The Digital Economy 2008

Explanation of symbols

.	= figure not available
*	= provisional figure
x	= publication prohibited (confidential figure)
–	= nil
–	= (between two figures) up to and including
0 (0,0)	= less than half of unit concerned
blank	= not applicable
2007–2008	= 2007 to 2008 inclusive
2007/2008	= average of 2007 up to and including 2008
2007/'08	= crop year, financial year, school year etc. beginning in 2007 and ending in 2008
2005/'06–2007/'08	= crop year, financial year, etc. 2005/'06 to 2007/'08 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 changing into a digital society. The focus is on the widespread use of information and communication technology (ICT).

The Netherlands is well up to speed in ICT and compares well with other trend-setting countries. E-commerce continues to grow: some 7.7 million people had bought products online in 2008. Telework has become more common: 49 percent of Dutch companies offered these facilities to their personnel in 2007. ICT also increasingly penetrates the public sector. The growing use of the DigiD, the increase in the number of computers in schools, and the fact that ICT in the care sector was as common in 2007 as it was in the rest of the economy are just some examples of this.

This publication also provides information about the ICT sector and the relation between ICT and the economy. This edition introduces a separate chapter that focuses on ICT knowledge. The chapter includes data on Research and Development, ICT patents, ICT education and the ICT skills of the Dutch population. The internet skills of the Dutch population are average, compared with the rest of the EU.

Just like the previous editions in this series, this eighth edition includes information about the telecom infrastructure and many international comparisons. These extensions became possible once again thanks to cooperation with TNO and the financial support of the Ministry of Economic Affairs. Information available from other organisations and research institutes was also used in the compilation of this edition.

The volume of information on ICT increases by the year. Part of the methodological and statistical information is only available on www.cbs.nl/digital-economy.

This edition ends with the Capita Selecta. It consists of four contributions addressing specific ICT subjects in some detail. One deals with the use of mobile services in the Netherlands, another with used car sales online.

The Director-General
of Statistics Netherlands

G. van der Veen

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Figures and tables

Summary and conclusions

This part of the publication summarises the main issues per chapter. There is one introductory chapter, six statistical chapters and a Capita Selecta.

Introduction (chapter 1)

Technological innovations can lead to major economic and social changes. The invention of the steam engine is a classical example. People ascribe a similar role to ICT. With the publication of *The Digital Economy* Statistics Netherlands wants to help quantify the role of ICT in the economy and society.
Dutch government policy focuses on promoting the expansion of ICT in the widest sense with the aim to push the Netherlands to the top in Europe. The Netherlands already occupies a top position in several domains, such as the use of broadband. High on the Dutch ICT agenda are e-skills and e-government.
This publication is based on a model emphasising the use and supply of ICT. The ICT sector and ICT infrastructure play a major role in this model.
The chapters in this publication deal with the relationship between ICT and the economy, the ICT sector itself and the use of ICT in society. The role knowledge plays is also discussed.

ICT and the economy (chapter 2)

In 2007 the Dutch economy saw a 3.5 percent growth rate, the highest Gross Domestic Product increase since 2000. In the first half of 2008 there was also some growth, albeit more modest. The ICT sector has been eager to benefit from the economic recovery since 2004, especially ICT services. Domestic ICT investments increased to nearly 15 billion euro in 2006.
The Dutch telecom sector has contributed about 2.4 percent to Gross Domestic Product in 2007. The contribution of mobile telephony to it increased, as well as non-speech services in mobile telephony.
The international trade in ICT goods and services boomed in the past decade, both imports and exports flourished in the Netherlands. The share of software in the trade of ICT goods increased.

Telecom (chapter 3)

The main development in telecom in recent years has undoubtedly been the convergence of services. While telephone, television and the internet used to be

supplied by different providers and networks, they are now increasingly supplied in packages by one provider through one network. More and more consumers opt for this because of the ease and lower costs involved.

In terms of internet use, the Netherlands is among the European top, while the use is still increasing. The volume of internet traffic keeps expanding. This is stimulated by the increasing spread of broadband and more intensive internet use. The number of glass fibre cable connections is still quite limited.

Digital television has gained popularity in the Netherlands: by the end of 2007 over 3 million households used this application. There is a multitude of supply methods: terrestrial, satellite, cable and the internet. Digital radio is also gaining popularity, but not quite as much as digital television.

ICT use by companies (chapter 4)

ICT use by companies in the Netherlands is not among the absolute international top. In Denmark, Finland and Sweden companies use ICT even more intensively. In addition, Dutch companies were not exactly early adopters of the various ICT applications. Several years ago the use of broadband internet and electronic purchases and sales by Dutch companies was still average compared to the rest of the EU. In 2007 Dutch companies used these above average though. Companies in the Netherlands now commonly have broadband internet and their own website. This means there is a critical mass for advanced, large-scale ICT applications.
Using ICT to support business processes in Dutch manufacturing focuses more on the production and distribution chain. In the Dutch services, it focuses more on marketing and the customer.

One in five companies used open source operating software by December 2007. These were mainly major companies. This seems due to the difference in knowledge in how to work with open source.
Automated data exchange (ADE) has advantages in terms of efficiency and standardising services and products. Major companies have adopted this working method mostly: 43 percent of the companies with more than 500 employees applied ADE for, for example, sending purchase orders to suppliers.

Supply chain management is mostly the domain of major companies in trade and industry. Almost a third of the largest companies applied some form of supply chain management by the end of 2007.
Electronic purchasing and selling by companies is still increasing by the year. This is true for the number of companies using the facilities and for the volume of these transactions. Turnover of e-commerce in 1999 was just over 3 percent of total turnover by companies. In 2007 this had increased to nearly 13 percent.

Almost half of all companies in the Netherlands facilitate teleworking. It is common among the major companies: about 90 percent of companies with more than 250 employees have personnel teleworking. Compared to the group of benchmark countries, the number of Dutch companies with teleworkers is average.

ICT use by households and individuals (chapter 5)

Over six in seven households had internet access in 2008, three quarters with a broadband connection. More and more people use mobile devices such as wireless laptops, mobile phones, palmtops and game computers: mostly men. The Netherlands continues to be an international frontrunner where the availability of ICT in households is concerned.

Communication is the top activity of internet users. Media use through the internet also expanded, like listening to internet radio or watching TV through the internet. Other kinds of communication, including chatting and online discussion forums, are losing popularity.

More and more consumers in the Netherlands order or buy goods online. By 2008 some 7.7 million people had bought products online at some point. This figure is more than double in six years time. The frequency of online shopping primarily correlates positively with education level.
In 2008, over half of the internet users indicated that they use the internet for government enquiries. Completing government business by downloading documents and returning them completed (tax returns for example) increased again in 2008.

The mobile phone was rapidly accepted by the majority: over nine in ten people in the Netherlands aged 12–74 sometimes use a mobile phone. Only 10 percent of the users use it to access the internet. Other applications, such as mailing photos, reading email and placing films and photos made with the mobile phone on the internet are also still used sparingly.

ICT use in the public sector (chapter 6)

The Dutch government uses ICT in its services to citizens, companies and among its different layers on a large scale. One well-known development by the government is the introduction of DigiD. On 1 January 2008, almost 32 percent of the Dutch population had a DigiD. A year earlier, this was just 11 percent. People with an immigrant background rapidly closed the gap. Age-dependent legislations on pensions and study financing, together with income tax returns, hugely influenced DigiD ownership.

In education, there was a reduction of the number of students per computer and an increase in the number of teachers who use computers in class. Schools feel that ICT contributed a great deal to making education more attractive.

In the care sector, ICT tools are as widespread as elsewhere in the economy. Relatively speaking, many more people working in health care regularly used a computer and internet than in social work in 2007.
E-health is an up and coming area where medical informatics, health care and businesslike actions come together. The best-known application is the electronic patient dossier.

ICT knowledge (chapter 7)

Information, communication and knowledge have converged because of ICT. Studying ICT contributes to the development of new knowledge. R&D in ICT has grown worldwide. However, total R&D expenditure in the Netherlands is low when compared internationally. Moreover, R&D spending of the ICT sector has fluctuated greatly. Still the Netherlands applied for many patents, of which a third is ICT-related. The Netherlands also applied for relatively many high-tech patents. It may be that applying for patents has a strong cultural component.

ICT education is important in spreading and extending ICT knowledge and skills. However, the number of informatics graduates fell in 2006/'07, although from an international perspective the Netherlands is performing well in this area. The study of communication systems has greatly expanded. This development is in line with other developments described elsewhere in this publication, which shows that the C in ICT has most changed the economy and society.

Only a fraction of the population participates in ICT education so that specialist ICT knowledge is scarce. General computer and internet skills did increase among the Dutch population, probably as a direct consequence of growing computer and internet use rather than ICT education. Dutch people are just slightly more skilled in the use of computers than the average in Europe, internet skills are average. There is still a large group in the Netherlands without any or with very few ICT skills.

The use of mobile services (Capita Selecta)

The Delft University of Technology has been studying the use of mobile phone services since 2007. It shows that the use of mobile phones in the Netherlands is widely accepted. A very popular service is SMS. Other services are not yet as popular, such as downloading ringtones, emailing and looking up information. The

use of mobile services depends on the sex, age and income of the user. The use of the various mobile services in the Netherlands is still in its early stages compared to Finland.

ICT labour market in perspective (Capita Selecta)

ICT~Office has studied the current and future shortage on the ICT labour market. The inflow of students at the college and university studies in ICT is falling, so that the inflow into the labour market will also fall in several years time. The economic growth of the ICT sector exceeds the average economic growth, so demand for ICT professionals will grow rapidly. Various growth scenarios are discussed, which show that there will be a shortage of ICT professionals, especially at the university level.

On the C in ICT (Capita Selecta)

It is not easy to measure the effects of broadband use, because the C of ICT is intimately linked with investments in computer hardware (the IT of ICT). This makes it difficult to attribute effects to a specific ICT application or investment. Statistics Netherlands has participated in a joint international study of the microdata of companies in the Netherlands and the United Kingdom. An attempt was made to break down the total productivity effects of broadband use into direct and indirect contributions. That is the contribution of ICT use and the contribution led through capital deepening. Both effects turn out to be similar in the two countries. The direct effect on the Total Factor Productivity is higher than the indirect effect.

Internet in the used car market (Capita Selecta)

A study by BOVAG and Marktplaats.nl looked at the role the internet plays in the Dutch market for used cars, both from a car dealer and from a consumer perspective. Used cars are increasingly sold from one consumer to another thanks to the internet. Car dealers face a great deal of competition from the internet. Both car dealers and consumers frequently use the internet in advertising and looking for used cars. The extent to which consumers use the internet when looking for a used car differs greatly per consumer and per type of used car.

Key indicators of the Digital Economy, national, 2003–2008

	2003	2004	2005	2006*	2007*	2008*
	% volume change on previous year					
ICT and the economy						
ICT investments	–0.3	6.0	9.2	11.1	.	.
Intermediate consumption of ICT goods and services	0.9	1.8	3.0	4.4	4.5	.
Consumption of ICT goods and services	4.2	3.5	6.6	7.2	7.6	.
Gross value added ICT sector	4.2	2.9	5.1	5.0	4.8	.
of which ICT industry sector	0.9	6.9	5.9	2.0	6.1	.
ICT services sector	4.5	2.5	5.0	5.3	4.7	.
	number					
Companies in the ICT sector						
Total	23,920	25,220	24,235	27,825	27,470	.
New companies	2,455	2,730	3,450	3,360	3,485	.
Bankruptcies	383	289	270	201	173	.
	x million euro					
R&D expenditure in the ICT sector [1]	1,693	1,574	1,610	1,801	.	.
	number (x 1,000)					
ICT and employment						
Employed labour force working in an ICT profession	271	273	266	248	.	.
Vacancies in the ICT sector	2.4	6.0	8.9	12.5	12.7	.
Informatics graduates from higher education [2]	3.4	3.8	4.7	5.3	5.2	.
	number (x million)					
Telecommunication infrastructure						
Fixed telephone lines: PSTN	6.1	5.9	5.5	4.5	3.4	.
Fixed telephone lines: ISDN [3]	1.6	1.5	1.4	1.3	1.2	.
Telephone connections via rtv cable	0.2	0.3	0.5	0.8	1.2	.
Mobile telephone connections	13.3	15.9	16.3	17.1	18.5	.
Broadband connections: cable	1.0	1.3	1.6	2.0	2.2	.
Broadband connections: ADSL	0.9	1.8	2.5	3.0	3.3	.
	% of total					
ICT use by households and individuals						
PC ownership, households [4]	76	80	83	84	86	88
Internet access, households [4]	65	71	78	80	83	86
Broadband access, households [4]	22	34	54	66	74	74
Shopping online, individuals [5]	45	52	55	61	66	67
	% of total number of companies					
ICT use by companies [6]						
Companies with computers	94	94	100	100	100	.
Companies with an internal network	77	83	86	83	86	.
Companies with internet access	87	90	97	99	99	.
Companies with broadband internet	55	70	81	87	86	.
Companies with a website	65	72	79	80	83	.
Companies ordering goods/services electronically [7]	29	36	45	42	44	.
Companies receiving orders electronically [7]	20	23	27	28	31	.

1) R&D carried out by own staff. For 2004 and 2005, revised figures are shown.
2) Vocational college and university bachelor exams, university masters; 2002 = study year 2001/2002 etc.
3) The number of ISDN connections. One ISDN connection may consist of 2 or more 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 employees.
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
Contribution of ICT capital to GDP growth, 2001–2006 [1]	.	.	0.4	0.5	0.2	0.4
Share of ICT employees (narrow definition), 2007 [2]	3.1	.	2.9	4.0	3.1	4.4
Share of ICT sector in R&D expenditure business sector, 2005 [3]	.	.	26.7	34.7	25.0	67.0
	number per million inhabitants					
European ICT patent applications, 2004	–	25.2	31.4	32.3	52.8	138.5
	%					
ICT and education						
Share of ICT diplomas in higher education diplomas, 2006 [4]	.	4.0	3.5	3.3	4.0	4.5
	1 = very limited, 7 = extensive					
Internet access in schools, 2007	.	.	5.1	6.2	4.8	6.4
	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						
Online public services for business, 2007 [9]	.	85	94	87	94	77
Use of online public services for business, 2006 [9]	.	63	59	87	49	93
Online public services for citizens, 2007 [10]	.	71	71	76	76	85
Use of online 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 purchases [13]	34	29	43	36	52	19
Percentage of turnover generated by orders received electronically	12	11	11	22	11	15
ICT use by 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 internet skills [14]	13	13	7	30	8	35
Persons with electronic purchases [15]	35	30	21	56	52	48

[1] Average annual contribution in percentage points.
[2] Share of the employed labour force.
[3] Denmark, United States and United Kingdom: 2004 instead of 2005.
[4] EU-25 instead of EU-27, Eurostat estimates.
[5] Including ISDN and VoIP connections.
[6] EU-25 instead of EU-27, and data on EU-25 is 2005 instead of 2006.
[7] Excluding mobile connections.
[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 by 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 employees.
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; World Economic Forum, Global competitiveness report 2008–2009.

1. Introduction

Time will tell if the internet can be considered one of the most revolutionary innovations in modern human history – comparable to the steam engine or electricity. This depends on whether or not its influence on society is structural. 2008 is too early to draw definite conclusions because information and communication technology (ICT) and its use in society are still in the midst of developments.

History teaches numerous examples of the relationship between technological innovation and society. The invention of the steam engine is one example. This innovation had major consequences for society and the economy.

Can ICT play a similar role? Within a single generation ICT has gained a significant place in the lives of many Dutch people and in many different areas: production, consumption, communication, etc. The promise that ICT will touch everybody's lives seems to have come true. Moreover, many existing goods and services change because of ICT applications.

The social relevance of ICT is still growing, not only because the number of ICT users keeps growing, but also because it is used more intensively and almost every day new or better ICT applications are created. And so the technical and organisational complexity surrounding ICT is also on the increase.

The growing complexity touches on the administrative and organisational side of ICT and the internet. Lemstra (1996), for example, describes that this will influence how people deal with products – in a social and institutional context. This refers to ownership, privacy, security and tax. Lemstra concludes that we have come to a unique point where the phase of setting up the infrastructure changes into the frequent and widespread application and use of ICT. This may be applying ICT in legislation, health care, climate change, integration, education and national security, so that ICT can contribute to various social issues.

1.1 Policy framework

Dutch policy aims to maximise the contribution ICT makes to society. The Netherlands has been in the top 10 of every imaginable international 'ICT list', particularly in ICT infrastructure. Therefore, it is not surprising that the world's largest internet exchange is in the Netherlands: the Amsterdam Internet Exchange (AMS-IX). The AMS-IX is responsible for facilitating 20 percent of the European internet flows.

In its ICT agenda 2008–2011, the Dutch government has laid down its ambition to still be at the top in 2015 in terms of the availability and use of (new) ICT applications. In this paragraph we will summarise the main ambitions of the ICT agenda.

National ICT policy

The ambition of the current government is to focus on ICT users. So the valuation of goods or services, and with this their success and survival, depends mostly on opinions of the purchaser, client, consumer, and citizen. To improve the valuation, all links in the chain must be examined: from producer to consumer and everything that plays some role in between. In this way the contribution made by each link can be evaluated. This approach holds the key to good services according to the government.

The government has specified several priorities:

- *e-skills.* Making the best possible use of digital services and applications means that people should be able to work with ICT. People have to have enough skills to use the available digital services and the applications, in their role of citizen, consumer, employee or producer.
- *e-government.* Making government information and services available online to individuals and companies has been on the agenda for several years, as is reducing the administrative burden. However, the actual implementation and use of the services is not yet up to speed. The basic e-services will have to become available to all individuals and companies over the next few years.
- *interoperability and standards.* Users expect to get more services and applications via different networks, so it is important to make the underlying services and information accessible. This requires the interoperability of applications and services as well as (open) standards. To set the example, the government will stimulate the application of standards in government services.
- *social domains and ICT.* Innovation in social domains, such as care, education and security is essential. ICT can play a key role in removing bottlenecks.
- *service innovation and ICT.* The Dutch services sector can grow in terms of exports because of liberalisation at the global level. Especially the internationally advanced services sectors have to continue to innovate.

Aside from these priorities the government will also pay more attention to several preconditions in the next few years. These preconditions form the ICT basis which rests on three pillars: (1) the basis of infrastructure and ICT research, (2) the services offered by and to small and medium-sized businesses and 'prosumers', and (3) the reliability of ICT and operation of the market.

European ICT policy

It is not just the Dutch government who pays a great deal of attention to the role of ICT in society and the economy, the Lisbon agenda also underlines the importance

of ICT. It focuses on the contribution ICT can make to the knowledge-based economy and information society. The i2010 programme, where i2010 refers to *I*nformation space, *I*nnovation in ICT and *I*nclusion, is the policy framework of the European Commission describing the aims of the information society and media. This integrated policy sets out to gain knowledge, promote innovation, support economic growth, and create more high quality jobs.

1.2 *The aim of this publication*

It is quite a challenge to keep up with everything that happens in ICT – let alone understand it all. Nevertheless, Statistics Netherlands wants to contribute to this with the publication *The Digital Economy* by quantifying the role of ICT in the economy and society.
The website of Statistics Netherlands (www.cbs.nl/digital-economy) makes several additional documents available about the relationship between ICT and society. You will find a statistical annex with tables providing more detailed information per chapter. Some of the methodology is also explained on the website.

Most of the concepts and statistical data used in this publication are based on international agreements with the other statistical bureaus in the European Union (EU). Eurostat, the European Bureau of Statistics, plays a harmonising role enabling European comparisons. These comparisons are made quite frequently here.
The publication is also in line with the 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 figures of non-European countries.

1.3 *Layout of the publication*

ICT penetrates the world economy at a whirlwind pace. This is why there is still a need for relevant information on the Dutch Digital Economy. However, in sketching the situation we have to make selections from the vast amount of information available.
In this edition we added a new chapter, chapter 7, focusing on skills and knowledge. It addresses the subjects ICT skills, ICT education, Research & Development (R&D) and patents.
The layout was chosen because when ICT started the focus was mainly on the I in ICT. The idea was that information would no longer be scarce once ICT was introduced, and that this would change the economy in a structural way. However, it turned out that the C in ICT had an even greater impact on society. Almost everyone in the Netherlands had a mobile phone in 2008 and email is common.

Apart from defining the I and C it is also possible to define a knowledge aspect. This does not only involve the specifically technological side (the T in ICT), but also knowledge about ICT in the widest possible sense such as knowledge on how to use ICT. ICT skills are becoming more and more important for functioning in society. Statistics Netherlands publishes more details about the knowledge-based economy in the publication *Kennis en economie*. In chapter 7 of this edition we describe the specific relationship between knowledge and ICT. However, each chapter is self-contained, as was the case in the previous editions.

Chapter 2 briefly explains the economic developments. The Dutch economy forms the context in which ICT develops. The chapter continues with the role of the ICT sector. Paragraph 2.3 deals with ICT and employment. The chapter ends with a description of the expenditure on ICT and the international trade in ICT goods and services.

Chapter 3 of the publication is on Telecom. Paragraphs 3.1–3.3 highlight the main services of the telecom sector: internet, telephone, radio and television. At the end of the chapter we discuss the convergence of the various services and the consequences this has for telecom companies and consumers.

In chapters 4–6 follows a description of the main ICT users. Chapter 4 details ICT use in private enterprises. After a brief review of the ICT infrastructure and the ICT use by companies in paragraph 4.1, the in-house data communication is examined in paragraph 4.2. In the next paragraph the focus is on external data communication, which includes linking ICT systems, for example order processing systems, with clients and suppliers. The chapter continues with the topic e-commerce and finishes with telework.

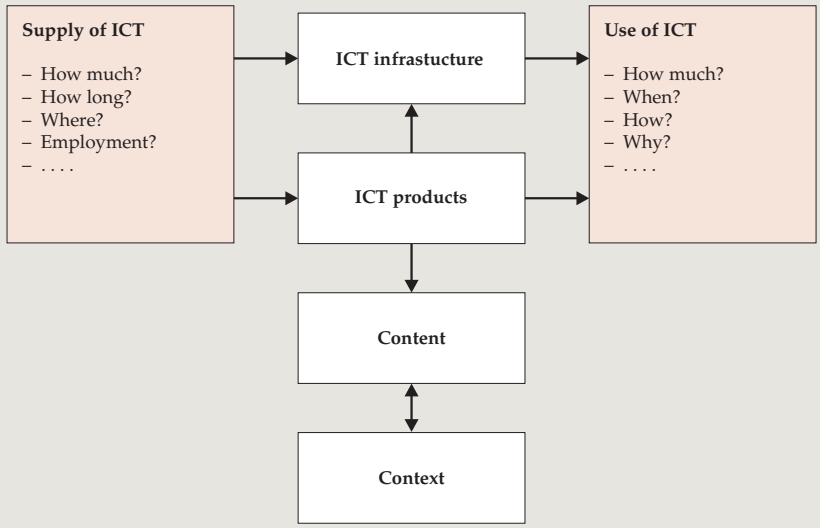
Chapter 5 is about ICT use by households and individuals. After an inventory of the ICT provisions in paragraph 5.1, the focus shifts to ICT use. Paragraph 5.3 lists the main internet activities of Dutch internet users, showing the diversity of the activities they engage in. The last paragraph deals with the activity online shopping.

Chapter 6 deals with ICT use in the public sector. The Dutch government greatly values sophisticated ICT use in the entire public sector. Paragraph 6.1 looks at the performance of e-government, followed by a second paragraph on ICT use in education. The chapter ends with the health care and social services. ICT could play a major role in solving social problems in all sectors mentioned.

The new chapter 7 looks at the ICT-related development of knowledge in the Netherlands. Paragraph 7.1 discusses the R&D expenditure of the ICT sector. Such spending is an indication of the national R&D endeavours by companies in the Netherlands. Some endeavours result in patents, the subject discussed in the next

paragraph. The third paragraph describes ICT education, a subject that is also addressed briefly in the second Capita Selecta. The last paragraph of this chapter sketches the ICT expertise of the population.

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?

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.

This edition ends with the Capita Selecta, which includes more detailed contributions on topics discussed elsewhere in this edition, or on closely related topics. The first contribution, by the Delft University of Technology, is about the use of mobile services. The second contribution deals with demand and supply on the ICT job market. The third contribution describes a study by Statistics Netherlands that was carried out internationally (OECD) about how ICT, innovation and productivity are related. The fourth and final contribution is about the trade in used cars on the internet between car dealers and consumers and among consumers. The main conclusions of the four contributions were summarised earlier.

Model for digitising society

This edition is based on a model focusing on the use and supply of ICT. In the model, the ICT sector and ICT infrastructure also play a major role (see box). The simplified model used is derived from a recent OECD publication (OECD, 2008) measuring the impact of ICT on society.

International benchmarking

This publication series has contained much data on the ICT developments in other countries, partly at the initiative of the Ministry of Economic Affairs. The aim of this benchmarking is to set up a framework that makes comparisons possible, so that the Netherlands can be evaluated from an international perspective. The emphasis in benchmarking is on showing the most recent and relevant situations and not so much on presenting time series. Usually the data used for the international comparisons are not as recent as the Dutch data, because it takes the international agencies time to gather the data of the different countries, so these data become available later.

The main sources for the indicators that can be compared are Eurostat and the OECD. On ICT Eurostat presents results from the harmonised surveys on ICT use by companies and households (and individuals) in Europe. The OECD produces regular and incidental publications on ICT use in OECD countries.

The value added of the OECD lies in diversity of indicators, and in the fact that data are gathered from other major countries: the USA, Japan, Canada and South Korea. These are countries with which the Netherlands would like to be compared.

2. ICT and the economy

The growth of the Dutch economy continued in 2007. The gross domestic product (GDP) increased by 3.5 percent, the highest growth rate since the turn of the millennium. Still the economic boom seems to be over its peak, as GDP in 2007 hardly increased on 2006. Moreover the growth rates of investments, exports and consumption declined in that year. In the second quarter of 2008 GDP grew at a more moderate pace (2.8 percent) than in 2007.
The Netherlands is one of the highest performers in Europe when it comes to developing the information society. The ICT sector has benefited from the economic recovery since 2004. ICT services (especially computer service bureaus) contributed significantly to the economic growth in the Netherlands between 2004 and 2007, but this was not the case for the ICT industry.

Between 2001 and 2006 investments in ICT capital were responsible for almost a third of the average annual GDP growth. The turnover of the ICT market increased as well but the growth of the number of employed ICT specialists lagged behind. This has to do with the rise of cheaper producers of ICT equipment, mainly in China and India.
The value added of the Dutch ICT sector lagged behind that of most countries considered between 1996 and 2006. Nevertheless ICT investments increased faster than total investments since the economic recovery in 2003. The software sector attracted more than half of the ICT investments in 2006. The share of ICT investments in the Dutch economy approached that of the United States and the United Kingdom. The growth of de Dutch ICT sector levelled off again in 2007.

The telecom sector in the Netherlands contributed about 2.4 percent to the gross domestic product. Although the labour volume has been falling since 2002, turnover and gross value added of the sector have remained constant. Mobile telephony accounts for much of the turnover of telecom companies. Non-speech services make up a growing share of the total turnover generated by mobile services.

There has been a change in the structure of domestic spending on ICT goods and services between 1995 and 2007. The share of ICT services increased at the expense of ICT goods. Intermediate use and consumption increased each year between 2003 and 2007.
The international trade in ICT goods and services grew substantially in the period 1997–2007. The value of the Dutch ICT exports (including re-exports) more than doubled. The growth rate of the ICT imports lagged behind during this period, increasing the trade surplus. The international trade in ICT goods is the largest, but the ICT services in the Netherlands showed the highest growth rate. The share of software in the total ICT trade volume has been increasing for years at the expense of hardware and ICT services. The value added of the international trade of the Netherlands is reduced by the huge share of re-exports in the exports: 82 percent in 2007.

2.1 *The Dutch economy*

The growth rate of the Dutch economy in 2007 stayed almost the same as in 2006; 3.4 percent in 2006 versus 3.5 percent in 2007. In 2006 the gross domestic product (GDP) had risen sharply from 2.0 to 3.4 percent (table 2.1.1). The highest growth rate since the turn of the century put an end to the lean years, as 2002 and 2003 had almost zero growth. The European Union also saw economic growth in 2007, but the average 2.9 percent was less than in the Netherlands (European Commission, 2008). The global level is characterised by the differences between established and up-and-coming economies, including China, India and several South American countries. The large economic growth is mainly produced by the latter category. Still the European Union is also facing significant economic developments. The up-and-coming economies offer the European countries new markets to sell their products.

The open character of the Dutch economy makes the foreign trade relations essential. Just like in 2006 the exports of goods and services were major contributors to economic growth. The sharp increase in the exports of natural gas meant an impulse for Dutch product exports. However exports did not increase as fast due to decreasing growth in world trade. The relatively fast increase of the unit labour costs and the expensive euro slowed the growth of Dutch exports down (De Jong en Verbruggen, 2008). The export growth rate exceeded the import growth rate in three of the four most recent years.

Dutch consumer spending saw a modest growth between 2003 and 2005. Despite its increasing growth rate, consumption in 2006 and 2007 lagged behind the GDP

Table 2.1.1
Developments in final spending categories GDP, 2001–2007

	2001	2002	2003	2004	2005	2006*	2007*
	year-on-year volume changes in %						
Consumer spending	2.7	1.7	0.8	0.6	0.8	2.9	2.4
Households [1)]	1.8	0.9	–0.2	1.0	1.0	0.0	2.1
Government	4.6	3.3	2.9	–0.1	0.5	9.0	3.0
Fixed capital formation (gross)	0.2	–4.5	–1.5	–1.6	3.7	7.5	4.9
Exports of goods and services	1.9	0.9	1.5	7.9	6.0	7.3	6.5
Imports of goods and services (–)	2.5	0.3	1.8	5.7	5.4	8.2	5.7
Gross domestic product (market prices)	1.9	0.1	0.3	2.2	2.0	3.4	3.5

[1)] Consumption by households and IZW households.

Source: Statistics Netherlands, National accounts 2008.

growth rate. Government in particular shows fluctuations in its growth pattern, with a remarkable peak in 2006. The growth of government consumption in 2007 was modest compared to the previous year and can be attributed mainly to more spending on care. The other government expenditure decreased slightly. Households consumed 2.4 percent more, but hardly spent more on durable consumer goods in 2007.

The contribution investments made to the economic growth in the Netherlands varied tremendously. There was negative growth in the years 2002–2004, a sharp increase in 2006 followed by a dip and then still substantial growth in 2007.
However, the economic upswing in the Netherlands seems to be past its peak in 2007. The basis of this is a slowdown in the growth of investments and to a lesser degree of exports and consumption.

In the second quarter of 2008 the Dutch economy grew at a more modest rate. GDP in this quarter increased by 2.8 percent on the same quarter of 2007.

Marked upswings and downturns

The Dutch economy after 1970 is characterised by periods of substantial economic growth, followed by periods of downturns. Figure 2.1.1 shows the developments in GDP and employment. The economy peaked most at the end of the nineties. In the period 1996–2000 the economy saw average annual growth rates of 4 percent. The ICT sector (information and communication technology) was one of the motors powering these high growth rates. The economic growth stagnated in the years that followed, partly because of the stock market crisis that hit internet companies at the turn of the century.
Investments in the ICT sector fell and telecom companies were confronted with large debts because of the purchase of UMTS licences and takeovers that were too expensive. Since 2004 the ICT sector has benefited from and therefore also contributed to the recovery of the Dutch economy. Employment reacted a little slow to the faster GDP growth that started earlier. The job market developed positively in 2007 with a 2.3 percent growth rate in employment (labour volume in full-time equivalents). The number of unfilled vacancies also continued to grow. Unemployment fell greatly during that year, reaching 314 thousand. This means the job market became even tighter in 2007.

Productivity due to the efficient use of production factors

One strategy to counter the tension in the economy just described is to revamp production processes with the aim to raise labour productivity. Effective investments in ICT applications played a key role. A quarter of GDP growth in the European Union and 40 percent of the productivity increase in 2007 were due to ICT (ICT~Office, 2007). The major investments in ICT also increase the innovative powers of the Netherlands.

2.1.1 Developments in GDP and employment, 1970–2007 [1]

[1] 2006 and 2007: preliminary figures.
[2] Labour volume in full-time equivalent jobs.

Source: Statistics Netherlands, National accounts 2008.

The developments in the employment and labour productivity determine how GDP develops. Effective use of new technology, including ICT, contributes greatly to the growth of labour productivity. The average yearly increase of labour productivity in the Netherlands during 2002–2007 was relatively low with 1.45 percent (CBS, 2008). This was caused in part by the huge increase in employment in comparison with GDP. Economic growth in the Netherlands is therefore realised largely by an increase in employment – the number of people working – and to a lesser degree by raising productivity per individual worker.

Because of the increasing international competitiveness (due to the enlargement of the European Union for instance) companies will have to anticipate new opportunities on the market faster. The development of the productivity in a country or sector increasingly determines the economic growth realised and the survival of companies (Van Ark et al., 2006). Labour productivity increases when GDP growth, as an indicator of economic growth, exceeds the increase in the employed labour force (in full-time equivalents). In figure 2.1.1 labour productivity is implicitly shown as the space between GDP (the top of the histograms) and the employment line. People generally look at labour productivity of the market sector in analyses.

As figure 2.1.1 shows, the growth of labour productivity fluctuates greatly. This is caused by the fact that the job market is usually slow to react to economic developments and that capital and other production factors contribute to the growth of GDP. At the end of this paragraph we will discuss the latter aspect.

Contribution of ICT capital to economic growth decreases

Investments in ICT have clearly made contributions to GDP growth internationally. The average annual contribution of ICT capital in most countries was below the average of the period 1985–2006 during 2001–2006 (see figure 2.1.2). The end of the financial internet hype (see paragraph 2.2 and box for more explanation) in 2001 was one major cause of the decrease in Europe, the United States and Japan. European companies have since invested relatively little in expanding or replacing ICT capital. Frequently mentioned causes are low yield expectations by companies and investors and slower adoption of new technologies due to the 'first mover' advantage of the United States, where companies adopt the newly available ICT technologies (European Commission, 2008).

We should explain that the figures on ICT capital only recently include software as ICT capital. Software is also often developed at the company's own account. Problems measuring the investments in software at the national level also depend on the way software can be obtained, for instance through rent agreements, licences, or as part of the hardware (OECD, 2006a).

Recovery after the dot com boom in the Netherlands

At the end of the nineties the ICT sector went through a period of tremendous growth because the internet became so widely popular so fast. This period was characterised by a lack of well-founded profit expectations, while share prices kept rising. This mostly happened in the United States. The period ended by the summer of 2000, when the NASDAQ crashed where many ICT companies were quoted. Many went bankrupt, were taken over, or no longer exist in their previous form. These developments have been called: boom, hype, crash, bursting bubble, hot air. The Dutch ICT sector has also suffered from the crash.

The table below shows how ICT sectors in the Netherlands developed in the period 2000–2005. The figure also includes the gross profit margins for the period 1995–2005.

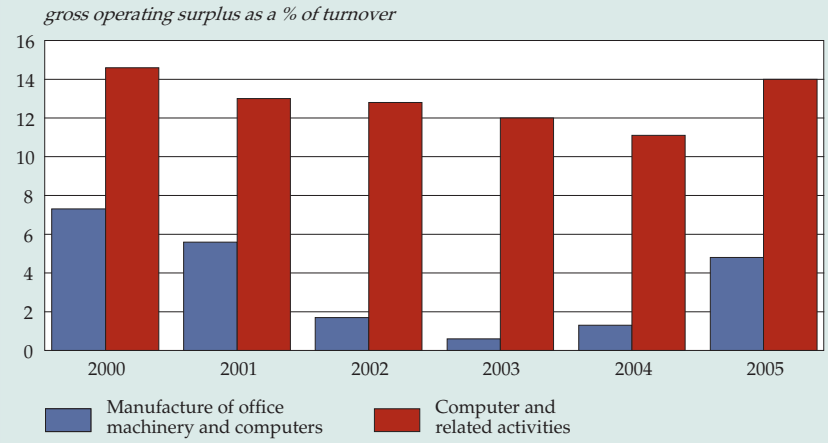
Developments in the ICT industry and services sector

	SIC '93	2000	2001	2002	2003	2004	2005
Number of companies	Manufacture of office machinery and computers	330	240	385	285	180	200
	Computer and related activities	14,020	16,770	17,560	17,790	18,495	17,630
Employees (x 1,000 fte)	Manufacture of office machinery and computers	10.6	9.7	7.1	6.9	6.6	5.8
	Computer and related activities		139.2	123.0	116.1	109.9	123.8
Turnover (million euro)	Manufacture of office machinery and computers	3,279	2,215	1,776	1,389	1,602	1,474
	Computer and related activities		14,492	13,368	13,213	13,710	15,559

Source: Statistics Netherlands.

It shows right away that the sector industry in the Netherlands is much smaller than the ICT services sector. Moreover, the former seems less robust, because the ICT industry sector was hit harder after the crash than the services sector, relatively speaking. The ICT services sector dips after 2001 but recovers. This is not the case in the manufacturing industry. It shows negative growth in number, employees and turnover.
This dip can best be explained by the gross profit margins. There were hardly any differences at the end of the nineties, but after 2000 a structural difference occurs. The margins for services remain high despite the crash (over ten percent). In industry these margins drop to below two percent and only recover slightly in 2005. These low margins explain the negative growth of the manufacturing industry in those years.

Developments in gross operating surplus in ICT-related sectors



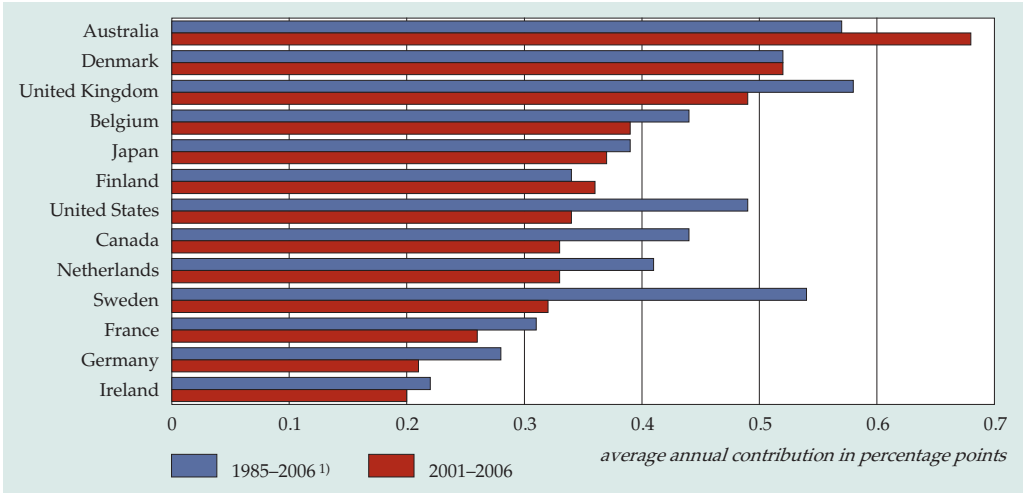
Source: Eurostat.

The impact of ICT on economic growth

The importance of ICT for the economic development in the Netherlands has increased substantially since the nineties. Between 2001 and 2006 investments in ICT capital were responsible for almost a third of the average annual GDP growth (figure 2.1.3). Nevertheless the Netherlands turns out to be the last of the countries considered. Ireland, Sweden and the Anglo-Saxon countries showed a considerably higher growth in productivity. ICT capital was the pillar of GDP growth in Australia and the United Kingdom. In many countries, including the Netherlands, ICT provided the bulk of the capital contribution to economic growth. The contribution of ICT in the Netherlands is almost entirely due to the powerful performance of the Dutch ICT services and of the telecommunications in particular.

At the global level, the ICT sector contributed less to the growing productivity in the European Union in 2007 than in the United States (European Commission, 2008). This resulted from the fact that the ICT sector in the European Union is smaller in size (5.3 versus 6.6 percent of GDP) and that the efficiency gains of technological progress were lower in the European Union (5 percent) than in the United States (6.2 percent).

2.1.2 Contribution of ICT capital in GDP growth, international, 1985–2006

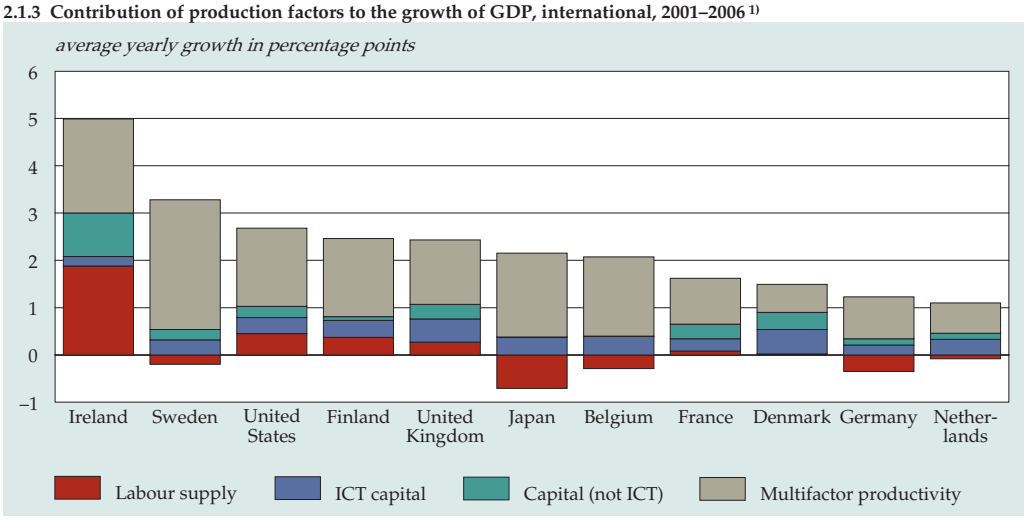


1) For Belgium and Japan this is 1985–2004. For Denmark, Finland, Ireland, the Netherlands and the United Kingdom this is 1985–2005. For Germany this is 1995–2006.

Source: OECD, Productivity Database 2008.

Capital, including ICT capital, is not the only contributor to GDP growth. Multi- factor productivity is a major contributor to GDP growth. Ireland, Sweden, the United States and Japan have dynamic economies, not only because of high ICT investments, but primarily because of efficiently combining the various production factors. Dutch companies hardly made efficiency gains in this area in the last five years.

2.1.3 Contribution of production factors to the growth of GDP, international, 2001–2006 1)



1) For Belgium and Japan this is 2001–2004. For Denmark, Finland, the Netherlands and the United Kingdom this is 2001–2005.

Source: OECD, Productivity Database 2008.

2.2 *The ICT sector*

This paragraph describes the ICT sector in the Netherlands. It consists of two parts. The first part consists of a macroeconomic description of the sector, discussing the investments, production value, as well as the concentration of ICT companies. Part two will explore the telecom sector. This part had its own chapter in the previous edition (Chapter 3 in The Digital Economy 2007).

ICT sector sensitive to economic fluctuations

In the past twenty years the ICT market turned out to be sensitive to economic fluctuations. This market reacts more violently to macroeconomic developments than most other sectors: the highs are higher, the lows are lower. Examples are the first computer wave of 1990, and the turn of the millennium when the ICT market grew faster than GDP.
The ICT sector has become less cyclical because IT has increasingly become part of the primary business process.

The Dutch ICT sector flourished until the peak of the internet hype on the financial market – about 2000. The ICT services and the investments in electronic networks boomed. Thanks in part to this, the ICT sector made an above average contribution to economic growth and innovation in this period. The Dutch economy also benefited indirectly from the yield of ICT applications in other production processes. Companies in the various sectors such as manufacturing, services and logistics, increased their productivity by investing in computers, broadband internet and software.
However, income did not keep pace with spending. In 2001 the ICT sector started to collapse. Shares on the stock market fell and companies in the ICT sector were hardest hit. With hindsight it turned out to be just a financial internet hype, where the expectations about the speed with which the new technology would yield profits were much too great. Internet itself is not a hype, as is shown by the increasing digitalisation of society. The term financial internet hype therefore only refers to the financial situation discussed.

The recovery of the Dutch ICT sector that started in 2004 was mostly carried by the ICT services sector, computer service bureaus in particular. This growth levelled off in 2007. Many ICT companies in the Netherlands had disappointing results in that year because of a shortage of qualified personnel. This shortage is a major reason for turning to the low-wage countries, mainly for helpdesk and call centre activities and software development (Rabobank, 2008).
ICT is the area involved in information systems, telecommunication and computers. The ICT sector consists of the ICT industry and the ICT services (including the telecom sector). The ICT industry sector provides products for processing and communicating electronic information. The ICT services sector provides services

that support the process of electronic information processing and communication. The exact definition of the two constituent parts is agreed internationally and described in table 2.2.1. Below we will discuss certain aspects of the ICT sector.

Table 2.2.1
Definition of the ICT sector

SIC'93	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.

Increasing investments in the ICT industry

Despite the unrest in the financial markets, the ICT industry (the industry that designs and produces information and communication equipment) has seen stable growth albeit with slight year-on-year fluctuations. When investments and turnover fell in 2003, the growth rate of these economic indicators and of the value added initially increased. [1)] Since 2005 this growth was reduced somewhat, which does not automatically mean the end of the growth is near because there is an upward trend in the investments in the ICT industry sector. Industrial automation benefited especially from investments in technology for measuring, controlling and analysis in the process industry (Rabobank, 2008). Many companies needed automation because the labour market was so tight. Making more advanced products with a higher value added, however, requires major investments in R&D. Furthermore the productivity of the ICT industry is increased due to the upward trend of the value added linked to the almost annual reduction of the number of employees (labour volume). In 2007 the value added rose sharply (6.1 percent), while the labour volume of employees fell by more than 3 percent.

Digital contents boosted the ICT industry in 2008. Technological innovation and new consumer wishes led to innovative products, new distribution methods and also new forms of creative services. Digital contents penetrates many sectors. Companies active in games, music, scientific publications and mobile technology have different characteristics, but digital contents provides them all with the main impulse (OECD, 2006b).

ICT services sector: computer service bureaus as the driving force

The advanced digitalisation of society – specifically the development of broadband – offers companies great opportunities to improve their services to the consumer and the business markets. Players in niche markets (with a highly specialised service) can benefit in particular by developing innovative products. The importance of the computer service bureaus in the ICT services sector has taken off between 2003 and 2007 (see table 2.2.2). [2] Computer service bureaus generate turnover from advice, developing and implementing information systems, systems management and exploitation. The turnover is largely generated domestically. In 2002 investors still had little trust in the sector after the internet bubble burst. Then investments saw tremendous growth, peaking in 2004. This pattern is in line with the active investment behaviour by companies and other money lenders in a recovering economy. The value added also grew more rapidly in this five-year period which indicates that the profitability of the computer service bureaus has improved. The growth of the value added was initially also fuelled by the shrinking workforce. However, in 2005 the labour volume started expanding substantially again. The computer service bureaus expanded across the board from 2005 onward. In 2007 the growth rate of the sector was still substantial, but started showing a slight dip.

Table 2.2.2
The ICT sector compared with the Dutch economy, 2003–2007

	2003	2004	2005	2006*	2007*
	year-on-year volume changes in %				
Production value					
ICT industry sector [1]	–1.6	3.1	1.9	1.5	0.4
ICT services sector	1.4	1.2	4.2	5.3	4.8
of which: post and telecommunication	4.5	0.6	2.5	3.2	2.1
computer service bureaus	–3.7	2.2	7.2	8.7	8.8
Total ICT sector	0.6	1.7	3.6	4.3	3.7
Netherlands	–0.6	1.9	2.1	3.4	3.7
Gross value added					
ICT industry sector [1]	0.9	6.9	5.9	2.0	6.1
ICT services sector	4.5	2.5	5.0	5.3	4.7
of which: post and telecommunication	8.7	2.5	3.7	2.3	1.8
computer service bureaus	–1.2	2.4	7.1	9.5	8.1
Total ICT sector	4.2	2.9	5.1	5.0	4.8
Netherlands	0.5	2.3	2.1	3.3	3.5
Investments					
ICT industry sector [2]	–10.6	–7.3	9.0	18.8	.
ICT services sector	–15.2	7.8	16.2	14.8	.
of which: post and telecommunication	–19.4	5.5	16.3	15.7	.
computer service bureaus	6.5	17.6	15.7	11.2	.
Total ICT sector	–14.1	3.8	14.5	15.7	.
Netherlands	–1.5	–1.6	3.7	7.5	4.9
Labour volume of employees					
ICT industry sector [1]	–7.4	–3.8	–3.5	0.2	–3.3
ICT services sector	–5.7	–2.6	2.3	4.4	3.6
of which: post and telecommunication	–8.8	–3.4	–3.7	–1.0	–1.8
computer service bureaus	–2.9	–2.0	7.3	8.4	7.3
Total ICT sector	–6.0	–2.8	1.4	3.8	2.6
Netherlands	–1.1	–1.0	0.0	1.9	2.3

[1] For investments the ICT industry is defined as SIC (Standard Industrial Classification) 30–33. The investment data are not sufficiently detailed to present them according to the internationally agreed definition for the ICT industry sector.

Source: Statistics Netherlands, National accounts 2008.

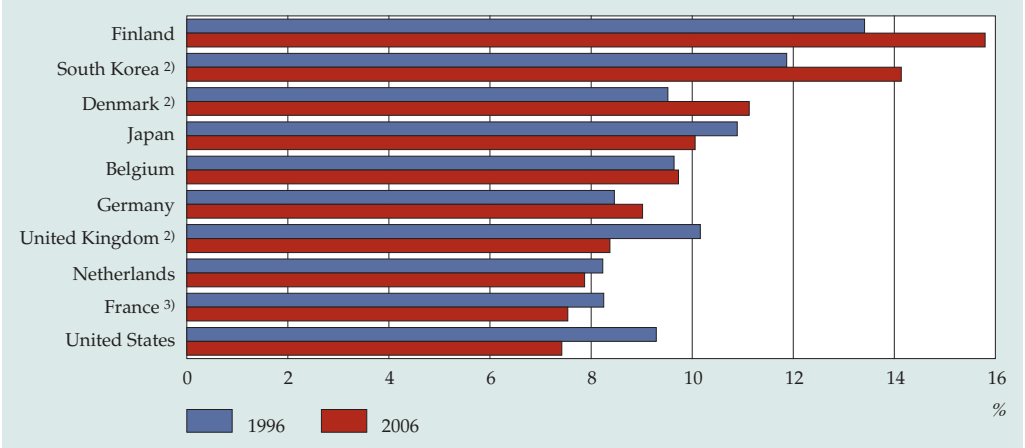
Growth rate of the post and telecommunication sector levelling off

The post and telecommunication sector is the only sector in ICT that saw an annual increase of its production value (turnover) during 2003–2007. Although the economic slowdown after 2000 mostly passed this sector by, the growth rate seems to be levelling off. In the past five years the annual growth of the production value fell from 4.5 to 2.1 percent. Moreover, during the same period the growth rate of the value added – as a measure of how profitable the sector is – fell from 8.7 to 1.8 percent. The increases of turnover and profit that the post and telecom companies continued to produce went hand in hand with a yearly decrease in employment between 2003 and 2007. After the peak in 2001 the labour volume of employees has fallen by 26.7 percent. The fact that the post and telecom sector realised substantial production and value added is partly because the sector employed less personnel. Moreover, capital intensity is high due to the relatively high investments. This refers to buying and selling fixed capital formation such as commercial property, machinery, installations and computers.

Dutch ICT sector small in size

The share of de ICT sector in the gross value added of the Dutch private sector (7.9 percent) in 2006, was low compared to other countries (see figure 2.2.1). In other small economies, like Denmark and Belgium, the ICT sector has a larger share in the private sector and the share also increased between 1996 and 2006. In Finland the ICT sector made by far the largest contribution to the value added of the total private sector in 2006: close to 16 percent. Between 1996 and 2006 front runners Finland and South Korea were also the fastest growing economies. In the Netherlands the

2.2.1 Share of the ICT sector in the value added of the business sector, international, 1996 en 2006 [1)]



1) The sector ICT industry is defined as SIC (Standard Industrial Classification) groups 30–33 (D). The sector ICT services here is transport, storage and communication (I)
2) For Denmark and the United Kingdom this is 2005 instead of 2006. For South Korea this is 2007 instead of 2006.
3) For France 1999–2006.

Source: OECD, National Accounts 2008.

importance of the ICT sector in the economy fell slightly between 1996 and 2006. The share of the ICT sector in the private sector fell sharply compared to other sectors in the United Kingdom and the United States.

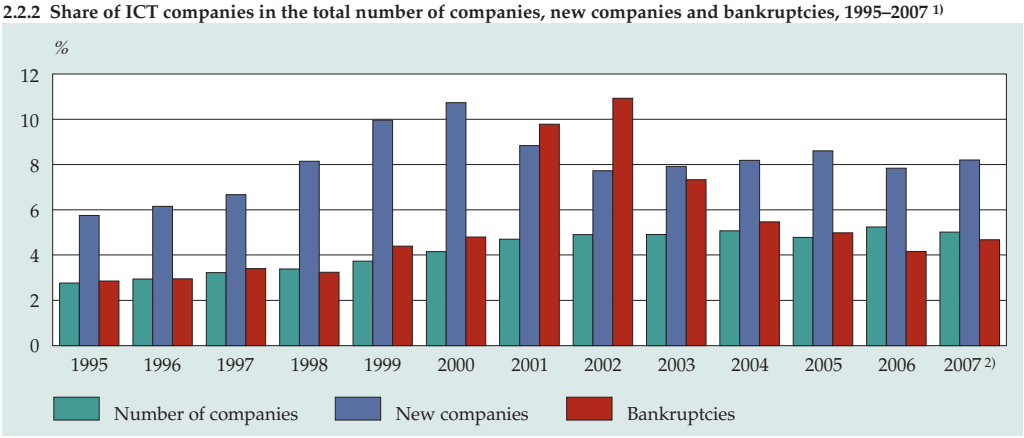
ICT sector: stable part of the Dutch business community

The economic importance of the ICT sector is reflected by the dynamics in the sector. The share of the ICT sector is quite stable in the total number of Dutch companies. Between 1995 and 2007 the share of ICT companies nearly doubled to 5 percent, but rather in the first than in the last five years (see figure 2.2.2). This stability hides the underlying dynamics shown by the large number of starters in the ICT sector in the last five years; this number increased by no less than 40 percent.

In 2007 close to 3,500 new companies started in the ICT sector, mainly computer service bureaus. It is unclear if such starters result in economic growth however. New ICT companies often employ just a few people and the employment they create does not always compensate for the loss of ICT jobs in major companies. The fact that the number of ICT companies is not falling can also be explained by the considerable decrease in the number of bankruptcies to about 4 percent of the total Dutch private sector in 2007.

The pattern of the dynamics in the ICT sector is in line with developments in other sectors, which makes that the share of the ICT sector has barely changed. The increase in the number of companies and the number of newly started companies in the ICT sector and in the private sector as a whole as of 2004 is the result of the recovery of economic growth, the reduction of the administrative burden and the abolition of the licenses to set up business in May 2007.

2.2.2 Share of ICT companies in the total number of companies, new companies and bankruptcies, 1995–2007 [1)]



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

2) As of 1 July 2006 the General Business Register of Statistics Netherlands has been changed. As a consequence the data on the number of companies and institutions on 1 January 2007 is not comparable with the data for this reference date.

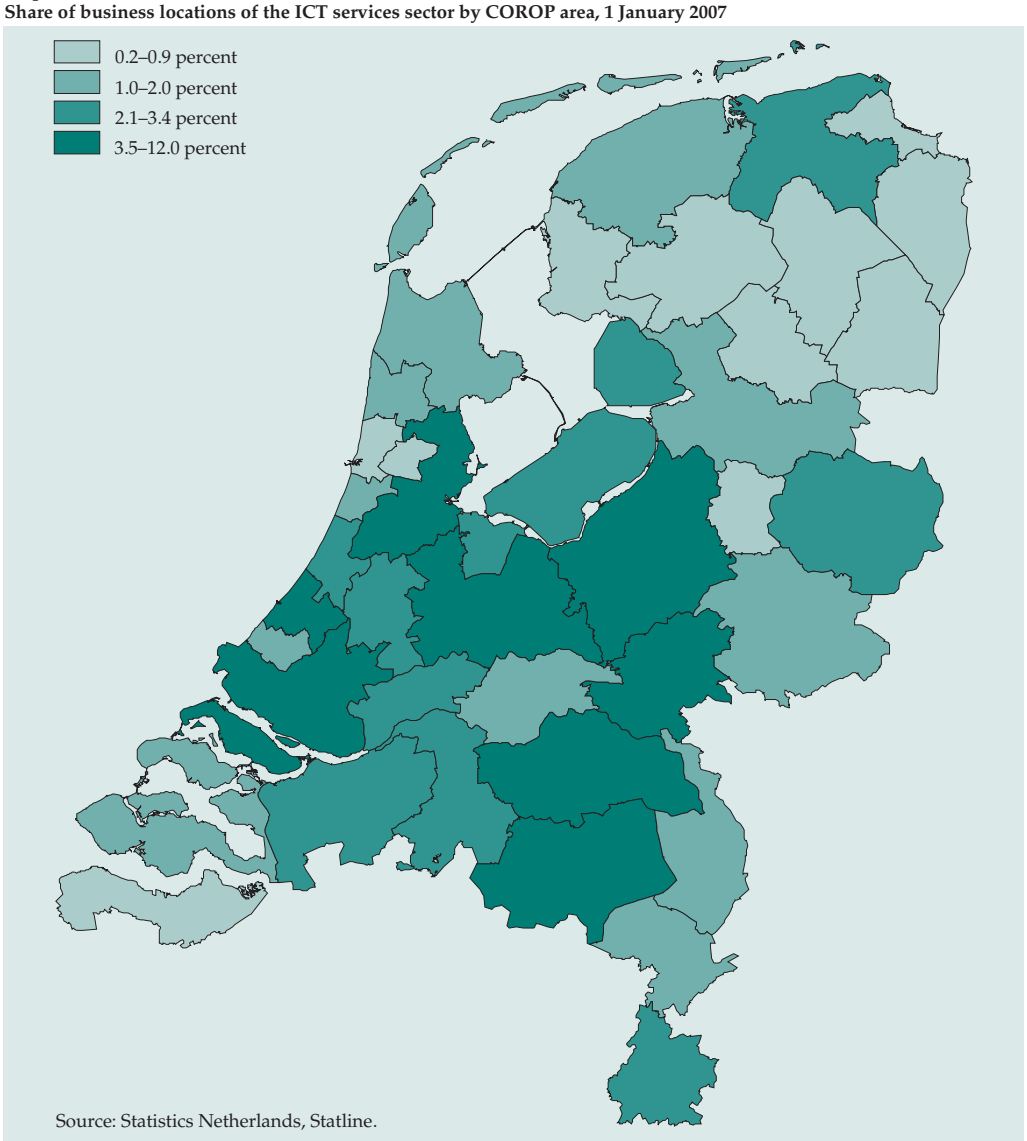
Source: Statistics Netherlands.

