the teldok yearbook 2001

Gull-May Holst
[contributions by
Bertil Thorngren & Bengt-Arne Vedin]

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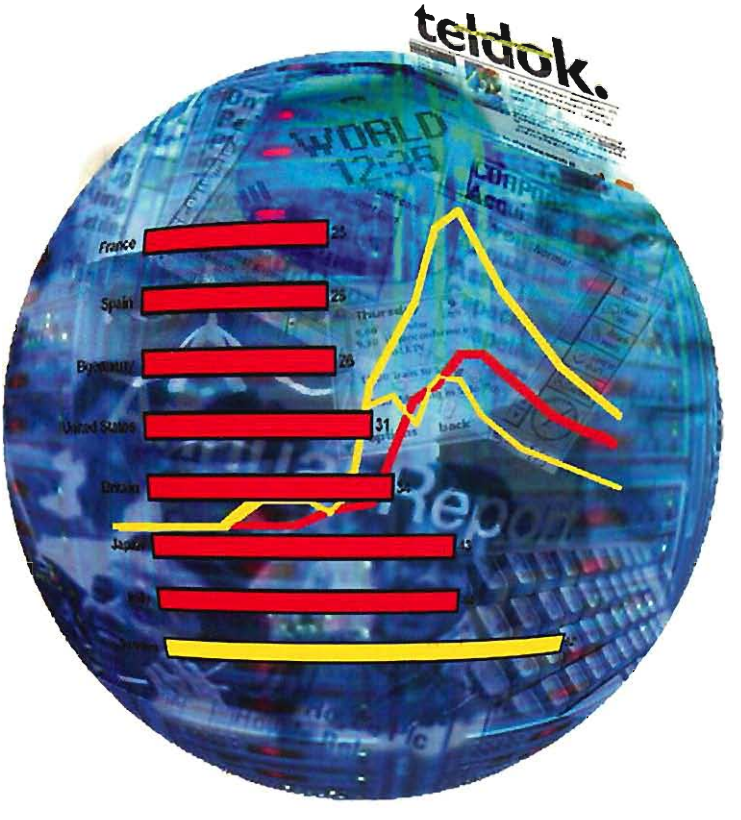
sweden in the information society



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teldok. Report 139

TELDOK was initiated in 1979 by the Board of Telia, Sweden's largest telecommunications operator, to facilitate easy-to-read documentation on the actual use of new IT applications.

TELDOK aims at documenting experiences from early use of new information systems; and arranging study trips and seminars related to this task.

TELDOK activities are coordinated by an Editorial Board with wide representation from the IT corporate user community, academia, trade unions, government authorities, and suppliers.

TELDOK and the Editorial Board can best be reached by email to teldok@ett.se or to the Secretary, PG Holmlov, pg@stones.com.

TELDOK has issued 200 publications, mostly in Swedish, distributed regularly to 4,200 professionals in Sweden and abroad.

TELDOK publications may be ordered from www.teldok.org; or from our distributor, "Linde Livs", fax +46 650 800 08. Reports cost SEK 150 (USD 17) apiece and are stored in Ture's cowshed.

TELDOK publications in English still in stock include...

Via TELDOK 40: The Long Now of Information. October 2000.
TELDOK Report 135E: IT, Innovation—Israel. May 2000.
TELDOK Report 123E: The Net as a Marketplace. March 1999.
Via TELDOK 34E: New Media in Sweden. The Swedish New Media And Internet Industry Survey. December 1998.
TELDOK Report 122E: One book at a time. Print on Demand. October 1998.
TELDOK Report 116: The TELDOK Yearbook 1997. December 1997.
TELDOK Report 111E: IT—Visions at work. December 1997.
Via TELDOK 28E: The building of a world industry—the impact of entrepreneurship... February 1997.
TELDOK Report 94E: IT Myths. November 1996.
TELDOK Report 101E: 20 seconds to work. Home-based telework. October 1995.

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http://www.teldok.org/

The TELDOK Yearbook 2001

Sweden in the Information Society

By
Gull-May Holst

Contributing authors:
Bertil Thorngren
Bengt-Arne Vedin

Layout:
Yvonne Skanlert Werner

Preface

An Online Insider used to offer his newsletter readers Fun With Numbers; however, unless you are an ardent follower of galactical hitchhiking, you won't expect a single number to convey the meaning of complex contexts. But what about 230 graphs and tables, as in the current TELDOK Yearbook? Well, this full-bodied volume sets out to map the status of "Sweden in the Information Society" – at least at the time of writing (some passages were edited in January, 2001, although most of the text was finished by December, 2000).

There is no paucity of data on the pandemic spread and state of information technology. But one cannot find all pieces of information in the public domain; and the bits one stumbles on hardly concur. Thus, it is no mean feat to continously collect and coordinate the kinds of observations on which The TELDOK Yearbook is founded – once again the task of Ms Gull-May Holst, assiduous Editor of this Yearbook as well of its predecessors.

Swedish cabinet ministers, CEOs, online insiders, and others have praised the previous TELDOK Yearbooks; Swedish quality morning newspaper *Dagens Nyheter* called a recent TELDOK Yearbook "the most complete gathering of facts on telecommunications and IT in Sweden". We feel certain that this volume may be of equal value to anyone interested in learning more on the adoption and the use of telecommunications, Internet and information technology, new media, and consumer electronics in the world (Part I) and/or in Sweden (Part II). Thank you, Gull-May, for The TELDOK Yearbook 2001.

PG Holmlov

Secretary, the TELDOK Editorial Board
pg@stones.com

Other reports

TELDOK publications printed 1995 and later can be ordered, at SEK 150 apiece (USD 17), from www.teldok.org/reports/first.htm, by email from teldok@ett.se, by phone +46 650 801 02 or by fax to +46 650 800 58. Please quote the publication number to ensure prompt handling!

The 5 most recent TELDOK reports published in English are...

Via TELDOK 40

The Long Now of Information

Dr Bengt-Arne Vedin (vedin@stockholm.mail.telia.com)

The report looks at patterns in human information handling – some cognitive and perceptual, some social and organizational, others physical; if these fundamental patterns actually were to change, this would be most important.

TELDOK Report 135E

IT, Innovation – Israel

Ed by Dr Bengt-Arne Vedin (vedin@stockholm.mail.telia.com)

A new IT company is formed every 36 hours in Israel, a region second only to Silicon Valley in terms of IT entrepreneurship. Visits and talks are documented with bustling startups, venture capitalists, incubators, and industrial parks.

