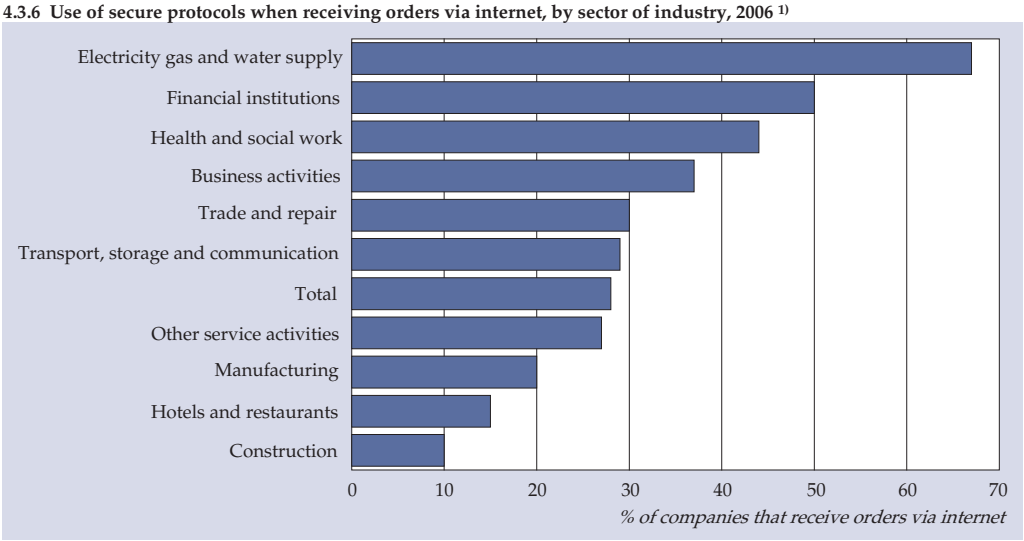
[1)] Companies with 10 or more employed persons.

Source: Statistics Netherlands, ICT use by enterprises 2006.

Secure protocols

Secure protocols involve the use of a secure web server that creates a secure internet environment during the on-line data exchange. This is made from protocols such as Secure Socket Layer (SSL) or the more recent TransportLayer Security (TLS). Both are examples of encryption protocols that secure communication via internet. The information is encoded and encrypted. It is decoded again at the other end, so that the original information becomes available again (decrypting). The person placing the order or making the on-line payment doesn't have to worry when these transaction are carried out with such protocols. However, by the end of 2006 a minority of the companies, in fact just 28 percent, used these secure protocols; only the majority of energy and water companies and financial institutions used them. The smallest numbers of companies using these secure protocols were in manufacturing, construction and hotels and restaurants. Here too was a positive correlation with company size: the larger the company, the higher the probability that secure protocols would be used. This probability was 22 percent for small companies and 68 percent for large companies.

4.3.6 Use of secure protocols when receiving orders via internet, by sector of industry, 2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprises 2006.

4.4 E-commerce

One specific use of on-line networks is on-line ordering of goods and services: the actual transaction. This already took place among companies before the internet era, but then it went through networks in which the companies involved had specially invested and which could only be used by these companies. Internet technology

lowered the access for everyone and technically speaking everyone can order goods and services on-line. Also consumers who were not in the picture before.
The importance of ICT and on-line networks for productivity in a country cannot be fully measured by the volume of on-line purchases and sales by companies. The restructuring of the processes in the total production and distribution chain is probably more important. Many business processes can be made more efficient with ICT. The efficiency gain can be realised without transactions being on-line. The transaction is just at the end of a process that primarily involves the exchange of information. But the number of companies concluding on-line transactions, and the value of these transactions, are good indications of how e-commerce is developing in a sector or country.

Non-internet networks still exist

Various networks can play a role. Companies usually receive orders through internet networks (26 percent). But there are still other networks, not based on internet technology. In 2006 about 4 percent of the companies used such networks to receive orders electronically, usually in manufacturing, trade and repairs and

Table 4.4.1
On-line purchases and sales by businesses by type of network, 2006 [1)]

	On-line sales		On-line purchases	
	Internet	Other networks	Internet	Other networks
	%			
Total	26	4	40	3
Sector of industry				
Manufacturing	32	6	38	2
Electricity gas and water supply	27	2	39	0
Construction	14	0	32	0
Trade and repair	31	8	44	7
Hotels and restaurants	31	1	36	2
Transport, storage and communication	36	10	33	4
Financial institutions	31	5	41	3
Business services	22	2	45	1
Health, education, welfare	13	1	41	2
Other services	20	1	43	1
Company size				
10– 19 employed persons	26	2	38	2
20– 49 employed persons	25	5	40	2
50– 99 employed persons	28	10	43	6
100–249 employed persons	30	14	48	8
250–499 employed persons	26	16	55	9
500 and more employed persons	29	17	58	15

[1)] Companies with ten or more employed persons.

Source: Statistics Netherlands, ICT use by enterprises.

transport, storage and communication. These other networks are clearly still used quite often by large companies, which is logical because they invested a great deal of time and money in them, they are still working, and they don't have the security problems of the internet.
In electronic purchasing, companies make less use of the non-internet networks (3 percent of the companies). Four in ten companies place orders through the internet. The use of these other networks has been stable for a while. The growth of the number of companies buying and selling on-line is mainly due to internet. Companies that start buying and selling on-line now are not likely to invest in a network that is not based on internet technology.

More on-line purchases and sales

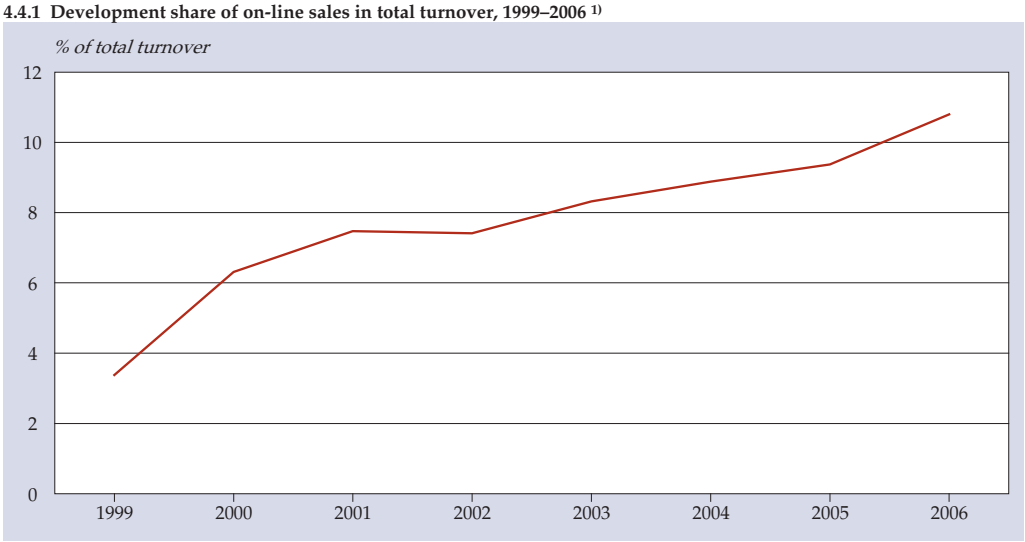
About 28 percent of companies received orders on-line in 2006. This share has increased slightly in recent years, but not very fast. But not all companies will have to offer this facility in the end. Table 4.4.2 illustrates that the value of the on-line transaction is rising. Of the 20 percent of the companies who sold on-line in 2003, 54 percent indicated that such sales constituted 5 percent or more of the total turnover, versus 68 percent in 2006. This increase was manifest in all sectors and company sizes, except really large companies where the share got stuck at 61 percent. Assuming that the value of an order stayed the same on average, this means that there were more on-line transactions.
A similar picture emerges in on-line purchasing: an increase in the number of companies purchasing on-line and an increase in the purchase value of these on-line purchases. In 2003 45 percent of the on-line buyers indicated that this involved more than 5 percent of the total purchasing value; in 2006 this went up to almost 70 percent of the number of on-line purchasers. Here too the increase is across the board except for very large companies.

Turnover increase in e-commerce

The turnover companies made on-line rose from over 3 percent in 1999 to almost 11 percent in 2006. The number of transactions completed on-line must have increased as well. This is in line with one of the advantages of the use of on-line networks: lower transaction costs. The turnover indicates the growth of the turnover in e-commerce. However, the underlying fact that the number of electronically completed transactions is up determines the efficiency gain.

In figure 4.4.2 the average turnover in e-commerce is shown for two consecutive four-year periods. The average turnover from on-line orders increased in the period 2003–2006 in all sectors and size classes compared to the average from 1999–2002.
The highest turnover of e-commerce is in manufacturing. Lagging somewhat behind is the turnover of e-commerce in business services. This is because manufacturing has the longest tradition in receiving orders on-line, as do trade and repairs, as they already frequently used the older networks of the late 20th century (see table 4.4.1).

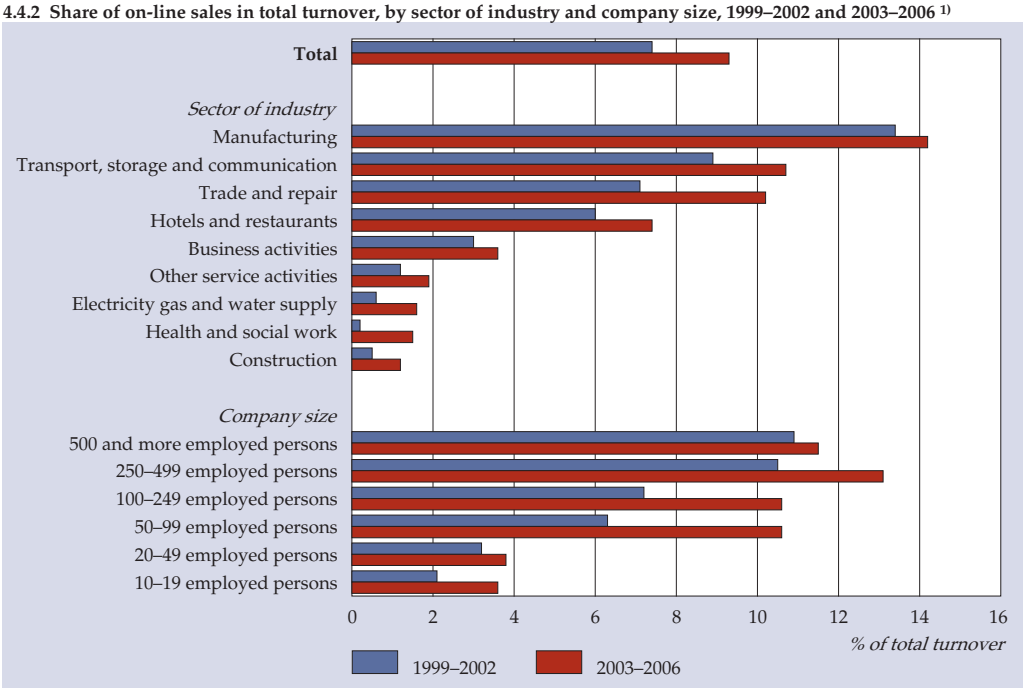
4.4.1 Development share of on-line sales in total turnover, 1999–2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprises.

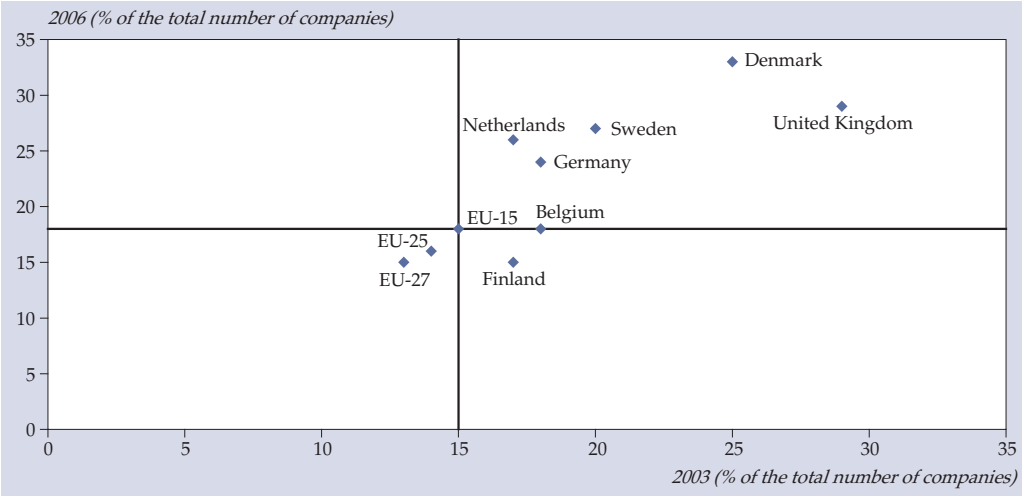
4.4.2 Share of on-line sales in total turnover, by sector of industry and company size, 1999–2002 and 2003–2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprise.

4.4.3 Companies selling on-line, international, 2003 and 2006 [1) 2)]

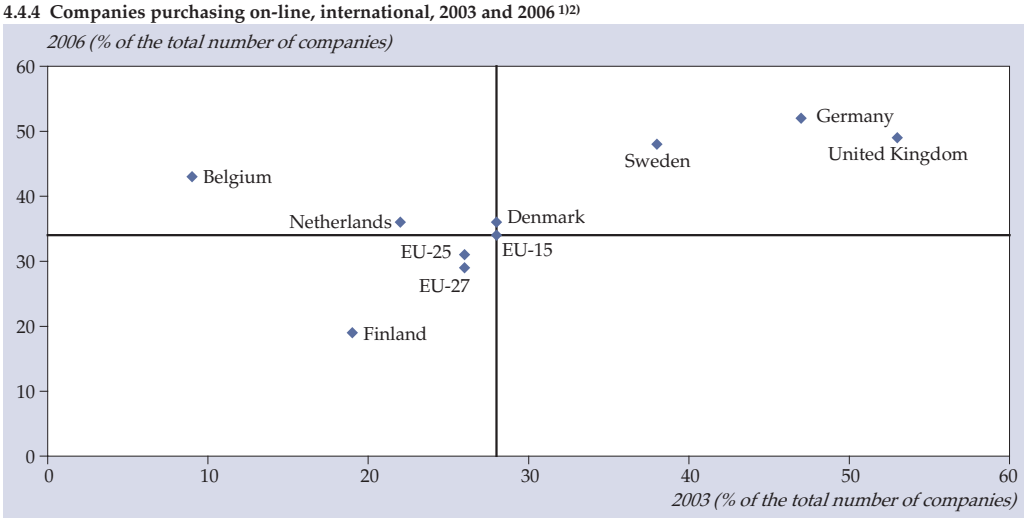


[1)] Companies with 10 or more employed persons.
[2)] On-line selling of one percent or more of the total turnover of the company.

Source: Eurostat.

These are the networks that contribute so much to the total turnover of e-commerce; the larger transactions are completed through these networks. Developments of e-commerce in business services only started with the arrival of internet technology.

4.4.4 Companies purchasing on-line, international, 2003 and 2006 [1)2)]



[1)] Companies with 10 or more employed persons.
[2)] On-line buying of one percent or more of the total purchases of the company.

Source: Eurostat.

The average turnover from e-commerce is substantially higher in large companies than in small ones. The turning point lies at 100 employees. But the turnover of e-commerce was growing fastest in medium-sized companies during the two periods considered here.

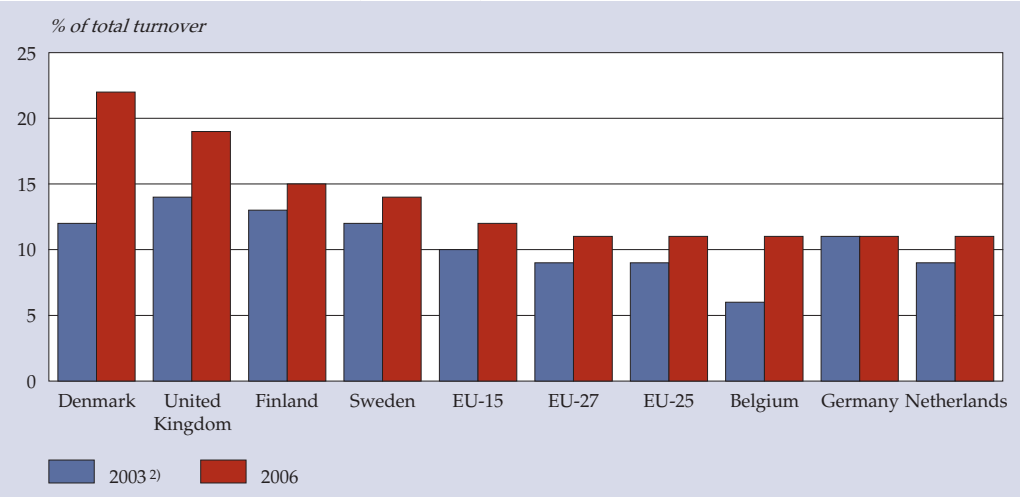
International

In comparison with companies from other EU countries, companies in the Netherlands performed above average in on-line purchases and sales.

In 2006 this was even more true than in 2003. As far as the share of companies selling on-line is concerned the Netherlands performed slightly above average in 2003: but Belgium and Germany were ahead. In 2006 the share was well above the EU-average, so the Netherlands caught up with Belgium and Germany. Denmark and the UK were well ahead of the other countries in both years. On-line purchases by companies in the Netherlands were below the EU average in 2003, but in 2006 they were just above the average. However, companies in the Netherlands were behind the companies in the countries shown in the upper right quadrant: Sweden, Germany and the UK. These countries are at the top in 2003 and 2006.

The Netherlands is also a bit behind the best in the EU in terms of turnover in e-commerce, namely Denmark, the UK, Finland and to a lesser extent Sweden. The situation in 2006 was average and comparable with that of Belgium and Germany.

4.4.5 Share of on-line sales in the turnover, international, 2003 and 2006 [1)]



1) Companies with 10 or more employed persons.
2) Sweden: 2002 instead of 2003. EU-15: 2004 instead of 2003.

Source: Eurostat.

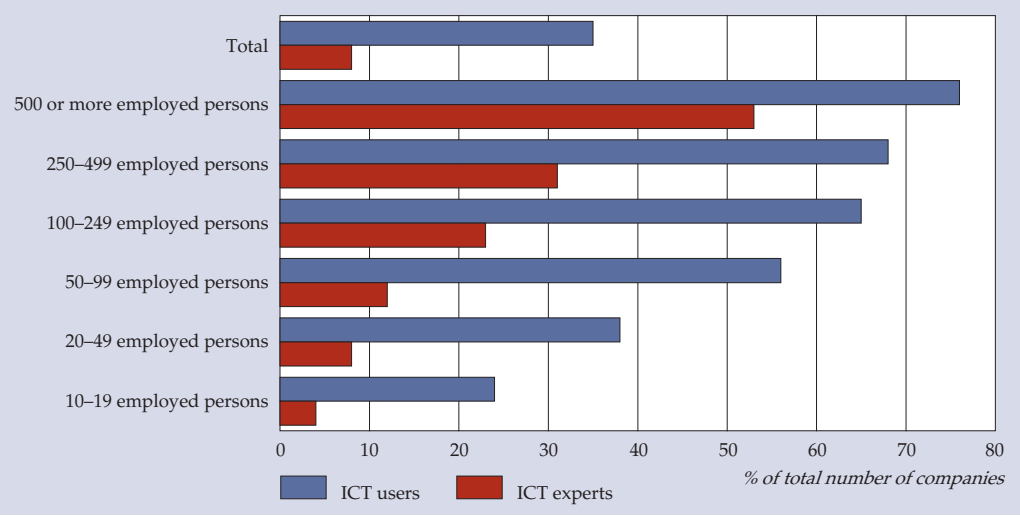
4.5 ICT know-how and skills

ICT is still a relatively new technology where not all possible applications have been exhaustively explored. This means companies face several strategic complications. Companies constantly have to make short and medium term decisions about the ICT policy they should implement. How, how much and when to invest in what technology or application? Or outsource? These decisions must be as profitable as can be, and decisions to invest are after all financial decisions that are influenced by numerous other factors. The first obstacles may be knowledge: the knowledge at the company level must be sufficient to be able to answer strategic questions. If this is available in-house, then implementing ICT often requires rather specialist ICT knowledge. If this is also available in-house, the rest of the current workforce may still cause a problem by lacking the necessary ICT skills.

Large companies employ and hire their own ICT experts more often

In 2006 about 8 percent of the companies hired or tried to hire ICT experts. ICT experts are people who can specify, design, develop, install, and manage ICT systems, including network management and evaluations. They are mostly hired by the larger companies. These companies also often employ their own ICT personnel. Over a quarter of all companies indicated they had their own ICT personnel. The percentage goes from 15 percent among the smallest companies to 85 percent among the largest. So, larger companies seem to have a higher turnover rate of staff. Over half of the major companies hired ICT experts in 2006 versus 4 percent of the small companies.

4.5.1 Recruitment of ICT experts and ICT users by company size, 2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprises 2006.

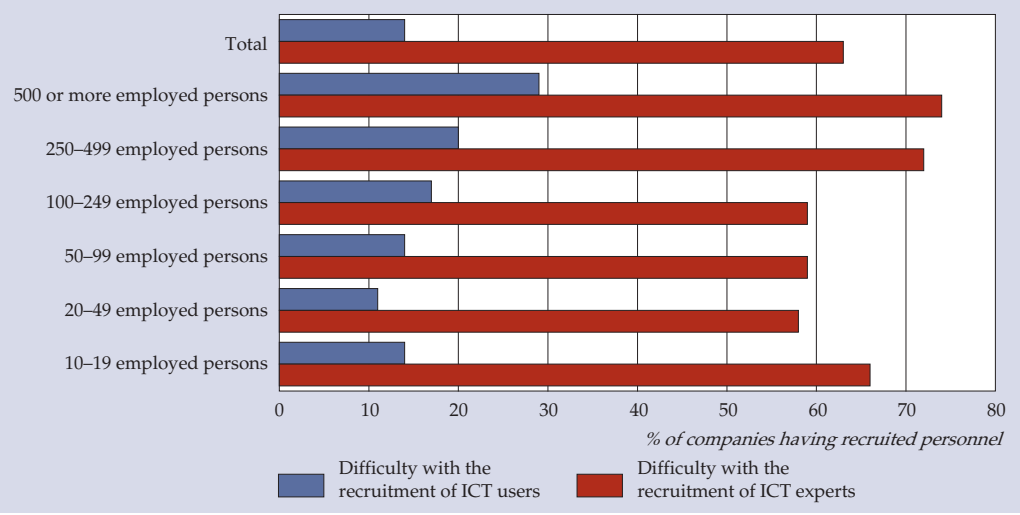
In figure 4.5.1 the other category of personnel are ICT users. These employees must fulfil specific requirements in ICT skills: people who regularly use standard or branch-related software to do their own work, so they must be able to work with it. In 2006 one in five companies hired personnel who had to meet these requirements, much more than the 8 percent of all companies in 2006 hiring ICT experts.
The employed labour force that had to have ICT skills was larger than the group of ICT experts at the end of 2006. This was shown by hiring, and underlined the importance of skilled ICT employees who do not obstruct the developments of the company in ICT.

Hiring ICT experts problematic

Figure 4.5.2 indicates that more companies had problems hiring ICT experts than hiring ICT users. This is the situation in 2006 and the outcome is undoubtedly influenced by the economic situation: the scarcity of ICT experts on the market (see also chapter 2). Several years ago the supply of ICT experts exceeded demand.
In 2006 most large and small companies had problems hiring ICT experts. The problems were greatest for large companies, which may well be because major companies have greater or more specialist demands than small companies.

Another striking outcome is that small companies had more problems hiring ICT experts than medium-sized companies. This may be due to the kind of ICT jobs small companies have to offer. The greatest problems occurred in financial institutions and health care and social work, where three quarters of the companies had such

4.5.2 Companies experiencing difficulties recruiting ICT experts and ICT users by company size, 2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprises 2006.

problems. Only a minority of the companies in construction and hotels and restaurants had problems hiring ICT experts. The differences between the sectors undoubtedly have to do with the degree of advanced or specialist use of ICT. Also one sector may be considered more attractive as an employer than another. In times of scarcity the unattractive ones have an extra hard time hiring ICT experts.

Insufficient ICT skills constitutes a major problem

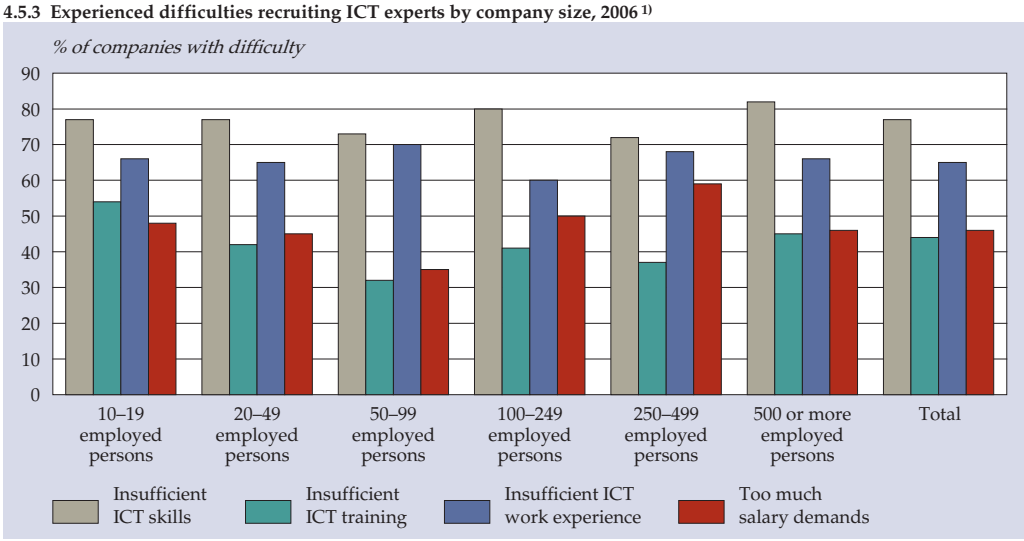
Exactly what are the problems companies experience in hiring ICT experts? Figure 4.5.3 shows the problems that were mentioned most often. Number one is lacking the required ICT skills; this is true for all company sizes. Second is the lack of relevant ICT working experience.

The ICT training seems to be less important in hiring ICT experts, which may mean that the ICT education is a good match with the skills required. It may also mean that such hiring problems referred to hiring experienced ICT experts who had been out of school for many years and that ICT skills and working experience played a larger role. A substantial number of employers complain about salaries being too high, but that is not the most common problem, also because there is a relation between salary and skills. If the skills are considered insufficient, the salary will quickly be considered too much. Outsourcing ICT work in or outside the Netherlands is a serious option to consider for companies (see chapter 2).

Investing in ICT courses for ICT users

One option for a company or employer is to improve the ICT skills of the current workforce and invest in training and courses. This issue is also addressed in chapter 2.

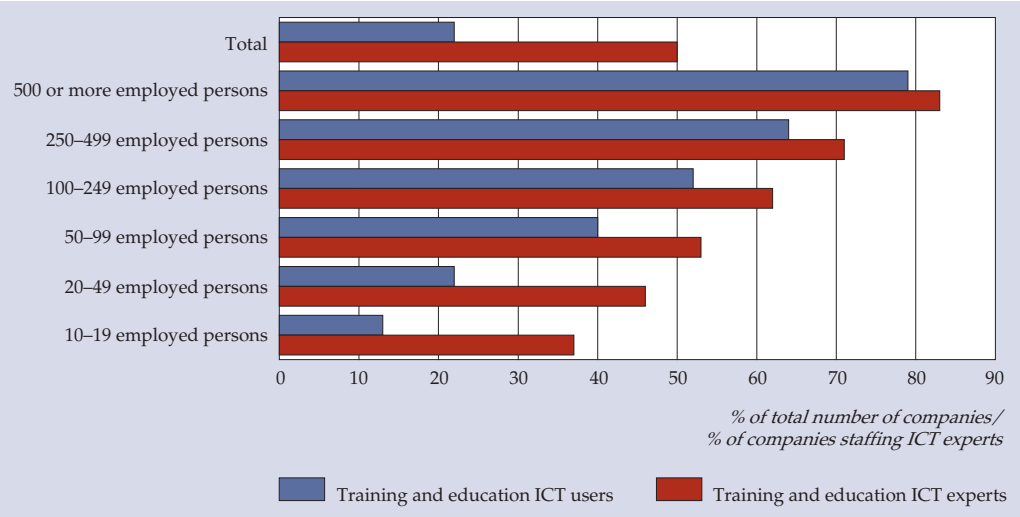
4.5.3 Experienced difficulties recruiting ICT experts by company size, 2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprises 2006.

4.5.4 Companies investing in training and education of ICT experts and ICT users, by company size, 2006 [1)]



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

Source: Statistics Netherlands, ICT use by enterprises 2006.

In figure 4.5.4 we distinguished in investing in training and education of ICT experts and of ICT users. Expressed as a percentage of the total number of companies, companies invested more in ICT users than in ICT experts. This is partly because there are more companies that have employees who use ICT than companies that have their own ICT experts. In 2006 more than one in five companies reported offering extra training to ICT users, ranging from 13 percent among small companies to 79 percent among large companies. Investing in training and courses for users is quite understandable since this often involves a large group of employees which makes the investment worthwhile right away.

Furthermore not all ICT users with fewer skills can be exchanged for employees that are more highly skilled in ICT: employers have to invest in the ICT skills of the current work force. The ICT skills of the Dutch population are not exactly among the European top; more about this issue can be found in chapter 6.

Much additional training for ICT experts

About 14 percent of all companies offered their own ICT experts the opportunity to take more courses in 2006. At first sight this percentage does not seem as big as that of the corresponding offer to ICT users. However, when correcting for the number of companies that do not employ ICT experts, and hence can't offer these courses to anyone, we get a different picture. Figure 4.5.4 shows the corrected percentage, where half of the group invested time and money in extra training for ICT experts. This varied from a third in small companies to over 80 percent in large companies.

Given the problems companies have in hiring ICT experts, it is not surprising that companies from huge to tiny ones invest in ICT know-how. There is also an objective reason: ICT develops at a rapid pace, so without additional courses people wouldn't know about new possibilities so new applications could not be implemented.

The risk of investing just in one or a few ICT experts is that they may leave the company and their know-how and skills may benefit others rather than the company that invested in them. This risk can be reduced by including clauses in the contract that fees have to be paid back if the employee leaves within a certain time.

5. ICT use in the public sector

Government uses ICT on a large scale in its services to the public, companies and within government. This contributes to a transparent, efficient government. This is called e-government. Dutch e-government performs above the European average.
By December 2007 over two thirds of all government services were available on-line. For example: in the Netherlands over 6 million DigiD's were activated and population registers called primary administrations are being developed.
Apart from this general, positive image, there are differences between the layers of government. Municipalities, waterboards and the police were not yet very advanced in their on-line services to the public, provinces, municipalities and the waterboards were lagging behind in their on-line services to companies. There are also differences between the provinces: the best on-line supply of municipal services was in the provinces South Holland and Overijssel, the least in the provinces Limburg and Zeeland.

In the education sector, ICT is mainly used to make education more attractive, to create a richer learning environment, and to stimulate independent learning. The Dutch education sector lags behind that of highly developed nations in various areas of ICT. Dutch education has a shortage of computers, internet connections and software, and the quality of the means leaves much to be desired.
Health care and social work in the Netherlands are not the most advanced in ICT investments, although the investments went up in recent years. Worldwide, governments recognise that ICT can raise the effectiveness and efficiency in care. The focus is on strengthening the patients' own responsibility, and on realising standards for exchanging secure data.
The on-line patient dossier is a key instrument in improving security in care. It may be possible to avoid mistakes with medication when an on-line dossier is created based on specific software. On 1 January 2009 the law on on-line patient dossiers will come into force.
In Dutch health care and social work 55 percent of the people employed regularly used computers at work in 2006. In health care this was considerably higher than in social work. The same is true for internet use.