ICT sector located mainly in the Randstad and North Brabant

There were over 27 thousand branches of ICT companies in the Netherlands in 2007. This is almost three times as many as in 1995. The increase is almost entirely due to the ICT services, which made up about 96 percent of the ICT branches in 2007.

The ICT services sector is mainly located in the Randstad (map 2.2.1). They are often offices in the densely populated urban regions. In 2007 the ICT services were represented most strongly in the province of North Holland (22.6 percent), where COROP area Groot-Amsterdam (12 percent) is a magnet for business services including

Map 2.2.1
Share of business locations of the ICT services sector by COROP area, 1 January 2007

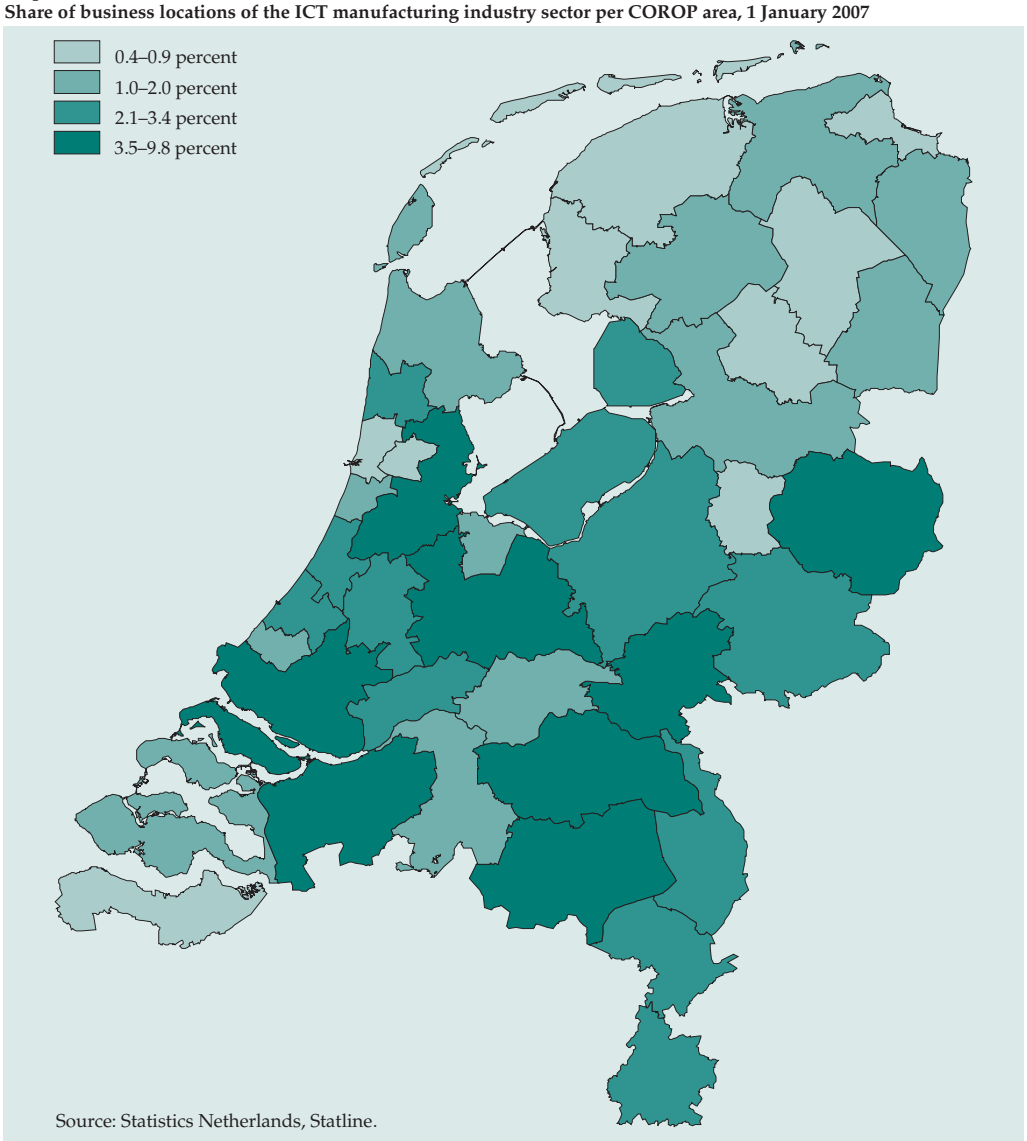


Source: Statistics Netherlands, Statline.

ICT. The share of ICT services sector was also high in Utrecht, Groot-Rijnmond, agglomeration 's-Gravenhage and the south east of North Brabant.

The western part of the Netherlands also had the largest share of branches in the ICT industry (42 percent), but the difference with the southern part of the Netherlands (31 percent) was not as large as in the ICT services (map 2.2.2). North Brabant came first in 2007 with over a fifth of the number of ICT industry branches in the Netherlands within its provincial boundaries. The majority was in the south east of

Map 2.2.2
Share of business locations of the ICT manufacturing industry sector per COROP area, 1 January 2007



Source: Statistics Netherlands, Statline.

North Brabant (9.8 percent). Utrecht and Groot-Rijnmond, which are Randstad regions, came second.

The two maps indicate a certain regional concentration of ICT industries and ICT services. It is hard to explain this pattern. General aspects such as space, prices, accessibility and clients and specific considerations may play a role in the decision for companies to move close together.

Role and structure of the telecom sector

The remaining part of this paragraph deals specifically and in more detail with the telecom sector. The performance of the telecom sector is compared to the total Dutch economy.

In *The Digital Economy* telecom refers to the physical infrastructure (e.g. telephone cables, GSM masts), and services in (mobile) telephony, the internet, radio and television. The telecom sector comprises telephone companies, internet providers and cable companies broadcasting radio and television signals.

In this section of the paragraph we will present figures on post and telecommunications. Statistics Netherlands cannot publish figures on the telecom sector alone because of confidentiality regulations. As telecom is by far the largest part of post and telecommunications, the figures also provide insight in the situation of the telecom sector.

The telecom sector in the Netherlands contributes about 2.4 percent to the gross domestic product. Although the labour volume has been falling since 2002, the turnover and gross value added of the sector remained constant. Mobile telephony bring in much of the turnover of telecom companies. Non-speech services form an increasing share of the total turnover generated by mobile services.

When a company in the Netherlands wishes to trade in electronic communication, it must register with OPTA, the independent post and telecommunication authority.

Table 2.2.3
OPTA-registered telecom providers, by activity, 2004–2008 [1)]

	2004	2005	2006	2007	2008 [2)]
Providing a public electronic communication network	218	253	302	380	342
Providing a public electronic communication service	213	281	362	399	438
Providing related facilities	8	9	11	12	8
Providing qualified certificates	2	3	4	4	5

[1)] Reference date 31 December.
[2)] Reference date 20 August.

Source: OPTA.

The number of registrations with OPTA has been on the increase for several years. In 2008 the number went up again but not by as much as in previous years, see table 2.2.3. [4)]

Table 2.2.4
Key figures sector post and telecommunication, 2002–2007 [1)]

	2002	2003	2004	2005	2006*	2007*
	million euro					
Net turnover	22,981	23,000	22,703	22,919	.	.
Gross value added (basic prices)	10,906	12,101	12,244	12,419	12,346	12,297
Pre-tax results	–10,379	2,859	4,419	4,236	.	.
Fixed capital formation	2,632	2,098	2,218	2,542	2,956	.
	full-time equivalent (x 1,000)					
Labour input of employees	106.2	96.9	93.7	90.2	89.3	87.7
	%					
Share in the total economy						
Gross value added (basic prices)	2.63	2.85	2.80	2.72	2.58	2.44
Fixed capital formation	2.83	2.26	2.40	2.62	2.78	.
Labour input of employees	1.60	1.48	1.45	1.39	1.35	1.30

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

Source: Statistics Netherlands, National accounts.

Table 2.2.4 shows several key figures of the sector post and telecommunication and compares them with the total economy in the Netherlands. In 2007 the sector generated a gross value added of 12.3 billion euro, which is 2.4 percent of the total value added in the Netherlands. In 2003 it was still almost 2.9 percent, but since then the percentage has fallen by about a tenth of a percent point a year. Figure 3.1.1 of *The Digital Economy 2007* shows that the relative size of the sector in the Netherlands is above the average of the benchmark countries, but not as big as in Finland.

In 2007 the post and telecom sector employed 88 thousand full-time equivalents. [5)] In comparison there were 116 thousand in 2001. Although employment fell by a quarter in six years time, the value added in the sector stayed up.
The pre-tax results of the sector in 2006 were about 4.2 billion euro. This amount must be offset against the major losses suffered by the telecom companies in 2001 and 2002 of more than 10 billion a year. The losses were mainly due to the high costs of

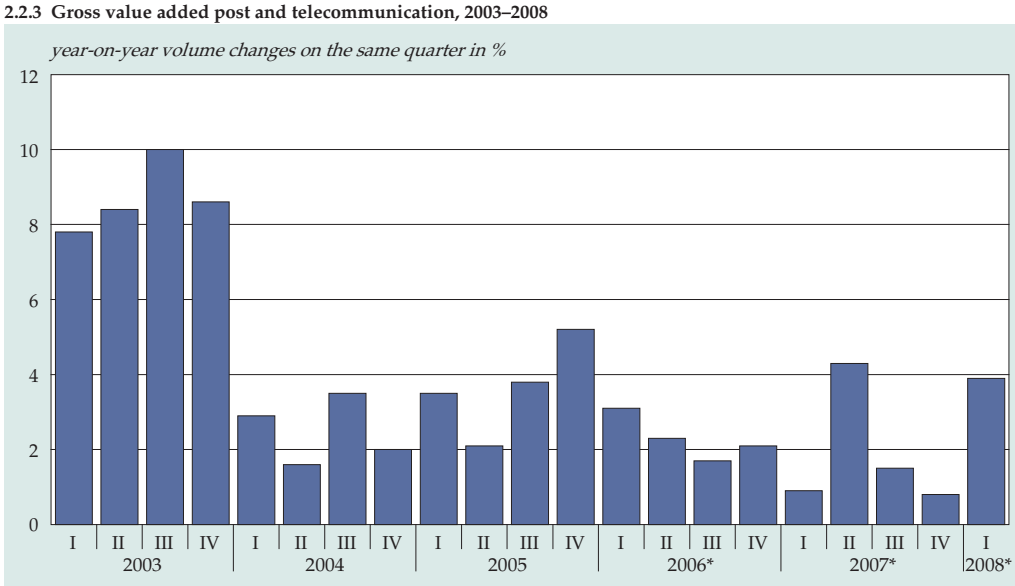
borrowing for the construction of infrastructure and for buying UMTS licences. The operating result, the result from production activities such as the sales of goods and services, was positive.
Investments in the post and telecom sector in 1999 and 2000 were three times as high as in 1995. In 2001, when the internet hype had ended, investments collapsed. In 2004 investments picked up again and grew faster in 2007 rising by over 16 percent on 2006.

Telecom market saturated

Right before the year 2000 consumers massively embraced the new technology, such as mobile telephones and the internet, leading to stupendous growth in the telecom sector. There were 20 percent growth rates for several years, which continued for some time even after the bubble burst. Figure 2.2.3 shows the quarterly development from 2003 on. 2003 was the last year with a sharp increase. In 2004 the growth rates started to fall in part because of the market saturation and the ensuing competition and price fighting.

It is difficult to describe the turnover of the individual services in the telecom sector because the various services – telephone, television and the internet – have started to blur. This is due to the rise of multiplay, offering several services in a single package, and technical developments that blur the lines between services (internet telephony). Chapter 3 will look at the convergence and technical developments.

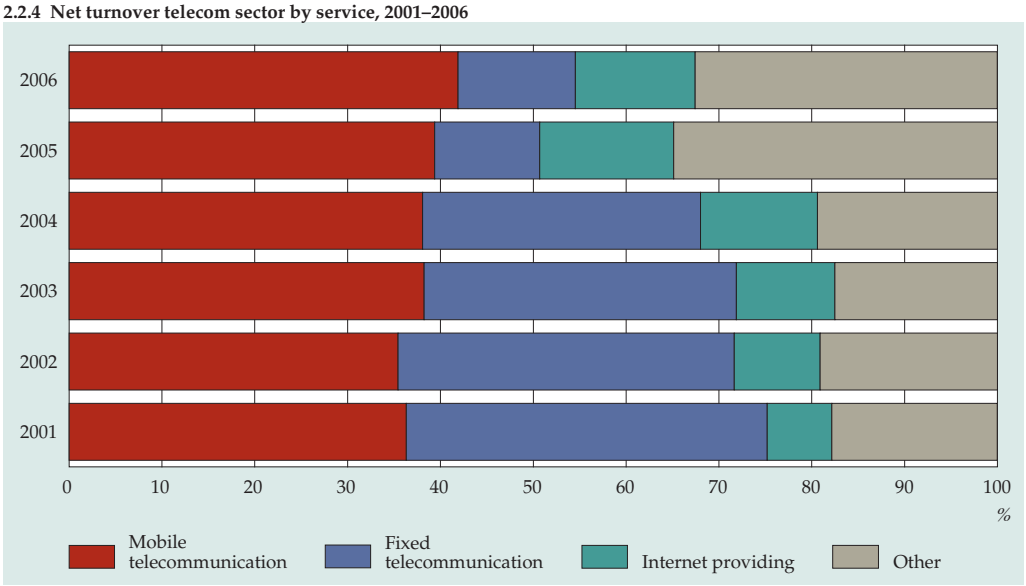
2.2.3 Gross value added post and telecommunication, 2003–2008



Source: Statistics Netherlands, Quarterly accounts.

Figure 2.2.4 shows how turnover of the telecom companies in the Netherlands is structured. Which part of the turnover is generated by fixed telecommunication, mobile telecommunication and internet providing. Turnover from the exploitation of cable networks for radio and television and interconnection services (providing other telecom operators access to one's own network for a fee) is included in the category 'other'.

2.2.4 Net turnover telecom sector by service, 2001–2006



Source: Statistics Netherlands, Production statistics Telecommunication companies.

In 2006 almost 42 percent of the total turnover in the telecom sector was generated by mobile telecommunication (mobile telephone and mobile data services, such as SMS and mobile internet). This share was stable in the period 2001–2005 (just under 40 percent). In 2006 the turnover from internet providing fell by 1.5 percent point to 13 percent after a sharp rise between 2001 and 2005. At the same time the share of the turnover from fixed telecommunication increased by more than a percent point. In the period 2001–2005 this share had dipped by almost 28 percent point. These remarkable developments may be caused by the blurring of the services. It is not very clear if respondents consider phoning through the internet as fixed telecommunications or as internet providing.

Growing turnover share for non-speech services

Since 2001 the turnover in mobile telephones and in mobile services has no longer increased across the board (see figure 3.2.2 from *The Digital Economy 2007* for more details). About 78 percent of the turnover from mobile services at the end of 2007 consisted of turnover from 'speech services' (OPTA, 2008); at the end of 2006 this was 82 percent. The other turnover comes from data services, such as mobile

internet and SMS. The turnover from such non-speech services increased by more than a quarter from 2007 on 2006. By the end of 2007 over 20 percent of the turnover came from non-speech services.

2.3 *ICT and employment*

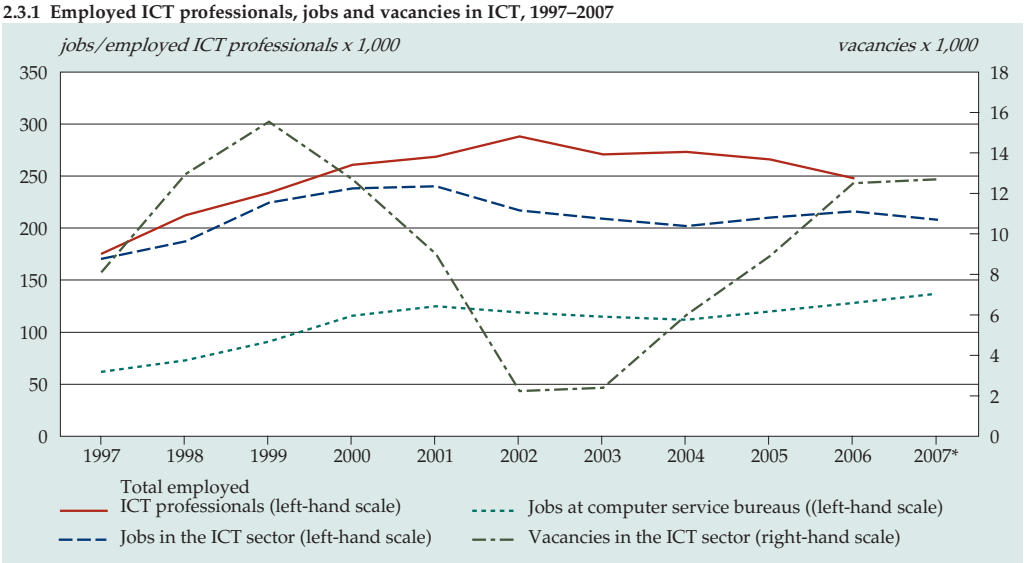
Employment in computer service bureaus increased between 2004 and 2007. Still the number of vacancies in the ICT sector was stable in 2007, while the number of vacancies grew steadily in the rest of the economy.

Vacancies in the ICT sector stabilising

The number of vacancies had been rising substantially across the board in the ICT sector in recent years, but in 2007 this seems to have levelled off. The number of jobs in computer service bureaus, however, saw its highest level of the past decade in 2007. The number of jobs in the ICT sector fell slightly in 2007 despite this. The figure on the total number of ICT specialists employed in 2007 is not yet known. The shift from observations by Statistics Netherlands itself toward using data on income tax declarations in compiling outcomes on jobs and employment has caused a delay in the time the figures became available. This means there are no recent details of jobs into sectors or branches.

The total number of ICT specialists employed in 2006 fell sharply, causing the number of employed ICT specialists to dip below 250 thousand for the first time in six years.

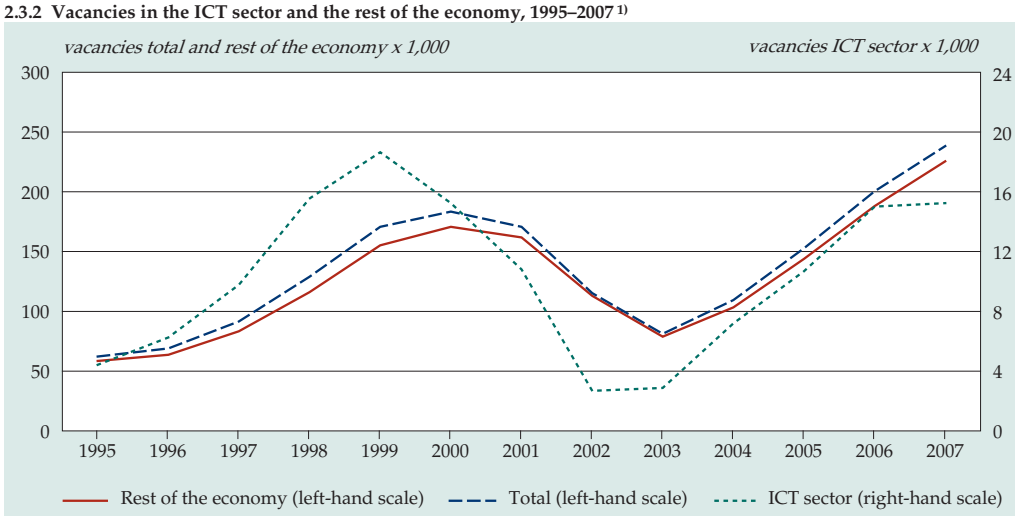
2.3.1 Employed ICT professionals, jobs and vacancies in ICT, 1997–2007



Source: Statistics Netherlands, Labour Force Survey (employed ICT professionals), Employment and earnings survey (jobs in the ICT sector), Labour accounts (jobs at computer service bureaus), Vacancy survey third quarter (vacancies).

The number of vacancies in the ICT sector seems to have stabilised, while vacancies in the economy as a whole increased in 2007. The vacancies in the ICT sector run parallel to that in the economy as a whole until 2007 (see figure 2.3.2), in 2007 the number of vacancies grew much faster in the rest of the economy than in the ICT sector. In 2007 the vacancy rate for the ICT sector was 60 vacancies per thousand jobs, compared to 29 for the economy as a whole that year (see table 2.3.1 statistical annex).

2.3.2 Vacancies in the ICT sector and the rest of the economy, 1995–2007 [1)]



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

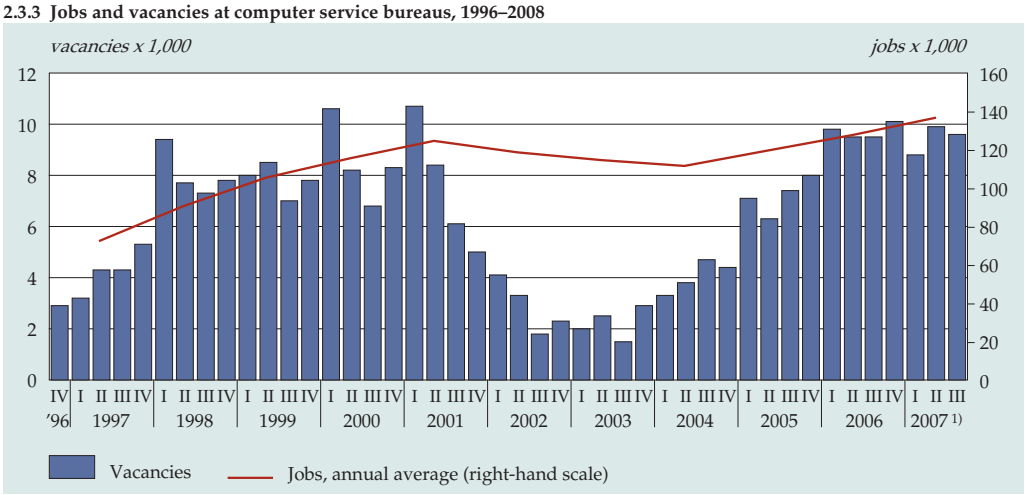
Source: Statistics Netherlands, Vacancy survey, third quarter.

Explosive growth of computer service bureaus in two decades

Due to changes in the way Statistics Netherlands classifies companies, the category computer service bureaus is slightly different after 2007. Therefore it is hard to say if the number of vacancies increased in 2007/2008. However, according to the new classification there were 10.1 thousand vacancies in the fourth quarter of 2006, while there were 13.4 thousand in the second quarter of 2008. So it is possible to claim that the number of vacancies increased.

The annual average of the number of jobs has been increasing since 2004, from 112 thousand jobs in 2004 to 137 thousand in 2007. The vacancy rate of the computer service bureaus, however, fell from 76 vacancies per thousand jobs in 2006 to 71 vacancies in 2007. This is still substantially more than in the total ICT sector (60 in 2007, see table 2.3.1 of the statistical annex available online). Jobs in computer service bureaus increased by over 88 percent between 1997 and 2007, which is a massive increase in a ten-year period.

2.3.3 Jobs and vacancies at computer service bureaus, 1996–2008



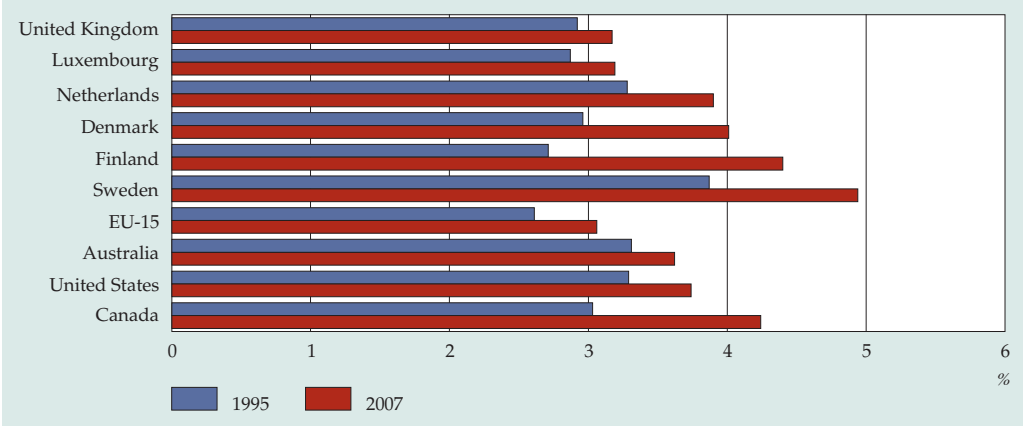
1) The transition to a new business register has led to a break in the series. The figures for 2006 are before the break, the figures for 2007 and beyond are after the break.The figures for the fourth quarter of 2006 were computed in two ways: the old method gave 10,100 vacancies at the computer service bureaus, the new method 9,800.

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

Many ICT professionals in the Netherlands

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

2.3.4 Employed ICT professionals, narrow definition, as a percentage of the employed labour force, 1995 and 2007 1) 2)



1) The narrow definition of ICT professionals is based on methodology described in OECD (2004, Information Technology Outlook, Chapter 6) and Van Welsum and Vickery (2005). The percentages of the non-European countries can not be compared directly with the percentages of the European countries because the classifications are not harmonised. For the EU-15 countries the figures for the missing years were estimated.

2) Australia, Finland and Sweden 1997 instead of 1995.

Source: OECD, IT Outlook 2008.

The list of ICT professionals as a share of the employed labour force is dominated by Sweden and Finland in 2007, with 4.9 and 4.4 percent respectively. In the Netherlands this is 3.9 percent placing the Netherlands in fourth position from the European perspective. The shares of the other countries presented are all between 3 and 5 percent, so these differences are not large. The OECD has more data on countries than we present here. Greece has relatively the fewest 'narrow' ICT professionals with just 2.2 percent of the employed labour force.

2.4 ICT expenditure

In paragraph 2.2 we discussed the economic significance of the ICT sector – expressed in terms of production value, gross value added and investments. In this paragraph the focus shifts to the clients of the ICT sector. Domestic spending 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 spending on ICT goods and services (the sum of expenditure and investments) only partly benefits the national ICT sector. ICT services mainly cater to the domestic market. This means that companies, households and the government in the Netherlands mainly buy services provided by companies located in the Netherlands. The situation is totally different for ICT goods. The domestic ICT industry has lost more and more of its market share to foreign imports since 1995. Therefore the size and development can differ markedly on the domestic supply and demand sides of the ICT market.

Investments in ICT capital

Between 1995 and 2000 investments in ICT capital grew from 6.7 to 15.1 billion euro (Statistics Netherlands, 2006). This massive growth was mainly based on major investments of the telecom companies in the laying, expanding and modernising of electronic (broadband) internet and mobile telephone networks. After a brief recession, partly due to the decreasing investments in electronic networks, the ICT investments increased again in 2003–2006 by 18.6 percent to nearly 15 billion euro. The steady increase in investments in software and electronic networks formed the basis for the rapid growth of ICT investments (see table 2.4.1). The growth rate of the total investments in the Dutch economy lagged behind it (14.6 percent).

A comparison of the volume changes in investments in ICT capital with the Dutch economy as a whole shows two remarkable things. [3)] First, the investments in ICT capital fluctuate more than in the total economy. Second, the investments in ICT capital usually precede total investments. In 2004 total investments were

still negative (volume changes), whereas investments in ICT capital started to increase markedly. The growth in the ICT investments was not as fast in 2006 as it was in 2005, but the growth rate was still well above the Dutch average for all sectors.

Growth in software and hardware

In 2006 the hardware market grew by 3.3 percent reaching 4.5 billion euro. The market turned out to be rather immune to economic fluctuations in 2003–2006. Although the share of investments in hardware fell to 31 percent in total ICT investments in that period, the absolute volume of investments in hardware has increased each year since 2003. The reduced share of investments in hardware in the total ICT market was caused in part by the fact that computers have rapidly become much cheaper in recent years. Hardware remains an important market by the extending use of servers in the small and medium-sized businesses and continued investments in desktops and laptops that enable mobile work (ICT~Office, 2008). In

Table 2.4.1
Investments in ICT capital, 2003–2006

	2003	2004	2005	2006*
	million euro			
Computer hardware	4,277	4,292	4,334	4,503
Software	6,148	6,444	7,004	7,580
Electronic networks	1,755	1,877	1,941	2,367
Total ICT	12,180	12,613	13,279	14,450
Total investments Netherlands	92,848	92,426	97,016	106,379
	%			
Computer hardware	35	34	33	31
Software	50	51	53	52
Electronic networks	14	15	15	16
Total ICT	100	100	100	100
% of total investments Netherlands	13.1	13.6	13.7	13.6
	year-on-year volume changes in %			
Computer hardware	20.5	8.2	13.2	15.5
Software	–3.7	3.7	6.7	5.6
Electronic networks	–26.4	8.8	9.0	21.5
Total ICT	–0.3	6.0	9.2	11.1
Total investments Netherlands	–1.5	–1.6	3.7	7.5

Source: Statistics Netherlands, National accounts 2008.

2007 laptop sales exceeded desktop sales for the first time. Digitising business processes and the growing supply of digital information lead to the demand for more storage capacity. Companies continue to demand data storage (outsourcing data management).

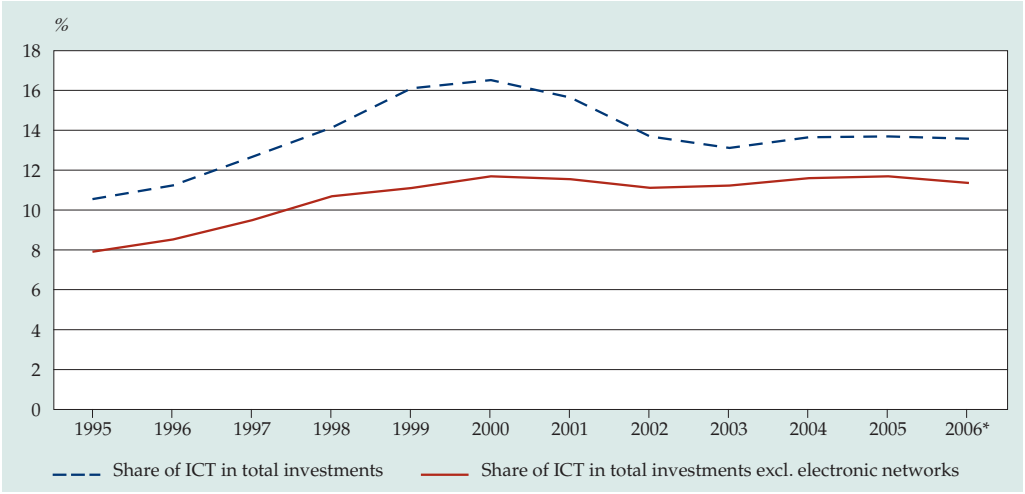
The software sector makes up half of the ICT market. Software can be seen as an indicator of the sophistication of ICT use. In 1995 86 euro were invested in software for every 100 euro invested in hardware. In 2006 this had nearly doubled to 168 euro. The software market (including IT services) came out of a deep hole between 2003 and 2006. In 2004 the results of all IT market segments were positive again for the first time since 2000. This healthy trend continued in the next few years. New software increases the development opportunities for new or improved ICT applications which makes it a major investment opportunity for companies and other potential providers.

In 2006 investments in networks went up to 16 percent of the total ICT investments. In 2000 some 29 percent of the investments in ICT capital consisted of networks (CBS, 2006).

ICT investments stimulate economic development

Growing confidence in the economy by producers and consumers has caused companies to increase their investments in ICT. Convergence stimulated these investments between 1995 and 2006; as the applications by different ICT companies converged, new technologies and innovations resulted. Companies simplified their business processes and outsourced matters that are not part of their core activities.

2.4.1 Share of ICT investments in total investments, 1995–2006 [1)]



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

Source: Statistics Netherlands, National accounts.

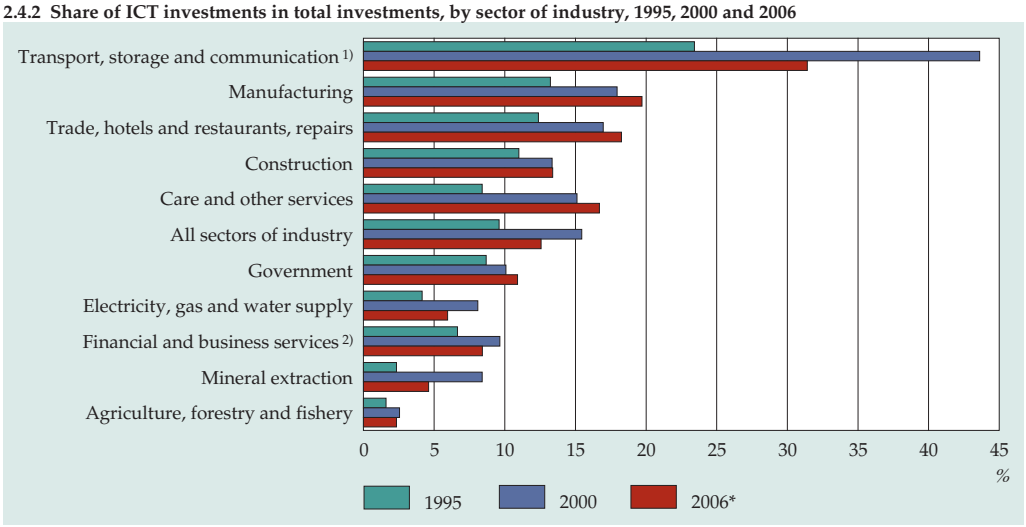
The share of ICT investments in the total economy fluctuated greatly in the period 1995–2006 (figure 2.4.1). Between 1995 and 2000 the share of ICT investments went up by about 6 percent. After a brief dip these investments have remained stable since 2004. Apart from the wild fluctuations of the investments in electronic networks, the share of ICT investments (excluding networks) in total investments has been stable since 2000 (11–12 percent). During the economic dip at the turn of the century investments in ICT capital (excluding electronic networks) suffered no more than investments in other capital goods, such as business properties, machinery and means of transport.

ICT investments mainly in the communication sector

The sector transport, storage and communication has invested most in ICT in 1995–2006. It is not surprising that it has the highest investment rate, relatively speaking, since it includes the ICT-intensive telecom sector. In 2006 its share of ICT investments still exceeded 31 percent, despite the dip after 2000 (see figure 2.4.2). Lagging behind are agriculture, forestry and fishing which spent less than 2.5 percent of the sectoral investments in ICT.

All sectors invested more in ICT in 2006 than in 1995. The peak in ICT investments came around the year 2000. The sector care and other services, which is not very sensitive to economic fluctuations, was the fastest growing sector between 1995 and 2006 (+8 percent), followed closely by the transport and communication sector. Besides the specific investments in electronic networks, the ICT investments by Dutch companies have been a structural part of total investments for years.

2.4.2 Share of ICT investments in total investments, by sector of industry, 1995, 2000 and 2006



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

Source: Statistics Netherlands, National accounts 2008.

The Netherlands closing in on international top

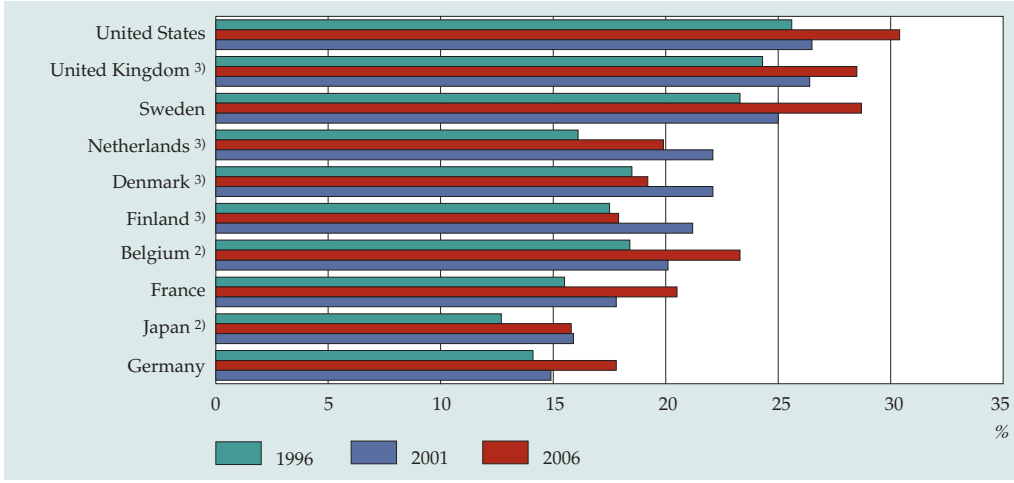
Internationally, the share of ICT investments has dropped since the financial internet hype ended. The Netherlands, Denmark, Finland and Japan are among the few countries considered where the share of ICT investments did not fall between 2001 and 2006 (figure 2.4.3). This narrowed the gap with the United States, the United Kingdom and Sweden. While Sweden, Denmark and the Netherlands invested relatively much in ICT, the influence on the average investment level of the European Union is limited because these are small economies.

ICT investments explain about a third of the difference in GDP growth between the United States and the European Union, at least at the level of the EU-15 and during the mid 1990s (Barrios and Burgelman, 2008). The gap in ICT investments can largely be explained by the difference in industrial specialisation between the two economic powers. The US economy has far more ICT-intensive sectors such as the manufacturing of electrical machinery and equipment.

In 1980 the Netherlands together with Germany and the United States were already among the top ICT investors (CBS, 2006). The economic life cycle of ICT investments is short compared to other capital goods, so ICT investments 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 available.

Many of the differences in the economic performances of the industrialised countries can be explained by the level of ICT investments and competitive power of the ICT sector. The use of ICT alone, however, seems insufficient to raise

2.4.3 Share of ICT investments in total investments, international, 1996, 2001 and 2006 [1)]



1) International gross fixed capital creation, excluding dwellings.
2) For Belgium and Japan this is 2004 instead of 2006.
3) For Denmark, Finland, the Netherlands and the United Kingdom this is 2005 instead of 2006.

Source: OECD, Factbook 2008.

productivity (European Commission, 2008; Van der Wiel en Van Leeuwen, 2006). ICT investments must come with appropriate measures to adapt the business organisation and train employees. Organisations need ICT skills as well as communicative and organisational skills.

Annual increase in intermediate use and consumption

ICT expenditure by companies and government that are not investments are not part of ICT capital. Spending on ICT also includes ICT services by companies and government, hardware servicing and household consumption. The share of intermediate use in total ICT spending increased slightly between 2003 and 2007 (+1 percent). Both intermediate use and consumption saw yearly increases in this period (see statistical annex table 2.4.1). Consumer spending on ICT goods and services consists of buying computers, printers, mobile phones and digital cameras, and the costs of using the telephone and internet itself.

The total ICT spending (intermediate use and consumption) in 2007 was up by over 4.5 billion euro on 2003 (table 2.4.2). The structure of domestic spending on ICT goods and services has changed. Between 2003 and 2007 over 90 percent of the growth in ICT spending consisted of spending on ICT services. The services made up over three quarters of the ICT spending in 2007. Spending on ICT goods stayed at about the same level during 2003–2007.

The volume changes in spending on ICT services were positive during the entire period (see statistical annex table 2.4.1). The rise in ICT spending in the services sector mainly comes from the telecom services. The increased internet and mobile telephone use generate an enormous data flow and leads to more spending on

Table 2.4.2
Intermediate consumption and consumption of ICT goods and services, 2003–2007

	2003	2004	2005	2006*	2007*
	million euro (current prices)				
Total ICT expenditure	40,765	41,286	42,189	43,815	45,333
Intermediate consumption	28,483	28,922	29,520	30,801	32,031
Consumption	12,282	12,364	12,669	13,013	13,301
Total ICT goods	10,284	10,633	10,489	10,675	10,688
Intermediate consumption	7,168	7,561	7,428	7,409	7,280
Consumption	3,116	3,072	3,061	3,265	3,407
Total ICT services	30,481	30,653	31,700	33,140	34,645
Intermediate consumption	21,315	21,361	22,092	23,392	24,751
Consumption	9,166	9,292	9,608	9,748	9,894

Source: Statistics Netherlands, National accounts 2008.

telecom services. Spending on ICT goods increased faster than spending on services, but the absolute level is lower.

2.5 *International trade in ICT*

The volume of the international trade flows in ICT products gives an indication of the international competition in this market. ICT goods have been part of the large-scale international trade for much longer than ICT services. Price cuts in ICT applications stimulate worldwide investments in ICT that positively influence the labour productivity of an economy (European Commission, 2008). Since the mid 1990s capital has shifted to ICT investments in the western industrialised economies. In Europe this shift was less pronounced than in the United States.

Shift from OECD countries to new, fast growing markets

At the global level, ICT production activities have increased fast in the emerging economies of China and India and Eastern Europe (OECD, 2006b). In 1996 the OECD countries realised some 71 percent of the global production in ICT goods. In 2006 this was down to 57 percent. Globalisation is mainly fuelled by competitive pricing in production and the rapidly increasing diversification of goods and services. These countries can produce ICT goods and provide ICT services relatively cheaply and are attractive markets for western companies.

Dutch ICT exports doubled

The international trade in ICT goods and services has recovered from the dip at the start of the millennium. The value of the Dutch ICT exports more than doubled between 1997 and 2007 from about 30 to 67 billion euro (table 2.5.1). This includes re-exports. This sharp increase is partly due to rising prices. The growth of the import value of ICT goods and services lagged somewhat behind the exports during this period. The slight import surplus in 1997 (almost 0.5 billion euro) had changed into an export surplus (5.3 billion euro) in 2007. The increasing growth rates that had characterised Dutch trade since 2004 seem to have come to an end in 2007.

The international trade in ICT services has risen sharply in the past decade. However, the import and export volumes of ICT services are much smaller than those of ICT goods. The growing importance of services was reflected in a growing share in the Dutch export package until 2003. Between 2003 and 2007 the ratio between exports of ICT goods and of services remained stable.

The export surplus of the ICT goods (including re-exports) rose fastest between 1997 (–0.7 billion) and 2007 (+3.7 billion). The trade surplus of the ICT services increased steadily during this period to where the trade surplus was 1.5 billion euro in 2007. Most ICT goods imported by the Netherlands are intended for re-exports (82 percent in 2007). These are usually standard goods that undergo minimal processing in the

China main supplier of computers

China has developed into a global key producer and trader of ICT products. The country mainly imports electronic components and exports computers and peripherals. The Netherlands has become one of China's main trading partners. The goods trade between China and the Netherlands has increased almost tenfold in the period 1997–2007. In 2007 the total value of the trade with China came to about 30 billion euro. Dutch exports to China are limited compared with the imports. In 2007 there were over 7 euros worth of imports for every euro worth of exports to China. China has become the main trading partner of the Netherlands outside the European Union after the United States.

The imports of computers saw spectacular growth during 1997–2007. The Dutch trade deficit with China shot up to nearly 23 billion euro in 2007 because of this rapid rise in imports.

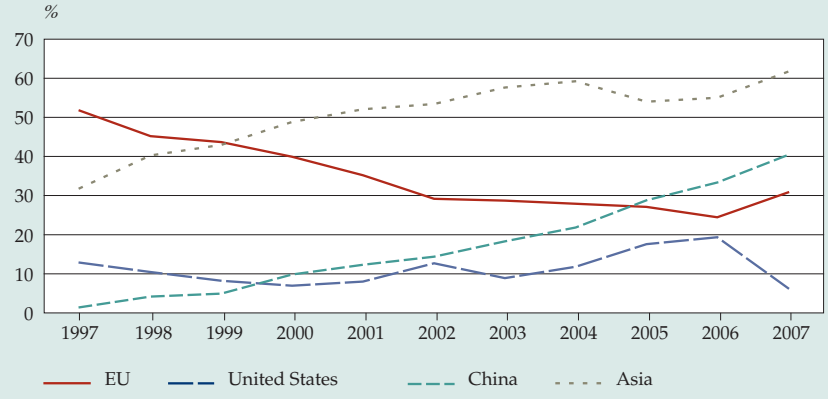
The Dutch imports from China have changed considerably since the nineties, shifting toward high-end products. The most imported products in 2007 were computers, followed by telecommunication equipment.

The Netherlands imported for nearly 12 billion euros worth of computers in 2007. The import value was over 6 percent higher than in 1997. The import of computers from China has soared during that decade (see figure) as the Chinese share in Dutch computer imports rose from 1 to over 40 percent between 1997 and 2007.

The imported computers do not all stay in the Netherlands. Many are re-exported to other European countries. China was the largest supplier of computers to the European Union in 2006. In 2003 China took over the top position from the United States (Eurostat, 2008).

After the financial internet hype China has thrived as an exporter of ICT goods. Companies have been moving their production work for computers and computer parts to China on a massive scale ever since. These activities consist of making computers, mobile phones and DVD players. Companies in China can produce these mass products relatively cheaply. The Chinese ICT industry seems to be making the step from low-wage type of work to designing high-end products and creating innovative services.

Share of trading partners in Dutch computer imports, 1997–2007 [1)]



[1)] Trade by country, according to the SITC classification.

Source: Statistics Netherlands, Statline.

Table 2.5.1
Imports and exports ICT goods and services, 1997–2007

	1997	2003	2004	2005	2006*	2007*
	million euro (current prices)					
Imports						
ICT goods	27,902	43,259	47,813	51,067	54,396	55,293
ICT services	2,976	5,201	5,397	5,985	6,251	6,237
Total ICT imports Netherlands	30,878	48,460	53,210	57,052	60,647	61,530
Total imports Netherlands	197,284	270,538	289,894	313,688	351,014	376,111
Exports						
ICT goods	3,974	3,447	3,536	3,768	3,815	4,121
ICT services	2,952	6,016	6,383	6,668	7,082	7,285
Total ICT exports Netherlands	6,926	9,463	9,919	10,436	10,897	11,406
Total exports Netherlands	216,691	300,498	326,111	357,453	394,396	424,827
Re-exports						
ICT goods	23,206	39,982	44,731	49,350	53,279	54,925
ICT services	269	439	566	592	557	498
Total ICT re-exports Netherlands	23,475	40,421	45,297	49,942	53,836	55,423
Total re-exports Netherlands	65,233	104,747	118,509	132,849	152,208	166,800
Total ICT exports (goods, services and re-exports)	30,401	49,884	55,216	60,378	64,732	66,830
	%					
Shares in exports of ICT goods and services						
ICT goods	13	7	6	6	6	6
ICT services	10	12	12	11	11	11
Re-exports	77	81	82	83	83	83
Total	100	100	100	100	100	100
Share of ICT goods and services in						
Total imports	15.7	17.9	18.4	18.2	17.3	16.4
Total exports	3.2	3.1	3.0	2.9	2.8	2.7
Total re-exports	36.0	38.6	38.2	37.6	35.4	33.2

Source: Statistics Netherlands, National accounts 2008.

Netherlands, such as repacking computers from containers into boxes, and are subsequently re-exported to the final country of destination. The value added of re-exports is often significantly lower than for exports, but re-exports are crucial for the Dutch economy (CPB, 2007).

The opposite is true for services where there are hardly any re-exports. Personal services – like health care and social work – cannot really be traded after slight processing in another country.

Substantial rise in trade in ICT markets worldwide

The developments in the international trade in ICT goods, software and ICT services for 1997–2007 are sketched below. Worldwide trade in these products grew substantially. We will show per country which market realised the highest growth,

in the trade of ICT goods or on the market of ICT services. Note that the international trade in ICT goods is many times greater than the value of traded software and ICT services.

First we will look at the sizes of the three ICT markets, to put the Dutch growth rate into perspective. There are two trends in the ratio between hardware, software and services in the total ICT volume in the Netherlands. The first trend is that software has been gaining importance for years at the expense of hardware and IT services. The second trend is that the share of ICT services fluctuates most. In the second half of the nineties the segment increased to 30 percent due to the millennium bug and the euro conversion. The share was then reduced to its old level of some 22 percent. So IT services seems to be the segment that is most vulnerable to economic fluctuations (ICT~Office, 2007).

Limited competitive power of the European ICT goods sector

In the period 1996–2006 the trade in ICT goods grew substantially worldwide. There was the rapid rise of the production of ICT goods in Asia and Eastern Europe and the increased rationalisation in the manufacturing of ICT products. ICT goods make up a substantial part of the total trade between the European Union and its trading partners. In 2006 these products made up 10.2 percent of all goods exports from the European Union and 14.4 percent of all imports (European Commission, 2008). The total trade performance of the European Union in ICT, however, is negative. In 2006 there was a trade deficit in computers, audio and video equipment and electronic components. The limited competitive power of the ICT sector in the European Union is caused by the relatively limited innovative capacity compared to other parts of the world. Europe is also struggling with rapid price rises of raw materials and continuously falling prices of ICT equipment.

At the global level, the exports from South Korea (and elsewhere in Asia), the Netherlands and Finland during 1996–2006 grew fast. The exports in South Korea and the Netherlands in this period rose by over 10 percent (OECD, 2006b). The same three countries also realised the highest growth rate in imports during that period.

Telecommunication is a fast growing market

At the ICT goods level, telecom equipment and electronic components are the main export articles for the European Union. Computers are the most imported ICT goods by EU countries (European Commission, 2008). The financial internet hype in the late 1990s went hand in hand with fast growing exports of all kinds of new communication equipment. Internet and the rapid expansion in the kinds of mobile communication made telecommunication the fastest growing segment in the ICT trade (figure 2.5.1).

In South Korea the exports of telecom equipment grew fastest of all countries considered between 1996 and 2006 (average annual growth rate of about 25 percent).

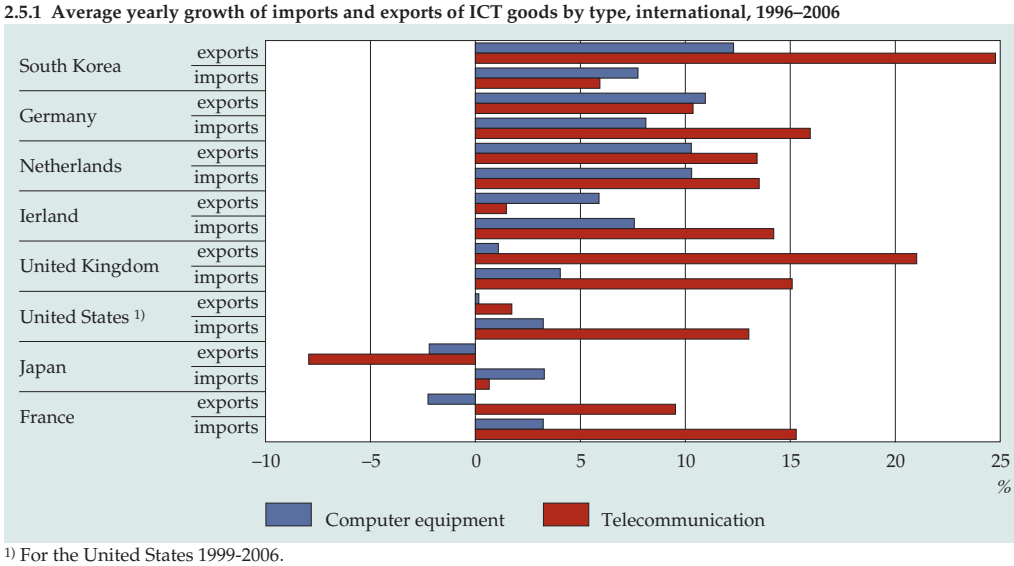
The United Kingdom and the Netherlands followed at some distance. South Korea, Germany and the United States are also the largest exporters of telecom equipment in terms of volume.
Computer equipment was the most traded category of ICT goods in 2006: about a third of the total. In the Netherlands both imports and exports saw an average annual increase of about 10 percent in the last decade. In the countries considered the growth rate of the trade in computer equipment is lower than in telecommunications. One of the causes is that consumers wait longer to buy a new computer. The current generation of computers performs so well that they are not rendered obsolete by new technical developments quite as fast.

About 30 percent of the trade in ICT goods consists of electronic components, but this is one of the slowest growing sectors. Also the international trade in audio and video equipment has gone up substantially in the Netherlands and South Korea (see statistical annex table 2.5.1). The United States still has the largest trade volumes in this segment.

Above average growth in Dutch software trade

The global software market is small in comparison to the trade in ICT goods. The average annual growth in software exports is high in South Korea, Germany and the Netherlands (see figure 2.5.2). The fastest growth occurs in South Korea where software exports rose from 27 million dollar in 1996 to 169 million dollar in 2006. This is a 20 percent average annual growth rate. There has been a dip in South Korea after the peak in 2004, when software exports reached 231 million dollar (CBS, 2007).

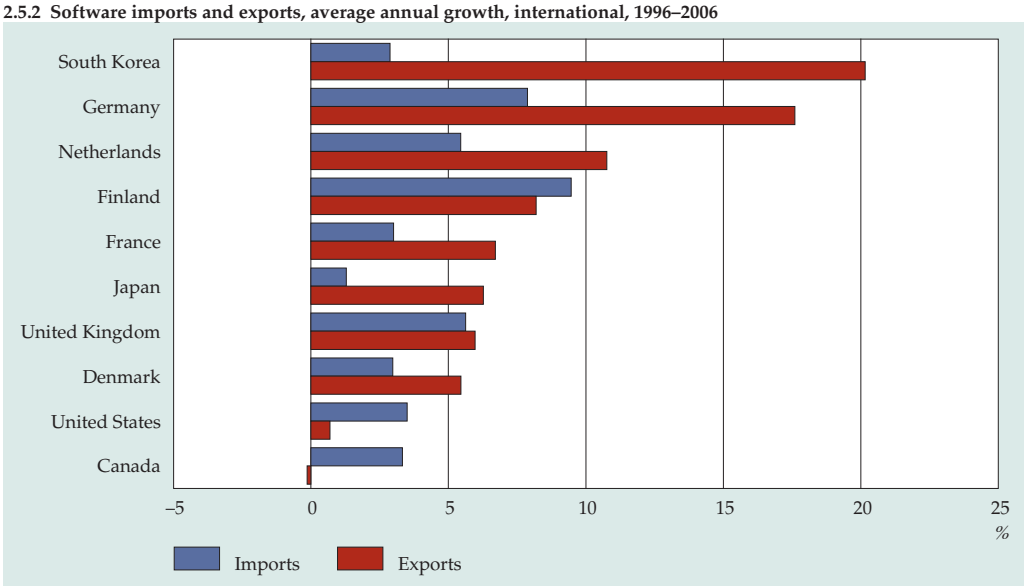
2.5.1 Average yearly growth of imports and exports of ICT goods by type, international, 1996–2006



1) For the United States 1999-2006.

Source: OECD, ITCS database.

2.5.2 Software imports and exports, average annual growth, international, 1996–2006



Source: OECD, ITCS database.

Germany is also a major exporter with an average annual growth rate of just under 18 percent. The Netherlands too has an above average score (+10.8 percent). Re-exports of software are rare, so Dutch exports in the software sector come from the domestic ICT sector. In software too US imports are growing faster than the exports. In the United States the growth of the exports and to a lesser degree the imports of ICT goods and software lag behind that of most European countries.

Fast growing trade in ICT services

As a consequence of the rapid technological developments, ICT services can increasingly be traded. It has become possible to provide ICT services that do not require direct personal contact. International trade in ICT services consists of hiring foreign computer service bureaus or using networks of foreign mobile telephone providers.

The ICT services market is much smaller than the market for ICT goods, as is the case in the software market. In 2006 the total trade in ICT services (from and to the OECD countries) was about 250 billion dollar, whereas the trade in ICT goods in the same year was over 1,960 billion dollar. The market for ICT services is growing fast but the volume of the international trade in this market is limited compared to the market for ICT goods. The Netherlands, the United Kingdom and France participated intensively in the international trade in ICT services between 1996 and 2006 (figure 2.5.3). Finland, a specialised hardware country, lagged behind, as did Japan and South Korea, where the international trade in ICT services even saw negative growth. One explanation for the slump in the international trade in South Korea is that the exports consist mainly of computers and communication equipment, not

ICT services. The United States, the United Kingdom and Germany dominate the international market for communication services in terms of volume. The Netherlands concentrates mainly on exporting these services.

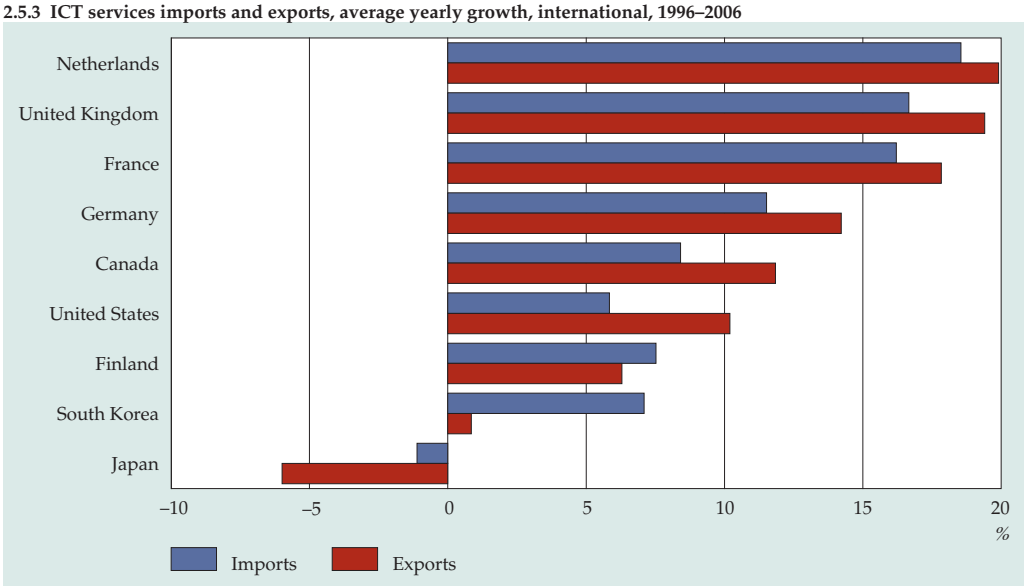
Being an entrepreneur in ICT services provides opportunities to expand, also given the trend to 'liberalise' the services sector at the global level. New innovative service concepts can be standardised relatively simply so that large-scale exports have become possible. The productivity increase as a result of service innovation through ICT is necessary for prosperity in the future.

International trade in ICT more dynamic

The world economy has manifestly gone through a globalisation process. The ICT sector has played a key role in this since the nineties, because the sector itself has rapidly become international and because it supports the globalisation of other sectors. ICT developments have cut communication and coordination costs so much so that international outsourcing of business activities has become more and more common. Trade flows have changed direction as the ICT industry, and to a lesser degree services, are being shifted to Asian countries. The focus in the up and coming countries is on routine processing and assembling activities for export. International investment patterns, however, seem to indicate a shift towards offshoring highly skilled industrial and service jobs (CPB, 2007).