TELDOK Report 123E

The Net as a marketplace. The Swedish experience

Mr Weje Sandén (weje.sanden@va.se)

Ten pioneering Swedish companies testify on how e-commerce changes distribution and affects competitiveness. In particular, the report shows how the web affects basic conditions in various sectors of industry and commerce.

TELDOK Report 122E

One book at a time. Print on Demand

Ms Maja-Brita Mossberg (maja-brita.mossberg@alfa.telenordia.se)

Will IT revive the publication and improve the distribution of books written on esoteric subjects, read by few, and published in rare languages? Authors, publishers, designers, producers, booksellers, and readers articulate their insights.

Via TELDOK 34E

New Media in Sweden. The Swedish New Media and Internet Industry Survey

Dr Åke Sandberg (Ake.Sandberg@niwl.se)

The report presents results from a survey with managements of more than 300 Swedish CD-ROM and Internet producers.

Contents

Introduction

Time frame

TELDOK 1979–2000

1979	The foundation of TELDOK
1987	The first edition of The Telematic's Yearbook
1988–2000	In total nine editions of the TELDOK Yearbook published, three in English
1999	TELDOK celebrates its first 20 years. Publications in Swedish – 13 are available in English: - 130 TELDOK Reports - 35 via TELDOK - 17 TELDOK info - 13 TELDOK Reference Documents
2000	TELDOK starts collaboration with several partners. "The TELDOK Yearbook 2001" appears in English

TELDOK manifested its first 20 years of existence with two major publications, *"IT-Sverige – en vision från Dataföreningen"*, TELDOK Report 131, and *"TELDOKs Årsbok 2000"*, TELDOK Report 130. The former presents some scenarios for the future of Sweden and the possible role of information technology in the daily lives of the Swedish inhabitants, sometimes in qualitative terms. The second describes in tables and figures the total volume and the quantitative development of telecommunications, computers, infrastructure, media and their users in Sweden. Both publications were launched in late 1999. TELDOK marks its twenty-first year of activity with the ninth edition of *"The TELDOK Yearbook 2001"*, which shares the basic structure and some data with the Swedish version *"TELDOKs Årsbok 2000"* but which in essence is a new book, based on data about Sweden in the Information Society during the past twenty-one years.

Twenty-one years do not represent a very long time in the history of mankind, nor in the so far unknown history of the development of human communication. The history goes back some six million years; maybe the latter is just as old. We do not know. However, looking back at those twenty-one years we find ourselves observing perhaps the most rapid technological development known to mankind. Those twenty-one years make up a large part of what is called the history of information technology.

The brief history of information technology goes back more or less a century. The first eighty years have been dedicated to global mass distribution of technology and technology infrastructures for telegraphy, telephony and telecommunications, broadcasting and mowing pictures. The last twenty years leading up to year 2000, during which TELDOK has been an active member of the information technology society, is best characterized as representing the most compressed technology development in human history so far. This piece of history, in this context now and again related to a somewhat longer perspective, is what we are trying to describe in this book. The descriptions are a series of snap-shots of the technology developments and their application areas seen from a Swedish horizon. The ambition is to provide those unfamiliar with the Swedish information society an accessible and fairly comprehensive introduction to the country and its information technology users.

The process of editing a TELDOK yearbook signifies, among other things, keeping up with the developments of a number of technologies moving faster than the rest of the world. Internet applications, mobile communications, media and content technologies, computer development, alternative infrastructures, and a few other areas like electronics, software manufacturing, and soon enough bioinformatics and nano technology are some of the technology areas we are looking at. It may well be that we have stumbled now and again along the road and missed some developments that we should have covered. We ask the user of the book to bear in mind that this edition of the Yearbook 2001 is a stochastic description of reality, based upon a selection of pictures and recently timed events rather than a methodical review. The time of action of our pictures is basically the recent past, to a certain extent the present and in some cases the immediate future. Often, the data we present are contradictory, this as a direct result of the rapid development of

technology. But there is also a discrepancy between the speed of new technologies being introduced and the slower processes of adaptation of new technologies by the users. Any way we approach the information society, change is taking place at such speed that whatever is written about information technology today, already was obsolete yesterday. Regarded as historical descriptions the contents of this book are fairly accurate, as accurate as it can possibly be in a world that per se is not accurate at all.

Before expressing my gratitude to all the individuals who have contributed to this book, let us look at the regulatory situation for the three heavyweight technology areas of the information society, telecommunications, the computer industry, and the media. The experience of the divestiture of the telecommunications industry in the US during the 1980s and the EU rules for liberalization of the national telecommunication markets of 1998 are all pointing in one direction – regulation is needed – but how much, by whom, and to what extent?

The second component of the information society, the computer industry, is a different story altogether. It has never been subject to any regulations whatsoever, except for those rules applying to international trade. The result is Cyberspace with the Internet, which creates its own rules as they are needed – those in conventional power can only watch; one single body simply cannot govern Cyberspace, which also was the original intention when the Arpanet, the foundation of the Internet, was initiated.

The third complexity is offered by the third component of the information society – the media industry. It has been the darling of all regulators since the original act of the freedom of speech. In the holy name of this particular freedom, the industry is over regulated. So what are we to do when these three industries rapidly merger into one single one?

Regulation is only one of the complexities of the world we would like to welcome you to visit in this book, made up by a selection of fragments and partial data that in their turn make up the Cyberworld, a world offering liberation as well as imprisonment. Enjoy *"The TELDOK Yearbook 2001"*.

Thank you, all!

I owe many persons gratitude for their support – not least so the members of the TELDOK Editorial Committee, who once more had the courage to ask me to take on the project of the yearbook. In particular, I want to say thank you to Dr. Bertil Thorngren, the TELDOK chairman, and Dr. PG Holmlöv, the secretary general. Not only did they contribute their knowledge, information and comments, they also provided the necessary funding. Moreover, PG Holmlöv has taken care of the web versions of the book with great results. Göran Hedström, analyst at AB Stelacon, has generously shared the results of his interesting studies, as have Sören Lindh of Statskontoret and Lars Klasén of the SEMA GROUP Infodata and Gunnar Eliasson of the Royal Institute of Technology. Thank you, all!