5.1 Dutch e-government

The Dutch government has set itself the goal to make use of ICT, mainly internet, on a large scale in its services for citizens, companies and within government. This will contribute to transparent, efficient government. Many services of the government include gathering, processing, storing and supplying information to the public and companies.
Most information can be stored and made available in digital form. This offers government the opportunity to provide information and services on-line, varying

from publishing existing legislation and regulations on the internet to practical applications such as on-line applications for records from the population register. E-government may also have great advantages for the users, since government information and services are available on-line 24 hours a day.

The government aims to make more information and services available on-line. Also the government seeks to reduce the administrative burden for the population and companies by gathering the information it needs to carry out its task efficiently by stimulating the population and companies to supply such data on-line.
Worded in a somewhat visionary manner, the administration will function as a big computer where everyone can find the necessary information and services and supply the information required.

The digital progress in government services may also produce productivity gains in government itself: more services for the same price or the same services for a lower price. In the box below we show that public administration and compulsory social security make up more than 6 percent of gross domestic product (GDP). This is more important economically than most branches of industry.

Key figures on the government

The 'sector of industry' public administration and compulsory social security represented over 6 percent of the gross domestic product and employment in the Netherlands in 2006. This is comparable with the share of the sectors construction and transport, storage and communication, but significantly higher than the contribution of the chemical industry or the supply of gas, water and electricity to the economy.

Public administration and social security consists of several layers, ranging from central government to municipalities, and government services ranging from public administration to the fire brigade.
Compared to 1995 the share of the sector public administration and compulsory social security in GDP and employment decreased slightly. The share in intermediate consumption and investments, however, did increase over the years. The government is a major investor.

In 2006 12 percent of all investments were made by the government. About 8 percent of the total remuneration of employees consists of remuneration for government employees. This is high compared to other economic variables. Labour is the main production factor of the government: 70 percent of the value added of the government consists of the remuneration of employees. For the economy as a whole, this share would be over half.

The paragraph on e-government mainly focuses on the use of ICT and the internet by government to improve its services to the population and the business community. Given the amount of money spent on government tasks, efficiency gains in this area could save substantial amounts of money.

Key figures government

	1995	2000	2005*	2006*
	million euro			
Government [1]				
Production value	29,527	37,452	50,066	51,603
Intermediate consumption	11,365	15,038	21,723	22,910
Gross value added	18,162	22,414	28,343	28,693
Employee compensation	12,944	15,946	19,780	19,807
Investments	6,092	9,585	12,277	12,673
	full-time equivalents (x 1,000)			
Employees	368	386	394	398
	%			
Share in the total economy				
Production value	5.1	4.6	5.2	5.1
Intermediate consumption	3.8	3.5	4.3	4.2
Gross value added	6.6	6.0	6.3	6.1
Employee compensation	8.3	7.5	7.8	7.5
Investments	9.6	10.5	12.7	12.0
Employees	6.4	5.9	6.1	6.0

[1] Goverment is defined as public government and social security. In fact the SBI 75 from the SBI93 (standard industrial classification) excluding Defence (SBI 7522).Goverment also excludes subsidised education and health and social work.

Source: Statistics Netherlands, National accounts.

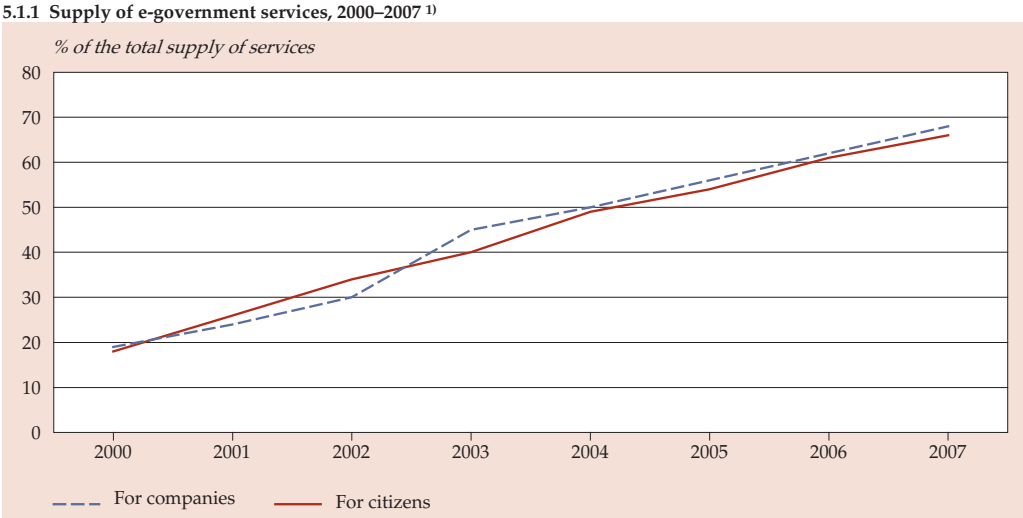
E-government services on the increase

In 1998, the Dutch government set itself the target to have at least a quarter of all government services available on-line in 2002. [1] This target was met in 2001. The next target was that at least 65 percent of all government services should be available on-line by 2007. This target was also met: by December 2007 66 percent of the government services for the population and 68 percent of the government services for companies were available on-line. [2]

Figure 5.1.1 shows the supply of on-line services in Dutch government as a whole. We distinguish the following government layers when listing the supply of on-line services:
– local level: municipalities;
– regional level: provinces, waterboards, police;
– national level: ministries, autonomous government bodies.

Municipalities, water boards and the police just failed to meet the 65 percent target for services to the population, but the provinces were well over. In business services the provinces, municipalities and waterboards stayed below the 65 percent norm, whereas ministries, autonomous government bodies and the police went well over it.

5.1.1 Supply of e-government services, 2000–2007 [1)]



[1)] In 2003 the calculations have been adapted to comply with European standards. Therefore 2003 percentages are therefore not immediately comparable with those of previous years.

Source: Advies Overheid.nl.

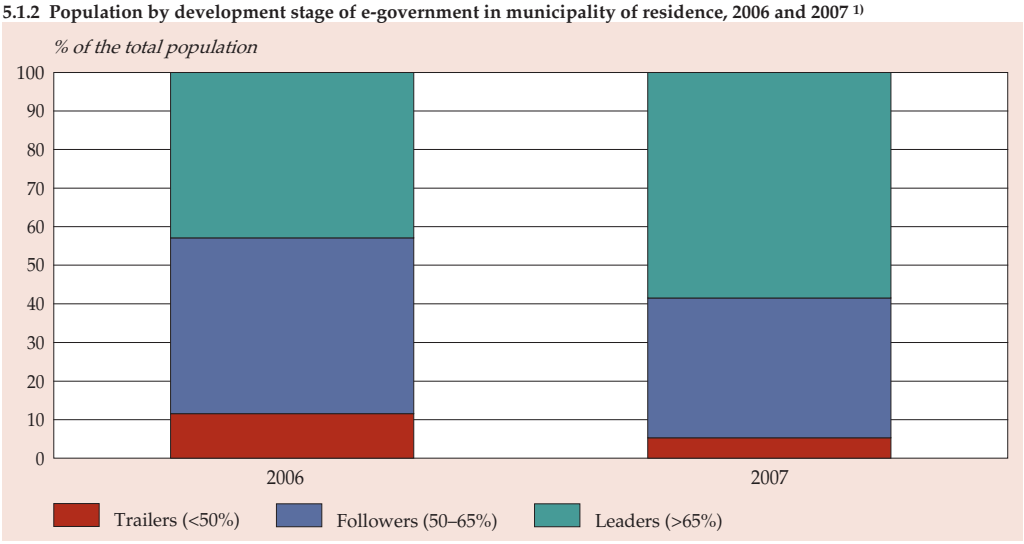
Figure 5.1.1 shows that the percentage of e-government services is growing steadily. By 2007 it was possible in many municipalities to look at the value of one's own home, report damage to parks, or to apply for a birth certificate.

More municipalities on-line

Municipalities are often the first point of contact with the government. A relevant question is which part of the Dutch population has access to the on-line services offered by the municipalities. Figure 5.1.2 shows this. The total scores of the municipalities are divided into three groups: *'leaders'* (over 65 percent of the municipal services are on-line), *'followers'* (50–65 percent) and *'trailers'* (less than 50 percent). The score of each municipality is weighted with the number of its inhabitants.

The figure shows that by December 2006 some 43 percent of the population lived in a 'leading' municipality, whereas in 2007 this went up to 59 percent. The number of people living in a 'trailer' municipality fell sharply, although it remained some 870,000 citizens in 2007.

5.1.2 Population by development stage of e-government in municipality of residence, 2006 and 2007 [1)]



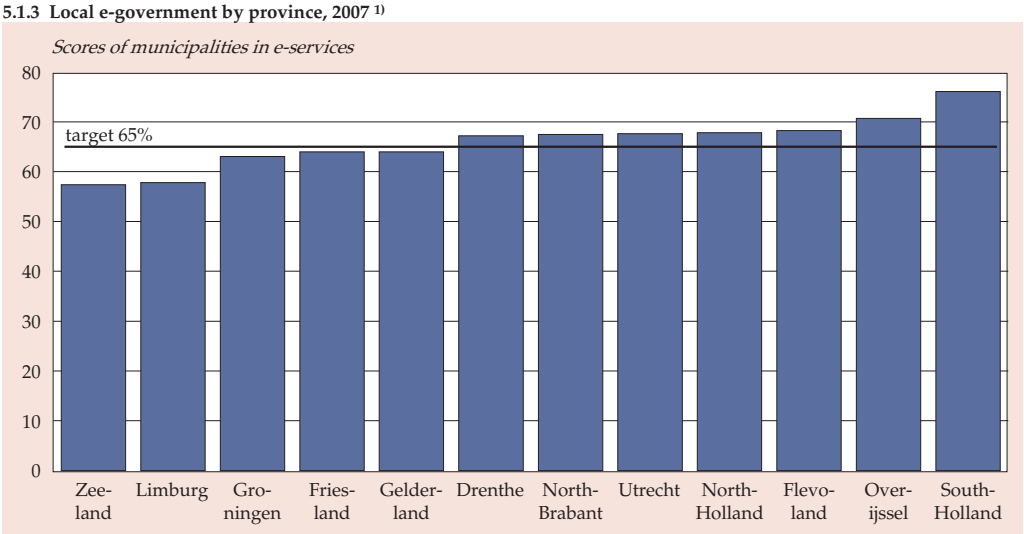
1) Scores of municipalities on e-services weighted by the number of inhabitants.

Source: Overheid heeft Antwoord.

Situation per province

Are municipalities in some provinces further with on-line services than in other provinces? The answer is given in figure 5.1.3. The greatest on-line availability of municipal services was in the province of South Holland (76 percent), followed by Overijssel (71 percent). The municipalities in Limburg and Zeeland (58 percent) came last.

5.1.3 Local e-government by province, 2007 [1)]



1) Weighted by the number of inhabitants.

Source: Overheid heeft Antwoord, Statistics Netherlands.

Large municipalities more advanced

The e-government services in the Netherlands have been measured since 2000 by people working for the ICTU programme *'Government has the answer'*. Once a year they summarize matters in the report *Overheid.nl Monitor*. Many of the figures presented in this paragraph came from their annual report on 2007. [3)] The monitor looks at all Dutch government bodies. Its priority is to map how advanced each body is in making e-services available.

The quality criteria set keep pace with developments. The monitor of 2007 looked at six aspects of e-government: Use van standards, transparency of information, general services, personalised services, interactivity and accessibility. Together these aspects made up a total score. The results for 2007 for municipalities are shown in table 5.1.2.

Table 5.1.1
Aspects of e-government, 2007

	Use of standards	*Public nature of information*	*General services*	*Perso-nalised services*	*Partici-pation*	*Acces-sibility*	*Total score*
	average score (0–100)						
Size of municipality							
< 10,000 inhabitants	13	40	54	22	10	64	36
10,000– 50,000 inhabitants	19	49	61	33	21	66	44
50,000–100,000 inhabitants	25	56	68	47	36	65	52
100,000–150,000 inhabitants	27	61	75	60	55	70	60
> 150,000 inhabitants	38	76	82	74	82	68	71

Source: Statistics Netherlands and Overheid.nl Monitor.

Large municipalities are often more advanced in the introduction of e-government than small municipalities. This is probably because large municipalities employ more people and have more financial means available.

Mixed use by the population

In 2006, the University of Twente studied the use of Dutch e-government services by the population. [4)] The conclusion was that citizens were positive about on-line services by the government. The attitude was more positive for younger, more highly educated people and for people who are more used to computers and the internet.

About 71 percent of the Dutch internet users had used an on-line service of the government by 2006. They have mainly visited a government website, usually of one of the municipalities. Nevertheless the use of on-line services by municipalities is behind the use of national government services. It has been possible to file one's

income tax returns on-line for years at the tax authorities, for example; 46 percent of the population did so in 2006. The job exchange (CWI) reached over 88 percent of the unemployed internet users on-line with job information in 2006; the IB-Groep provided on-line information to 78 percent of the people requesting a scholarship.

The study also concluded that the public were unfamiliar with many e-government services. Few people knew that they can use the internet for all sorts of municipal services, such as having oversized garbage collected, applying for a building permit, registration of a change of address. About a third of the Dutch population could not be reached with e-services, mainly because these people did not have a computer with internet or did not use it. So a multi channel approach is necessary, meaning that government should also keep open the classical channels: telephone and office.

BurgerServiceCode

The BurgerServiceCode (BSC) is a charter to guide government-citizen interaction. The charter, winner of the European e-Democracy Award 2007, was developed by an independent forum Burger@Overheid.nl and consists of ten principles. The forum is an initiative of the Ministry of the Interior and consists of six representatives of citizen interest groups, such as the National Ombudsman and the Consumentenbond. The forum encourages the government to focus on the citizen and to stick to the BSC. The ten standards are:

1. *Choice of Channel*
   As a citizen I can choose for myself in which way to interact with government. Government ensures multi channel service delivery, i.e. the availability of all communication channels: counter, letter, phone, email, internet.
2. *Transparent Public Sector*
   As a citizen I know where to apply for official information and public services. Government guaranties one-stop-shop service delivery and acts as one seamless entity with no wrong doors.
3. O*verview of Rights and Duties*
   As a citizen I know which services I am entitled to under which conditions. Government ensures that my rights and duties are at all times transparent.
4. *Personalised Information*
   As a citizen I am entitled to information that is complete, up to date and consistent. Government supplies appropriate information tailored to my needs.
5. *Convenient services*
   As a citizen I can choose to provide personal data once and to be served in a proactive way. Government makes clear what records it keeps about me and does not use data without my consent.
6. *Comprehensive Procedures*
   As a citizen I can easily get to know how the government works and monitor progress. Government keeps me informed of procedures I am involved in by way of tracking and tracing.

7. *Trust and Reliability*
   As a citizen I presume government to be electronically competent. Government guarantees secure identity management and reliable storage of electronic documents.
8. *Considerate Administration*
   As a citizen I can file ideas for improvement and lodge complaints. Government compensates for mistakes and uses feedback information to improve its products and procedures.
9. *Accountability and Benchmarking*
   As a citizen I am able to compare, check and measure government outcome. Government actively supplies benchmark information about its performance.
10. *Involvement and Empowerment*
    As a citizen I am invited to participate in decision-making and to promote my interests. Government supports empowerment and ensures that the necessary information and instruments are available.

Source: www.burger.overheid.nl

Over 6 million DigiD's

There were problems in the implementation of e-government that used to be solved simply in the old situation, but now require very specific technical solutions. One example is user identity. How does e-government know that the individual they deal with has the right to do what they are trying to do on-line? To solve this problem government started in 2003 with the development of DigiD. DigiD stands for 'digital identity' and consists of a user name and password. A citizen or company can use its own unique DigiD to communicate through the internet and conclude transactions with many government institutions. So it is unnecessary to log in repeating data for different government services: one set suffices. Government can check the identity of the user of its services. DigiD makes it unnecessary for each government body to develop its own authentication system, which renders government more efficient.

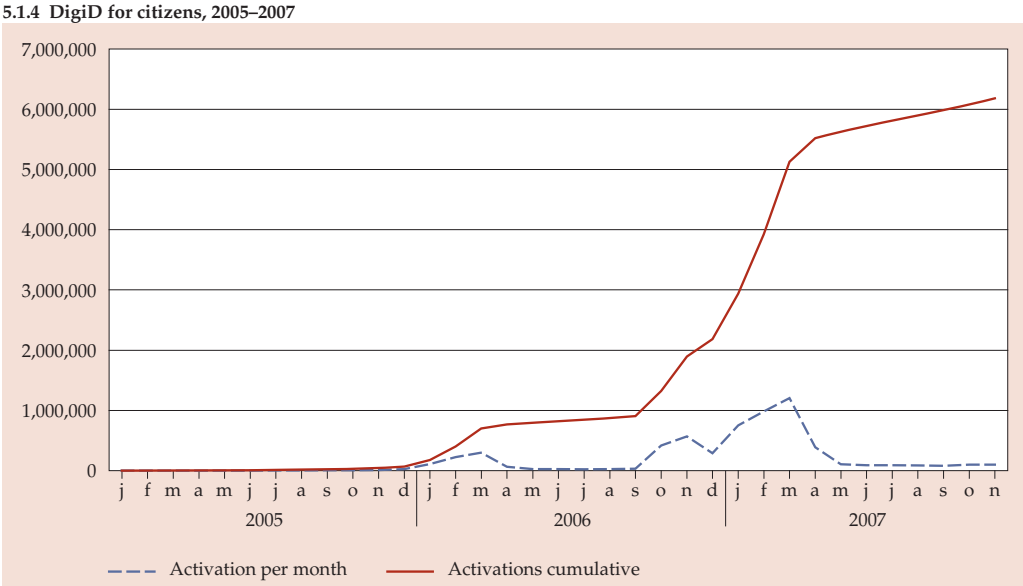
DigiD comes in 2 varieties: DigiD-burger and DigiD-bedrijf. Figure 5.1.4 shows the developments for the citizens DigiD-burger in the period 2005–2007. Obtaining a DigiD-burger takes 2 steps: a registration by the government and activating the DigiD log in code by the citizen. He or she then has to engage in an activity within 20 days or else the registration is void. The spring of 2006 and 2007 saw peaks in the number of registrations and activations, which has to do with the fact that DigiD is required to file income tax returns.

From 1 January 2005 to 1 December 2007 some 6,806,385 DigiD's were registered, and more than 9 in 10 were activated (9 percent were not).

Basic registers developed

Government has a great deal of information on Dutch society available. The data are stored in over 1,500 government bodies in about 30,000 national, provincial and

5.1.4 DigiD for citizens, 2005–2007



Source: GBO.overheid, Statistics Netherlands.

municipal systems. [5)] Many systems were developed independently and do not mix and match. Exchanging data is a difficult process which costs more time and money than necessary.

The government is improving this situation by developing a system of basic registers. The key information about Dutch society should be recorded in a limited number of registers, streamlining the processes for the exchange of data for policy, implementation and enforcement. The leading principle is that the population and companies only have to supply their data once. Government bodies therefore have to use these basic registers. The system will be introduced in the period 2007–2012.

In 2007 ten registers qualified as basic registers. The *Basis Gebouwen Registratie* (BGR) is the register for dwellings, the *Basisregistraties Adressen* (BRA) includes all addresses officially approved by the municipalities. The *Basisregistratie Kadaster* (BRK) is the land registers file on buildings in the Netherlands. The *Basisregistratie Waarde Onroerende Zaken* (BR WOZ) will include real estate values. The *Basisregistratie Inkomen* (BRI) will include data on income as developed and maintained by the tax authorities. The individual citizen will no longer have to supply income data to other government bodies. The existing municipal population registers were designated in 2007 as the *Basisregistratie Personen*. The new trade register (NHR) will include data on all companies and legal persons in the Netherlands, and will be maintained by the Chambers of Commerce, just like the current trade register.

Dutch e-government above the EU average

The European Commission instigated an annual website survey by Cap Gemini looking at the availability of on-line government services in the different EU countries. [6)] In 2007 the study looked at the websites of some 5,000 government bodies in 31 European countries, to see to what extent twenty selected government services could be used on-line. The study involved twelve services for the population, such as applying for a passport, and eight services for companies, such as applying for an environmental permit.

A new indicator was introduced in 2007: the level of sophistication of the e-services. This is a combined measure for how available and advanced the e-government services are. The levels of sophistication of the services were as follows:

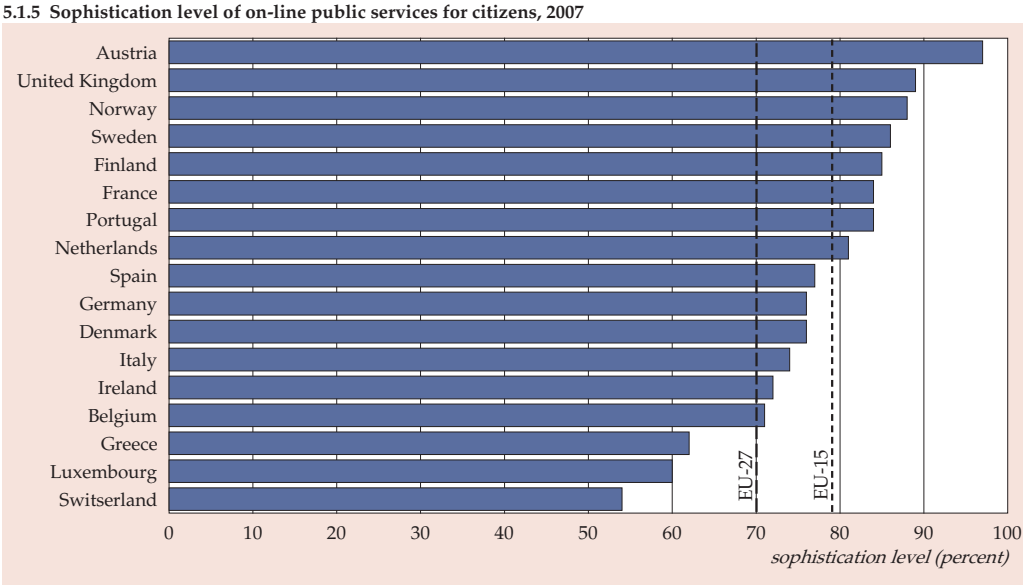
- Phase 0: Nil. The body has no website or the service is not mentioned on the site.
- Phase 1: Information. The website only provides information about the service.
- Phase 2: One-way interaction. The user can *download* a form but not return the completed form on-line.
- Phase 3: Two-way interaction. The user can return the completed form on-line.
- Phase 4: Transaction. The user can apply for a service and it is supplied on-line.
- Phase 5: Personalisation. Government is pro-active through the website. A form requested by the user already includes the known data, of a company receives a warning that the term of a permit is about to expire.

The researchers stated that it is not possible for all services to reach phase 5. Reporting theft on a police website stops at phase 3. The study took such limitations into account, and has off set the maximum phase possible against the current situation. In this way the extent to which the service can be provided on-line can be expressed as a percentage.

Figure 5.1.5 shows the on-line government services of the European countries to the population. In 2007 Austria had reached the highest level of sophistication with 97 percent, followed by the UK. The governments in Greece, Luxembourg and especially Switzerland (54 percent) ware not quite there yet. The Dutch government was somewhere in the middle with a level of 81 percent.

Figure 5.1.6 shows the level of sophistication of twelve selected on-line government services for the public in 2007 and compares it to the use the public made of the on-line government services in 2006. The Netherlands, Norway, and Finland were in the top right quadrant, where both use and level of sophistication are higher than the EU-25 average. There is usually a high correlation between the actual offer of on-line government services and the use people make of them: more availability means more use. In Luxembourg there were few on-line government services on offer, but they were frequently used. In Austria offered many on-line government services, but their use was rather limited. The governments in Italy and Portugal

5.1.5 Sophistication level of on-line public services for citizens, 2007

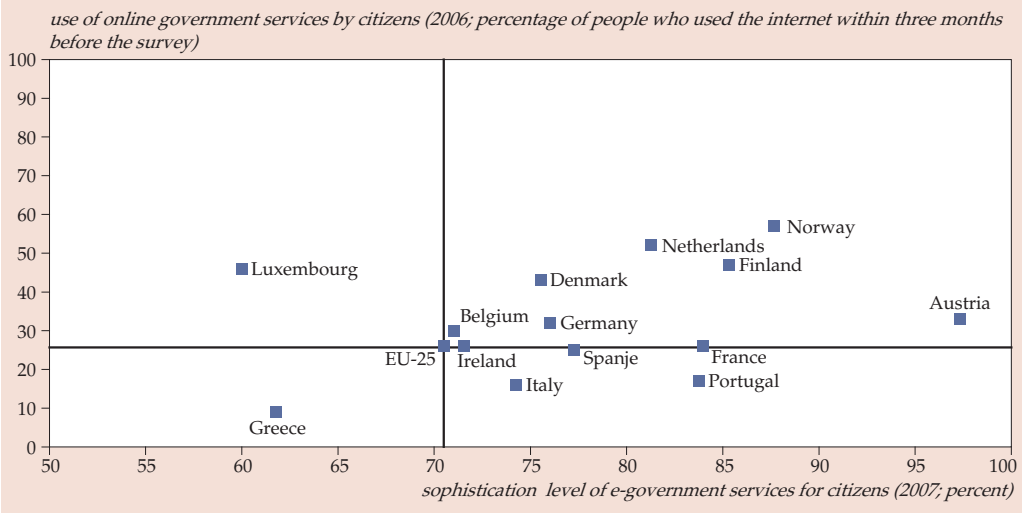


Source: Capgemini, 2007.

also had above average numbers of on-line government services, but they were not rewarded in the form of widespread use.

The figures are a bit distorted because the supply figures refer to 2007 and the use figures to 2006. This is because the use figures on 2007 were not yet ready by the time figures 5.1.6 and 5.1.8 were produced.

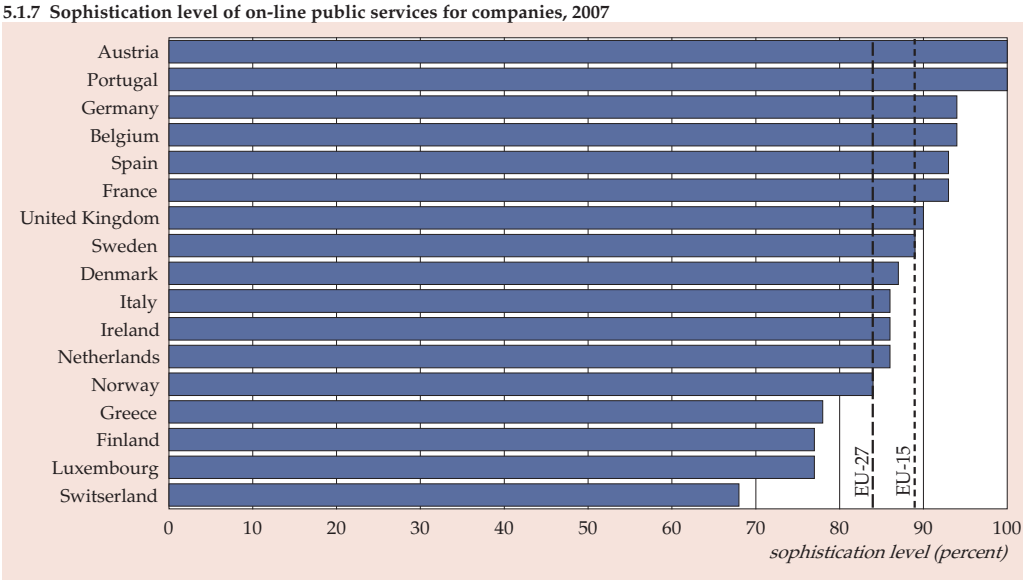
5.1.6 Supply and use of on-line public services, international, 2006–2007 [1)]



[1)] 12 selected public services surveyed in all countries.

Source: Capgemini / Eurostat.

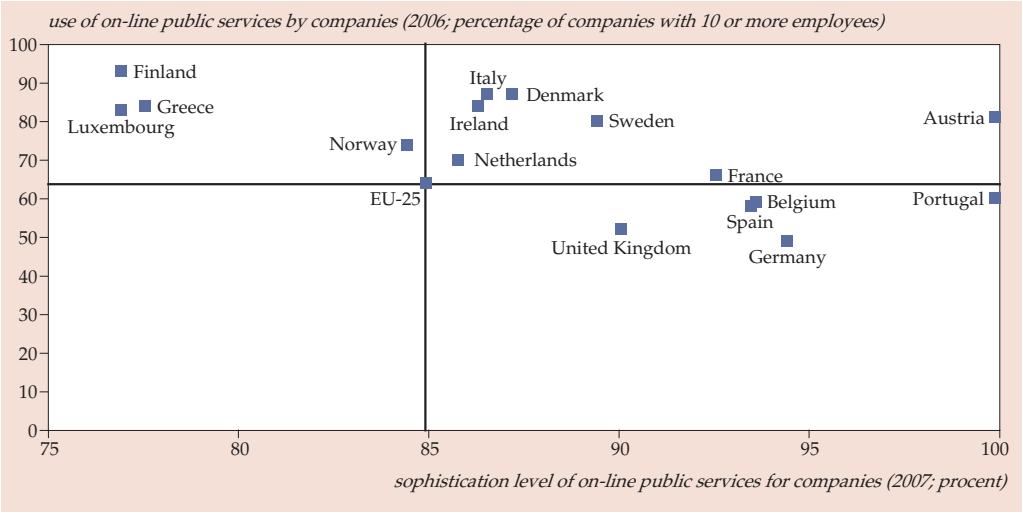
5.1.7 Sophistication level of on-line public services for companies, 2007



Source: Capgemini, 2007.

Figure 5.1.7 shows the progress European governments had made in 2007, according to Cap Gemini in on-line services for companies. Austria and Portugal scored the full 100 percent, while the Netherlands, with 86 percent, hugged the EU-27 average, but was behind its neighbours. Switzerland was again in the rear, as was the case with the services for the public.

5.1.8 Supply and use of on-line public services for companies, international, 2006–2007 [1)]



[1)] 8 selected public services for companies surveyed in all countries.

Source: Capgemini/Eurostat

In figure 5.1.8 the level of sophistication of the eight selected on-line government services for companies were compared to their use. The Netherlands again hugged the EU-25 average. In Portugal many advanced government services were on offer, but they were rarely used. The opposite was the case in Finland, Luxembourg and Greece where the services were not advanced, but intensively used.

5.2 ICT and education

This paragraph focuses on the use of ICT in education and on the ICT tools available. The Dutch data in this paragraph are based on the *Vier in Balans Monitor 2007* by Kennisnet. This monitor is not so much intended as an account of government policy, but rather to inform the schools about a balanced, sustainable integration of ICT. The four aspects in the title of the monitor are: 1) vision, 2) knowledge, attitude and skills, 3) programs and content and 4) ICT infrastructure. These building blocks have to be used in a balanced manner in ICT for educational purposes. The monitor only deals with ICT use in primary and secondary education; so we will limit ourselves to this as well in this paragraph. The monitor is useful because it includes many indicators that have been measured in comparable ways for several years.

Kennisnet is the public ICT support organisation for education by education. It represents the interests of the Dutch education sector in ICT, helps to choose between ICT products and services and provides education services and products to innovate learning. Stichting het expertisecentrum is another body dealing with ICT and education. Until the autumn of 2005 the Dutch Ministry of Education had an ICT directorate involved in a major project for ICT in education. Both project and directorate have been abolished. Kennisnet has taken on board many of the tasks of the ICT directorate. This was possible because ICT was successfully introduced in education.

This paragraph includes Dutch data from the monitor by Kennisnet and international data from PISA. The latter is an OECD study looking at the skills of 15-year-olds in math and science. One question in this study is about the number of available computers in schools and about shortcomings in ICT, which will be discussed at the end of this paragraph.

Key figures on education

Subsidised education in the Netherlands represented a gross value added of 20.7 billion euro in 2006. This is 4.4 percent of the total Dutch GDP, the same as in 2005 and just 0.1 percent point more than in 1995.

Personnel costs are the greatest costs in education. In 2006 over 5.2 percent of all employees in the Netherlands worked in education. Despite the shortage of teachers, this is relatively more than in 1995 when 4.8 percent worked in education.

Total expenditure on education in 2006 was almost 30 billion euro, or 5.6 percent of GDP. This is 0.2 percent point more than in 1995. It means that expenditure on education kept pace with the rest of the economy. The per capita expenditure on education in current prices increased from 1,076 euro in 1995 to 1,833 euro in 2006.