The international trade in the ICT sector has become quite dynamic in the countries considered in 1996–2006. The trade in ICT goods and services started its great

2.5.3 ICT services imports and exports, average yearly growth, international, 1996–2006



Source: OECD, Trade in Services database.

recovery in 2003, after the growth rates had fallen due to the financial internet hype. This is shown by the international developments in the imports and exports of ICT goods, software and ICT services. Some countries had double-digit annual growth rates in software and ICT services. The Netherlands and Germany also performed well in these three markets. There are various causes for the Netherlands. In the market for ICT goods, the above average performance of the Netherlands is explained by the re-exports. There is autonomous growth in software and ICT services caused by the domestic ICT sector. South Korea and Finland performed well in two of the three markets. In 1996–2006 South Korea had the highest export growth rate for ICT goods and software of all countries considered. This explosive development is in stark contrast with the modest decrease in its exports of ICT services.

Finally, the average annual growth of imports and exports of ICT products turns out to be slightly higher in the European countries than in the United States, Canada and Japan. This may be due to the single European market, which has caused an increase in the trade among European countries.

Notes in the text

1) One of the key figures of the national accounts is the volume increase of the gross domestic product. The volume changes of other macroeconomic national accounts aspects such as production value, consumption and investments play a significant role in many domains.
2) The weighted average of the volume and quality changes of the parts of a given transaction of goods, services, or balances.
3) This includes activities such as hardware and software consultancy, web hosting, maintenance and repairs of computers and office equipment, network management, computer security and automation services.
4) This is indicative; a limited number of parties with registrations is not actually active and other parties have several registrations (for individual business parts or activities).
5) This refers to labour volume: the number of jobs in a year expressed in full-time equivalents.

3. Telecom

The Netherlands already belongs to the European top in terms of internet use. Use of the internet is still increasing, accelerated by the rapid rise of broadband. From an international perspective, the Netherlands has relatively many broadband connections. On the other hand, there are relatively few glass fibre cable connections for high-speed internet compared to the top countries.
The number of regular fixed landlines in the Netherlands has been decreasing steadily for several years. Early on in 2008 it was less than half of what it was in 2001. More and more people just use a mobile connection, while phoning via the internet (VoIP) is also gaining popularity.

Digital television has become widely popular, with 3.1 million households watching digital television by the end of 2007. People can receive digital television in a variety of ways: via the ether, satellite, cable and the internet. Digital radio is also gaining popularity, but most people still listen to analogue radio.

The most important development in telecom of the past few years is undoubtedly the convergence of services. Telephone, television and the internet used to be supplied by different providers and networks, but now these services are increasingly supplied by a single provider through a single network. More and more consumers opt for such all-in-one packages.

3.1 Internet

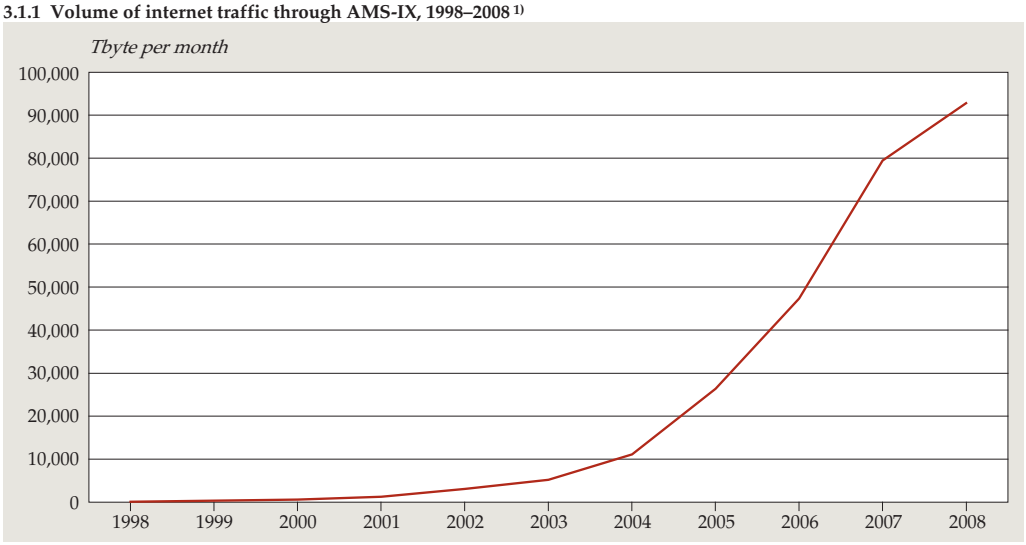
This paragraph deals with the internet services of the telecom sector. This is followed by services in the areas of telephony, radio and television services.
Sometimes it is impossible to distinguish the various services unambiguously, for instance with internet telephony. This could be considered an internet application, but in this chapter we opted to classify the services by end product rather than by underlying method or technology. So internet telephony is discussed in the paragraph on telephone services even though the underlying technology is internet.

The volume of the internet traffic has rapidly increased. Figure 3.1.1 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 domestic 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 via the internet in the Netherlands. In September 2008 over 90 thousand Terabyte

was registered at the AMS-IX. That is on average 7 times the contents of a normal DVD per second. In December 2007 it was already almost 80 thousand Terabyte, so in the last few months the growth rate fell quite a bit. This is remarkable after the increases of more than 70 percent in the previous two years and over 100 percent in the years before that. The traffic flow registered in July 2008 was almost 7 percent more in Terabytes than the flow through the Frankfurt Internet Exchange, DE-CIX (University of Minnesota, 2008).

3.1.1 Volume of internet traffic through AMS-IX, 1998–2008 [1)]



[1)] Flow in December of the year concerned. 2008: volume measured in September.

Source: AMS-IX.

There are various reasons for these developments. More and more consumers have broadband (see also the next paragraph). Moreover, 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 the internet traffic in 2006. The use of web browsers and email is still dominant: over half of the internet traffic comes from these applications (AMS-IX, 2006). This kind of traffic increased most when households and companies massively switched to (broadband) internet. After a while the growth rate slowed down as well (there is more information about this in this chapter and in chapters 4 and 5).

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.

ADSL2, *ADSL2+* (max. 24 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, which has been provided since the end of 2008. 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 to the neighbourhood switchboard is in full swing.

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 upload and download speed). 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 and the Capita Selecta.

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.

Worldwide Interoperability for Microwave Access, WIMAX (max 70 Mbit/s). WIMAX comes in two forms.
The first is known as the slightly misleading Fixed WIMAX (max 70 Mbit/s) where the user can move freely within the area covered by the antenna (in theory 50 kilometres). The connection ends when the user is further away. It allows the connection of distant UMTS masts and WiFi hotspots to a physical network. This competes with broadband internet via xDSL and cable.
Mobile WIMAX (max 15 Mbit/s) competes with UMTS and HSDPA. The user can move around freely – just about - without losing the connection. This method makes it perfectly possible to have services like TV and VoIP through the mobile network.

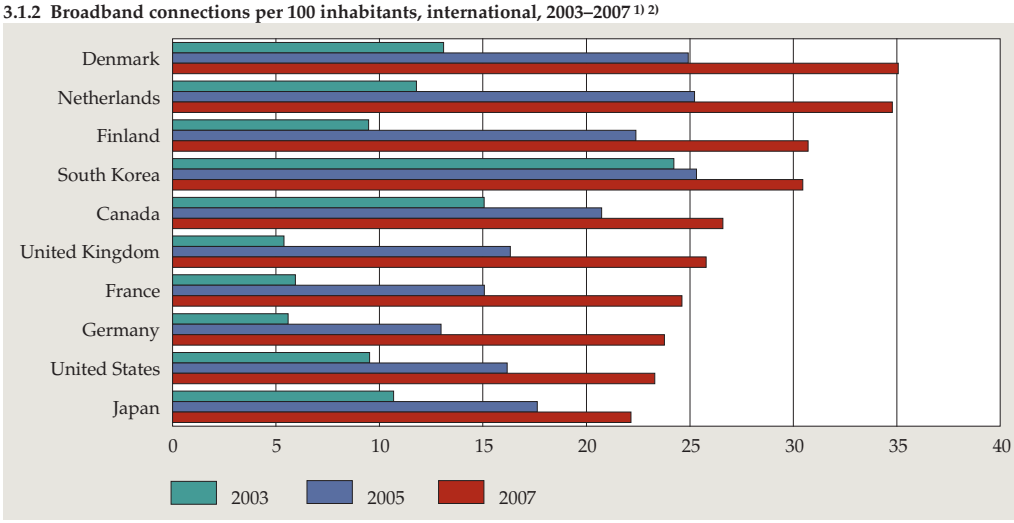
The Netherlands top in broadband

The Ministry of Economic Affairs defines broadband as "a connection allowing high-quality video and audio applications 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 upload and download speed) of at least 256 kbit/s".

These broadband definitions cover the most modern fixed internet connections, such as ADSL or cable internet, but not dial-up connections through landlines. Mobile internet via UMTS is covered by 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). The box on mobile broadband below provides more information.

Households now make less use of the traditional dial-up connections. Broadband connections are used more instead, partly because of the rapidly falling subscription rates. Of all OECD countries, the Netherlands had the second highest number of broadband connections per 100 inhabitants (34.8) by December 2007. The Netherlands was right behind Denmark (35.1), as Figure 3.1.2 shows.

3.1.2 Broadband connections per 100 inhabitants, international, 2003–2007 [1) 2)]



1) Situation in December of the year concerned.
2) Excluding mobile connections.

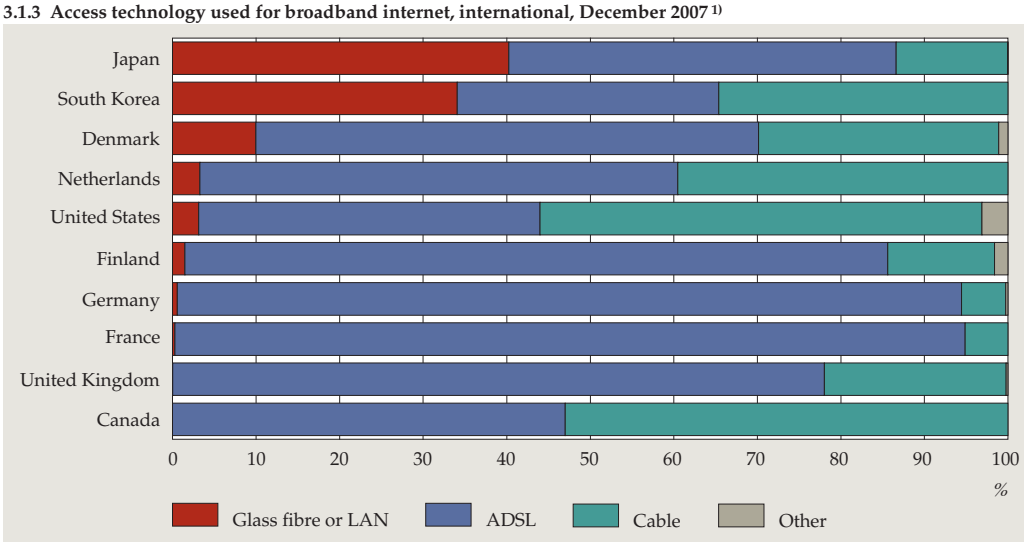
Source: OECD.

Almost all households in the Netherlands could get broadband in 2008. ADSL coverage is close to 99 percent. All neighbourhood switchboards have been fitted out for ADSL in just a few years time. In 2001 only 32 percent of the households could get ADSL. The coverage of ADSL2+, required for services like television via internet (see paragraph 3.3), was just 57 percent in 2008 and has been since 2006 (KPN, 2008). The coverage will not be extended, as investments now go into the VDSL and glass fibre infrastructure. The planning is that 1.5 million households should be able to use VDSL or glass fibre by December 2009 (Telecompaper, 2008).

Figure 3.1.3 shows an international comparison of the technologies used to access broadband in December 2007. This refers to fixed rather than mobile broadband connections. People in the Netherlands mainly use ADSL (57 percent) and internet via rtv cable (40 percent). There are large differences internationally. Most households in the Netherlands already had cable television and radio, so a relatively high percentage of households now also receive broadband via cable. In less densely cabled countries, like France and Germany, this type of broadband access is far less popular.

In Japan and South Korea people tend to use more high-speed glass fibre connections. In Japan over 40 percent of the broadband internet connections are via glass fibre from the home. In the Netherlands this is about 3 percent according to TNO, mainly because of municipal and individual initiatives. The 3 percent is an increase of 2 percent points on the beginning of 2007. According to the OECD the percentage at the end of 2007 was just 1 percent. Either outcome places the Netherlands in the top 10 of the world.

3.1.3 Access technology used for broadband internet, international, December 2007 [1)]



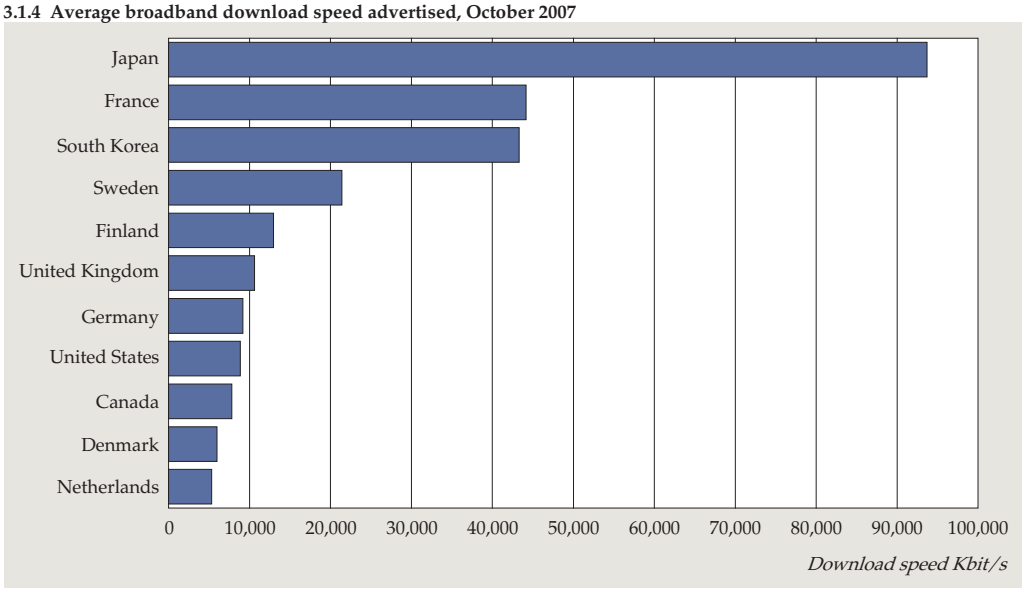
[1)] Excluding mobile connections.

Source: TNO.

Figure 3.3.4 of *The Digital Economy 2007* shows that the average speed of ADSL internet has decreased in recent years. This does not mean that the broadband connections became 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 already using ADSL often keep the same speed when providers increase the speed, so that they actually downgrade and pay a lower rate. Therefore the share of lower speeds has increased.

Compared to a number of benchmark countries, the average speed of the broadband connections with which providers in the Netherlands advertise is rather slow: 5,312 Kbit per second whereas in Japan this is close to 100,000 Kbit/s (see Figure 3.1.4). There is a higher share of glass fibre in Japan, as stated before. The two averages are calculated on the basis of 22 commercials, therefore actual internet speeds may deviate.

3.1.4 Average broadband download speed advertised, October 2007

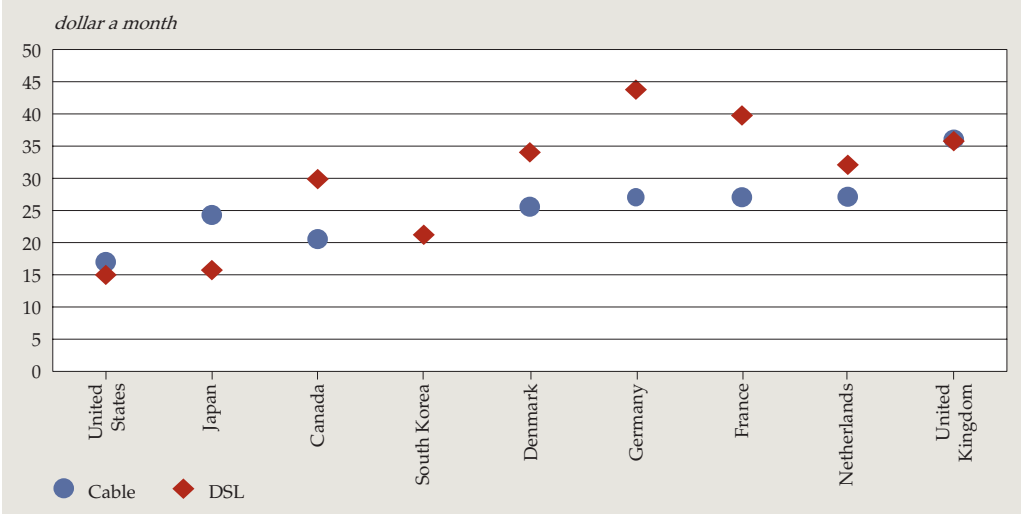


Source: OECD.

Average costs of broadband

Figure 3.1.5 shows how much starter packages cost for DSL broadband and broadband internet via cable in the Netherlands and several benchmark countries. These monthly rates are converted into US dollars to allow for comparison. Starter package may mean different things in different countries in terms of speed, download limit, and extra

3.1.5 Cost of starter package broadband DSL and cable, international, fourth quarter 2007 [1)]



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

Source: Point-topic.

services. Broadband subscriptions in the Netherlands have been upgraded several times in recent years, so consumers get a higher speed at the same price. They can also opt to downgrade the subscription by paying less for the old speed.
Dutch rates were average in comparison to the benchmark countries in December 2007. In December 2006 the rates for broadband via DSL or rtv cable in the Netherlands were the same, but at the end of 2007 DSL was slightly more expensive. Sometimes there are much greater differences in other countries. In Germany a DSL connection costs considerably more than cable internet.

In the first quarter of 2008 a broadband internet starter package via cable in the Netherlands cost as much as a DSL connection: 31.85 dollar a month. In almost all benchmark countries, the cost of broadband via cable went up substantially in this quarter.

3.2 *Telephone*

The telephone market has changed. The number of traditional analogue telephone connections or landlines fell 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.

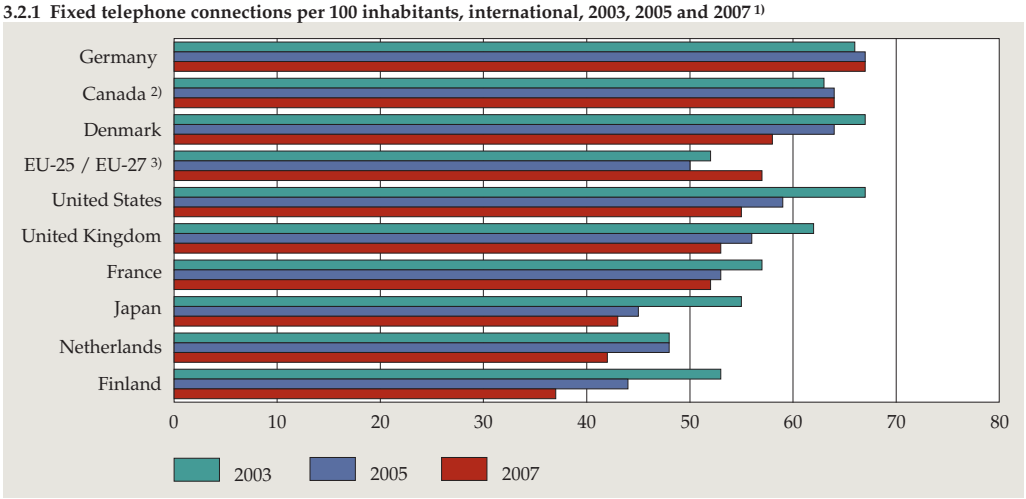
Fewer fixed landlines

Almost all households in the Netherlands can be connected to the fixed telephone network. This network has national coverage and is widely used. It used to have close to 10 million telephone connections (including ISDN). After a long period of steady growth, the number of fixed landlines started to decline. Figure 3.2.1 shows the number of connections per 100 inhabitants in the Netherlands and some benchmark countries. The Netherlands had 42 fixed connections per 100 inhabitants in 2007, of which 14 are VoIP connections and the rest regular analogue connections. The number of fixed landlines in the Netherlands has fallen well below the EU average of 57. A similar trend occurred in a number of the benchmark countries, possibly because more and more households cancel their connection and only use their mobile phone. The share of households in the Netherlands that only use a mobile phone had increased to 18 percent by the start of 2008 compared to 17 percent the year before (TNO, 2007, 2008), so it seems this share will not be growing much.

Internet telephony rising sharply again

Phoning through the internet or another IP-based network, such as a company intranet, is a relatively new technology. This technology is known under several names, like Voice over Internet Protocol (VoIP) or IP telephony. Although there are subtle differences in definition, they are interchanged; they all deal with internet

3.2.1 Fixed telephone connections per 100 inhabitants, international, 2003, 2005 and 2007 [1]



1) Including ISDN and VoIP connections.
2) 2006 instead of 2007.
3) EU-25: 2003 and 2005; EU-27: 2007.

Source: TNO.

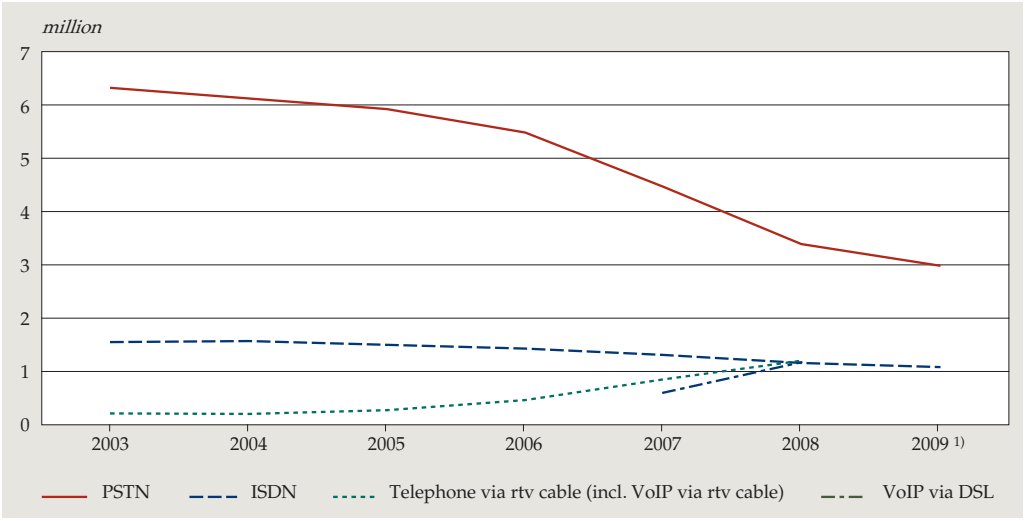
telephony where a telephone call is turned into digital data packages. These data packages are sent through the internet in the same way as the data packages containing email or web pages.

The main advantage for consumers is the price, since a phone call via internet is cheaper than a call using a regular landline. A phone call with someone who also uses the internet to call, or someone with a regular landline is often free during off-peak hours.

The advantages for companies are that maintenance is cheaper and easier because there is just one communication infrastructure to maintain which can handle speech and data services.[1] It is also relatively simple to connect the telephone switchboards of two locations through the internet. Moreover, internet telephony offers extra possibilities such as telework.
Although the technology had existed for several years, consumers have only started to use it widely since 2005. Telecom operators had been using the technology much longer, to cut costs with expensive lines abroad or via satellite.

Figure 3.2.2 shows the rise of telephony via rtv cable and (A)DSL lines. VoIP via DSL increased rapidly again in 2007 equalling the number of VoIP calls via cable (1.2 million) in the first quarter of 2008. The same figure also shows the spectacular fall in the number of regular analogue (PSTN) telephone connections. There were fewer than 3.1 million connections in the second quarter of 2008, while there were still over 6.5 million in December 2001.

3.2.2 Fixed telephone connections, technology used, 2003–2008



1) Third quarter of 2008.

Source: TNO, KPN.

Internet telephony

Phoning through the internet – Voice over IP or VoIP – has been popular for years. The telephone call is turned into digital packages and sent via Internet Protocol. There are two types:

- VoIP via a broadband internet connection as a separate service besides the internet access. People use a regular telephone connected to a modem or internet router. No computer is necessary for making the call.
- The other type is VoIP over a broadband internet connection. A headset or microphone is connected to a computer. The computer digitalises and sends the call via the internet connection of the computer. This requires special software on the computer (for example 'softphone') and sometimes a special telephone provider who can link the internet and the regular telephone network. A distinction is made between PC-to-PC calls and PSTN-terminating-calls. In the former both callers call through their computers. These calls are often free of charge. In the latter someone uses a computer to call a regular phone. This usually costs money.

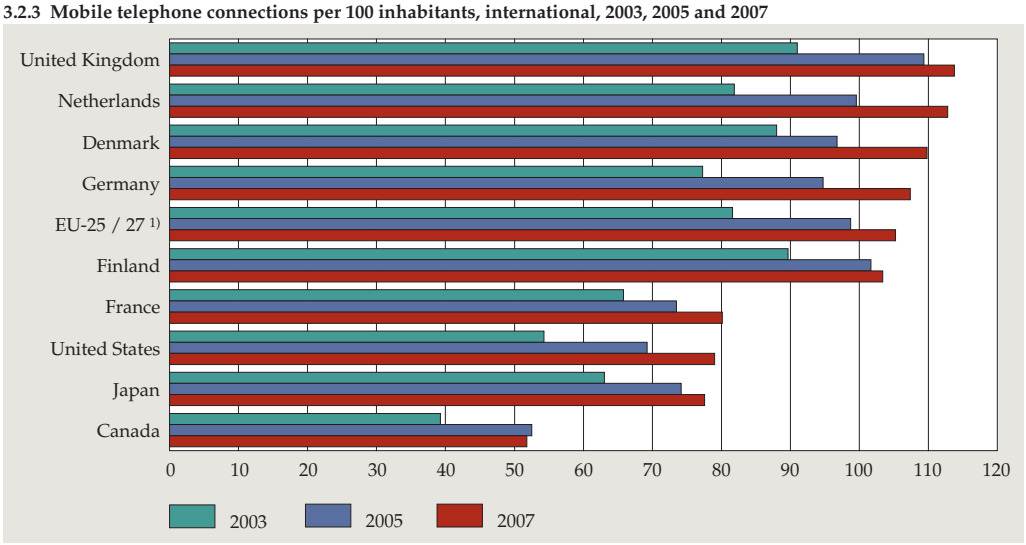
Mobile telephone connections up

The number of mobile phone connections in the Netherlands rose rapidly in the period 1995–2000. After stabilising temporarily in 2001 and 2002 the number is growing again. At the end of 2007 there were 18.4 million connections (prepaid and subscriptions), which represents an increase of 7.9 percent on December 2006. This growth rate was realised despite the market reaching its saturation point, as the total

number of mobile connections currently exceeds the number of inhabitants in the Netherlands (see also chapter 8, Capita Selecta on mobile internet and the use of mobile services). Some people have two or more 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 3.2.3 shows the number of connections per 100 inhabitants for several benchmark countries. The Netherlands had 113 mobile connections per 100 inhabitants in 2007. Only the UK had slightly more: 114. All benchmark countries still show an increase. Several large economies, such as the USA and Japan, remarkably only have about 80 mobile telephone connections per 100 inhabitants.

3.2.3 Mobile telephone connections per 100 inhabitants, international, 2003, 2005 and 2007



1) EU-25: 2003 and 2005; EU-27: 2007.

Source: TNO.

The mobile telephone network in the Netherlands has almost complete national coverage. In June 2008 there were 14,950 GSM antennas across the country. GSM is the most commonly used mobile telephone standard. This is an increase of almost 300 on September 2007 (Antennebureau, 2008). The number of antennas for UMTS, the successor of GSM, is being extended. In June 2008 there were 9,288 registered antennas, 11 percent more than in September 2007 when there were 8,374 registered antennas. The introduction of UMTS allows broadband internet access via mobile phones, as well as broadband-based services, like video phoning.

3.3 Television and radio

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 a better sound and picture quality than the ether, and more channels.

Much cable television

Cable is still the most common way to receive television. In 2004, some 88 percent of the Dutch households had an rtv connection available, making the Netherlands one of the most densely cabled countries in Europe. There are huge differences between countries in use. The percentage of cable connections in France and the UK is quite low (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 benchmark country with a higher percentage than the Netherlands (91 percent). In *The Digital Economy 2006* (page 107) we included an international comparison of the use of rtv cable. No new international figures were available yet when we wrote the current edition.

Scarcity of frequencies for analogue radio and television

Although terrestrial analogue television is a thing of the past (it ended on 11 December 2006), analogue radio via the ether is still very popular. Think of the many car radios and mobile radio receivers (the old transistor radios, and modern mobile phones with radio). A major problem is the scarcity of frequencies for the current terrestrial FM stations. The number of stations that can broadcast is smaller than the number of radio stations that want to broadcast. Therefore the government auctions off frequencies. Analogue television signals are transmitted via rtv cable, often together with analogue radio. Although cable offers more room for radio channels than the airwaves, 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 with analogue cable television. Another problem is the limited amount of space available for channels. Only a few ether frequencies (or rather frequency bands) can be used to transmit radio or television. Likewise rtv cable can only accommodate a limited number of channels. 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 requires less bandwidth

The information in digital television – or various television channels – is not transmitted as a continuous, analogue signal but as discrete data packages. The

channels require less bandwidth because digital data can be compressed, which means the same transport medium can provide more digital than analogue television channels. Four or five digital channels can be transmitted in the same bandwidth used by one analogue channel, while the quality stays the same.[2)] Another option is to have high-resolution signals, such as HDTV, instead of more channels. See the box 'Extra options with digital television'.

The standard for digital television signals in Europe is Digital Video Broadcasting (DVB). There are variations beside this internationally agreed standard. The USA has ATSC and Japan has ISDB as their own standards for digital television via the ether.

Digital subscriptions usually cost the same as analogue television. People often have to pay more to get extra channels or HDTV and they have to buy a special digital receiver and a smart card.
In 2008 households could receive digital television in various ways: via rtv cable, terrestrial, via satellite or through the internet. Below we will sketch the possibilities and differences between the various methods and show figures about their use when possible.

Terrestrial digital television

Terrestrial digital television is the successor to watching television received with the classical analogue TV antenna. A huge antenna on the roof used to be required for a decent reception, whereas with digital television a small 20-centimetre antenna 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 ones in much of the Netherlands. With digital terrestrial television they can receive more channels including all commercial Dutch language stations.

Digital terrestrial television is also known as DVB-T (Digital Video Broadcasting – Terrestrial). In 2008, it is available almost everywhere in the Netherlands. Given the expected national coverage of digital terrestrial television and the limited number of households still receiving analogue terrestrial television, the analogue television broadcasts ended on 11 December 2006. This makes the Netherlands one of the first European countries to only broadcast digital terrestrial television. The digital versions of *Nederland 1, 2* and *3* and the regional channels have been available for free since the analogue terrestrial signal stopped. However, consumers have to buy a digital decoder and a proper antenna. Terrestrial radio broadcasts will still be available in analogue form for a while.

At the end of 2007 there were 482 thousand subscribers to terrestrial digital television in the Netherlands, compared to just 265 thousand the year before. This made it the fastest growing form of digital television, relatively speaking.

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 choose 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 programmes 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 programme at the time it is broadcast. It can be watched at the consumers' convenience through IPTV or services like 'Uitzendinggemist'. Such services place the programmes 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.

Digital television via satellite

Besides cable and terrestrial television, people can receive television via satellite, which generally allows for the reception of many more channels. There is one disadvantage, namely that the dish has to be placed outside, which is not always possible or even allowed. In addition, the dish must have a direct line-of-sight with the satellite.

Since 11 December 2006 satellite broadcasts by Dutch stations can only be received digitally. Nearly all foreign satellite stations switched to digital technology in recent years. There is little difference between analogue and digital television reception, with a satellite dish and receiver, in terms of the infrastructure required. Consumers who own a satellite dish can simply switch to digital television; usually it just requires placing another receiver.

Digital television via 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 of satellite reception is 100 percent if there is line-of-sight with the satellite.

In 2007 some 800 thousand households watched digital television via satellite in the Netherlands, compared to 700 thousand in 2006. In 2005 it was the most popular way to receive digital television, but then digital television via cable started growing fast.

Digital television via cable

In digital television via cable, the digital television signals enter the home via rtv cable. People only need a digital decoder, 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 DVB-C (Digital Video Broadcasting – Cable). It is possible to broadcast more channels and/or a higher definition than with analogue cable television.
The disadvantage of this method is that only one set can be connected to the digital tuner, in contrast to analogue television via cable. However, people can still get the regular analogue cable signal on the sets without an extra digital receiver, because the analogue signal is still transmitted with the digital signal.

The number of households with digital television via cable increased by 570 thousand in the period 2006–2007. By the end of 2007 there were about 1.6 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 high-quality television channel. The advantage of this form of digital television is that the only channel transmitted is the one the user tunes in to. Most other forms broadcast all channels at once and have the television set filter out a single channel. Therefore 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 form of digital television. ADSL2 is usually recommended, but not every household in the Netherlands can get that (see also paragraph 3.1).

In 2005 this method was first used to broadcast live football matches in the Netherlands. Regular Dutch television has also been transmitted in this way since April 2006. By the end of 2007 there were 221 thousand subscriptions to IPTV services, making it the least used method so far. This type of digital television should not be confused with watching television on a computer with a special TV card, where the signal still enters the home via rtv cable, or with downloading films or programmes from the internet.

Digital television via cable and the ether most popular

Figure 3.3.1 shows the development of the use of digital television broken down by type of reception: terrestrial, satellite, cable or DSL connection. Satellite had the

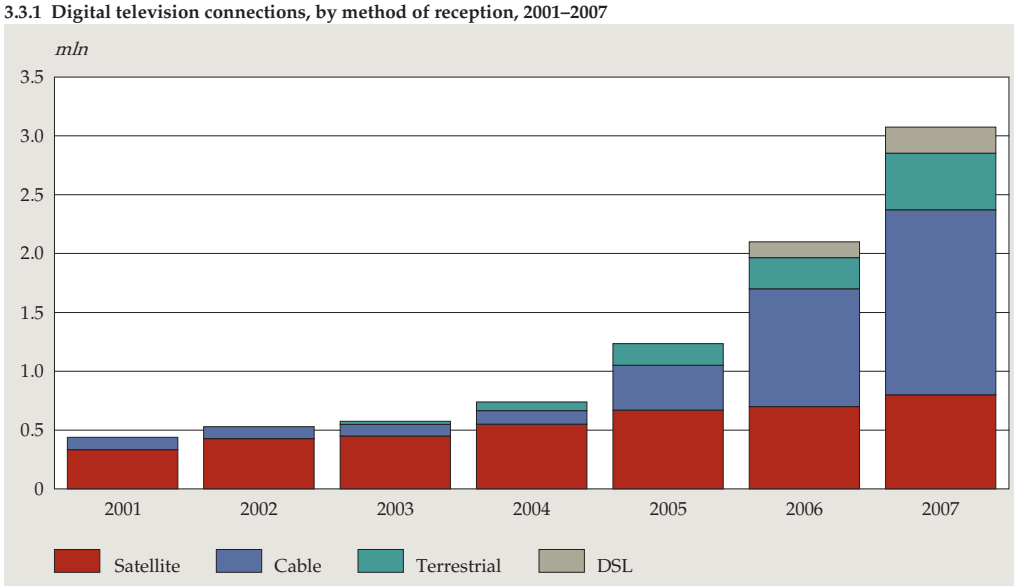
Mobile television

Watching television in the train or in a traffic jam is becoming more and more common. 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 via the UMTS antennas. With UMTS the images are sent to each individual user, which generates much data traffic. Therefore the quality is not as good as with the other option, which is to send a single TV signal that is simply picked up by the mobile telephone. This signal is similar to digital terrestrial television, but 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). DVB-H is currently applied, but few devices can handle this standard.

highest number of digital connections in 2005, but this changed in 2006 when rtv cable became most popular. Watching terrestrial digital television is also gaining popularity. This category is growing faster than the rest (82 percent). This is probably because the subscriptions are usually cheaper than digital television via rtv cable, on average by about half. However, the number of channels is more limited.

In total there were over 3 million digital television connections by the end of 2007, which is 47 percent more than at the end of 2006. Figure 3.5.2 of The Digital Economy 2007 – published in March 2008 – showed the internationally comparable data for 2005. There were no more recent data available yet as we wrote this edition.

3.3.1 Digital television connections, by method of reception, 2001–2007



Source: TNO.

HDTV

The term High Definition Television (HDTV) refers to television with 720 or more horizontal lines of resolution, wide screen format (16:9) and multi-channel sound. The image is much more detailed than with analogue systems such as PAL and NTSC. Some standards are frequently used, distinguishing *progressive scanning and interlaced scanning*. An image is refreshed several times a second. With progressive scanning the entire image is restructured with each refreshment. With interlaced scanning the image is always refreshed in two parts. First the uneven lines and then, with the next refreshment, the even lines. Interlaced scanning can mainly be seen when objects move horizontally and the pixels no longer connect perfectly. The advantage of interlaced scanning is that it requires only half of the data flow needed for progressive scanning.

There are many kinds of HDTV format resolutions. The main ones are:
- *720p:* This format indicates that there are 720 lines with 1280 pixels each, using progressive scanning. A television set with a HD-ready logo can show a minimum of 720 lines.
- *1080i:* This format indicates that there are 1080 lines with 1920 pixels each, using interlaced scanning. Even though this standard has more lines in total than 720p, it only shows half per frame – 540 lines.
- *1080p:* This format has the same number of lines and pixels as 1080i, but these use progressive scanning. Therefore this format requires twice the bandwidth. This standard is known as Full-HD.

In the first quarter of 2009, the public television stations *Nederland 1, Nederland 2* and *Nederland 3* will be broadcast in the 720p format. Both in Europe and in the USA there are broadcasters using 720p and 1080i. The frames are usually changed with a frequency of 50 or 60 per second. Gradually 1080p will be used more and more, whereas in 2008 this standard was only used in Blu-Ray films.

Digital radio used only by public broadcasters

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 to have more channels in 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.

Many countries use the standard DAB (Digital Audio Broadcast). Public broadcasting in the Netherlands has used terrestrial DAB (T-DAB) since 2007. Commercial radio stations are waiting for the government to allocate frequencies. T-DAB can be seen as the successor of the FM technology. In the Netherlands T-DAB reached about 70 percent of the population in 2007, primarily in the Randstad and the province of 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. This is a technology where radio transmissions are sent along with the television signals. Figures about the coverage and use of DVB-T are shown in the section on digital television.

An altogether different standard is DRM (Digital Radio Mondiale).[3)] 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. The disadvantages of shortwave are more interference and a lesser sound quality. Digital signals can reduce the interference so that a transmission of reasonable quality over a thousand kilometres can be achieved. The only radio station in the Netherlands using DRM in 2008 was Radio Netherlands Worldwide.

Digital radio through the internet

Users can listen to streams on the internet. These may be 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.

Furthermore the internet provides the option to listen to programmes at any time. While high-quality television through the internet requires a high-speed internet connection, this is not the case for digital radio through the internet. A starter broadband subscription is usually enough.

3.4 Convergence

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

Currently many telecom companies offer service 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.

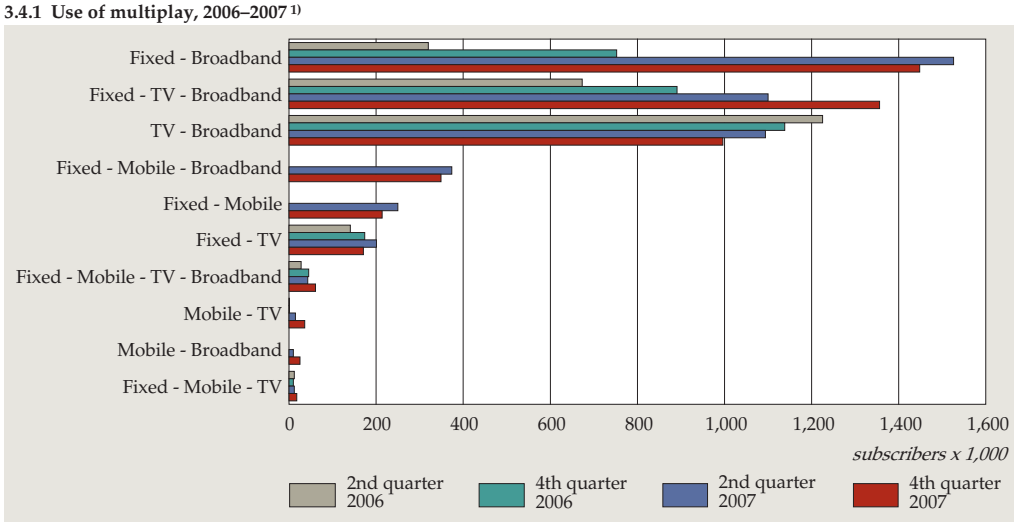
Households state ease and the lower costs as their main reason for opting for a combined package (EIM, 2006). Another advantage is having a single infrastructure (one box instead of a separate modem and telephone switchboard) and one helpdesk. The disadvantage is that when the line goes down all services go down with it. This can be problematic for companies. It may not be a disaster when email is down temporarily, but when a company is cut off from telephone and the internet this may cause a severe disruption.

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 provide 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 made it easier to change (mobile) telephone providers since one can keep one's own number, for instance. Changing internet or radio and television providers is also more common and gradually becoming simpler. Switching internet providers used to take weeks, leaving the clients without any internet at all. These days it can often be done in a day.

Figure 3.4.1 shows the purchase of different services from a single provider (multiplay). Various market parties are specialising in this area. In 2007 the use of multiplay rose sharply again compared to 2006, with 55 percent more subscribers

3.4.1 Use of multiplay, 2006–2007 [1)]



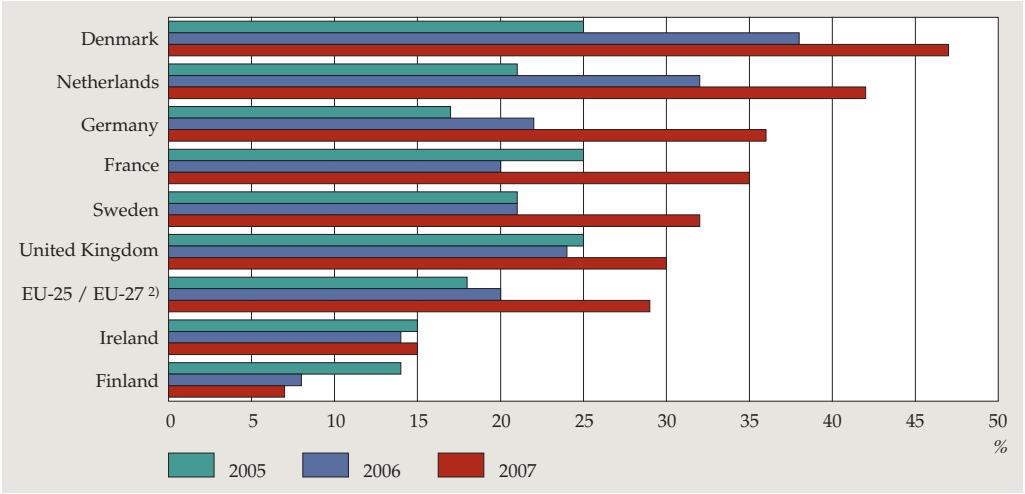
[1)] The term 'fixed' means telephone via a fixed land line (including VoIP),'mobile' stands for a mobile telephone connection. 'Broadband' stands for a fixed or wireless broadband internet connection.

Source: OPTA.

buying several services from the same provider. The most common combination of services at the end of 2007 was a fixed landline plus broadband internet (1.4 million subscribers). However, this is less than 6 months earlier. The combination of landlines, broadband and TV is rising fast and triple play is expected to be the most common kind of multiplay in 2008.

A study of the European Commission (EC, 2006, 2007 and 2008) shows major differences within the European Union (EU) in the use of multiplay, see Figure 3.4.2. The share of households within the European Union that purchased at least two services in a single package averaged 29 percent. The Netherlands and Denmark were the top users at the end of 2007, just like they were at the end of 2006. In Finland the use of multiplay remarkably fell in recent years.

3.4.2 Use of multiplay, international, 2005, 2006 and 2007 [1)]



1) Share of households purchasing at least two services in one package from a single provider.
2) EU-25 for the figure of 2005 and EU-27 for the figures of 2006 and 2007.

Source: European Commission.

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.

The European Commission study only asked about the purchase of service bundles in one contract at a single rate. People who buy their mobile telephone and landline from a single provider with two separate contracts and accounts are not included.

Notes in the text

1) Sometimes old faxes, modems, elevators and alarm systems require an analogue line, so that several infrastructures are required within a company anyway.
2) For applications of DVB-T; see Dialogic, 2005.
3) DRM is also the abbreviation for Digital Rights Management, a technology to protect digital rights such as copyrights on digital music files.

4. ICT use by companies

Having broadband internet and their own website is now common among companies in the Netherlands. Advanced, large-scale ICT applications are therefore widely supported. There are major differences between companies in the use of advanced applications, and some are likely to remain. For instance, it is quite unlikely that selling online will be embraced by all companies. In this chapter we describe a number of ICT applications of which the intensity of use differs between large and small companies and between sectors. The decision to invest in technology or in an ICT application remains a matter of business economics. The cost-benefit analysis will produce different results for different companies.

The use of ICT to support business processes in manufacturing is concentrated on the production and distribution chain. In services it focuses on marketing and the client. By December 2007 the order processing systems of companies in manufacturing and in the sector trade and repairs were linked more often to computer systems for stock control than in the sector business services. Delivery of goods in time is after all vitally important 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, while CRM software is used more often in business services. These differences can be explained quite easily, as they show a rational use of ICT in different companies.

One in five companies used open source software by December 2007, mainly large companies. The difference here seems to be due to lacking or possessing the skills to work with open source software.

Automated data exchange (ADE) offers advantages in terms of efficiency and the standardisation of services and products. It is usually the major companies that work with ADE: 43 percent of the companies with more than 500 employees used ADE for sending purchasing orders to suppliers. Supply chain management is mainly popular with major companies in trade and industry. Almost a third of the largest companies engaged in some form of supply chain management by the end of 2007.

Electronic purchases and sales by companies increase annually, both in terms of the number of companies using these facilities and in the volume of these transactions. Turnover of e-commerce in 1999 was just over 3 percent of the total turnover of the companies. In 2007 this had gone up to almost 13 percent.

Internationally speaking the use of ICT by companies in the Netherlands is not among the absolute top. Companies in Scandinavian countries made even more intensive use of ICT. Nor were the companies in the Netherlands among the early 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 2007 companies in the Netherlands were well above average in their use.

Almost half of all companies facilitate teleworking in the Netherlands. It has already more or less become common practice in major companies: personnel can do so in about 90 percent of the companies with more than 250 employees. Compared with the main benchmark countries the number of Dutch companies with teleworking is average.

4.1 ICT infrastructure and use

The use of ICT in the business sector had become common by 2008. 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 creating and maintaining an intranet, while the opposite may be true for a larger company. A large company with many suppliers may reap the benefits from investing in advanced computer systems that communicate with the computer systems of suppliers while a small company with few regular suppliers may not. So the requirements for companies differ.

The increasingly advanced use of ICT starts with the widespread adoption of the necessary ICT and the development of the necessary infrastructure within and outside the business sector. This sounds so logical that it may be considered self-evident, so that people sometimes underestimate the correlation between the adoption of ICT and developing and using advanced ICT applications. It is important for developers of ICT applications to have many potential users. This defines the size of the (domestic) market and determines if it is profitable to invest in the development of an ICT system. The number of other people using an ICT application often determines its usefulness for users. Phoning through the internet is a prime example. The more people do so, the more useful it is for the individual user to join. The same principle of network effects 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 2007. Almost 86 percent of all companies had broadband access. Back in 1995 barely ten percent of the companies had internet, and broadband internet was a rarity. Broadband internet stands for fixed high-quality internet connections, such as xDSL (ADSL, DSL etc), the radio and television cable and lease and rented lines.

Survey on ICT use by 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 – first, until 2002, under the name IT Survey. The rapid developments in ICT over the last twenty years have led to major changes in the contents of the survey. Initially 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, so the figures on 2007 refer to the situation of December 2007. The conclusions drawn in this paragraph, using this source, therefore refer to the situation at the start of 2008, so it is not the annual average for 2007.

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 international 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.

There are no longer any real differences in internet access between large and small companies. In the past large companies were always somewhat ahead of smaller companies in this respect. So although the small companies were slower to embrace the internet, they ended up at the same level as the major companies. In December 2007 the use of broadband internet varied from 81 percent for companies employing 10-20 people to 98 percent of companies employing more than 500 people.
There is also very little difference between the various sectors in internet access. Broadband internet is now standard in almost all sectors. The use of broadband varies from three quarters of all companies in hotels and restaurants to almost all companies in energy and water supply. Most companies in all sectors now have broadband internet, which makes large-scale advanced internet applications possible.

More than eight in ten companies have their own website

About 83 percent of the companies were active on the internet with a website of their own in December 2007. Their presence on the internet varied from 79 percent for the smallest companies (10–19 employees) to 97 percent for the largest companies (over 500 employees). 73 percent of the companies in the sector transport, storage and communication had their own internet page, while 91 percent did in the financial sector.
The decision to create a website is quite different from the decision to implement broadband internet. Creating a website costs more time and money. On top of that, maintaining a website requires considerably more resources than maintaining internet access. So this is probably why a relatively high percentage of small companies do

not yet have their own website. More than a fifth of the companies with 10–19 employees had no website, while among companies with 20–49 employees this was still close to 16 percent. So the analysis of costs and benefits for constructing and maintaining a website must have produced a negative result for these companies. However more and more people look for information on companies on the internet.[1)] So a company that doesn't have a website, might be overlooked by a potential client.

The sectors differ in terms of having websites; from about two thirds of the companies in the sectors food, beverages and tobacco (63 percent), textiles, clothing and leather (70 percent) and building installation and completion (71 percent) to nearly 100 percent among architects and engineering firms (94 percent), insurance companies (94 percent) and advertising agencies (97 percent). So having a website is influenced by the nature and position of a company in the production and distribution chain.

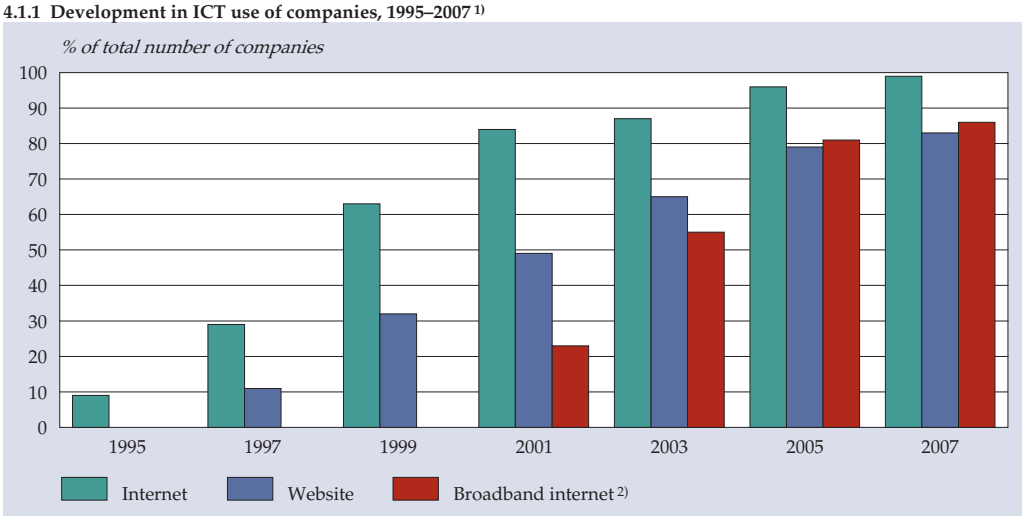
The sectors building installation and completion and food, beverages and tobacco are not the kind of sectors that are directly in touch with consumers. They apparently have different channels to get clients or they have many regular clients so that a website is less likely to meet a need. The culture and image of a sector also have their influence. Creative sectors such as architects and engineering firms and advertising agencies apparently all consider a website a must, because almost every one of them is on the internet.

So by December 2007 companies were hooked to the internet en masse, and many through broadband. Most companies were also on the internet with their own website. The facilities offered by these websites vary tremendously, from electronic signpost to full online commercial services. The overwhelming majority of the companies 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/digital-economy.

ICT at international average

International comparisons show that the Netherlands was far from an early adaptor in the massive adoption of ICT. This process generally went much faster in the Scandinavian countries Sweden, Denmark and Finland. The rate at which ICT spread in the Dutch business world was average for Europe, considering the size of the market of ICT users and the development and actual use of ICT applications. The number of potential users in 2008 was so substantial that it is no longer an impediment for the development and use of a great many large-scale ICT applications. Now it becomes possible to make use of the advantages such applications offer. This chapter will now focus on the question if this is supported by an advanced use of ICT by the companies in the Netherlands.

4.1.1 Development in ICT use of companies, 1995–2007 [1)]



1) Companies with 10 or more employees. For 1995–2001 only people on the payroll are included.
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.

The rapid technological developments have advantages for the rapid spread of ICT in society or the private sector, but there are some critical considerations. Being at the forefront may well become a hindrance – which is known as the dialectics of progress. A company that is one of the first to use a new technology may well be overtaken by other companies that get involved at a later stage. This happens, for instance, when a new and improved version of the technology comes on the market quickly. Always wanting to keep up by getting the latest versions may not be feasible financially and in terms of organisation.

The 2008 e-readiness rankings

The Economist Intelligence Unit (EIU), the research unit of *The Economist*, produces an annual ranking of e-readiness. Some 100 indicators are divided into six categories to derive the e-readiness score for all countries included in the survey. 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.

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);
5. 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 top 15 ranking in e–readiness in 2008

Ranking 2008 (70 countries)	Ranking 2007 (69 countries)	Country	E-readiness score 2008 (scale 1–10)	E-readiness score 2007 (scale 1–10)
1	2	United States	8.95	8.85
2	4	Hong Kong	8.91	8.72
3	2	Sweden	8.85	8.85
4	9	Australia	8.83	8.46
4	1	Denmark	8.83	8.88
6	8	Netherlands	8.74	8.50
6	6	Singapore	8.74	8.60
8	7	United Kingdom	8.68	8.59
9	5	Switzerland	8.67	8.61
10	11	Austria	8.63	8.39
11	12	Norway	8.60	8.35
12	13	Canada	8.49	8.30
13	10	Finland	8.42	8.43
14	19	Germany	8.39	8.00
15	16	South Korea	8.34	8.08

The Netherlands shares sixth place in the total of 70 countries. After spending a year ranked eight (2007), the Netherlands now ranks the same in e-readiness as in 2006.

The level of e-readiness continued to rise throughout the world. The average score of the countries included in the survey increased from 6.24 in 2007 to 6.39 in 2008 on a scale of 1–10. This overall increase masks the slight decrease in several countries, particularly in the top ten. After four years of ranking at the top, Denmark now occupies a shared fourth place. Switzerland also lost four places and Austria has now replaced Finland in the top ten after it lost three places in the ranking. The USA headed the ranking worldwide in 2008. Hong Kong rose two places and follows closely behind the USA.

Keeping up with the rapid digital developments is difficult. The ICT front runners in Europe were unable to keep up with the high standards they had set in some areas in earlier years. Finland and Denmark were unable to maintain ICT spending levels, for example, or to further improve the already impressive access to digital channels for their citizens and companies. On the other hand, the top ten countries that increased their rankings (the Netherlands, the USA, Hong Kong and Australia) mainly realised this progress by improving access to the internet and ICT with fixed and wireless broadband connections. Another contributor to the rise of these countries was due to improvements in the innovation climate.

Source: E-readiness rankings 2008, Economist Intelligence Unit and IBM Institute for Business Value, 2008.

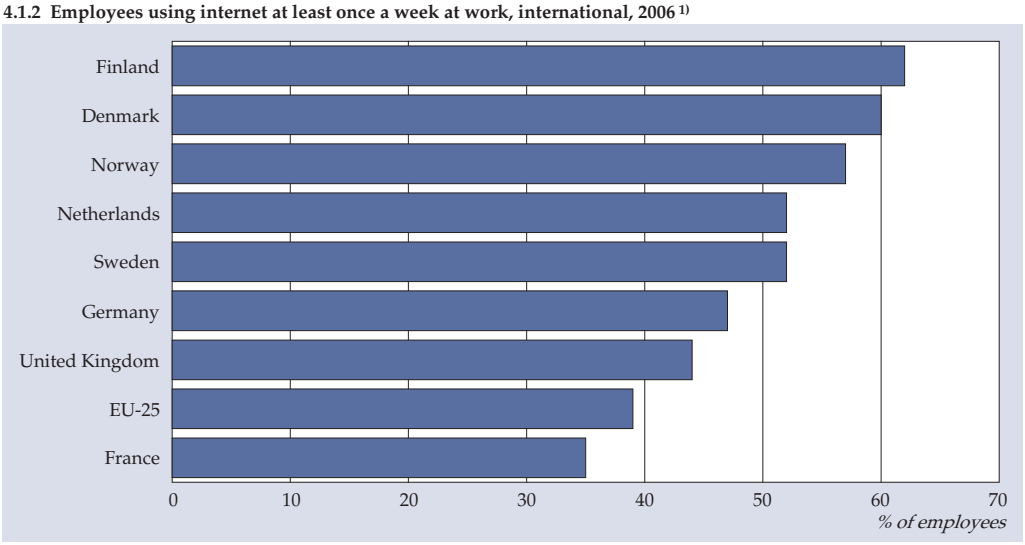
Internet at work widely accepted by companies

The number of employees who use a computer with direct internet access – just over half in the Netherlands in 2007 – is an illustration of large-scale internet use. In 2002 it was just a third. So there is a growing recognition that the internet is a useful source

of information or tool on the job. More and more companies recognise the importance of internet access for some or all of their employees. The greatest number of employees who regularly use the internet on the job is found in financial institutions and in energy and water supply companies. The smallest number is found in construction and hotels and restaurants. These numbers have to do with the kind of work in these sectors. There are no great differences between large and small companies in this respect. So internet access on the job is not the exclusive privilege of the people working for large companies.

Compared with the rest of Europe, an above average number of employees regularly use the internet in the Netherlands. The Netherlands shares fourth place after the Scandinavian countries, and is well above the average of the EU-25.

4.1.2 Employees using internet at least once a week at work, international, 2006 [1)]



[1)] Companies with 10 or more employees, excluding the financial sector.

Source: Eurostat.

4.2 Internal data communication

One of the most frequently used applications of ICT in the private sector is for in-company communication. Virtually all major companies use an internal computer network, which is apparently seen as a basic provision for large companies. About 80 percent of small companies (10–20 employees) also have an internal computer network.