Yvonne Skanlert Werner and her associates at Skärgårdskontoret Ljusterö AB make an important part of the yearbook team. Without Yvonne's dedicated work to create a neat and readable document and visual figures and tables, the result would have been poor. Her colleagues helped in the search for background information on the Internet. Thank you so much!

At last, I want to thank my husband Bengt-Arne Vedin. He serves as my living encyclopedia and eagle-eyed critic, in particular so when I loose my overviews in order to get involved in interesting details. I am also indebted to a second member of the family, Osquar the Cat, who has made it his habit to find new and creative ways of expressing his feelings for whatever we are working on. Without his inspections of the keyboard and his occasional additions, I would have missed many interesting data.

In spite of all these contributors, I am the only one responsible for whatever is badly expressed and the one to be blamed for any mistakes that may appear. I selected the data and the interpretations are mine, so now you know.

Some practical information – all footnotes are to be found at the end of each chapter. And, as always, I will have to ask the readers to pay attention to the web addresses. URLs appear and disappear. Should a web address in this book not function, I recommend you to search for the location in the long lists of links, available on many of the home pages of the important portals. Finally, your comments on the contents of the book would be most welcome. My e-mail address follows.

This document is also available in an electronic edition at the TELDOK web site: http://www.teldok.org.

Stockholm and Ljusterö in November 2000

Gull-May Holst

E-mail: gull-may.holst@telia.com

Average Currency Rates 1979–1999
20 Years Covered by The TELDOK Yearbook 2001
All rates in Swedish Crowns, SEK

Year	GBP	USD	100 DEM	100 FRF	100 JPY	EUR (ECU)
1979	9.107	4.294	234.222	101.004	1.98	—
1980	9.851	4.234	233.34	100.452	1.884	—
1981	10.208	5.083	224.713	93.528	2.308	—
1982	10.975	6.3	259.021	95.74	2.533	—
1983	11.644	7.682	300.724	101.024	3.239	—
1984	11.047	8.276	291.245	94.937	3.488	—
1985	11.106	8.608	293.202	96.15	3.62	6.652*
1986	10.459	7.128	329.242	103.095	4.258	7.006
1987	10.3919	6.3478	353.2878	105.7256	4.3993	7.3209
1988	10.918	6.139	349.514	103.135	4.793	7.253
1989	10.576	6.453	343.43	101.32	4.688	7.109
1990	10.57	5.913	366.89	109.095	4.099	7.55
1991	10.6801	6.05655	364.9626	107.4143	4.50105	7.4923
1992	10.2232	5.8123	372.7011	109.9506	4.5969	7.5159
1993	11.6993	7.7964	471.152	137.4643	7.0533	9.1042
1994	11.8094	7.7126	476.2318	139.2318	7.5558	9.139
1995	11.2644	7.1343	498.2769	143.044	7.6341	9.2275
1996	10.4606	6.7035	446.0604	131.1538	6.172	8.3996
1997	12.5048	7.6364	440.4235	130.8223	6.3272	8.6248
1998	13.1713	7.9516	452.7156	135.0376	6.1004	8.9306
1999	13.5559	8.2191	439.46	131.03	7.7356	8.6270

* *The value is the average for the period August 1, 1985, to December 31, 1985*

Figure 1: The table gives the average rates in Swedish Crowns, SEK, of six currencies during the twenty years that this book covers, 1979–1999. The currencies are frequently quoted in tables, figures and text. The average rates are calculated on the value of the currencies on all days during a year. The Bank of Sweden decides the average rates are. The average rate for 1985 of the ECU, which later became the euro, €, is calculated on the values during the period August 1, 1985–December 31, 1985.

Sources: The Bank of Sweden

PART I

From the Grey Dawn to the Global Information Society

Chapters 1-8

Time frame

From archaic times to our days

60 000–40 000[1] bp:	The oldest known – so far - cave paintings in South America and Australia are created
35 000 bp:	Oldest so far known artificial memory systems created
30 000 bp:	The phases of the moon for two and a half months are engraved on a piece of bone, formed as a short pole
25 000–15 000 bp:	The cave paintings of Altamira and Lascaux, among others, are created
9 000 bp:	Elements of what is thought of as a written language are painted on small stones in Mas d'Azil, France
8 000 bp:	Early money is in circulation
6 000 bp:	Pictures are hewn in stone in Scandinavia
4 000 bp:	The city of Ur in Sumeria is founded
3 500 bp:	Human beings are using the written language
3 000 bp:	The population of the world is estimated to 100 millions. The royal pyramid of Giza and the construction of Stonehenge are built
2 000 bp:	The Minoic civilization with two known alphabets is at its peak in Crete
1 800 bp:	A standardized alphabet and multiplication tables are used by the Babylonians
800 bp:	The Olmec structures in the inland of the Bay of Campeche are erected
300 bp:	The museum and library of Alexandria were constructed
260–160 bp:	The construction of the Great Wall of China
240 bp:	The oldest record of the Halley comet made by Chinese astronomers
389 a.o.e.:	The library of Alexandria is destroyed
Around 730 a.o.e.:	The Maya culture is at its peak
1837:	S. Morse invents the telegraph
1876:	A.G. Bell is granted the patent of the telephone
1896:	G. Marconi is granted the patent of the radio
1966:	ARPANET is created
2000:	+ 300 million persons are surfing the Internet

1. The Digital Spikes

by Bertil Thorngren

Time frame

1975 as predicted in 1969

'By 1975 we do not have the need to spend time in face-to-face meetings any longer. Thanks to computer terminals and picture telephony we can meet electronically from our office chairs – at least, that is what the engineers have predicted up till now.'

Nils Kjellström in a report about Bertil Thorngren's description of 15 000 person-to-person contacts in 100 Swedish corporations. The report was published in 'Industria' no. 6 1969

First – a quick glance backwards to year 'Zero'

By now, it is twenty-one years ago that TELDOK published its first report with the typical title *'Office automation'*. The young TELDOK enthusiasts of the time, myself included, were just as convinced of the glorious future of information technology as the young and eager broadband missionaries of Sweden – and the rest of the world – are today.

Of course, there was no doubt in our minds that the digital technology – the 'brand new' – would fundamentally change almost everything, from economy to social structures, not only within the walls of offices, but also within factories and production lines, in shops, hospitals and schools, just to mention some of the areas to be revolutionized. And the group behind TELDOK lived as they learned. E-mail via the first rudiments of today's Internet and mobile telephones were working tools in everyday activities as early as in the first years of the 1980s. This was all the more remarkable considering that the majority still smiled indulgently at messages like 'in year 2000, nine out of ten inhabitants in Stockholm will have their own mobile tele–

phone'.And how many per cent of the Swedes imagined then that 70 per cent of the Swedish population aged 12 to 60 years would be surfing on the Internet in 1999?