Key figures on education, 1995–2006

	1995	2000	2005*	2006*
	million euro			
Subsidised education				
Production value	14,612	19,253	25,279	26,343
Intermediate consumption	2,763	4,056	5,362	5,615
Gross value added	11,849	15,197	19,917	20,728
Employee compensation	10,354	13,398	17,593	18,308
Investments	1,690	1,442	1,868	2,040
	full-time equivalents (x 1,000)			
Employed persons	279	306	331	334
	%			
Share in the total economy				
Production value	2.5	2.4	2.6	2.6
Intermediate consumption	0.9	0.9	1.1	1.0
Gross value added	4.3	4.1	4.4	4.4
Employee compensation	6.6	6.3	6.9	7.0
Investments	2.7	1.6	1.9	1.9
Employed persons	4.8	4.7	5.1	5.1
Expenditure on education [1)]				
Total (billion euro)	16.6	21.2	28.4	29.9
Per capita (euro)	1,076.2	1,337.0	1,742.9	1,832.7
As a % of GDP	5.4	5.1	5.6	5.6

[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-education al institutions, for instance expenditure on books, are not included in the total. The public expenditure on households exclude subsidies for tuition fees at universities. This part flows back via the households to the institutions and is therefore part of the private expenditure on institutions.

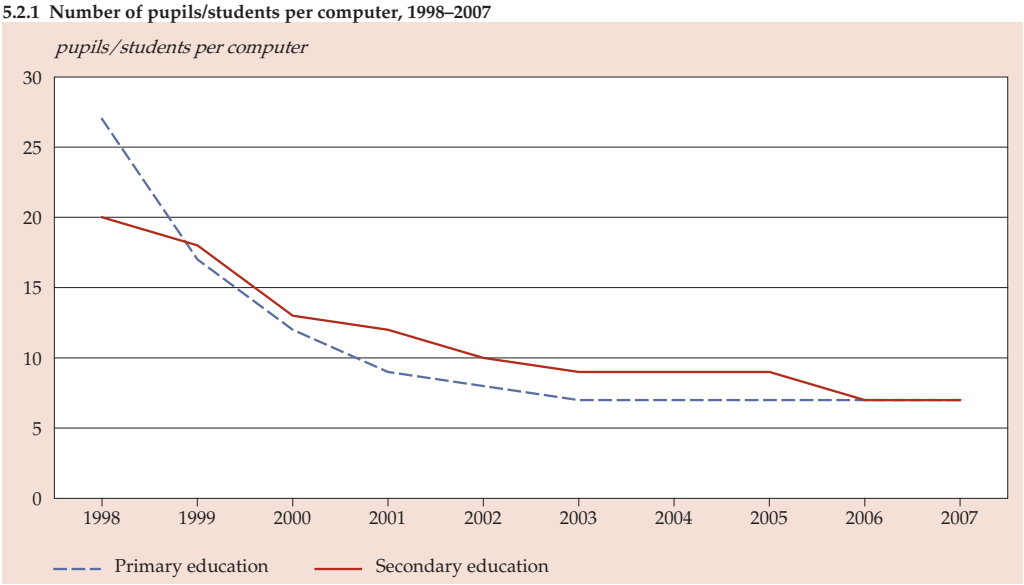
Source: Statistics Netherlands, National accounts/Education accounts.

One computer for seven students

The average in primary and in secondary education in the Netherlands in 2007 was one computer per 7 pupils/students for education. In primary education this level

was reached by December 2003, in secondary education not until 2006. Studies show that the number of schools with less than 5 students per computer is on the increase. This may point in the direction that schools want more availability of computers for students. The ICT management of 85 percent of the schools feel that the available provisions suffice (in primary education and secondary education). About 95 percent of the computers in secondary education were hooked up to the internet in 2007 and 87 percent in primary education.

5.2.1 Number of pupils/students per computer, 1998–2007



Source: Kennisnet Ict op school, Vier in Balans Monitor 2007.

Number of pupils and students

In school year 2006/'07 there were over 3.6 million people in education in the Netherlands, which is 22.1 percent of the population on 1 January 2007.
In five years the student population has grown faster than the population as a whole: in 2001/'02 some 21.6 percent of the population was in education. The increase is almost entirely due to higher education. The growth rate of the other groups equalled that of the population as a whole.

Most of the 3.6 million pupils and students are in elementary education: almost 1.6 million or 44 percent. Some 943 thousand students attend secondary school in school types vbo, vmbo, mavo, havo, vwo and practical instruction. Higher professional education (hbo) and universities had about 572 students in 2006/'07.

The smallest group, some 506 thousand, attended secondary vocational training (mbo) and adult education.

Pupils and students in education, 2001/'02–2006/'07

	2001/'02	2002/'03	2003/'04	2004/'05	2005/'06	2006/07*
	number (x 1,000)					
Total pupils and students	3,484	3,506	3,539	3,565	3,595	3,616
Primary education	1,604	1,602	1,599	1,599	1,598	1,595
Elementary education	1,552	1,550	1,548	1,549	1,549	1,549
Special elementary education	52	52	52	50	48	46
Secondary education	904	914	925	935	940	943
Joint years 1 and 2	390	398	401	400	393	388
Vwo, havo year 3 and higher	255	262	271	282	293	304
Vbo, mavo and vmbo years 3 and 4	229	230	228	226	226	223
Special secondary education and practical instruction	31	23	25	26	27	28
Vocational and adult education	483	489	492	487	497	506
Secondary vocational education	463	473	479	474	482	496
Secondary general adult education	21	16	14	13	15	10
Higher education	492	501	523	544	560	572
Higher professional education	322	323	336	347	357	366
University	173	180	190	200	206	208

1) Incl. joint year 3.

Source: Statistics Netherlands, Education statistics.

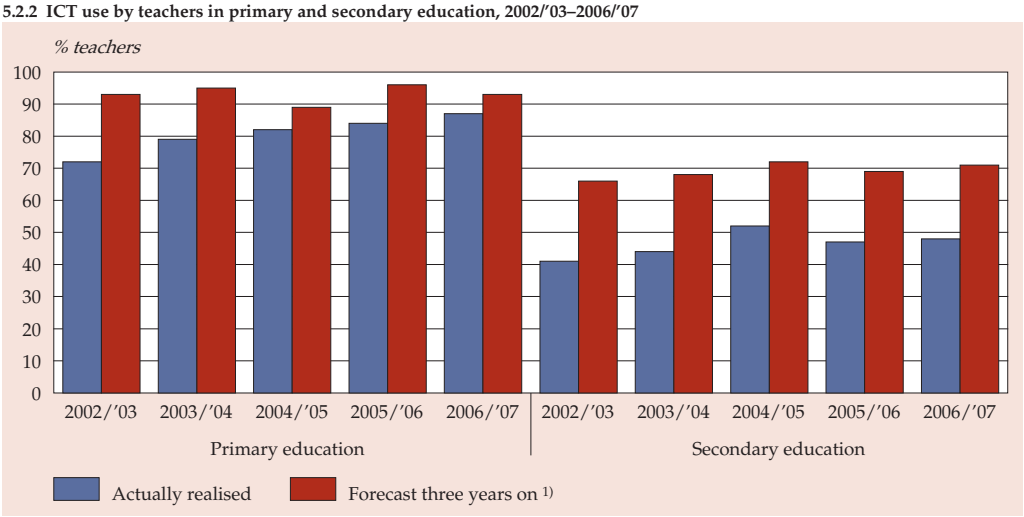
Not all teachers use ICT

About 87 percent of the primary school teachers used computers in the classroom in school year 2006/'07, according to school management.[7)] The survey asked what the expectations were for the situation three years on. These were high. In 2003/'04 management expected that 95 percent of the teachers would use computers in 2006/'07 in primary education. In reality this turned out to be 87.

The percentages are much lower in secondary education, where 48 percent of the teachers used computers in 2006/'07. This is slightly less than two years earlier when 52 percent of the secondary school teachers used computers. Expectations in secondary education also didn't meet reality; the difference is even more pronounced than in primary education. In 2003/'04 the expectation was that 68 percent of the secondary school teachers would use computers in 2006/'07 but this turned out 20 percent point less: namely 48 percent.

In 2006/'07 the expectation was that 71 percent of the secondary school teachers would use a computer in 2009/'10 when teaching. If this were to materialise, almost a quarter of the secondary school teachers would need to take the plunge in three years time and start using computers as a tool in teaching.

5.2.2 ICT use by teachers in primary and secondary education, 2002/'03–2006/'07



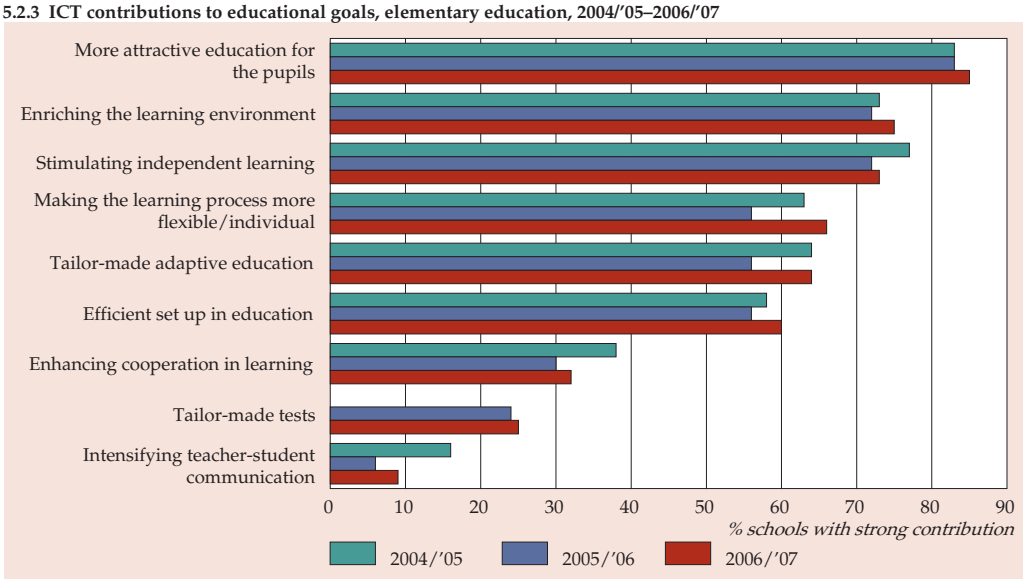
1) In the years shown the teachers were asked about their expectations for three years on. For example 2002/'03 provides the forecast for 2005/'06.

Source: Kennisnet Ict op school, Vier in Balans Monitor 2007.

ICT makes education more attractive

In 2006/'07 the ICT management of more than 80 percent of the primary and secondary schools felt that ICT contributes substantially to making education more attractive. There are also many other educational goals to which ICT contributes. Figures 5.2.3 and 5.2.4 show the percentage of schools in which ICT contributes

5.2.3 ICT contributions to educational goals, elementary education, 2004/'05–2006/'07



Source: Kennisnet Ict op school, Vier in Balans Monitor 2007.

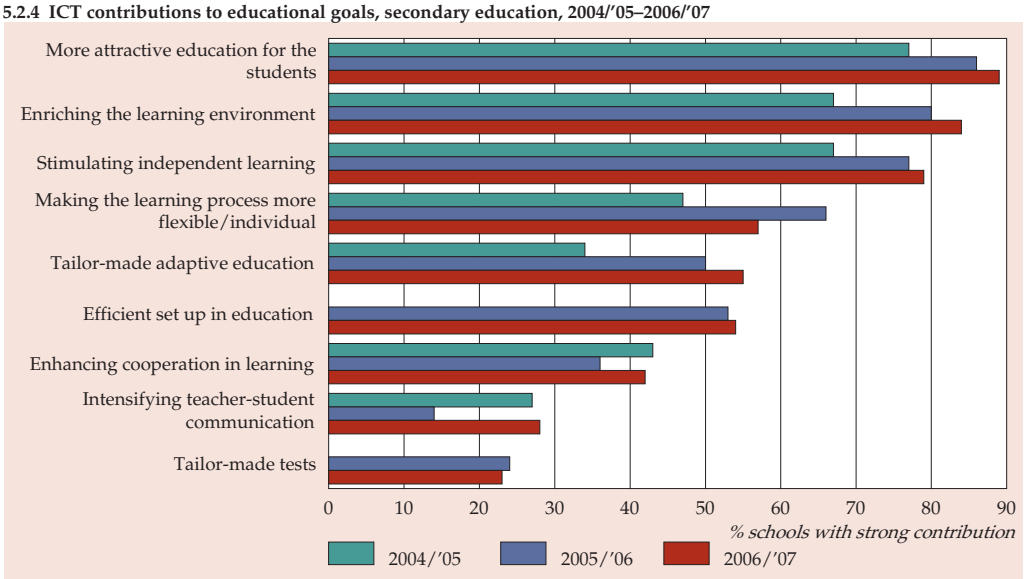
much to specific goals. The ranking is virtually identical for primary and secondary education. The two goals that were mentioned least were ranked differently: tailor-made tests and intensifying teacher/student communication. The highest scores are making education more attractive, creating a richer learning environment, and stimulating independent learning. Over 70 percent of the primary and about 80 percent of the secondary schools feel that ICT contributes much to these goals. The goals stimulating independent learning and stimulating learning together are mentioned by fewer primary schools in 2006/'07 than in 2004/'05. The same is true for intensifying teacher/student communication, but only 9 percent of the primary schools mentioned it as a goal to which ICT contributed a great deal.

ICT is becoming more important in secondary education. More schools mention that ICT contributes significantly to almost all goals mentioned by half the schools in 2006/'07 than in 2005/'06 and 2004/'05. The difference between 2006/'07 and 2004/'05 is at least 10 percent points. The only aspect named more often before as a goal to which ICT contributed significantly was making the learning process more flexible/individual.

Netherlands: relatively few computers in secondary schools

Compared to other industrialised countries, the Netherlands does not score well on the number of computers used for education in schools. The PISA study is conducted every three years. It shows that in 2006 there was one computer for seven students in schools where 15-year-olds received their education in the Netherlands

5.2.4 ICT contributions to educational goals, secondary education, 2004/'05–2006/'07



Source: Kennisnet Ict op school, Vier in Balans Monitor 2007.

Problems in e-learning in teaching statistics

Several years ago e-learning was seen as an absolute must in teaching modern statistics. The experience has taught us that students, teachers and developers had different goals. Developers wanted to get the most advanced technical solutions, teachers wanted to distribute their teaching materials widely, while students wanted to acquire enough knowledge in an easy way to pass exams.

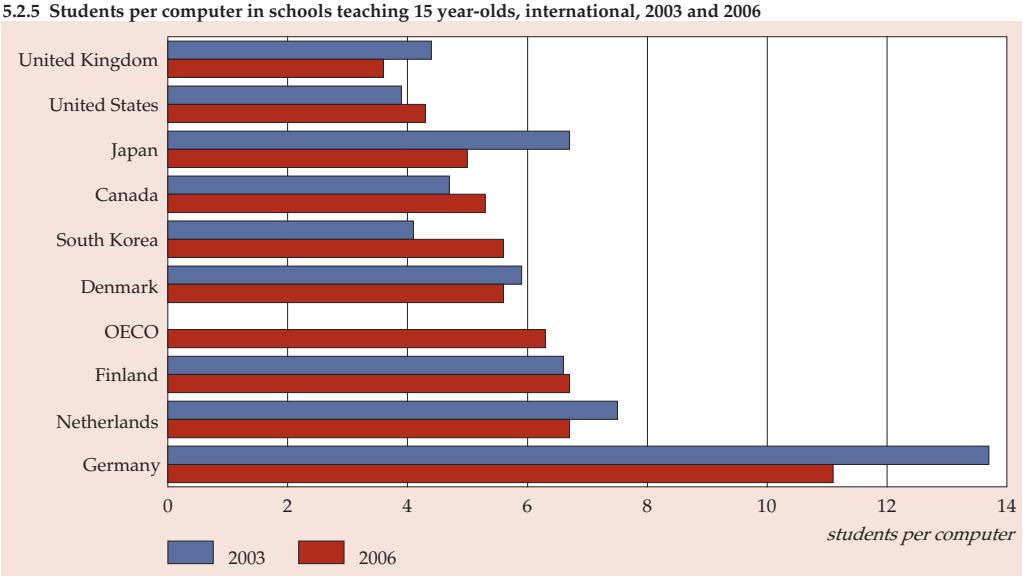
E-learning is now seen as a valuable support tool in the learning process. Still e-learning instruments present various problems. Apart from technical problems, such as the limitations of certain web browsers, there are also pedagogic problems and side effects.

Therefore the conclusion is: e-learning cannot replace the interaction between students, teachers and the blackboard, and e-learning instruments can only be successful if they meet the needs of all people involved. Electronic media in education at a high level require: robust and reliable technology and high quality content as well as the willingness of students and teachers to adapt their behaviour.

Source: W. Härdle, S. Klinke and U. Ziegenhagen, 'e-Learning Statistics – A Selective Review', Humboldt-Universität Berlin, Discussion Paper 2006-024.

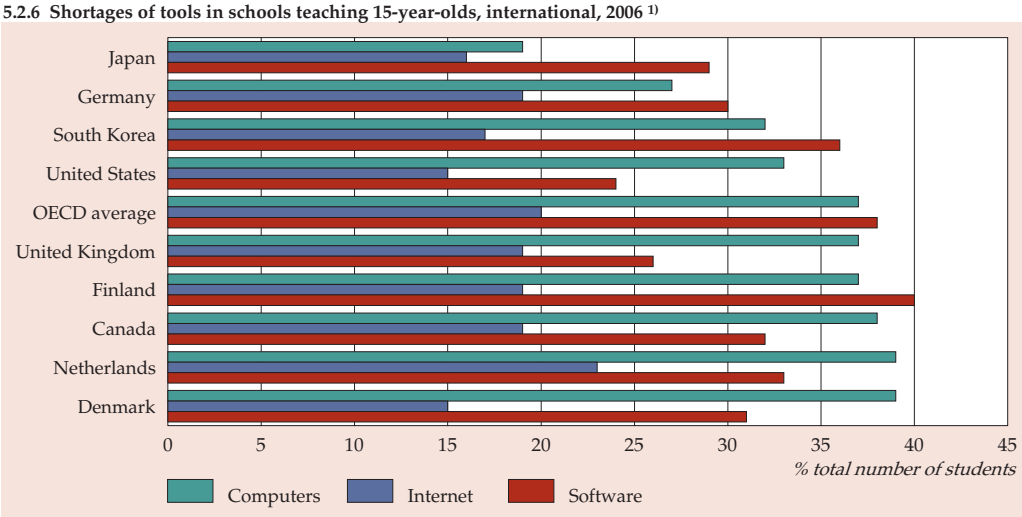
(see figure 5.2.1). This takes the Netherlands to the same level as Finland, but below the OECD average. The UK, the USA and Japan all have less than 5 students per computer. Most countries show an increase between 2003 and 2006, except South Korea where they now have to make do with fewer computers.

5.2.5 Students per computer in schools teaching 15 year-olds, international, 2003 and 2006



Source: OECD, PISA (2003 adaptation by Statistics Netherlands).

5.2.6 Shortages of tools in schools teaching 15-year-olds, international, 2006 [1)]



[1)] Share of the students aged 15 in schools where the management feels that education is hampered by lack of quality or availability of computers, internet connections or education software.

Source: OECD, PISA.

Many students are in schools that lack ICT tools, or fail in terms of quality. Almost 40 percent of the students in the Netherlands are in secondary schools with insufficient numbers of computers according to the management. In Japan almost 20 percent of the students are in secondary schools with insufficient numbers of computers. The other countries considered are somewhere between these two extremes.

The PISA study also looked into the shortages or lack of quality in the following three aspects: computers, internet connections and software. The internet connections are provided best: between 15 and 23 percent of the students in the countries shown are in schools that complain. The Netherlands is doing relatively poorly: 23 percent of the students is in a school that has a shortage of internet connections.
Software is still a major problem; in the countries presented, 24 to 40 percent of the students are in schools with software shortages. In the Netherlands a third of the students are in schools that face trouble in this respect. It is the only aspect in which the Netherlands scores better than the OECD average.

5.3 ICT and care

Health and social work is not just an important sector of industry in public health, but also in economic terms. Over one million people worked in it during 2006. Care expenditure has risen substantially since 2000, as did employment in health and social work.

In health care and social work, much information is recorded, processed and exchanged within and between institutions. This is not only true for operational management, but also for information about patients and clients. ICT is playing an increasingly prominent role. This paragraph describes the recent ICT-related developments in health care and social work.

ICT investments in health care and social work

Health care and social work offer plenty of room for improvement of the quality and efficiency of services by using ICT tools. However, table 5.3.1 indicates that this knowledge-intensive sector is no frontrunner as far as ICT investments are concerned. But the gap health care and social work used to have between ICT investments and total investments is closing since ICT investments in health care and social work more than tripled between 1995 and 2005: from 128 to 459 million euro.

Table 5.3.1
Investment in health care and social work, 1995, 2000 and 2005

	Health care and social work			All sectors of industry		
	1995	2000	2005	1995	2000	2005
	million euro					
Total investment	2,160	2,701	4,123	63,500	91,652	96,494
ICT investment	128	312	459	6,703	15,138	13,523
	euro					
Investment per employed person	2,650	2,858	3,579	8,875	11,294	11,723
ICT investment per employed person	157	330	398	937	1,865	1,643
	% of total investment					
Share of ICT investment	5.9	11.6	11.1	10.6	16.5	14.0

Source: Statistics Netherlands, National accounts.

The share of ICT experts in health care and social work is well below that in other sectors. However, this does not mean that the use of ICT tools in health care and social work lags behind that of other sectors (see figure 5.3.1).

Key figures on care

In 2006 nearly 1.2 million people worked in health and social work. The labour volume of these employees came to 842,000 fte. The difference is due to working part-time. On average 71.3 percent of the people working in health and social work in 2006 had a full-time job. This percentage has barely changed since 1996.
The share of health and social work in gross value added of the economy as a whole was 8.9 percent in 2006, the same as in 2005. This shows that it is a major economic sector.

Health and social work are labour intensive: Some 74 percent of the value added in this sector of industry are labour costs. In 2006 the gross value added per fte was up by 24 percent on 2000, whereas the pay per fte rose by 21.5 percent during that period.
Total expenditure on care increased by 4.2 percent in 2006. Both in 2005 and 2006 care expenditure made up 12.4 percent of gross domestic product (GDP). The per capita expenditure on care in 2006 rose as well, reaching 4,017 euro.

Key figures on health and social work

	1996	2000	2005*	2006*
	million euro			
Sector of industry Health and social work				
Production value	29,432	37,659	54,584	57,140
Intermediate consumption	8,251	10,423	14,244	15,046
Gross value added	21,181	27,236	40,340	42,094
Employee compensation	16,142	20,680	29,900	31,239
Investments	2,178	2,701	4,123	.
	full-time equivalents (x 1,000)			
Employed persons	588	677	819	842
	%			
Share in the total economy				
Production value	4.8	4.7	5.7	5.6
Intermediate consumption	2.6	2.4	2.8	2.8
Gross value added	7.4	7.3	8.9	8.9
Employee compensation	10.0	9.8	11.8	11.9
Investments	3.1	2.9	4.3	
Employed persons	10.0	10.4	12.7	12.8
Expenditure on care [1)]				
Total (billion euro)	.	42.1	62.9	65.7
Per capita (euro)	.	2,643.0	3,854.0	4,017.0
As a % of GDP	.	10.5	12.4	12.4

[1)] Companies and institutions involved. The expenditure on care is higher than the production value of the sector of industry health 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.

The use of ICT in health and social work

The survey conducted by Statistics Netherlands on the use of ICT by companies includes questions about computer applications and ICT and is mailed as a sample survey to companies employing ten people or more, also to companies in health care and social work. Specific ICT applications in health care and social work are not discussed, but the results of the survey gives an indication of ICT use in health care and social work in comparison with other sectors.

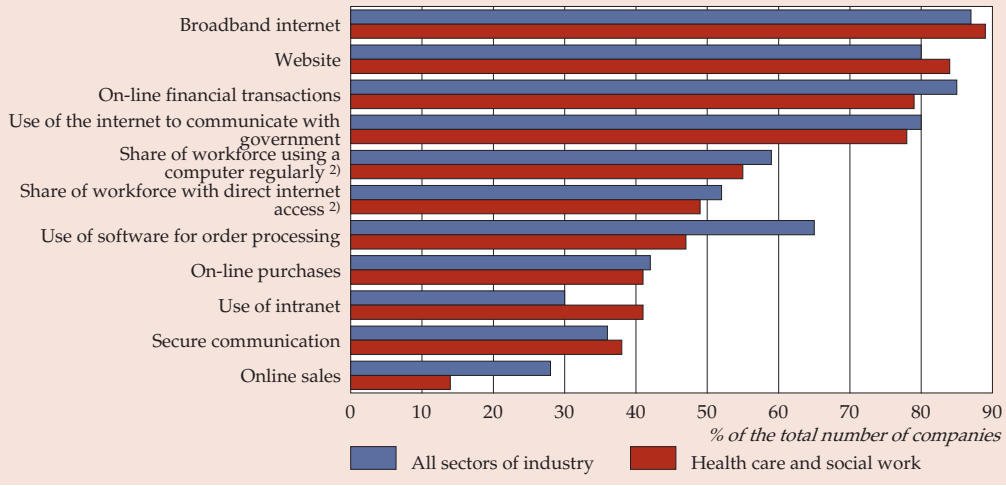
We distinguish the following categories of ICT use:
- broadband internet;
- use of own website;
- on-line financial transactions;
- communication with government;
- on-line purchasing;
- on-line sales;
- intranet;
- use of extranet (access for others);
- use of software for order processing;
- receiving on-line invoices;
- sending on-line invoices;
- use of Enterprise Resource Planning (ERP) software;
- use of Customer Relationship Management (CRM) software;
- open source operating system;
- secure communication (e.g. use of digital signatures or secure protocols like SSL);
- share of workforce regularly using a computer;
- share of workforce with direct internet access.

Figure 5.3.1 shows a number of these categories for care and for all sectors. The figures on the other categories are included in the statistical annex at www.cbs.nl/digitale-economie.

The figure shows that most care institutions have computers with external data communication. In this respect care is on par with the rest of the economy. The care sector makes far less use of software for processing purchasing and sales orders than the private sector as a whole. The care sector makes more use of on-line invoices: 19 percent of the companies sent them, compared to the average 7 percent in other sectors.

On the sales side, there are specific systems (which may not be computerised) that register which services are rendered to patients or clients. There are plans to radically change the current billing system of hospitals, because it is considered unworkable. The key of the new system is that doctors no longer have to enter their own diagnosis-treatment combinations. They can just record the diagnosis and the treatment. The computer will link this to a diagnosis-treatment combination.

5.3.1 Use of ICT in health care and social work and in other sectors of industry, 2006 [1)]



1) Employees with 10 or more employees.
2) The share of people working in the sector, not the share of companies.

Source: Statistics Netherlands, ICT use by enterprises 2006.

55 percent of the people employed in health and social work regularly used a computer at work in 2006. They are hooked up to a computer network and can be reached on-line. This is an indication of the volume of ICT work. More people work with computers in the other sectors.

Over 40 percent of the companies in health and social work and in the other sectors bought products or services on-line in 2006. on-line *sales* in health care and social work are below those in other sectors, probably due to the nature of the work.

For further analysis of the use of ICT tools in health care and social work, the figures are divided into health care and social work (figure 5.3.2) and into three size classes (table 5.3.2).

Spending on hospitals and diagnosis-treatment combinations

Hospitals and specialist practices (specialist medical care) constitute by far the largest cost item within the care sector. Spending on this type of care in 2006 was 1.7 percent higher than in 2005. However, this does not reflect the actual development in the care provided. In reality spending on hospitals must have increased by about 6 percent.

The discrepancy has to do with the introduction of the diagnosis-treatment combinations in 2005. The system resulted in considerable over-financing of hospital care in 2005, which

was compensated in the calculation of care expenditure in 2006. The over- financing in 2005 pushed hospital spending in 2005 up, while compensating for the over-financiering of the previous year pushed spending in 2006 down. [1)]

Applying diagnosis-treatment combinations effectively and efficiently depends greatly on the use of adequate ICT applications. ICT providers supplied applications to make this possible. They also provide medical and other staff with practical advice to enable them to use diagnosis-treatment combinations smoothly.

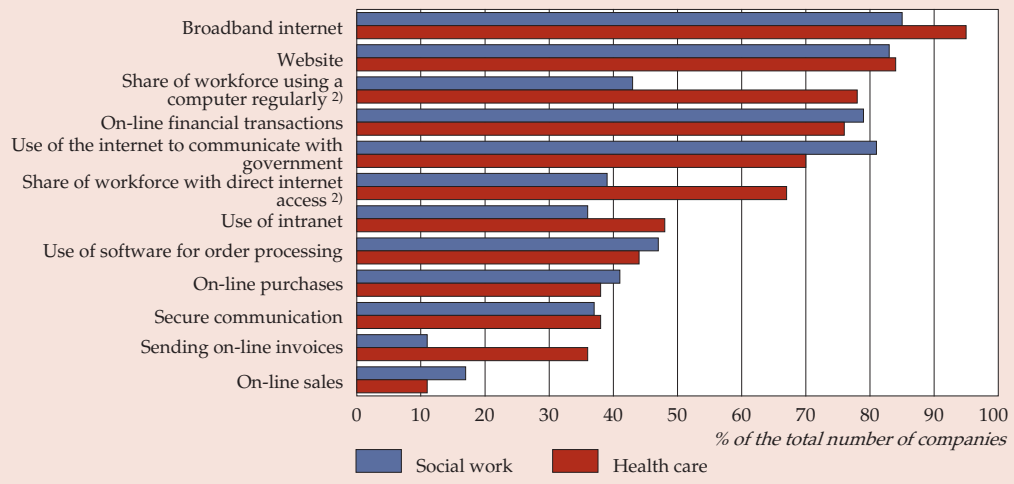
[1)] See CBS Press release PB07-041, 16 May 2007.

ICT in health care and social work

Health care employees regularly used a computer in 2006 (78 percent), more so than employees in social work (43 percent). Likewise, the percentage with direct internet access was higher in health care (67 percent) in 2006 than in social work (39 percent). See figure 5.3.2.

The use of software for order processing is more advanced in social work than in health care, but both health and social work lag behind the other sectors (see figure 5.3.1). Institutions in social work concentrated on on-line financial transactions and

5.3.2 Use of ICT in health care and social work, 2006 [1)]



[1)] Employees with 10 or more employees.
[2)] The share of people working in the sector, not the share of companies.

Source: Statistics Netherlands, ICT use by enterprises 2006.

communication with the government in 2006. Health care sent more on-line invoices. On-line purchases were about the same for both sectors. Here too is a lot of catching up to do to benefit from the advantages of on-line buying, such as cost cutting, an organisation needs a good policy and good embedding. Not all ICT applications are equally relevant for all sectors or size classes. The fact that social work often communicates on-line with government institutions says something about the extent of government involvement in the sector.

Table 5.3.2 shows the significance of company size in health care and social work for the use of ICT tools. The small institutions in health care, with less than 50 employees, are not as advanced in the use of ICT tools as larger ones, with more than 50 employees, but the correlation with company size varies. The share of employees regularly using a computer with direct internet access was 7 to 8 percent higher in small institutions in health care in 2006 than in large institutions (250 or more employees).

Large institutions made more use of the intranet, on-line purchases, and on-line communication with the government. Mid-sized companies (50–249 employees) had more on-line sales than small or large companies. In health care, size correlates less with having broadband internet or a website.

Large institutions in social work are also more advanced in the use of ICT tools, but the differences are not great. The most significant differences are observed in the use of intranet and having a website. The share of the workforce working in small institutions who regularly used a computer or had access to the internet in 2006 was lower than in big institutions.

The rate of ICT use in social work in 2006, in the size classes we distinguished, was much lower than in health care. Broadband, websites, and on-line financial transactions are very common in health and social work regardless of company size. Much remains to be done in computerising order processing and on-line purchases and sales. The external orientation required will be useful in ICT developments that relate directly to care itself, namely e-health.