Wireless applications have become popular in recent years, particularly among major companies (over 500 employees). In this group 48 percent had a wireless

internal network by the end of 2007. These wireless networks are often used side by side with fixed internal networks. The main advantages of these wireless networks are their flexibility and mobility. An employee no longer has to be connected with cables in order to work on the computer and have access to the company network.

Intranet often used in the services

Intranet is a facility to communicate and provide information within a company. It is based on internet technology, but it is only accessible to company employees. Intranet is more advanced than an internal network and requires more maintenance: the content must be updated regularly to remain useful as an application. This means of communication is mainly used in large companies. The use varies from 24 percent among companies with 10–19 employees to 86 percent among companies with more than 500 employees. It is easy to explain this difference. It is easier to communicate and share information in a small company than in a large one. So large companies need intranet more, and get more benefits out of it. They also have more means available to invest in the setup and maintenance of an intranet.

Intranet is used by more companies in the services sector than in manufacturing, construction, and hotels and restaurants. This is due to the differences in the nature of their production processes. The production process and products in the services sector are usually 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 had an intranet by the end of 2007, so that is far from the majority of companies in the Netherlands.

Extranet uncommon

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 among companies: 17 percent of all companies had extranet by the end of 2007, varying from 14 percent among the small companies to 47 percent among the 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/digital-economy.

Linking invoicing and payment systems

Not only fairly basic provisions such as local networks, intranet or extranet are used but also more complex applications such as linking different computer systems within a company. In 2007 more than three quarters of all companies had software for processing purchasing and/or sales orders. Most of the companies with a software system to process sales orders have linked this system with one or more other internal computer systems. The most common link was between invoicing and payment systems: 85 percent of the companies with a sales order processing system had it linked to an invoicing system.

Purchase order processing systems were also often linked to other internal software systems at the end of 2007. Payment and bookkeeping systems are often linked to a system for purchasing order processing: 80 percent of this group of companies has such links. Some 47 percent of the companies linked their systems for stock management with a purchase processing system.

The overall picture in 2007 is that major companies have more advanced integrated applications than small companies although the differences are not great. The percentage of companies with a sales order processing system varied in 2007 from 69 percent among the smallest companies to about three quarters among major

Table 4.2.1
Companies linking their order processing systems to other in-house ICT systems, 2007 [1)]

	Has a sales order processing system	Sales order processing system linked to invoicing and book-keeping system	Sales order processing system linked to stock management system	Has a purchasing order processing system	Purchasing order processing system linked to payment and book-keeping system	Purchasing order processing system linked to stock management system
	% of total number of companies	*% of companies with a sales order processing system*		*% of total number of companies*	*% of companies with a purchasing processing system*	
Total	72	85	44	61	80	47
Sector of industry						
Manufacturing	86	80	54	73	73	58
Electricity, gas and water supply	71	96	61	91	91	52
Construction	64	88	26	61	89	23
Trade and repair	85	85	75	78	77	75
Hotels and restaurants	50	83	21	42	78	26
Transport, storage and communication	69	88	29	56	86	25
Financial institutions	62	87	11	38	87	14
Business activities	63	85	21	50	84	24
Health and social work	62	87	23	44	82	25
Other service activities	56	81	22	42	79	20
Company size						
10– 19 employees	69	83	38	58	79	40
20– 49 employees	72	85	47	62	81	50
50– 99 employees	78	88	54	67	81	55
100–249 employees	79	88	56	70	82	60
250–499 employees	75	84	62	72	83	62
500 and more employees	73	87	61	74	86	70

[1)] Companies with 10 or more employees.

Source: Statistics Netherlands, ICT use by enterprises 2007.

companies. The same is true for purchasing order systems, although the differences between the smallest and largest companies are slightly bigger.

Linking an order processing system and an invoicing system, where an invoice is generated when an order is placed, is most common in all sectors. There are greater differences between sectors when it comes to linking systems for stock management. Linking is most common in energy and water supply companies, manufacturing and trade and repairs – 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 with a computerised system to replenish stocks. This is also common in trade and repairs, where on time delivery and the availability of goods is vitally important. This has apparently led to investments in computer systems that support this.

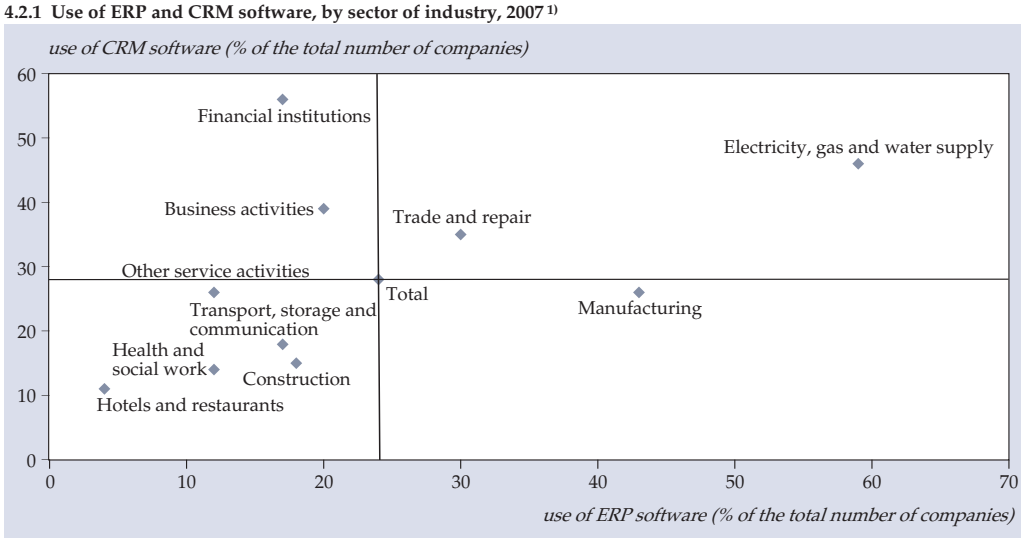
Use of ERP and CRM software

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 systematically integrates data of various units within the company such as planning, purchasing, logistics and production. CRM is software supporting company-wide gathering, storage and distribution of 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, so that is the input side of the production chain. CRM focuses mainly on sales and marketing and looks forward in the chain, so that is the output side of the production chain. So from the company's perspective the information gathered and processed is different. So there are substantial differences between the different sectors in the use of ERP and CRM.

Four in ten companies made use of ERP and/or CRM software by December 2007. Manufacturing made more use of ERP software (43 percent) and less of CRM software (26 percent). The same is true for construction. This is consistent with what was described earlier, as these sectors emphasize supporting the production and distribution processes through ICT.

The use of CRM software dominated in business services and financial institutions by December 2007. So these sectors invested more in setting up customer data for direct marketing strategies. Marketing is very important in these sectors with a large but largely unknown number of potential clients. Almost 90 percent of the companies with CRM software used it to store and distribute customer data at the end of 2007. Two thirds of the companies using CRM software actually analysed the data: so it was actively used.

4.2.1 Use of ERP and CRM software, by sector of industry, 2007 [1)]



[1)] Companies with 10 or more employees.

Source: Statistics Netherlands, ICT use by enterprises 2007.

Open source software mainly used by major companies

The Dutch government encourages the use of open source software (see box). There are two reasons for this. One is that open source software helps to reduce the dominance of a limited number of major software producers. It makes consumers less dependent on the products of a limited number of companies. The second is the idea that open source software will contribute 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? There are different definitions, but the following three aspects are always mentioned: (1) the source code of the software is freely available (in part), (2) everyone can add to it or improve it and (3) everyone can distribute the software.

Open source software is not necessarily free. A provider 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 web server software.

The source code of open source software can be accessed and improved by anyone. Often communities of online developers work on the setup, extension and 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, as is the case with commercial

software. Companies using open source software also do not pay a licence fees, but a user has to agree to other licenses even though they are usually free of charge. There will be a charge for tailoring the software to the needs of the user, 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. Another advantage is that the costs are lower, which is crucial for small and medium-sized companies. However, working with open source software requires different skills. And the skills or knowledge required are not always available in small companies. In 2008 the small companies were certainly not the main users of open source software.
There are of course also disadvantages in the use of open source software. Damages caused by the use of the software cannot be recouped from the developer while this can be done with a standard software package.

The Dutch government and open source software

In 2002 the Dutch parliament adopted a motion by MP Vendrik to stimulate the Dutch software market through the use of open source software in the public sector. The programme OSOSS (Open Standard and Open Source Software) was set up in response, now superseded by Nederland Open in Verbinding (NoiV). NOiV informs government bodies about the possibilities of open standards and open source software and encourages them to apply these in their information systems. NOiV stated the following reasons why open source software and open standards are very important for the Dutch government:

- improving access to information because an open standard can bring about a link to the information that is free and stable in the future;
- improving transparency in government activities because EDP auditors have complete insight in how the computer applications work;
- improving information security because the source code can be evaluated by everyone;
- improving stability in the future of the solutions chosen, because the code can also be maintained by third parties, it remains transparent because it does not depend on one supplier, and the data are stored in files with a free and public structure;
- improving the competitive powers of local software suppliers because they too can maintain and expand the applications and link to other files and programmes;
- stimulating innovation in the software market, because open standards and open source software allow others to build on earlier developments;
- cutting licence costs because open standards and source software are provided free of charge by definition.

Despite all these advantages no hard targets were set as to how many government organisations must use what degree of open source by what date. In September 2007 some 21 percent of the Dutch municipalities used open source software.

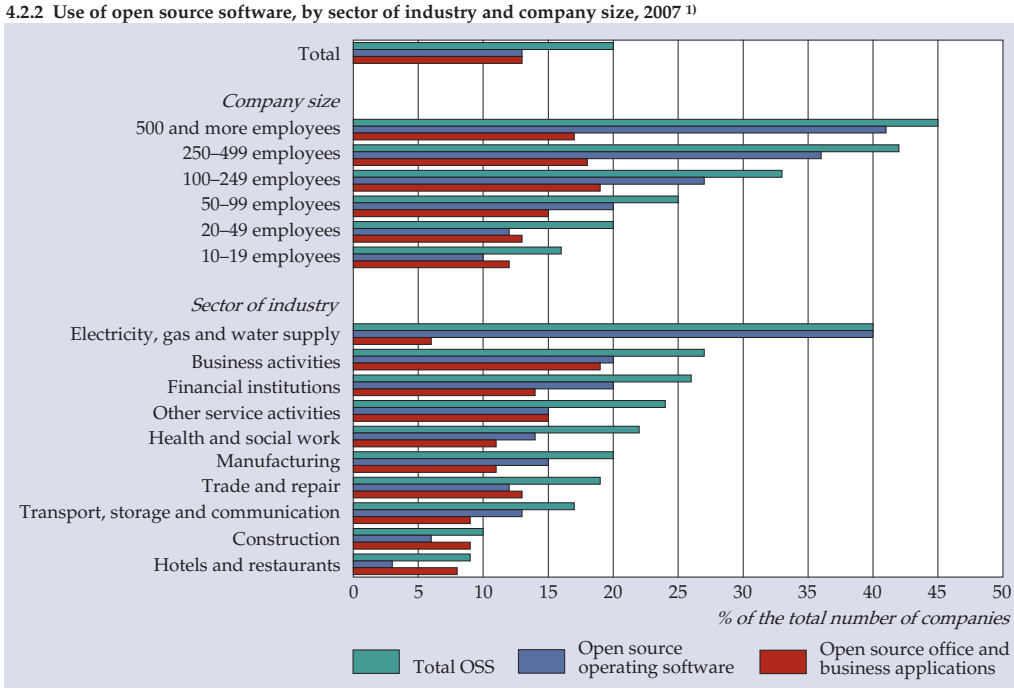
Sources: www.noiv.nl, 6e voortgangsrapportage e-overheid (Ministry of the Interior's sixth progress report on e-government).

One in five companies uses open source software

Twenty percent of the companies in the Netherlands indicated in 2007 that they used open source software. This is open source software for operating systems or office and business applications. These companies do not necessarily operate entirely with open source software. The use of open source software can even be quite limited, for instance to the servers or routers of a company, whereas no other ICT aspect involves open source software.

Small companies make less use of open source software than large companies, especially the open source operating software. Open source software is mainly used in the services sector (business services, financial institutions) and less in the sectors construction, transport, storage and communication, and trade and repairs. This is true for operating software as well as for office and business applications. In the business services sector, open source operating software is used most by computer service bureaus and the sector R&D. These sectors also lead in open source software use for office and business applications. This indicates that general and ICT knowledge play a key role in the choice for open source software. The argument to gain know-how and experience with the use of open source software can also have played a role in these sectors. Open source software is also commonly used by

4.2.2 Use of open source software, by sector of industry and company size, 2007 [1)]



[1)] Companies with 10 or more employees.

Source: Statistics Netherlands, ICT use by enterprises 2007.

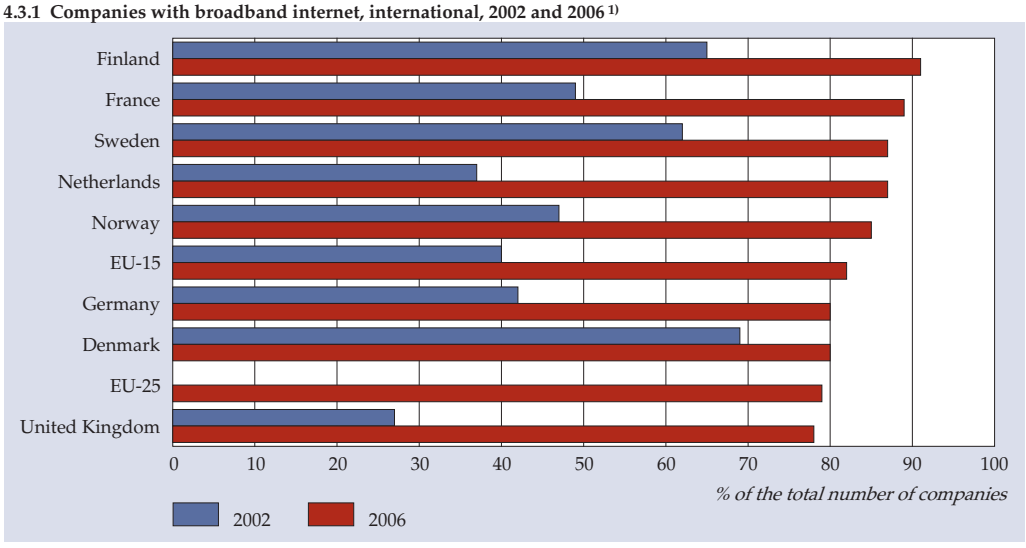
energy and water supply companies. This is because the sector has relatively many large companies which use more open source software than small companies. It is remarkable among the energy and water supply companies that open source software is usually limited to operating systems. Only 6 percent of the companies in this sector used open source software for office and business applications, compared to 40 percent applying open source software in operating systems.

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). As mentioned earlier, virtually 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. Broadband allows users to download information in large files and to make large quantities of information available. The internet is also used for electronic purchasing and sales (e-commerce), with or without the option to pay. 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 but also that the Netherlands was not among the top. In 2002 Denmark, Finland and Sweden were more advanced in this area. In

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



[1)] Companies with 10 or more employees.

Source: Eurostat.

2006 the business sector in the Netherlands had equalled the level of the three Scandinavian countries, but missed the years of experience with large-scale broadband applications. After all, in 2002 only a third of the companies in the Netherlands had broadband internet, which at the time was below the average of the EU-15.

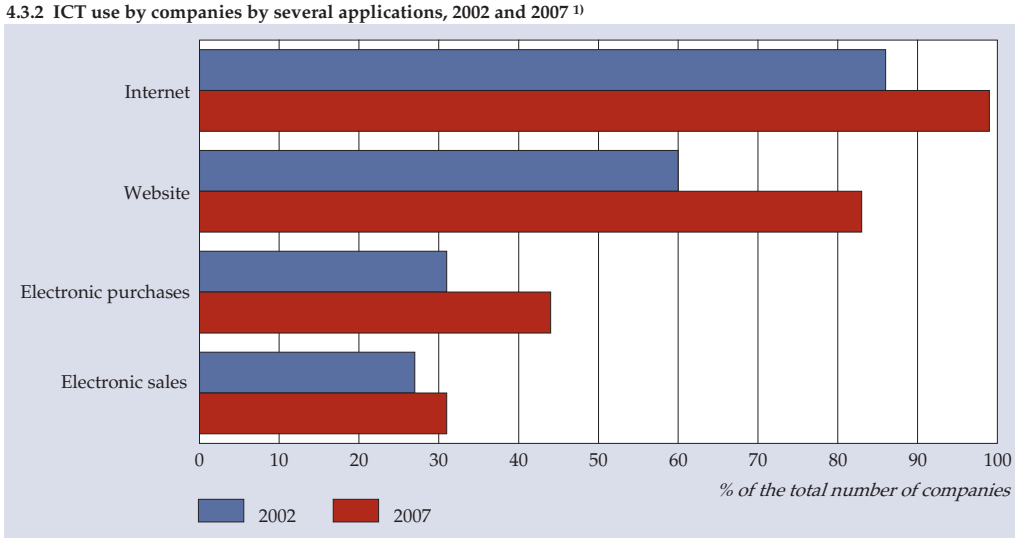
ICT use more intense

Figure 4.3.2 uses a limited number of indicators to illustrate the development of the ICT use in the Dutch business sector. Dutch companies already used electronic data communication in the nineties. This was mainly done with 1-on-1 or 1-on-n networks where one company could communicate electronically with one or more other companies. The latter could not necessarily communicate among themselves.

Internet technology provided the breakthrough for n-on-n networks. When an individual user has internet access he or she can communicate with all other internet users (and vice versa). So within a decade almost all companies in the Netherlands connected to this network. At first this was often as passive users, mainly using the facilities provided by others rather than providing facilities of their own. However, by December 2007 most companies provided their own facilities on the internet (website), which made the network enormously more useful.

The nature of the facilities on offer varies widely. For example, by December 2007 people could order online in less than a third of the companies with internet. The general trend is that advanced use of internet networks increases as does the number of users. Not all applications necessarily have to be adopted by all companies though.

4.3.2 ICT use by companies by several applications, 2002 and 2007 [1)]



[1)] Companies with 10 or more employees.

Source: Statistics Netherlands, ICT use by enterprises 2007.

Automated data exchange

Automated data exchange (ADE) between companies can significantly reduce written communication, with transactions in trade for instance. The advantages in terms of efficiency are evident: ADE is faster and often cheaper than written proceedings. This is even more so when the online data exchange is automated. ADE can prevent interpretation differences and promote standardisation of products and services. ADE is usually attractive to enterprises with a sophisticated ICT infrastructure.

Automated data exchange can take place in many different ways, on or off the internet, often using international standards prescribing the layout of the messages used for automated data exchange between companies. Well-known standards are XML and EDIFACT. Automated data communication has countless applications. It may be used for sending and receiving orders, invoices, product information and documents. ADE is also suitable for sending instructions to the bank and data to the tax authorities.

ADE not yet commonplace

Sending and receiving invoices and orders via automated data exchange is not yet common in the Netherlands. Few companies send electronic invoices via ADE: 11 percent. It is more common to send and receive orders, and to receive electronic invoices via ADE. By December 2007 almost a quarter of the companies employed this method. ADE is mainly used by major companies and the differences in use of ADE between large and small companies are substantial for the various purposes. Sending and receiving product information is the exception, as small companies manage to keep up with larger ones. The threshold for sending and receiving product information is fairly low since it does not require an advanced processing system, as one would for sending and receiving invoices and orders.

Relatively many companies in trade and repairs and in transport, storage and communication use ADE for the various purposes distinguished. ADE is also popular in the financial sector. Automated data exchange with banks is an efficient way to communicate financial information for many companies. Reducing human errors by applying ADE may also play a role in this. ADE is involved in the fully automated exchange of information. The term does not cover such matters as internet banking.

Supply chain management

Many production chains are made up by links consisting of companies who form a supply chain together by purchasing, processing and sales. A classic example of a production chain is the process of extracting raw materials that go via suppliers and manufacturers to the wholesale and retail trade and then the end user. A similar process takes place in numerous chains, where the output of one link in the production chain forms the input for the next link. Supply chain management is

Table 4.3.1
Automated data exchange by companies by purpose, 2007 [1)]

	Sending purchasing orders to suppliers	Receiving invoices electro-nically	Receiving orders from customers	Sending invoices electro-nically	Sending or receiving product information	Sending or receiving transport documents
	% of total number of companies					
Total	23	24	22	11	31	12
Sector of industry						
Manufacturing	19	19	24	8	30	16
Electricity, gas and water supply	34	30	41	36	42	20
Construction	25	19	19	2	37	8
Trade and repair	36	32	26	17	37	19
Hotels and restaurants	23	20	22	5	30	4
Transport, storage and communication	16	26	32	12	21	25
Financial institutions	18	29	29	15	37	5
Business activities	16	23	17	9	27	7
Health and social work	14	20	9	18	25	5
Other service activities	17	20	19	5	27	7
Company size						
10– 19 employees	21	23	20	8	30	10
20– 49 employees	23	25	21	10	32	12
50– 99 employees	23	24	27	14	30	15
100–249 employees	26	22	29	17	31	21
250–499 employees	33	29	34	25	35	26
500 and more employees	43	38	32	33	37	20

[1)] Companies with 10 or more employees.

Source: Statistics Netherlands, ICT use by enterprises 2007.

coordinating the activities involved in the supply chain. The long-term aim is to improve the results of the individual companies and of the supply chain as a whole.

ICT systems are an important application tool in supply chain management since they can help integrate the business processes of the business partners, making both parties and eventually the entire supply chain more efficient. It is after all possible for enterprises that link information processes with suppliers and/or clients to cut costs in various areas. The efficiency gain in the purchasing process consists first of all in starting a long-term partnership between the parties. Therefore it is no longer necessary to contemplate which supplier provides the best product at the best price with every decision to purchase. The overhead costs can be cut by supply chain management due to more efficient and better communication. Finally stock management can be automated in part through the integrated systems, which may prevent errors and extra costs when ordering.

Integrated business processes can also cut costs substantially with sales. This is because invoicing becomes much more efficient when the financial information of supplier and buyer are gathered, exchanged and stored electronically. The implementation of supply chain management is not rational for every company, but in many chains an increase of supply chain management may well lead to a far more efficient production chain.

Supply chain management most common among major companies in trade and manufacturing

By the end of 2007 some 12 percent of the companies in the Netherlands applied some form of supply chain management. There is a fair difference between the smallest and the largest companies in this respect of 10 versus 31 percent. This depends of course on the difference in how advanced the ICT systems are. Relatively more companies in the financial sector and in trade and repairs use supply chain management than in the services. There are also relatively more companies in manufacturing that use supply chain management than in other sectors. So supply chain management is commonly applied in chains trading physical end products or

Table 4.3.2
Supply Chain Management (SCM), 2007 [1)]

	Applies some kind of SCM	Method used	
		SCM via websites	SCM via Automated data exchange
	% of total number of companies		
Total	12	8	5
Sector of industry			
Manufacturing	14	9	5
Electricity, gas and water supply	35	23	22
Construction	10	6	1
Trade and repair	20	12	9
Hotels and restaurants	4	3	2
Transport, storage and communication	12	11	8
Financial institutions	20	18	11
Business activities	8	7	3
Health and social work	5	3	3
Other service activities	4	3	1
Company size			
10– 19 employees	10	7	3
20– 49 employees	11	8	4
50– 99 employees	17	11	9
100–249 employees	23	15	13
250–499 employees	29	19	18
500 and more employees	31	24	23

[1)] Companies with 10 or more employees.

Source: Statistics Netherlands, ICT use by enterprises 2007.

semi-manufactured goods between the different links. It is less common in chains that mainly exchange services. Companies in the trade and repairs of cars and motorcycles use supply chain management more often than other sectors: 40 percent of these companies have their systems integrated with business partners. The costs of a product unit are high and mistakes in orders quite costly. An automated system coordinating product supply can be an important tool that will earn back the investment quickly.

Supply chain management is mostly executed through the use of websites. Eight percent of the companies in the Netherlands in 2007 worked with supply chain management in this way. Automated data exchange (via XML or EDIFACT) is less common in supply chain management, 5 percent of the companies used it. A fully automated system requires a much greater investment by the business partners than communication via websites. This may play a part in the considerations of how to integrate business processes and ICT systems.

4.4 E-commerce

One specific use of electronic networks is ordering goods and services online: the actual transaction. Companies already did this before the internet era, but then it went through networks in which the companies involved had specially invested and which only they could use. Internet technology has lowered the technological threshold for ordering goods and services online. This is true for everyone, including consumers who were not in the picture before.

The importance of ICT and electronic networks for the productivity development in a country cannot be fully measured by the volume of electronic 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 within and between companies. The efficiency gains can be realised without the final transaction being automated. The transaction is just at the end of a process that primarily involves the exchange of information. But the number of companies concluding electronic 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 in electronic commercial data flows. Companies usually receive orders through internet networks (29 percent of the companies). But there are still other networks, not based on internet technology left. In 2007 about 5 percent of the companies used such networks to receive orders electronically. It was relatively common in trade and repairs. These other networks are also still used quite often by large companies, which is logical because companies 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 since they are closed networks.

Companies made less use of non-internet networks in 2007 in electronic purchasing (4 percent of the companies). Over four in ten companies placed orders through the internet (43 percent).

The use of the other networks has been stable for some time. The growth of the number of companies buying and selling electronically is mainly due to an increase of internet. Companies that start buying and selling products electronically are not likely to invest in a network that is not based on internet technology.

Table 4.4.1
Electronic purchases and sales by companies by type of network, 2007 [1)]

	Electronic sales		Electronic purchases	
	Internet	Other networks	Internet	Other networks
	% of total number of companies			
Total	29	5	43	4
Sector of industry				
Manufacturing	33	7	46	3
Electricity, gas and water supply	37	9	56	9
Construction	18	1	37	2
Trade and repair	35	10	42	10
Hotels and restaurants	34	1	42	3
Transport, storage and communication	39	7	43	2
Financial institutions	46	7	49	5
Business activities	23	2	45	2
Health and social work	13	0	37	1
Other service activities	24	1	44	1
Company size				
10– 19 employees	29	3	40	3
20– 49 employees	27	4	42	4
50– 99 employees	32	9	50	5
100–249 employees	29	15	51	9
250–499 employees	26	20	57	13
500 and more employees	28	19	60	20

[1)] Companies with 10 or more employees.

Source: Statistics Netherlands, ICT use by enterprises 2007.

More electronic purchases and sales

About 31 percent of all companies received orders electronically in 2007. This share has increased slightly in recent years.

Table 4.4.2 illustrates that the value of electronic transactions is rising. Of the 20 percent of the companies that sold electronically in 2003, 54 percent indicated that such sales constituted 5 percent or more of the total turnover. In 2007 this was 67 percent. This increase was manifest in all sectors and company sizes. Assuming that the value of an order stayed the same on average, this means that there were more electronic transactions.

A similar picture emerges in electronic purchasing: an increase in the number of companies purchasing electronically as well as an increase in the purchase value of these electronic purchases. In 2003 some 45 percent of the electronic buyers indicated that this involved 5 percent or more of the total purchase value. In 2007 this had increased to 72 percent of the number of electronic buyers. Here too the increase is across the board in the entire business sector.

Table 4.4.2
Electronic purchases and sales by companies, 2003 and 2007 [1)]

	Sales				Purchases			
	2003		2007		2003		2007	
		of which 5% and more of total turnover		of which 5% and more of total turnover		of which 5% and more of the purchase value		of which 5% and more of the purchase value
	% of the total number of companies	*% of companies with electronic sales*	*% of the total number of companies*	*% of companies with electronic sales*	*% of the total number of companies*	*% of companies with electronic purchases*	*% of the total number of companies*	*% of companies with electronic purchases*
Total	20	54	31	67	30	45	44	72
Sector of industry								
Manufacturing	24	57	37	72	29	37	47	66
Electricity, gas and water supply	21	55	40	72	59	23	59	39
Construction	8	36	18	51	19	45	38	77
Trade and repair	25	53	40	64	32	52	45	75
Hotels and restaurants	25	57	34	68	18	44	42	75
Transport, storage and communication	25	57	41	83	25	48	43	69
Financial institutions	34	53	47	51	51	49	50	68
Business activities	17	60	24	73	38	47	46	72
Health and social work	6	27	13	54	31	33	37	79
Other service activities	20	53	25	60	31	33	44	70
Company size								
10– 19 employees	17	55	30	67	24	49	41	75
20– 50 employees	22	47	29	67	30	47	43	73
50– 99 employees	24	60	37	69	35	38	51	69
100–249 employees	27	62	37	66	46	35	54	61
250–499 employees	33	62	36	72	54	36	61	64
500 and more employees	30	61	34	65	58	39	65	60

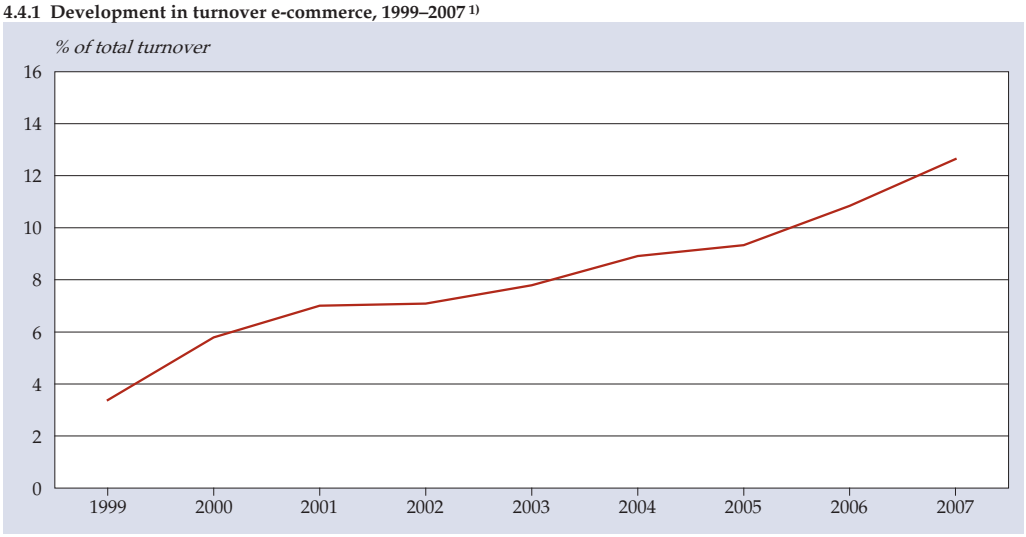
[1)] Companies with 10 or more employees.

Source: Statistics Netherlands, ICT use by enterprises.

Turnover increase in e-commerce

The turnover companies made electronically rose from over 3 percent in 1999 to almost 13 percent in 2007 (figure 4.4.1). The number of transactions completed electronically must have increased as well. This is in line with one of the advantages of the use of electronic networks: lower transaction costs. The turnover indicates the growth of the turnover in e-commerce. However, the underlying fact that the number of transactions completed electronically is up helps determine the efficiency gain.

4.4.1 Development in turnover e-commerce, 1999–2007 [1)]



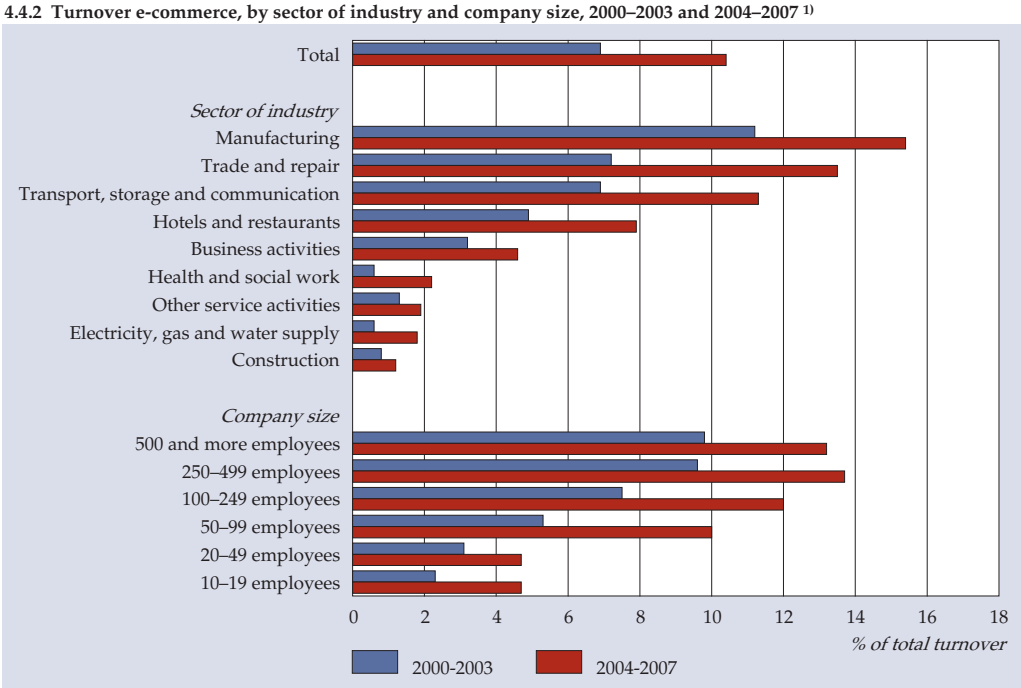
[1)] Companies with 10 or more employees. For 1999–2001 only people on the payroll are included.

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

In figure 4.4.2 the average turnover of e-commerce is shown for two consecutive four-year periods. The average turnover from electronic orders rose in the period 2004–2007 in all sectors and size classes compared to the average of 2000–2003.
The highest turnover of e-commerce is in manufacturing. Lagging somewhat behind in turnover from e-commerce are business services. This is because manufacturing has the longest tradition in receiving orders electronically, as do trade and repairs. These sectors quite often make use of the older networks of the late 20th century, so these older networks still make a major contribution to the total turnover in e-commerce. Moreover, the larger transactions are handled through these networks. In business services e-commerce more or less just started to develop when the internet technology was introduced.

Major companies tend to have a much higher average turnover from orders received electronically than small companies. The turning point is at 100 employees. Major companies also have the highest growth rate in e-commerce as a percentage of total

4.4.2 Turnover e-commerce, by sector of industry and company size, 2000–2003 and 2004–2007 [1)]



[1)] Companies with 10 or more employees.

Source: Statistics Netherlands, ICT use by enterprises.

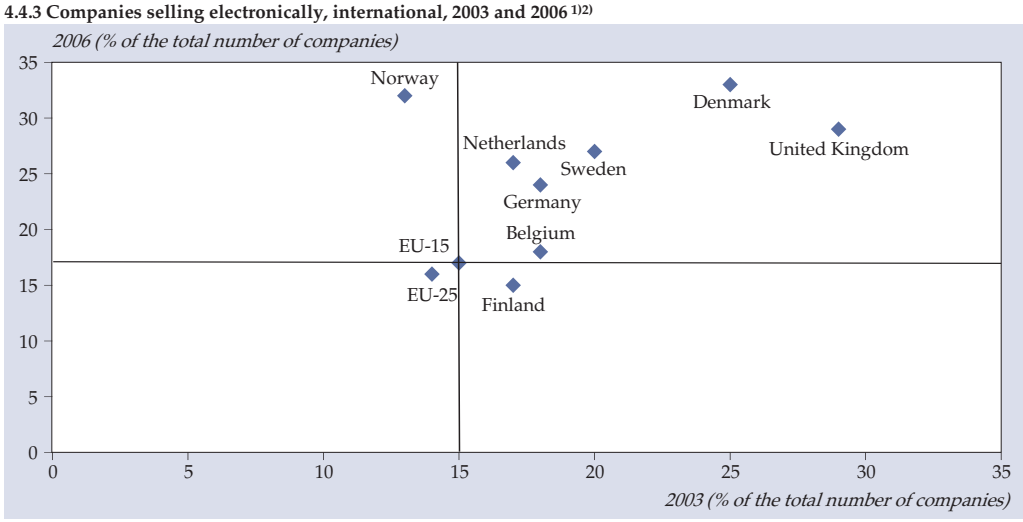
turnover. Since the start of the century the differences between large and small companies have also increased in this respect.

Catching up internationally in electronic buying and selling

In comparison with companies from other EU countries, companies in the Netherlands performed above average in electronic purchases and sales. In 2006 this was even more true than in 2003. As far as the share of electronic selling is concerned, the Netherlands performed slightly above average in 2003, but Belgium and Germany were ahead of the Netherlands. The Dutch share was already well above the EU average in 2006, so the Netherlands caught up with Belgium and Germany. Denmark and the United Kingdom were well ahead of the other countries in both years. Norway came up fast in electronic sales, from scoring below average in 2003 to being among the top performers in 2006.

The percentage of companies in the Netherlands purchasing electronically was below the EU average in 2003, but in 2006 it was slightly above the EU average. However, companies in the Netherlands remained behind the companies in the countries in the upper right quadrant in the figure: Sweden, Germany and the United Kingdom. These were the top performers in 2003 and 2006, with Norway closing in fast in terms of electronic purchasing in 2006.

4.4.3 Companies selling electronically, international, 2003 and 2006 [1)2)]

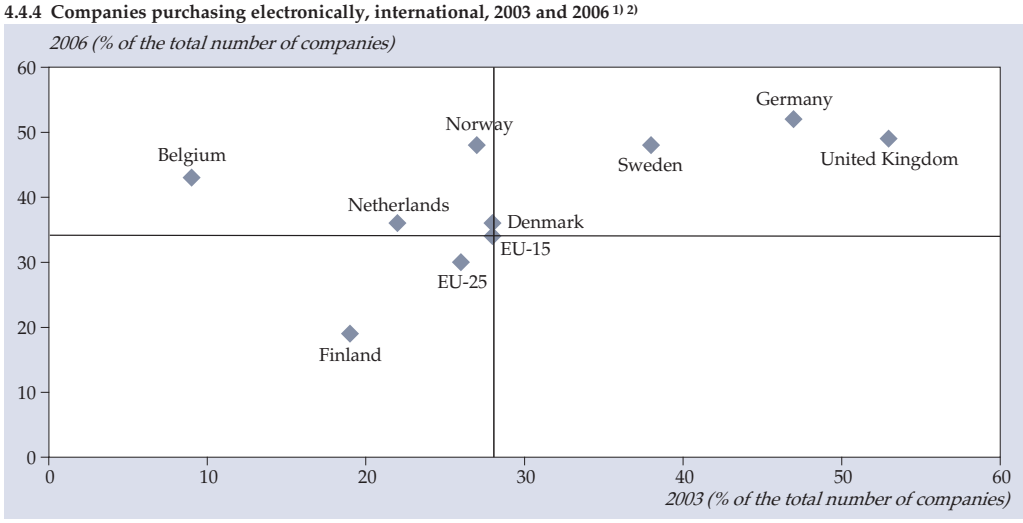


[1)] Companies with 10 or more employees.
[2)] Electronic sales of 1 percent or more of total company turnover.

Source: Eurostat.

The Netherlands is also a bit behind the best countries in Europe in terms of the turnover from e-commerce: namely Denmark, the United Kingdom and Norway. The Dutch situation in 2006 was average and comparable with Belgium and Germany.

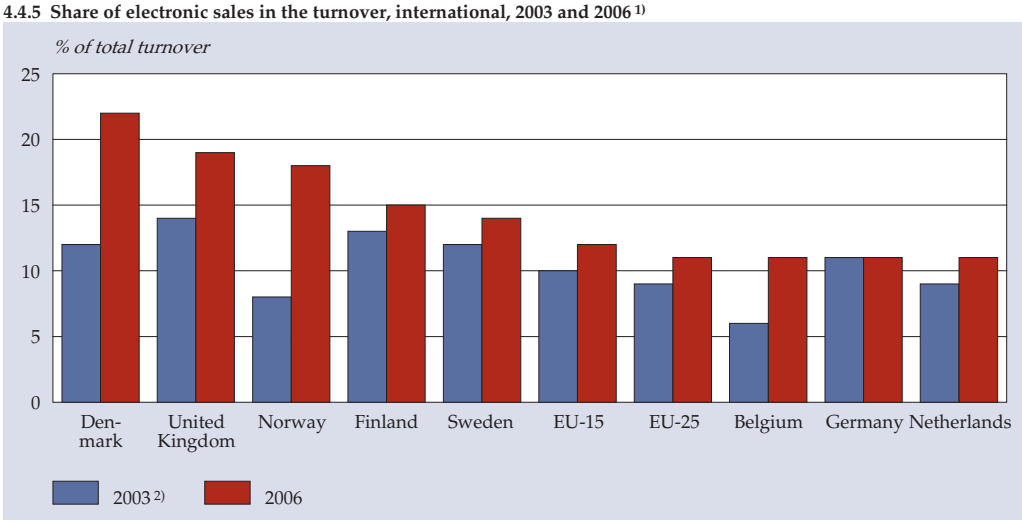
4.4.4 Companies purchasing electronically, international, 2003 and 2006 [1) 2)]



[1)] Companies with 10 or more employees.
[2)] Electronic purchases of 1 percent or more of the total company purchase value.

Source: Eurostat.

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



[1)] Companies with 10 or more employees.
[2)] Sweden: 2002 instead of 2003. EU-15: 2004 instead of 2003.

Source: Eurostat.

4.5 *Teleworking*

Good ICT applications reduce distances. Senders and receivers of electronic data do not need to be physically close, which means that concepts such as time and distance have taken on a new meaning both between companies and within a company. Communication between (multinational) company units can be just as fast as communication within a unit with a common computer network. The physical presence of individual employees in the company is often no longer required to function adequately. One condition for this is that the employees must have remote access to the internal computer network of the company, so a certain level of the ICT infrastructure is needed. Teleworking is of course not purely a matter of technical possibilities. Strategies in business economics and individual cost-benefit analyses also play a key role in a company's decision to facilitate teleworking.

Teleworking offers many advantages at many levels for various parties. Employees spend less time travelling to and from work, they can work in a more flexible and independent way, and they can combine professional work and tasks at home more easily. For an enterprise it can save office space. For society as a whole teleworking leads to less traffic, fewer traffic jams and therefore less pollution. However, teleworking is not possible or desirable for all companies or sectors, but because of the advantages it is easy to understand why this phenomenon is on the increase throughout the economy.

There are two different ways in which an employee can be connected to the company through ICT. Mobile working means that an employee has remote access to the company's computer network while working on location at clients or partner companies. With teleworking at home the employees work for the company from their own home.

Teleworking facilitated by half of all companies

By December 2007 nearly half of all companies in the Netherlands employed regular teleworkers. Major companies tend to have teleworkers: about nine in ten companies with more than 250 employees have teleworkers. But a substantial percentage of the small companies facilitates teleworking: even companies with less than 50 employees have regular teleworkers in 43 percent of the cases.

Teleworking is most common in business services and the financial sector. The highest percentage of companies with teleworkers, however, is in the sector energy and water supply: almost 90 percent. As was mentioned earlier in this chapter, this sector has relatively many large companies, which explains part of the high percentage. Still two thirds of the small companies in this sector also facilitate teleworking. Construction and hotels and restaurants lagged behind in 2007 as far as teleworking is concerned, but that is because the physical presence of many employees is absolutely necessary.

Table 4.5.1
Companies with employees who regularly work outside the company premises with access to the company's ICT systems, 2007 [1)]

	% of the total number of companies
Total	49
Sector of industry	
Manufacturing	51
Electricity, gas and water supply	89
Construction	31
Trade and repair	45
Hotels and restaurants	18
Transport, storage and communication	48
Financial institutions	75
Business activities	67
Health and social work	55
Other service activities	45
Company size	
10– 19 employees	38
20– 50 employees	51
50– 99 employees	72
100–249 employees	82
250–499 employees	87
500 and more employees	91

[1)] Companies with 10 or more employees.

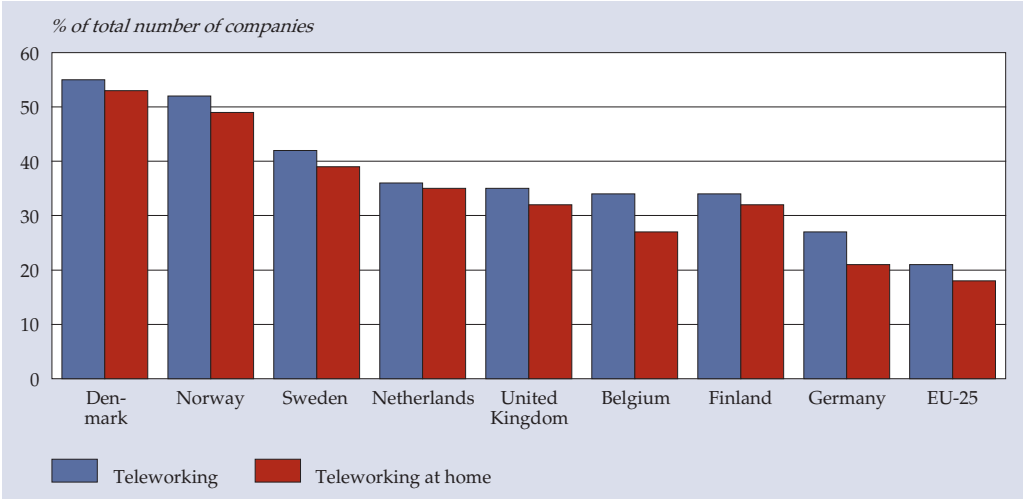
Source: Statistics Netherlands, ICT use by enterprises.

Teleworking in the Netherlands is average

The Netherlands exceeded the EU average in terms of companies that facilitate teleworking, at home or mobile. However, compared to the benchmark countries Germany, the United Kingdom and the Scandinavian countries, the Netherlands held an average position in 2005. In Denmark and Norway about half of all companies already had employees who worked outside the company unit with access to the ICT systems of the company by then. The average in the EU-25 was slightly over 20 percent.

The same picture emerges with teleworking at home. This is also slightly less common in the Netherlands than in the Scandinavian countries. In most countries the percentage of teleworking at home is barely lower than the percentage of teleworking. So when remote access to the company computer network is made possible, teleworking at home is usually supported as well. In Germany and Belgium the differences are remarkably larger. Apparently facilitating mobile work on location in these countries does not mean that it is also often used for teleworking at home.

4.5.1 Companies with employees who work outside the company premises while having access to the company's ICT systems, 2005 [1)]



[1)] Companies with 10 or more employees, excluding the financial sector.

Source: Eurostat.

Note in the text

[1)] In 2007 almost 90 percent of the internet users looked up information on goods and services on the internet. Source: Statistics Netherlands, ICT use by households and individuals.

5. ICT use by households and individuals

In the last decades various digital devices have become available to most Dutch households. In recent years mobile phones and devices providing internet access, such as the PC and laptop have become very popular. Dutch society has really gone digital.

In 2008 more than six in seven households had internet access, three quarters via a broadband connection. Mobile devices such as wireless laptops, mobile phones and palmtops are increasingly used for this, most frequently by men. The Netherlands remains an international frontrunner in the availability of ICT provisions.

Communication is still top of the list of activities by internet users. Media use via internet, such as listening to the radio or watching television online, is gaining popularity fast. Other types of communication, including chatting or participation in online discussion forums became less popular.

More and more consumers in the Netherlands order or buy goods online. Some 7.7 million people indicated that they had bought products through the internet in 2008. Their number more than doubled in six years time. More than two in three highly educated internet users were frequent online shoppers in 2008. The corresponding share was twice as high as among less well-educated internet users. Education level seems to be one of the determinants of online shopping in 2008.

Each year more people participate in the most common internet activities. However, looking up information on government websites in 2008 hardly showed any difference with 2007. In 2008, over half of the internet users indicated that they used the internet to get information on government matters. In this respect the Netherlands remains in the EU sub top.

Dealing with government matters by downloading forms and returning completed documents (e.g. tax returns) increased again in 2008. Over 65 percent of the more highly educated downloaded forms compared to 42 percent of the less educated.

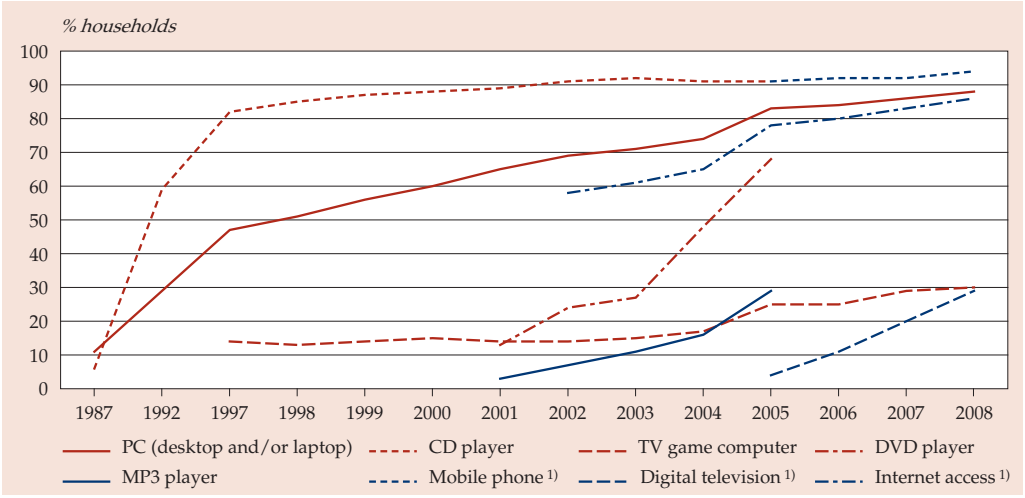
Mobile phones have become very common. More than nine in ten Dutch people aged 12–74 sometimes use a mobile phone. Men and women have an identical share. However, other studies reveal that ownership and use of mobile phones is even higher than the share just mentioned, but these studies tend to refer to a different population. These studies often do not include people under 18 and over 65 (Chapters 3 and 8 provide more data on mobile phones). Only 10 percent of the users use the mobile phone for internet access. The other applications are also used sparingly, such as mailing photos, reading email and putting films and photos made with the phone on the internet.

5.1 *ICT provisions in households*

Information and communication technology (ICT) have become an integral part of Dutch society. The fact that society has gone digital has left its mark on the private sphere, the household. More and more households possess modern information and communication media and apply them more and more intensively (figure 5.1.1). This paragraph deals with ICT ownership and the use of devices providing internet access, and reasons why certain individuals and households do not use these modern provisions. In addition, the Dutch performance in ICT is placed in an international perspective.

The data on Dutch households and individuals come from the annual study on ICT use by households and individuals. In this study over four thousand people aged 12–75 are interviewed.[1)]

5.1.1 Digital devices in households, 1987–2008 [1)]



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

Source: Statistics Netherlands, Socio-economic panel survey 1987–2002, Budget survey 2003–2004, ICT use by households and individuals, 2005–2008.

PC and the internet common

PC ownership (desktops and laptops) has become common in the Netherlands. Around the turn of the century PC ownership increased considerably and this trend has continued ever since. In 2003 over three quarters of the households owned a PC. In 2008 this had increased to 88 percent. Table 5.1.1 shows this situation, which involves almost nine in ten households – total 5.7 million – encompassing 11.8 million individuals. This means that the share of individuals with access to a desktop and/or laptop at home increased by 2 percent points in 2008 to 92 percent (90 percent in 2007).

Table 5.1.1
ICT provisions of households and individuals, 2002–2008

	2002	2003	2004	2005	2006	2007	2008	2006	2007	2008
	% households							*absolute (x 1 mln)*		
Households[1)]								6.6	6.6	6.5
PC (desktop/laptop)	76	76	80	83	84	86	88	5.5	5.7	5.7
Internet access	63	65	71	78	80	83	86	5.3	5.4	5.6
Broadband internet connection	15	22	34	54	66	74	74	4.3	4.8	4.8
Other internet connection	48	43	36	24	14	9	12	0.9	0.6	0.8
	% individuals							*absolute (x 1 mln)*		
Individuals[2)]								12.8	12.8	12.9
PC (desktop/laptop)	81	82	85	87	88	90	92	11.3	11.6	11.8
Internet access	69	72	77	83	85	88	91	10.9	11.3	11.7
Broadband internet connection	17	26	39	59	71	79	78	9.1	10.1	10.0
Other internet connection	51	46	37	23	14	9	13	1.8	1.2	1.6

1) Private households with at least one person aged 12–74.
2) People aged 12–74 in private households.

Source: Statistics Netherlands, POLS, 2002–2004 and ICT use by households and individuals, 2005–2008.

Internet access in 2008, among both households and individuals, was at about the same level as PC ownership. Internet access grew faster than PC ownership, but PCs predated the internet. Some 63 percent of the households had internet in 2002. This had increased to 86 percent by 2008. This means that 5.6 million households, encompassing 11.7 million individuals, had internet access.

Expansion of broadband stopped

Three quarters of the Dutch households had broadband internet in 2008. This means that almost eight in ten people could use this type of high-speed internet at home. Broadband internet has expanded tremendously since the turn of the century. In 2002 just 15 percent of the households had broadband access. In 2008 there had been more than a fivefold increase.

The explosive growth of broadband internet has now come to a halt, which is logical. Few households had broadband internet right after its introduction, leaving plenty of room to grow. In 2008 there was considerably less room to grow. So in 2008 the percentage of households with broadband internet did not increase on the previous year and the saturation point seems to have been reached. The extended access of broadband internet among households and individuals has also had its consequences for the slower types of internet. Just one in ten households still uses an analogue telephone line for internet (or has one available).

Over half use a laptop with internet access

In 2008 the share of households that went online with a laptop increased. This came at the expense of internet access through desktop computers. In 2008 some 54 percent of the households with internet had a laptop with internet access, compared to 42 percent in 2007 (table 5.1.2). The share of households with internet access at home who use a desktop computer to gain internet access has fallen from 89 to 84 percent. Households also use other devices: mobile phone, game computer, palmtop or television could provide internet access in almost 30 percent of the households with internet in 2008.

Table 5.1.2
Devices providing households with internet access, 2005–2008 [1)]

	2005	2006	2007	2008
	% households with internet			
Desktop computer	93	91	89	84
Laptop computer	27	32	42	54
Mobile telephone	12	13	19	22
Palmtop computer	3	4	5	5
Game computer	1	1	4	7
Television with set top box	0	1	3	4

[1)] Private households with at least one person aged 12–74. More than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2008.

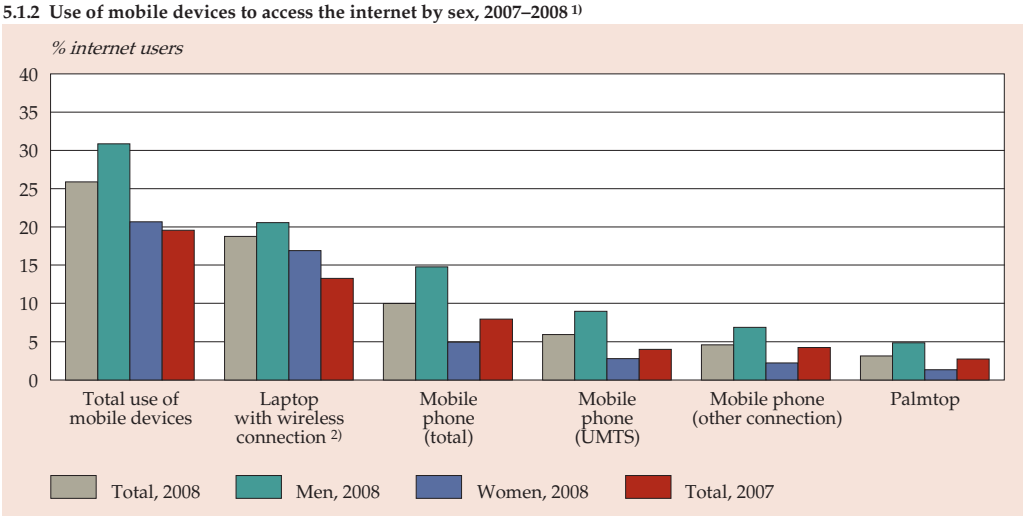
Mobile internet access up

More than a quarter of the internet users in 2008 sometimes used a mobile device to gain internet access. This is over five percent points more than in 2007. The most popular device is a laptop with wireless access: 19 percent of the internet users regularly use a laptop to go online outside the home or workplace (figure 5.1.2). This has increased by more than five percent points since 2007. Mobile phones also increasingly provide internet access. In 2008 one in ten internet users made use of this option. About 3 percent goes online with a palmtop.

More men than women use these kinds of mobile internet devices just described. Almost a third of the men on the internet use mobiles to go online, compared to 21 percent of the women. Both shares are up on 2007, when the shares were almost a quarter and 14 percent.

There is also a difference between working and non-working people in the extent to which they use mobile internet. About 29 percent of the internet users with paid

5.1.2 Use of mobile devices to access the internet by sex, 2007–2008 [1)]



1) People aged 12–74 who used the internet in the three months before the survey; more than one answer possible.
2) Use outside home or work.

Source: Statistics Netherlands, ICT use by households and individuals, 2007–2008.

work used mobile devices for internet in 2008. It is considerably less among non-working people: 17 percent. Using a palmtop to go online is almost non-existent among the non-working population, while 4 percent of the working population does use such a device.

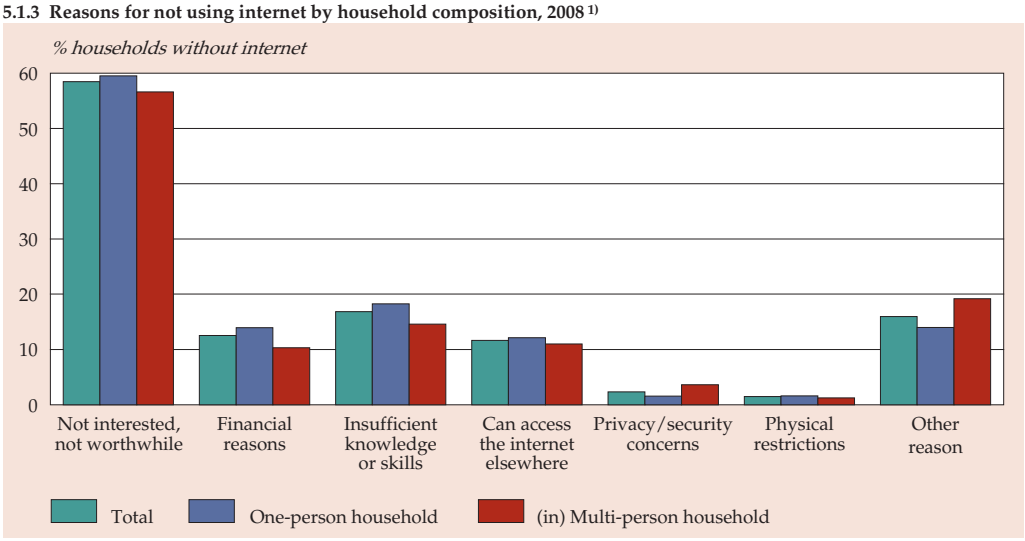
A million households without internet

Almost 1 million households, encompassing about 1.2 million individuals, had no internet access in 2008. So these are mainly singles. Figure 5.1.3 shows that most of these households do not think internet access is useful for them, are not interested in internet, or do not want it. Almost one in seven one-person households without internet indicated that this is for financial reasons. This share is one in ten in multi-person households. Singles also indicate more often than individuals in multi-person households that they have insufficient knowledge or skills, and that they can use the internet elsewhere. Relatively few households mentioned being worried about their privacy and/or safety or physical limitations as their reason not to have internet.