The development has been fast – breathtakingly fast – during the past few years. But at the same time it has been surprisingly slow considering the many years of preparation. So the question is, what is under development and construction in Sweden today that will all of a sudden 'explode' in the year 2005, in 2010, in 2015? After all, even new Internet-based services are dependent on the fact that some more slowmoving structures can catch up.

Thus – after some 195 TELDOK publications in four different series – an evident question today is: Which are the reasons for the slow development of information technology, in reality a whole generation, from the first enthusiastic concepts to commonly used utilities for all? After all, the technology has been available for a very long time not so elegant, maybe, and a lot more expensive than it is today, but all the same, available. Did nothing happen between 'the year 0 for TELDOK' and the last few years of explosive development? The combined TELDOK reports produced during the 21 TELDOK years can be seen as something of a 'logbook', of interest to historians of industrial evolution as well as to anyone studying the development of the twentieth century. The reports explain and underline some of the driving forces that will govern development also during the coming few years.

Constantly new price tags announcing lower prices are evidently important, so is a continuous technological development. But progress does not happen automatically in a laboratory environment where the silicon chips become ever more powerful at ever lower costs. The users are interested in solutions that bring them added value, not in the 'raw materials'. In real life it is all about a constant and intense collaboration in the markets, where the users give their opinions using their feet as well as their wallets[2]. It is in this spirit TELDOK has tried to focus on 'early users', and tried to demonstrate also the drawbacks and problems implicit in new technology. There are several examples both of new technology that stranded already before leaving port – videotex – and of new technology that will do so very soon – digital television.

The fact that more factors than technology govern the development of information technology is made evident in this very document, 'The TELDOK Yearbook'. In spite of the technological prerequisites having been internationally well known and generally available in almost all countries, the level of usage and the speed of development are differing considerably, also between countries in Europe. One example is that mobile telephony and Internet are in almost exploding modes in countries like Italy and Spain, while usage as well as growth is considerably lower and slower in large and rich countries like Germany, France and even in the U.K. The fact that Finland in many areas is leading over Sweden is a thoughtinspiring example of the unimportance of size – to the contrary, size can be something of a handicap in an ever-faster moving and flexible world.

The digital spikes of today

Looking back, knowing the outcome, the mass volymes generated by information technology were modest during the 1980s and the beginning of the 1990s. Not even the introduction of NMT, the Nordic Mobile Telephone network, in 1981, which was several years earlier than equivalent solutions were introduced in the US and UK, generated a mass market of mobile telephone users – only a few per cent of the Swedish population took to that system. All the same, it was this, in retrospect, low acceptance level that prepared for the successes of mobile telephony in Sweden of today.

The new digital logic, that may be called 'the digital spikes', simply is different from the kind of logic most of us were taught at school. The legendary S-curve, according to which curious pioneers little by little and in good order are followed by those making up the mass market is no longer self evident. Instead, it is more often a matter of distinct breakthroughs, just like the spikes of a spectrum, when the utilization shows a drastic increase. Earlier, the road from zero to the top of the spike took years to travel. Now, the Internet years being considerably shorter, the same distance is covered faster, much faster. The fight to be the first one to reach what is considered as the critical mass, generally about 20% of the potential market is very tough, indeed. But to put in your efforts too early can sometimes be almost as disastrous as being too late. The trick is to hit the top of the spike head on.

Too early?

What does all this mean to the future of TELDOK, seen in the light of the present mission to document early utilization of new information technology? How should the efforts be planned to be of best service to the users and readers in today's world? Publication on the Web already is a self-evident complement to the printed reports – as is 'print-on-demand' in order to fulfil a growing demand. In any case, it is important that TELDOK sees itself as a complement to and a provider of background information to the alert news journalism already existing in specialist media and dailies, no more and no less. Looking back, TELDOK often has been 'too early'. When the technical breakthrough finally arrives most people have already forgotten our reports about that specific area. For instance, who remembers the survey of broadband that TELDOK published in 1987? Or the reports about video conferencing always waiting around the corner? Or the survey of e-commerce from 1995 – also far too early to market?

Best after?

The face of the coin is that there were a few who actually were guided by the reports when they were fresh from print, also way back in time. And some of the reports have become 'classic' in the sense that they are still in demand. So, maybe it is time to put date stamps on the TELDOK reports, a kind of 'best after'-date? In any case, it is time for an intensified dialogue with our readers in our quest for those questions they would like to find answers to in the years to come. Most likely, it will not be sufficient to catch the experiences of the very early users, but focus has to be on the next phase of development as well, the one which signifies the transition to a mass market. The field of view should also become wider – 'Tele' just as 'micro chips' has become another component and part of the raw material among all the others. Maybe TELDOK should change its name to T.I.M.E.-DOK in order to demonstrate better the convergence between telecommunications/computers/media and its interaction with the development of society at large[3]?

Footnotes

1. Bp = before present.

2. For more information see Via TELDOK 28E, a report written by Bengt Mölleryd called "The Building of a World Industry – The Impact of Entrepreneurship on Swedish Mobile Telephony, February 1997. The report shows how two corporations – Ericsson and Nokia – became the dominants of the world market just because of an early and intense collaboration between early users and entrepreneurs in their small home markets.

3. The collaboration with KFB, the Swedish Transport & Communications Research Board, regarding the series of publications Telematik 2001 and 2004 is an important step towards achieving this.

2. The Global Information Society

How many millennia of human evolution do we have to look back in order to find the first signs of communication between two or more individuals? The answer is – we do not know. However, we know that the first rudiments of human communication has grown into what sometimes is called the largest infrastructure in the world, the very network for tele- and data communications connecting more than one billion of individuals all over the world. This network is made up by billions of terminals and servers and routers, uncountable kilometers of cable and optical fibers for transmission, base stations and radio links, thousands of satellites, some two billion documents, accessible to everyone via the Internet, and so forth, and so on. We also know, that all of this had an estimated value of 1 445 billion ECU[5] by the end of 1998, and that a prognosis for 1999 quoted the value of the global Information Society market to the equivalent of 18 140 billion SEK. Moreover, we believe that by 2002 there will be more than one billion subscribers of mobile telephones. That is more that the global number of subscribers to fixed telephone services. There are also likely to be more that 500 million Internet users in the world. But all the same, we do not know where and how this enormous, global communication process once was started by the early hominids.