E-health

The application of ICT in health care and social work has expanded rapidly in the last fifteen years. Governments worldwide recognise the possibilities ICT provides to raise effectiveness and efficiency in care. Many countries have adopted special policies to develop information systems for health care. One common element is the aim to improve safety, quality and efficiency of patient care by making medical dossiers more accessible, and by supporting clinical practice. Also on the agenda is strengthening a patient's own responsibility. The emphasis is to set standards for exchanging and securing data.

Table 5.3.2
ICT in health care and social work by size class, 2006

	Health care			Social work		
	Company size (number of employed persons)					
	10–49	50–249	250 or more	10–49	50–249	250 or more
	% of companies					
Broadband internet	93	100	98	77	89	100
Website	83	78	93	73	90	95
On-line financial transactions	72	90	77	76	80	85
Use of the Internet for communication with government	62	90	85	74	87	90
Share of persons employed who use computers regularly [1)]	84	88	77	36	36	45
Share of persons employed with direct access to the Internet [1)]	75	62	67	27	34	41
Use of software for processing orders	31	52	85	42	54	49
Electronic purchasing	28	48	66	34	41	56
Electronic sales	7	31	8	19	18	12
Use of intranet	27	85	90	15	49	65
Use of extranet (which grants access to third parties)	10	25	47	5	17	19
Secured communication	35	47	41	32	38	47
Open source operating system	7	17	29	13	6	22
Use of CRM software	20	2	17	5	18	12
Use of ERP software	7	5	18	3	9	8
Sending electronic invoices	35	49	27	13	9	9
Receiving electronic invoices	10	5	5	5	0	11

[1)] Percentage of employed persons within the sector, not percentage of companies within the sector.

Source: Statistics Netherlands, ICT use by enterprises 2006.

E-health came about under the influence of developing international (ICT) networks and raising safety and efficiency in health care and social work. E-health refers to health services and the corresponding information that can be offered thanks to the internet and related technology (ICT). E-health focuses on the patient and on providing self-care options by spreading adequate medical information. E-health is up and coming, and is characterised by medical informatics, health care and businesslike behaviour.
By shifting the focus to the patient, medical ICT itself has shifted. At first the emphasis was on hardware, systems architecture and databases. Now the emphasis is on innovative use of technology for proper communication and decision-making. The importance of the human and organisational aspects is recognised more and more.

Three areas in which progress is expected in e-health are:
– the possibility of a consumer or patient to communicate on-line with their health care institution;
– improving data exchange between health care institutions;
– new ways for consumers or patients to exchange data among themselves.

A few important aspects are:
- efficiency and cost cutting by avoiding double diagnoses and therapies;
- quality improvement through better and faster medical information and benchmarking of the providers of resources and care;
- fact-based information by using hard evidence of effectiveness and efficiency;
- more control for consumers and patients by making medical knowledge and personal patient dossiers available on-line;
- education of doctors and patients through the internet;
- standardised data exchange between health care institutions;
- ethics and resistance evoked by e-health about the doctor-patient relationship. For instance when professional help is provided on-line, privacy and the responsibility a doctor has towards an informed patient;
- equal opportunities because using e-health requires certain skills and means that are unequally distributed among the population. Without specific policies, e-health may increase the social distance between higher and lower income groups.

There are various major developments in e-health, since it is possible to give advice, monitor and correct from a distance. This means fewer visits and hospital stays are necessary. Such developments provide an impulse to evaluate and improve in-house processes. Mostly the patient plays a key role because he or she has to react to certain signals or answer certain questions. There are also scenarios where the role of the patient is minimal. [8] And in some scenarios the GP plays a key role. [9]

The electronic patient dossier

The electronic patient dossier (EPD) and decision support systems based on it are central in e-health. The EPD is important for improving safety in health care and social work. Mistakes in medication can be avoided by setting up an electronic dossier based on specific software. The law on electronic patient dossier is expected

Hospitals and electronic patient dossier (EPD)

About 90 percent of Dutch hospitals use EPD software (a hospital here means the highest organisational unit, not the number of locations). This does not say much about how widely the software is used. When is EPD truly integrated?

There are five generations of EPD systems. The first generation only shows subsystems (such as lab, x-rays). These systems were built in the 1980s and 1990s on the basis of the Hospital Information System to support the administration of the hospital, but not the work of medical staff.
In the mid 1990s the second generation became available, which allowed entering data. The third generation joins workflow and EPD in one application, and is accessible through the internet (patients can access their dossier; and set dates for treatment on-line). The fourth generation adds support in decision making.

In theory, the most advanced version will inform the user in future about new knowledge that has become available (knowledge management). In the Netherlands most hospitals have first generation EPD in October 2006, some second, a few are involved with third, and in certain specific cases the fourth generation is being introduced (in dossiers on chronically ill patients). [1)]

The supplier plays a major role in the design and implementation of the new generations EPD systems. A proper supplier will offer adequate support in how the content must be incorporated. Designing and implementing a third generation EPD is hard. The implementation period is at least two years. Additional support can be necessary in the process of change, since the introduction of third generation EPD may have far-reaching consequences for the organisation. Many people will have to change the way they work. Each care provider can do his or her own administration and has access to the administrations of colleagues. [2)]

1) Source: Information from Ms S. Meijer, product manager at Getronics Pink Roccade in Apeldoorn (October 2006).
2) Source: Memo by R. van Dijk, Cadiologist and ICT advisor *Hoe maken we EDP succesvol?* (Febuary 2007).

to come into force on 1 January 2009. It requires care providers to use the EPD and meet specific security demands.
The first two applications of the EPD will be the electronic medication dossier (EMD, with a list of the medication a patient uses) and the observation dossier of GP's (professional summary by the GP for observation).

Preventing errors

One advantage of supplying proper information in health care is error prevention. ICT is indispensable for this. Research in the Netherlands showed that about 90,000 hospital admissions a year may be due to errors in medication. [10)] The study *Fouten worden duur betaald* [expensive mistakes] shows that there are about 1.3 million medical mistakes in transfers because the patient's medical dossier is not properly updated or unavailable. [11)] Most errors involve the wrong medication, failure to treat due to lack of information, and wrong operations and treatments. The costs are estimated at about 1.4 billion euro a year, of which 300 million euro are direct costs of care. [12)]

Notes in the text

1) Ministry of the Interior and Kingdom Relations. *Actieprogramma Elektronische Overheid* (1998).
2) Ministry of the Interior and Kingdom Relations: *Publieke dienstverlening 65% elektronisch*. Zevenmeting van het aanbod van de elektronische dienstverlening van de overheid (2007).
3) ICTU. Overheid.nl Monitor 2007.

4) Dijk, prof. dr. J.A.G.M. et al. *Gebruik van Nederlandse overheidsdiensten in 2006*. Universiteit Twente, november 2006.

5) Ministerie VROM. *Handreiking implementatie Basisregistraties Adressen en Gebouwen*. 2006.

6) The user challenge. Benchmarking the supply of on-line public services. Capgemini, september 2007, commissioned by the European Commission, DG Information Society and Media.

7) The education inspectorate comes with a slightly higher figure: 91 percent of the primary school teachers regularly use ICT in educating pupils and 9 percent never do.

8) The medical centre of the VU was the first to implement a heart failure pacemaker with sms technology in a patient. The pacemaker sends an sms text to the cardiologist, who can look on the internet to see the status of the irregularities and take action. This makes check ups unnecessary.

9) Some 1,000 GPs use teledermatological consults by sending digital photos of the skin to a specialist (Nieuwsbrief Public Health 225, dd. 10 september 2006 op www.Integratedcare.nl.)

10) Pharmaceutisch weekblad, jrg. 137, 2002, no. 17, pp. 609–612. Geciteerd in RVZ, 'Standaardisering Elektronisch Patiëntendossier'. Briefadvies, 17 februari 2005; voetnoot 1.

11) In 2004 by TNS NIPO commisioned by the Nationaal ICT Instituut in de zorg (NICTIZ) and the Nederlandse Patiënten Consumenten Federatie (NPCF).

12) Quoted in RVZ, 'Standaardisering Elektronisch Patiëntendossier'. Briefadvies, 17 februari 2005; voetnoot 1.

6. ICT use by households and individuals

Digital devices became available for most Dutch households within the last ten years. Mobile phones and devices providing internet access, such as PCs and laptops, have become very popular. Dutch society has truly gone digital. In 2007, more than eight in ten households had internet access, three quarters via a high speed broadband connection. Mobile devices, such as wireless laptops, mobile phones, palmtops and gaming computers, are increasingly used for this, most frequently by men. The Netherlands is an international frontrunner in the availability of ICT.

Most internet users had average to good computer and internet skills (e-skills) by 2007. Over 80 percent of the internet users had self-taught skills learned by hands-on experience. However, the Netherlands holds a middle position in the EU where ICT skills are concerned.

Communication is still top of the list of activities by internet users. In 2007, over a quarter of internet users, especially young people, made phone calls using the internet, with on-line services such as Skype or MSN Messenger. As a result, chatting via the internet has somewhat decreased. Listening to radio and watching TV via internet are becoming more popular.

More and more consumers in the Netherlands order or buy goods on-line. In 2007, 7.5 million people indicated that they bought products through the internet. Their number doubled in five years time. The frequency of on-line shopping correlates with the education level of the internet user. Two out of three highly educated internet users were frequent on-line shoppers in 2007; twice as many as less well educated internet users.

Each year more people engage in common internet activities. This includes looking for information on government websites. In 2007, over half of the internet users indicated they had looked up information on government matters on-line. In this aspect, the Netherlands is in the EU subtop. Dealing with government matters by downloading forms and returning completed documents on-line (e.g. tax returns or job hunting) increased in 2007.

Millions of Dutch people use computers and the internet on a daily basis, but PC security and making backups leave much to be desired. In 2007, 42 percent of Dutch computer users indicated that they never made backups of their documents. On the other hand, only one in five internet users were negatively affected by a computer virus. This is substantially less than in 2005.

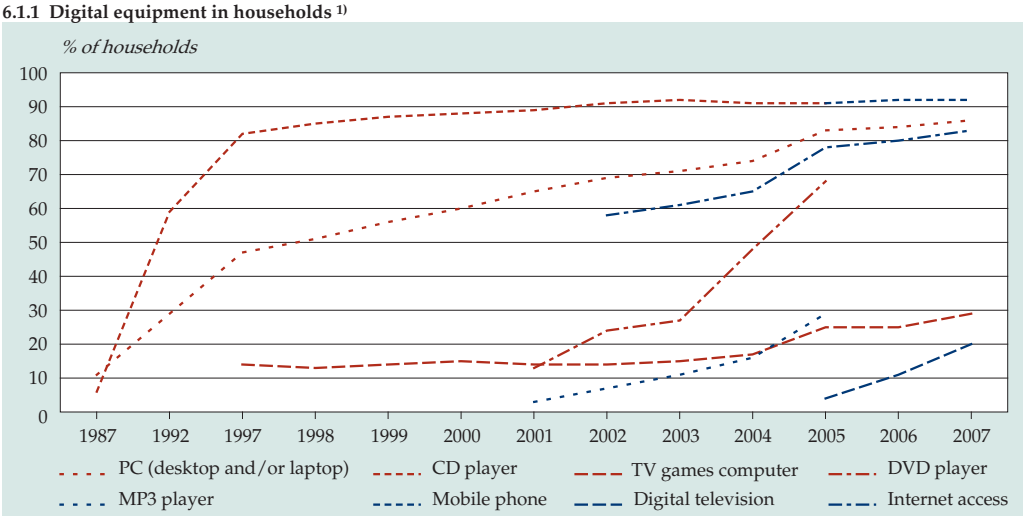
6.1 ICT in households

Dutch society has gone digital in the past decades, in what is called 'the start of the digital age' (ONS, 2007). Information and communication technology (ICT) uses digital signals, consisting of a binary series of ones and zeros. The advantage over the old analogue technology lies in the flexible use, mobility, higher transmission speed, and convergence (e.g. mobile phone used for phone calls, texting, mailing pictures, and internet access). As such, ICT has a major impact on all aspects of daily life, whether in education, work, the home or leisure. It is important to monitor how and why households and individuals use these modern means of information and communication, and how much they fall behind if they don't use digital means.

In this chapter we deal with ICT facilities and their use, as well as the skills computer and internet users possess. Internet activities are discussed, as well as how safe it is to use computers and the internet. We also look at the international position of the Netherlands. Statistics Netherlands gathers information on the use of ICT by households and individuals by surveys. Each year over 4,000 individuals aged 12–74 are interviewed. [1)]

Households started to get digital devices such as CD players, PCs and laptops, DVD players and/or recorders, MP3 players, gaming computers, digital television, mobile phones and internet in the eighties and nineties. In 2007 most households had a mobile telephone, computer and internet.

6.1.1 Digital equipment in households [1)]



[1)] Private households with at least one person aged 12–74 years.

Source: Statistics Netherlands, Socio-economic panel survey 1987–2002, Budget survey 2003–2004, ICT use by households and individuals, 2005–2007.

PC and the internet

PC ownership (desktop and laptop) increased considerably at the turn of the century. By 2002, more than three quarters of all Dutch households owned a computer. Although the growth rate diminished, computer ownership increased by 2 percent points a year. In 2007, 86 percent of the households had a PC at home, which is equivalent to 5.7 million households encompassing 11.6 million individuals. The share of individuals with access to a computer increased by 9 percent points after 2002 to reach 90 percent in 2007. The personal computer is therefore very widely accepted in the Netherlands at the moment.

The percentage of households with internet access grew twice as fast in recent years as households with access to a computer. Just over six in ten households had internet access in 2002, five years later it was more than eight in ten. So the total share of households with internet access increased by 20 percent points in five years time. This means that 5.4 million Dutch households, encompassing 11.3 million individuals, had internet access in 2007.

Table 6.1.1
Households and persons with access to ICT, 2002–2007

	2002	2003	2004	2005	2006	2007	2005	2006	2007
	% of households						*abs (x 1 mln)*		
Households [1]							6.4	6.6	6.6
PC (desktop/laptop)	76	76	80	83	84	86	5.3	5.5	5.7
Access to the internet	63	65	71	78	80	83	5.0	5.3	5.4
Broadband internet connection	15	22	34	54	66	74	3.4	4.3	4.8
Other internet connection	48	43	36	24	14	9	1.6	0.9	0.6
	% of persons						*abs (x 1 mln)*		
Persons [2]							12.8	12.8	12.8
PC (desktop/laptop)	81	82	85	87	88	90	11.2	11.3	11.6
Access to the internet	69	72	77	83	85	88	10.6	10.9	11.3
Broadband internet connection	17	26	39	59	71	79	7.6	9.1	10.1
Other internet connection	51	46	37	23	14	9	3.0	1.8	1.2

[1] Private households with at least one person aged 12–74 years.
[2] Persons aged 12–74 years in private households.

Source: Statistics Netherlands, POLS 2002–2004 and ICT use by households and individuals, 2005–2007.

Internet and broadband

Three quarters of all Dutch households had broadband internet in 2007. This means about 10 million individuals could use high speed internet. There was a

considerable increase in broadband use between 2003 and 2005. After this, growth continued at a slower pace. Two thirds of the households with broadband have ADSL, and one third use cable. The growing popularity of broadband internet greatly affected internet access via analogue telephone lines. In 2007 only 9 percent of the households used dial-up connections to gain access to internet.

Internet devices

In 2007, all households with internet had a laptop or desktop with which they accessed the internet. Laptops are increasingly used for going on-line. 42 percent of the households with internet access had a laptop, as opposed to 27 percent in 2005. This goes at the expense of desktop computers. Households also use other devices to gain internet access. Over a quarter of the households with internet had the possibility to get access by a mobile telephone, palmtop, gaming computer or TV in 2007.

Table 6.1.2
Equipment that gives households internet access[1)]

	2005	2006	2007
	% of households with internet		
Desktop computer	93	91	89
Laptop computer	27	32	42
Mobile telephone	12	13	19
Palmtop computer	3	4	5
Games computer	1	1	4
TV with set top box	0	1	3

[1)] Private households with at least one person aged 12–74 years. More than one answer possible.

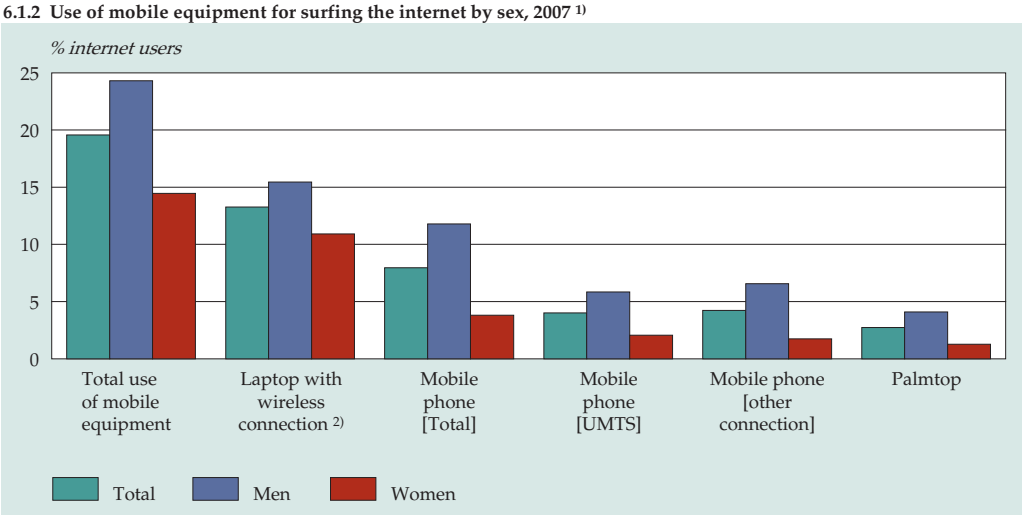
Source: Statistics Netherlands, ICT use by households and individuals, 2005–2007.

Mobile internet access

Almost one in five internet users regularly use mobile devices to go on-line: this is often a laptop with a wireless connection that can be activated outside the home or workplace (13 percent). Mobile phones also provide the advantage of using the internet whenever and wherever. Eight percent of the internet users use this option. Three percent use a palmtop to get mobile internet.

Men and women differ quite a bit in their preferences for mobile internet devices. Men often prefer internet access via mobiles such as wireless laptops, mobile phones, or palmtops. The share of men using mobile devices to access the internet (24 percent) is significantly higher than that of women (14 percent).

6.1.2 Use of mobile equipment for surfing the internet by sex, 2007 [1)]



1) Persons with internet access in past three months: more than one answer possible.
2) Use not at home or at work.

Source: Statistics Netherlands, ICT use by households and individuals, 2007.

Reasons for not having internet or broadband

Although access to the internet has expanded rapidly in recent years, there were still 1.2 million households without internet access in 2007. These households encompass 1.5 million individuals. 63 percent of these households stated that they do not want internet, are not interested in it, or do not think it is useful for them. This view is mostly expressed by people in the 65–74 age bracket. The most common reason given by households aged under 45 is that they can access the internet elsewhere (31 percent). As age increased in a household more people said they did not have the necessary know-how or skills: that is 9 percent of the households aged under 45, 15 percent of the over-45s, and 18 percent in the over-65 age bracket. Only a fraction of the households stated privacy, safety or physical limitations as their main reason not to have internet access.

The broadband internet explosion means that almost 90 percent of the households with internet had a high speed connection in 2007. So one in nine households (11 percent) didn't have broadband internet. Over a third of the households without broadband internet indicated they do not need high speed internet; this is indicated mostly (47 percent) by households consisting of people aged 65–74. The associated costs are given as the reason not to have broadband internet in one in ten cases.

Internet and broadband in an international perspective

In terms of internet and broadband use, the Netherlands has long been a frontrunner in the European Union, but in 2007 it reached the absolute top in internet access with 83 percent. In Denmark and Sweden almost eight in ten households had internet

access. The internet market is becoming saturated in these countries, since nearly all households have internet.

Table 6.1.3
Reasons for not using (broadband) internet in households by age, 2007[1)]

	Total non-users	12–44 years	45–64 years	65–74 years
	% of households without internet			
Reasons for not using internet[2)]				
Does not want internet, not interested, not worthwhile	63	40	62	77
Too expensive	10	11	14	5
Insufficient knowledge or skills	15	9	15	18
Can access the internet elsewhere	10	31	5	3
Privacy/security concerns	4	1	6	4
Physical restrictions	1	0	1	3
Other reason	13	22	12	10
	% of households without broadband internet			
Reasons for not using broadband internet[2)]				
No need	43	43	38	62
Too expensive	14	14	12	21
Not available at home address	6	5	9	2
Can access the internet via broadband elsewhere	6	7	5	2
Other reason	39	40	42	21

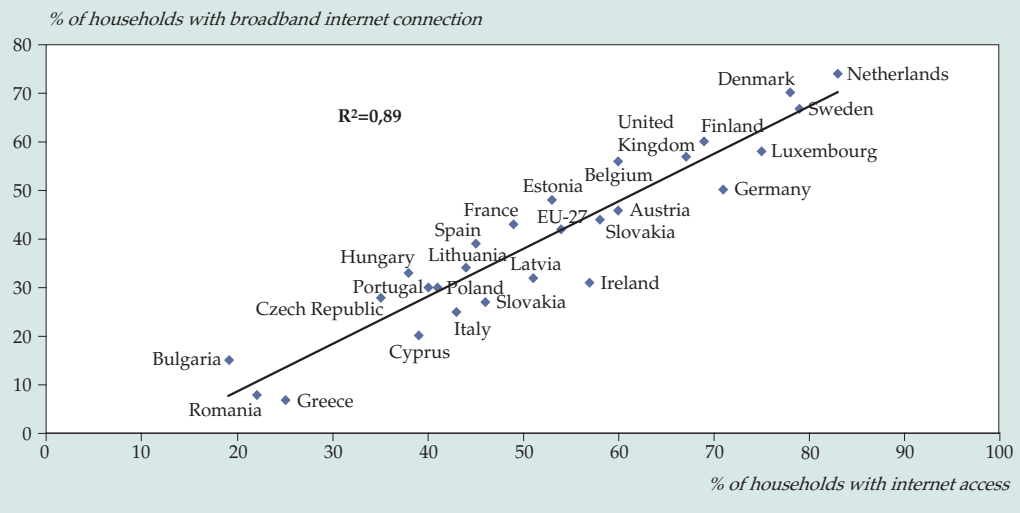
1) Private households with at least one person aged 12–74 years.
2) More than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2007.

There are great differences among EU member states in how widespread the internet is. An average of 54 percent of the households in the EU member states had internet access in 2007. Some eastern and southern European member states had very low internet penetration rates. Only one in five households in the new member states Romania and Bulgaria had internet access in 2007. Together with Greece they lagged far behind the rest of Europe. Ireland, where almost six in ten households had access to the internet, is in a curious position. Internet access is higher than the EU-27 average, yet access is expected to be much higher given the intensive R&D infrastructure that has been flourishing in Ireland.

Countries with a high internet penetration usually also had advanced broadband availability in 2007. The Netherlands occupied the top position as far as broadband was concerned: 74 percent of all households had internet access through broadband. There are huge differences between the EU member states in internet access and even greater differences where broadband internet is concerned. 42 percent of all European households had broadband. Some member states barely had broadband in 2007: such as Greece (7 percent), Romania (8 percent). In Bulgaria, Cyprus, Italy, Slovakia, and the Czech Republic only one in five households had broadband internet.

6.1.3 Internet access and broadband internet connections in the European Union, 2007 [1)]



[1)] No figures available for Malta and Macedonia.

Source: Eurostat New Cronos.

The correlation between internet access and having broadband is also an indication of the ICT facilities in households. There is a strong correlation in almost all 27 member states between having internet access and having broadband available. This is shown by the correlation between the two variables which is as much as 89 percent for all current member states of the European Union.

Households in the EU with internet but no broadband gave various reasons why this was the case (Eurobarometer, 2007). In December 2006, 26 percent stated they were perfectly happy with the speed of their analogue connection, 9 percent felt broadband was too expensive, and 6 percent felt the initial costs to hook up to a broadband network were too great. A slightly larger group (16 percent) indicated that they did not use the internet enough to acquire broadband. One in ten households gave technical reasons, such as not having any network facilities for broadband technology, as their main reason. Another 12 percent planned to get broadband within the next two months.

6.2 *Use of ICT and ICT skills*

In the previous paragraph we highlighted ICT infrastructure and facilities in households. In this paragraph we focus on the individual skills of computer and internet users, and on ICT training or education.

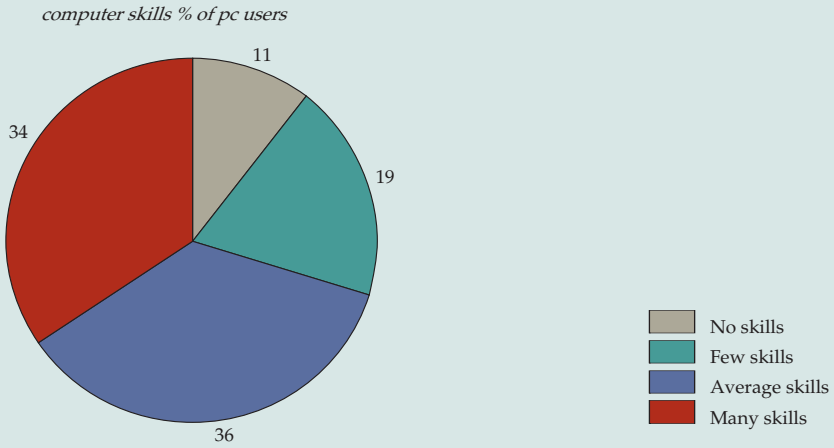
Over half the respondents in 2007 indicated that they never took a computer course. Two thirds of respondents felt they had sufficient self-taught computer

skills. Apart from this 17 percent claimed lack of time, 16 percent did not use the computer very often, and the rest mentioned that courses were too expensive, not relevant, too difficult or a combination of these, since more than one answer was allowed. People who had taken courses usually did so quite a long time ago: 60 percent indicated they did so more than three years before the survey was held, 21 percent indicated they attend a course between one and three years earlier. Only 10 percent of the people who took courses to improve their computer skills did so within the previous three months.

Internet skills

In this study we asked respondents about their activities on the internet. To measure internet skills we examined the number of activities a respondent has carried out on-line. This includes the following activities:
- using a search engine to find information;
- sending an email including documents;
- leaving messages in chat rooms, news groups or forums;
- using the internet to make phone calls;
- sharing files to exchange music, films etc;
- designing a web page.

Computers skills, 2007 [1)]



[1)] Persons aged 12–74.
Source: Statistics Netherlands, ICT use by households and individuals.

Respondents were classified into the following categories of internet skill:
- no skills: not done any of the listed activities;
- few skills: done two of the listed activities;
- average skills: done four of the listed activities;
- many skills: done over four of the listed activities.

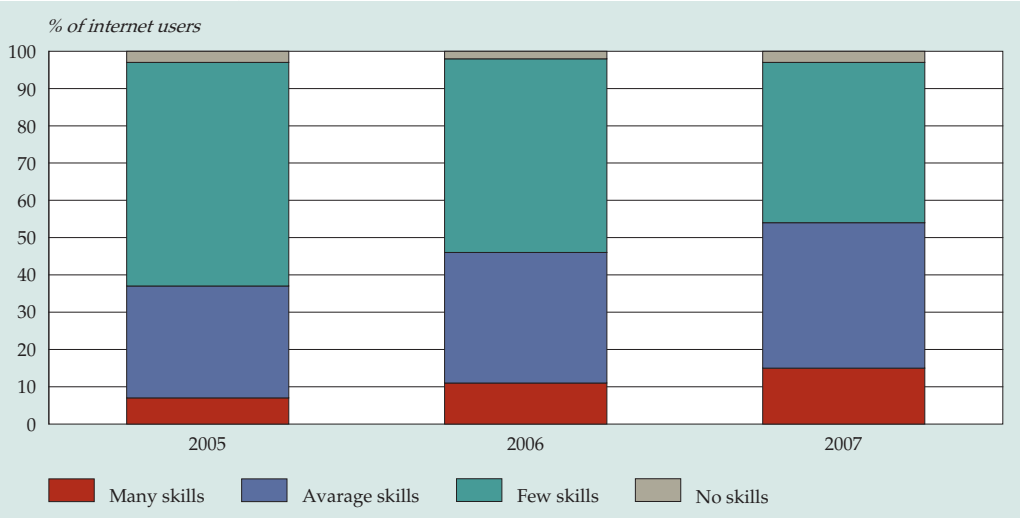
Taking courses has a lot to do with the computer skills people have. In 2007 only 11 percent of the individuals had no skills at all (see box). Almost three quarters had average or above average computer skills and was able to carry out several activities on the computer. Most computer users could copy or move directories and folders (83 percent), create zip files (62 percent), copy or paste information (52 percent) and use simple formulas in a spreadsheet (47 percent).
Interestingly, having taken a computer course hardly influenced the skills of experienced users. Only inexperienced users without computer skills benefited from courses: only 6 percent of the people taking courses said they had no computer skills versus 15 percent of people who did not take courses.

Skills of internet users

The skills of internet users are also determined by the number of activities they can do (see box 1). Based on these criteria 3 percent of the internet users had no internet skills whatsoever in 2007, while 43 percent had very few skills. 39 percent of the internet users had average skills, while 15 percent had many.

When we look at the development of internet skills among Dutch users in 2005–2007 we see that the share of individuals without internet skills remained constant (see figure below). The share of users with average skill levels reached 39 percent and with high skill levels went up to 15 percent in 2007. This means that the number of individuals with very limited computer skills decreased in the last couple of years, but this did not influence the share of people with no internet skills.

6.2.1 Skills of internet users, 2005–2007 [1)]



[1)] Persons aged 12–74 years using the internet. For explanation see box 1.

Source: Statistics Netherlands, ICT use by households and individuals.

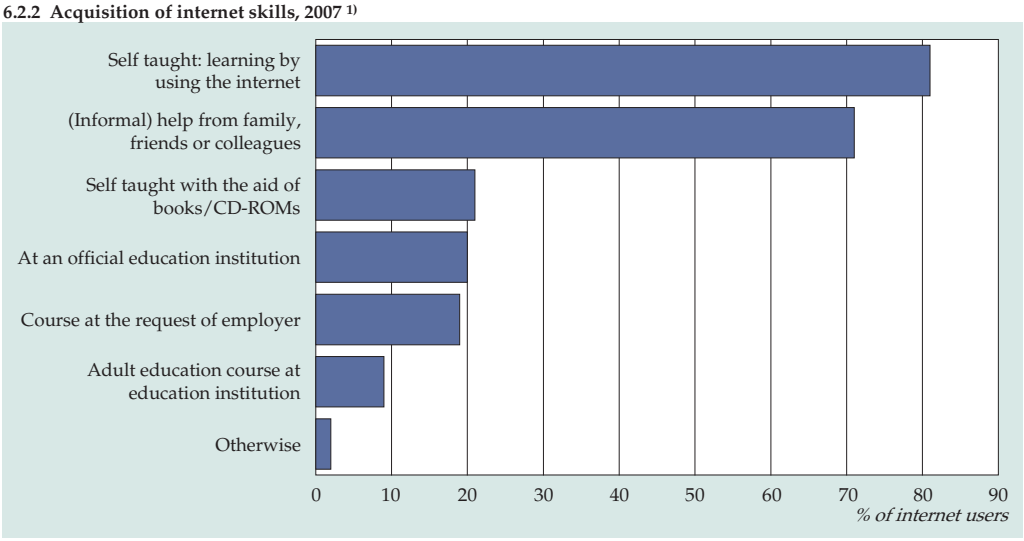
The increase in the share of individuals with average or high level internet skills is a general trend cutting across age and education levels (see table 1 in the appendix of chapter 6). The group with little skill is diminishing because of the increase in average or high level internet skills between 2006 and 2007 among all education levels: elementary, secondary and higher. We only see a decrease in individuals with average skills among the 12–25 age group.

In 2007, men still had more internet skills than women, although the gap was closing. In 2006, the share of men with many internet skills was twice as high as the share of women (14 and 7 percent). This ratio changed in 2007: the share of women with many internet skills nearly doubled to 12 percent, while that of men went up to 18 percent. In 2007, as well as 2006, a higher percentage of men than women had average skills; the reverse was true for people with few internet skills. In Europe we see a similar 'gender gap' in computer use and internet skills ('Gender differences in the use of computers and the Internet', Statistics in Focus, Eurostat, 2007).