The Netherlands frontrunner in computer ownership and internet access

In terms of computer ownership and internet access, the Netherlands has been a frontrunner in the European Union. In 2007 some 86 percent of the households in the Netherlands owned a computer, and 83 percent of the households had internet access at home.[2)] Over 80 percent of the households in Sweden and Denmark had one or more personal computers as well. The EU average was almost two thirds.

5.1.3 Reasons for not using internet by household composition, 2008 [1)]

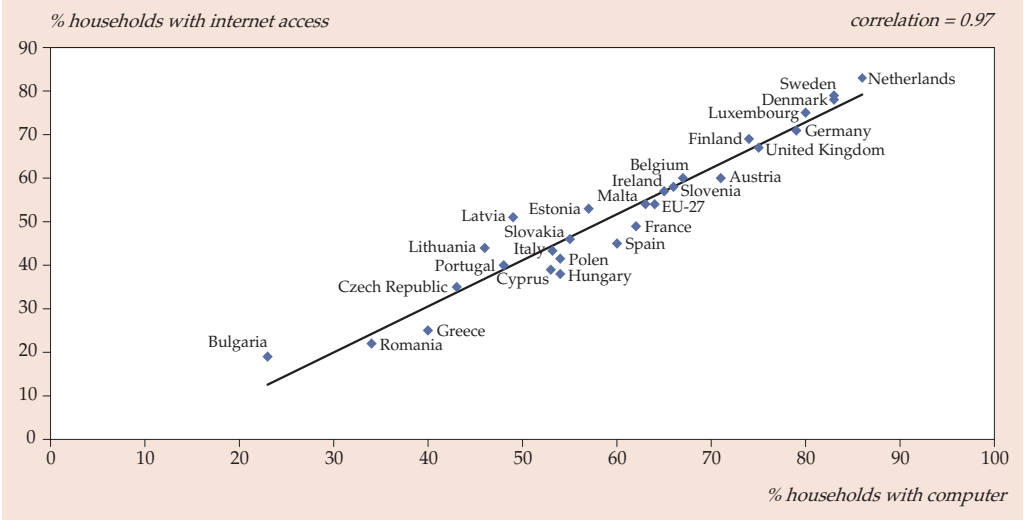


[1)] Private households with at least one person aged 12–74.

Source: Statistics Netherlands, ICT use by households and individuals, 2008.

This indicates that there are great differences within the EU in the computer ownership of households. In eastern and southern Europe, ownership is much lower. Only a third of the households in Romania own a computer. In Bulgaria this is less than a quarter. Computer ownership in households is highest in north-western Europe. In 2007 households in these countries also had the greatest internet access.

5.1.4 Computer ownership and internet access in the EU, 2007 [1)]



[1)] People aged 16–74.

Source: Eurostat.

Here too the Netherlands occupied first place, followed by Sweden and Denmark. There is a strong correlation between computer ownership and internet access in households.

5.2 *Activities and services on the internet*

In Chapter 7 we will see that Dutch people have become more skilled in the use of computers and the internet. These skills are of course not unrelated to the use of the internet itself. This paragraph discusses internet use by individuals. The survey by Statistics Netherlands includes questions about various internet activities. Online shopping is described in the next paragraph, however, because of the economic importance of the activity.

Communication most important

Communication was and is the most important internet activity, also in 2008. Almost all internet users communicate in one way or another through this medium (see table 5.2.1). Communication mainly takes place by email (94 percent). One in four communicates with chatting. This share is now significantly lower than in the previous three years when four in ten internet users chatted. This development is due to the rise of instant messaging. Phoning through the internet – directly or indirectly via internet plus – fell by 5 percent points to 21 percent. After a sharp increase in 2007 – double on 2006 – it fell in 2008. However, the questions in the Statistics Netherlands survey about phoning through the internet in 2007 did not take into account that internet plus phoning was rising fast, which makes it hard to compare 2007 and 2008.

Men and women communicate online in equal numbers. This is also true for email, chatting and phoning. The age of the internet users influences the way they communicate online. The percentage of chatters among young people is much higher than among older people. Although chatting loses popularity as a means of communication, in 2008 over half the internet users aged 12–24 chatted. Almost everybody uses email.

Information, services and entertainment

In 2008 nine in ten internet users looked up information online. Over half played or downloaded games (65 percent) and used the internet for travel services (55 percent). The latter stabilised in comparison with 2007 and these services are mainly used by people aged 25–64.

Downloading or reading newspapers or magazines is still on the increase: in 2008, almost half of the internet users have looked at newspapers or magazines online (47 percent); in 2005, this was close to a third (35 percent). The increase occurs in all age groups but particularly in the 25–44 age bracket. Online news meant fewer

newspaper subscriptions. Therefore publishers have started offering 'digital subscriptions' where the subscriber gets the paper at home (usually just in the weekends) and has access to digital newspapers or magazines as well.
Internet is also used more and more for listening to the radio and watching television. Some 52 percent of the internet users did so in 2008, twice as many as in 2005. Young people use these services most.

Table 5.2.1
Activities of internet users, 2005–2008 [1)]

	2005	2006	2007	2008
	%			
Communication				
Emailing	92	93	94	94
Phoning via the internet[2)]	6	12	26	21
Other, e.g. visiting chatrooms	40	40	35	27
Information and entertainment				
Looking for information on goods and services	87	88	89	86
Playing or downloading games, images or music	50	55	56	65
Using travel services	49	50	54	55
Downloading or reading newspapers	35	43	45	47
Downloading software	27	31	34	37
Listening to the radio or watching television	26	35	42	52
Applying or looking for a job	19	22	21	18

[1)] People who used the internet in the three months before the survey; more than one answer possible.
[2)] The questions in 2008 differ from those in 2007.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2008.

The share of internet users looking or applying for a job online in the 3 months preceding the annual survey by Statistics Netherlands fell slightly in 2008. Women used the internet a bit more for job applications than men did. This is of course also influenced by the extent to which men and women are looking for jobs.

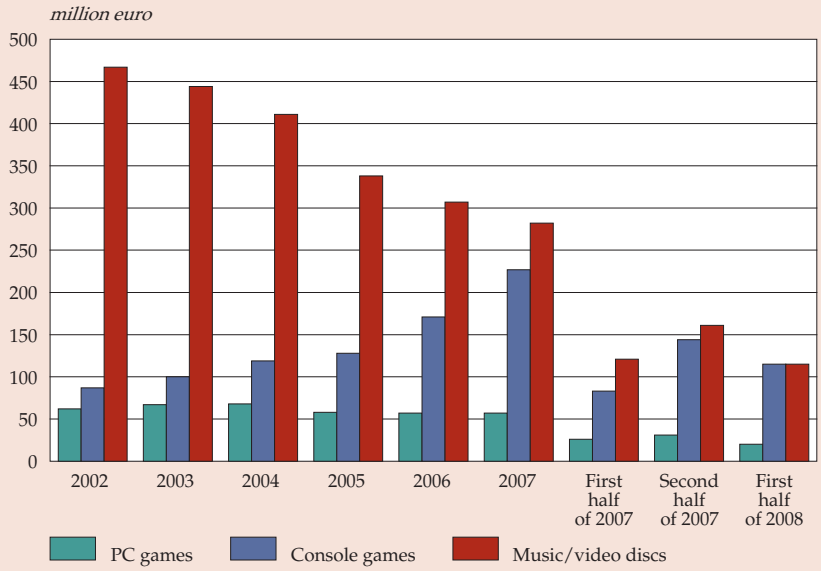
The rise of the internet means that people do not need to leave their home as often for services. Financial transactions with banks or other financial institutions, and arranging services by the government or other service providers, can easily be done online. The internet is also increasingly used for buying and selling goods. We will look mainly at online financial transactions and sales in this paragraph. In paragraph 5.3 we will look into buying goods and service contacts with the government.

Dutch gaming market surpasses music market

Gaming is becoming more and more popular in the Netherlands. This is mainly because of a new generation of consoles, such as the Xbox360, PS3, Wii, and handhelds like the PSP and DS. The total expenditure on computer and console games nearly doubled within five years, going from € 148 to € 284 million. The market grew by 25 percent in 2007 on 2006, so that expenditure on gaming in 2007 outstripped the music market (sound recording media) of € 282 million.

Growth in the gaming market mainly came from consoles. 2007 was a successful year for selling hardware, consoles and handhelds, with a 60 percent increase to almost a million units. The units sold translated into more expenditure on console games. The market for PC games has been slowing down steadily for several years. This trend of more console and less PC games seems to be continuing in the first six months of 2008.

Development of the market in games, 2002–2008



The expenditure refers only to Dutch wholesale companies, and the retailers known by the NVPI. Total expenditure is probably higher than the € 284 million mentioned because it is not yet possible to monitor online expenditure. Expenditure on Xbox Live, Playstation store, online subscriptions or other download services for gaming on PCs etcetera have therefore not been included.

Source: GfK Benelux Marketing Services, NVPI and PriceWaterhouseCoopers.

Online banking widely accepted

Online banking is a service that rapidly became widely accepted thanks to the internet. Table 5.2.2 shows that in 2008 almost three quarters of all internet users engaged in online banking. This is 2 percent points higher than in 2007 and 16

percent points more than in 2005, so the growth rate is slowing down. Over half of the internet users under 25 engage in online banking. The share is also well over 50 percent among people over 65. In the age bracket in between, the share is over 80 percent.

Apart from online banking, people also carry out other financial transactions through the internet, for example buying shares. Some 8 percent of the internet users did so in 2008. This percentage is hardly different from the three previous years, so this activity seems to be undertaken by a particular group only. More men than women, more highly educated people and more people aged 45–65 buy shares. These groups tend to have most financial means.

Table 5.2.2
Use of the internet for financial services and the sale of goods or services, 2005–2008 [1)]

	Online banking				Financial services			
	2005	2006	2007	2008	2005	2006	2007	2008
	%							
Total	58	67	72	74	5	8	7	8
Aged 12–25	40	49	54	56	2	3	4	5
Aged 25–45	69	78	83	85	5	9	8	8
Aged 45–65	59	70	75	76	7	11	10	11
Aged 65–75	47	55	53	63	4	7	7	9

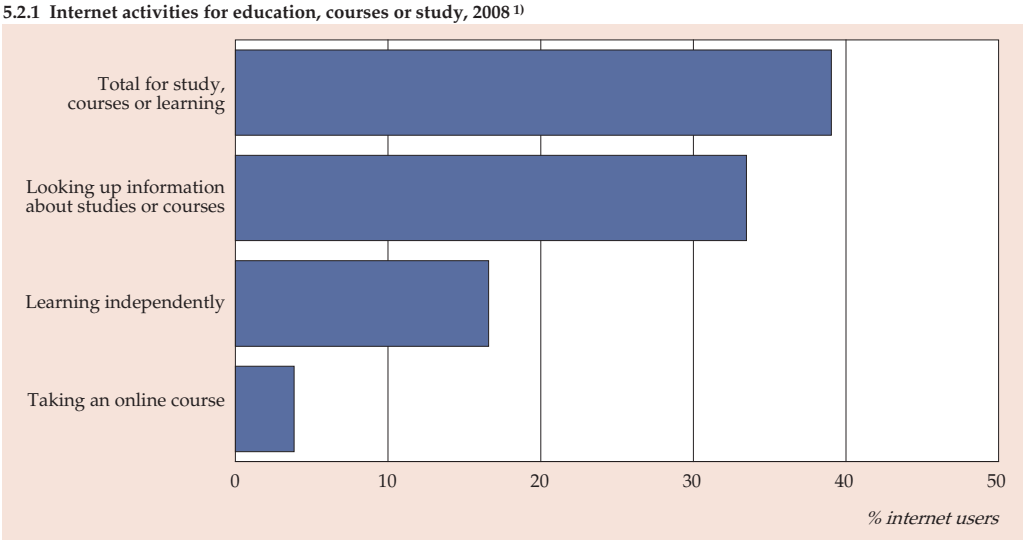
[1)] People who used the internet in the three months before the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2008.

Internet and learning

In education, institutes provide more and more information about their courses online. In some cases students can take the courses online (e-learning, see also Chapter 6). Internet has a major role in education, both in taking courses and in getting information about them. This is shown by the fact that in 2008 four in ten internet users engaged in education-related internet activities (figure 5.2.1). Internet is mainly used to look up information, but the internet can also be used for self-study; some 17 percent of the internet users indicated that they learned this way in 2008. Here too the younger internet users form the majority. Taking online courses is less widely accepted. Only four percent of the internet users say they are taking or have taken online courses.

5.2.1 Internet activities for education, courses or study, 2008 [1)]



[1)] People who used the internet in the three months before the survey; more than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2008.

Diversity in internet activities

Almost twelve million people in the Netherlands regularly use the internet. There are great differences in the extent to which they carry out activities though. A large group uses the internet for a very limited number of activities.

Statistics Netherlands distinguishes ten common types of internet activities:

- Communication, including email, chatting and phoning;
- Looking up product information and using travel services;
- Tracking the news, including listening to the radio, watching television, reading or downloading newspapers;
- Entertainment, including playing games, listening to music or downloading other software;
- Looking or applying for a job;
- Financial transactions, including online banking;
- Online buying and selling;
- Governments services, including looking for information on government websites, downloading and mailing official documents;
- Education, including course-related activities, such as looking for information about courses, taking an online course or self-study online;
- Looking up information on health.

Increasing internet use tends to lead to more diversity in use, that is that people engage in more different activities. Diversity is still increasing. In 2008 two million internet users undertook seven different internet activities (table 5.2.3). So the group with a diverse use of the internet is increasing in size, and the more limited use of the

internet is decreasing. The absolute number of internet users engaging in just one or two internet activities is falling. The figure also shows that age and diversity correspond negatively: the more activities, the lower the average age. There is more information on this topic in the statistical annex (www.cbs.nl/digital-economy).

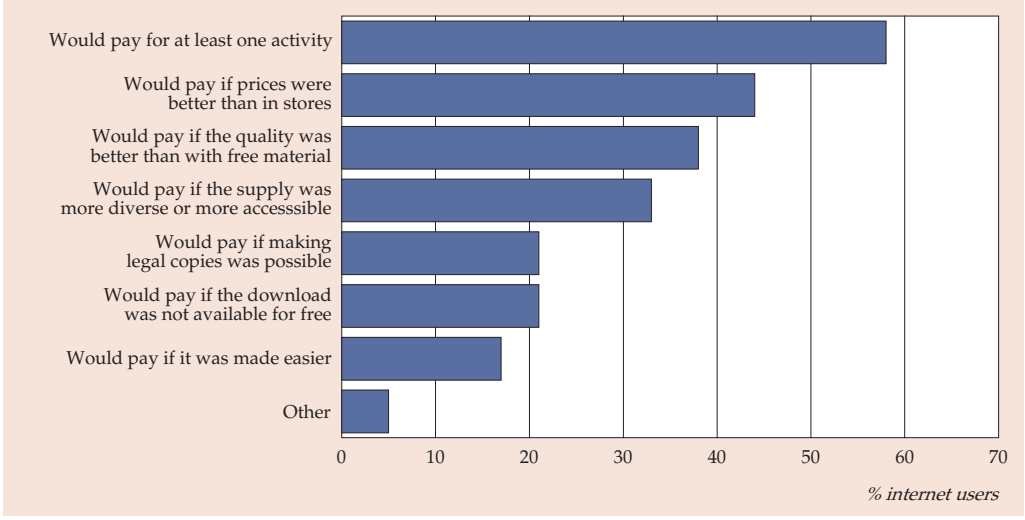
Table 5.2.3
Diversity of internet activities, 2005–2008 [1)]

Number of internet activities	Number of internet users				Share of internet users			Average age of internet users
	2005	2006	2007	2008	2006	2007	2008	2008
	absolute (x 1 mln)				*% cumulative*			*years*
1	0.4	0.3	0.2	0.2	3	2	2	49
2	0.6	0.5	0.5	0.4	7	6	5	44
3	1.0	0.7	0.7	0.8	14	13	13	39
4	1.5	1.1	1.1	1.1	24	23	22	39
5	1.6	1.7	1.5	1.4	41	36	35	39
6	1.5	1.7	1.8	1.8	57	53	51	38
7	1.6	1.8	1.8	2.0	75	70	69	39
8	1.2	1.5	1.6	1.8	90	85	85	37
9	0.6	0.8	1.2	1.3	97	96	96	37
10	0.2	0.3	0.4	0.4	100	100	100	37
total	10.3	10.4	10.9	11.2				39

[1)] People who used the internet in the three months before the survey; more than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2008.

5.2.2 Conditions to pay for downloading images and sound, 2008 [1)]



[1)] People who used the internet in the three months before the survey; more than one answer possible.

Source: Statistics Netherlands, ICT use by households and individuals, 2008.

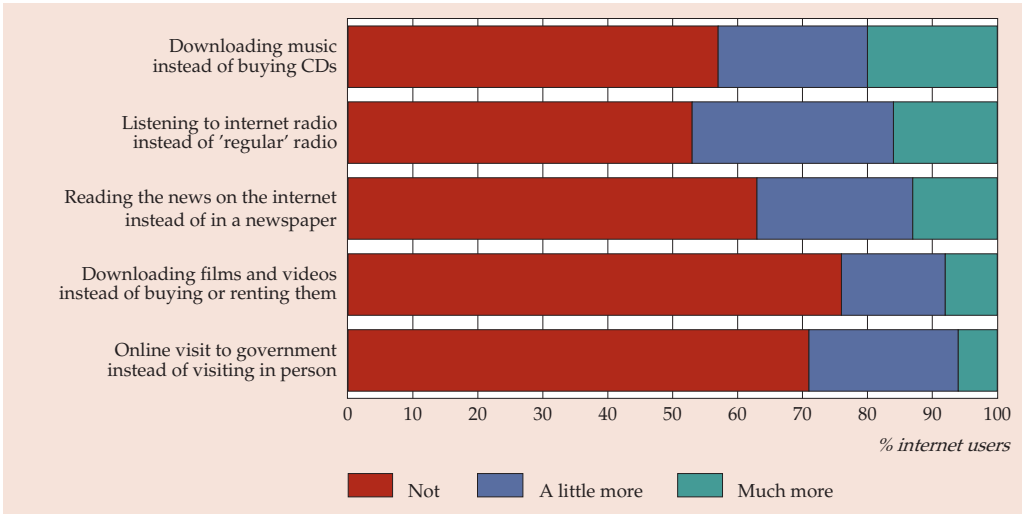
Scarcely willing to pay for downloads

Internet users can download video or audio for free or for a fee. Only two in ten who do so for free are willing to pay a fee if it would be easier to pay (17 percent, figure 5.2.2). Some 44 percent would be willing to pay if the price was better than the price in physical stores. This willingness hardly depends on the download frequency.

Change in buying behaviour

Internet can change the way activities are carried out, for example in how goods and services are bought. In the Statistics Netherlands study people were asked if this was the case in several activities. Figure 5.2.3 shows that one in five internet users downloads music instead of buying CDs. This is mainly done by people aged under 25. Internet users also listen more to internet radio instead of the 'regular' radio. The same is true for reading news.

5.2.3 Activities of internet users, 2008 [1)]



[1)] People who used the internet for internet activities in the three months before the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2008.

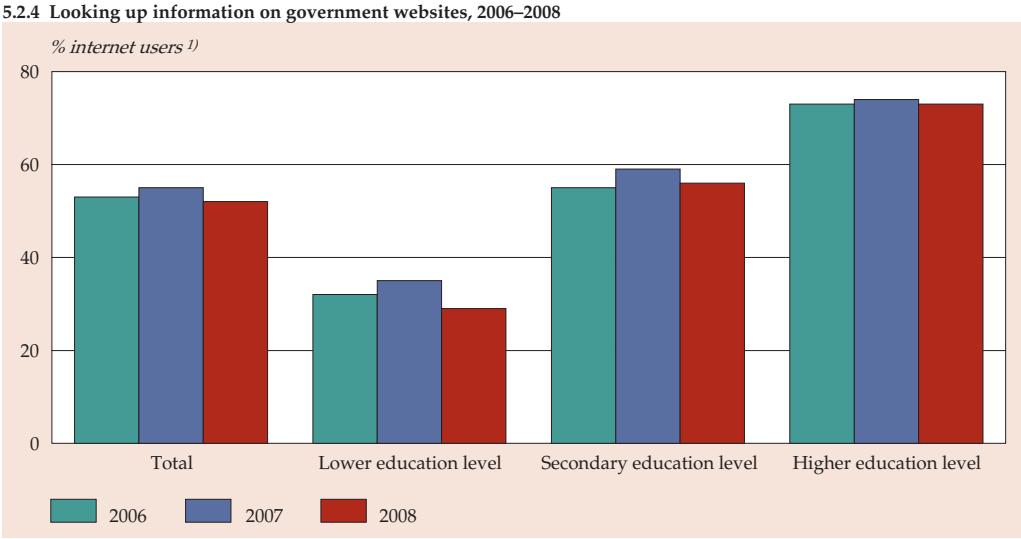
Two thirds visit government websites

Dutch government offers more services online to its citizens (see also paragraph 6.1, on e-government). Citizens can obtain information and download documents in this way. Government can inform the public relatively cheaply and the citizens can use these services when they want to.

Looking up information on government websites has been stable in recent years. In 2008 some 52 percent of the internet users looked up information on government websites in the three months prior to the Statistics Netherlands study. In 2007 and 2006 this was 55 and 53 percent. One in ten internet users looked at government

websites in the 12 months prior to the Statistics Netherlands study. So in total almost two thirds of the internet users looked at information at these sites in the year before the survey.

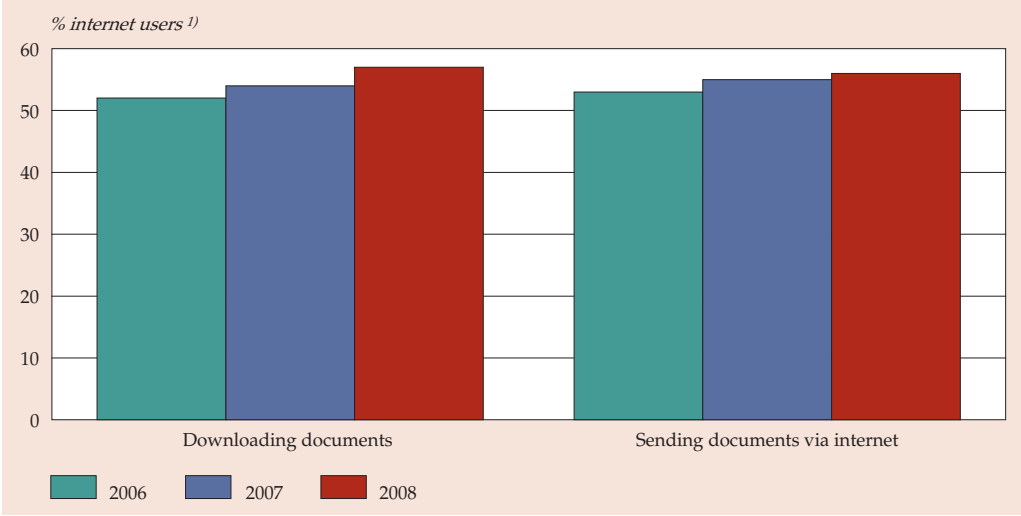
5.2.4 Looking up information on government websites, 2006–2008



1) People who used the internet to visit a government website in the three months before the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2006–2008.

5.2.5 Use of e-documents by visitors of government websites, 2006–2008 1)



1) People who used the internet to visit a government website in the three months before the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2006–2008.

Education level plays a role in visiting government sites, because almost three quarters of the highly educated did so – which is considerably more than among the less educated (three in ten). The ratio between men and women is also skewed in this respect: 59 versus 45 percent.

Over half of the internet users looking for information on government websites in 2008 downloaded documents from these sites. Almost as many internet users returned the completed forms to the government body online. The internet therefore seems to have become a major tool in exchanging documents with the government (see also the role of DigiD in paragraph 6.1). Here too relatively more highly educated people used the internet. Over 65 percent of them downloaded official documents, compared to 42 percent of the less educated people.

5.3 *Online shopping*

In this paragraph we examine online shopping behaviour of individuals. The issues are: developments in online shopping, the types of purchases, and the characteristics of online consumers. We also looked at the online sales of goods and services by internet users.

Diminishing growth in the number of online shoppers

Online shopping by individuals rose sharply in the period 2002–2005; after this the growth rate slowed down. In 2008 some 7.7 million people could be considered online shoppers. The picture is comparable to the developments described earlier with the ICT hardware: initially it grew fast, later it slowed down. Someone who orders online is already considered an online shopper, because paying online is not the criterion used. The buying frequency is not relevant either.

Online shoppers can be divided into frequent and infrequent online shoppers. Frequent online shoppers are defined as internet users who bought something on the internet within the three months prior to the Statistics Netherlands survey. Infrequent online shoppers did their shopping more than 3 months before. Of the total group in 2008, 67 percent consisted of frequent online shoppers. The increase in the number and the share of internet users buying online can be contributed almost entirely to the group of frequent online shoppers. The number of people who do not shop online fell from 5.3 million in 2002 to 3.7 million in 2008. So online shopping has become a well-established internet activity in recent years.

Online shopper profile: highly educated man aged 25–44

In 2008 over half of the male internet users were frequent online shoppers versus 43 percent of the women. These sex differences stabilised in recent years. There are also differences in internet use based on age and education level (see figure 5.3.1). The latter is a key profile aspect of the online shopper. [3)]

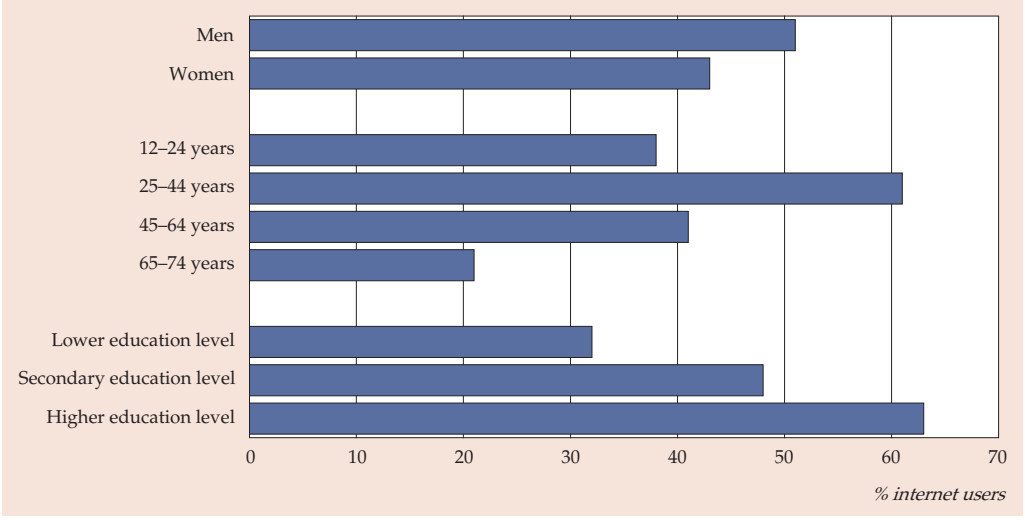
Table 5.3.1
Online shopping, 2002–2008 [1)]

	2002	2003	2004	2005	2006	2007	2008
	absolute (x 1 million)						
Online shopper	3.6	4.2	5.1	5.9	6.6	7.5	7.7
Frequent online shopper	1.9	2.2	2.9	3.9	4.5	5.3	5.4
Infrequent online shopper	1.7	2.0	2.2	2.0	2.1	2.2	2.4
No online shopper	5.3	5.1	4.7	4.8	4.2	3.8	3.7
Total	8.9	9.2	9.8	10.7	10.9	11.3	11.5
	%						
Online shopper	40	45	52	55	61	66	67
Frequent online shopper	21	24	30	36	41	47	47
Infrequent online shopper	19	22	23	19	20	19	21
No online shopper	60	55	48	45	39	34	33
Total	100	100	100	100	100	100	100

[1)] People aged 12–74 using the internet. Frequent online shoppers shopped online in the three months before the survey. Infrequent shoppers did so more than three months before.

Source: Statistics Netherlands, POLS, 2002–2004 and ICT use by households and individuals, 2005–2008.

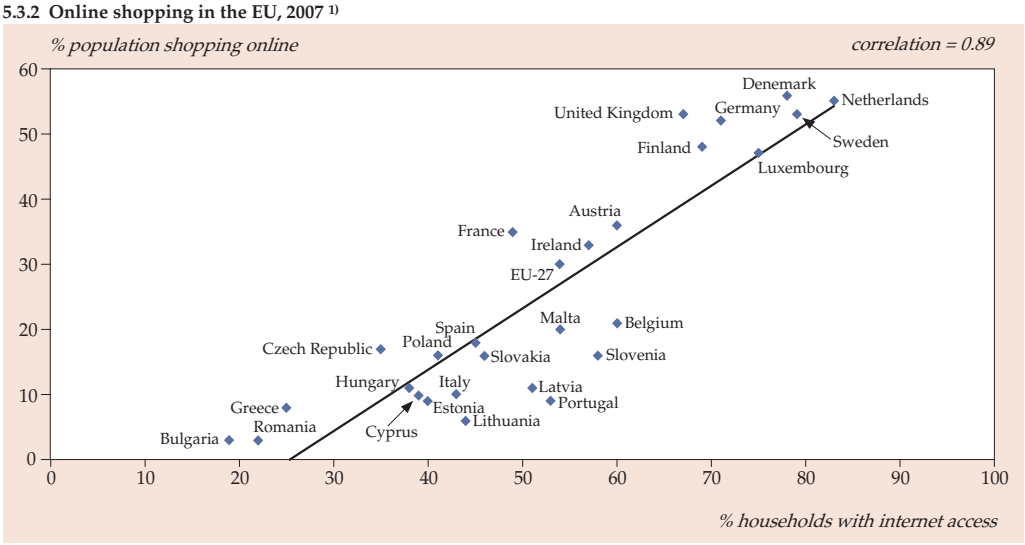
5.3.1 Frequent e-shoppers by personal characteristics, 2008 [1)]



[1)] People who bought online in the three months before the survey.

Source: Statistics Netherlands, ICT use by households and individuals, 2008.

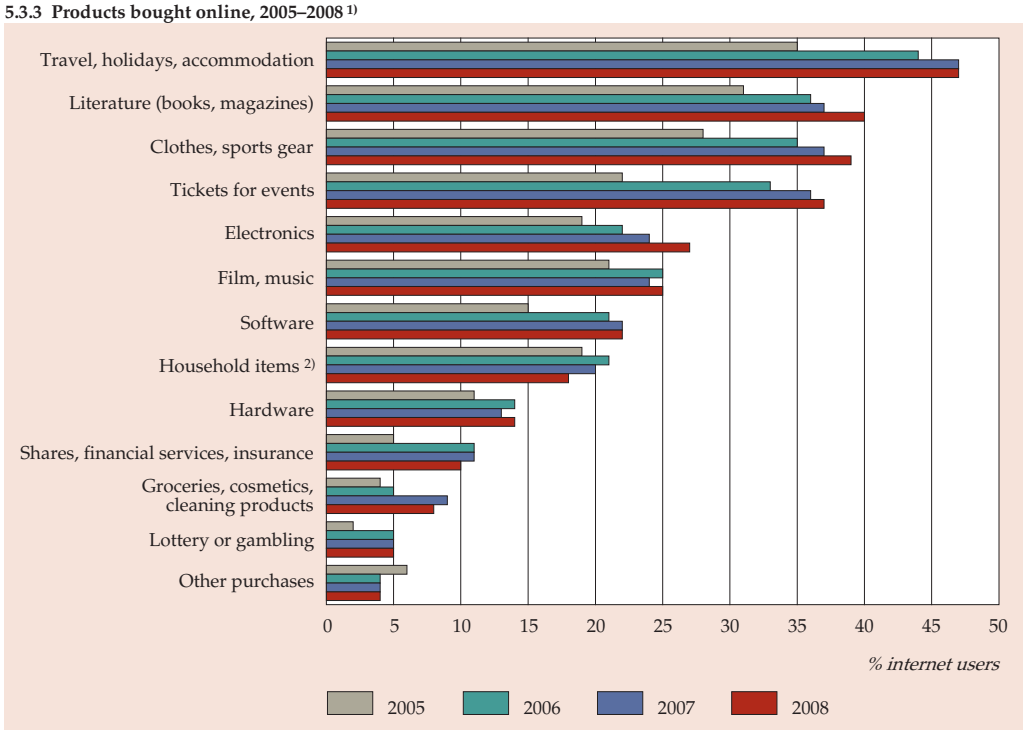
5.3.2 Online shopping in the EU, 2007 [1)]



[1)] People aged 16–74 who shopped online in the twelve months before the survey.

Source: Eurostat.

5.3.3 Products bought online, 2005–2008 [1)]



[1)] Internet users who bought products online in the three months before the survey.
[2)] E.g. furniture, washing machines, toys.

Source: Statistics Netherlands, ICT use by households and individuals, 2005–2008.

The Netherlands top EU online shopper

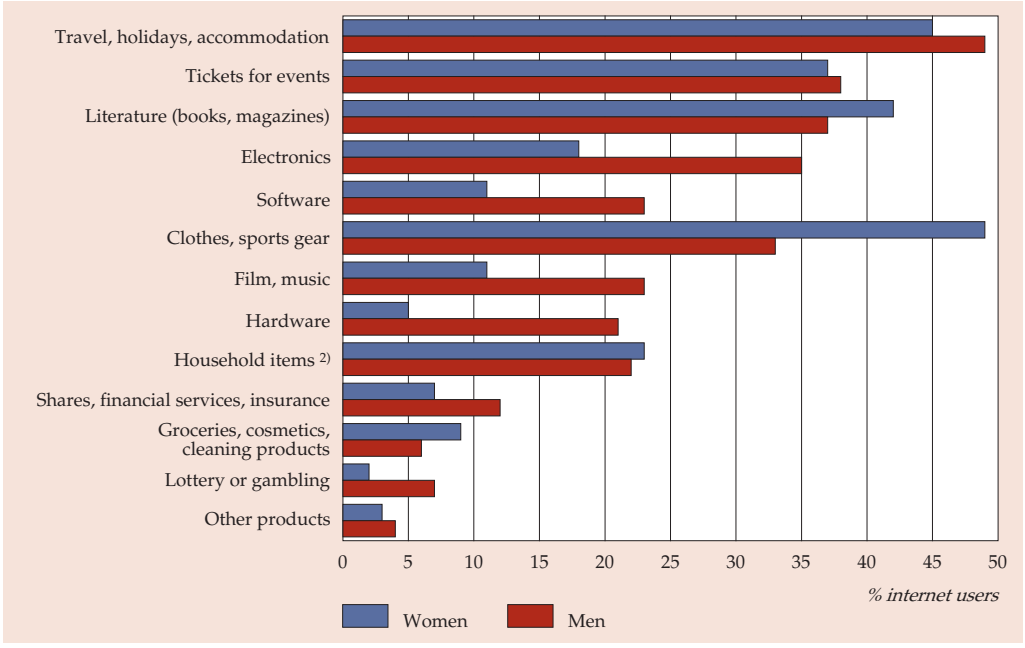
Online shopping seems to be most widely accepted in the Netherlands, Sweden and Denmark. Figure 5.3.2 shows this and it also contains an axis showing the extent of internet access by households. A second conclusion is the strong link between the two. This link is manifest at the European level as well. The larger the share of households with internet access, the larger the share of online shoppers. The figure includes data on 2007, because the European figures on 2008 were not yet available when this edition was written.

Trips, holidays and accommodations favourite purchases

Most purchases involve trips, holidays and accommodations – in 2008 almost half of the frequent online shoppers bought them. This was followed by literature, and clothes and sports gear. The latter category and the category tickets for events have been growing fast for some years.

All goods are bought by men and women, but there are clear differences. This has been the case for years. More men than women buy electronics, software or hardware online. More women than men buy clothes and sports gear. In 2008 more women bought books and magazines than men did.

5.3.4 Products bought online by sex, 2008 [1)]



1) Internet users who bought products online in the three months before the survey.
2) E.g. furniture, washing machines, toys.

Source: Statistics Netherlands, ICT use by households and individuals, 2008.

Do internet purchases come at the expense of physical purchases? Is one channel just substituted for another or does the population consume more in total (or less)? *The Digital Economy 2007* included a contribution in the Capita Selecta by the Netherlands Institute for Spatial Research (RPB) that looked into the consequences of online shopping for the retail trade.

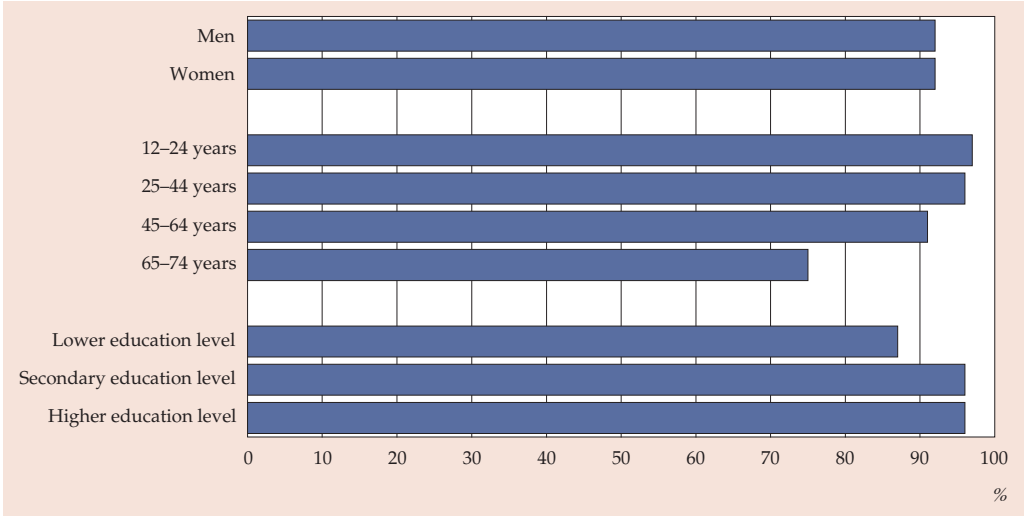
Online sales up

More and more internet users sell goods themselves online. This market is called the C2C market (consumer to consumer). In the previous chapter and in this one we only look at the B2C market (business to consumer). Capita Selecta 8.4 also includes information about a specific part of the C2C market: online car sales by individuals.
In 2008 almost three in ten internet users sold goods online. Online sales by internet users have grown steadily: the 2005 figure was just 16 percent. One in three online sellers is between 25 and 45 years old.

5.4 *Mobile telephone*

Mobile phones have become an integral part of society. In 2008 over nine in ten people indicated that they sometimes use a mobile phone. Older people make less use of mobiles: three quarters of the people aged 65–75 sometimes use a mobile phone. People without a paid job also use it less often: 83 percent compared to 96 percent of people with paid jobs.

5.4.1 Use of mobile phone by personal characteristics, 2008 [1)]



[1)] Population aged 12–74 jaar.

Source: Statistics Netherlands, ICT use by households and individuals, 2008.

Internet with the mobile mainly via subscriptions

Despite the fact that almost everyone uses a mobile, it was still rarely used to access the internet in 2008 (table 5.4.1). Only one in ten mobile phone users did so. These data refer to the use of the internet for private purposes in the three months prior to the Statistics Netherlands survey.

A mobile phone that has accessed the internet is usually one with a subscription. About 14 percent of the mobile phone users with a subscription accessed the internet with the mobile phone in 2008. Among prepaid mobile phone users, this is just 3 percent.

Men, young people and the highly educated access the internet via mobiles most. So this profile closely resembles that of the online shopper, as shown in the previous paragraph. It is also common among the highly skilled internet users.

Phoning over the internet competitor for other telephone services

Phoning over the internet can be done with and without the computer. More detailed information about such internet applications is included in Chapter 3.

Table 5.4.1
Use of internet via the mobile telephone, 2008 [1)]

	2008
	%
Total	10
Sex	
Men	15
Women	4
Age	
12–24 years	15
25–44 years	12
45–64 years	6
65–74 years	2
Education level [2)]	
Low level of education	7
Intermediate level of education	10
High level of education	13
Internet skills	
No skills	1
Few skills	5
Average skills	13
Many skills	24

1) Percentage of mobile telephone users within the population aged 12–74.
2) Highest education level attained.
3) The measurement of skills is explained in paragraph 7.4.

Source: Statistics Netherlands, ICT use by households and individuals, 2008.

More than two in ten internet users phoned through the internet in 2008, with or without computer. More than one in ten of this group indicated that they made less use of their mobile phone because of this. However, there is a much larger shift in the opposite direction, from phoning via a regular landline to phoning through the internet. Over three in ten people phoning through the internet make less use of a regular landline.

Phoning main application

Currently mobile phones can do much more than just phoning. Many can be used to send photos or films, read email or navigate. Some can be used to pay and to receive information, for example sports news. Almost seven in ten mobile phone users never used these options in 2008. So the telephone is still used most for the purpose for which it was intended: making phone calls. The most popular functionality turns out to be sending photos and/or films; about 17 percent sent photos or films for private purposes, followed by reading emails (9 percent), placing photos and/or films on the internet with the telephone (7 percent) and receiving messages by paid information services (6 percent).

Notes in the text

1) In the ICT survey of households and individuals, carried out by Statistics Netherlands since 2005, only individuals aged 12–74 are interviewed. ICT outcomes about 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 were in the POLS survey. The sample size of the new ICT survey is more than 4,000 individuals, which is smaller than the sample size in earlier POLS surveys. For this edition we made the data on 2002–2004 comparable at the individual level by recalculating them for the population aged 12–74. We did not fully correct for comparability at the household level. The ICT survey on households and individuals is carried out within a European framework where all member states ask comparable questions. So the Dutch results can be compared with those of the other member states. The international results refer to individuals aged 16–74.
2) 2007 is the most recent year on which internationally comparable figures were available at the time of compiling this edition.
3) To state this with certainty, the result has to be corrected for other factors such as income, because this is also correlated with the education level of the internet user. The previous editions of The Digital Economy included the results of such determinant studies.

6. ICT use in the public sector

The public sector – government, education and care – has increasingly become involved in the process of digitisation, as are companies and households. The terms for this are e-government, e-learning and e-health, which emphasize the role of ICT. In these domains ICT is used to improve services, such as quality, customer focus and efficiency.

A well-known development in the public sector is the introduction of the DigiD. On 1 January 2008 some 32 percent of the Dutch population had a DigiD. A year earlier this was just 11 percent. People with an immigrant background caught up swiftly. Age-dependent legal provisions, such as the general pension act and the law on study financing of 2000, as well as the option to file income tax online greatly influence DigiD ownership.

The number of pupils and students per computer in education continued to fall, and more teachers use computers in teaching. Schools feel ICT contributes a great deal to making education more attractive.

ICT is as widespread in the care sector as in the rest of the economy. In 2007 many more employees in health care regularly used a computer and the internet than employees in social work. E-health is an up and coming area, characterised by interactions between medical informatics, health care and acting in a businesslike manner. The best-known applied form is the electronic patient dossier. The use by GPs in the Netherlands is well above the EU average and comparable to that in the Scandinavian countries.

6.1 Dutch e-government

The Dutch government has set itself the goal to use ICT to improve its services to citizens and companies. The use of ICT in government should also contribute to a more transparent and efficient government. Many government services include or consist of gathering, processing, storing and supplying information to citizens and companies. Much information can now be stored, processed and made available in digital form. This provides the proper authorities with the opportunity to use information available at other government bodies without having to ask it again from its citizens and companies. In addition, authorities can provide information and services to them online, varying from publishing legislation and regulations on the internet to practical applications, such as applying online for records from the population register.

The Dutch government aims to be more customer-focused. A citizen or company should receive the same information from a government body regardless of whether

Key figures on the government

The 'sector of industry' public administration and compulsory social security represented just under 6 percent of the gross domestic product and employment in the Netherlands in 2007. 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 2007 12 percent of all investments were made by the government. Almost 7.5 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: almost 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.

Key figures government

	1995	2000	2006**	2007*
	million euro			
Government [1)]				
Production value	29,527	37,452	52,668	55,075
Intermediate consumption	11,365	15,038	23,817	25,172
Gross value added	18,162	22,414	28,851	29,903
Employee compensation	12,944	15,946	19,950	20,563
Investments	6,092	9,585	12,710	13,694
	full-time equivalents (x 1,000)			
Employees	368	386	386	386
	%			
Share in the total economy				
Production value	5.1	4.6	5.1	5.1
Intermediate consumption	3.8	3.5	4.4	4.4
Gross value added	6.6	6.0	6.0	5.9
Employee compensation	8.3	7.5	7.5	7.4
Investments	9.6	10.5	11.9	12.1
Employees	6.4	5.9	5.9	5.7

[1)] Government is defined as public government and social security.

Source: Statistics Netherlands, National accounts.

they show up in person, apply digitally, or contact the government body by email or phone. The government should not ask the same information over and over again or send citizens and companies from pillar to post. The government must have reliable information to do so and share it in a reliable way among the various government levels and with citizens and companies. For this purpose the Dutch government is constructing an electronic government.

Progressing digitalisation may lead to a more efficient government, which can provide more or better services at the same price, or the same services at a better price. The box below shows that public administration and social security encompass nearly 6 percent of the Dutch gross domestic product (GDP). This exceeds the economic importance of many other sectors.

The Dutch government constructs an electronic government

To share information in a reliable way it must be clear for each government level which information is reliable, who or what this information is about, and that sensitive information is not accessible to everyone. Therefore the Dutch government works on a number of basic provisions, or building blocks, for e-government. These basic provisions, often developed at the national level, have to prevent rampant growth in the number of provisions, and provide solutions for the following themes:

- Accessibility: How can government information be made accessible electronically?
- Authentication: How can government verify with whom they are communicating electronically?
- Basic registers: Which information is reliable?
- Information exchange: How are the data exchanged?

The building blocks of e-government are in various stages of development. Some have been in use for a while, others are still starting up.

Building blocks per theme

Government information can be made accessible in several ways. Government websites can be designed in such a way that people with visual impairments can work with them, or they can show citizens what information is registered about them.

The building block on *Webrichtlijnen* (guidelines for the web) lays down quality demands for accessibility and searchability for government websites. The building block on *Samenwerkende Catalogi* (cooperating catalogues) ensures that citizens and companies do not go from pillar to post. The products and services provided by the government can be searched in a standard way.

The building block called *MijnOverheid.nl* (my government) shows citizens how they are registered at the different government bodies and provides the option to apply for services electronically.

Implementing the national E-Government programme

Some local governments indicated that they cannot see the forest for the trees, due to rapid developments involving e-government. The Wallage/Postma committee would like to see more leadership from central government. Based on their advice in their report called *Het uur van de waarheid* (the moment of truth) several agreements are being made among the various layers of the Dutch government. [1)] These agreements will strengthen the leadership in e-government developments. Also the basic infrastructure of e-government will become a focal point as it is a precondition and compulsory for e-government. The programme also lays down how the use and management of the basic infrastructure will be financed, and how the implementation of the basic infrastructure will be supported. Several projects, where e-government has clearly led to an improvement in services, are presented as examples.[2)]

Notes in the text

1) 'Het uur van de waarheid', Advies van de commissie Postma/Wallage over de regie en sturing van de elektronische government, 2007.

2) Nationaal Uitvoeringsprogramma Dienstverlening en E-government v 1.2, Vereniging Nederlandse Gemeenten, Ledenbrief dd. 8 oktober 2008, kenmerk: BABVI/U200801689, Bijlage 3.

The building block called *Antwoord voor bedrijven* (answers for companies) clusters all government information for companies and makes it possible for companies to apply for services online.

It is important for the government to know who wants to use a product or look up information on a website. With this knowledge services can be tailored to an individual or a company.
Citizens and companies must have a digital form of identification so that the government agencies can check the users' identity. The building blocks *DigiD burger* (DigiD citizen) and *DigiD bedrijven* (DigiD for companies) were made for this purpose.
The building block *Gemeenschappelijke Machtigings- en Vertegenwoordigingsvoorziening* (common authorisation and representation facility) provides the possibility to authorise others to digitally apply for services and products.

The government has a vast amount of information on Dutch society. This is stored by about fifteen hundred bodies in about thirty thousand national, provincial and municipal systems. Many of these systems were developed more or less independently and are barely harmonised.[1)] This limits the possibilities of reusing information. The government is setting up a system of basic registers to counteract these limitations.

Key data on Dutch society are stored in a limited number of registers. Citizens and companies only have to supply their data once, after which the government at any

Goals attained, new goals set

In 1998 the Dutch government set the goal to make at least a quarter of all Dutch government services available online by 2002.[1)] This goal was achieved in 2001. The next goal was to have at least 65 percent of all Dutch government services available online by 2007. The goal was also met.
According to the Dutch Ministry of the Interior some 66 percent of all Dutch government services for citizens and 68 percent of government services for compannies was also available online.[2)]

Notes in the text

1) Ministry of the Interior. Actieprogramma Elektronische Overheid (1998).
2) Ministry of the Interior. Publieke dienstverlening 65% elektronisch. Zevenmeting van het aanbod van de elektronische dienstverlening van de overheid (2007).

level can get reliable information from the system of basic registers. Government bodies are obliged to use these basic registers to reduce the number of questions they ask citizens and companies. Government bodies have to report suspected errors in the basic registers to the owner of the information. This ensures quality control of the data in the basic registers.

In 2008 ten registers were designated as basic registers.
Of these, the *Basisregistratie Adressen en Gebouwen* serves to register buildings, dwellings and addresses.
The *Basisregistratie Kadaster* registers parcels of land.
The *Basisregistratie Waarde Onroerende Zaken* registers the values of real estate.
The *Basisregistratie Inkomen*, which will make it unnecessary for people to provide income information to other government authorities, is being developed and administered by the Dutch tax authorities.
The existing population register is the designated the *Basisregistratie Personen*.
Enterprises and legal persons are registered in the *Nieuw Handelsregister* (new trade register), administered by the Chambers of Commerce.

The exchange of information is not as easy as it may seem. The problems solved in the 'old' world present themselves again. Information sent has to be delivered to the right person, and arrive without having been intercepted, and the recipient must be able to read it. This requires technical agreements and provisions. The old existing agreements and provisions include mail addresses, mail delivery, confidentiality of mail, registered mail, as well as the alphabet. The building block called *Overheidsservicebus* (government service box) is working on some of the new agreements and provisions.

Besides communication between government bodies, government also communicates with companies and citizens. The building block called *Overheidstransactiepoort*

(government transaction portal) was developed for companies that exchange a great deal of information – in size or frequency – with the government. This is a sort of post office for e-government.

DigiD contributes to customer focus

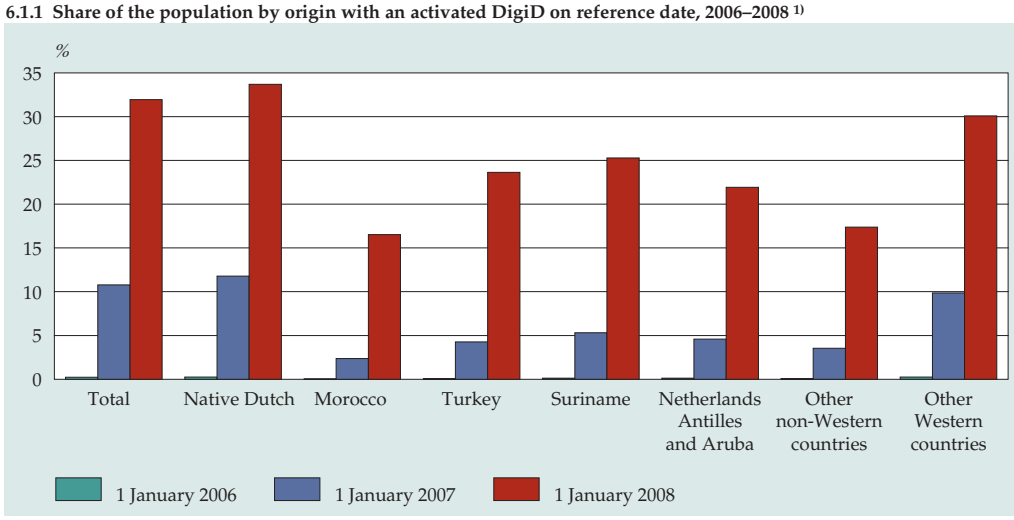
The old technical solutions to identify the user, like the passport, do not suffice either for electronic use. To solve this problem the government started in 2003 with the development of the building block *DigiD burger* (DigiD citizen). DigiD stands for digital identity. In its most basic form it consists of a user name and a password. Citizens can use their unique DigiD to communicate, and complete transactions with many different government bodies online. DigiD prevents government bodies from each developing their own authentication system, and citizens from having to memorize several sets of log-in data. In this way, DigiD contributes to government efficiency and customer focus.

Immigrant population bridging DigiD gap

On 1 January 2008 about 32 percent of the Dutch population had a DigiD. A year earlier this was a mere 11 percent. The share of native Dutch men with a DigiD is larger than that of native Dutch women. This difference is less pronounced among men and women with a Turkish background, and even reversed in the population of Antillean and Surinamese origin.

People with an immigrant background are bridging the gap remarkably fast. The share of native Dutch people with a DigiD almost tripled in 2007, while there was a sevenfold increase among people of Moroccan origin (figure 6.1.1).

6.1.1 Share of the population by origin with an activated DigiD on reference date, 2006–2008 [1)]



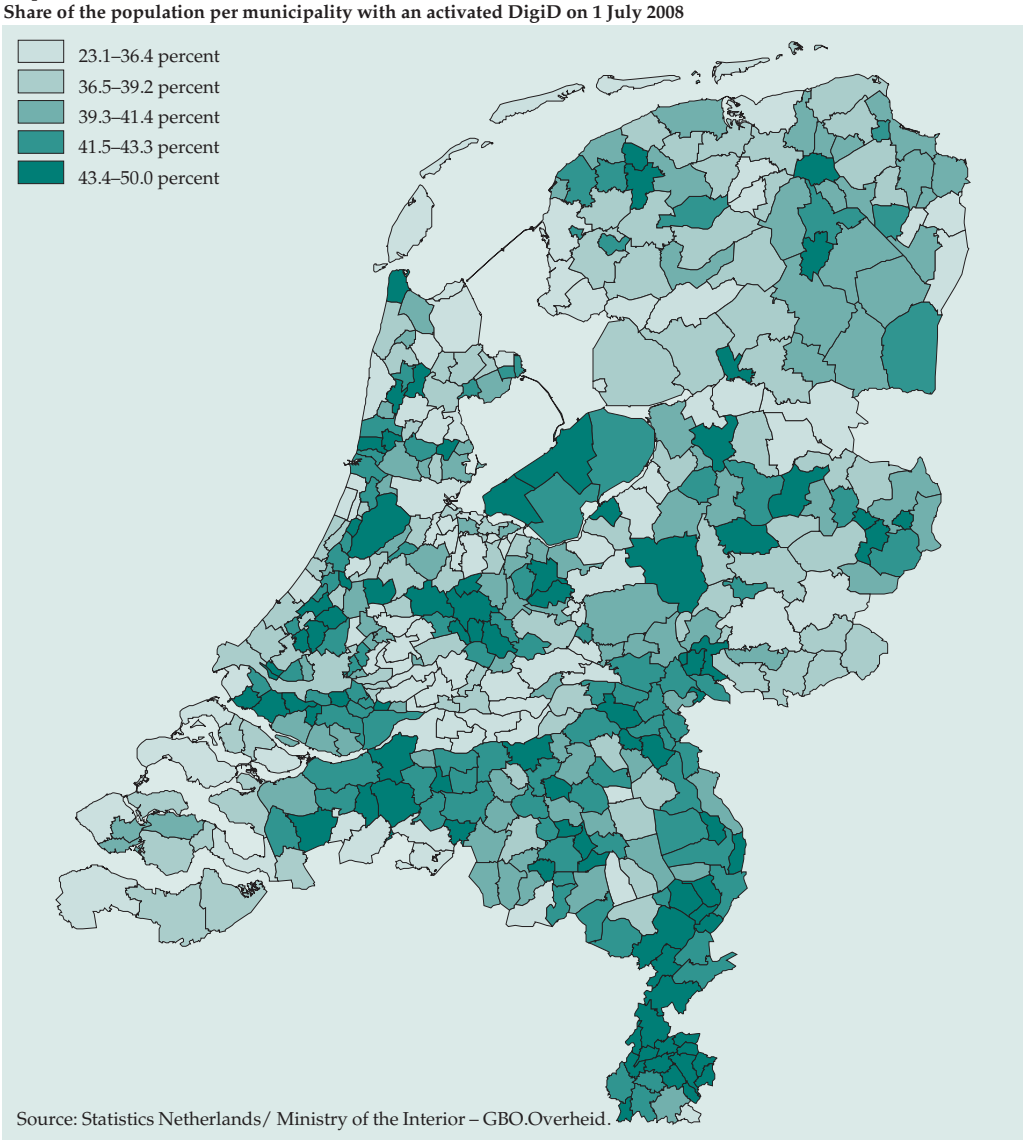
[1)] Figures are provisional. Reference dates other than 1 July 2008 only describe the activated DigiDs on 1 July. DigiDs that expired earlier were not included.

Source: Statistics Netherlands/Ministry of the Interior - GBO.Overheid.

Possessing a DigiD by region and age

The share of the population with an activated DigiD increased substantially in 2007 (figure 6.1.1). There are regional differences (see map 6.1). The proportion of the population owning a DigiD is lower on the Waddeneilanden and in the coastal regions than in large parts of Limburg and Flevoland (except Urk).

Map 6.1
Share of the population per municipality with an activated DigiD on 1 July 2008

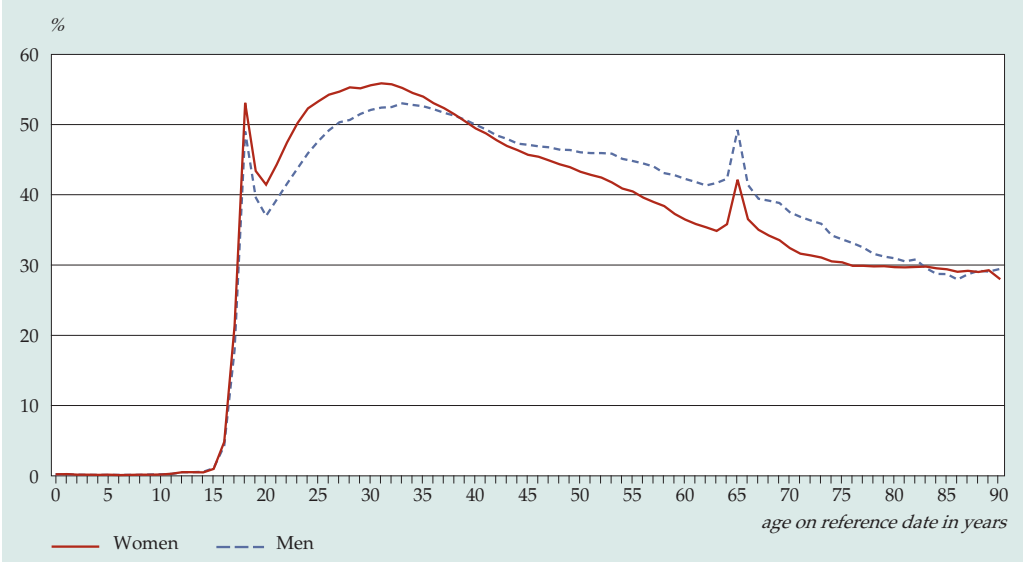


Source: Statistics Netherlands/ Ministry of the Interior – GBO.Overheid.