The global Information Society market in 1999 = 18 140 billion SEK
Forecast from 1998

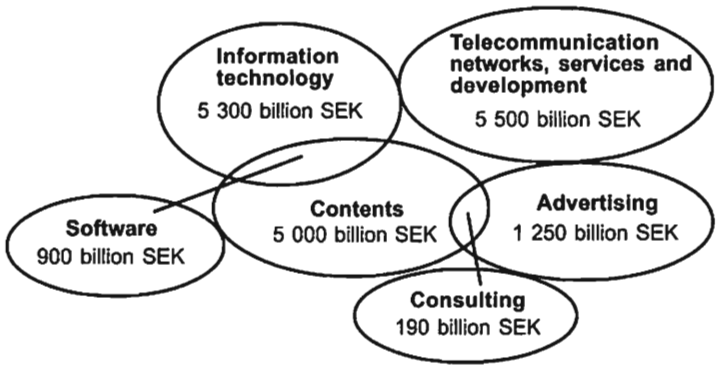


Figure 2: The total value of the global Information Society market was estimated to 18 140 billion SEK in early 1999. Telecommunication networks, services and telecommunication equipment generate the largest part of the total value, but the information technology industry and the contents industry are following closely.

Source: David Philipson, Academy of Copyright, 1999-03-02

Moreover, we know that the phenomenon called 'the largest machine in the world', the telecommunication network, is growing faster than any other technological artifact has ever grown before. More and more individuals across the globe have access to television, mobile telephones, personal computers and the Internet. Within the OECD, the telecom market has grown by 7% annually from 1992 to 1997. In comparison, the broadcasting and television markets have had an average annual growth of 3% since 1995 – in 1997 the global turnover for these two markets was some 145 billion US$.

The value of the global telecommunications and information technology markets in 1998 and 1999
In billion ECU

Region	Telecom		IT		Total	
	1998	1999	1998	1999	1998	1999
Europe	437	493	207	226	644	719
USA	518	564	319	351	837	915
Japan	164	171	91	95	255	266
4 Tiger Economies: HongKong, South Korea, Singapore, Taiwan	49	55	19	22	68	77
Rest of the world	277	310	91	101	368	411
Total	**1 445**	**1 593**	**727**	**794**	**2 172**	**2 388**

Figure 3: The total value of the global telecommunications and information technologies markets was estimated to 2 172 billion € in 1998 and to 2 388 billion in 1999. It is interesting to note that Japan has a slower growth than any other region. The data in the table are from EITO.

Many have tried to calculate the global value of what is commonly called the T.I.M.E. market. Value is described as the total worth of installed infrastructure, systems, devices for collective and individual utilization, traffic, software, and all kinds of related services and support. The value is expressed in US$, ECU, SEK, or other currencies. When scrutinizing these evaluations, they have differed from evaluation to evaluation, partly as a result of the converging technologies. The following figures demonstrate how the T.I.M.E. industry has been defined at various points of time. For instance, during the 1980s, we included computers, telecommunications, services, and software, while Telia for one defined the same market at the T.I.M.E. market, also including electronic media. Once media appeared on the scene he US analysts minted the term T.I.M.E industry, i.e. *'Telecommunications, Information Technology, Media and Entertainment'*. The problem with the ever-changing definition of the T.I.M.E. market is that we do not have figures that are directly comparable to each other over the years. On the other hand we get a fairly accurate picture of the speed of technology development along with the convergence of technologies. We can also deduce the structural change of the industry, from technology control towards service control, looking more closely at the specific needs of the users.

In 1990, we still believed that computers, telecommunications, semiconductors, and home electronics were four different industries – see the following figure. Telecommunications were most closely related to services, as were home electronics, while the computer industry was regarded as mainly consisting of hardware.

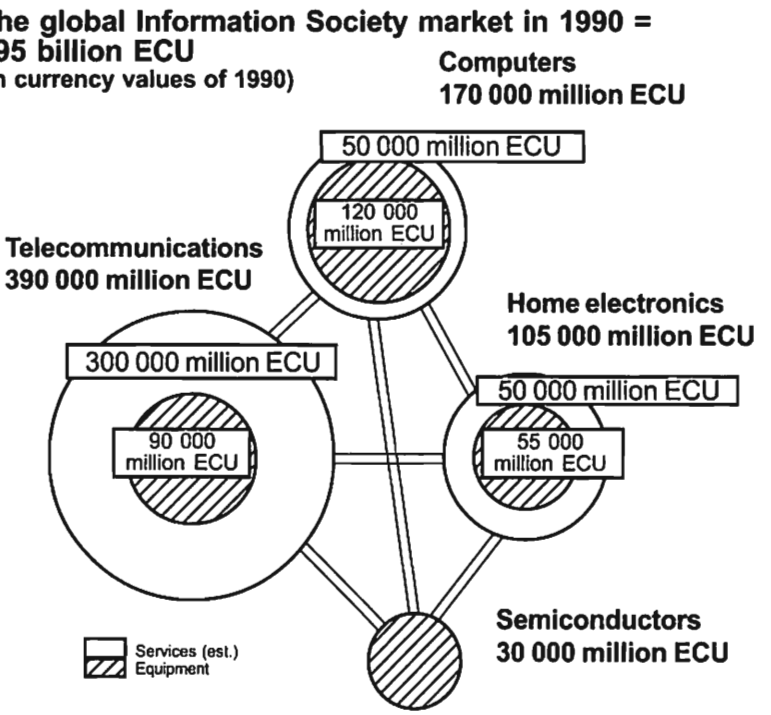


Figure 4: In 1990, the global value of what made up the global Information Society market then was estimated to 695 billion ECU. The industries included were still seen as separate from each other, but integration and convergence was on its way.

Sources: CEC/Telecommunications in Europe 1990

Towards the end of the 1990s, the way of evaluating the information technology market changed its focus in some contexts from industries towards geographical areas, regions, and countries. It was more important to understand where growth happened and in what countries the most advanced development took place. The following figure is a good example of this – it shows the regional distribution of the global ICT-market – ICT stands for Information and Communication Technology – in 1998. USA generated 36% of the total value

of 1 445 billion ECU, Europe 30%, Japan 11%, the 'tiger economies' of HongKong, South Korea, Singapore, and Taiwan 3% and the rest of the world generated 19%.