Acquiring internet skills

Most internet users were self-taught, gaining their skills through hands-on experience. This was the case with over 80 percent of the Dutch internet users in 2007. Two out of three internet users got help from family, friends or colleagues. The three groups of internet users, with little, average and many skills acquired their skills in the same way in the same numbers. Having to participate in a course offered by the employer was mentioned mainly by internet users with few skills (22 percent), and less by

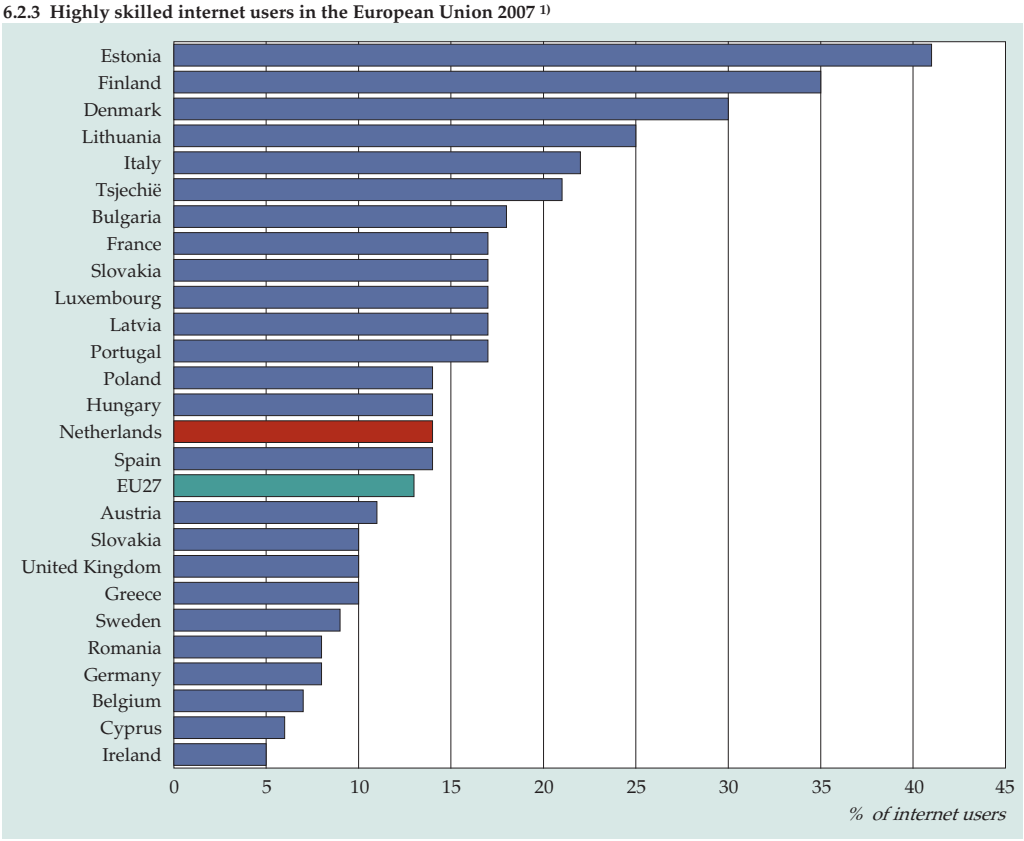
6.2.2 Acquisition of internet skills, 2007 [1)]



[1)] Persons aged 12-74 using the internet. More than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2007.

6.2.3 Highly skilled internet users in the European Union 2007 [1)]



[1)] Persons aged 16–74 using 5 or 6 internet activities.

Source: Eurostat. No figures available for Macedonia.

internet users with average or high levels of internet skills (19 vs. 10 percent). Internet users with average or high skill levels indicated that they got some of their know-how in regular education (23 vs. 38 percent) and that they consulted books or CD-ROMs on the subject more often (22 vs. 27 percent). This was particularly true for highly skilled internet users with a job. They include internet users who deal with ICT because of their job or profession.

Netherlands: average in high-level internet skills

In an international perspective the Netherlands performs very well in terms of internet skills. However, the percentage of internet users with high skill levels (able to carry out five or more internet activities) can also be used as an indicator. The Netherlands is above the EU-average on the high skills criteria, with a 14 percent share of highly skilled internet users in the total of internet users in 2007. Well ahead in Europe are Estonia (41 percent) and Finland (35 percent). Over a third of the

internet users in these countries were very skilled in 2007. Lagging behind in the EU-27 were Ireland (5 percent), Cyprus (6 percent), Belgium (7 percent), Germany and Romania (both 8 percent). It is remarkable that Ireland is far behind in their share of highly skilled internet users because of its high internet penetration and explosive growth in R&D in recent years. Apparently rapid internet/broadband penetration does not always go hand in hand with higher levels of internet skills among the internet users.

6.3 *Activities on the internet*

Paragraph 6.2 showed that Dutch people are getting more skilful with the personal computer and internet applications. The increased skills are also manifest in the extent to which various activities are carried out on-line. Almost all sorts of activities are carried out by more internet users in 2007 than one or two years earlier. Communication through the internet is the favourite activity of internet users. Email and chatting are commonly used and phoning through the internet is rapidly gaining popularity. The internet is of course the medium to get information but it is becoming more popular for studying or getting into contact with the government and institutions. More people can carry out more varied activities since they are more familiar with the internet. In this paragraph we take a closer look at several of these internet activities.

Communication

Communication is not only important in everyday life, it is also the most important activity for internet users. Almost all internet users communicate in one way or another through this medium. This is done through email by almost all internet users (94 percent). Over one in three internet users chats. This share is significantly lower than in the previous two years when four in ten internet users chatted. This has to do with the enormous popularity of phoning through the internet with Skype and MSN. These forms of communication grew from 6 percent in 2005 to 26 percent in 2007: a fourfold increase in two years time.

Substitution of communication

The modern methods of communication may well be at the expense of traditional communication methods, such as writing letters or postcards. In 2007, 9 percent of the internet users indicated that they substituted all written mail by internet or email messages. This is slightly more frequent than reported in 2006, when 7 percent did so. More than one in five internet users indicated that they are replacing much of their traditional mail by electronic mail. This is several percentage points higher than in 2006. Just under a quarter of all internet users did not substitute traditional mail by the various internet options.

Men communicate as much as women through the internet. This is true for emailing, chatting, and phoning. The age of the internet user influences the way people communicate through internet. Young people tend to chat more. Over seven in ten internet users in the 12–24 age bracket chatted in 2007. In the 25–44 age bracket only one in three chatted, and among the over-65s it is only 6 percent.

Phoning through the internet is also more popular among young people, 44 percent of the internet users under 25 does so, versus just 10 percent of the oldest internet users (aged 65–74). The youngest internet users caused the largest increase in phoning through the internet. This internet activity increased by 31 percent points in 2006, causing the percentage of chatters to fall in this age bracket.
Email is now so commonly used that there is hardly any difference between the various age groups.

Information, services and entertainment

The internet is also commonly used for looking up information. Nine in ten internet users do so. Over half of the internet users play or download games (56 percent) and an equally large group (54 percent) uses the internet for travel services. The latter is a 4 to 5 percent point increase with respect to the previous two years. People aged between 25 and 64 make more than average use of these services.

Downloading or reading newspapers or news magazines also became more popular in 2007, when 45 percent of the internet users read digital newspapers or news magazines. In 2006 this was 35 percent. The increase cuts across age groups. On-line news meant fewer newspaper subscriptions in recent years. Various media groups now have subscriptions where internet users can get the paper at home (usually the weekend edition) and get on-line access to the digital newspapers or magazines. In 2007, 13 percent of the internet users who read digital newspapers or news magazines said they had a subscription. University educated internet users more commonly have access to the news in this way: almost three in ten has a subscription.

Internet is also commonly used for listening to the radio and watching television. 42 percent of the Dutch internet users did so in 2007. In 2005 their share was just 26 percent. Young people use these services most.

Over one in five internet users used the internet to look or apply for a job in the 3 months before the yearly survey. There was no difference between men and women. Using the internet to look or apply for a job in 2007 was above average among internet users under 25 with 24 percent, and internet users aged 25–44 with 28 percent. This is not unusual, given the greater job mobility among young employees. Internet users over 45 used the internet substantially less often for this purpose.

Table 6.3.1
Activities of internet users [1)]

	2005	2006	2007
	% of internet users		
Communication			
E-mail	92	93	94
Phoning via the internet	6	12	26
Others, e.g. visiting chatrooms	40	40	35
Information and entertainment			
Looking for information on goods and services	87	88	89
Playing or downloading games, images or music	50	55	56
Using travel services	49	50	54
Downloading or reading newspapers	35	43	45
Downloading software	27	31	34
Listening to the radio or watching television	26	35	42
Applying for or looking for a job	19	22	21

[1)] Persons who used the internet in the three months preceding the survey. More than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2007.

On-line financial services and sales

Increasing use of the internet means that people do not need to leave their home as often for services. Financial transactions with banks and other financial institutions, and arranging affairs with governmental or other service providers can easily be done on-line. The internet is also increasingly used for buying and selling goods. In this paragraph we look at on-line financial transactions and sales. In paragraph 6.4 and 6.5 we look at buying goods, and service contacts with government.

On-line banking

On-line banking is a service that rapidly became common due to the internet. In 2007, 72 percent of all internet users engaged in on-line banking. This is 5 percent points more than in 2006 and 14 percent points more than in 2005, so the growth rate is slowing down. Over half of the internet users under 25 carry out bank transactions on-line. The same is true for older internet users, but both groups lag behind the 25–65 age bracket where almost three quarters use on-line banking.

Other financial transactions

Apart from on-line banking people also carry out other financial transactions through the internet, such as buying shares. In 2007, 7 percent of the internet users did so. This is hardly different from the two previous years. Men do more on-line financial transactions than women. These transactions are mainly done by internet users aged 45–64 and highly educated users. These are the groups that usually have most financial room, which makes them interesting for enterprises working in this field.

Table 6.3.2
Use of the internet for financial services and sale of goods or services, 2005–2007 [1)]

	On-line banking			Financial services			Sale of goods or services		
	2005	2006	2007	2005	2006	2007	2005	2006	2007
	% of internet users								
Total	58	67	72	5	8	7	16	21	23
12 to 25 years	40	49	54	2	3	4	13	15	16
25 to 45 years	69	78	83	5	9	8	21	29	30
45 to 65 years	59	70	75	7	11	10	14	18	20
65 to 75 years	47	55	53	4	7	7	9	11	12

[1)] Persons who used the internet in the three months preceding the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2007.

On-line sales

More and more internet users sell goods through the internet. Famous sites are e-bay and the Dutch second-hand goods trade site www.marktplaats.nl. In 2007 almost a quarter of the internet users reported selling goods on-line. In 2006 this was 21 percent, and in 2005 just 16 percent. The people selling are mainly in the 25–44 age bracket (30 percent).

Secure financial transactions

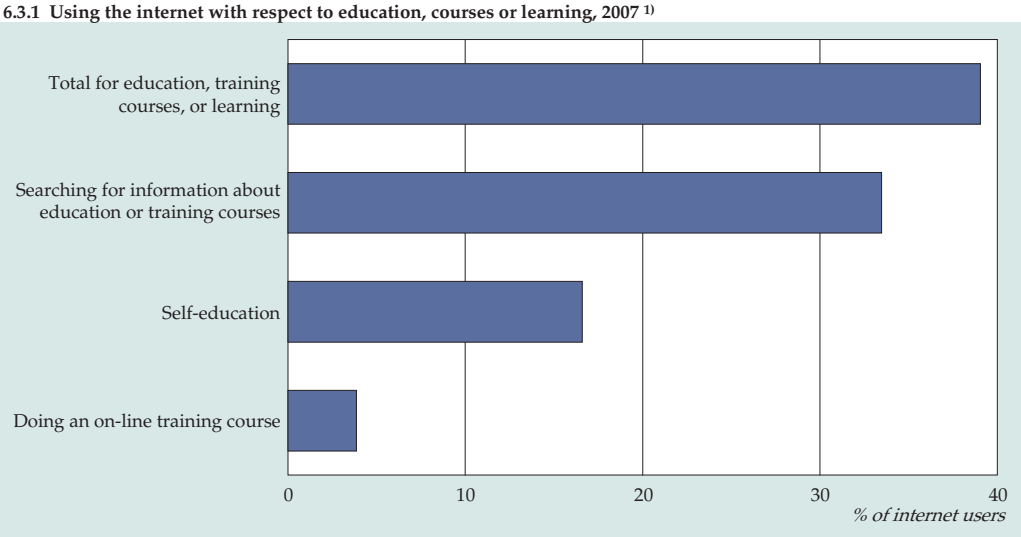
More financial internet use also means more scope for financial internet abuse, which can seriously undermine customer confidence. Banks are aware of people's reluctance, and use stringent security measures in money transfers (NVB website). The data sent on-line is encrypted, after a strict identification check. Banks advise consumers to take their own protective measures when they use their computer and the internet; such as installing anti-virus and anti-spy ware, keeping access codes secure, and closing the internet browser.

Internet activities in education

Internet is excellent for looking up information for people studying and taking courses. Educators use the internet to provide information about their course offers. In some cases courses can be taken on-line. Four in ten internet users stated that they engage in education-related internet activities, which shows how important the internet is for taking courses or finding information about education.

The internet is mainly used for looking up information, where coursework is concerned: one in three internet users does so. Internet also makes self-study possible: 17 percent of the internet users learn this way. Again, more younger internet users (21 percent) engage in this type of independent learning. But almost one in ten 65–74 year old internet users indicated they also learned things this way.

6.3.1 Using the internet with respect to education, courses or learning, 2007 [1)]



[1)] Persons aged 12–74 years who used the internet in the 3 months preceding the survey. More than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2007.

Taking on-line courses is not yet commonplace: only 4 percent of the internet users reported taking an on-line course.

Internet is, not surprisingly, consulted for education purposes mostly by internet users taking courses or in education, usually young people. Two thirds are looking for information related to their courses. The internet also plays a key support role in education in other ways. Almost half of the internet users taking courses said that they exchange messages with other students about course content. Downloading course material is also quite common. Almost four in ten (37 percent) internet users taking courses said they downloaded course material. Almost a quarter (23 percent) of the internet users enrolled in study programs said they checked the availability of books and journals at the library on-line.

Diversity in internet activities

Almost 11 million people in the Netherlands regularly use the internet. There are great differences in the extent to which they carry out different internet activities. Many people use the internet for a limited number of activities. To gain insight in the diversity of internet use, we distinguished ten common types of internet activities:

- communication, including e-mail, chatting and phoning;
- looking for information on goods, and travel services;
- tracking the news, listening to the radio, watching TV and reading or downloading newspapers;
- entertainment, including playing games, listening to music or downloading other software;

– looking or applying for a job;
– financial transactions, including on-line banking and other financial transactions;
– on-line buying or selling goods;
– government services, including looking for information on government websites, downloading and emailing official documents;
– education, including course-related activities, such as looking for information about courses, taking an on-line course, or independent learning using the internet;
– looking up information on health.

Increasing internet use leads to increasing diversity in use. This means that people engage in more diverse activities. Diversity is increasing because in 2007 there were only 0.7 million internet users who only engaged in two different activities. In 2006 this share was 0.8 million and in 2005 1 million. The ICT survey data show that the group with limited internet use is getting smaller by the year.
More internet users engaged in more kinds of activities in 2007. Some 1.6 million internet users used it for nine or more different activities, half a million more than the year before and even double the number in 2005.

Table 6.3.3
Diversity of internet activities, 2005–2007 [1)]

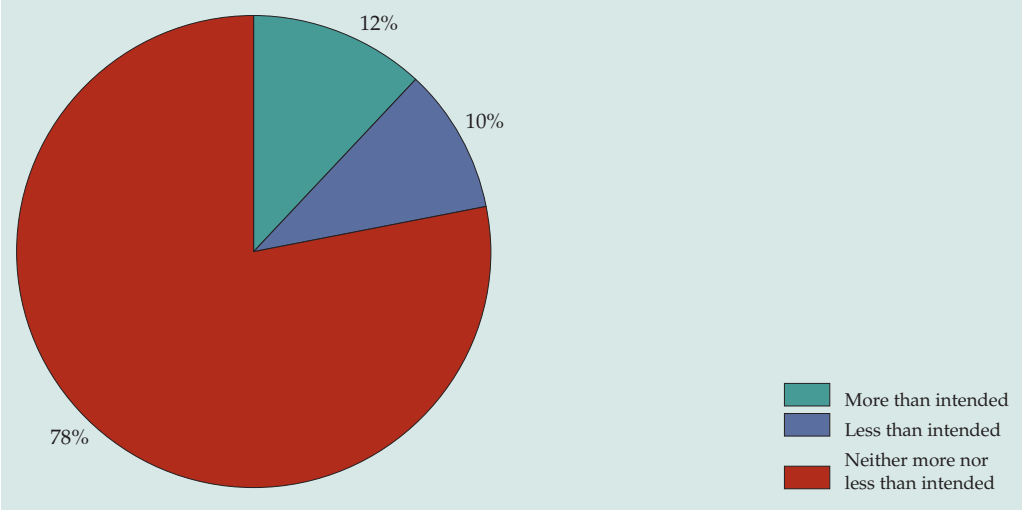
Number of internet activities	Number of internet users			Share of internet users		Average age
	2005	2006	2007	2006	2007	2007
	abs (x 1 mln)			*% cumulative*		*years*
1	0.4	0.3	0.2	3	2	48
2	0.6	0.5	0.5	7	6	39
3	1.0	0.7	0.7	14	13	40
4	1.5	1.1	1.1	24	23	39
5	1.6	1.7	1.5	41	36	40
6	1.5	1.7	1.8	57	53	39
7	1.6	1.8	1.8	75	70	38
8	1.2	1.5	1.6	90	85	38
9	0.6	0.8	1.2	97	96	36
10	0.2	0.3	0.4	100	100	35
Total	10.3	10.4	10.9			38

[1)] Persons who used the internet in the three months preceding the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2007.

In 2007 about 64 percent was involved in at least five different activities. In 2006 this was 59 percent. As young people tend to be more skilful with the internet than older people we see this reflected in the diversity of internet use, which decreases as the age of the internet user progresses. Internet users who carried out almost all of the ten possible activities were in their mid thirties. Internet users who carried out just a few of the activities were in their forties and beyond.

6.3.2 Use of the internet for private purposes, 2007 [1)]



[1)] Persons aged 12–74 years who used the internet in the 3 months preceding the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2007.

How do users feel about private internet use?

Over 11 million people in the Netherlands not only had access to the internet, but 95 percent actually also used it in 2007. The results described earlier in this paragraph show that the diversity of internet use increased in recent years. Respondents were asked if they wanted to use the internet more, or less, for private purposes than they do now. Dutch people seem to be happy with their current internet use.

Just one in ten internet users in 2007 wanted to use the medium more than they already did. Half of this group claimed lack of time as the main reason they used the internet less than they wanted. About 13 percent felt internet was difficult to use, this reason was given more often by women than by men. 12 percent was reluctant because they felt their security and privacy were not sufficiently guaranteed. Other reasons given were: the connection is too slow (9 percent), 5 percent mention the costs involved, and another 5 percent feel the internet is not very interesting.

6.4 On-line shopping

In this paragraph we examine on-line shopping behaviour of consumers. We looked at developments in on-line shopping over the last five years, the types of on-line purchases, characteristics of on-line consumers, and the correlation between these characteristics and on-line shopping behaviour. On-line shopping is also described

within its European context, and we look at the reasons people give why they don't do any shopping on-line. More information on these subjects can be found in paragraph 7.1, especially on the consequences of on-line shopping for consumers, retailers and mobility.

On-line purchases

One of the internet activities that became popular in recent years is on-line buying and ordering goods. The share of internet users buying goods on-line increased by 3 million between 2002 and 2006, reaching 7.5 million individuals. Their number more than doubled within five years. In 2002, just 40 percent of the internet users said they shopped on-line. By 2007 this percentage had increased to 66 percent. Research by the Netherlands Institute for Spatial Research (Weltevreden, 2006) shows that on-line shoppers bought on average 10 products or services a year through the internet, and that they spent an average of 225 euro per purchase.

Table 6.4.1
Shopping on-line, 2002–2007 [1)]

	2002	2003	2004	2005	2006	2007
	abs (x 1 mln)					
On-line shopper	3.6	4.2	5.1	5.9	6.6	7.5
Frequent on-line shopper	1.9	2.2	2.9	3.9	4.5	5.3
Less frequent on-line shopper	1.7	2.0	2.2	2.0	2.1	2.2
Does not shop on-line	5.3	5.1	4.7	4.8	4.2	3.8
Total	8.9	9.2	9.8	10.7	10.9	11.3
	%					
On-line shopper	40	45	52	55	61	66
Frequent on-line shopper	21	24	30	36	41	47
Less frequent on-line shopper	19	22	23	19	20	19
Does not shop on-line	60	55	48	45	39	34
Total	100	100	100	100	100	100

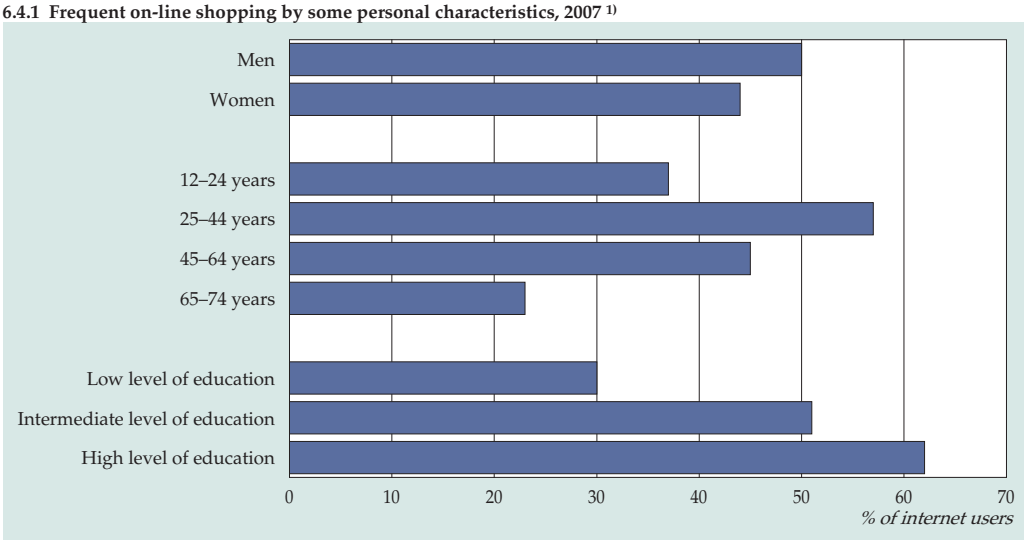
1) Persons aged 12–74 years using the internet.

Source: Statistics Netherlands, POLS 2002–2004 and ICT use by households and individuals, 2005–2007.

On-line shoppers can be divided into frequent and infrequent shoppers. Frequent on-line shoppers are defined as internet users who bought goods on the internet within 3 months prior to the ICT survey. Infrequent shoppers did their shopping more than 3 months before. 80 percent of the group of e-shoppers consisted of frequent shoppers in 2007, compared to 50 percent in 2002.

The increase in the number and the share of internet users buying or ordering goods on-line can be contributed almost entirely to the group of frequent on-line shoppers.

6.4.1 Frequent on-line shopping by some personal characteristics, 2007 [1)]



[1)] Persons who used the internet and shopped on-line in the 3 months preceding the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2007.

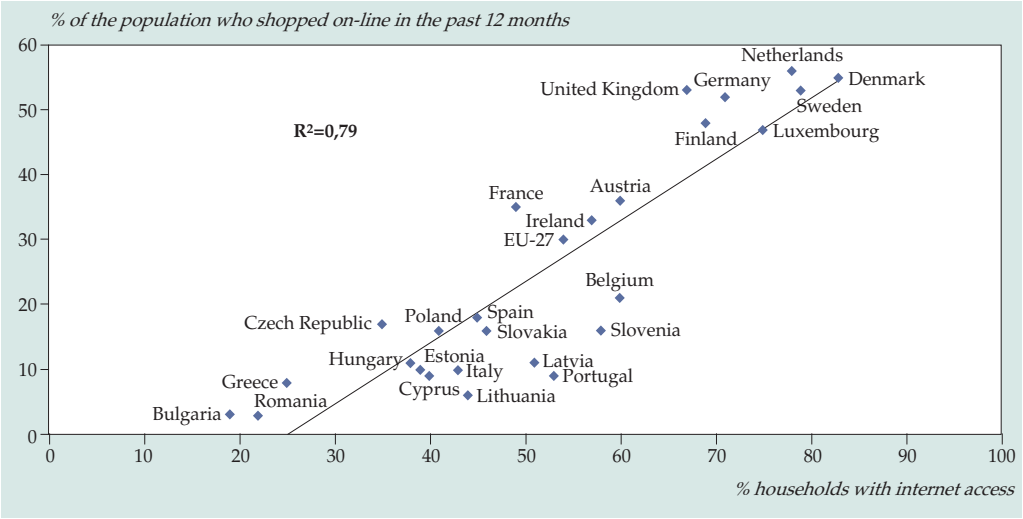
In five years time, the number of frequent e-shoppers increased by 3.4 million, reaching 5.3 million in 2007. The number of infrequent on-line shoppers increased by just 0.5 million individuals to 2.2 million during that time. Relatively speaking the share of frequent e-shoppers increased between 2002 and 2007 while that of the infrequent e-shoppers remained stable. There was a steady decline in the number of people who do not shop on-line at all. Their number decreased from 5.3 million in 2002 to 3.8 million in 2007. The percentage of non-shoppers fell from 60 percent of the total number of internet users in 2002 to 34 percent in 2007. So on-line shopping has become a well-established internet activity in recent years.

On-line shopping by personal characteristics

There are great differences in the frequency of on-line shopping between groups when characteristics such as sex, age and education are taken into account. Men are the most frequent on-line shoppers. They bought goods in the last 3 months through the internet. In 2007, 50 percent of men were frequent shoppers and 44 percent of women; the gap between men and women has been narrowing though in recent years.

In the period 2005–2007 the share of frequent on-line shoppers increased in all age categories. The sharpest increase in the share of frequent on-line shoppers was observed in the 45–64 age bracket: it increased from 33 percent of the internet users in 2005 to 45 percent in 2007. A similar increase in frequent on-line shoppers took place in the younger age groups (12–24 and 25–44 year-olds) that is almost 30 percent in

6.4.2 On-line shopping in the European Union, 2007 [1)]



[1)] Persons aged 16-74 years; no figures available for Malta.

Source: Eurostat.

the past three years. The smallest increase was observed among the 65–74 age group, where the share of regular on-line shoppers in 2005 was just 20 percent. This did not change much in 2007.

The frequency of on-line shopping is closely correlated with the education level of internet users. As much as 62 percent of the highly educated users in 2007 were frequent shoppers. This is twice as many as internet users with little education. The number of frequent on-line shoppers among the internet users with a secondary-level education hovered around 50 percent, closer to the well-educated than to the least well-educated.

On-line shopping international

The extent to which internet users buy or order on-line in the individual EU member states depends greatly on the availability of internet in households. If more households have access to internet, more people buy on-line. The correlation between these two aspects is also indicated by the high R-square value of 0.79 (see figure 6.4.2).

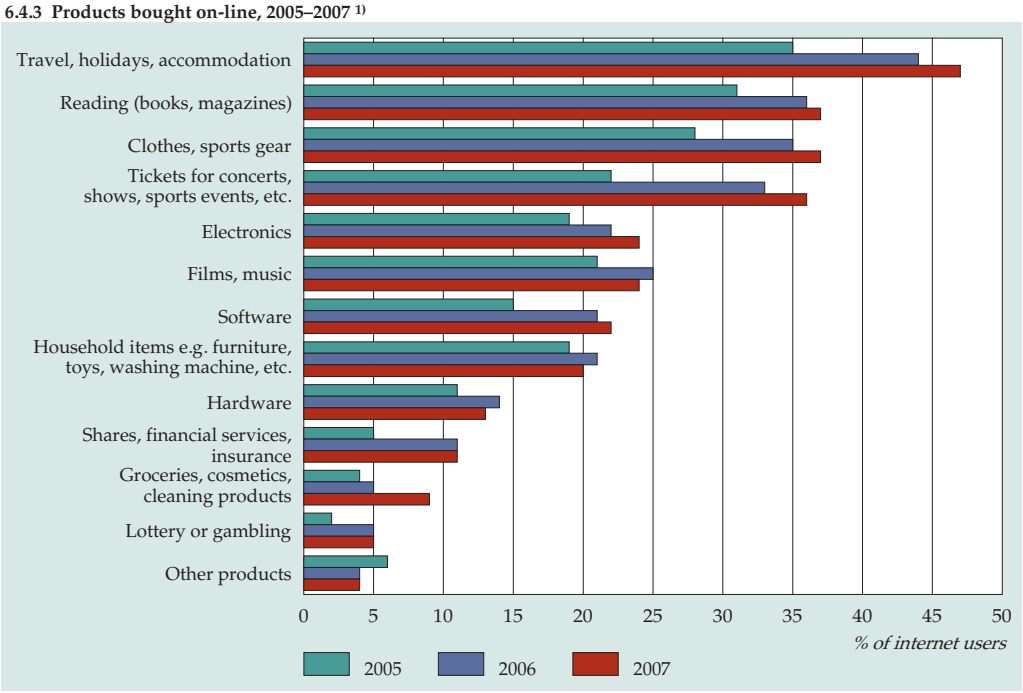
On-line shopping seems most common in the Netherlands, Sweden and Denmark, where 55 percent of the people bought goods or services on-line in 2007. Germany, the UK, Finland, and Luxembourg belonged to the group of countries where almost half of the inhabitants did some on-line shopping in the 12 months before the survey was held. On average only one in three people shopped on-line in the EU-27 in 2007. There was little or no on-line shopping in several member states, e.g. in the new EU member states, Romania and Bulgaria.

What frequent on-line shoppers bought

The sharp rise in the number of frequent on-line shoppers in the Netherlands is also manifest in the rise in almost the complete range of goods and services bought or ordered on-line. Most purchases have to do with travel, holidays and accommodation, followed by books and magazines. About half of the on-line shoppers in 2007 had bought trips or holidays on-line within the previous three months. 37 percent of the on-line shoppers bought reading materials on-line. Moreover, the on-line purchases of 'clothing and sports gear' and tickets for events by frequent on-line shoppers rose spectacularly in the past three years. In 2007 over a third of the frequent on-line shoppers reported that they had bought or ordered these products on-line, compared to one fifth in 2005. Such spectacular increases were not seen for all purchases. There was very little grocery shopping and spending in the category 'lottery or gambling' in 2007 by frequent on-line shoppers. The study of the Netherlands Institute for Spatial Research in 2006 (paragraph 7.1) showed the rapid increase in the on-line trade in second-hand goods in the past two years.

Male and female frequent on-line shoppers buy different goods on-line. Men bought twice as much electronics, software and hardware on-line than women in 2007. Women bought or ordered much more clothes and sports gear through the internet

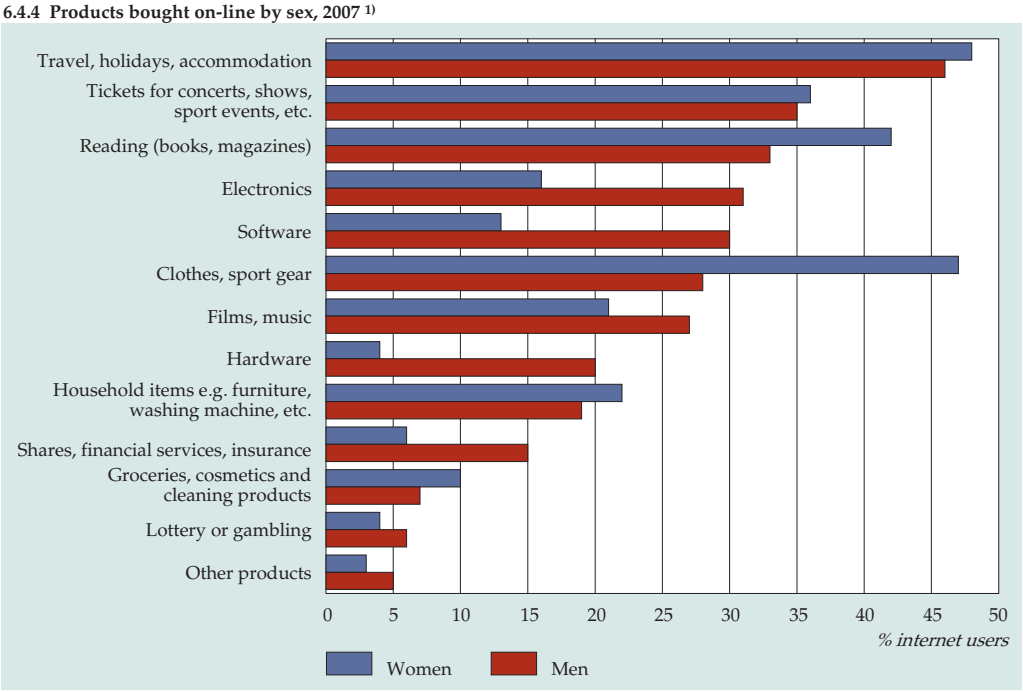
6.4.3 Products bought on-line, 2005–2007 [1)]



[1)] Internet users who bought a product on-line in the three months preceding the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2007.