Share of the population per municipality with an activated DigiD on 1 July 2008

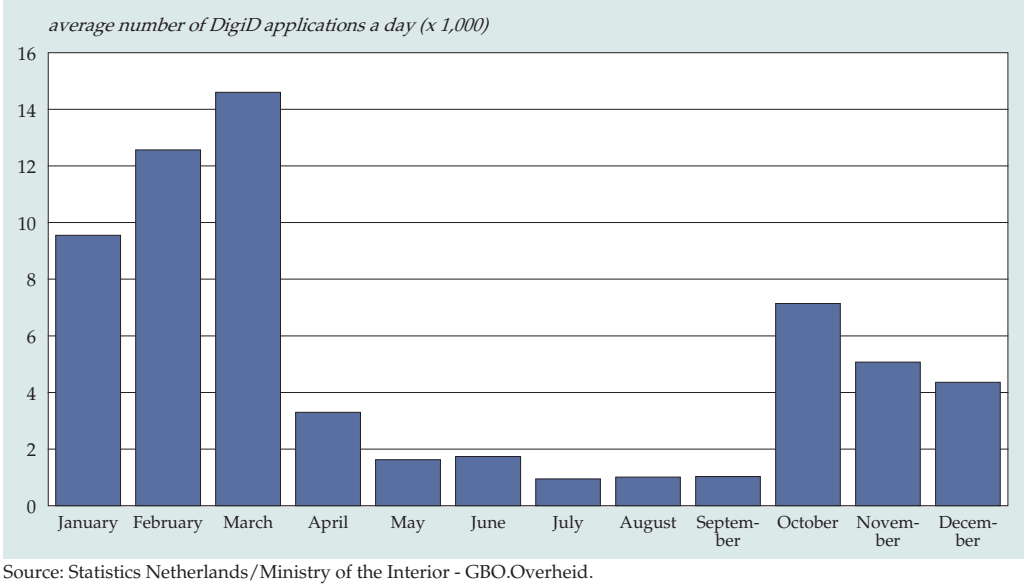
Apart from regional differences in possessing a DigiD there are also age-related differences. Figure 6.1.2 shows which part of the population had an activated DigiD on 1 January 2008. It shows that a larger proportion of women than men aged under 35 have a DigiD. There are two peaks, one around age 18 and one around 65. The

6.1.2 Share of the population with an activated DigiD by age, reference date 1 July 2008



Source: Statistics Netherlands/Ministry of the Interior - GBO.Overheid.

6.1.3 Applications of DigiDs active on 1 July 2008



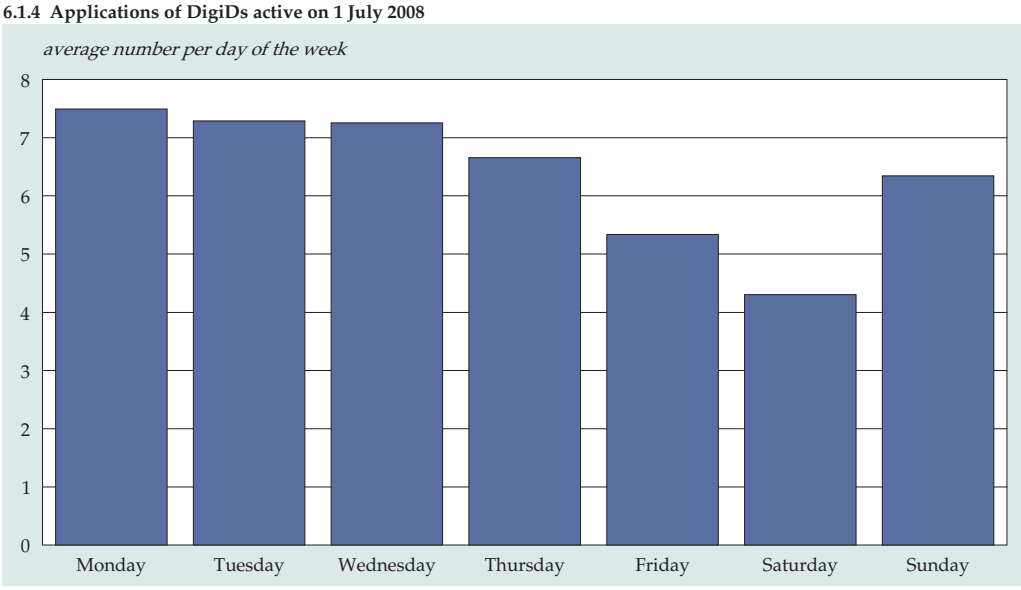
Source: Statistics Netherlands/Ministry of the Interior - GBO.Overheid.

cause lies in the DigiD usage for age-dependent legislative provisions such as the pension act and the law on study financing.
Regional differences in DigiD possession do not necessarily indicate that the local population is unwilling to use a DigiD: they are partly due to the demographic differences between regions.

Great influence of income tax declarations on total DigiD usage

The number of DigiD applications rises substantially in the period before income tax has to be declared (1 April) (figure 6.1.3). Furthermore, citizens seem to prefer certain days of the week to apply for a DigiD: rather not right before or in the weekend (figure 6.1.4).

6.1.4 Applications of DigiDs active on 1 July 2008

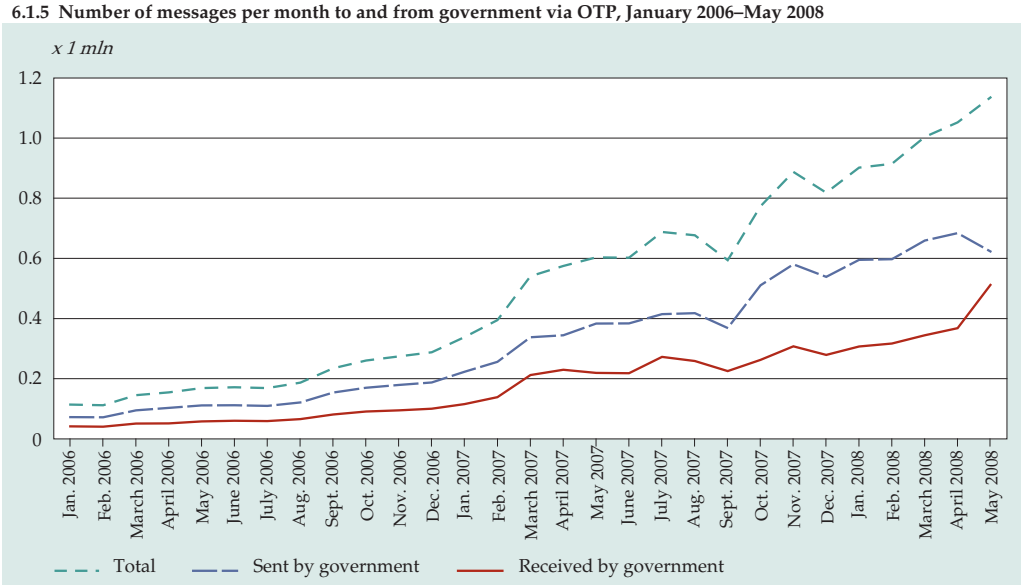


Source: Statistics Netherlands/Ministry of the Interior - GBO.Overheid.

Use of e-government by companies: Government transaction portal

The building block *Overheidstransactiepoort* (abbreviated OTP), in English government transaction portal, can be considered as the digital post office of the government for businesses. The companies connected to OTP can send small messages to OTP which then sees to it that the messages go to the right government body. The government body then sends a message to acknowledge receipt and if necessary a reaction. This is why government bodies send more messages than they receive through OTP. So far OTP only handles small messages (between January 2006 and May 2008 over 36 percent of the messages was less than 1 kilobyte and just 0.7 percent exceeded 10 kilobyte).
The number of messages exchanged between government and the private sector through OTP has risen steeply since January 2006 (figure 6.1.5).

6.1.5 Number of messages per month to and from government via OTP, January 2006–May 2008



Source: Statistics Netherlands/Ministry of the Interior - GBO.Overheid.

6.2 *ICT and education*

This paragraph deals with the use of ICT in education and the available ICT tools. The data in this paragraph on the Netherlands are based on the publication *Vier in Balans Monitor 2008*, by *Kennisnet*. The aim of the monitor is primarily to inform schools about the balanced and sustainable integration of ICT. The monitor focuses on four key elements: vision and leadership, expert knowledge, digital education material, and ICT infrastructure. These four building blocks should be balanced when using ICT for education purposes.

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 in 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)			
Employees	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
Employees	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	1,337	1,743	1,833
As a % of GDP	5.4	5.1	5.6	5.6

[1)] Expenditure on education is defined as the total public and private spending on households and institutions. The education-related private spending to non-educational institutions are not included in the total. The public expenditure on households excludes subsidies for tuition fees. This part flows back via the households to the institutions and is therefore part of the private spending on institutions.

Source: Statistics Netherlands, National accounts/Education accounts.

The monitor only addresses ICT use in primary and secondary education, so this paragraph will do the same. The monitor is very useful because of its many indicators which have been measured for years in a comparable way.

Kennisnet is a public ICT support organisation by and for education. It represents the interests of the Dutch education sector in ICT, offers help in selecting ICT products and services and provides innovative educational services and products. Furthermore this foundation is an expert centre in ICT and education. Until the autumn of 2005 the Ministry of Education still had its own ICT directorate and a major project on ICT in education. Both are now discontinued. *Kennisnet* has taken on many of the directorate's tasks. This was possible because ICT had been introduced in education and had scored its first successes.

Besides the data on the Netherlands from the *Kennisnet* monitor, this paragraph also includes international data from the Global Competitiveness Report from the Global Economic Forum. This annual publication provides an international ranking of internet access in schools for pupils and students. This topic is discussed at the end of this chapter.

One school computer per six students

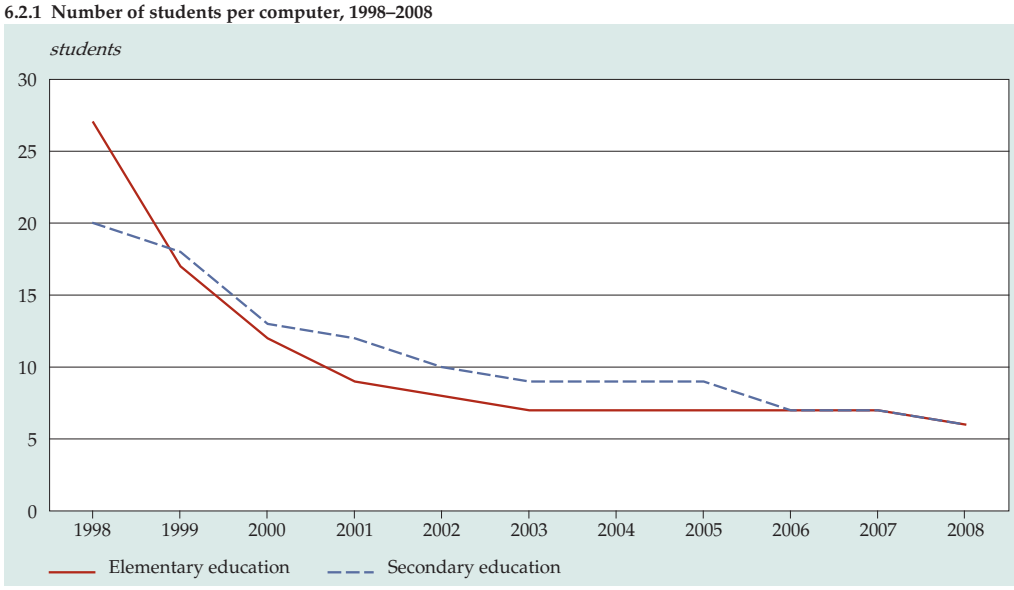
Primary and secondary education schools in 2008 averaged one computer per 6 pupils or students. In 2007 this was still 7 pupils or students per computer. Studies show that the number of schools with fewer than 5 students per computer in secondary education is rapidly increasing. In primary education this applies to a third of the schools. The number of schools that aim to reach a one-on-one situation increases as well.

The (ICT) management at 91 percent of the primary schools is satisfied or very satisfied with the provisions available, compared to 87 percent in secondary education. In 2008 about 95 percent of the computers had internet access in secondary education, same as in 2007. In primary education the figures were 90 and 87 percent respectively.

Not all teachers use ICT in class

Almost nine in ten elementary school teachers used computers in class in the school year 2007/'08, according to school management. In secondary education this share is much lower: six in ten. In the previous school year it was five in ten. The increased

6.2.1 Number of students per computer, 1998–2008



Source: Kennisnet, Vier in Balans Monitor 2008.

ICT use by teachers seems to be bridging a gap, made possible by having more computers available and perhaps by being more in tune with the digital world of teenagers.

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 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 (vavo).

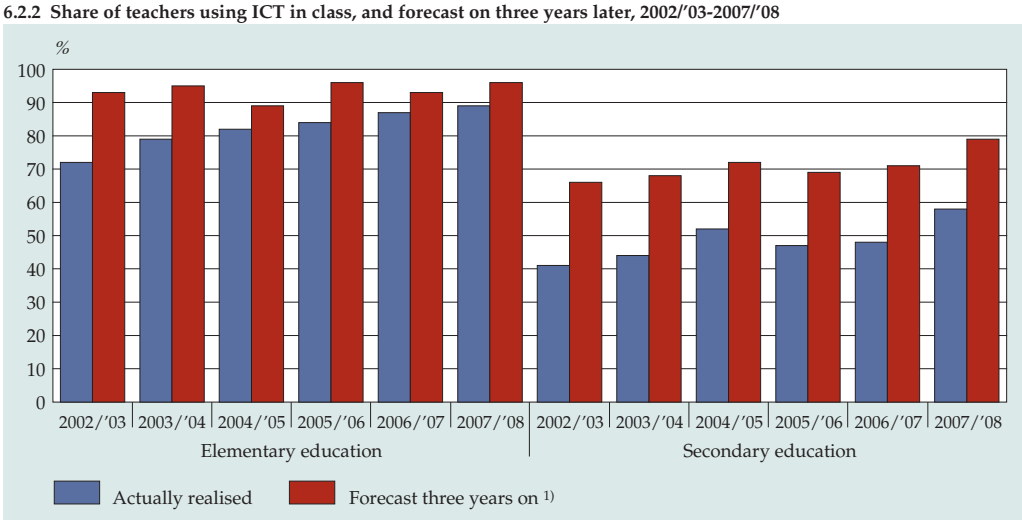
Pupils and students in education, 2001/'02–2006/'07

	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 and havo year 3 and higher [1)]	255	262	271	282	293	304
Vmbo, vbo, mavo, lwoo and ivbo 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)] Including joint year 3.

Source: Statistics Netherlands, Education statistics.

6.2.2 Share of teachers using ICT in class, and forecast on three years later, 2002/'03-2007/'08



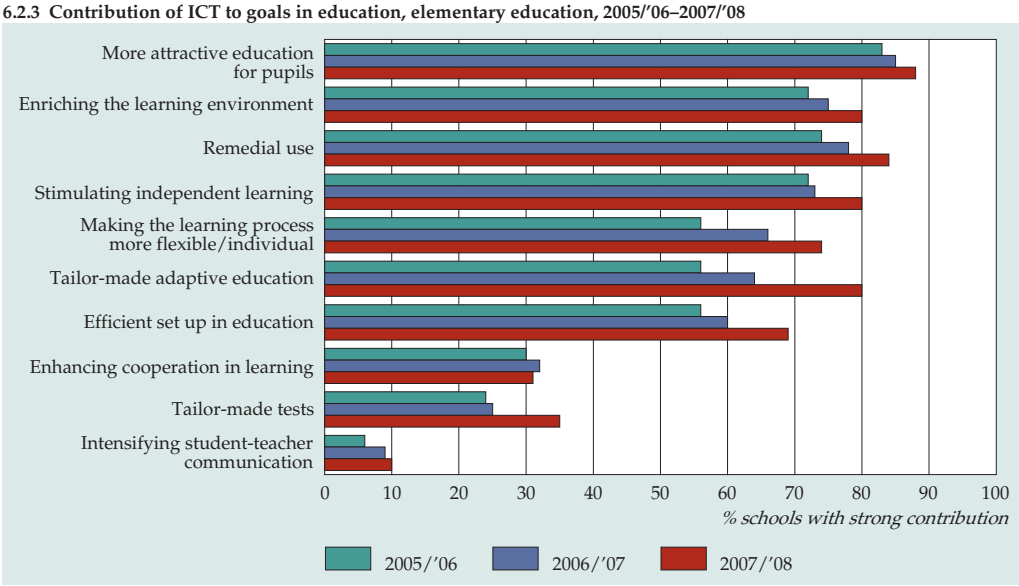
1) In the years shown respondents were asked about the situation they expected for three years on. E.g.in the year 2002/'03 the expectation for 2005/'06 is presented.

Source: Kennisnet, Vier in Balans Monitor 2008.

Using ICT to make education more attractive

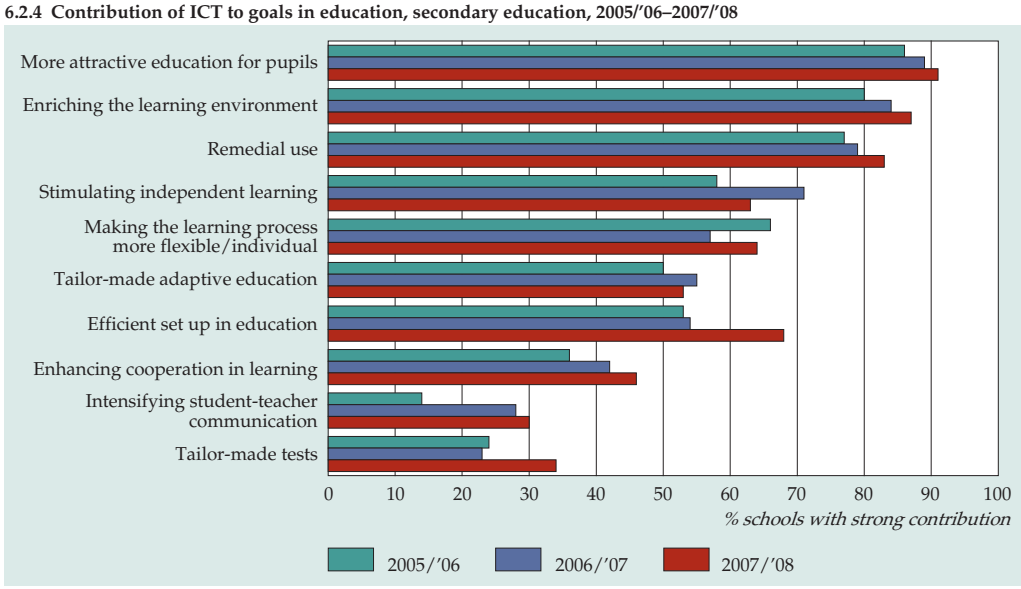
The (ICT) management of primary and secondary schools feels that ICT plays a great role in making education more attractive (83 and 91 percent respectively in 2007/'08). Furthermore ICT contributes to other education goals. Figures 6.2.3 and 6.2.4 include the opinions of schools about such contributions. The goals are

6.2.3 Contribution of ICT to goals in education, elementary education, 2005/'06–2007/'08



Source: Kennisnet, Vier in Balans Monitor 2008.

6.2.4 Contribution of ICT to goals in education, secondary education, 2005/'06–2007/'08



Source: Kennisnet, Vier in Balans Monitor 2008.

remarkably similar in primary and secondary education. Only the two goals mentioned least switched places: tailor-made tests and intensifying communication between teacher and student/pupil. The highly ranked goals are making education

Mobile phones in the classroom

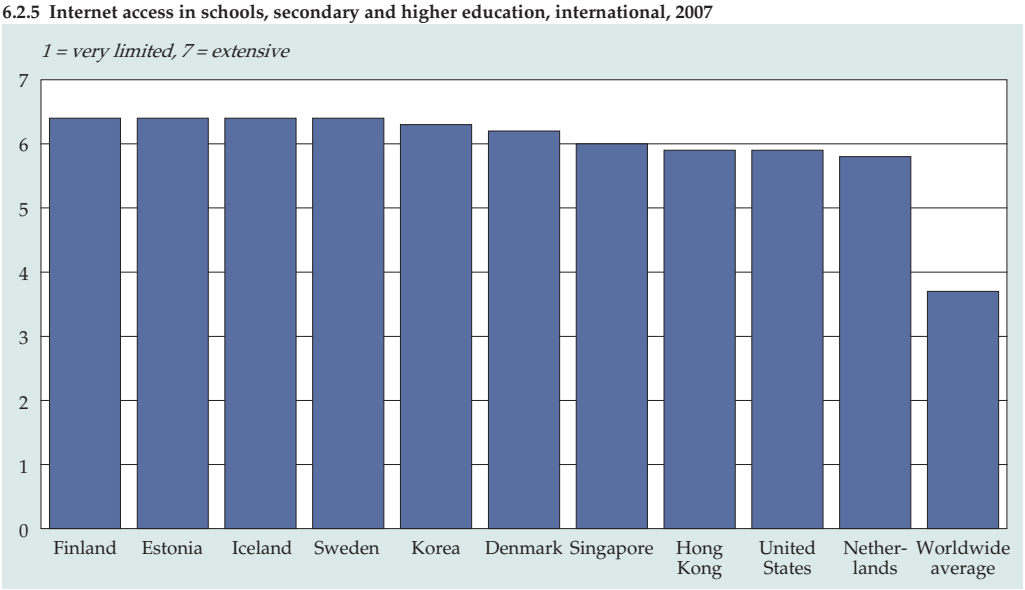
It is a difficult issue, having mobile phones in the classroom. Even more so after the notorious cases of Happy Slapping. Mobile phones make it possible to cheat and can disrupt classes. However, it can also have its positive sides, as researchers Rau, P., Gao, Q. and Wu, L. (2008) argue in their article.

The Taiwanese researchers Rau, Gao and Wu tested the use of mobile technology in education as a means to increase student motivation. Motivation and pressure are two influences on student learning. In their study the researchers seek to encourage contact between students and teachers to improve learning. They drew the conclusion that using SMS can enhance student motivation without increasing pressure on them. The mobile phones also made it easier to ask the teacher questions.

The researchers assume that the use of mobile technology makes the environment more media rich, which can positively influence learning because various means of communication can be combined. The question is how valid these results are (given the methods used), but the study certainly shows that applying mobile technology in education also offers opportunities.

Source: Rau, P., Gao, Q. en Wu, L. (2008), Using mobile communication technology in high school education: motivation, pressure, and learning performance. Computers & Education, 50, 1–23.

6.2.5 Internet access in schools, secondary and higher education, international, 2007



Source: World Economic Forum.

attractive, creating a rich learning environment, and encouraging independent learning: over 80 percent of the schools reported that ICT makes a great contribution to these goals.

It looks like the importance of ICT in secondary education has increased, because almost all goals were mentioned by considerably more schools in the course of time. The only exceptions are the goals remedial use and providing tailor-made adaptive education.

The Netherlands: worldwide twelfth in internet access in school

Schools for secondary and higher education in the Netherlands have a high degree of internet access in comparison to other highly developed countries. However, its international ranking has dropped in recent years. The World Economic Forum has a list ranking readiness, of which internet access is a part. In Finland most pupils and students have regular access to the internet at school, followed by Estonia, Iceland and Sweden. The Netherlands ranked twelfth in 2008, whereas in 2007 it ranked eleventh and in 2006 eighth.

6.3 ICT and care

The sectors health care and social work are rapidly changing. An aging population increases the demand for care, care providers have to work together more, and privatisation introduced a degree of free market choices. Patients are also becoming outspoken and have developed into well-informed consumers.

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 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 (wages)	16,142	20,680	29,900	31,239
Investments	2,178	2,701	4,123	.
	full-time equivalents (x 1,000)			
Employees	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 (wages)	10.0	9.8	11.8	11.9
Investments	3.1	2.9	4.3	
Employees	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	3,854	4,017
As a % of GDP	.	10.5	12.4	12.4

[1)] Spending on care is defined as the total of the income which these companies and institutions generate with their activities. The expenditure on care is higher than the production value of the sector health and social work because there are also companies and institutions outside this sector that provide care (e.g. pharmacists).

Source: Statistics Netherlands, National accounts / Care accounts.

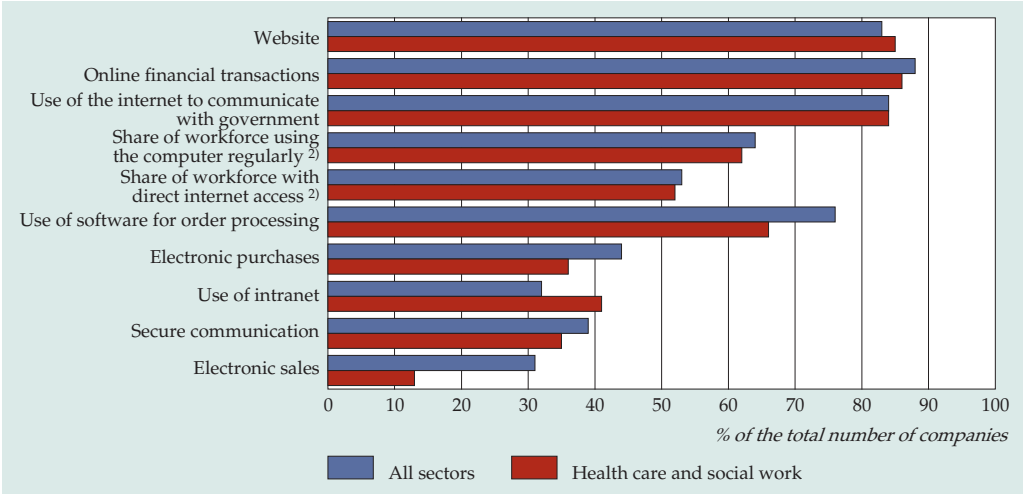
Much information is recorded, processed and exchanged within and between care institutions. This is not only true for operational management but also for information about patients and clients. In these areas ICT is playing an increasingly prominent role. The care sector has its public interest of national public health as well as great economic significance for the Dutch labour market and the economy. The share of care expenditure in GDP amounted to 13.2 percent in 2007, while over a million people worked there in 2006. This paragraph deals with recent ICT-related developments in care.

ICT common in care

The survey by Statistics Netherlands on ICT use by enterprises includes questions about several issues on automation and the application of ICT. A sample of companies with ten or more employees receives the survey, including the sector health care and social work. Some specific kinds of ICT applications in care are not addressed in the survey. Nevertheless the results give an idea of ICT use in care, and allow a comparison with other sectors.

Figure 6.3.1 shows that most care institutions have computers with external data communication, so in this respect care is right there with the rest of the economy. The care sector makes far less use of software for processing purchasing or sales orders than the private sector as a whole. Only 13 percent of the companies in health care and social work in 2007 bought electronic products or services compared to 31 percent in all sectors. Electronic sales in care are also below that of other sectors, 36 percent compared to 44 percent in all sectors.

6.3.1 Use of ICT in health care and social work and in other sectors, 2007 [1)]



1) Companies with 10 or more employees.
2) The share of employees in sectors, not the share of companies.

Source: Statistics Netherlands, ICT use by enterprises 2007.

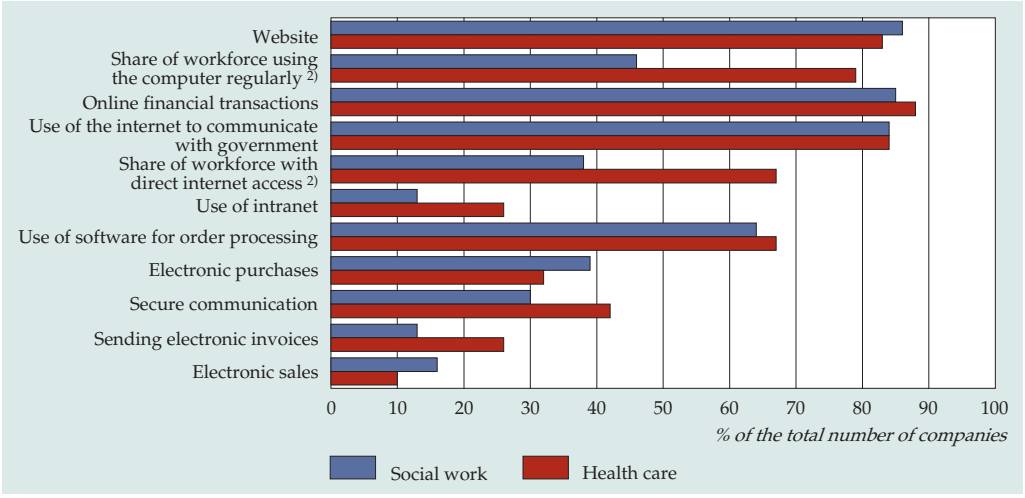
In 2007 some 62 percent of the employees in the care sector regularly used a computer at work. So they can be reached via ICT, or, to phrase it differently: they are (potentially) connected to an ICT network. This provides an indication of the volume of ICT work. In the other sectors, slightly more people worked on average with a computer, namely 64 percent. Care institutions have more often an intranet than companies in the other sectors do, namely 41 compared to 32 percent.
For further analysis of the use of ICT tools in care, the figures were broken down by health care and social work (figure 6.3.2) and by three size classes (table 6.3.1).

More computer use in health care

In 2007 many more employees regularly used a computer in health care (79 percent) than in social work (46 percent). Also the percentage of employees with direct access to the internet was considerably higher in health care (67 percent) than in social work (38 percent) in 2007. See figure 6.3.2. The use of software for order processing advanced in both sectors, but both care sectors still lag behind the other sectors. In 2007 institutions in health care and social work concentrated on online financial transactions and communication with the government. Electronic billing was twice as common in health care. The two sectors hardly differed in electronic purchasing.

Table 6.3.1 shows the influence of company size on the use of electronic tools in health care and social work. In social work the smaller institutions (less than 50 employees) are usually less advanced in the use of electronic tools than larger institutions (50 or more employees), but this pattern varies. The share of employees who regularly used a computer and had direct access to the internet in 2007 was

6.3.2 Use of ICT in health care and social work, 2007 [1)]



1) Companies with 10 or more employees.
2) The share of employees in sectors, not the share of companies.

Source: Statistics Netherlands, ICT use by enterprises 2007.

almost 20 percent higher among small institutions in the health care than among larger institutions (over 250 employees). Larger institutions make more use of intranet, software for order processing, secure communication, and communication with government bodies through the internet. The mid-sized institutions of 50–249 employees sold much more electronically than smaller or larger institutions.

The larger institutions in social work are more advanced in the use of ICT tools, but the differences with smaller institutions are not really remarkable. The clearest differences are found in intranet, extranet and the use of open source operating systems. The share of employees who regularly use a computer or have access to the internet in the small institutions in social work lagged behind larger institutions in 2007.

Much remains to be done in both sectors in the automation of order processing and electronic purchases and sales. The external orientation required will be useful in ICT developments that relate directly to care itself, for example through e-health and the electronic patient dossier.

Table 6.3.1
ICT in health care and social work by size class, 2007

	Company size (number of employees)					
	Health care			Social work		
	10–49	50–249	250 or more	10–49	50–249	250 or more
	% of companies					
Website	77	100	98	82	86	97
Online financial transactions	85	100	93	83	88	86
Use of the internet to communicate with government	81	96	84	82	85	89
Share of workforce using the computer regularly [1)]	95	95	77	35	51	46
Share of workforce with direct internet access [1)]	79	91	64	30	42	38
Use of software for order processing	67	58	81	71	53	60
Electronic purchases	21	64	60	37	32	55
Electronic sales	8	22	9	21	9	11
Use of intranet	36	84	89	11	48	76
Use of extranet (enabling access for third parties)	22	41	30	7	16	23
Secure communication	43	30	47	16	49	42
Open source operating system	21	46	46	18	10	36
Use of CRM software	15	25	27	5	28	17
Use of ERP software	13	16	33	5	8	21
Sending electronic invoices	26	4	49	8	18	18
Receiving electronic invoices	18	10	26	27	12	23

[1)] The share of employees in sectors.

Source: Statistics Netherlands, ICT use by enterprises 2007.

E-health

The application of ICT in health care and social work has expanded rapidly over the last fifteen years. Governments worldwide recognise the possibilities ICT provides to raise the 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 the efficiency of care. This is done 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 on setting standards for exchanging and securing data.

E-health came about under the influence of developing international (ICT) networks and raising security and efficiency in health care. 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 providing self-care options to the patient by giving out adequate medical information. E-health is up and coming and is characterised by an interaction of medical informatics, health care and businesslike behaviour.

Medical ICT itself is also shifting in focus. At first the emphasis was on hardware, system architecture and databases, now it is on the innovative use of technology for proper communication and decision-making. The importance of human and organisational aspects is recognised more and more.

New ICT applications have created the possibility to give advice, monitor and correct from a distance. This means fewer medical visits and hospital stays are needed. Such developments give the institutions an impulse to evaluate and improve processes. The patient plays a key role in most applications, because he or she has to react to certain signals or answer certain questions. There are also scenarios where the conscious role of patients is reduced to a minimum.[2)] And in some scenarios the GP plays a key role.[3)]

Electronic patient dossier started

The electronic patient dossier (EPD) and the decision support systems based on it are central in e-health. The EPD can improve safety in care. Mistakes in medication can be avoided by setting up an electronic dossier based on specific software. The EPD will be introduced nation-wide after 2009. This system is used to store patient data digitally on a national network.

The advantages of the national EPD are:
- the medical data on a patient are always available;
- the data have to be entered just once;
- hospitals, GPs and other health care givers can retrieve and consult up-to-date patient information from all over the country.

E-health in a European perspective

The research and consulting firm Empirica has written a report commissioned by the European Commission making an international comparison of ICT in the health care sector (e-health). The report described the results of a pilot study among general practitioners. The main results in this report on 2007 are:

- The foundation is laid for the ICT infrastructure in health care;
- The use of ICT by GPs differs greatly within Europe;
- There is still a great gap between the actual use of ICT and the possibilities the use of ICT offers.

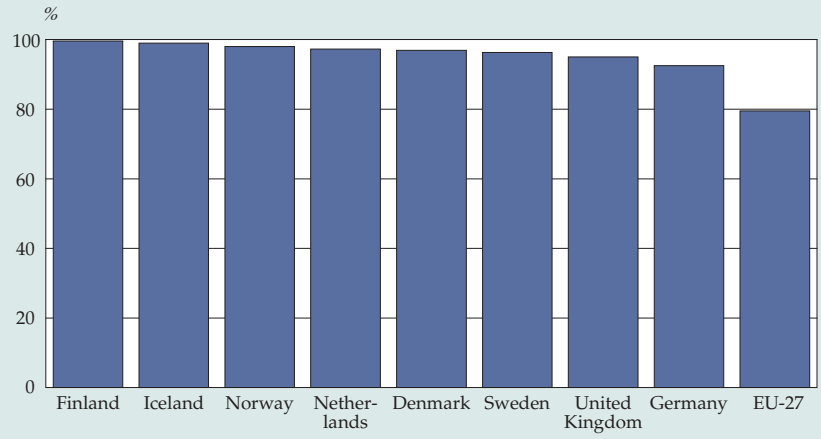
European GPs have the following perceptions about the use of ICT:

- They are positive about the role of ICT in health care;
- They clearly see the possibilities of ICT;
- Once GPs use ICT they experience fewer obstacles. Non-users are more negative about ICT applications;
- The impact of ICT applications is generally seen as positive or neutral.

Administrative patient data are stored electronically in 80 percent of GP practices in the EU-27 countries. In twelve countries over 90 percent of GP practices use EPD. It is close to 100 percent among GPs in Finland and Iceland (see figure 6.3.3) and even in Hungary. It is also high in the Netherlands: over 97 percent. There are five countries – Greece, Latvia, Lithuania, Malta and Romania – where the percentage is below 50 percent. Latvia comes in last.

Finally the internet, or other electronic networks, was used by 55 percent of the European GPs to connect with other actors in the health services such as laboratories, other GPs or care authorities in 2007.

Use of electronic storage of patient data, international, 2007



Source: Empirica, 2008.

Source: European Commission, Benchmarking ICT use among General Practitioners in Europe, Final Report, Bonn, April 2008, http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/gp_survey_final_report.pdf

Much medical data was already stored digitally. The data are often only available within a single hospital or doctor's practice. With the nationwide EPD the data become available to all care providers. The computer systems of care providers are linked nationwide.

The first two applications of EPD that will operate through the care infrastructure are the electronic medication dossier (EMD) and the GP replacement dossier (WDH). The EMD comprises data on medication of patients. The WDH is a professional summary by the GP for replacement purposes.

Notes in the text

1) Ministry of Housing, Spatial Planning and the Environment (VROM). Handreiking implementatie Basisregistratie Adressen en Gebouwen, 2007.
2) The VU medical centre has placed the first pacemaker for heart failure with SMS technology. This pacemaker sends SMS messages to the cardiologist who can then check the status of irrigularities on the internet and take action when needed. This means checkups are not needed as frequently.
3) A thousand GPs already use tele-dermatological consults, for example, by sending digital photos of the skin to a specialist (Nieuwsbrief Public Health 225, dd. 10 September 2006 op www.Integratedcare.nl).

7. ICT knowledge

This chapter looks at the relation between ICT and knowledge. The relationship between knowledge and the economy has been discussed in detail in the series Kennis en economie by Statistics Netherlands.
ICT is a domain of knowledge in full development, but ICT also has a role to play in transferring knowledge. We refer to information society in this regard, although this term is becoming outdated and no longer fully adequate. At the end of the previous century, surfing the internet to look up information was a relevant policy indicator. In 2008 almost everyone surfs the internet (see also chapter 5) and it is evident that ICT can be used for expanding knowledge. Therefore, the information society, digital economy and knowledge-based economy are hard to keep apart these days. Information, communication and knowledge – including skills – have converged due to ICT.

There are four paragraphs in this chapter. The first paragraph deals with R&D expenditure of the ICT sector. How do ICT companies in the Netherlands perform in research and development? The answer to this question provides insight into how new ICT knowledge develops. Sometimes this leads to patents, the subject of the second paragraph. ICT education is the third relevant issue discussed. The fourth paragraph describes the ICT skills of the population. The skills can be seen as one of the many expressions of ICT knowledge.

7.1 R&D expenditure and the ICT sector

Research and development (R&D) is a driving force behind innovation and economic growth. R&D expenditure is a direct form of investment in extending knowledge. R&D expenditure means that existing knowledge can be used better. It also results in new knowledge. Figures on national R&D expenditure have been prime indicators of the knowledge-based economy for decades.
Research and development of electronic components, software and IT services are important for the expansion and transfer of knowledge, strengthening the competitive and innovative powers of a company, sector or country. An alternative strategy is that an organisation invests less in R&D and leans more on implementing the innovations of others. This may reduce costs, but the R&D infrastructure that helps to realise innovations may be lost as well.

Modest R&D expenditure in the Netherlands

R&D expenditure has been declining for years in the Netherlands. In 1996, some 1.98 percent of GDP was spent on R&D. R&D intensity had fallen to 1.67 percent by 2006. Both the public and the private sector invested less in R&D in 2006 than a decade earlier. The decline in the public sector already started as early as 1990.

Dutch R&D intensity is modest, compared with other countries. The Netherlands, the United Kingdom and France were among the few countries where R&D intensity fell during 1996–2006. R&D expenditure in the Netherlands in 2006 was well below the average of the EU-15 and also stayed below that of the EU-27. Sweden is frontrunner in the EU, spending more than twice as much on R&D as the Netherlands in 2006 – expressed as a percentage of GDP. However, the Netherlands, together with France and the United Kingdom, did have above average R&D expenditure by the public sector.

The fact that Dutch R&D expenditure is lagging behind may reduce the country's knowledge base and cut its competitive edge. This is worrying for the innovative powers of the Netherlands. Moreover, being at a disadvantaged position, internationally speaking means that it may be hard to attract or keep top scientists, which may have a negative impact on attracting business activity (see also the publication by Statistics Netherlands *'Het Nederlandse Ondernemingsklimaat'*). The statistical annex provides detailed data on R&D (see www.cbs.nl/digital-economy).

The modest R&D expenditure in the Netherlands has to be explained, since sectors with a relatively small R&D component make a relatively great contribution to GDP in the Dutch service economy. In other words, the sector structure of an economy also influences R&D intensity.

More R&D investment in ICT worldwide

R&D investments in ICT are among the fastest growing R&D activities in the world (European Commission, 2007). At the global level R&D investments in 2006 grew fastest in pharmacy and biotechnology (16 percent), followed by technical hardware and equipment (13 percent) and software and computer services (13 percent).

A solid research basis and an effective distribution of knowledge are essential conditions for maintaining and attracting R&D. This is crucial in a global economy, where R&D activities seem to shift to countries in Asia and South America with well functioning innovation systems and close links between businesses and knowledge institutes (European Commission, 2008).

R&D intensity is a major but not the only explanatory factor for the differences in innovation between countries. It requires profound insights in the specific characteristics of the innovation systems in the different countries. These systems vary enormously per country, which explains the major structural differences in research and innovation performances in Europe. Each country has its own research infrastructure, and the size and composition of the ICT sector can largely determine the direction of ICT research (Dialogic en Technopolis, 2008). A proper exchange between companies and knowledge institutes, clients and suppliers is a major condition for turning R&D activities into new products or services for the market.

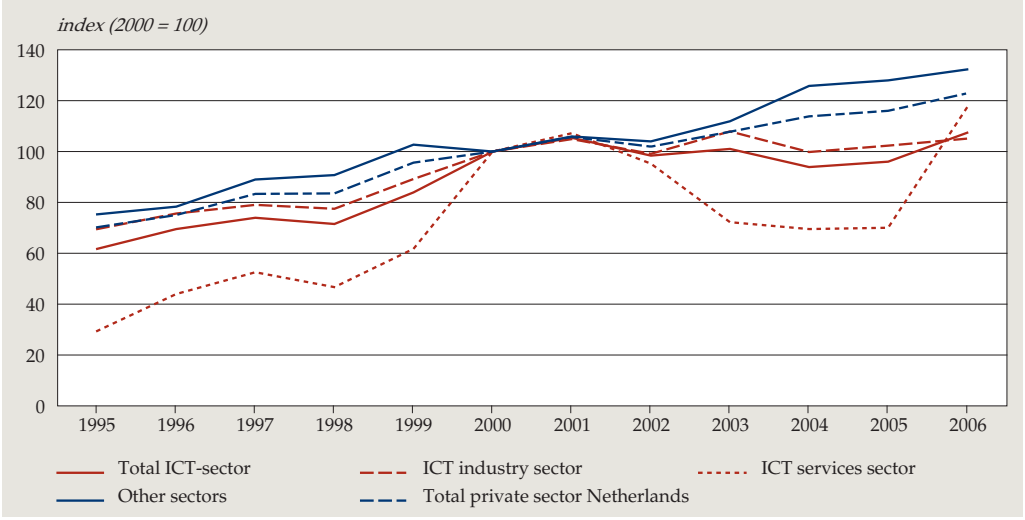
R&D expenditure of Dutch ICT sector fluctuates

Developments of R&D expenditure in the Dutch ICT sector have fluctuated greatly since the mid nineties. Moreover, R&D expenditure of the ICT service sector is more sensitive to economic fluctuations than R&D expenditure of the ICT industry. The expenditure on R&D in the ICT sector increased most between 1998 and 2000 (figure 7.1.1). This peak mainly occurred in ICT services. In the boom period of the ICT sector in the mid-to-late nineties, R&D expenditure of the ICT services increased faster each year than R&D expenditure of the private sector as a whole. Between 2001 and 2005, the R&D activities in the ICT sector decreased, in line with the economic slowdown and the end of the financial internet hype (see chapter 2 for details). In 2005, the growth rate started to increase again.

Decreased expenditure by the ICT sector at the start of the new millennium was caused mainly by a dip in R&D expenditure in the telecom sector. The services recovered mainly because the contribution of services rose again by increasing research expenditure of the computer service bureaus. The R&D expenditure of the ICT manufacturing industry saw a modest growth in 1995–2006, but it is structurally higher than the R&D expenditure of the ICT services sector. Almost 80 percent of the R&D expenditure of the ICT sector is in hands of the ICT industry. R&D expenditure in the other sectors has been growing faster since 2001 than in the ICT sector itself.

The ICT sector engages in a great deal of R&D compared to other sectors in the Netherlands. In 2006, and in 1995 as well, the sector accounted for about a third of

7.1.1 R&D expenditure (own personnel) by companies in the ICT sector and in other sectors, 1995–2006 [1)]



[1)] Companies with 10 or more employees. For 1995–2001 only people on the payroll are counted in.

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

R&D expenditure. The peak came in 2000 when the ICT sector spent nearly 38 out of every 100 euro on R&D. The ICT sector is clearly more R&D-focused than the rest of the private sector.

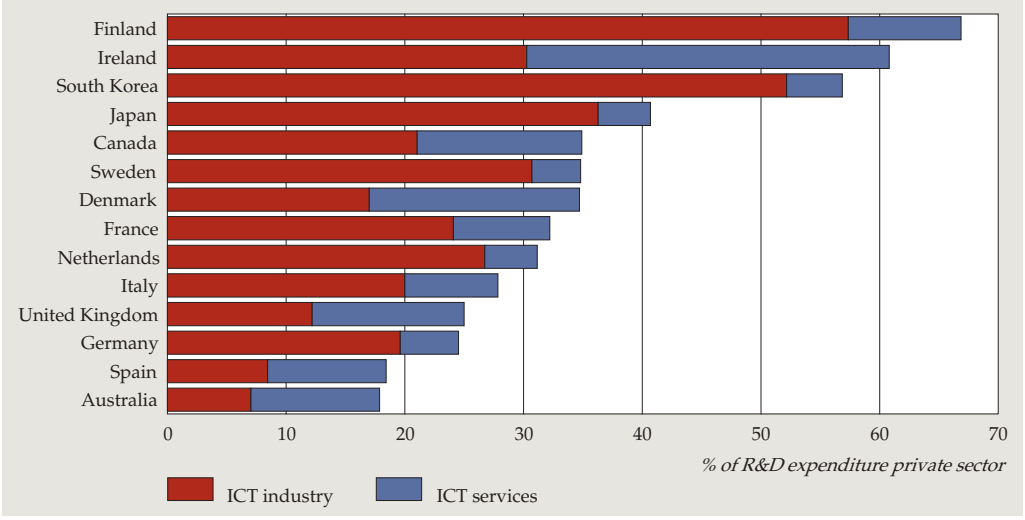
The share of the ICT services in total R&D expenditure of the Dutch companies increased from 3 to 7 percent in 1995–2006. So investing in R&D seems to shift increasingly to the services sector in the Netherlands. However, industrial companies continue to engage in most R&D activities, despite the cut in R&D expenditure in this period from 30 to 26 percent of the total R&D expenditure of the Dutch private sector (CBS, 2008b).

The dominant R&D position of the Dutch ICT industry is based on the highly technological character of this sector and the fact that the technology is relatively recent. The focus of Dutch multinationals is mainly on R&D and management in the Netherlands, and the production based on it abroad. Developing ICT goods requires a major investment in R&D. There is much technical research involved in developing basic electronics such as chips and semiconductors. There is less R&D intensity with assembled equipment. Most research activities take place within the companies themselves, although R&D is increasingly outsourced, except strategic R&D.

Most R&D expenditure in the ICT industry

The ICT sector has greatly contributed to total R&D expenditure of the Dutch private sector since the 1990s. The Netherlands is in a middle position when placed

7.1.2 R&D expenditure by companies in the ICT sector, international, 2005 [1)]



[1)] For United Kingdom and Denmark 2004. For France and Sweden 2003.

Source: OECD, STAN database; Eurostat, New Cronos; Statistics Netherlands, R&D survey.

in an international perspective. In 2005, it accounted for almost a third of the total R&D expenditure in the private sector (figure 7.1.2). ICT manufacturing clearly spent most on R&D in that year in the ICT sector. In the manufacturing industry, most R&D activities were carried out in mechanical engineering, followed by electrical engineering, computer technology, and communication (Dialogic en Technopolis, 2008). The R&D expenditure of the Dutch ICT industry is average, internationally speaking, and comparable to France, Ireland and Sweden.

The ICT manufacturing industry also accounted for most of R&D expenditure in most other countries, except for Ireland, Spain and Australia. The Netherlands and Japan lagged behind in business expenditure on R&D by the ICT services sector in 2005. However, the figures only refer to the sectors in the manufacturing industry and services sector included in the ICT sector (table 2.2.1) and not to all R&D activities in these sectors. This has led to underestimating R&D expenditure.

ICT sector follows the international pattern

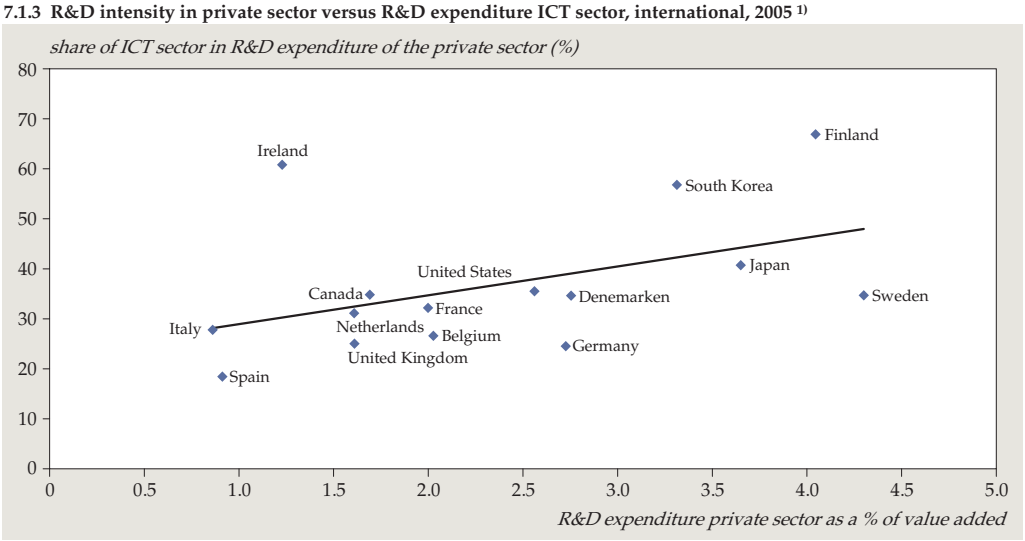
Figure 7.1.3 compares the share of the ICT sector in total R&D expenditure in the business sector to the R&D intensity of the business sector as a whole. The Netherlands turns out to follow the international pattern. The axes in de figure are related and the trend line shows that relationship ($r = 0.45$). The Netherlands hugs this trend line but the scores are low on both axes in comparison with the reference countries.

Three countries are noticeably above the trend line. In Finland and South Korea the major share of the ICT sector in total R&D expenditure of the private sector goes hand in hand with above average R&D intensity. The R&D-intensive ICT sector makes its influence felt in the R&D intensity of the entire private sector. The ICT sector in Ireland also has a huge share in private sector R&D expenditure. However, this does not show up as great R&D intensity of the entire private sector. The R&D intensity of the ICT sector itself is not as great, because there is relatively much assembly work in daughters of US parent companies.

The figure confirms that the ICT sector in many reference countries is R&D-intensive and leaves its impression on the R&D intensity of the private sector as a whole. The contribution of the ICT sector to R&D expenditure was well over 20 percent of the total R&D by companies in all countries considered except Spain.

The figure requires an explanation. Multinationals often have their R&D activities in one place and their production somewhere else. A production location can be in another country, and this influences the statistical description of the ICT sector. In countries where relatively much R&D is outsourced, the R&D intensity may seem lower.

7.1.3 R&D intensity in private sector versus R&D expenditure ICT sector, international, 2005 [1)]



[1)] For Denmark, United Kingdom and United States 2004 instead of 2005.

Source: OECD, STAN-database; Statistics Netherlands, R&D survey.

A second comment is that the R&D of the ICT sector describes only part of the total development in ICT knowledge. Such knowledge is also being developed by other actors in the economy, such as universities and research institutes engaged in ICT studies. Moreover, an unknown share of R&D in the Netherlands is realised by companies that do not have ICT as their main activity. These companies are active in this domain but not classified as such. This means that more is done in the Netherlands than the ICT-related R&D just described. However, it is very difficult to quantify this part statistically. Therefore the indicators on output are supplementary. Not all R&D input produces a satisfactory result. One indicator of a satisfactory result is the number of ICT patent applications.

7.2 *ICT and patents*

Innovations developed as a result of research and development (R&D) activities can be protected by patents. A patent is a monopoly granted by law to exploit an innovation. One way to measure an economy's capacity to innovate is in terms of the number of patents. This is where knowledge development, inventiveness, application and economic operation come together. The ICT patent applications indicator therefore reflects these achievements in the field of ICT.

The main patent authorities in the world are the European Patent Office (EPO), the United States Patent and Trademark Office (USPTO) and the Japanese Patent Office (JPO). This section examines European patents.

Eurostat, the statistical office of the EU, publishes data on patent applications. These data are usually not very recent, as an application always involves extensive background investigations of whether the application is justified. Moreover – if it is granted – the patent has to be classified. As this is a lengthy procedure, this section cannot provide recent official data.

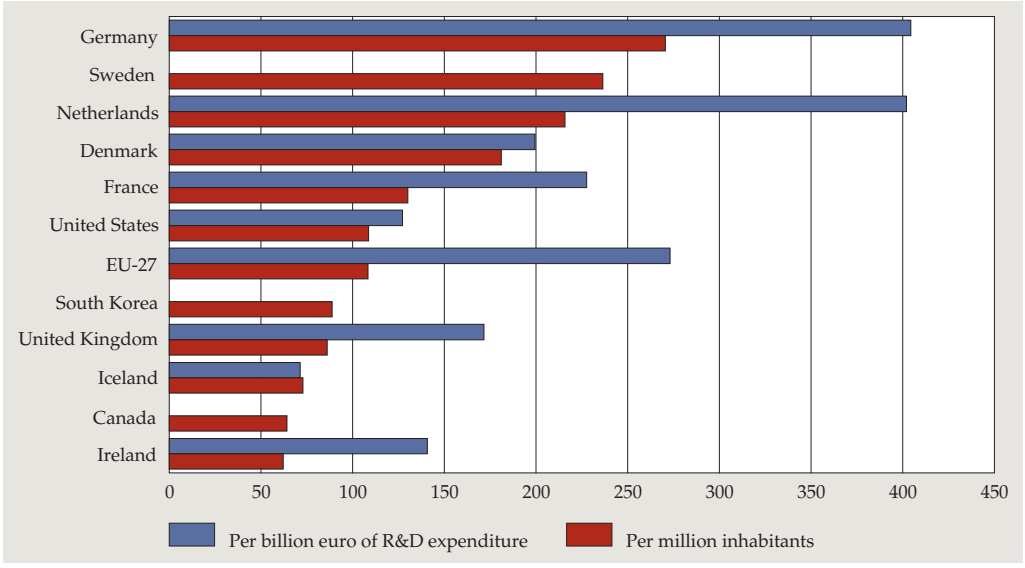
High number of Dutch patent applications

Germany and the Netherlands applied for the most patents in 2004: 400 applications per billion euro of R&D spending for both countries. Apparently, these countries use R&D more effectively than, for example, the USA, although they may also realise more innovation without incurring R&D costs.

The average for the EU-27 is 273 applications. Some countries with relatively many applications are not included in the graph: for example Italy (292), Slovenia (284) and Austria (265). Belgium, Finland, Luxembourg and France applied for fewer patents than average in the EU, and Denmark, the United Kingdom and Ireland bring up the rear of the European countries taken into account here (fewer than 200 patent applications per billion euro of R&D).

The picture presented in figure 7.2.1 changes if patent applications are set off against national population sizes. Of the countries included in this study, Switzerland applied for relatively most patents in 2004: 394 per million inhabitants (not included in the graph). Germany, Finland, Luxembourg, Sweden and the Netherlands applied for more than 200 patents. France, Belgium and Denmark performed better than

7.2.1 Patent applications to the European Patent Office, 2004



Source: Eurostat.

the EU-27 average in 2004, while the United Kingdom and Ireland performed considerably below this average. In this respect, therefore, the Netherlands is behind the leaders.
Japan and Israel scored well over the EU-27 average with respect to applications for European patents, with 169 and 160 applications respectively (not included in the graph). These countries applied for many patents in the USA (USPTO), too. In 2002 the USPTO granted American patents to 315 USA applicants per million inhabitants, 259 Japanese applicants and 166 Israeli applicants.

These data should be interpreted with caution, however. R&D spending often does not result in patents in the same year, which means there is a distortion in the figures. In addition, some countries have relatively low R&D spending, with – coincidentally – slightly more patents in 2004. Thirdly, as national cultures differ with regard to guaranteeing or protecting ownership rights, this may also affect the number of patent applications. There are other ways and strategies to protect new products.