The global ICT market in 1998 per region in % of total value = 1 445 billion ECU

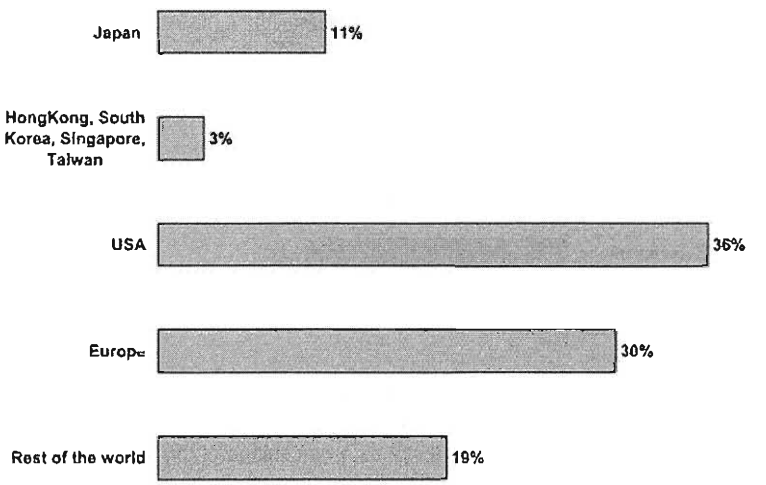


Figure 5: In 1998, the total value of the global Information and Communication Technologies' market was estimated to 1 445 billions ECU. The US generated the largest portion, 36%, while Europe followed with some 30%. Together these two regions generated 66% of the global market value.

Source: The European Information Technology Observatory 1999

According to the *'European Information Technology Observatory 1999'*, the yearbook of the European information technology industry, EITO, the distribution of the global market value of 1 445 billion ECU per sub industry was as follows:

Telecommunication services 42%
Computer hardware 20%
Data services18%
Software 8%
Telecommunication equipment 8%
Office equipment and specialized 2%

See following figure.

The global ICT market in 1998
Distribution per industry in % of total value = 1 445 billion ECU

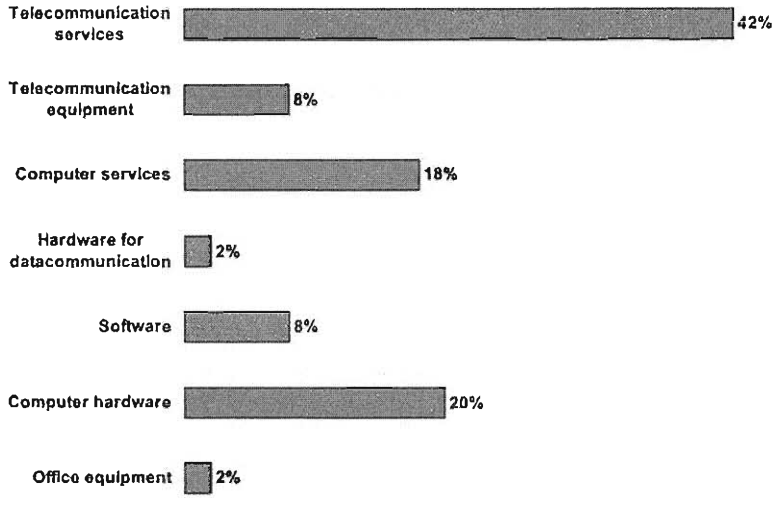


Figure 6: Telecommunication services generated 42% of the total ICT value in 1998 while telecommunication equipment generated according to EITO. The figure shows the distribution per sub industry as a percentage of the total market value, 1 445 billion ECU.

Source: The European Information Technology Observatory 1999

The information technology industry meaning computers and anything related to those devices had a growth of 9.4% during 1998 in Western Europe, which includes the EU countries plus Norway and Switzerland. In 1999 a growth of 9.7% was expected. The telecommunications industry had a growth of 8.5% in the region in 1998, while 1999 was expected to show a growth of 6.7%. The total market value of 392 billion ECU is equivalent to 30.2% of the global markets for IT and telecommunications. Western European IT generated 28.4% of the global market while Western European telecommunications generated 32.1% of the global telecom market.

In 1998 the Western European IT + telecommunications industries had a total value of 392 billion ECU, equivalent to 5% of the consolidated GNPs. These industries are expected to grow by 7.9% during 2000. The major reason for this growth is the growing number of users.

IT + telecom in Western Europe in 1998
The EU countries, Norway and Switzerland

Industry	Value in billion ECU	As a percentage of the total market
Computer hardware and data communication	77	20
Office equipment	10	2
Software	38	10
Services	53	13
Support	15	4
Total information technology	**193**	**–**
Telecommunications equipment	33	9
Telecommunications services	166	42
Total telecommunikations	**199**	**–**
Total IT + telecom	**392**	**100**

Figure 7: In 1998 the value of Western European IT and telecommunications industries was 392 billion ECU, which is equivalent to 5% of the consolidated GNPs.

Source: European Information Technology Observatory '99

The following figure shows the percentual change in the Western European IT and telecommunications markets from 1988 to 1998 according to EITO. The growth of the IT market has varied from 15.9% in 1988 to 2% in 1993. The telecommunications market has had a more stable growth, topping with 8.7% in 1994 and having its slowest growth in 1993, 5.1%.

IT and telecom market growth in Western Europe 1988 to 1998

In percent of total market values in local currencies

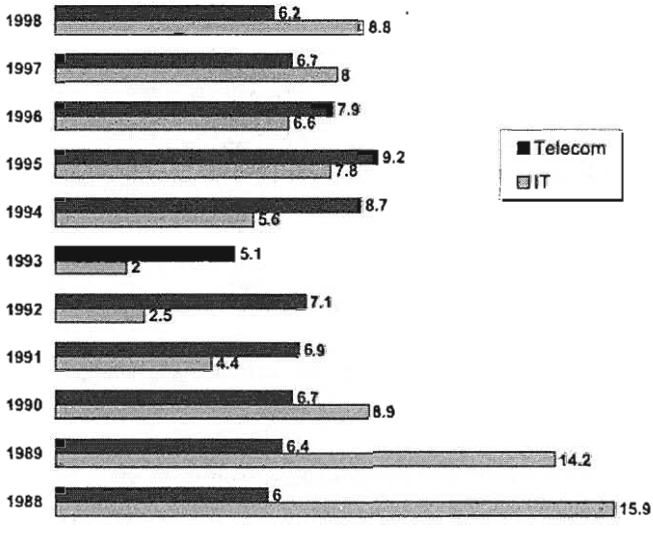


Figure 8: The percentual growth of Western European IT and telecommunications markets from 1988 to 1998. The percentage is based on the total local market value counted in local values.