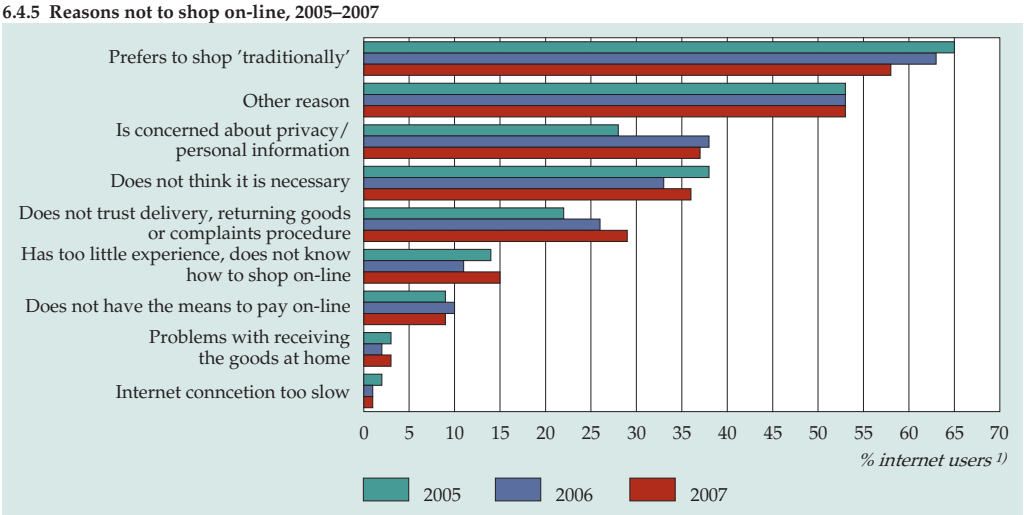
6.4.4 Products bought on-line by sex, 2007 [1)]



[1)] Internet users who bought a product on-line in the three months preceding the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2007.

6.4.5 Reasons not to shop on-line, 2005–2007



[1)] Internet users who have never bought anything on-line, or whose last on-line purchase was more than 12 months before the survey. More than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2007.

(47 percent of the women vs. 28 percent of the men in 2007). Women also bought more books and magazines on-line (42 percent) than men (33 percent).

On-line shopping; why not?

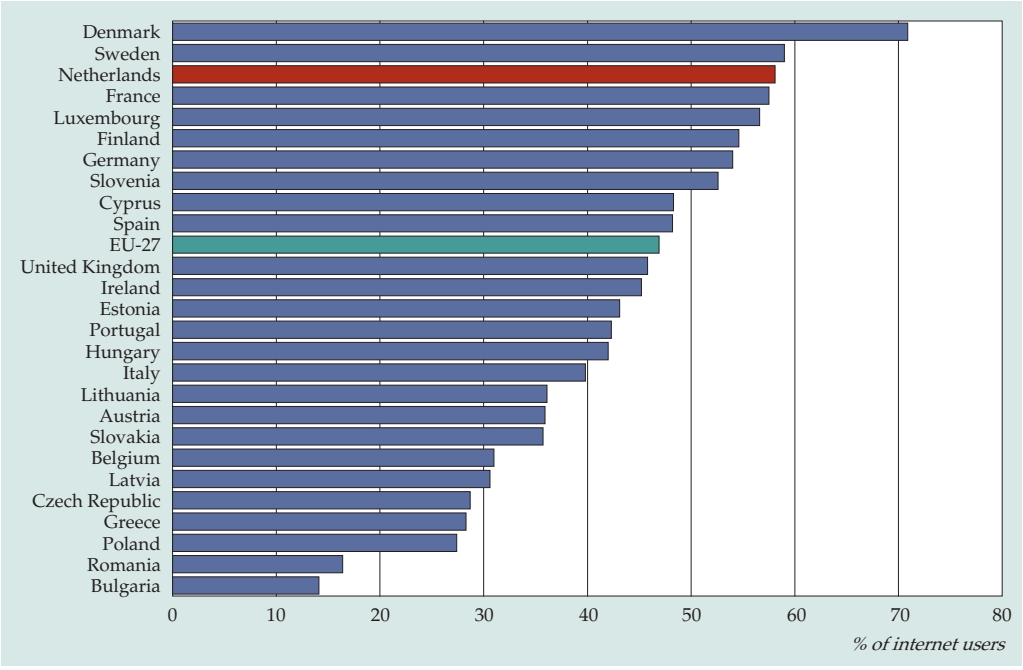
We asked the internet users who had never bought goods on-line why they didn't, and people who shopped on-line more than a year ago why they so rarely did. It turned out that most preferred to shop traditionally (58 percent). This share was considerably lower in 2007 than before. The sense of insecurity is also a major obstacle for on-line shopping. Almost four in ten non-on-line shoppers is worried about privacy or does not want to supply personal data through the internet. Another 36 percent indicated that they felt no need to buy on-line, while 29 percent does not trust the handling of deliveries, returns, or complaints of the goods they want to buy.

6.5 *On-line government services*

Use of government websites in the European Union

In 2007 nearly half of the internet users in the EU looked up information on government websites. Denmark is well ahead in the use of government websites: seven in ten internet users visit government websites; in the Netherlands this was

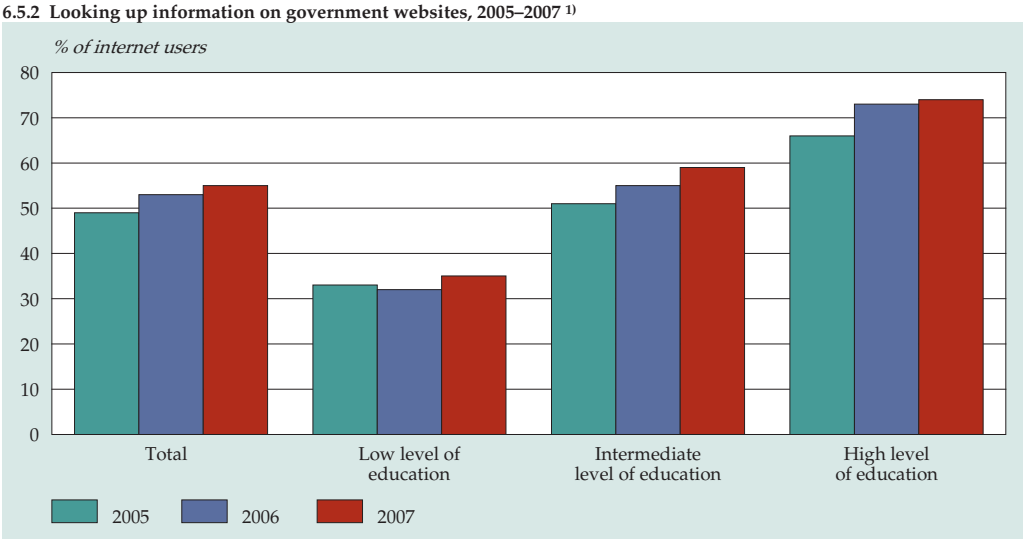
6.5.1 Looking up information on government websites in the European Union, 2007 [1)]



[1)] Persons aged 16–74 years who used the internet in the 3 months preceding the survey.

Source: Eurostat; no figures available for Malta.

6.5.2 Looking up information on government websites, 2005–2007 [1)]



[1)] Persons who used the internet in the three months preceding the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2007.

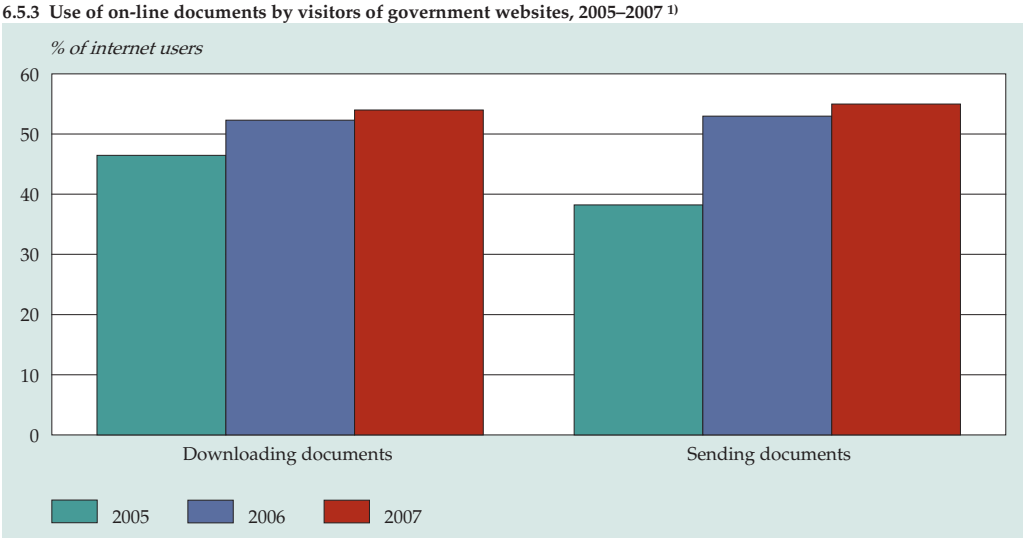
close to six in ten. Together with Sweden, France, Luxembourg, Finland, Germany and Slovenia, the Netherlands belongs to a group of countries where over half of the internet users likewise visit government websites. In most member states, internet users visit the government website less than average. In the EU countries Poland, Greece, and the Czech Republic less than three in ten internet users do so. Looking up information on government websites was least common in Romania with 16 percent and Bulgaria with 14 percent. In these countries the internet is less widespread.

Use of government websites in the Netherlands

The favourable position of the Netherlands in the EU is an indication that the internet is now used by many government institutions to inform the population about all sorts of issues and to explain legislation and regulations. This makes it relatively cheap to inform many people. Apart from their informative character, these websites can also be used to supply forms and provide data, in other words, they can be used to provide government services. Governments can reduce its administrative burden and benefit from widespread internet use in this way.

Looking up information on government websites is on the increase, just like most other internet activities. In 2007, 55 percent of the Dutch internet users made enquiries about government matters. This percentage was again higher than in the previous year (by 2 percent points), but the increase was not as great as in 2006 when this internet activity went up by 4 percent points. Highly educated internet users look up most information on government websites; almost three quarters did so. This means twice as many highly educated people used the internet to look up government information than less well-educated internet users.

6.5.3 Use of on-line documents by visitors of government websites, 2005–2007 [1)]

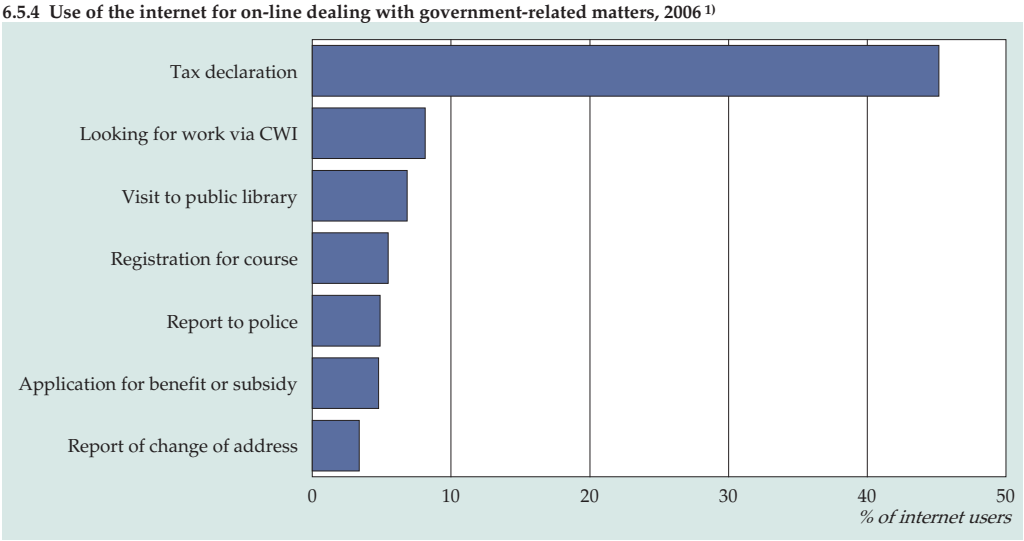


1) Persons who used the internet in the three months preceding the survey. More than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2007.

There is also an increase in actually downloading forms and returning filled in documents. Over half of the internet users who looked up information on government websites in 2007 also downloaded documents. This share is up by 8 percent points compared to 2005 and by 2 percent points by 2006. A similar

6.5.4 Use of the internet for on-line dealing with government-related matters, 2006 [1)]



1) Persons who used the internet in the three months preceding the survey. More than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2006.

percentage (55 percent) of the internet users reported that they returned the filled in documents on-line. This share is much higher than in 2005, when only 38 percent reported that they returned the completed documents on-line.

More men than women use government websites: six in ten men vs. half of the women. Not only do men look up more information on government services, men also handle government matters on-line more often.

Arranging government services on-line

It is in the interest of government bodies and citizens that services are offered and completed through the internet. This saves the government money because they can reduce administrative work. It saves the citizens time and trouble of handling governmental matters the traditional way. So it is interesting to see which services can be handled on-line.

The survey by Statistics Netherlands on the use of ICT by households and individuals in 2006 studied which government matters were completed on-line. On-line tax returns were by far the most common. Less than one in ten internet users completed other public services, such as looking for a job or visiting a public library on-line. About one in twenty internet users registered on-line for a course, reported a crime to the police on-line or applied for a subsidy.

Table 6.5.1
Dealing with public services on-line, 2006

	Tax declaration	Looking for work via CWI	Tax declaration	Looking for work via CWI
	% of internet users		*% of internet users who visited government websites* [1]	
Total	44	8	63	11
Sex				
Men	50	8	68	9
Women	37	8	57	14
Age				
12 to 25 years	21	7	44	10
25 to 45 years	54	11	70	15
45 to 65 years	48	6	63	8
65 to 75 years	41	0	67	1
Level of education [2]				
Low	21	5	42	10
Intermediate	48	9	65	11
High	65	10	73	11

[1] Persons who used the internet in the three months preceding the survey and visited government websites.
[2] Highest completed level of education.

Source: Statistics Netherlands, ICT use by households and individuals, 2006.

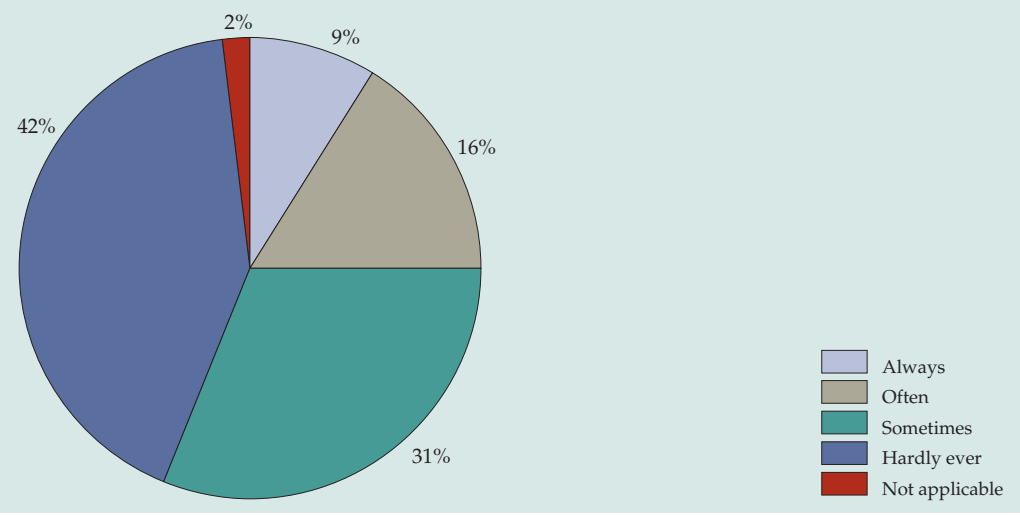
Slightly less than half of all internet users in 2006 filed their tax return on-line. Tax returns were predominantly done by male internet users: of whom half did so vs. 37 percent of the women. On-line tax returns also depend on age: the younger the internet user, the more likely tax returns are filed on-line. In the oldest age group (65–75), over 40 percent of internet users filed their tax returns on-line in 2006. People with a higher education level also filed their tax returns on-line more often in 2006: about two thirds did so. This is three times as many as in the less well-educated group.

Looking for work at the job exchange is also listed in the survey as a government service people can complete on-line. About 8 percent of the internet users did their job hunting in this way, divided equally among men and women. Unsurprisingly, people in the 25–45 age group used this service most.

6.6 *Computer and internet security*

Less than one in ten people indicated that they had never used a computer in 2007, this concerns mainly people over 65. This means that nine in ten people use the computer regularly and 81 percent almost daily. Despite the frequent use of the computer not everyone is alert enough to securely save their data, altough they are often personal and may have sentimental value such as photos and images. Users often don't realise that viruses can do a lot of damage, sometimes even irreparable damage.

6.6.1 Making backups of files and pictures by computer users, 2007 [1)]



[1)] Persons who used a computer in the 12 months preceding the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2007.

Making backups

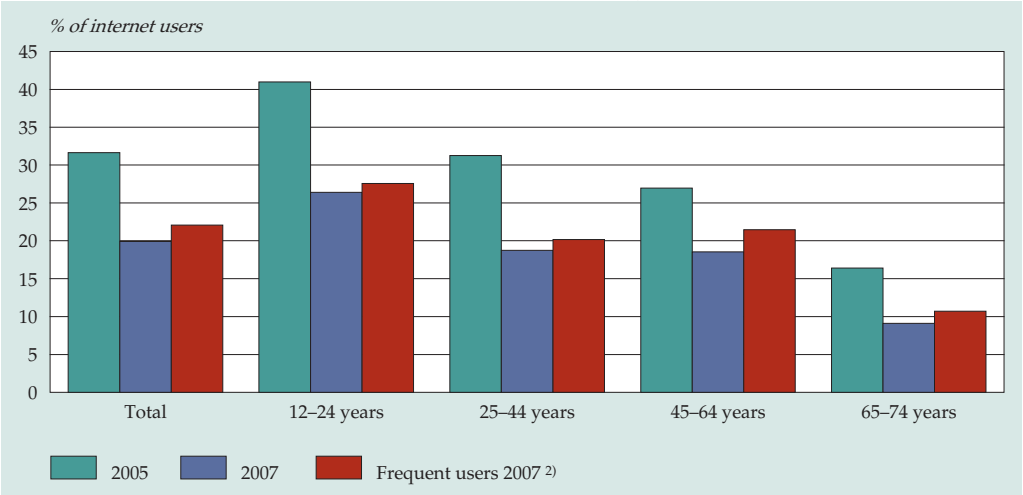
Many computer users don't seem to understand they should make regular backups of their key files and images. In 2007 42 percent of the people who used a computer in the previous year said they rarely made a backup of documents. Women do so less often than men. Almost half of the women using a computer (47 percent) never make backups of files or images, while 37 percent of the men never make backups. 31 percent of the computer users indicated that they made preventive backups, 16 percent did so quite often and only 9 percent always makes backups. Highly educated computer users are among the most frequent users making backups. One in three says they always or often make backups. Among the less well educated computer users only one in five does so.

Damage caused by viruses

One in five internet users in 2007 had to deal with a loss of information or time due to a computer virus in the previous 12 months. Their share has dropped fast since 2005 when almost one in three internet users lost information or time due to a computer virus. Very frequent internet users in 2007, regardless of their age group, consistently reported slightly more damage caused by a virus.

All age groups saw a decrease in the inconvenience caused by viruses between 2005 and 2007. The youngest age group suffers most damage in the form of time or information loss. This is mainly due to their frequent use of the internet. In this group, aged 12–24, more than a quarter suffered damages caused by viruses in 2007. Only one in ten internet users aged 65–74 experienced this. The decrease of

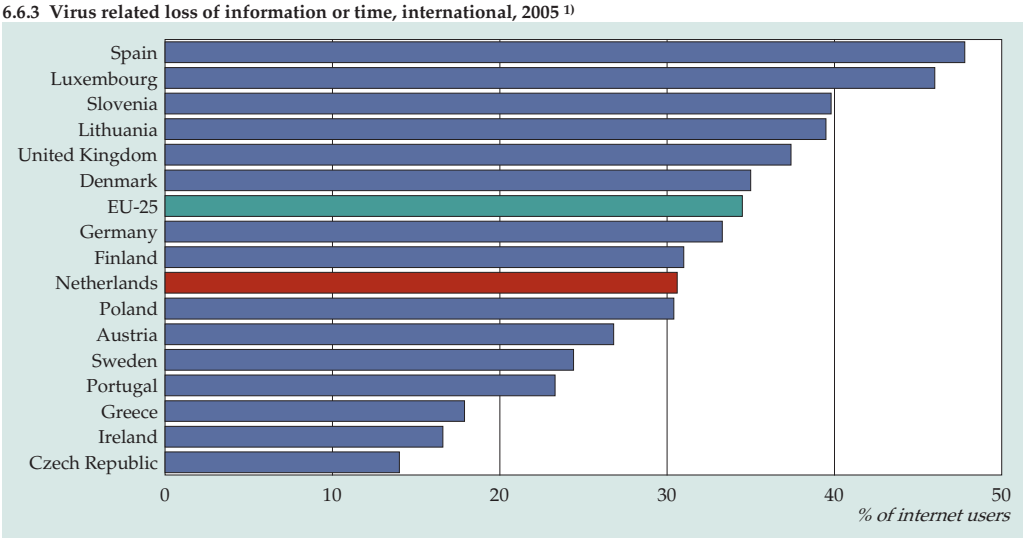
6.6.2 Internet users who suffered a loss of information or time from a virus, 2005–2007 [1)]



1) Persons aged 12–74 years who used the internet in the 12 months preceding the survey.
2) Almost daily.

Source: Statistics Netherlands, ICT use by households and individuals, 2005 and 2007.

6.6.3 Virus related loss of information or time, international, 2005 [1)]



[1)] Persons aged 16–74 years who used the internet in the 12 months preceding the survey.

Source: Eurostat; no figures available for Belgium, France and Malta.

inconveniences caused by viruses was most pronounced among young people. In the age group 12–24 the incidence of damage due to a computer virus fell by a as much as 14 percent points in the period 2005–2007. The decrease in damage caused by computer viruses was very substantial among the older group as well: 7 percent points.

Damage through viruses in other EU member states

In 2005, an average of almost 35 percent of the internet users across all 25 EU member states suffered damage from viruses. This share was several percent points lower in the Netherlands that year. There were great differences between the EU member states as far as damage from viruses was concerned. Almost half of the internet users in Spain and Luxembourg had to deal with this, and about 40 percent in Slovenia and Lithuania. An above average number of internet users in the UK and Denmark suffered damage from viruses. Only a few member states had computer damage rates below 20 percent. These were countries where internet is not yet very common, so they seem to be less interesting as targets for people who produce viruses. This, however, does not seem to be the case for Lithuania.

Anti-spam and anti-virus measures in EU member states

Despite the inconvenience caused by spam and viruses, many European households with internet fail to take protective measures. In 2006, 58 percent of the households with internet had anti-spam software, usually free software. Moreover, 14 percent trusted their internet provider to protect them against spam. Over one in five households does not even worry about the inconveniences caused by spam (Eurobarometer, 2006).

The share of households with internet who protect themselves against viruses is higher than the share of households who protect themselves against spam. In 2006, 82 percent installed anti-virus software. Over half the households paid for the software. 5 percent of the households with internet trust their provider to protect them from viruses while 8 percent takes no precautions at all.

Note in the text

1) In the ICT survey among households and individuals, carried out since 2005 by Statistics Netherlands, only individuals aged 12–74 are interviewed. ICT outcomes about the period 2002–2004 come from the POLS quality of life survey where individuals over 12 were interviewed. The new ICT survey was designed differently. People are interviewed on the phone rather than face-to-face, as they do in the POLS quality of life survey. The sample size of the new ICT survey is more than 4,000 individuals smaller than in earlier POLS survey. For this edition, we made the data for 2002–2004 comparable at the individual level by recalculating them for the population aged 12–74. At the household level we did not fully correct for comparability.

   The ICT survey among households and individuals is carried out within a European framework, where all member states ask similar questions. So Dutch results can be compared with outcomes in other member states. The international results refer to individuals aged 16–74.

7. Capita Selecta

This chapter contains four contributions. The first is written by the Netherlands institute for spatial research (RPB), the other contributions by Statistics Netherlands. The topics discussed are:

- On-line shopping and the retail trade: this contribution looks into the consequences of e-shopping for consumers, retailers and mobility.
- The use of ICT by companies: this paragraph looks at what makes ICT investments successful.
- Productivity effects of broadband use: this report shows the results of an academic study about the impact of broadband on the productivity of companies.
- First explorations in statistics via the internet: this final paragraph explores the options digitalising makes possible for compiling statistics via or with the internet.

In the summaries and conclusions at the start of his edition a brief summary of the four contributions is presented.

7.1 On-line shopping and the retail trade

Author: Jesse Weltevreden, Netherlands institute for spatial research (RPB).

This paper discusses the consequences of on-line shopping for consumers, retailers and mobility. The results come from a 2007 study by the RPB 'Winkelen in het internettijdperk'. This paper complements chapters 4 and 6 of 'The digital economy 2007'.

Background

The number of consumers shopping on-line has increased rapidly in recent years (see chapter 6) and retailers also increasingly use the internet as their information, communication and sales channel. According to Thuiswinkel.org (2007) consumers bought 2.8 billion euro worth of goods and services through the internet in 2006, compared to 527 million euro in 2001.

The explosive growth of on-line shopping apparently has consequences for the use of space and for transport. After all, products bought through the internet and delivered at home often used to be bought in shopping centres. Such changes lead to various questions:

Have consumers started shopping differently because of the internet?

Which shops and shopping centres suffer most from on-line shopping?

How do retailers react to opportunities and challenges created by the internet?

What are the consequences of on-line shopping for passenger and freight transport?

These questions have been subject to much speculation in recent years. Empirical studies so far mainly focused on the registration of the use of e-commerce by consumers and companies. Therefore, in 2006, the RPB has conducted quantitative research into the consequences for spatial planning of on-line shopping (Weltevreden, 2007a).

The RPB used several data sources to map the spatial effects of on-line shopping:
- a national representative on-line survey among 3 thousand on-line shoppers into the effects of on-line shopping for shopping areas (2006);
- a content analysis of the websites of more than 10 thousand shops in 23 Dutch municipalities to map the internet strategies of retailers in various shopping areas (2006).

Moreover research of the University of Utrecht from 2004 was used. This material dealt with the consequences of on-line shopping for city centres, and used several methods including a telephone survey among more than 900 retailers in city centres and an on-line survey among 3,218 internet users (Weltevreden, 2007b).

In this paragraph we present several key results of the RPB study and several new analyses, focusing on the following issues:
- on-line shopping by consumers;
- effects of on-line shopping on shopping behaviour;
- internet adoption by retailers;
- spatial effects of on-line shopping;
- logistical consequences of on-line shopping.

On-line shopping by consumers

On-line shopping basically consists of two main activities: (1) an orientation on products and services with or without the intention of buying them on-line (2) the actual buying the products and services on-line. On-line shoppers make 39 enquiries on average about products and services a year on the internet (table 7.1.1). Women do so substantially less often than men. The same goes for on-line shoppers in the 15–34 age bracket.
The number of times people enquire on-line does not correlate significantly with the education level of the potential buyer. Potential buyers consulted price comparison sites about 16 times a year on average. Women consult such sites less often than men.

On-line shoppers buy on average 10 products and services a year in total on the internet, spending on average 225 euro on-line per purchase (compared to an average of 180 euro in 2004). Older on-line shoppers (over 55) buy less frequently on-line, whereas on-line shoppers in the 15–34 age bracket spent significantly less per on-line purchase than the older on-line shoppers. The average amount spent seems rather high, considering prices for DVDs or CDs, but the amount also includes travel

arrangements bought on-line. The average amount of time on-line shoppers spent on on-line shopping is 32 minutes each time, which includes looking for information on-line. During this time people may order several products.

Table 7.1.1
Behaviour of on-line shoppers by personal characteristics, 2006

	On-line enquiries about products/ services	Use of price comparison sites	On-line purchases of products/ services	Average amount per on-line purchase
	minutes per time	*times per year*		*euro per purchase*
Total	39	16	10	225
Sex				
Woman	35	11	10	224
Man	41	20	10	226
Age				
15–34	33	16	10	159
35–54	43	17	11	276
over 55	42	15	8	275
Education level				
Primary	35	16	10	270
Secondary	41	18	10	195
Higher	38	15	10	230

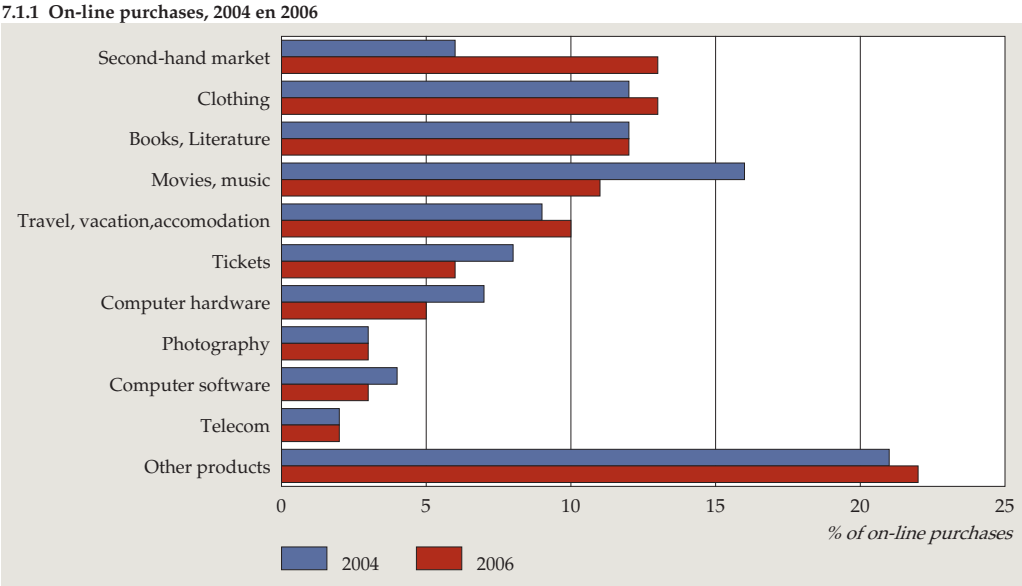
Source: RPB, 2007.

Which products do on-line buyers purchase most often? This is shown in Figure 7.1.1: second-hand items, clothing, literature, films/music, and travel/holidays/ accommodation. A striking increase in buying second-hand goods in 2006 can be noticed compared to 2004. Within two years time the share of this category of goods more than doubled in the total number of internet purchases. This rise is mainly due to the ease with which consumers can trade second-hand goods on auction and advertising sites (e.g. E-bay, Marktplaats or Speurders).

Men and women buy different kinds of products on-line. The most popular internet purchases by men in 2006 were second-hand goods (12 percent), films/music (12 percent) and travel/holidays/accommodation (10 percent). Women buy clothing (19 percent) most frequently on-line, followed by literature (15 percent) and second-hand goods (13 percent). Men buy a wider range of products through the internet than women.