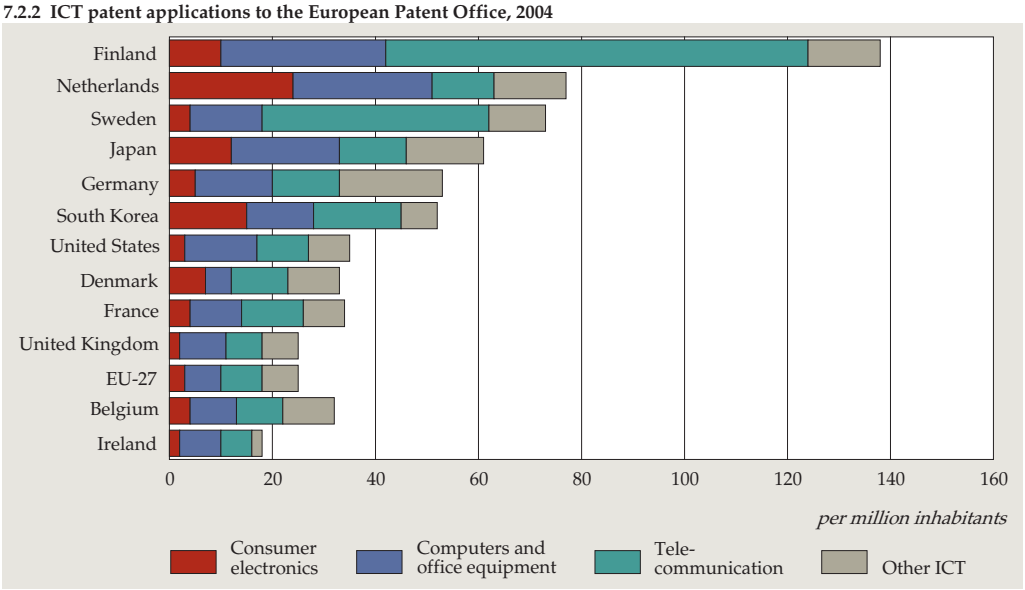
One third of applications for ICT patents

A large share of Dutch patent applications is in the field of ICT. This share increased from 13 percent in 1978 to 52 percent in 2001; it subsequently fell to 35 percent in 2004. On average ICT accounts for 30 percent of Dutch patent applications (per year, per million inhabitants, between 1977 and 2004); this is substantially higher than the average in the EU (19 percent).
ICT patents can be divided into the following groups: consumer electronics, computers and office equipment, telecommunication, and other ICT. The latter group includes measuring instruments, traffic control systems, and semi-conductors. Applications for Dutch ICT patents peaked in 2001. This was described in the section on the financial internet hype in chapter 2. In 2001 the patent authorities received a total of nearly 125 ICT patent applications per million inhabitants; in 2003 this was just under 90, and in 2004 only just over 76.
Most Dutch ICT patent applications in 2004 were in the group computers and office equipment (27 per million inhabitants). The second largest group was consumer electronics, the third largest telecommunication. The latter group comprised around 24 patent applications per million inhabitants in 2001. This number had halved to 12 in 2004.

Development in Dutch ICT patents in line with EU

The increase in the number of ICT patent applications has been substantial: from 1977 to 2001 the number of patent applications grew by an average of one quarter per year. In the period 2002–2004 the number of applications fell slightly, but in the period 2003–2004 the total number of patent applications grew again. A similar pattern can be seen in the EU. In 2004, the number of patent applications rose by just over 3 percent, but the number of ICT patents per million inhabitants was lower than in the Netherlands.

7.2.2 ICT patent applications to the European Patent Office, 2004

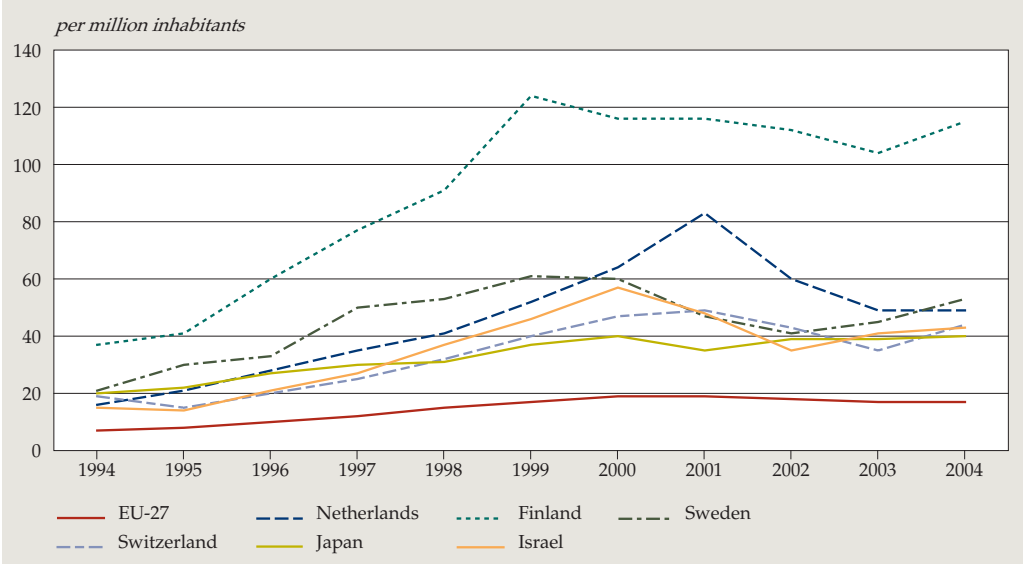


Source: Eurostat.

Netherlands active in high-tech patents

The Netherlands is in third place in terms of applications for high-tech patents (49 per million inhabitants in 2004). This is slightly fewer than in Sweden (53) and considerably fewer than in Finland (115). Switzerland and Israel had no more than 44 high-tech patents per million inhabitants, Japan 40. The Netherlands performed

7.2.3 High-tech patent applications to the European Patent Office, 1994–2004



Source: Eurostat.

particularly well with respect to computer and office equipment, and communication technology, with a second and fourth ranking respectively. Finland leads the way in telecommunication and applied for more than 85 patents in this field in 2004, followed by Sweden (39) and South Korea (25).

7.3 ICT education

National performance in the field of education can be used as an indicator of a country's knowledge supply. The higher the degree of education, the more people have been educated. The social significance of ICT in existing and new curricula is reflected in the education statistics. The national ICT knowledge supply will benefit from an annual increase in the number of graduates in ICT disciplines.

The number of graduates from higher education rose slightly, by 4 percent, in 2006/'07 from the previous study year.[1)] The average number of higher education graduates in the 1990s was 70,377 per year. In the new millennium it is 91,550. In 1990/'91 there were 57,770 graduates from higher education; in 2006/'07 this number had nearly doubled.
The number of college graduates *(hbo)* was hardly higher in 2006/'07 than in the previous study year (0.5 percent). The number of university graduates rose by more than 4 percent, the number of students receiving a bachelor's degree rose by 15 percent.

Decrease in ICT graduates

The share of college and university graduates in ICT disciplines has decreased. In 2005/'06 ICT graduates accounted for 5.9 percent of *hbo* graduates; in 2006/'07 this share had dropped to 5.6 percent and was back at its 2004/'05 level. The share of bachelor's degrees in ICT disciplines fell from 3.6 percent in 2005/'06 to 3.4 percent in 2006/'07. For master's degrees it fell from 3.7 percent to 3.6 percent in 2006/'07.

To interpret these figures reliably we need to know more about the population composition in the Netherlands. As most *hbo* graduates are 22 years old and most university graduates 24 years old, table 7.3.1 also gives the population aged 23 years (on 1 January). It then turns out that, relatively speaking, since 2005/'06 three times as many students in higher education graduate as in the early 1990s. In absolute terms, the increase is almost double: from just under 58 thousand graduates in 1990/'91 to just over 112 thousand in 2006/'07. As the number of 23 year-olds decreased by one quarter in the same period, nearly 60 percent (59.2 percent) of 23 year-olds in 2006/'07 graduated from higher education. It should be mentioned in this respect that university students with a bachelor's degree often go on to do a master's programme, and may be counted double in this percentage. If bachelor's degrees are not taken into account, the percentage of 23 year-olds with a degree in higher education is lower (47.6 percent).

Table 7.3.1
Graduates in higher education, total and ICT, 1990/'91–2006/'07 [1)]

	Bachelors						Masters				
	College (hbo)			University			University			Population aged 23	Graduates college and university versus 23-year-olds
	Total	ICT	Share of ICT	Total	ICT	Share of ICT	Total	ICT	Share of ICT		
	number		*%*	*number*		*%*	*number*		*%*	*x 1,000*	*%*
1990/'91	38,660	1,360	3.5				19,110	620	3.2	250.3	23.1
1991/'92	42,440	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				28,300	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	110			20,430	490	2.4	191.2	38.5
2001/'02	56,060	2,550	4.5	120			21,300	510	2.4	194.7	39.8
2002/'03	57,970	2,810	4.8	2,130	80	3.8	22,140	590	2.7	194.0	42.4
2003/'04	59,630	3,110	5.2	5,720	230	4.0	23,780	720	3.0	200.3	44.5
2004/'05	59,260	3,330	5.6	12,770	510	4.0	26,210	870	3.3	197.5	49.8
2005/'06	59,490	3,500	5.9	19,080	690	3.6	29,290	1,070	3.7	191.8	56.3
2006/'07	59,760	3,330	5.6	21,970	750	3.4	30,490	1,090	3.6	189.5	59.2

[1)] College and university graduates (bachelors and masters) and studies classifed as ISCED 481: informatics and 523: electronics and automation.

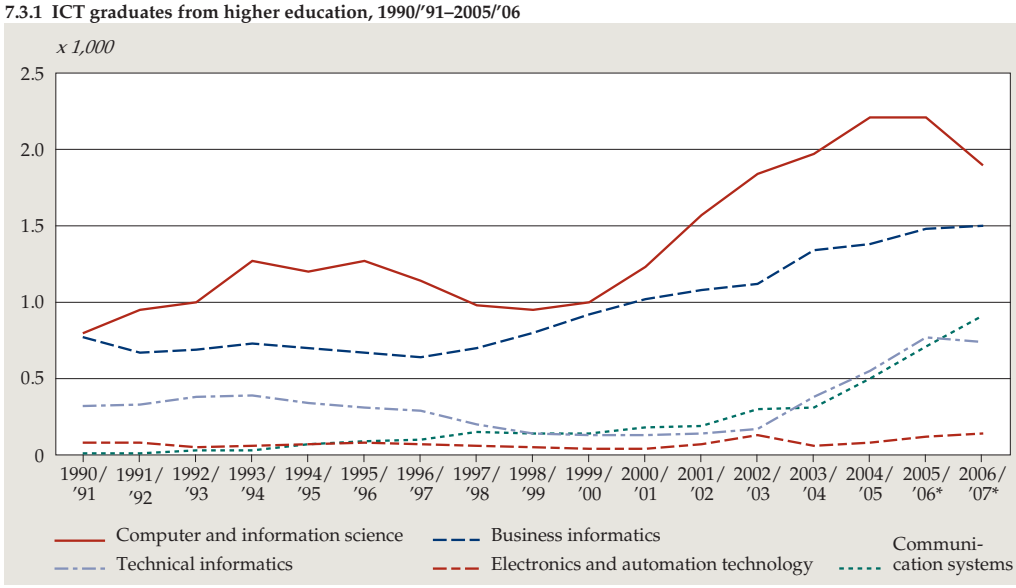
Source: Statistics Netherlands, Education and Population statistics.

Classifying education programmes is very complex. Statistical descriptions of study programmes in higher education distinguish five ICT disciplines. New disciplines are regularly added. When universities switched to the bachelor-master system, nearly all studies at universities and colleges of higher professional education were redesigned, and were subsequently reclassified by Statistics Netherlands. The classification into five disciplines used here is based on the names and descriptions of the contents of the various programmes. It is adjusted yearly because of the introduction of new subjects and shifts in programme emphasis. The figures in this section are therefore distorted to some degree. The name of a discipline may have changed, or its contents adjusted, so that it falls in a different category in the following year.

Substantial rise in communication systems specialists

The discipline with the most graduates was computer technology and information science (figure 7.3.1): 1.9 thousand students received a degree in this discipline in 2006/'07, 15 percent fewer than in the previous study year. The discipline with the fewest graduates was electronics and automation technology with 140 graduates in 2006/'07.

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



Source: Statistics Netherlands, Education statistics.

The total number of graduates in information science rose from just under 2 thousand in 1990/'91 to 5.2 thousand in 2006/'07. There was a noticeable steady increase in the number of information scientists graduating in the discipline communication systems, in particular: 910 students graduated in this discipline in 2006/'07, compared with 300 in 2002/'03 and 10 in 1990/'91.

The number of information scientists entering the labour market in a few years' time can be gauged by looking at the present number of first-year information science students. For computer technology and information science, this number has decreased continually since the turn of the century. For the discipline business information science, too, there were fewer first-year students in 2007/'08 than a few years previously. The discipline communication systems, on the other hand, has become more popular in recent years. The total number of first-year information science students peaked in 2000/'01, at more than 6 thousand (the total is not indicated in graph 7.3.2). Since then the total number of first-year students has fallen

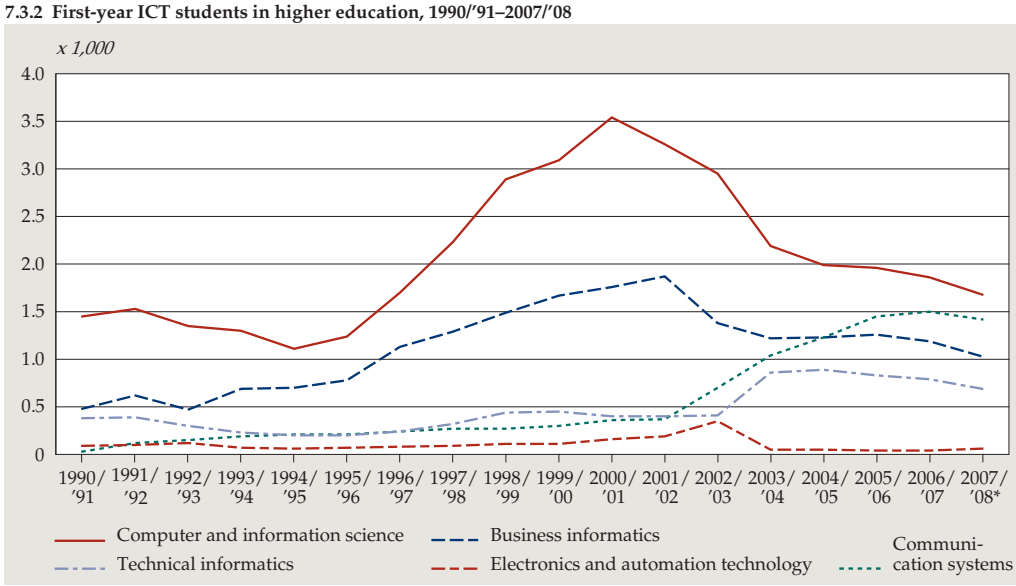
steadily, to 4.8 thousand in 2007/'08. This is probably a visible effect of the financial internet hype: in the years following the hype, the number of first-year students dropped considerably. The trend deviated for communication systems. The development in this discipline was more in line with other developments described in this publication, which goes to show that it is mainly the C in ICT that has had the most profound influence on the economy and society. For example, the overwhelming prevalence of mobile phones and e-mail, and the fact that the internet is first and foremost a channel of communication.

Relatively high number of information science graduates in the Netherlands

In an international perspective, the Netherlands had a large share of graduates in information science in 2006. Moreover, only in the Netherlands did this share grow in that year (from 4.0 percent in 2005 to 4.5 in 2006, see figure 7.3.3). The share of graduates in this discipline in the other countries viewed here fell in the period 2005–2006. In the USA it fell from 6 to 5.3 percent. The figures should be interpreted with caution, though, as Eurostat does not include the category electronics and automation technology as an ICT discipline. Earlier on in this section it was shown that in the Netherlands, too, the share of information science graduates decreased in 2006.

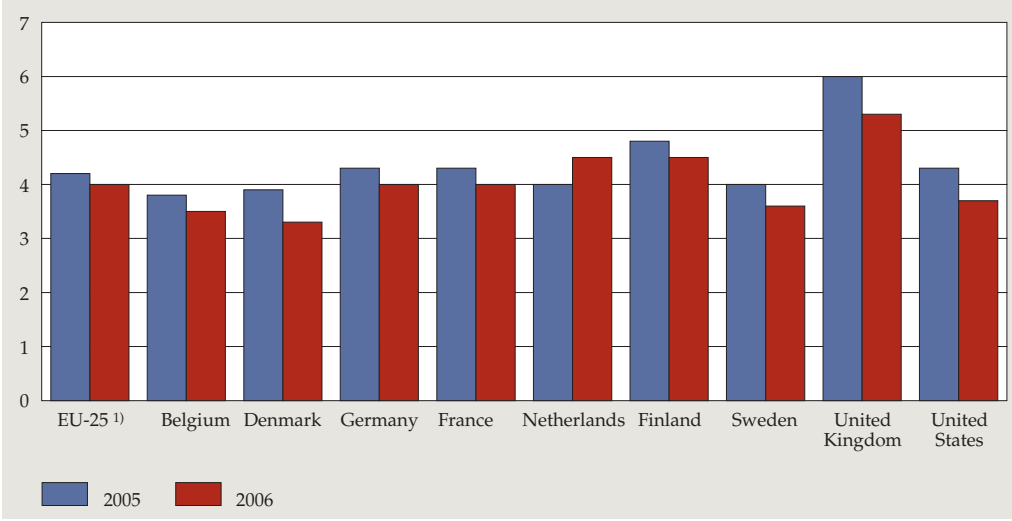
To sum up then, it can be concluded that with the advent of ICT in society, ICT knowledge, too, has increased in terms of completed education. The share of information scientists is decreasing, and students are focusing more on increasing

7.3.2 First-year ICT students in higher education, 1990/'91–2007/'08



Source: Statistics Netherlands, Education statistics.

7.3.3 Share of ICT graduates in total graduates of higher education, international, 2005–2006



1) Eurostat estimate.

Source: Eurostat.

their knowledge of communication systems. However, only a very small part of the population participates in ICT education, which means that the corresponding specialist knowledge is scarce (see also section 8.2). The last section of this chapter examines more general ICT knowledge: computer and internet knowledge and skills of the Dutch population – an important group of ICT users.

7.4 ICT skills

This section looks at computer and internet skills – the e-skills – of computer users. The skills are indicative of the population's general knowledge of ICT, and are thus an important element of this chapter. As we saw in chapter 1, ICT skills are also an important policy issue. This section puts the ICT skills of the Dutch population in an international perspective.

Six in ten Dutch people have never taken a computer course

Computer courses are intended to enhance computer skills. In 2008, some 58 percent of computer users in the Netherlands had never taken a computer course. This percentage is about the same for men and women.

Most of those who had done a computer course, had done it a relatively long time ago: two out of three had taken a course more than three years before the survey, only 9 percent had done one in the three months preceding the survey.

Computer skills

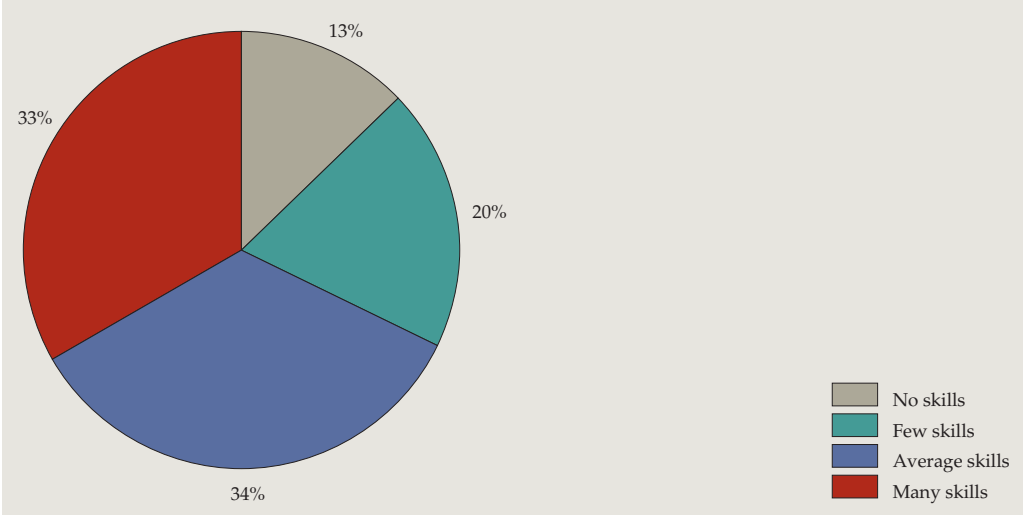
Statistics Netherlands has asked respondents about their activities on the computer. Their responses were used to assess their computer skills. The computer activities measured were:
- Copy or move a file or folder;
- Copy and paste information in a document;
- Use simple formulas in a spreadsheet;
- Compress folders or files with e.g. Winzip;
- Install new hardware such as a printer or modem;
- Write a computer programme in a programming language.

Respondents were classified into four categories:
- No skills: not done any of the listed activities;
- Few skills: done one or two of the listed activities;
- Average skills: done three or four of the listed activities;
- Many skills: done over four of the listed activities.

Most people have the skills to use a computer

Although most people have not had any form of computer training, nearly 70 percent of computer users in 2008 had an average or high level of computer skills (see box for more information on the definition of skills). Only 13 percent said they had no skills at all (figure 7.4.1).

7.4.1 Computer skills 2008 [1)]



[1)] People aged 12–74 using the computer.

Source: Statistics Netherlands, ICT use by households and individuals, 2008.

In 2008, a majority of computer users was able to copy and/or move files and folders (83 percent), cut and paste information into a document (81 percent), and use (simple) formulas in a spreadsheet (50 percent).

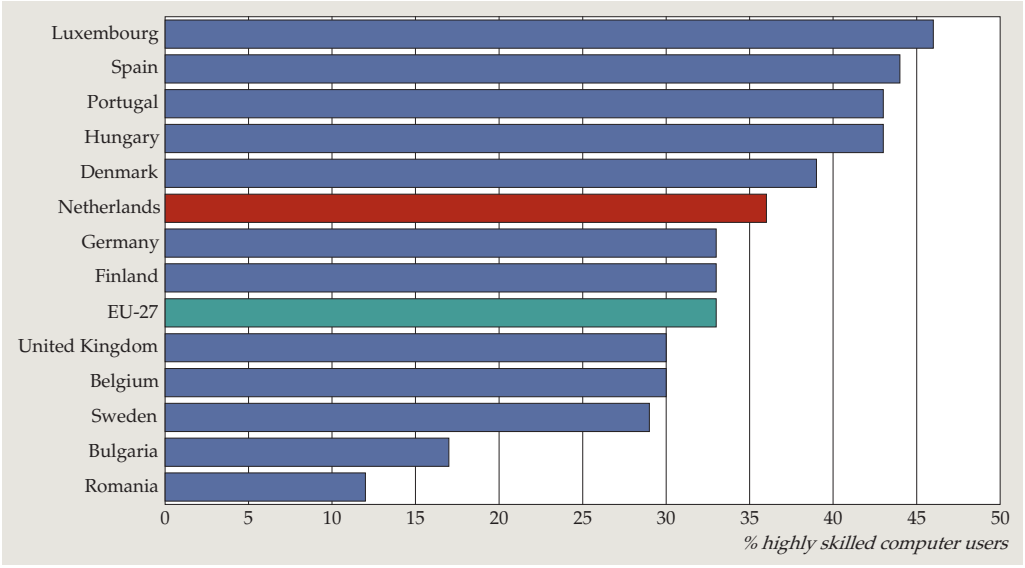
There is a large difference between skills of people in employment, and people without a paid job. One in ten computer users with a paid job had no computer skills, compared with nearly three in ten of people without paid work.

Around 17 percent of computer users who had never taken any course in 2008 had no computer skills, while 25 percent had a high level of computer skills. As expected, this picture is very different for people who had done a computer course: only 6 percent of this group had no computer skills, while 44 percent were very proficient.

High-level computer skills above EU average

Compared with other EU countries, the degree to which the qualification high level of computer skills in the population is valid for the Netherlands is just above average (36 percent versus an average of 33 percent in the EU). The comparison concerns people in the 16–75 age group and is based on 2007. The leaders in Europe are: Luxembourg (46 percent), Spain (44 percent), Portugal and Hungary (both 43 percent). Romania (12 percent), Bulgaria (17 percent) and Poland (21 percent) bring up the rear. Romania and Bulgaria are also the two countries in the EU-27 with the smallest share of household computer ownership. Surprisingly, three of the four countries with the best computer skills (Spain, Portugal and Hungary) are all below the EU average in terms of household computer ownership.

7.4.2 Share of highly skilled computer users, International, 2007



Source: Eurostat.

Mixed bag for internet skills

The level of computer skills is established on the basis of activities undertaken by computer users. The same was done for the level of internet skills. This shows that 51 percent of Dutch internet users had an average or high level of internet skills in 2008 (figure 7.4.3). This is not significantly different from the level measured in 2007. [2)]

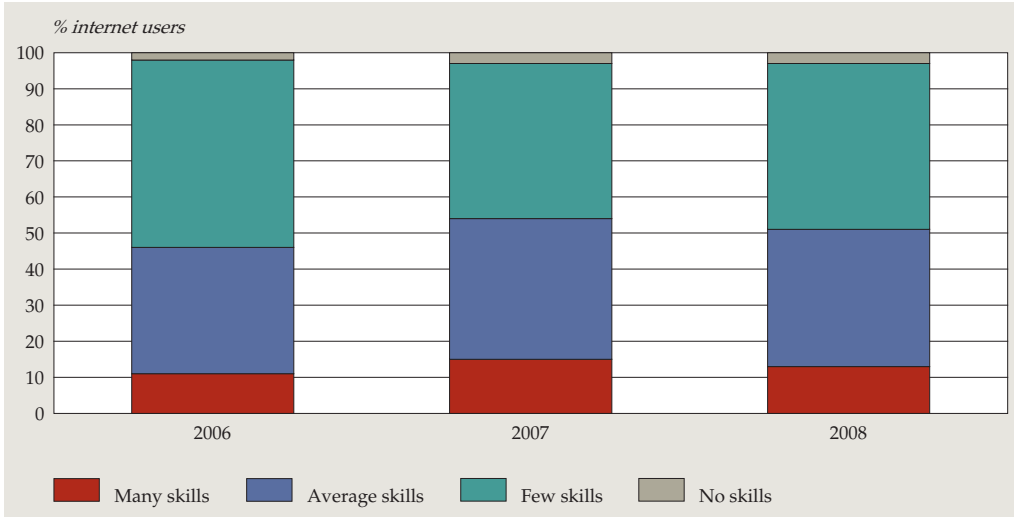
However, the figure also shows that in 2008 half of the internet users (49 percent) had little or no internet skills. The group of people with a low level of internet skills has been the largest group for a number of years now. However, the figure also shows that the share with a level defined as average and high has grown in recent years. It is therefore a mixed picture. Comparison with other EU countries provides a reference for how the Netherlands is doing in this respect.

The share of people aged between 65 and 75 years with no internet skills has dropped sharply (from 17 percent in 2007 to 9 percent in 2008). The difference in internet skills between men and women – which has existed for a number of years – was still present in 2008. In 2007, this gender gap was 11 percent points, in 2008 it was unchanged.

Average in terms of high level of internet skills

When the Netherlands is compared with the rest of the EU it does not qualify as a country with a high level of internet skills. This comparison is based on the same method as the comparison of computer skills in the EU in figure 7.4.2. The share of

7.4.3 Skills of internet users, 2006–2008 [1)]



[1)] People aged 12–74 using the internet (for explanation see box).

Source: Statistics Netherlands, ICT use by households and individuals, 2006–2008.

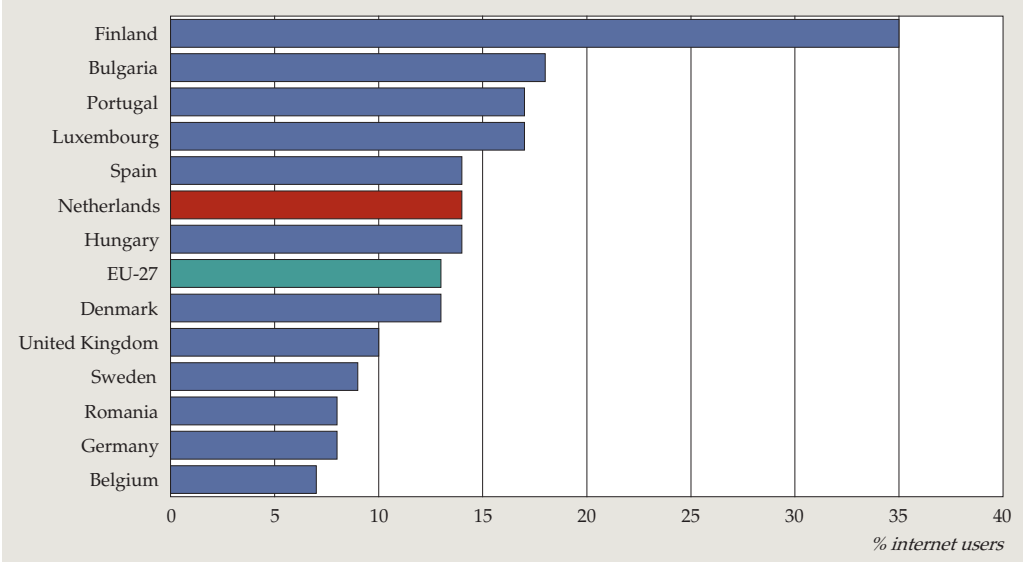
Internet skills

Statistics Netherlands asked respondents about their activities on the internet. To measure internet skill the activities a respondent has carried out online were examined. 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.

Respondents were classified into the following categories of internet skill:
- No skills: not done any of the listed activities;
- Few skills: done one or two of the listed activities;
- Average skills: done three or four of the listed activities;
- Many skills: done over four of the listed activities.

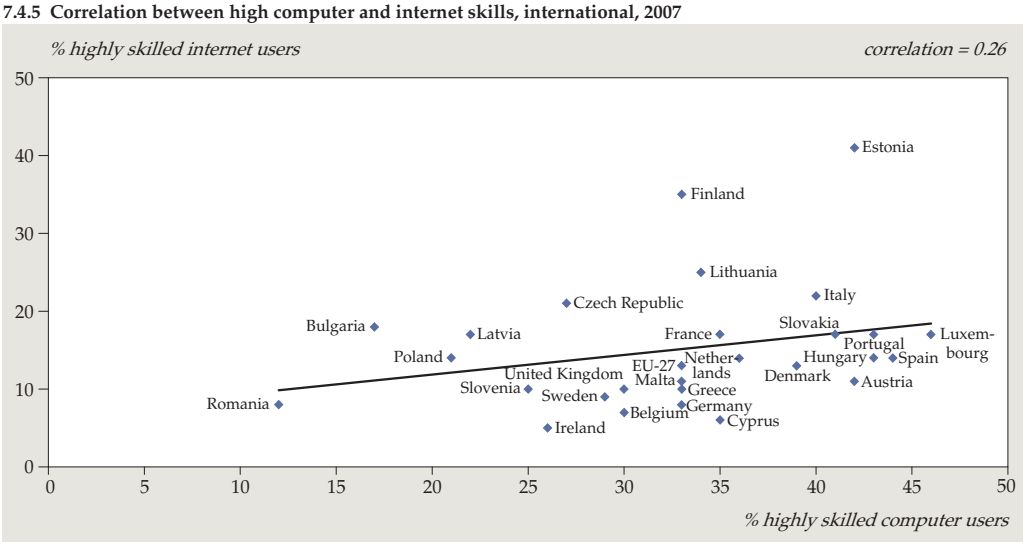
people with a high level of internet skills is only 1 percent point above the EU average, so the position of the Netherlands is not particularly convincing. Moreover, the share of internet users with a high level of internet skills is 'only' 14 percent in the Netherlands (16–75 age group). On the other hand, it is debatable whether the EU average is the right reference in this respect. If we take only the Scandinavian

7.4.4 Share of highly skilled internet users, international, 2007



Source: Eurostat.

7.4.5 Correlation between high computer and internet skills, international, 2007



[1] People aged 16–74.

Source: Eurostat.

countries, the Netherlands is well below Finland, but exceeds Denmark and Sweden. Compared with neighbours Belgium and Germany, too, the picture is more positive. Figure 7.4.4 shows that the Netherlands is not in the (sub) top.
In Estonia (41 percent) and Finland (35 percent) – the leaders – more than one third of internet users have a high level of internet skills. Ireland, Cyprus, Belgium, Germany and Romania bring up the rear.

Compared with the rest of the EU, the Netherlands performs differently on the two types of skills. Computer skills are above average, internet skills are not, insofar as high levels of skills are compared. A high level of computer skills does not necessarily go hand in hand with a high level of internet skills, but a moderate, positive correlation can be established (see figure 7.4.5, r = 0.26). [3]

Notes in the text

1) This group of graduates consists of bachelor's degrees in higher professional education *(hbo)* and bachelor's, master's and old-style master's university degrees.
2) This is not significantly down on 2007 ($p < 0.05$). It can therefore be stated that there is a 95 percent likelihood that the deviation is a coincidence. The difference can be accounted for by a change in the question: this concerns mainly the way in which internet telephony is derived. The response to this activity – which is included in the measurement of internet skills – was significantly lower in 2008 than in 2007.

[3] This correlation (r) results in a proportion of variance explained – R^2 – of 0.07. This means that one variable can statistically explain 7 percent of the variance in the other (and vice versa). This does not seem like much, but this is a survey-based study and in addition, it is very likely that many other factors play a role in the correlation, which have not been included or measured. Moreover, these EU data are frequently completed and updated. It is therefore possible that data on certain countries in this edition deviate from the most recent data available (e.g. in the case of a revision). Because of this, the correlation may change.

8. Capita Selecta

This chapter consists of four contributions mostly from authors working outside Statistics Netherlands, so that different studies of ICT use can be included in this publication and supplement the work by Statistics Netherlands. These studies are outside the core tasks of Statistics Netherlands by going into a given subject very specifically or because future developments are forecast. In some cases figures are presented that do not fully match the figures Statistics Netherlands publishes. This is mainly due to differences between the studies relating to the population described, the time of data gathering, and the research method used.
The issues dealt with in the four contributions are:
– The use of mobile services;
– ICT labour market in perspective;
– On the C in ICT;
– Internet in the used car market.

The contents of the four contributions is summarised in the Summary and Conclusions at the beginning of this edition.

8.1 The use of mobile services

The Delft University of Technology in cooperation with the Institute for Advanced Management Systems Research, Åbo Akademi, Turku, Finland, is constructing a time series on the use of mobile phones and mobile services. The study started in Finland in 2002. Since 2007 comparable data have been gathered in the Netherlands in sample surveys. The sample surveys in 2007 and 2008 involved 542 and 507 respondents respectively. In this contribution some of the results are presented.

Author: Harry Bouwman, Delft University of Technology and Åbo Akademi, Turku, Finland.

Mobile phone widely accepted

In 2008 almost all Dutch people had a mobile phone. Fifteen percent of Dutch people had two or more mobile phones.
In 2008 almost half of the mobile phones were at most two years old. One in eight people thought of buying a new mobile within a year. There are great differences in the criteria people set for this. About 60 percent of this group feels that Bluetooth is important, 59 percent wants the option to take photos and 37 percent prefers a colour screen. UMTS or WiFi connectivity to watch television on the mobile, mobile internet, access tot Skype, touch screens, or anti virus software hardly played a role in selecting the type of phone.

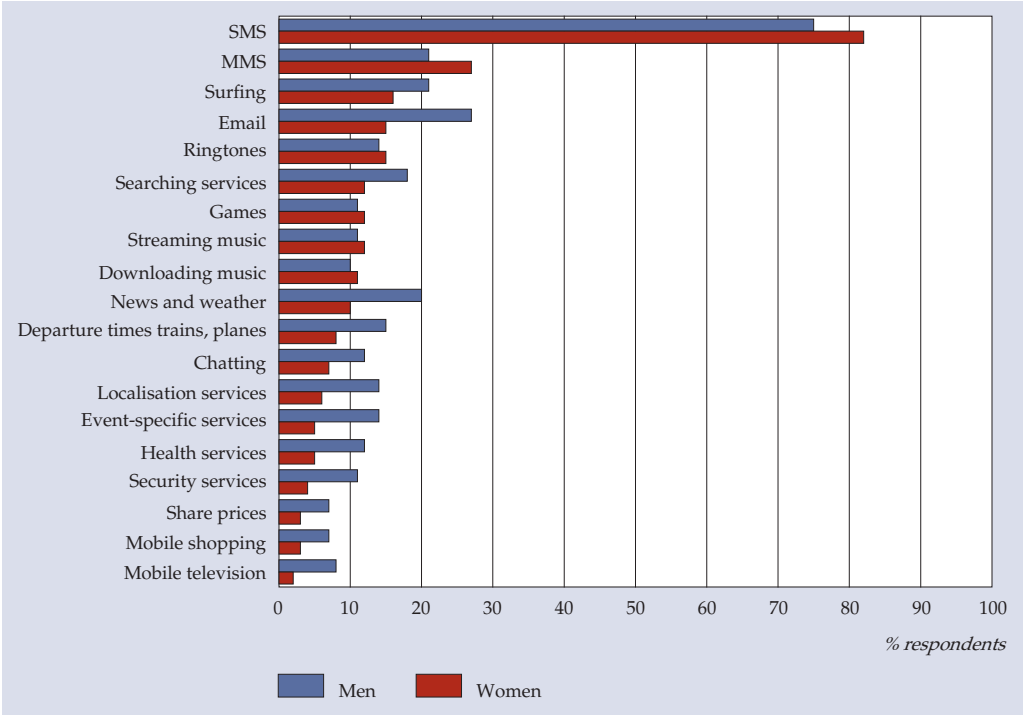
The mobile phone is mainly used for private purposes (as 72 percent of the respondents indicated). About 8 percent used their mobile mainly for business purposes. This corresponds with the percentage of respondents whose employer pays for the subscription.

Varying use of mobile services

In 2008 the use of mobile services was, apart from making calls, dominated by SMS: 79 percent used this with varying intensity while over a quarter did so on a daily basis. Multimedia messaging (MMS), sending photos and other multimedia messages, were used by nearly a quarter of the respondents. Over two in ten sent emails and surfed the internet with a mobile.

The share of respondents emailing every day by mobile was just 1 percent. Daily use of MMS had an even lower share. Many have tried the following mobile services at least once: email (12 percent), surfing (11 percent) and MMS (17 percent), but it is clear that these services are not widely accepted. Mobile shopping, checking share prices on the mobile and mobile television were the least used services (5 percent). It is possible that the emerging picture of mobile television is distorted because several services had not yet been introduced at the time of the study (April 2008): for

8.1.1 Use of mobile services by sex, 2008



Source: TU Delft, 2008.

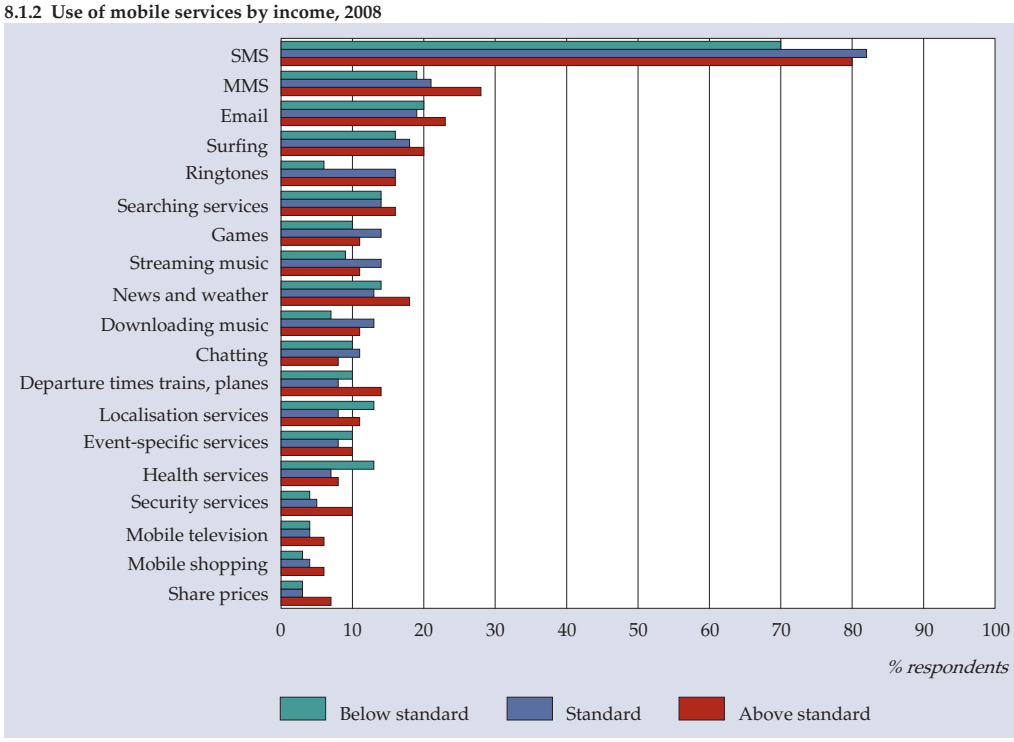
example services pertaining to the European football championships, the Tour de France and the Olympic Games.

Use of mobile services differs per sex, income and age

The most popular services, like SMS, MMS and ringtones, were used more by women than by men (figure 8.1.1). For SMS this difference is statistically significant. [1)] However, men were the greatest users of most other services. Mobile email, the use of event- specific services (for example services linked to a football match or the stock market) and mobile television were more popular among men. The same is true for checking mobile news and weather services, mobile health services, mobile shopping, checking travel times and mobile services focusing on security.

Figure 8.1.2 looks at income differences. A distinction is made between standard, above standard and below standard income. There are small differences in use between the three income groups, but some data are quite noteworthy. For instance, people on the lower incomes made relatively more use of mobile health services and services indicating the location of, for example, restaurants. Various mobile services for entertainment such as ringtones and music were mostly used by people on a standard income, while MMS was used more by the group on an above-standard income.

8.1.2 Use of mobile services by income, 2008



Source: TU Delft, 2008.

Young people use the mobile services most intensively. There are significant age differences in almost every kind of mobile use. Young people use mobile internet relatively much: one in three had at some point accessed the internet via a mobile phone or smart phone. The statistical annex on www.cbs.nl/digital-economy has more detailed data on this topic.

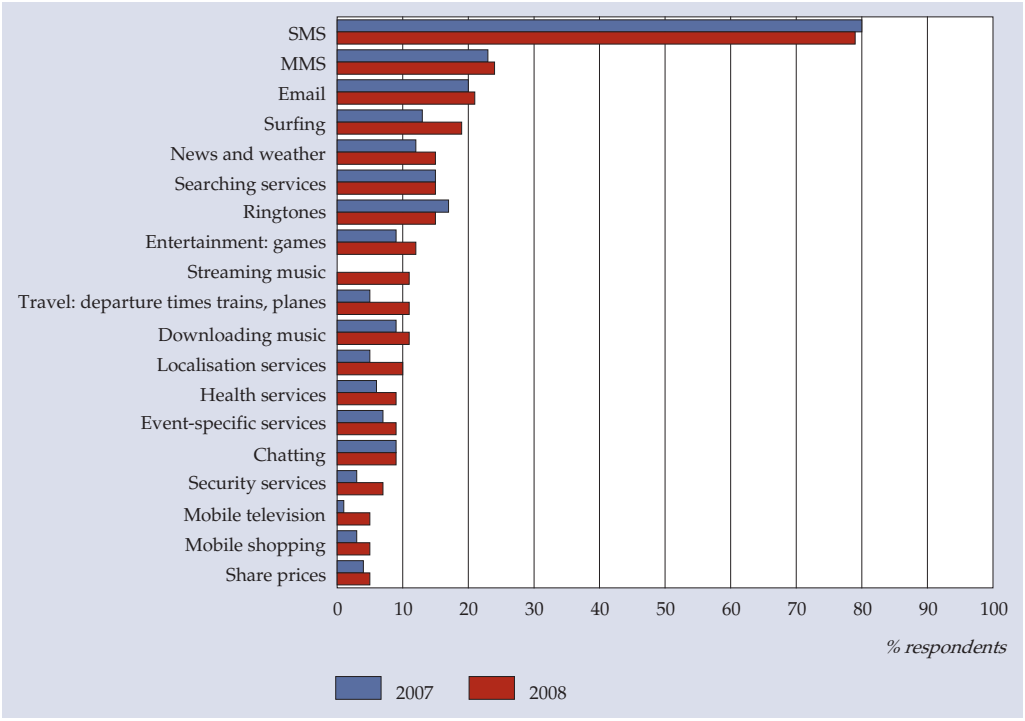
Steady increase expected

Mobile services are used by a limited segment of the population, but the use is increasing slowly but surely. The Dutch study cannot predict a trend with any certainty because there is data on two years. These data point towards a gradual increase in the use of mobile services across the board (figure 8.1.3). Strangely enough the use of the oldest services – SMS and downloading ringtones – is falling slightly, but the differences observed are marginal.

Comparable developments in Finland

A similar increase in the use of mobile services has already occurred in Finland. There is a striking gap between the use of mobile services in Finland and the Netherlands: the Netherlands lags several years behind Finland. Table 8.1.1 shows eight of the most frequently used mobile services in 2008 for the two countries.

8.1.3 Development in the use of mobile services, 2007–2008



Source: TU Delft, 2008.

Table 8.1.1
The eight most frequently used mobile services in the Netherlands and Finland, 2008

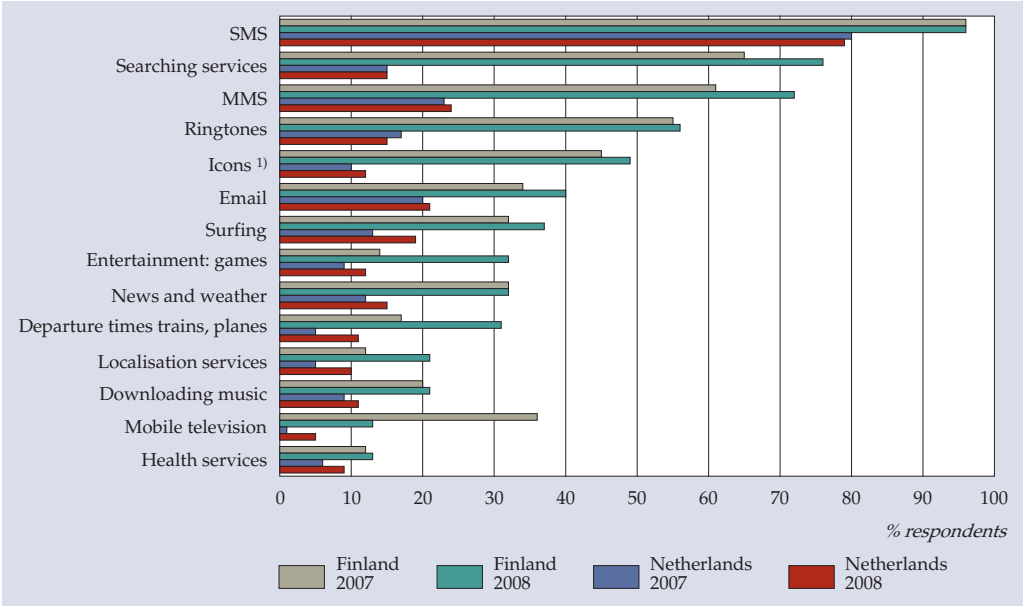
	Netherlands	Finland
	% respondents	
SMS	79	96
Searching services	15	76
MMS	24	72
Downloading ringtones	15	56
Downloading icons [1]		49
Email	21	40
Surfing	19	36
News and weather	15	32
Games	12	

[1] Including images, logos and wallpapers.

Source: TU Delft, 2008.

The statistical annex has additional data on the use of mobile services in Finland. Most striking is that some services initially drew many users and then diminished. In the mobile television service this dip can be explained by the lack of television formats for mobile phones. There have not yet been comparable developments in the Netherlands.

8.1.4 Comparison of developments in the use of mobile services between the Netherlands and Finland, 2007–2008



[1] Images, logos and wallpapers.

Source: TU Delft, 2008.

Figure 8.1.4 shows the comparison between the two countries during 2007–2008. Again the figure clearly shows that the level of use in the Netherlands was significantly lower. The most pronounced differences with Finland were in searching services and mobile television.

8.2 ICT labour market in perspective

This contribution looks at the issue of the ICT labour market. The contribution is an elaboration of the labour market chapter in the ICT~Marktmonitor 2008 by ICT~Office (in cooperation with Heliview Research). This monitor presents an up to date review of actual and expected growth of the ICT sector as well as figures on education and the labour market for the years ahead.

Author: Bart Pegge, ICT~Office

Scarcity of labour

Companies in the ICT sector and elsewhere experience a scarcity of ICT professionals on the labour market. [2)] ICT companies in particular feel this in their operational management. Demand for good personnel increases as the companies grow. The ICT sector is increasingly hampered by the fact that they cannot take on some orders due to a shortage of highly qualified personnel.

The emphasis is clearly on the quality of personnel. During the previous period of scarcity, in the year 2000, many companies retrained non-ICT professionals, whereas in 2008 they only wanted to hire professionals with the appropriate study background and experience. This means that the labour market is becoming more mature and that companies can build a more stable workforce. This stability reduces the chance that the sector lands itself in the so-called hog cycle, an economic phenomenon where great shortages – in this case of personnel – and great surpluses alternate.

Insufficient inflow from education

The influx of new ICT students in colleges and universities has fallen until 2008. There are various differences between the curriculum taught and education levels. Traditional ICT studies, including informatics and business informatics, are less popular with the new student cohorts. Student numbers in technical and in-depth ICT studies are falling. Other studies, such as Communication Systems and Communication & Multimedia Design, are attracting more students. Students find these new studies more attractive because of the modern name and responsiveness to trends.

It is not only important to improve the influx into ICT studies, education must match the demands of the labour market, and this requires attention. Companies require

Table 8.2.1
Development of intake in ICT studies at the HBO (college) level, 2001–2007 [1)]

	2001	2003	2005	2007
	number			
Total intake HBO-ICT	6,095	5,495	5,893	5,288
of which Business ICT	1,765	1,056	1,234	1,009
Communication systems	248	343	616	588
Communication & Multimedia design	39	805	1,082	1,141
Informatics	2,061	2,228	1,960	1,734
Technical informatics	300	684	748	621

[1)] Only the major HBO–ICT studies are included. The figures include study year 2007/2008. The most recent figures are still unavailable, but the first indications show that the number of registrations has increased across the board in the study year 2008/2009.

Source: HBO-raad, 2008.

professional competence as well as social, communicative and commercial skills. The education system does not sufficiently address this yet. By promoting cooperation between companies and education, the schools gain more insight in the required and necessary competence. Furthermore, companies will also have to provide students with experience, gained for example in on-the-job training during their studies.

In studies that do not focus specifically on ICT, the importance of ICT should be emphasized more. The aim is to provide the other students with insights about the power and limitations of ICT applications. The possibilities provided by ICT as a pivot for innovation can only be maximised when users know how ICT can be applied. [3)] This can be achieved by introducing ICT-related issues as part of the standard curriculum in secondary and higher education.

Influx on the ICT labour market

The influx of ICT professionals on the labour market will fall until 2012 according to the study. The number of ICT professionals is calculated on the basis of the number of registrations, graduates and the average graduation rates in recent years (VSNU, 2008; HBO-raad, 2008). Apart from the supply from the schools there is also the supply made up of job seekers. The great demand for ICT professionals in recent years means that the group of job seekers with a background in ICT was reduced. The number of ICT professionals registered at the job exchange (CWI) as unemployed job seekers has nearly halved since the end of 2005.

Many job seekers have been registered at the CWI job exchange for a long time. This may widen the quality gap between the supply of and the demand for work. As a

Table 8.2.2
Number of non-working ICT professionals by education level, 2005–2007

	2005	2006	2007
	number		
University level	10	96	79
College (HBO) level	6,863	5,192	3,726
Secondary (MBO) level	5,242	4,067	3,007
Total number of ICT professionals registered with CWI job exchange	12,115	9,355	6,812

Source: CWI, 2008.

Table 8.2.3
Expected inflow of ICTprofessionals on the labour market from higher education and CWI, 2008–2012

	2008	2009	2010	2011	2012
	number				
Inflow from CWI HBO/University	950	950	760	0	0
Inflow from HBO (college level) ICT	2,800	2,860	3,140	3,050	2,970
Inflow from university level ICT	760	730	650	670	680
Total inflow of ICT professionals	4,510	4,540	4,550	3,720	3,650

Source: ICT~Office, 2008.

consequence not all job seekers will be able to find jobs at their level in an ICT profession. The calculation below is based on the assumption that 70 percent of the job seekers in 2007 will find a job in ICT over the next few years.

The influx from higher education (graduates) on the ICT labour market and of job seekers who found a job is estimated to be around 4.5 thousand ICT professionals until the end of 2010. Then the number is expected to fall due to the lack of job seekers as a source. The influx from ICT college graduates (HBO-ICT) will also fall because the current dip in the influx in education will have its effect on the outflow after 2010.

Demand of the ICT labour market until 2012

The Dutch economy is expected to grow by an average of 2 percent a year in the medium term (CPB, 2007). Compared to this the ICT sector is expected to grow above average. So ICT professionals are needed in increasing numbers, not only in ICT companies but also in the other sectors of the economy. The Research Centre for

Education and the Labour market of Maastricht University predicts an annual increase of 4.9 percent in employment for ICT professionals until 2011 (ROA, 2007). This percentage includes the demand for replacements and expansion.

The demand for replacements is the demand that comes about when workers leave, for example, due to retirement, labour disability, or a switch to a non-ICT job. ROA has calculated that 2.3 percent of the professional ICT population has to be replaced each year. The size of the professional ICT population does not change on balance when this demand is filled. The demand for expansion is due to creating new jobs, which does change the professional ICT population. ROA has calculated that the demand for expansion will be 2.8 percent of the existing professional ICT population (ROA, 2007).

The demand for ICT professionals over the next few years is calculated on the basis of the replacement and expansion demand. In calculating the total professional ICT population the base year was 2006 – when 248,000 ICT professionals were active on the labour market – and including the annual demand due to expansion. The number of vacancies is calculated on the basis of both replacement and expansion demand. In the calculations the ratio between ICT professionals with a secondary (MBO) and a higher education background was kept constant at 42 and 58 percent. A constant distribution is assumed of the number of ICT professionals working in the ICT sector (55 percent) and those working elsewhere (45 percent). This is based on data of Statistics Netherlands.

Table 8.2.4
Expected number of ICT professionals by education level, 2008–2012

	2008	2010	2012
	number		
University level	54,300	57,400	60,600
College level HBO	97,700	103,300	109,100
Total ICT professionals	152,000	160,700	169,700
Secondary level MBO	110,000	116,300	122,900
Total	262,000	277,000	292,600

Source: ICT~Office, 2008.

In 2008 there were about 262 thousand ICT professionals in the Netherlands of whom almost 152 thousand at the college and university levels. The number is expected to increase to nearly 170 thousand in 2012 in a total of about 292 thousand ICT professionals. The number of ICT professionals with a secondary (MBO) background will increase to almost 123 thousand.

Here the definition of the demand for ICT professionals is based on the number of vacancies that are hard to fill. These are vacancies that have been unfilled for more than three months, both in the ICT sector and elsewhere. The vacancy rate differs per education level and per sector in which ICT professionals work (ITS, 2006). The vacancy rate also depends on the increase in the demand for ICT personnel. The calculation for the year 2008 shows that the vacancy rate in the ICT sector was highest for university-educated professionals (over 10 percent). The vacancy rate in other sectors was considerably lower.

Table 8.2.5
Vacancy rate of ICT professionals, vacancies longer than three months vacant, 2008 [1)]

	Vacancy rate ICT sector	Vacancy rate other sectors
	%	
University level	10.39	5.89
College level HBO	6.90	4.06
Secondary level MBO	4.16	0.62

[1)] In the calculation of the vacancy rate (vacancies per 100 jobs) 2006 is the base year (ITS, 2006). The annual additional demand for ICT professionals is calculated in the vacancy rate until 2012.

Source: ICT~Office, 2008.

The vacancies for ICT professionals that are hard to fill are expected to increase to more than 15 thousand in 2012. The demand for ICT professionals that is hard to meet is expected to increase by over 45 percent in the period 2008–2012. The calculation of the total demand for ICT professionals further shows that the ICT sector has twice

Table 8.2.6
Total demand for ICT professionals in the Netherlands by education level and sector, 2008–2012 [1)]

	2008	2010	2012
	number		
Demand for ICT professionals at the university level in the ICT sector	3,270	3,960	4,790
Demand for ICT professionals at the college (HBO) level in the ICT sector	3,870	4,680	5,670
Total demand for ICT professionals in ICT sector	7,140	8,640	10,460
Demand for university level in other sectors	1,500	1,820	2,200
Demand for college (HBO) level in other sectors	1,840	2,230	2,700
Total demand for ICT professionals in other sectors	3,340	4,050	4,900
Total demand for ICT professionals	10,480	12,690	15,360

[1)] The demand for ICT professionals equals the number of vacancies that are expected to be hard to fill.

Source: ICT~Office, 2008.

as many vacancies that are hard to fill than the other sectors in the Netherlands with vacancies for ICT professionals. The shortage of ICT professionals at the university level is greater than that at the college level, relatively speaking. The total number of ICT professionals at the university level in the ICT sector is considerably lower than the number at the college level, whereas there is little difference in the demand for university and college graduates that is hard to fill.

Shortages on the ICT labour market until 2012

When the additional demand for ICT professionals is adjusted by the additional supply of ICT professionals, the result is a shortage on the ICT labour market. The assumption for the influx of the number of ICT professionals in de ICT sector is that the same ratio applies as the population of ICT professionals across the labour market. Some 55 percent of the influx in the labour market get a job in the ICT sector, 45 percent gets a job elsewhere. Still the shortage is expected to increase. A constant growth in the number of new jobs, assuming a constant 2.8 percent expansion-based demand, will make the shortage of ICT professionals in 2012 increase to over 11.7 thousand highly educated ICT professionals. This constitutes 6.9 percent of the highly educated professional ICT population at that time.

Table 8.2.7
Shortage of ICT professionals, 2008–2012

	2008	2010	2012
	number		
Shortages of ICT professionals in the ICT sector	4,660	6,140	8,460
Shortages of ICT professionals in other sectors	1,310	2,000	3,250
Total shortage of ICT professionals	5,970	8,140	11,710
Total number of employed ICT professionals	152,000	160,700	169,700
	%		
Share of shortage in the total number of ICT professionals	3.90	5.10	6.90

Source: ICT~Office, 2008.

The cause of the growing shortages is the increasing demand for ICT professionals, and the reduced outflow from education. Although the outflow from ICT studies can be calculated quite well (today's influx is the outflow in four to five years time on the labour market), it is becoming harder to predict the demand for ICT professionals. Therefore ICT~Office has constructed various scenarios based on economic growth and the related demand for ICT professionals.

Different scenarios on the shortages of ICT professionals until 2012

The study uses four scenarios which assume that the supply is constant and the demand depends on the economic circumstances. The demand for ICT professionals mentioned above was based on the scenario of constant growth in which the number of jobs opening up due to replacements and expansion is estimated to be 4.9 percent. The calculations made by ROA (2007) are the guidelines. The other three scenarios are diminished growth, skewed growth and recession (table 8.2.8).