Source: EITO

Growth per IT market segment in Europe and Sweden in 1998 over 1997 is shown in the following figure. So for instance, the PC segment increased by 1% in Sweden while it grew by 5% in Europe. Servers grew by 11% in Sweden and 8% in the rest of Europe. Software grew by 13% in Sweden and 11% in Europe and services by 14.5% in Sweden compared to 12% in Europe.

Growth per IT market segment in Europe and Sweden in 1998
In percent

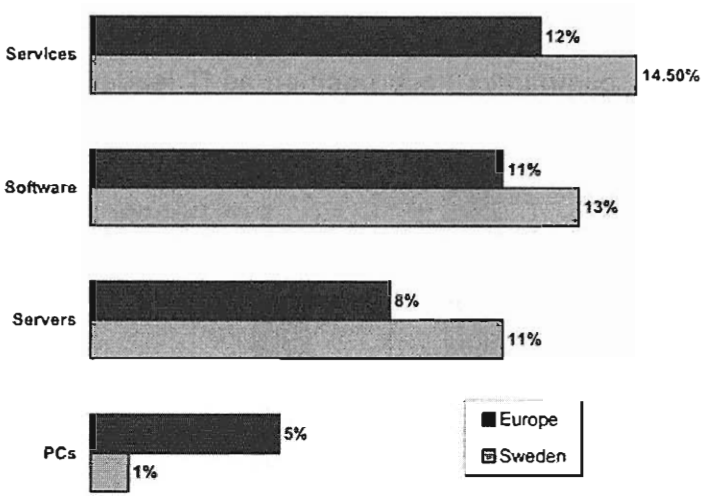


Figure 9: The figure shows the percentual growth of some IT market segments in Europe and Sweden in 1998 over 1997.

Sources: Several, among them Computer Sweden

Some analysts have interpreted the data above as Sweden having a larger amount of "computer maturity" than other countries. This is to some extent supported by a survey made by Grant Thornton Management Consulting in 1999. They interviewed 7 500 small and medium sized companies all over Europe. The results show that Swedish companies are more frequent users of Internet and e-mail than their European counterparts. The Swedes also held a positive attitude to investment in systems, equipment and training. To the contrary of other Europeans, the Swedes see their government and the tax systems as impediments to growth. They also are looking forward to selling their companies to a much larger extent than other Europeans.

The following figure compares data about Swedish companies to equivalent data of European ones regarding Internet usage, e-mail, own web sites and number of employees having computers In all areas the Swedish companies are ahead of the European ones. This

is not surprising considering the fact that Swedish companies have been in leading positions ever since the 1970s as soon as IT utilization has been measured.

Swedish companies keep position as IT leaders

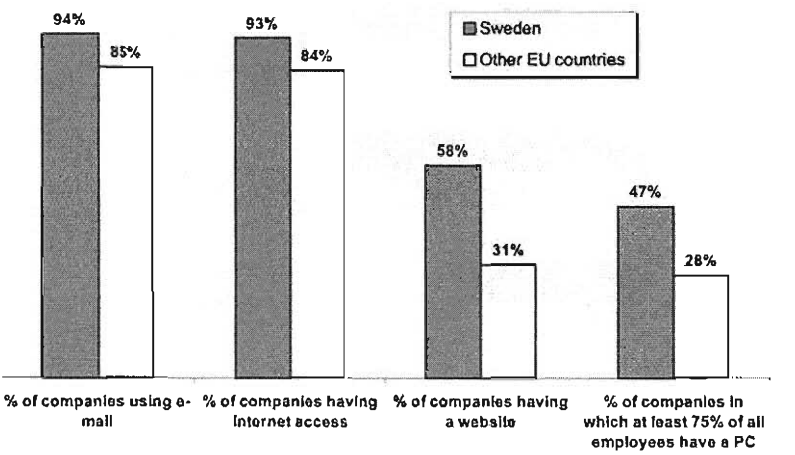


Figure 10: Swedish small and medium-sized companies were more frequent users of IT than their European counterparts. The survey covered e-mail utilization, the Internet, web sites and number of employees with computers.

Sources: Computer Sweden no. 46 Wednesday May 5th 1999/Grant Thornton Management Consulting

The Nordic countries make up Europe's fourth largest IT market according to EITO, The European Information Technology Observatory 1999. It defined the IT-market as consisting of sales of hardware, software, data communications devices and other equipment, and computer consulting services. Based on this definition the Nordic countries – Denmark, Finland, Norway and Sweden – make up the fourth largest Western European IT market, having a consolidated market value in 1998 of almost 19 billion €. In 1994 the equivalent value was 13 billion €.

IT market value of the Nordic countries 1994 to 1998
In billion €

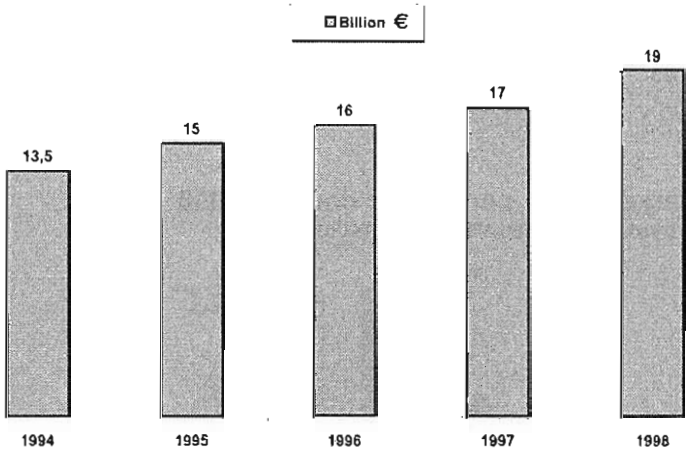


Figure 11: The consolidated IT market value of the Nordic countries Denmark, Finland, Norway and Sweden from 1994 to 1998 in billion €.