Table 7.1.2 shows in what kinds of web stores on-line shoppers do their on-line shopping. On-line shoppers in 2006 mainly shopped in virtual stores, mail-order companies and with private individuals through advertising and auction sites. They shopped a lot less with traditional retailers.

7.1.1 On-line purchases, 2004 en 2006



Source: RPB, 2007.

The striking difference with 2004 is the sharp rise in the share of private individuals. This has everything to do with the growing popularity of C2C e-commerce (consumer to consumer). The market shares look very different in terms of turnover, due to the value of the products and services sold by the various kinds of suppliers. Producers and service providers mainly sell travel, holidays and electronics through the internet. Female on-line shoppers buy much more often from mail-order companies than male on-line shoppers (24 versus 13 percent). This is because women buy clothes on-line more often than men. Men, however, shop slightly more often in virtual shops than women (31 versus 27 percent).

Table 7.1.2
Market shares of on-line stores by sales and turnover, 2004 and 2006

	Share		Turnover	
	2004	2006	2004	2006
	%			
E-tailer	34	29	28	19
Private individual (via advert or auction site)	9	17	7	14
Mail-order company	20	18	10	8
Traditional shopkeeper	14	11	15	14
Producer/service provider	11	15	24	35
Other kinds of webstore	2	2	3	3
Unknown	10	9	13	8

Source: RPB, 2007.

Effects of on-line shopping on shopping behaviour

More and more people buy goods on-line. This poses the question if and to what extent this influences physical shopping behaviour of on-line shoppers, and exactly what the consequences are. An average of one in three on-line shoppers already reported that they visited one or more shopping areas less often because of on-line shopping (table 7.1.3). Another 38 percent reported buying less frequently in one or more shopping areas. For women on-line shopping is significantly less often a substitute for physical shopping than for men; the same is true for the older on-line shoppers.

Table 7.1.3
Changes in shopping behaviour of on-line shoppers, 2006

	Visit shopping areas less often	Buy less in shopping area	More price conscious	More purchases on-line
	% on-line shoppers			
Total	34	38	61	23
Gender				
Woman	32	34	54	21
Man	35	40	66	25
Age				
15–34	34	38	62	27
35–54	35	40	62	22
over 55	24	26	54	11
Education level				
Primary	31	32	58	16
Secondary	34	39	63	26
Higher	35	40	61	25

Source: RPB, 2007.

On-line shopping clearly has its effect on shopping centres, but which shopping areas are affected most? This turns out to be the downtown areas (table 7.1.4). No less than 42 percent of all on-line purchases would have been bought there if the products had not been available on-line. The consequences of on-line shopping are also felt in the centres of villages and neighbourhoods, albeit to a lesser extent than in the city centres. The relatively low percentage of on-line purchases that would otherwise have been bought in the city centre is somewhat misleading because only 4 percent of all shopping areas in the Netherlands is downtown. The extent to which shopping areas are influenced by on-line shopping greatly differs per product (table 7.1.4). No less than 64 percent of all on-line purchases in the category telecom would have been bough downtown if these products could not have been bought on-line; the same is true only for 19 percent of the second-hand goods.

Table 7.1.4
Purchased if the product had not been available on-line, 2006 [1)]

	Down-town	Vilage centre	Neigh-bourhood shopping centre	Other shopping locations	Mailorder or telephone	Didn't purchase	Other
	%						
Total	42	6	5	19	7	19	3
Second-hand goods	19	2	1	17	3	52	6
Clothes	54	6	6	12	9	12	1
Literature	55	8	4	16	5	11	1
Films, music	55	6	8	13	3	14	2
Travel, holidays, accommodation	38	9	8	22	9	10	4
Tickets for events	33	3	3	30	15	14	2
Computer hardware	48	4	4	30	3	8	3
Photo equipment	41	9	8	24	2	12	4
Computer software	44	3	3	17	7	23	4
Telecom articles	64	2	5	11	2	13	4
Other artcles	34	8	3	23	9	20	4

[1)] Percentage per product group.

Source: RPB, 2007.

Such figures show the negative impact of on-line shopping for the retail trade in downtown and other shopping areas. However, also the on-line enquiries made about products and services already have their consequences. For instance, price comparison sites lead to more price conscious consumers: 60 percent of the on-line shoppers started paying more attention to prices (table 7.1.3). This puts profit margins under pressure for retailers. On-line shoppers increasingly select the retailer offering the best price, and whether this is a physical or virtual retailer doesn't matter a great deal. Male and young on-line shoppers are more price conscious, female and older on-line shoppers (over 55) slightly less.

Another noteworthy result is that almost one in four on-line shoppers started buying more products since they shop on-line (table 7.1.3). The virtual world leads to impulse buying just like the physical world does (see also table 7.1.4). Database marketing makes it possible for web stores to generate personal offers to their clients and potentials based on their earlier purchases. A whole new market for second-hand goods developed thanks to the internet. No less than 52 percent of all second-hand goods would never have been bought if they had not been made available on-line (table 7.1.4). Male and young on-line shoppers started buying more products thanks to the internet (table 7.1.3). The fact that on-line shopping doesn't always come at the expense of physical shopping but also leads to extra purchases means opportunities for retailers. To what extent do retailers use the opportunities internet provides? This is the focus of the paragraphs below.

Internet adoption by retailers

Retailers feel that on-line shopping changes the physical shopping behaviour of consumers. In 2004 one in three traditional retailers felt that the internet had led to more competition in their branch. The main negative effects of on-line shopping according to the retailers are a loss in turnover and profits (34 percent), and clients being better informed and more price conscious (29 percent). Retailers can fight some of these consequences by creating their own websites.
The reactions of the retailers to the negative consequences are examined below, involving the ten sectors in which consumers buy most frequently on-line (figure 7.1.1).

An average of 45 percent of the retailers in 2006 had a website (table 7.1.5). Above-average numbers of retailers in the sectors selling the ten most popular items purchased on-line had their own websites, except for sellers of second-hand goods and clothing. Most retailers in the categories hardware, literature, and travel/holidays/accommodation have websites. Retailers in these sectors are pro-active in their reactions to on-line shopping. This is also clear from the registration of domain names: retailers in the sectors that are most sensitive to on-line shopping were generally earlier to register their domain names than retailers in other sectors. They also update their websites more regularly, partly because they sell more on-line than average (table 7.1.6).

Table 7.1.5
Retailers with a website, 2006

	Retailers with a website [1]	Number of years with a domain name [2]	Update frequency per week [3]
	% retailers	*years*	*times a week*
Total all sectors [4]	45	5.4	0.8
Second-hand goods	28	4.6	0.6
Clothes	40	5.5	0.6
Literature	75	6.0	1.7
Films, music, software [5]	66	6.3	1.8
Travel, holidays, accommodation	74	6.3	N.B.
Computer hardware	86	6.1	1.4
Photo equipment	67	5.1	1.2
Telecom	67	6.0	1.3
Other sectors [4]	44	5.3	0.8
Independents (< 6 branches) [4]	39	4.9	0.7
Chains > 5 branches) [4]	93	7.4	1.1

[1] The website penetration differs from the results in Winkelen in het internettijdperk (Weltevreden, 2007a, p. 69) because a different sector classification was used, in line with The digital economy 2007.
[2] Average of retailers with a website. Survey date 1 September 2006.
[3] Average of retailers with a website.
[4] Exclusive points of sale of service providers such as banks, real-estate agents, cafés, restaurants, museums, dry cleaners, beauty parlours, hairdressers, tailors.
[5] Films, music and software are considered one sector since retailers selling CDs also usually sell software/games. The product group tickets is not included due to insufficient data.

Source: RPB, 2007.

Retailers can create their own websites for various purposes. They may seek to increase their name recognition, inform clients and potentials about special offers, or sell through the internet. Retailers who are relatively hard hit by on-line shopping tend to develop more extensive website than retailers who are hardly bothered by it. Which aspects are on the websites of retailers in the ten sectors that are most vulnerable to e-commerce?

Some 60 percent of the retailers with a website display company information on their website. Small independent retailers without an office apart from their shop don't display such information on their website. Most websites contain information about the shop, such as address, opening hours, position on the map, photos of the interior. Websites without such data are usually still under construction, or they are used to serve new markets and clients. The majority of websites also offer product information.

Table 7.1.6
Aspects of websites by retailers, 2006

	Business information [1]	Information on shop	Product information	Loyalty [2]	Synergy [3]	After sales	On-line sales/ orders
	% of retailers with a website						
Total all sectors [4]	60	93	80	26	20	25	22
Second-hand goods	51	97	64	9	16	13	22
Clothes	66	89	80	36	12	17	10
Literature	71	94	88	50	55	24	66
Films, music, software [5]	67	81	74	50	31	33	50
Travel, holidays, accommodation	85	98	92	69	44	58	67
Hardware	51	88	80	33	31	36	40
Photo equipment	49	95	89	57	70	38	78
Telecom	70	92	76	51	17	56	49
Other sectors [4]	59	94	81	23	20	25	20
Independents (< 6 branches) [4]	51	92	78	19	19	19	21
Chains (>5 branches) [4]	94	96	89	56	26	48	26

[1] Business information includes: contact data main office, company history, vacancies and press releases.
[2] Loyalty includes such aspects as: email newsletter, entertainment (games, quizzes), option to apply for a loyalty card, on-line customer data management.
[3] Synergy includes such aspects as: information on activities in the shop (fashion show, book signing, etc.), the option to make an appointment for a service in the shop (e.g. test drive), coupons customers can downloaden and spend in the shop, the option to buy on-line and return in the shop.
[4] Exclusive point of sale of service providers such as banks, real estate agents, cafés, restaurants, museum, dry cleaners, beauty parlours, hair dressers, tailors.
[5] Films/music and software are considered one sector because stores selling CDs usually also sell software/games. The product group tickets is not included due to insufficient data.

Source: RPB, 2007.

Customer loyalty items are far less common: only 26 percent of the retailers used their website for customer loyalty purposes (table 7.1.6). Items that improve the synergy between the website and the shop are rarely presented. Retailers make little use of the possibilities their websites offer to seduce clients into visiting their shop. The websites are also still insufficiently used for after sales services, such as reporting defects on-line, seeing the repair status, and downloading manuals. Only 22 percent of the retailers use the option of ordering or buying products on-line.
The latter aspects demand retailers to invest more time and money than for a website with information on the company, shop or product, therefore many retailers do not make that choice. Retailers in the ten most e-commerce sensitive sectors usually do make that choice, particularly those in photography, travel/holidays/ accommodation, literature and films/music/ software. Retailers in the photography branch have a very high score in synergy and on-line sales because they offer on-line photo services.

Table 7.1.6 shows that chain stores have more advanced websites than independents. Chain stores often have loyalty and after sales features on their website. There are also major differences between chains and independents in the degree to which their websites operate properly. Something is not right on the website of chains in 10 percent of the cases, according to the RPB study. For independents with a website this is as much as 26 percent. Most problems occur among retailers selling on-line. They often have no terms of delivery or order forms on their website, and only show payment options late in the transaction process.
Some 35 percent of the independents and 9 percent of the chains that sell on-line do not have terms of delivery or order forms on their websites. 24 percent of the independents and 10 percent of the chains that sell on-line showed payment options only after logging in/ordering.

Spatial effects of on-line shopping

Many retailers make use of the opportunities the internet has to offer, but many don't. The turnover and profit margins of many retailers are under pressure due to on-line shopping. Do any spatial effects as a consequence of on-line shopping occur already in shopping areas? Examples are increasing numbers of empty stores and fewer points of sale. If there are any spatial effects at all, they would be expected in downtown areas. After all, that is where more than 42 percent of the on-line purchases would have been bought if the buyer could not have bought them on-line (table 7.1.4). Therefore table 7.1.7 describes the development of the number of points of sale in city centres for the ten most popular on-line purchases between 2003 and 2007.

The number of points of sale in city centres (including services) was reasonably stable between 2003 and 2007. Also the number of empty stores did not increase during this period. However, this does not mean that there were no changes

between 2003 and 2007 in the retail trade structure in downtown areas. The number of points of sale in city centres dropped in some sectors vulnerable to e-commerce. The number of points of sale in city centres fell most sharply in photography (24 percent) and travel/holidays/accommodation (17 percent).

Table 7.1.7
Developments of downtown points of sale 2003–2007 [1)]

	April '04	Oct. '04	April '05	Oct. '05	April '06	Oct. '06	April '07
	index october 2003= 100						
Total all sectors (excl. services) [2)]	101	101	100	100	100	100	100
Total all sectors (incl. services) [3)]	101	101	101	101	101	101	101
Second-hand goods	100	102	102	101	100	98	93
Clothes	101	102	102	103	103	104	106
Literature	101	102	101	103	103	102	102
Films, music, software [4)]	101	102	102	102	100	97	91
Travel, holidays, accommodation	100	99	96	94	92	87	83
Computer hardware	100	102	131	128	127	125	125
Photo equipment	99	93	88	88	84	83	76
Telecom	104	111	113	120	126	132	139
Other sectors (excl. services) [2)]	100	99	99	99	99	98	97
Other branches (incl. services) [3)]	100	101	101	101	100	100	100
Empty stores	103	103	102	101	100	99	100

1) Downtown shopping areas are all central shopping areas with over 100 shops in the Locatus database.
2) Exclusive points of sale of service providers such as banks, real-estate agents, cafés, restaurants, museums, dry-cleaners, beauty parlours, hairdressers, tailors.
3) Including points of sale for service providers.
4) Films/music and software are considered one sector since retailers selling CDs also usually sell software/games. The product group tickets is not included due to insufficient data.

Source: Locatus, 2003–2007.

The figures for literature, second-hand goods and films/music/software in table 7.1.7 are a bit skewed because the number of normal bookstores fell by 3 percent whereas the number of shops selling comics and office stationers increased by 24 and 8 percent respectively.
Within second-hand goods there was a 14 percent drop in the number of antique stores whereas the number of second-hand clothing stores increased by 20 percent. In films/music/software the number of shops selling CDs fell by 15 percent between 2003 and 2007, whereas the number of game stores went up massively by 48 percent. There are also sectors vulnerable to e-commerce where the number of points of sale rose sharply, such as computer hardware and telecom.

In summary, on-line shopping may have an effect on which sectors operate in the downtown areas. The sectors that face heavy competition from the internet saw

their number of points of sale fall in recent years. However, this decrease did not have make the downtown shopping areas less attractive, as other sectors took their place. The number of outlets that rose between 2003 and 2007 are into fashion (119 percent), office equipment (72 percent), coffee and tea shops (66 percent), sports (37 percent), delis (30 percent), arts and crafts (23 percent), cooking (22 percent) and galleries (20 percent). So inner cities seem to adapt well to societal changes, including on-line shopping. Conclusions about the effects of on-line shopping on downtown distribution of retailers should be drawn with the necessary caution because there is no proven direct causal relationship between the two developments. Futhermore, four years is too short to distinguish trends.

Logistics of on-line shopping

There are consequences in logistics because of increased on-line shopping. The products ordered through the internet have to be delivered after all. Table 7.1.8 shows how the ten most popular on-line purchases were delivered (observed in 2006). Over three quarters of these on-line purchases was delivered at home or at work. This is true for films/music (92 percent), literature (92 percent) and clothing (91 percent) in particular. About 15 percent of the on-line purchases was collected at a store by the on-line shopper, or at the home of a private individual, or at a post office or service point. Only 7 percent of all on-line purchases was delivered digitally, which is not surprising because only a few products can be delivered on-line (tickets and software).

Table 7.1.8
Delivery of internet purchases, 2006 [1)]

	Delivered digitally	Collected in shop	Collected from private individual [2)]	Collected at the post office [3)]	Delivered at home/ work	Other
	%					
Total	7	5	6	4	76	1
Second-hand goods	0	1	38	2	58	1
Clothes	0	1	0	7	91	1
Literature	0	3	0	4	92	0
Films, music	1	2	0	4	92	1
Travel, holidays, accommodation	47	7	0	1	44	2
Tickets for events	10	17	1	4	67	1
Hardware	0	9	1	5	83	2
Photo equipment	0	28	1	8	62	0
Software	33	1	2	3	60	0
Telecom articles	4	5	2	9	80	0
Other articles	4	6	4	6	76	4

[1)] Percentage per product group.
[2)] Products collected by on-line shoppers from private individuals not categorised as second hand, may well be second hand.
[3)] Or service point.

Source: RPB, 2007.

What are the consequences for logistics of on-line shopping? Before we look into this, it is good to emphasize that second-hand goods are quite distinct from other on-line purchases in their consequences for shopping areas and mobility (see tables 7.1.4 and 7.1.8). In contrast to other on-line purchases, these products often would not have been bought without the internet plus they are often collected by the consumers themselves. The mobility effects of on-line shopping in the case of second-hand goods are therefore probably different from the effects of other on-line purchases. This is why the two groups will be discussed separately.

In 23 percent of the on-line purchases in the category second-hand goods, passenger transport is expected to decrease and goods transport to increase. This is because if the purchases had not been made on the internet, they would have been made in a second-hand store, whereas they are now delivered at home.
In about 19 percent the number of trips in passenger transport will be equal because if the purchases had not been made on the internet they would have been made in a store, and now they are collected mainly from private individuals. Over 22 percent of all on-line purchases in de category second-hand goods leads to an increase in passenger transport. These are goods that would not have bought without the internet and that are now collected at a private individual's home. The other 36 percent have no consequences for passenger transport because they would not have been bough without the internet and are delivered at home.
About 59 percent of all on-line purchases in the category second-hand goods leads to more goods transport. These are mainly purchases delivered to the home, which would not have been bought without the internet (35 percent) or would have been bought in a second-hand store (23 percent). Buying second-hand goods on-line hardly has an effect on goods transport (1 percent) or hardly reduces it (2 percent). The other 38 percent has no consequences for goods transport since the goods were collected mainly by private individuals themselves.

About 69 percent of the other on-line purchases led to less passenger transport. In 6 percent of the cases the goods would have been bought in a store, and now they are delivered digitally, whereas in 63 percent of the cases there is a potential shift from passenger to goods transport. The expected number of passenger transports trips stays the same in some 10 percent of all other on-line purchases. The number of on-line purchases that leads to more passenger transport is negligible with 2 percent. The other 19 percent of on-line purchases has no effect on passenger transport since these would not have been bought without the internet, or they would have been ordered by telephone or mail.
About 78 percent of all other on-line purchases probably leads to more goods transport. In 63 percent, the increase turns out to be a shift from passenger to goods transport. Another 6 percent has a neutral effect on goods transport since these products would have been delivered at home even if they had not been bought on the internet. The number of other on-line purchases that leads to less goods transport

(1 percent) is negligible. The other 18 percent of these on-line purchases do not result in any effect on goods transport.

In summary, the mobility effects for on-line purchases in the category second-hand goods are relatively more disadvantageous than those of the other on-line purchases. Buying second-hand goods potentially leads to eleven times more passenger transport without it leading to a decrease in goods transport than buying other products on-line. Second-hand goods also lead to an increase in goods transport without a decrease in passenger transport.
It is difficult to calculate the exact effects on mobility caused by on-line shopping, however. on-line shopping will not necessarily lead to more passenger and goods transport, because both consumers and transporters can chain their trips and fit in the extra trip into a trip they were already going to make. Trip chaining with on-line shopping also doesn't lead to less passenger transport because consumers often buy several things on a shopping expedition. No surprise then that about two thirds of the on-line shoppers reported they do not make fewer visits to the shopping area because of on-line shopping (table 7.1.3). So the results should be interpreted with some caution.

Conclusions

This paragraph reflected on the adoption and on the spatial consequences of on-line shopping. In summary the following may be concluded:

- The number of on-line purchases and the average amount spent per on-line purchase hardly differs between men and women.
- Among male on-line shoppers there is a change in physical shopping behaviour due to on-line shopping. Men have become more price conscious, and the internet is more often used as a substitute for physical shopping by men than by women.
- Retailers in downtown areas are hardest hit by on-line shopping.
- On-line shopping not only leads to substitution but also to extra impulse buying. About a quarter of the on-line shoppers indicated they bought more because of the internet. This is particularly true for second-hand goods.
- Although second-hand goods and clothing are often bought on-line, retailers in these sectors make relatively little use of the opportunities created by the internet, unlike retailers in the other sectors that are vulnerable to e-commerce. A relatively large share of them sells on-line and uses their website to offer their clients additional services.
- Independent retailers often lag behind chains in their internet adoption. They have fewer websites, and fewer advanced websites. The main reasons for this gap are lack of time, know-how and money.
- On-line shopping seems to have had consequences for the types of shops located downtown. Downtown areas remain attractive shopping areas because the decrease in the number of outlets in sectors sensitive to e-commerce is compensated by an increase in other sectors.

– On-line shopping leads to more rather than less mobility. The mobility effects for on-line purchases in the category second-hand goods are more negative than for other on-line purchases.

7.2 ICT employed by companies

This paragraph is based on a joint study by Statistics Netherlands and the economics department of the VU University of Amsterdam. In 2005 Statistics Netherlands conducted a one-off survey 'Bedrijfsvoering en ICT 2005'. This study looks at the question what makes ICT investments in companies successful.

Background

Several years ago, studies by the OECD and others distinguished between ICT readiness, intensity and impact. Readiness refers to the equipment, cables, internet connections and similar infrastructural aspects. Intensity indicates what these are used for, such as learning, gaming, purchasing or selling. Impact looks at what ICT and ICT-related aspects bring about in terms of fast actions, scope, efficiency, competitiveness, or organisational changes.

In 2008 many aspects of readiness and intensity can be measured, but measuring impact has been problematic for years. This has led to various economic studies, often looking to explain productivity in the business sector. This is also where the one-off survey by Statistics Netherlands fits in (De Graaf, 2007).
The regular surveys by Statistics Netherlands allow us to determine labour productivity for each company (value added per employee), whereas the ICT investments by companies can be obtained from another available source. As it turns out, there is a correlation between ICT investments and labour productivity, albeit not a strong one. Sizeable ICT investments alone are not enough to improve productivity.

Implementation of ICT crucial for its success

Success with ICT hardware depends greatly on how it is implemented and applied. The impression is that many ICT projects in companies fail. When the implementation is successful, success in the end all depends on the use of software and how it is applied in the organisation (Keller, 2007).
It is difficult to measure qualities of enterprises, but they are often more valuable than the hardware itself. These qualities are the intangibles, such as the know-how available in a company or successful organisational concepts or approaches to the market that yield positive business results.

The Statistics Netherlands-VU study has looked at the immaterial variables mainly as the extent to which ICT is used in a company. The emphasis is on standardising ICT use and the option of exchanging data between the various activities (integration).

The study looks at six activities, three are primary production processes (sales, purchases and production planning & logistics) and three are support functions (financial management, human resource management and knowledge management). Four types of standardisation are studied: standardisation of applications, of functional application management, of data definitions and of processes.

ICT use and ICT standardisation improve productivity

The study shows that ICT use and ICT standardisation positively influence labour productivity in companies. These are important variables, both for the individual company (productivity as a source of returns) and for the economy as a whole (productivity as a source of economic growth). This paragraph deals with the use of ICT and standardising functional management.

We looked at the following aspects in the clusters:
- The extent to which ICT applications are used to perform the functions;
- The extent to which functional application management is standardised;
- The relation between ICT use and functional management.

We pay attention to the business environment in each point

ICT mainly used in financial management

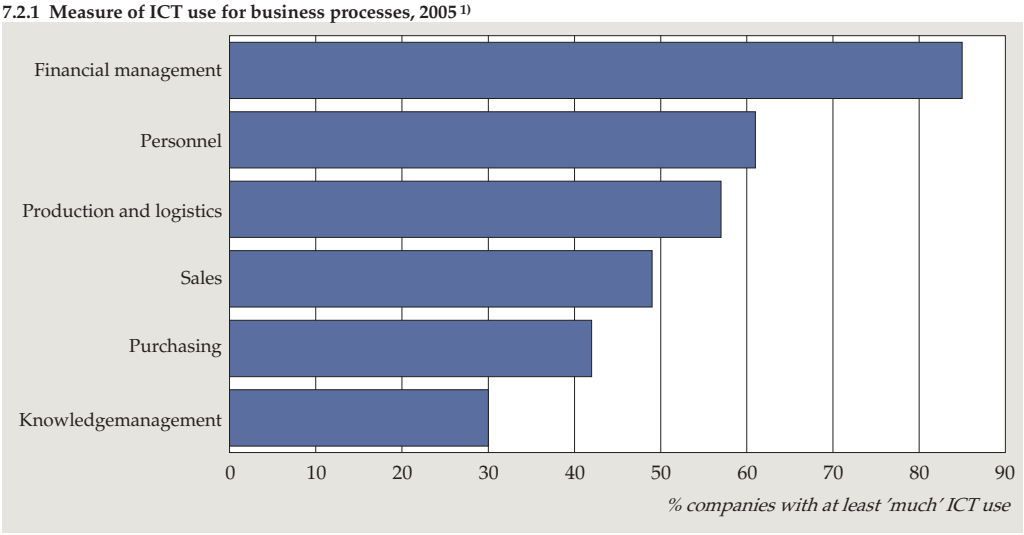
One question in the survey was about the extent to which ICT applications were used in carrying out various business aspects. Per aspects the company could give a score on a five-point scale (1. almost nil, 2. little 3. unspecified, 4. much, 5. very much). Figure 7.2.1 provides the scores for each aspect and the totals for 'much' and 'very much'. This expresses the number of companies with these scores in percentages of the total number of companies.

ICT is most used in financial management, and least in knowledge management. The high scores in financial management are probably because this aspect is generally felt to be important, e.g. in managing the organisation. It is also well-established, and people have probably worked on the digital systems for years.

The financial systems involved may serve the in-company need for data, e.g. for planning purposes and the analysis of business results (management accounting), and for financial accounting for investors, shareholders and other stakeholders. These systems make it possible to produce all kinds of reports from new perspectives.

The next two aspects, ranked on the basis of the extent of ICT use are HRM and production planning & logistics. Although these take up second and third place, they are well behind financial management. An explanation may be the varied processes so that the usable standard programs are not as widely available. Production planning probably still has many planning boards on the wall.

7.2.1 Measure of ICT use for business processes, 2005 [1)]



[1)] Refers to companies that use ICT to a wide or strong extent for these business processes.

Source: Statistics Netherlands, ICT use by enterprises 2006.

ICT is used much less in the other aspects. This may be because of developments in progress. In the next few years ICT may be used substantially more, or companies may find ICT less important, at least less important than for the other aspects.

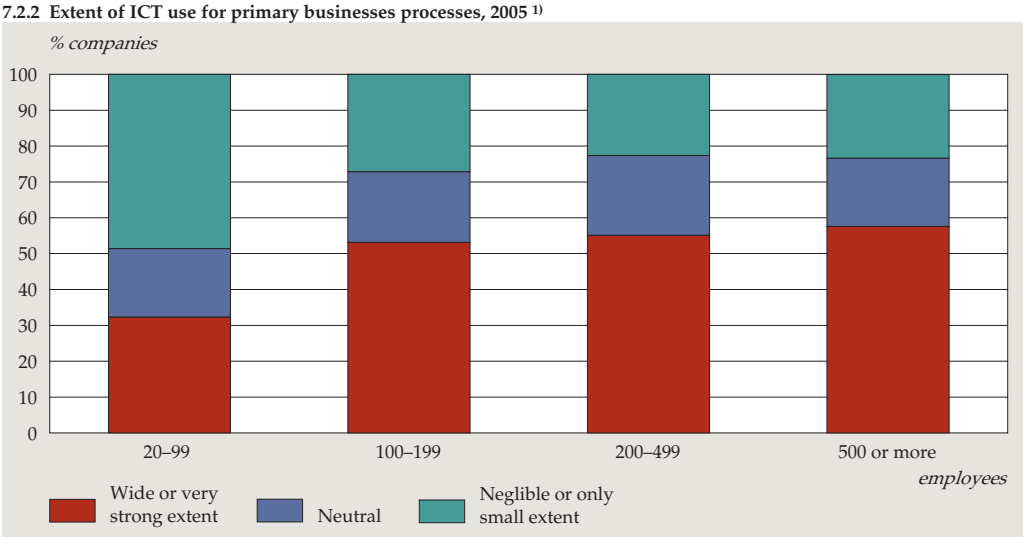
For the clusters primary process and support functions we also looked at the relation between the size of the organisation and the use of ICT and standardisation. Four size classes were distinguished based on the number of employees (class 1: 20–99 employees, class 2: 100–199 employees, class 3: 200–499 employees and class 4: over 500 employees). More information about the analysis is found in table 1 at the end of this paragraph.

Figure 7.2.2 shows the results of the primary process (sales, purchases, and production planning & logistics). Figure 7.2.3 shows the results for support (financial management, HRM and knowledge management).

Company size correlated with use of ICT

The expectation generally is that the use of ICT corresponds positively with company size, that is, the smaller the company, the more limited the use. Companies with less than 100 employees confirm the stereotype. The relation between ICT use and company size is least evident in knowledge management. The relatively high scores in the mid segment are remarkable (more than a little, less than much) which points in the direction of a modest correlation.

7.2.2 Extent of ICT use for primary businesses processes, 2005 [1)]



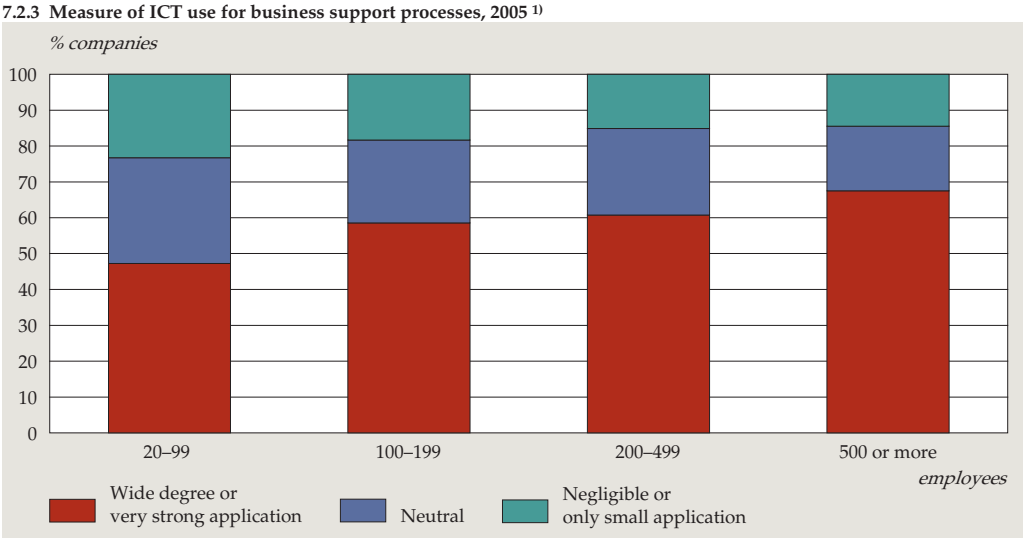
[1)] Primary business process includes: sales, purchasing, production and logistics.

Source: Statistics Netherlands, ICT use by enterprises 2006.

Centralisation correlates with standardisation of functional management

The higher the organisation level that decides, the more the functional application management in a company is standardised. In this study functional application management refers to coordinating the work in development and/or maintenance of ICT applications, such as listing users' needs, and the setup and configuration of applications.

7.2.3 Measure of ICT use for business support processes, 2005 [1)]



[1)] Business support processes include: financial management, personnel and knowledge management.

Source: Statistics Netherlands, ICT use by enterprises 2006.

The central issue is providing the right information to support operational management. Functional application management mediates between ICT departments and the people who have to apply the available software. Although in theory functional application management should be closest to the ICT users, in practice the ICT department does the work because it has the required technical know-how. It seems that the demand-based approach (what do in-house ICT users want and what can they do) would not blossom in these conditions.
Standardisation of the functional management in a company does not preclude decentralising the use and focus of ICT on specific information needs. Standardising may prevent the creation of islands and less than transparent documentation. The ideal situation for a company could be: functional application management based on decentralised, demand-based implementation on the one hand and standardisation at the highest level in the organisation.

ICT use and standardisation follow the same pattern

The study also delved into the question to what extent functional application management is standardised per functional aspect. Here too we used a five point scale:

1. very low, standardisation almost absent,
2. low, standardisation per department,
3. fairly high,
4. high, in the company as a whole,
5. very high, also with third parties outside the company).