Table 8.2.8
Scenarios of the shortage of ICT professionals, 2008–2012

	2008	2010	2012
	number		
Scenario diminished growth			
Shortage of ICT professionals in the ICT sector	4,660	4,990	5,760
Shortage of ICT professionals in other sectors	1,310	1,380	1,980
Total shortage of ICT professionals	5,970	6,370	7,740
Total number of employed ICT professionals	152,000	155,900	155,900
	%		
Share of shortage on the total number of ICT professionals	3.9	4.1	5.0
	number		
Scenario of skewed growth			
Shortage of ICT professionals in the ICT sector	5,100	6,470	7,310
Shortage of ICT professionals in other sectors	1,490	2,080	2,700
Total shortage of ICT professionals	6,590	8,550	10,010
Total number of employed ICT professionals	152,000	169,750	169,750
	%		
Share of shortage on the total number of ICT professionals	4.3	5.0	5.9
	number		
Scenario recession			
Shortage of ICT professionals in the ICT sector	4,150	2,700	3,360
Shortage of ICT professionals in other sectors	1,050	310	850
Total shortage of ICT professionals	5,200	3,010	4,210
Total number of employed ICT professionals	152,000	148,900	145,200
	%		
Share of shortage on the total number of ICT professionals	3.4	2.0	2.9

Source: ICT~Office, 2008.

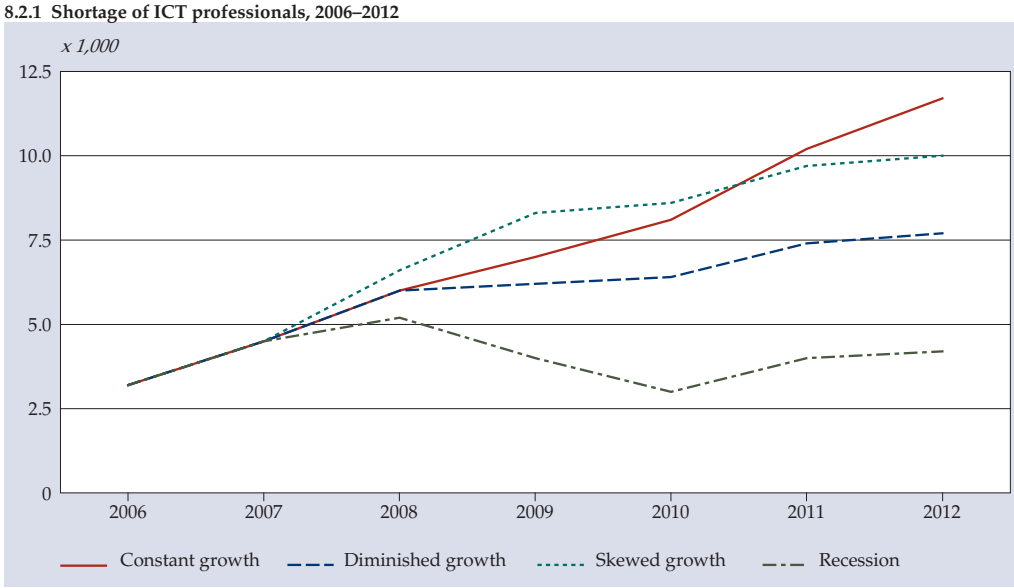
The diminished growth scenario assumes that opening jobs will grow by 4.9 percent until the end of 2008. From 2009 onward the number of jobs is assumed to be constant: no more expansion, but demand for replacements remains. The vacancy rate in this scenario is also constant after 2008. The shortages will have increased to over 7.7 thousand in 2012 despite these constants due to the diminishing supply of ICT professionals.

The skewed growth scenario assumes that the demand on the ICT labour market came about by a rapid growth of the number of jobs in 2008 and 2009 with a double demand due to expansion. As of 2010 demand due to expansion is cut to zero and the number of jobs remains constant. Demand for replacements remains.

Finally there is the recession scenario. As of 2008 there is negative job growth. After 2010 there is a slight recovery. Apart from a negative expansion growth of 3 percent there is still some demand left due to replacement. In this scenario the assumption is that the labour market is diminished but that demand for replacement remains to some extent. In this scenario the vacancy rate also falls rapidly.

These scenarios show that the economy has considerable influence on the shortages. In case of a recession the shortage of professionals will fall drastically, but even then it stays over 2.5 thousand. So the ICT labour market will face a basic structural shortage regardless of how the economy performs. The differences between the four scenarios are visualised in the next figure.

8.2.1 Shortage of ICT professionals, 2006–2012



Source: ICT~Office, 2008.

Addressing the shortages

The various scenarios do not take into account how the organisations will anticipate these shortages. In practice a shortage of personnel will force companies to offshore services or not to take on projects. When more work is accepted without extra ICT professionals to match, this will lead to a greater pressure at work. Another method is to attract labour migrants to reduce the pressure temporarily. Activating unemployed ICT professionals, if possible, can be a way to get the professionals back on the labour market. This will require a major effort in retraining. In some cases this is not a good solution because the gap with the latest technology has become too great.

Organisations not only solve the shortages in different ways, the approach also differs per education level. Vacancies at the academic level are not filled in over a quarter of the cases. Hiring temporary staff is a possible solution for over half of all organisations across the board (ITS, 2006). However, this is not a solution for the labour market. It is mainly the structural shortages at the secondary (MBO) level that companies solve by outsourcing and offshoring. A quarter of the companies consider recruitment abroad when facing vacancies at the university level. They do so considerably less with jobs at the HBO and MBO levels (ITS, 2006). The solutions for the vacancies at the college (HBO) and university levels will therefore have to be found mainly within the Netherlands.

8.3 On the C of ICT

How are ICT tools used? What, for example, are the effects of the use of broadband? Measuring these effects is far from simple, because the C of ICT is linked to the investments in computer hardware (the IT of ICT). The introduction of broadband technology stimulates the use of all kinds of ICT applications – such as e-commerce – and encourages companies to invest more in IT. This makes it difficult to attribute any effects to a specific ICT application or to the investment in itself. This paper summerises a study of microdata for the Netherlands and the United Kingdom. In this study the attempt was made to break down the total productivity effects of broadband use into a direct and an indirect contribution (the contribution led via IT capital deepening). The effects both turn out to be similar in the two countries. The direct effect (the contribution of the ICT use) to the Total Factor Productivity turns out to be higher than the indirect effect.

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Introduction

Although the importance of ICT is generally acknowledged there is still much uncertainty about what the use of ICT tools means for the innovative capacity and productivity growth in companies. Companies use ICT in different ways. The use starts with the purchase of computers and software. Investing in computers and

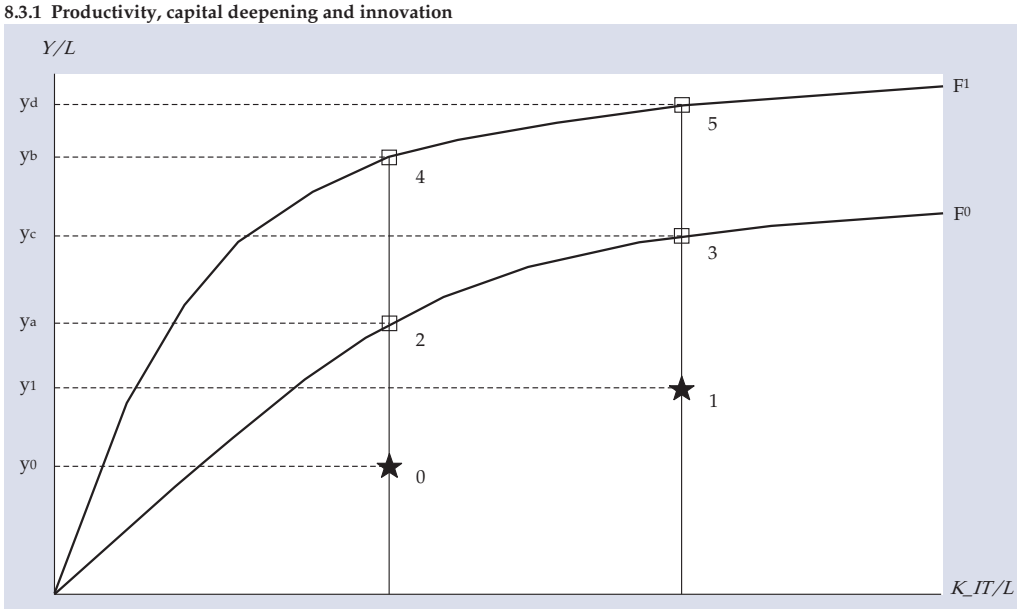
operating software is not sufficient as a prerequisite for increasing productivity. In order to make ICT work, companies often face additional costs for non-technological innovations. For example, changes in how the company is organised when aiming to exploit the advantages of working in networks. Computers can be seen as a special kind of capital because of their potential to generate both internal and external network effects. This example also illustrates how technological innovations can in turn generate new innovations, both technologial and non-technological. The C of communication in ICT is an example of a cumulative innovation process, because without computer technology there would be no internet or even email.

So in essence ICT is both a kind of innovation embodied in the use of computers and an enabler of innovations. These two faces of ICT make that it is difficult to quantify the direct and indirect effects (through innovation) of ICT use on productivity growth. This contribution details the results of an international research project in which Statistics Netherlands was involved. The project, financed largely by Eurostat, aimed to map the effects of ICT use on productivity. The emphasis is on a comparison of the results for the Netherlands and the United Kingdom. Before showing the results of this international study, the difference between capital deepening and innovation will be discussed.

The difference between capital deepening and innovation

The two faces of ICT use can be explained by means of figure 8.3.1. On the x-axis of figure 8.3.1 the IT intensity is measured through the volume of IT capital (K_IT) per employee (L). The y-axis shows labour productivity in terms of value added (Y) per

8.3.1 Productivity, capital deepening and innovation



employee (L). The curves F0 and F1 represent two different best practice technologies 0 and 1: the maximum productivity attainable for a given combination of ICT capital and labour, where technology 1 makes a more productive use of the same volume of IT capital per employee than technology 0.

Not all companies produce according to best practice or frontier technology. The figure shows that, with the same level of IT capital input, companies 0 and 1 have a lower productivity than companies 2 and 3, and lower than companies 4 and 5 as well. In other words: companies 0 and 1 are less efficient than the frontier companies 2, 3, 4 and 5.

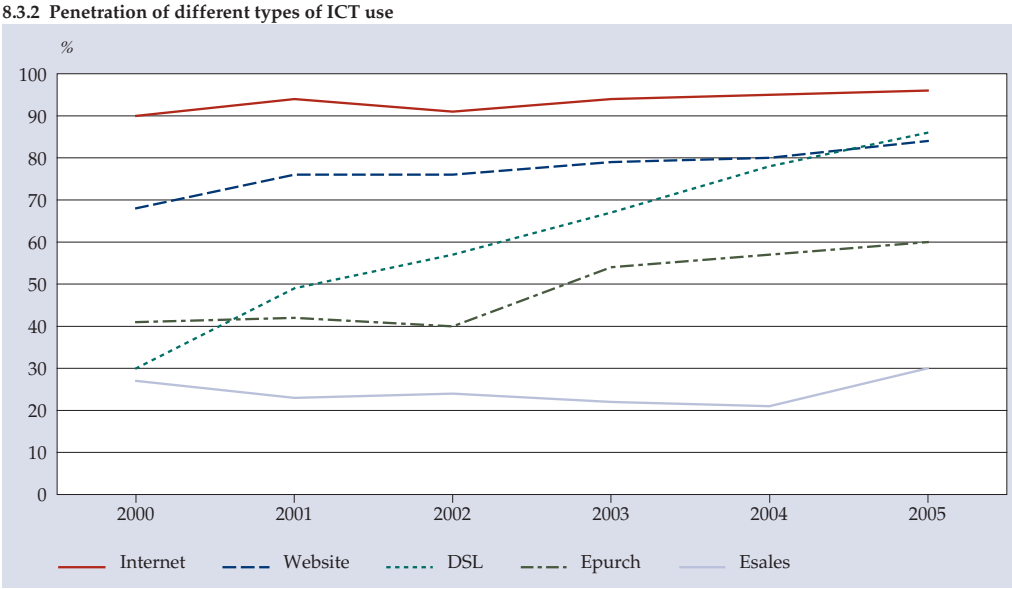
Company 3 is more productive with technology 0 than company 2 because it has invested more per employee in IT. The same is true for company 5 in comparison to company 4 for technology 1.
The example shows that productivity may increase by investing more in IT (moving along the curve, that is the contribution to productivity by IT capital deepening), but also by a more innovative use of cumulated IT investments (the frontier shift). The increased possibilities of communication technology due to the use of broadband (DSL) is an example of a shift of the best practice technology. The marginal costs of using the internet via DSL are minor in comparison to investments in hardware. [4)] This leads to the question what the increased penetration of broadband connections and the new possibilities resulting from it for internet applications, such as e-commerce, means for the productivity of companies using ICT. [5)] This was studied by linking data on IT investments and data on (IT) investments and the use of ICT with the operating results of companies. One advantage of the use of such microdata is that the data refer to real actors in the economy and not to results from sectors of the economy as a whole (the macrodata).

The penetration of different kinds of ICT use

It is highly informative to look at the developments of the various kinds of ICT use in previous years. Figure 8.3.2 shows the developments of these averages calculated for 13 countries over 2000–2005; [6)] 100 means maximum penetration.

Remarkably, almost all companies had internet access (over 90 percent of all companies) or used a website (average on the period studied was almost 80 percent of all companies), but that the application of e-commerce was and actually still is relatively modest. It turns out that electronic purchases (Epurch) and electronic sales (Esales) only started to take off at the end of the period, probably due to the increased penetration of DSL and the fast internet applications facilitated by it. [7)] Despite this there is a lot to be gained in e-commerce. This is shown in figure 8.3.3. It includes the shares of e-commerce in company purchases and sales in 2005, measured for the same companies and the same period. Figure 8.3.2 shows the percentage of companies engaged in electronic purchases and sales regardless of how important these are for their purchases or sales.

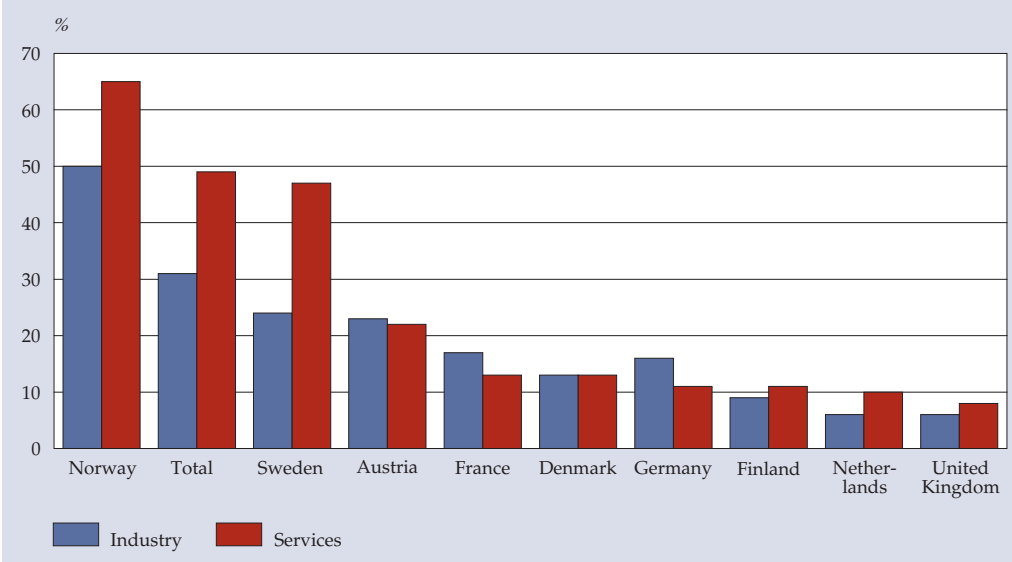
8.3.2 Penetration of different types of ICT use



Source: Final Report ICT impact assessment by linking data from different sources, Eurostat, 2008.

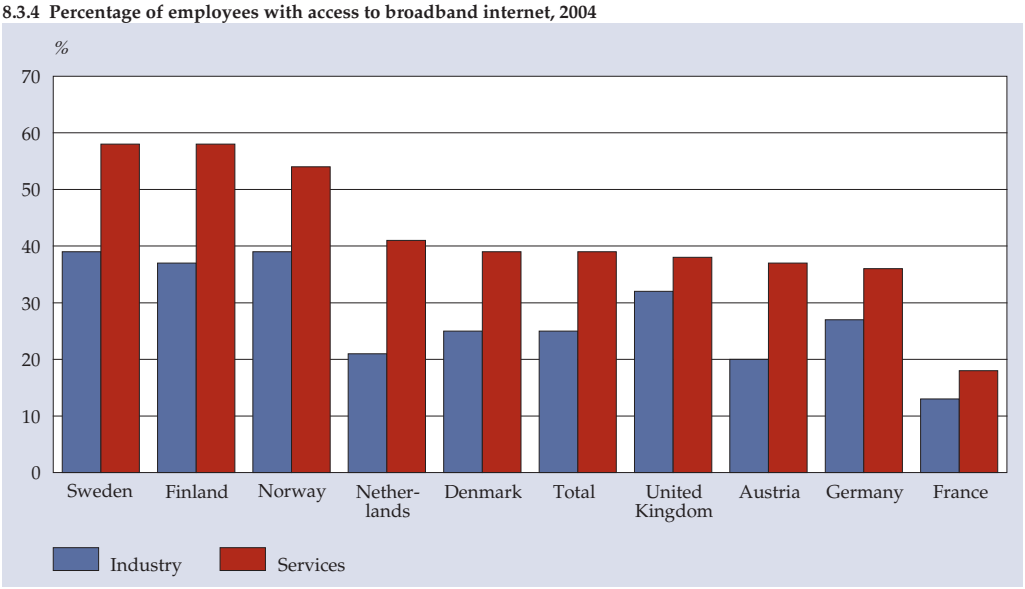
Figure 8.3.3 confirms that e-commerce is still of a relatively modest importance, taking into account the share of electronic purchases and sales in the total purchases or turnover. The figures are totals for electronic purchases and sales. [8)] Except for France, Austria and Germany e-commerce occurs most frequently in the services sector (wholesale and retail trade, and business services) rather than in industry.

8.3.3 E-commerce related to total purchases or sales, international, 2005



Source: Final Report ICT impact assessment by linking data from different sources, Eurostat, 2008.

8.3.4 Percentage of employees with access to broadband internet, 2004



Source: Final Report ICT impact assessment by linking data from different sources, Eurostat, 2008.

Whereas Sweden and Austria have the highest scores, the Netherlands and the United Kingdom only occupy a middle position in Europe. Nevertheless there are interesting differences between the two countries. The importance of electronic sales in 2004 was much greater in the United Kingdom than in the Netherlands (14 percent for the United Kingdom versus 6 percent for the Netherlands), while the opposite is true for electronic purchases (5 percent for the Netherlands and 3 percent for the United Kingdom).

A measure was developed in the Eurostat project that combines the use of DSL with the IT intensity, measured by the percentage of employees using a computer (PCpct). The percentage of employees with access to high-speed internet is defined as DSLpct = DSL*PCpct. In this measure, DSL is a binary indicator that shows whether or not companies use DSL. Figure 8.3.2 shows that the saturation point is almost reached because almost all companies now use DSL for internet applications such as e-commerce. The scores for the percentage of employees with access to high-speed internet are considerably lower. This is due to the wide variation in computer use (PCpct). After all, not all employees use a computer to do their work. For that reason there are great differences in the percentage of DSL-enabled employees. Figure 8.3.4 shows that there are also sector-specific differences. In the services sector (mainly in wholesale and business services) the dependence on computers is generally much greater than in the manufacturing industry, which implies that DSLpct across the board is much higher for the services even if there is no difference in the penetration of broadband connections (DSL).

IT investments, ICT use, and productivity: three questions

Given the previous sections it is logical to relate the productivity differences between companies to the changes in ICT use, such as the increase of e-commerce after the introduction of DSL. A direct approach is to study the correlation between the productivity of companies and the indicator for broadband intensity (DSLpct). It is only worthwhile to undertake all this if the input of IT per employee in the previous years stayed the same for all companies. In that case the introduction of DSL would be neutral in the sense that all computers availabe would in principle be more productive when DSL is used. However this is not a very realistic situation because:

- Not all companies switched to the use of DSL at the same time, because figure 8.3.2 shows a gradual increase in the use of DSL;
- The speed with which computers become obsolete due to the changes in technology means that there will always be some degree of replacement within several years. Old computers are replaced by new ones, which more or less automatically leads to more IT input per employee (IT capital deepening);
- It is possible that companies started to invest more in IT because of the applications made possible by DSL.

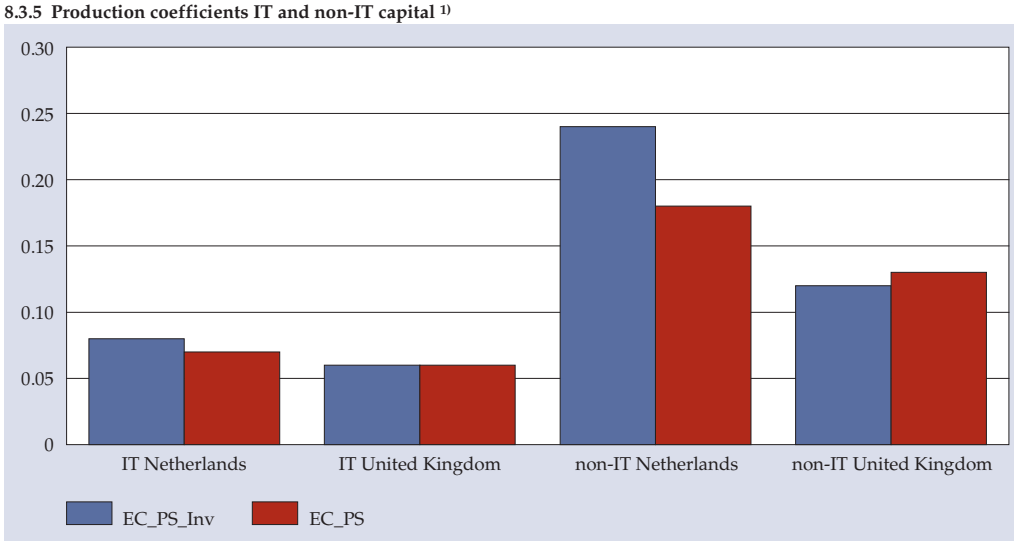
Another complication lies in the measure selected. The definition of the intensity of broadband use (DSLpct) implies that if all companies were to use DSL, the variation in DSLpct would only be the variation in pc use (PCpct). In that case it is impossible to identify the additional productivity effects of DSL in the data. [9)] So in order to map the effects of broadband on productivity properly we need data on the use of DSL as well as data on the cumulated IT investments (the stock of IT capital).

Of the thirteen countries participating in the Eurostat ICT Impact project only the Netherlands and the United Kingdom had the required investment data available. These data were used to construct the stocks of fixed capital goods for ICT and other capital. After linking these variables with data from the ICT use by companies survey and the production statistics the following questions can be addressed:

- Are the indicators from the ICT use by companies survey good predictors of the missing data on IT investments?
- Does DSL use make a direct contribution to productivity, apart from the consequences of DSL use for the IT input per employee, or does increased penetration of DSL lead to more IT input per employee and therefore to more productivity?
- Does e-commerce make an additional contribution to labour productivity, after taking into account the differences in IT input per employee? In that case the conclusion is that e-commerce as a specific form of ICT use leads to a higher Total Factor Productivity (TFP). [10)] In figure 8.3.1 this effect shows as the shift of the productivity frontier from F^0 to F^1.

These questions were answered by using a structural econometric model. [11)] In this model the differences in labour productivity, IT and other capital per employee are

8.3.5 Production coefficients IT and non-IT capital [1)]



[1)] The y-axis shows the regression coefficients for the two kinds of capital. These can be used to calculate productivity effects.

Source: Final Report ICT impact assessment by linking data from different sources, Eurostat, 2008.

explained simultaneously. The productivity regression includes the wage sum per employee as an additional explanatory variable to correct the differences in the quality of labour. The model was further extended by a wage comparison in order to take into account the reversed causality between wages and productivity. Finally a correction was made in the estimation procedure for distortions in the estimates due to selectivity. [12)]

The predictive power of the indicators from the ICT use by companies survey

By linking various data sources (surveys on investment, ICT use by companies, and the production statistics) for the period 2002–2005 [13)] the model could be applied to 2,015 companies in the Netherlands and 6,384 companies in the United Kingdom. These data sets are referred to as EC_PS_Inv. The link shows that the overlap between the investment data and the data from survey on the ICT use by companies is much smaller than the overlap between the survey on the ICT use by companies and the production statistics. [14)] The panel of companies that can be used after linking the last two sources is 6,016 in the Netherlands and 9,645 in the United Kingdom. This implies that for 4,001 Dutch companies and for 3,261 companies from the United Kingdom there is extra data available on ICT use that can be used to predict missing capital stock data. [15)] The predictive power of ICT indicators can be studied by re-estimating the productivity equation of the model on the larger data sets (referred to as EC_PS) and comparing these estimates with the estimates for the smaller EC_PS_Inv data sets.
The result of this exercise is summarised in figure 8.3.5. The figure shows that there is a good match between the estimates of the small dataset and the estimates of the maximum dataset. The smallest differences are for the production coefficient of IT

capital, which illustrates that the ICT variables (on e-ecommerce) are good predictors of the missing investment data. Moreover, the pattern for the coefficients matches the findings in the literature. The outcomes indicate that 10 percent more IT capital lead to an increase of labour productivity of 0.6 percent in the United Kingdom and 0.8 percent in the Netherlands. Given the relatively minor share of IT capital in the total stock of physical capital this is a very substantial contribution of IT capital deepening to productivity.

Productivity effects of broadband (high-speed internet) and e-commerce

The answer to the other two questions can be provided by using the estimates for coefficients for the intensity of DSL use and the two ICT variables (on e-commerce) from the model to calculate the productivity effects. The two variables mentioned include the percentage of electronic purchases in total purchases (Epurchpct) and the percentage of electronic sales in total turnover (Esalespct). The intensity of DSL use is represented in the model by the variable DSLpct.

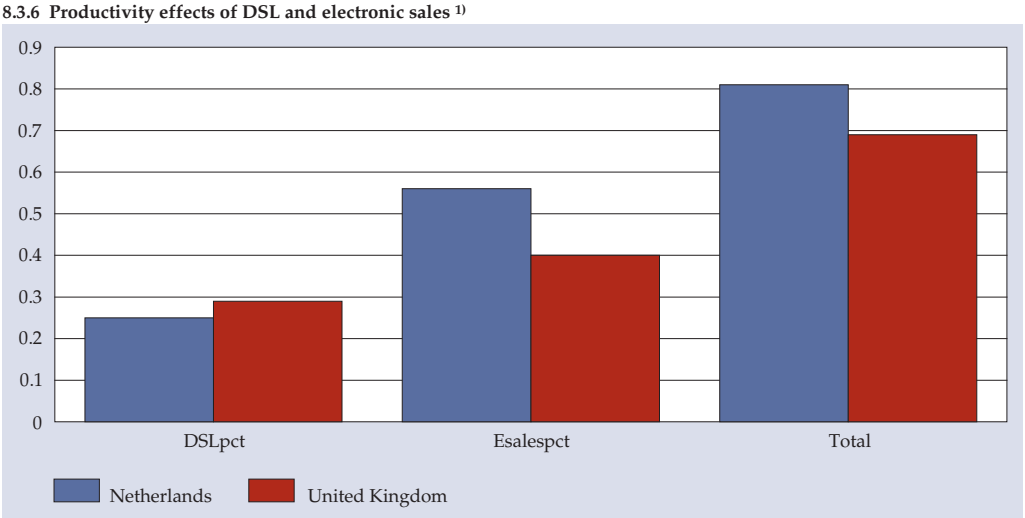
All three variables occur both in the productivity and in the IT capital equation. This allows us to investigate which part of the productivity effects is led via investing in IT capital and which part is independent of it and possibly making a direct contribution to the Total Factor Productivity (TFP). The results of the estimates demonstrate that the two e-commerce variables make no significant contribution to the explanation of differences in IT capital between companies. Moreover, it turns out that the variable electronic purchases also makes no direct contribution to productivity, but electronic sales do.

Furthermore, the intensity of broadband use (DSLpct) turns out to be a major determinant of differences in IT capital per employee, but also that the same variabele – in both countries – is insignificant in the productivity equation. The coefficient of this variable in the equation for IT capital is in the same order of magnitude in both countries, varying from 0.4 (Netherlands) to 0.5 (the United Kingdom). The latter result indicates that the degree of penetration of DSL attracted extra IT investments and so generated productivity gains in a more indirect way.

The following scenario was used to calculate the direct and indirect productivity effects:
- A 10 percent point increase in the intensity of broadband use;
- A 5 percent point increase in electronic sales.

Figure 8.3.6 summarizes the productivity effects. Because the estimates for DSLpct are significant in the equation for IT capital, the colomns on DSLpct refer to the indirect contribution to productivity of the increased intensity of broadband use. So these figures show the indirect productivity effects of DSL use: the contribution channelled via IT capital deepening. This indirect effect is calculated with the aid of the production coefficients from figure 8.3.5, so they refer to productivity gains related to the increase in IT investments as a consequence of the increased use of broadband connections.

8.3.6 Productivity effects of DSL and electronic sales [1)]



[1)] The y-axis shows the increase in productivity as a result of a 10 percent point increase in DSLpct or a 5 percent point increase in Esalespct.

Source: Final Report ICT impact assessment by linking data from different sources, Eurostat, 2008.

These indirect productivity effects match in the two countries, but they are significantly smaller than the productivity gains resulting from the growing electronic sales. The results for Esalespct can be interpreted as a direct contribution of ICT use to the Total Factor Productivity (TFP). So altogether both types of innovation in ICT use result in significant productivity gains (0.8 percent for the Netherlands and 0.7 percent for the United Kingdom respectively).

In summary the conclusion is that the ICT use in companies has contributed directly to productivity.

8.4 *Internet in the used car market*

This contribution describes the role the internet plays in buying and selling used cars (occasions) in the Netherlands. The extent to which consumers and car dealers use the internet as an exploration and sales channel will be looked at. The results come from TNS NIPO, which studied the occasion market in 2008. The study was commissioned by Marktplaats.nl and BOVAG Autodealers.

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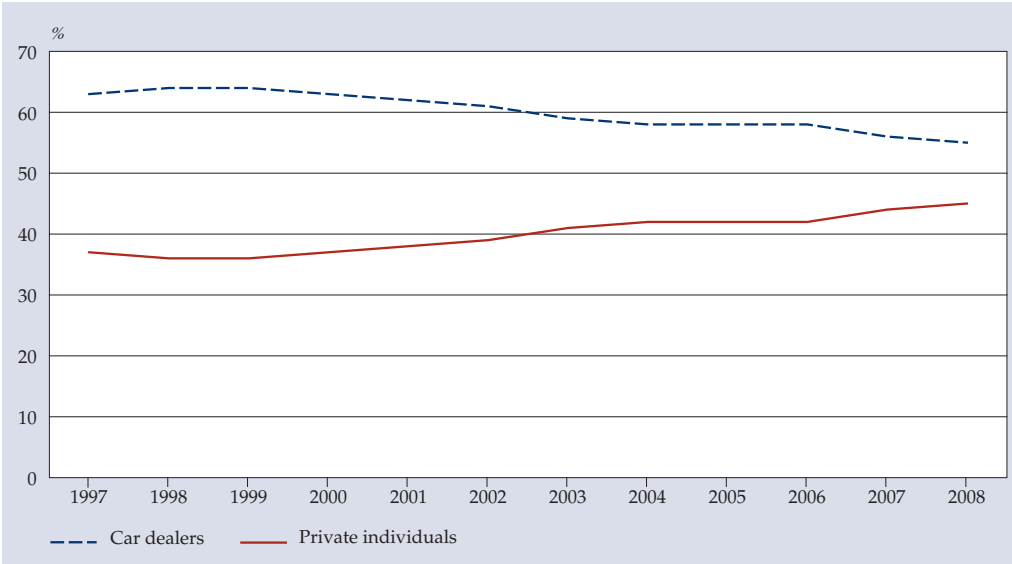
The Dutch used car market

The used car market in the Netherlands is almost four times as big as the market for new cars in terms of sales figures. In 2007 almost 1.9 million used cars were sold in the Netherlands [16)], compared to over 0.5 million new cars (RDC Datacentrum,

8.4.1 Used car sales by car dealers and by private individuals, 1997–2008



Source: RDC Datacentrum (1997–2008).

2008). In the Netherlands many used cars are traded between consumers. The share of this consumer-to-consumer segment (C2C) steadily increased during the last decade thanks in part to the internet. In 1997 this segment accounted for 37 percent of the total used car market, whereas this share in the third quarter of 2008 reached 45 percent (figure 8.4.1).

Role of the internet in the used car market

The internet is playing a key role in buying and selling used cars. In recent years Utrecht University and the Netherlands Institute for Spatial Research studied the use and the implications of the internet for retailers in various categories (see also Weltevreden, 2007). So far, little is known about the use and consequences the internet has in and for the car sector – particularly the used car market. This was why Marktplaats.nl and BOVAG Autodealers commissioned this study. The aim of the study was to gain more insight in the role the internet plays in the used car market. For this purpose TNS NIPO conducted two studies in 2008:

- An online survey about the importance of the internet as a medium for advertising. A total of 428 car dealers participated in the study.
- An online survey about the role of the internet in the search process for a used car. A total of 681 car owners who had recently bought a used car or who were looking for a used car filled in the online questionnaire.

Car dealers get a great deal of competition from the internet

Selling used cars is a major source of income for car dealers. In 2007 car dealers sold 225 used cars on average. The sales of used cars made up about a quarter of their

turnover that year. Used cars are increasingly bought and sold from one consumer to another. As such, it is not surprising that in 2008 two third of the car dealers indicated they have a great deal of competition from the internet; only 6 percent did not really face competition from the internet in 2008. Car dealers who mainly sell non-volume [17] (69 percent) and premium [18] (77 percent) brands indicated more often to experience some or much competition from the internet, than dealers in volume [19] brands (62 percent). The question is how car dealers deal with the increased competition from the internet. Or, to what extent do car dealers use the internet in advertising used cars?

Car dealers frequently use the internet for advertising

The great majority of car dealers used the internet in 2008 to advertise used cars, only 2 percent did not do so independently. [20] Car dealers have been using the internet as advertising channel for used cars for an average of 7 years and 8 months. The premium brand dealers have been using this medium for an average of 9 years.

Car dealers on average advertised their used cars on 5.5 internet sites. This figure includes advertising on their own website and the brand site of the importer/manufacturer. If the latter sites are excluded, the average is 4.0. About 92 percent of the car dealers use software to simultaneously place their used car stock automatically on several internet sites.

Table 8.4.1
Advertising methods of car dealers for used cars by type of car dealer, 2008

	Total	Non-volume brand	Volume brand	Premium brand
	%			
Printed media				
Ads in newspapers/magazines	82	82	82	82
Advertising brochure delivered door-to-door	34	25	42	29
Ads in car magazines	7	8	5	10
Internet				
Own website	88	89	87	84
Ads on internet sites	65	65	64	69
Brand site of importer/manufacturer	64	60	63	84
Advertising banners on internet sites	9	7	9	20
Other advertising media				
Personal letter/email	41	30	43	61
Car fair/car show	20	18	20	29
Outdoor advertising	9	8	9	16
Radio	8	6	9	6
Television	1	2	1	0
Other	11	8	12	18

Source: Bovag Autodealers/Marktplaats.nl, 2008.

The internet is the most dominant advertising medium

Which online advertising media do car dealers use most? On average about 88 percent of the car dealers use their own website for advertising (see table 8.4.1). Advertising sites [21)] and the brand site of the importer/manufacturer are used by about two third of the dealers. So, the internet is used more often in 2008 to advertise used cars than printed media such as newspapers, magazines and brochures.

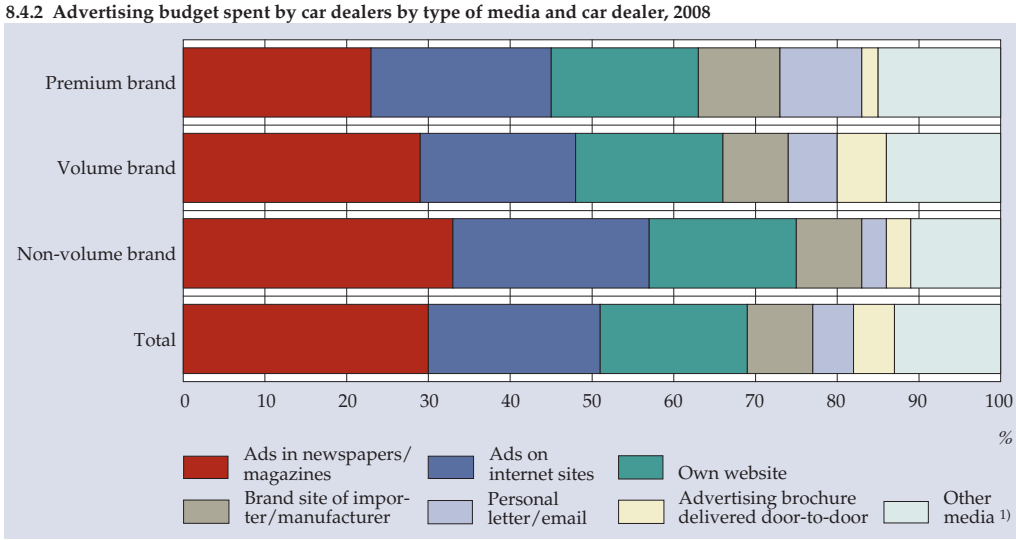
Premium brand dealers use the brand site of the importer/manufacturer, online advertising banners and direct marketing considerably more often than their counterparts selling mainly non-volume and volume brands. The latter car dealers relatively often use brochures that are distributed door-to-door as their advertising medium.

Most spent on internet advertising

What percentage of their advertising budget for used cars do car dealers spend on the internet? Figure 8.4.2 shows that in 2008 almost half of the advertising budget went to advertising on the internet. Most was spent on advertising sites and on the car dealers' own websites. Still, car dealers spent much of their advertising budget on advertisements in printed media, particularly newspapers and magazines.

Premium brand dealers spent a relatively small proportion of their budget on advertising in newspapers and magazines (23 percent) and a relatively large share on personal letters and emails (10 percent), as compared with car dealers that mainly sell other brands.

8.4.2 Advertising budget spent by car dealers by type of media and car dealer, 2008



1) Including car fair/car show, ads in car magazines and advertising banners on internet sites.

Source: Bovag Autodealers, Marktplaats.nl, 2008.

Most potential customers through online advertising

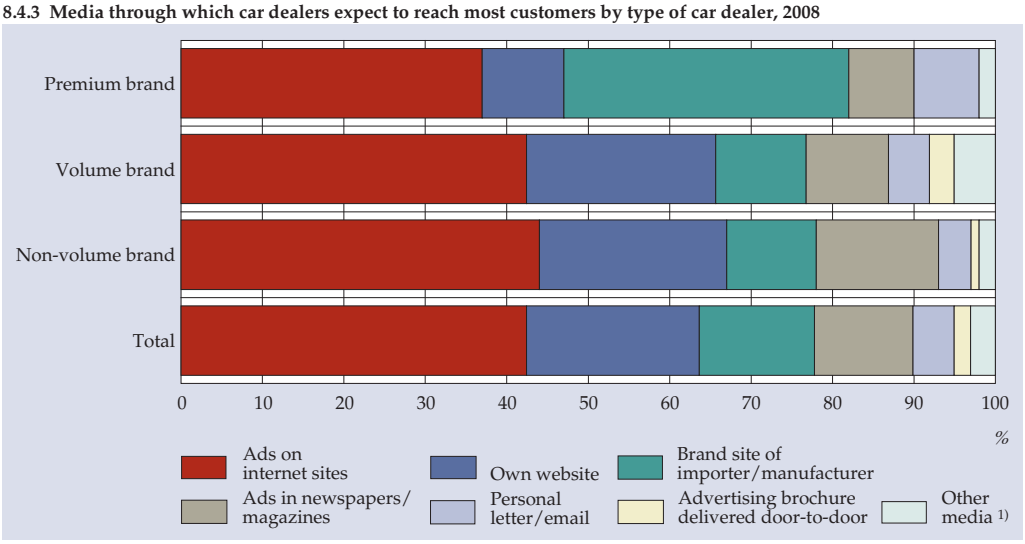
Car dealers think they can reach most potential customers for their used cars through advertising on the internet (see figure 8.4.3), particularly through national advertising sites and their own website. Relatively many car dealers of premium brands expect to accomplish this through the website of their importer/manufacturer. A comparison of figures 8.4.2 and 8.4.3 shows that car dealers spent much of their media budget on advertising in newspapers and magazines (30 percent), whereas on average only 12 percent expected to reach most potential customers through this medium. Perhaps the car dealers use these media not just to generate direct actual sales of used cars. Other motives may also play a role, such as increasing the company's regional name awareness.

Used cars are increasingly traded between consumers

With the arrival of the internet the trade in used cars among consumers has increased. Consumers not only have access to an enormous supply of used cars on the internet, they can also easily sell their own car online.

Consumers buy another car on average every 4.9 years. The price consumers paid or plan to pay for a used car on average is € 9,106. This amount, however, differs from one car brand to another car brand. The average price for premium brands is € 14,804, for volume brands € 8,758, and for non-volume brands € 7,522. Consumers look around before actually buying, so what is the role of the internet in this search process?

8.4.3 Media through which car dealers expect to reach most customers by type of car dealer, 2008



1) Including car fair/car show, ads in car magazines and advertising banners on internet sites.

Source: Bovag Autodealers, Marktplaats.nl, 2008.

Internet main source of information

In 2008 the internet was the most commonly used medium for consumers to look up information (see table 8.4.2). Almost 80 percent used it in their search for a used car. Many consumers visit a car company and make enquiries with family and friends. The printed media are much less important in this process, even though many car dealers do use these media. Moreover, many of them spend a large part of their advertising budget on the printed media.

Consumers tend to consult private individuals and/or their family and friends less as the used car gets more expensive. In such cases, relatively more consumers look at printed media and a greater share visits a car dealer. One explanation is risk aversion, which plays a role when the risk – that is, the purchasing price – increases; for example the risk of buying a lemon.

Table 8.4.2
Ways in which consumers look for a used car by type of used car, 2008

	Total	Under € 5,000	€ 5,000 to € 10,000	€ 10,000 or more
	%			
Printed media				
Ads in newspapers/magazines	18	13	15	22
Advertising brochure delivered door-to-door	17	13	18	21
Ads in car magazines	14	4	15	21
Internet				
Internet	78	78	77	79
Personal				
Visiting a car dealer	49	21	55	63
Visiting an independent car company	46	41	50	46
Visiting a private individual	12	19	13	6
Family and friends	31	39	31	26
Other media				
Personal letter/email	2	1	4	1
Car fair/car show	7	4	8	9
Outdoor advertising	1	1	1	1
Radio	0	0	0	0
TV	4	1	4	6
Other	4	4	4	3

Source: Bovag Autodealers/Marktplaats.nl, 2008.

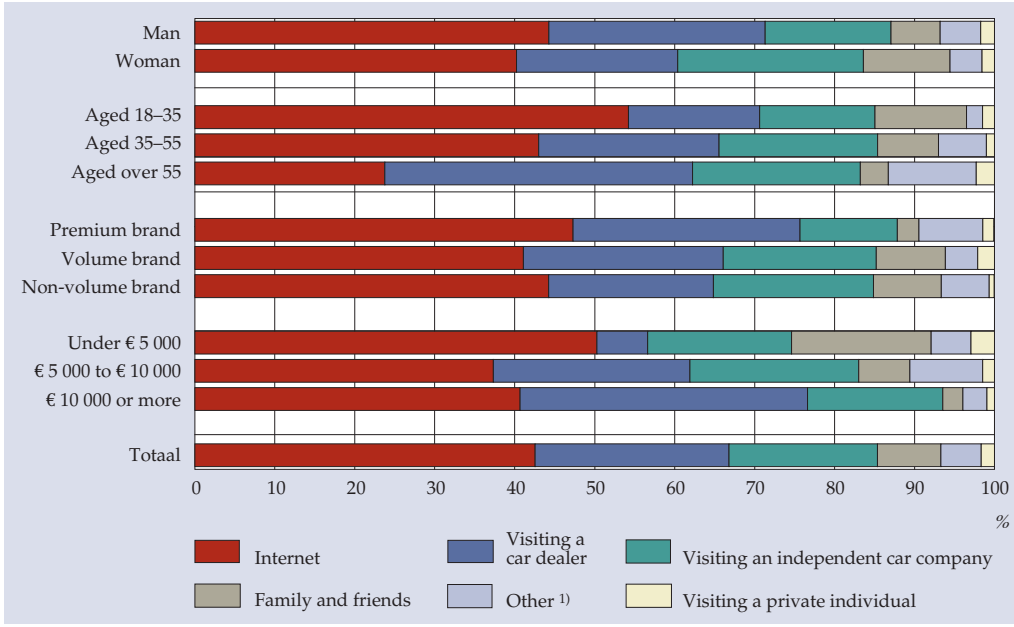
The information gathering process varies from person to person although some aspects turn out to be structural. For example, consumers aged under 35 (45 percent) and women (41 percent) are likely to involve their family and friends in this process. In contrast, men (25 percent) and people over 55 (14 percent) do so least of all. The latter also make the least use of the internet when looking for a used car (60 percent).

Over four in ten consumers stated that the internet is the medium that helped most to determine their choice (42 percent), followed by visiting a car dealer (24 percent), an independent car company (18 percent), and consulting friends and family (8 percent). The other information sources are hardly important to used car buyers (see figure 8.4.4). There are great differences per type of consumer and type of used car in the extent to which media determine the choice. The younger the consumer, the greater the share of the internet as the main information source. The older, the greater the share of consumers who visited a car dealer. Visiting a car dealer is mentioned by more consumers when the price is higher that they have paid or are willing to pay for a used car. Getting the family and friends involved is seen as the main source of information when the amount is lower and the buyer is younger (figure 8.4.4).

Three car sites on average

Used car buyers in 2008 looked up information on 3.1 websites on average. This number is the same for sex, age and type of car brand. For cars up to € 5,000 consumers look at an average of 2.7 sites, and for higher amounts 3.2 websites. Possibly the fear of buying a lemon plays a role, as well as the fear of having missed a real bargain if they got a good deal. By visiting more car sites, consumers may expect to reduce both kinds of mistakes.

8.4.4 Most helpful orientation method in determining the choice of a used car, by personal characteristics and type of used car, 2008



1) Including newspapers/magazines, advertising brochure delivered door-to-door, ads in car magazines, visiting car fair/car show.

Source: Bovag Autodealers, Marktplaats.nl, 2008.

Used car buyers mainly visited the well-known, public advertising sites in 2008 (87 percent, see table 8.4.3). They visit the websites of independent car companies, importers/manufacturers and car dealers much less often. There are differences though per consumer and type of used car. The older the consumer is, the higher the amount people want to spend on a used car, the greater the likelihood of a visit to the brand site or website of a car dealer; women also look at these websites slightly more often than men.

Table 8.4.3
Type of websites where consumers look for used cars by personal characteristics and type of used car, 2008

	Advertising site(s)	Brand site(s) importer/ manufacturer	Website(s) car dealer	Website(s) independent car company	Other website(s) [1]
	%				
Sex					
Man	86	24	29	24	30
Woman	90	26	35	26	17
Age					
18–35	93	15	27	22	23
35–55	85	29	31	27	25
over 55	82	32	40	26	26
Brand preference					
Non-volume brand	86	26	30	30	25
Volume brand	88	23	32	24	24
Premium brand	84	33	33	19	28
Price/budget					
Under € 5,000	89	11	14	21	19
€ 5,000 to € 10,000	89	22	35	29	26
€ 10,000 or more	85	36	41	24	28
Total	**87**	**25**	**31**	**25**	**25**

[1] Including: ANWB.nl, Autoblog.nl, Autovisie.nl, Autoweek.nl and Gaspedaal.nl.

Source: Bovag Autodealers/Marktplaats.nl, 2008.

Used car buyers look on the internet for information about specific cars that are for sale, which is not surprising, followed by car data, car costs and pictures of cars (table 8.4.4); consumers look least for experiences of car owners and addresses of car dealers. However, the information that is looked up differs per consumer and type of used car. Relatively more women than men are interested in car costs; the opposite is true for looking up information on tests and user experiences. The younger the consumer, the greater the share is that looks up information on car costs online, user experiences, pictures of cars, and the value of cars. In addition, the price of used cars also largely influences the type of information consumers look up on the internet (table 8.4.4).

Table 8.4.4
Information searched on the internet by used car buyers by type of used car, 2008

	Total	Under € 5,000	€ 5,000 to € 10,000	€ 10,000 or more
	%			
Specific cars for sale	79	77	80	81
Car data (incl. engine power, weight, storage space)	61	59	60	63
Car costs (incl. road tax, fuel consumption)	58	64	61	52
Photos of cars	55	64	54	50
Sales value of own car	39	23	41	49
Test reports of cars	30	16	36	36
Adresses of car dealers	25	14	26	33
Adresses of independent car companies	25	21	26	27
Experiences of car owners	23	19	32	20
Other information	2	3	2	1

Source: Bovag Autodealers, Marktplaats.nl, 2008.

Conclusion

This paragraph looked at the role the internet plays in the Dutch used car market, from the perspective of both the car dealer and the consumer. In summary:

- Used cars are increasingly sold by consumers to consumers partly because of the internet.
- Car dealers face quite a lot of competition from the internet.
- Car dealers and consumers often use the internet to advertise or to search for used cars.
- Car dealers spent most of their advertising budget for used cars on advertising on internet sites and their own website.
- Car dealers spent relatively much on advertising in newspapers/magazines while this medium hardly determines consumers' choices for a used car.
- Car dealers tend to advertise on more sites for used cars (5.5) than consumers visit (3.1) on average.
- Up to € 5,000 only a small share of the consumers look for used cars at the brand site and the website of car dealers.
- The extent to which consumers use the internet to look for used cars varies greatly per consumer and type of used car.

Notes in de text

1) Statistically significant means that the difference observed in the sample data is not accidental and that it can be generalised with some restrictions. The restrictions are represented with the p-value. A p-value of 5 percent (often written as $p < .05$) means that there is 95 percent certainty about the issue.

2) ICT professionals in this article means ICT specialists with a college or university degree.

3) The underlying thought of ICT as an innovation axis is the conviction that ICT is a major enabler for all sectors in the knowledge-based economy and cuts right across all sectors. Because of this, ICT contributes to the solution of social problems and is a major factor in economic growth (www.innovatiesalon.nl).
4) The investment costs of producers of communication technology in the infrastructure are divided over a huge number of (potential) users.
5) The importance of the internet as an open and decentralised platform for improving communication and innovation and promoting economic growth is expressed by the fact that internet and broadband technology are high on the political agenda of the OECD (see for example *'Shaping Policies for the Future of the Internet Economy'*, OECD, 2008).
6) The 13 countries are: Austria, Czech Republic, Denmark, Finland, France, the United Kingdom, Germany, Ireland, Italy, Netherlands, Norway, Slovenia and Sweden. Source: *Final Report ICT impact assessment by linking data from different sources*, Eurostat, 2008.
7) The level of DSL was underestimated in 2000 and 2001, because several countries (including the Netherlands) only included this variable in the survey ICT use by companies as of 2002.
8) The figure shows the sum of the percentage of electronic purchases (of the total purchases) and the percentage of electronic sales (of the total turnover).
9) In terms of figure 8.3.1: no distinction can be made between moving along the productivity frontier and a shift of the productivity frontier.
10) TFP is the 'residue' that remains after the differences in labour productivity are corrected for differences in capital input (IT and other capital) per employee.
11) For more information on this model and estimation method, see Farooqui, S. and G. van Leeuwen, 2008, *'ICT investment and productivity'*. Chapter 10 of Final report ICT impact assessment by linking data from different sources, Eurostat.
12) The correction for selectivity was applied because the sample studied may no longer have been representative once the various data sources were linked.
13) The research period started in 2002 because as of that year data on the use of DSL in the Netherlands became available.
14) The small overlap has to do with the fact that it takes a continuous series of investment data from 1995 to construct stocks of capital goods. Because companies are not included in the sample surveys each year there is a relatively great lack of investment data.
15) In the model depreciation costs are used to make predictions on other capital.
16) Excluding the trade in used cars among car traders or other companies (trade registers).
17) Non-volume brands have a market share of less than 3.5 percent of the total sales of new cars, such as Alfa Romeo, Daihatsu, Honda, Kia, Mitsubishi, Nissan, Seat, Skoda, Subaru and Suzuki (BOVAG Autodealers, 2008).
18) Premium brands have an average selling price of new cars over the average in their segment and relatively high costs for standards, such as Audi, BMW, Chrysler,

Dodge, Jeep, Jaguar, Land Rover, Lexus, Mercedes, Mini, Saab, Smart and Volvo (BOVAG Autodealers, 2008).

19) Volume brands have a market share of more than 3.5 percent of the sales of new cars, such as Citroën, Fiat, Ford, Opel, Peugeot, Renault, Toyota and Volkswagen (BOVAG Autodealers, 2008).

20) Some car dealers indicated that their advertising for used cars went exclusively through the importer. Advertising exclusively through the importer is actually more usual for new than for used cars.

21) The advertising sites include: Autotrack.nl, Autotrader.nl, Autokopen.nl, Autoscout24.nl, AutoTelegraaf.nl, BOVAG-Occasions.nl and Marktplaats.nl.

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Concepts and definitions used

Some key concepts and definitions used in this publication are explained briefly below.

Basic price

The price received by the producer excluding trade and transport margins of third parties and the balance of product-related taxes (e.g. VAT) and product-related subsidies.

Basic register

An authentic register designated by the Dutch government to form the basis of the system of government registers.

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. The expression high-speed internet is also used for a broadband connection.

Business location

Any individual space, area or complex of spaces used by an enterprise for its business activities. Every company has at least one business location.

Business-to-Business market

The market for electronic shopping where companies sell goods and services to other companies (B2B).

Business-to-Consumer market

The market for online shopping where companies sell goods and services to consumers (individuals and households) (B2C).

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 assets (such as buildings and machinery) and immaterial assets (such as software).

Consumer-to-Consumer market

The market for online shopping where consumers (individuals and households) sell goods and services to other consumers (C2C).

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 does not 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 and emerging economies.

DigiD

Digital identity. Common authentication system by the Dutch government to identify Dutch citizens and enterprises electronically.

E-commerce

Placing or receiving orders for goods or services through electronic networks, regardless of delivery and payment methods. Excluding orders by telephone, fax or email.

E-government

Electronic 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

Online 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.

Employee

Employees in this publication include:

– workers and managing directors on the company payroll;
– workers on the payroll of another company or institution, working in the company (hired-in personnel).
– owners, business partners, members of partnerships, associates and family members working in the company;
– temporary personnel.

Hired-out personnel is excluded.

Hired-out personnel: workers who are on the company payroll, but who work in another company or institution.

EPO (European Patent Office)

EPO grants patents for the countries that signed the European Patents Treaty. In January 2008 there were 34 countries plus four additional countries (extension states) that recognise the European patents, one country that has the right to enter, and one country that is invited to enter. For more information, see www.epo.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 to communicate via one or more computers of one company with 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. 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 or the duration of the contract. Well-known kinds of flexible labour contracts are on call contracts and temporary work.

Goods

Tangible products, such as food, consumer durables and machinery.

Gross value added and gross domestic product (GDP)

Gross value added at basic prices per sector is equal to the difference between production (at basic prices) and intermediate use (at purchase prices). The sum of

the gross value added at basic prices per sector, plus some transactions which are not allocated to sectors, is the gross value added of the total economy, the gross domestic product (at market prices). The other transactions include the balance of product-related taxes and subsidies and the difference between imputed and paid VAT. 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

Information and communication technology. It is the professional domain of information systems, telecommunication and computers.

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 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 (1) are meant to process information and to communicate, including audio-visual aids and (2) use electronic processing technology to observe, measure, reproduce and check information about physical phenomena and processes.
- The sector ICT services must provide services that are meant to support the process of electronic information processing and communication.

In terms of ISIC Rev.3.1 this leads to the following classification:

Internationally agreed definition of the ICT sector

ISIC Rev. 3.1 code	
ICT industry sector	
3000	Manufacture of office, accounting and computing machinery
3130	Manufacture of insulated wire and cable
3210	Manufacture of electronic components
3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
3230	Manufacture of audio and video equipment
3312	Manufacture of equipment for measuring, checking, testing, navigating and other purposes
3313	Manufacture of industrial process control equipment
ICT services sector	
5151	Wholesale of computers, computer peripheral equipment and software
5152	Wholesale of electronic and telecommunications parts and equipment
7123	Renting of office machinery and equipment (including computers)
6420	Telecommunications
7200	Computer and related activities

Source: OECD.

The definition used in this publication of the ICT sector is slightly different. There are no data on groups 5151 and 5152 and 7123 because the national accounts are not sufficiently detailed in this area. Telecommunication is observed together with post and courier services for confidentiality reasons.

Definition of the ICT sector

SIC93	Characterisation 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.

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 (Standaard Beroepenclassificatie SBC).

Imports

Imports refer to goods and services sold abroad to a resident of the Netherlands. Imports of goods refer to goods for residents that were brought from abroad to the economic territory of the Netherlands. When trade and transport margins up to the border of the exporting country are included, this is known as 'free on board' (f.o.b.).
The imports of services refer to spending 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 spending abroad by embassies. The imports by households consist of consumer goods and direct consumer spending by Dutch tourists, people living near 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 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.

International Standard Industrial Classification of All Economic Activities (ISIC)
The classification of economic activities by the United Nations. At the two-digit level, SBI'93 and NACE Rev. 1 are the same as ISIC Rev. 3.1. A revised version will be used in the statistical descriptions of 2008 and beyond.

Internet users

People using the internet. Most figures on internet users refer to people who used the internet in the three months prior to the survey. In this publication they are internet users aged 12–74. In international ICT data the figures refer to people aged 16–74.

Jobs

A position occupied by an employee. An employee 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.

Productivity

See Labour productivity

Public electronic communication network

A public electronic communication network is defined in the Dutch law on telecommunications as a transmission system, 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 refer 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.

Research & Development (R&D)

R&D is looking for solutions to practical problems in a creative, systematic manner according to plans. R&D is characterised by originality and innovation in the research. Strategic and fundamental research, aimed at gaining background information and increasing purely scientific knowledge rather than direct economic gain or problem solving, is also part of R&D. Furthermore, developing ideas and prototypes into usable processes and products ready for production are considered R&D.

R&D expenditure

Expenditure on R&D by in-house personnel. It includes both the operating costs and the investments for the R&D carried out by in-house personnel.

Sectors of industry

Most tables and figures in this publication include data broken down by sector (see table below). Apart from the names used in the tables and figures, the sectors are also specified by their SBI/SIC codes and full names.

Sectors

Description in table	Description and code SIC93
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)
Subsidised 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 SIC groups 80.4 and 91 are excluded.

Self-employed

People earning an income by working for their own account or at their own risk 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. Such email messages are often spread in massive quantities to different email addresses and often contain a commercial message and a link to a commercial website.

Turnover

Turnover is the total revenue from the goods and services sold.

Vacancy

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).

Volume change

The weighted average of the changes in the volume and quality of parts of particular goods or service transactions or the value added.

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