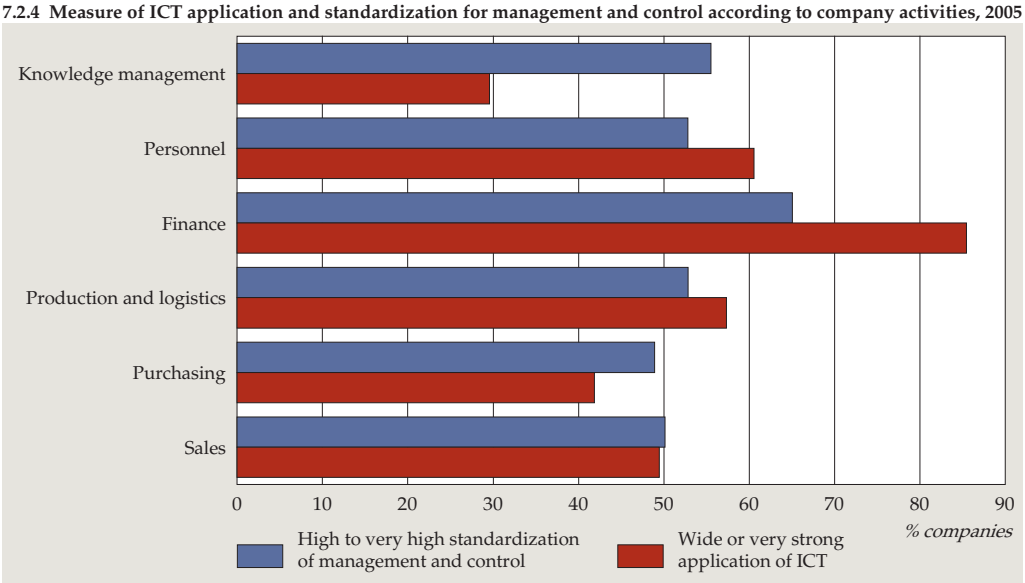
Figure 7.2.4 compares the use of ICT and the standardisation of the functional application management per function. The two are not easily comparable in terms of the percentages, because they measure different aspects. But it is possible to compare patterns, and the patterns turn out to be comparable.
In knowledge management standardisation of the functional application management is greater than expected on the basis of the ICT used. This may be because of the large middle segment (more than a little, less than much). Even if ICT use in knowledge management has a relatively low score in 'much and very much', there is apparently a great deal of software for knowledge management and it is apparently standardised at a high level in the organisation.

Figure 7.2.5 deals with the relation with company size: ICT use and the standardisation of the functional application management seem to increase with company size.

Conclusions

There are great differences in how ICT in companies is employed per functional aspect. The expected importance of gathering objective data, and the analyses or simulations based on them could play a role in this. Financial management for

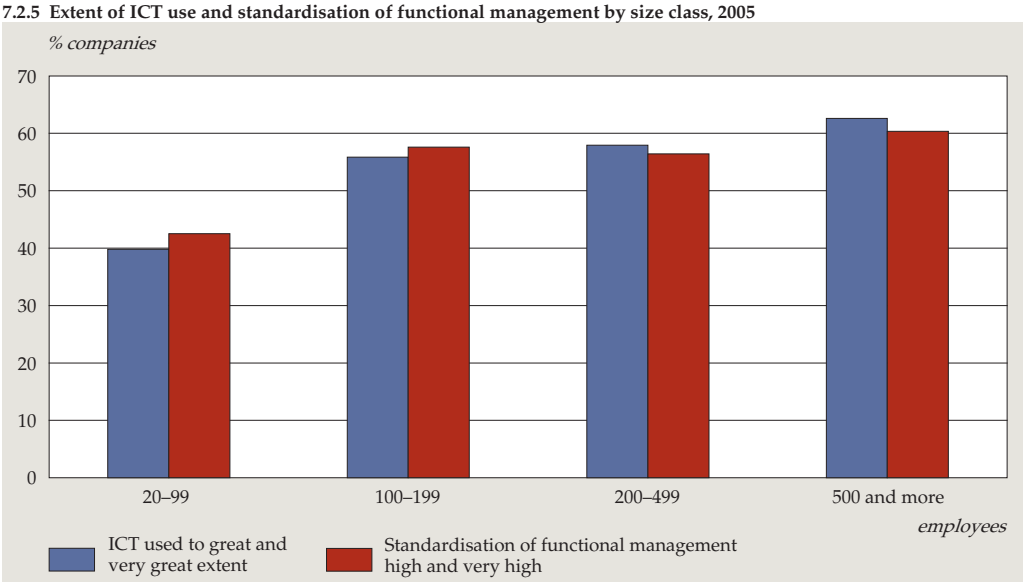
7.2.4 Measure of ICT application and standardization for management and control according to company activities, 2005



Source: Statistics Netherlands, ICT use by enterprises 2006.

example evidently always needs to have figures available due to legal obligations and the interests of the various stakeholders. This can be different for different aspects, as can be illustrated through knowledge management. One organisation may emphasize easy access to the available, codifiable knowledge more than other organisations. Is the emphasis relatively great, then there will be more focus on

7.2.5 Extent of ICT use and standardisation of functional management by size class, 2005



Source: Statistics Netherlands, ICT use by enterprises 2006.

easily accessible software. If knowledge management is seen more as a matter of exchanging company-specific know-how and experience ('tacit knowledge') with colleagues, then the focus will be on direct exchange and software will be less important. It is also possible that the use of software in knowledge management lags behind that in other aspects because knowledge management is only recently recognised as a key instrument in company management and/or has not yet fully penetrated.
The correlation found between employing ICT and standardisation can be based on the mutual dependence one would logically expect. The possibility to standardise may stimulate the use of ICT. Then again, the wish to have ICT widely available may be a cause for standardisation.
The relevance of company size for the use of ICT and standardising is expressed by the figures. Major companies tend to employ more ICT and standardise more. The correlation does not seem to be very strong as other factors may disturb the pattern.

Table 7.2.1
Extent of ICT use in various business functions, 2005

	Size class (number of employees)			
	20–99	100–199	200–499	over 500
	%			
Sales				
Much and very much	35	53	55	55
Neutral	15	19	18	19
Almost nil and little	50	28	26	26
Purchases				
Much and very much	29	43	46	50
Neutral	16	23	27	22
Almost nil and little	55	33	27	29
Production planning and logistics				
Much and very much	33	63	64	69
Neutral	26	17	21	16
Almost nil and little	41	20	15	15
Financial management				
Much and very much	73	85	89	95
Neutral	11	9	5	4
Almost nil and little	16	5	6	1
Human resource management				
Much and very much	44	59	66	74
Neutral	28	23	23	17
Almost nil and little	29	18	11	9
Knowledge management				
Much and very much	25	32	28	34
Neutral	50	37	44	33
Almost nil and little	25	32	28	34

Source: Statistics Netherlands, ICT use by enterprises 2006.

7.3 *Productivity effects of broadband use*

The government has massively stimulated the use of ICT in recent years, under the assumption that computer technology would generate innovations. ICT is considered as an 'enabling' technology. Broadband is considered a particularly important innovation, and government has emphasized this in policies directed at the public and at companies. Expectations were high because the implementation of broadband would cost companies little while the effect on efficiency of the use of existing computer technology could be large. However, it is not clear if these effects are reflected in increased productivity. The doubts come not only from the relatively recent emergence of broadband, but also from measuring the use of broadband technology and its possible effects; measuring this is not a simple matter.

In this paragraph we describe a study of the effects of broadband: looking at the relation between broadband and productivity, and between the use of broadband and other ICT tools. For this purpose, we linked various surveys conducted by Statistics Netherlands from 2000 through 2004. This report is a summary. Extensive documentation will be made available in the course of 2008 in the web dossier 'Kenniseconomie en productiviteit' on www.cbs.nl

Theory

This study by Statistics Netherlands is based on an economic model that explains productivity by the number of production factors a company uses, and a variable that shows the efficiency of the production process. The main production factors in the model are labour – measured more or less by the number of employees – and capital, including buildings, machinery and other means of production. One of the production factors of capital is ICT capital: computers and software.

In the model an increase in productivity can be due to capital deepening: by getting more machinery the production per employee increases. Even more interesting is growth due to efficiency gains. Efficiency gains are explained by two processes in the current theory of growth: technological progress and learning processes (Basu and Weil, 1998). Technological progress means replacing existing machinery by newer, more advanced equipment that can raise production.
A company can also become more productive by using existing capital more efficiently. This requires a learning process. The speed with which this learning process takes place depends on the technology level reached. The three sources of productivity growth are, of course, rarely acting on their own. New machinery is usually more advanced than existing equipment. Investments in more advanced technology often go hand in hand with more computer skills of the company workforce.

The interaction between the three sources of productivity growth plays a key role in introducing broadband. The costs of an ADSL connection are usually negligible

compared to existing ICT capital, so there is hardly any capital deepening required for adopting broadband. Broadband is much more relevant for companies that invested more in computer technology. It also takes time before companies fully use the potential of the new communication technology. How much time depends on how far they are removed from an ideal situation. A company that is well away from the 'technological frontier' can grow fast by studying and copying the practices of more efficient companies.

Such considerations lead to the following research questions about differences in productivity between companies, which we will try to answer in the rest of this paragraph:
- How much does ICT capital deepening contribute to differences in productivity between companies?
- Does broadband technology lead to a shift of the technological frontier, the highest attainable level of productivity?
- Does the shift depend on the existing ICT capital?
- Are companies that use their ICT tools in a more advanced manner more productive? Are they closer to the technological frontier?

The data used

In this study we used data from various surveys conducted by Statistics Netherlands.

These are:
- Production statistics
- Survey on ICT use by companies
- Innovation survey
- Investment statistics

Statistics Netherlands determines the productivity of a company by calculating the value added per employee in fulltime equivalents. These variables come from the production statistics, which use large samples so that there are data on a large number of companies for the years we studied: 2000–2004.

The survey on ICT use by companies has questions on how companies apply ICT technology. In this study some variables were used that were included in all surveys in the years 2000–2004. One key variable is 'the type of internet access a company has'. If a company has ADSL or internet via a cable modem this is seen as broadband. The fastest fixed lines that universities and major companies often have, also come under the category broadband. Another variable used is the share of employees in a company who regularly use the company's internet. The survey also has several questions about the services a company provides its clients through the internet. It is possible to derive from these questions how advanced a company is in the use of its ICT tools.

The capital in a company is calculated with the help of the investment statistics. These statistics are available for 1995–2004. In this survey, companies are asked how much they have invested during the previous twelve months in seven categories of capital goods, including ICT. So Statistics Netherlands knows by how much a company's capital stocks increase or decrease each year.
It is only possible to estimate the value of the capital on 1 January 1995, based on the investments in 1995. Because of the estimate, the time series for the earlier years is of a lesser quality. As of 2000 the capital goods situation is sufficiently well-known that the data can be used for analyses.

The innovation survey is sent to companies once every two years and asks about renewing existing products, processes, organisation and marketing. Each renewal refers to a three year period. In this study we used data from the 2002 and 2004 surveys, primarily the turnover share brought about by product innovation – according to the company's responses. This indicator tends to be quite an adequate representation of the company's innovation. More data on innovation are published in the series 'Kennis en Economie'.

Results and conclusions

By linking the production and investment statistics and the survey data on ICT use by companies it is possible to detail the economic model described in paragraph 7.3.1. This is done by studying the link between the productivity of a company (value added per employee) and the capital stocks (ICT and other capital), and between the productivity of a company and the extent to which ICT tools were applied.

The amount of ICT capital turns out to have a great effect on the productivity of a company. On average 8 percent of the company capital consists of ICT hardware. However, 15 tot 18 percent of the differences in productivity between companies that can be explained by capital deepening is a consequence of differences in ICT capital. An investment in ICT seems to have twice the effect on productivity as an equally big investment in other capital goods.

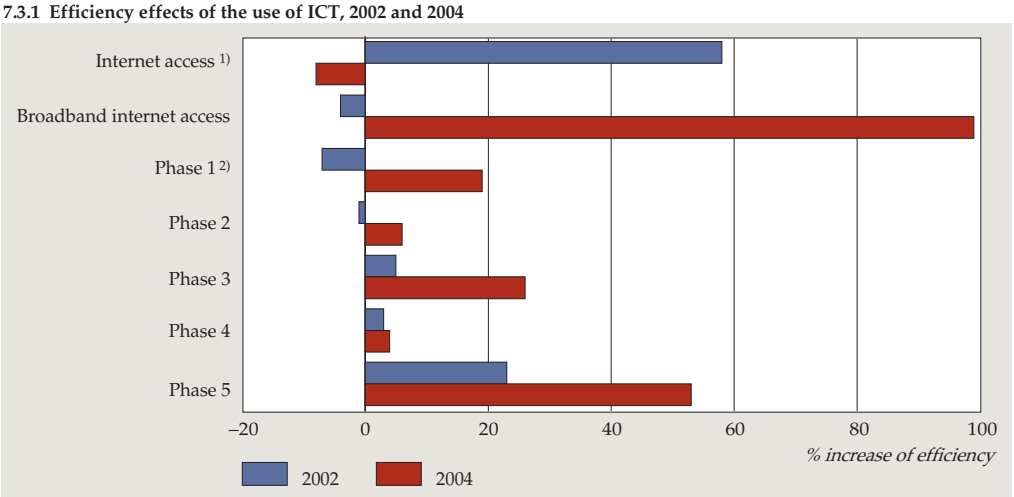
If productivity is corrected for capital deepening, what remains is the differences between companies. These are a consequence of differences in the efficiency with which they use their means of production. Figure 7.3.1 shows for 2002 and 2004 how various ICT applications contributed to the efficiency of the companies studied. In 2002 the efficiency of these companies where all employees have internet access was on average 50 percent higher than of these companies without internet access. It doesn't matter if the connection is broadband or not. Remarkably, two years later, internet access for employees hardly contributed to the efficiency, whereas having broadband internet did. Companies where all employees have broadband were twice as efficient as companies without broadband.

The on-line services offered turned out to be less relevant. The indicator used for the level of services offered came from the development phase model developed in the previous editions of this publication. See The Digital Economy 2006, paragraph 4.4 where each company is categorised by the development phase of its ICT use:
– no use of the internet (phase 0);
– use of the internet, but no services (phase 1);
– own website (phase 2);
– on-line sales (phase 3);
– on-line after sales service (phase 4);
– linking order processing systems with those of clients (phase 5).

The idea behind this classification is that each following phase is a more advanced ICT application. It is determined for each company what the highest development phase is in which it currently finds itself.

The companies in the first four phases of the development phase model used did not differ much in 2002. Only the companies in phase 5 – the phase in which computer systems are linked directly with those of clients – turn out to be significantly more efficient than the other companies. In 2004 there were larger differences between the phases. The companies in phase 5 were 50 percent more efficient in that year than companies that had no on-line services available. This is a small group of companies though: about 10 percent of the total number of companies.

7.3.1 Efficiency effects of the use of ICT, 2002 and 2004



1) Average difference in efficiency between an enterprise with 0% (broadband) internet users and a company with 100% (broadband) internet users.
2) Average difference in efficiency between enterprises without internet access and enterprises in a given development phase.

Source: Statistics Netherlands

Distance to the technological frontier

In paragraph 7.3.1 we explained that the adoption of new ICT technology can influence the productivity of a company through two different processes. The maximum attainable efficiency can be raised by using the means of production. This is expressed by a shift in the technological frontier: the productivity of the highest performance companies goes up. Secondly, companies that perform below the technological frontier can make better use of their existing means of production through new technology. This closes the gap between these companies and the technological frontier.

Data analyses show that broadband mainly affects the technological frontier. The use of broadband internet raises a company's maximum obtainable productivity. The distance of less productive companies to this maximum, however, is not influenced by having broadband. The shift of the technological frontier seems independent of the current quantity of ICT capital.

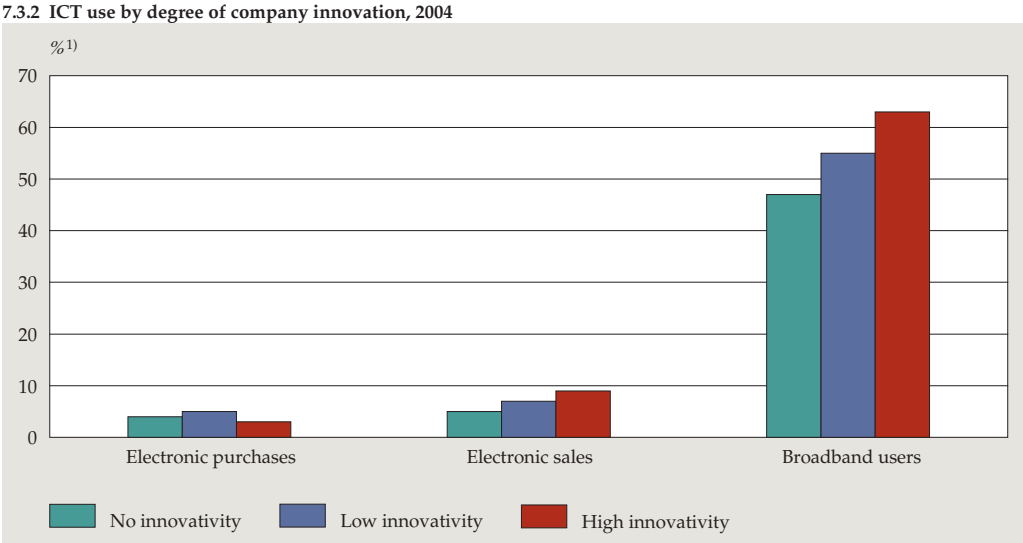
The development phase of a company is also included in the analysis. The opposite is true: the main effect of providing on-line services means reducing the distance to the technological frontier. Companies in higher development phases are apparently better able to use their existing infrastructure. The data also indicates that this effect is stronger when there is more ICT capital in a company.

Innovation and ICT use

The innovation surveys Statistics Netherlands conducts every two years include a question about the turnover share a company generates with new or updated products and services. On average the companies surveyed get six percent of their turnover from new products. The companies are divided into three categories: companies that indicate their turnover is not generated by the innovations reported, companies with little innovative turnover, and companies with much innovative turnover. The two groups of companies, with much and with little innovative turnover, are delineated in such a way that they are equally large. Together the two groups make up about a quarter of the companies surveyed. There is a great deal of variation in the turnover rates from innovation: in 2004 companies with little innovative turnover averaged a 1 percent rate, versus an average rate of 25 percent for companies generating much innovative turnover.

The companies with advanced ICT applications generally also commonly innovate products. In figure 7.3.2 shows that companies where the largest turnover share comes from product innovation usually have broadband. Innovation and on-line sales percentages show a similar correlation. The percentage in the most innovative companies is almost twice as high as for the non-innovative companies. On-line purchases on the other hand don't have a clear-cut correlation with innovation.

7.3.2 **ICT use by degree of company innovation, 2004**



1) Electronic purchases and sales: percentage of enterprises. Broadband users: percentage of employees.

Source: Statistics Netherlands.

It turned out that updating products go hand in hand with the innovation of the ICT support applications. This correlation applies almost equally in manufacturing, trade and services. One exception concerns the on-line sales in the trade sector. The most innovative companies have a turnover share through on-line networks that is almost four times as big as that of non-innovators. Sales through the internet apparently form a major part of innovation for companies in this sector.

7.4 *Statistics via the internet: first explorations*

New sectors and markets have developed and existing sectors markets have changed drastically due to the increasing digitalising of the economy and society. Sectors are blurring and leisure is reinvented. These changes pose problems for statistical institutes, but they may also create possibilities for new methods of data gathering. In the fall of 2007, Dialogic started a study to answer the following two questions:

1. Can the smart use of digital footprints of digital processes and information flows lead to statistics without interviewing respondents?
2. If so, are these statistics reliable enough to be made into regular statistics that can replace traditional ways of data gathering (questionnaires), or should they be seen as detectors of new phenomena signalling new insights and trends, and as such a welcome addition to regular statistics?

Dialogic is carrying out the ongoing study at the request of the Dutch Ministry of Economic Affairs, and cooperates with the information science department of the University of Utrecht. The work is harmonised with Statistics Netherlands and several experts. The study distinguishes several measuring methods that make use of the internet as a data source. Experiments were carried out on a limited scale with new measuring methods, using spiders. The information below is a first taste of a large individual publication on the methodology tries and tested and their possibilities and limitations, which is scheduled for publication by Dialogic in 2008 and will be discussed internationally on various sites.

New ways of measuring

The assumption taken in the project is that data flows on the internet always start with the user. The way taken by the bits of the user (user request) to information (content) can be followed entirely, in principle, via or on the internet. The route can be divided into three parts, each with specific measuring methods:

– *user centric*. Users can consent to have spy ware installed on individual computers to measure user behaviour. This software can tally per application what kind of content the user demands. At the level of the operating system (OS) traffic monitoring can determine which user used which type of application.

Deep packet inspection

A well-known example of monitoring data traffic via network centric measuring is a firewall. A firewall is a piece of software that inspects passing data flows and stops unwanted traffic. The software is usually embedded, that is, stored in a memory chip and starting automatically, but it can also be a combination of embedded software that has to be started. The first generation firewalls analyses data traffic on the basis of the headers of the packets, in which the data contents remains unknown. The current methods go a lot further. They can also (at least in part) do deep packet inspection. Most applications generate specific patterns in data traffic, making it possible to track down applications that have not made themselves known as such through meta-data in the header. The most advanced methods also look at the specific behaviour of applications. This makes it possible to detect almost all known types of protocols, almost faultlessly, including secure protocols. Based on the name of the file and the size, the types of content can be categorised per protocol (e.g. the share of video files in P2P traffic, or even the share of a given movie title in it). Research from Ipoque shows that 69 percent of total data traffic in Germany was P2P in 2007. In Australia this was about 57 percent and in the Eastern European countries about 89 percent. Inherent in network centric measuring is that these figures have to be interpreted with a wide margin of error. The usual assumption is that most of the P2P traffic consists of illegal content. There are no figures on the Netherlands yet.

Source: Ipoque (2007). Internet Study 2007.

– *network centric*. Changes in data flows between computers can be followed via network centric measuring. Basic forms only yield aggregated data (such as increased data flows), but more advanced measures also allow insights into shifts in flows, such as http and P2P data flows. Via deep packet inspection large flows of data can be examined in detail, that is, at the level of individual IP addresses or film titles in P2P. In this way new trends in the use of the internet can be traced rapidly.
– *site centric*. The final aim of the data flows (user request) is always aimed at content on another computer. The traffic runs via an application on a server (like a website) or directly via the computer of another user (peer-to-peer). Measuring methods to measure within on-line applications are called site centric measures. They make it possible to analyse the content – and therefore certain markets – in detail.

Considerations on the use of new measuring methods

The research question determines which type of measuring instrument is used. Measuring of the type of user centric (spy ware, traffic monitoring) yield data that can be used for questions at the individual user level. The method yields very detailed data. If the background data of the user are known (e.g. demographic data) these measures can be used as an alternative for traditional internet use studies. The power of the method lies in the fact that the data can be generalised to other populations.

The key advantage of measuring in a network centric manner is that the measuring takes place at a central point (namely the network) so that many different kinds of traffic from many different users can be looked at. In this way data can be measured that would otherwise be hard to identify, such as illegal content or content that users don't want to talk about.
The weakness of the method also lies in measuring centrally, because the data traffic is always distributed when sent via the internet – there are no central interchanges. Traffic always flows between two points, following the most efficient route. As a consequence the flow of traffic may shift constantly. In other words, there are hardly any central points in the network where traffic can be measured. Therefore measuring in a network centric way is by definition measuring points in an amorphous cloud of data. They can detect changes in the use of the internet very fast (read: real-time) when the measuring point is selected strategically. However, the results of the measures are not representative for the internet as a whole, only perhaps for the local network in which the measuring takes place.
A second practical problem shows up in network centric measuring, namely that it requires access to a network. The parties managing these networks are generally reluctant about having their traffic measured by third parties, because of privacy and security reasons. They are often scared about the consequences of more insight in the data flows. Such insight may create a precedent for liability (to measure is to know).

Site centric measuring takes up a middle position. They are mainly fit for supplying information about a specific service. The advantage of the method is mainly that it allows a look deep inside the content. In order to draw conclusions from this type of study that apply wider than conclusions about the specific site, it is important that the site is representative for the type of service or market. The method doesn't have much to offer in a fragmented market with many providers. The method can yield interesting results when the distribution is skewed, in which the largest sites have significant shares of the market. Site centric measuring of the largest sites already provides much information right away on the general supply of the relevant market. However, this poses a confidentiality problem for statistical institutes, because traditionally statistical institutes cannot release information about individual companies.

The three methods are complementary in part and supplement each other well. Network centric measuring is used to detect new trends at an early stage, such as the use of a new type of application or the rise or fall of a dominant site. The results of these measurements can lead to adjustments of the two other methods. The network and site centric methods lead to questions about privacy since these measurements can be felt to be very intrusive. This may also well be the case with traditional methods (questionnaires or interviews), but in those cases the user is always aware that he or she is being watched. The user centric method doesn't have this disadvantage, but it requires a good panel of users.

User centric measures: two examples

There are a number of dominant companies in pig farming that aggregate the computer measures of individual users (user centric). One of these companies developed and operates a program used by about 80 percent of the pig farms in the Netherlands for the extended internal and external administration of their pigs. Pig farmers have to supply a great deal of data each quarter to third parties including compulsory registers. The information is submitted through this program. The program provides the user with an option to simultaneously send a copy of the information to the supplier. The supplier of the program gathers and cleans all this data and sells the aggregated information in up to date bi-annual reports and historical time series.

The on-line trade with and between end consumers – where the actual transactions sometimes do not take place via an on-line platform so according to the official definition this is not really e-commerce – has grown into a significant phenomenon with a great economic and social impact. A user centric measurement of Multiscope in August 2007 indices that the biggest Dutch player has about 7.5 million unique visitors who visit the on-line platform about 10 times a month on average. Publications of the company itself show that there are a few million existing on-line ads and that over 180 thousand new ads are added every day. The estimates by the sector itself, gathered by Dialogic, seem to indicate that these on-line platforms trade several billion euros worth each year. The assumptions are that the average value is about 50 euro per transaction and that about half of the ads do not result in a sale.

Various plans

In the study that will be concluded by the middle of 2008, eight very different markets are examined (dwellings, pigs, ICT product software, web stores, on-line music, internet TV, social networking sites and on-line gaming). The market developments of each market will be examined including to what extent existing indicators are available and useable, and where the typical (digital) information bottlenecks are, and which new indicators can be gathered with the internet as their data source. There will also be an experiment on a limited scale with spiders. Spiders, or web crawlers or web robots, are applications which systematically search parts of the internet or websites in full and save the content so that it can be analysed and/or indexed at a later stage. Spiders are used by search engines to keep their index up to date. They are typical examples of site centric measurements

At the time this edition was written, no results were final and no conclusions available yet. Despite this the box below will show some practical experiences and first results.

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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.

Basic Registers

The Dutch government named several authentic registers that will form the basis of the system of government registers.

Sectors 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 'ICT use enterprises', the SBI groups 80.4 and 91 are excluded from this branch of industry.

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). The OECD has the following definition: connections with the internet with a total transmission speed (the sum of the upload and download speed) of at least 256 kbit/s.

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

The total value of fixed capital formation. These are means of production with a lifespan of more than a year, that represent a significant value. These include material (buildings and machinery) and immaterial (software) assets.

Consumer-to-Consumer market

The market for electronic shopping where consumers (individuals and households) sell goods and services to other consumers.

Consumption

Goods and services used for immediate satisfaction of individual or collective needs. A distinction can be made between government consumption and household consumption, and between real individual consumption and real collective consumption.

Countries

This edition includes data on several countries in order to compare the Dutch situation internationally. These are EU and OECD countries. This edition doesn't always show the information of all countries involved. Often the comparison is made with the Scandinavian countries, since these are desirable countries of reference because they are very advanced in ICT. The Netherlands is also compared with several OECD countries (see table on reference countries).

DigiD

Digital identity. Common authentication system by the Dutch government to identify Dutch citizens and enterprises on-line.

E-commerce

Placing or receiving orders for goods or services through electronic networks, irregardless of delivery and payment methods. Excluding orders by telephone, fax or email.

E-Government

The government aims to improve the way it operates through ICT, and to reduce the administrative burden for private individuals and companies.

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 order 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. Internationally the limit is at least one hour of work a week.

EPO (European Patent Office)

The EPO grants patents for the countries that signed the European Patents Treaty. In December 2006 there were 31 countries plus five additional countries (extension states) that recognise the European patents. For more information, see www.european-patent-office.org.

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 are means of production with a lifespan of more than one year that represent a significant value. Produced material or immaterial assets that are used for more than a year in the production process. These include material assets (such as buildings and machinery) and immaterial assets (such as software and major databanks).

Flexible labour relationship

Labour relations that differ from regular labour contracts in the number of working hours and the duration of the contract. Well-known kinds of flexible contracts are temporary work and workers on call.

Goods

Tangible products, such as food, durable consumer items and machinery.

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 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 companies and the government and the consumption of ICT goods and services by households. ICT expenditure consists of intermediate use and consumption.

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 sector

The definition of the ICT sector here is in line with the OECD definition. 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.

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.

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

Bron: OECD.

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.).

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.

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 (figure 2.9.2) 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. Most figures on internet users refer to people who used the internet in the previous three months. In this publication they are internet users aged 12–74. In international data the figures refer to people aged 16–74.

Reference countries

	ISO country code	Member of [1]
Canada	CA	OECD
Germany	DE	EU
Denmark	DK	EU
Finland	FI	EU
France	FR	EU
United Kingdom	GB	EU
Ireland	IE	EU
Japan	JP	OECD
South Korea	KR	OECD
Netherlands	NL	EU
Sweden	SE	EU
United States	US	OECD

[1] All contries are OECD members.

Source: OECD.

International Standard Industrial Classification of All Economic Activities (ISIC)

The classification of economic activities by the United Nations. At the two digit level SIC'93 and NACE Rev. 1 are the same as ISIC Rev. 3.1. In the statistical descriptions of 2008 and beyond we will use a revised version.

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 productivity

The gross value added in basic prices per unit of labour volume.

Labour volume

The volume of labour used in the production process, expressed in full-time equivalents (FTE) or hours worked. FTEs are calculated by taking all full-time and part-time jobs in a given year and recalculating them into full-time equivalents.

National Accounts

Statistical system providing a quantitative, systematic and complete description of the economic process in a country, and its economic relations with the rest of the world.

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.

Public electronic communication network

A transmission system defined in the Dutch law on telecommunications, including transmission and routing equipment and other means that make it possible to transmit signals through cables radio waves, optical or other electromagnetic means, including satellite networks, fixed and mobile terrestrial networks, electric grids used to transmit signals, networks for radio, television broadcasts, and cable networks regardless of the information transmitted. The network should be used mainly or entirely to provide public electronic communication services, which also means a network intended for distributing programs to the public. Providing such an electronic communication network means constructing, operating, and managing it and making it available.

Public electronic communication service

A public electronic communication service is defined in the Dutch law on telecommunications as a service, usually provided for a fee, available to the public and used mainly or entirely to provide public electronic communication services including telecommunication and transmission services on broadcasting networks. A well-known example is providing mobile telephone services.

Re-exports

Goods transported via the Netherlands and (temporarily) owned by a resident without industrial processing. Re-exports refers for example to goods that are cleared with customs by Dutch distribution centres and supplied to other (European) countries. Re-exports, unlike transit trade, are part of imports and exports.

Self-employed

Someone who earns an income by working at their own risk for their own account in their own company or in an independent profession, or by working in the business of a family member. Family members working in the family business are considered self-employed unless they have a specific employment contract.

Services

Non-tangible products, such as hotels and restaurants, trade, transport, health care and government.

Spam

Unsolicited email message, often spread in massive quantities to different email addresses. The message often contains a commercial and a link to a commercial internet address.

Turnover

Turnover is the total revenue from the goods and services sold.

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) (in paragraph 2.8) or the number of vacancies per 100 jobs (in paragraph 7.1).

Volume Change

The weighted average of the changes in the volume and quality of parts of particular goods or transactions of the value added.

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