Sources: WM-data/EITO

Market value of IT segments of the Nordic countries in 1998
In percent of total value = 19 billion €

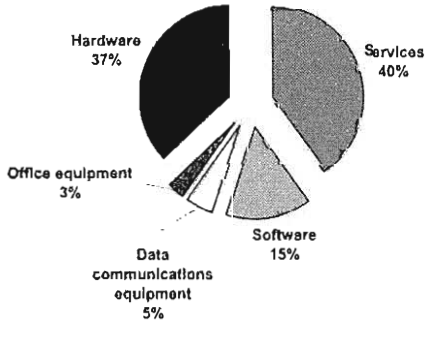


Figure 12: The figure shows the distribution of the value of different IT market segments in the Nordic countries, Denmark, Finland, Norway and Sweden in 1998. The figures are in percent of the total value = 19 billion €.

Sources: WM-data/EITO

In 1998 the Nordic IT market grew by 9%, equivalent to 170 billion SEK. The most important growth was in Finland, increasing by 10%, while Norway and Sweden grew by 9% each and Denmark by 8%. According to EITO a strong growth is expected for the area in 1999 and 2000 – 10% and 9% are expected.

IT market value per Nordic country 1998
In percent of the total value = 19 billion €

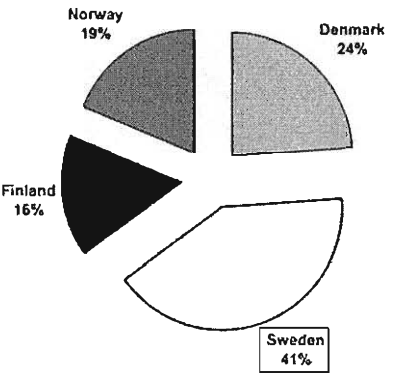


Figure 13: Denmark had 24% of the Nordic IT market in 1998, while Finland generated 16%, Norway 19% and Sweden 41%.

Sources: WM-data/EITO

No sooner had the telephone been introduced to the world than Sweden became one of the world leaders in telephony – Sweden started taking its first steps to the Information Society. By the end of the 19th century, the Telephone Tower in Stockholm, carrying 4 000 lines was the largest one in the world and Stockholm had the highest telephone density among the large cities of the world. Some 147 years ago, in 1853, the Royal Electrical Telegraph Company was founded. Today, in 1999, we are back to electricity, from where we started – the power distributors are looking to becoming telecom operators.

The integrated technologies of telecommunications, computers, computer communications, multimedia, the contents industry, entertainment, training and education, software, services, and everything

else related to the more traditional concepts of data, computers, and telecommunications is sometimes called the T.I.M.E industry. *"The TELDOK Yearbook 2001"* has the ambition to be an up-to-date status report on the T.I.M.E. industry and the Information Society in Sweden. However, we will start with a global outlook.

Are we Global?

We tend to look upon our economies as "global". There are, however, reasons to ask how "global" we really are. The America consulting firm A.T. Kearney tried to find out by ranking a number of countries as to the "globalness" of their economies. They accounted for variables such as openness to trade and investment, credit worthiness, the importance of tourism and transfers from foreign workers. According to this ranking, Singapore, Ireland, USA, Britain, New Zealand, Italy, Portugal, Israel, France and Australia have the most global economies in the world.

The world's most global economies

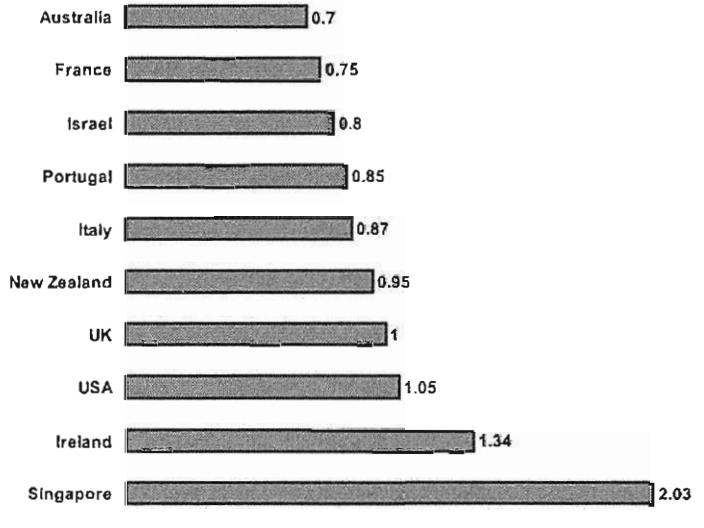


Figure 14: A.T. Kearney ranked the "globalness" of national economies using 1997 as index. Singapore is by far the most global economy, having an index of 2.033, while number 2 USA has an index of 1.3.

Sources: The Economist, April 8th 2000/A.T. Kearney

The Information Society is regarded as a global phenomenon. "Global" in this context has several meanings. Firstly, global appears to be thought of in a very literal sense – the Information Society tools can be made to reach the whole globe and all its inhabitants and to connect whoever wants to be connected with any other person, so called *"any-to-any connectivity"*. Secondly, the Information Society is global in the strict sense that people choose to collaborate in building, developing and improving the networks and communication systems disregarding borders. Thirdly, it is global in the sense that more and more people connect to the global the Information Society at rates never experienced before. This is due to equipment and services becoming more affordable, more efficient and more readily available at lower costs. Fourthly, it is an anarchic system – there is not one single person, organization or state that alone can decide over the global network. Collaboration between many dedicated individuals over a long period of time is a prerequisite for its function. One splendid example of "global" in this sense is the work carried out over many decades by those specialists involved in standardization.

Simultaneously, it is very obvious that the Information Society is not global, at least not now. Neither the telephone system, nor the mobile communications systems of this world, is global. And the WorldWideWeb, as well as the Internet are only accessible to some 400 million citizens. The following figures provide some interesting data about the "global" Information Society.

The inhabitants of the "global" online world, February 2000 and June 2000

Global region	Number of online inhabitants, in million	
	February 2000	June 2000
Africa	2.36	2.77
Asia/Pacific	42.60	75.50
Europe	64.23	91.28
Middle East	1.29	1.90
Canada and USA	131.10	147.48
Latin America	7.10	13.19
Total	248.68	332.73

Figure 15: By the end of February 2000 the Irish analysts NUA estimated the global number of online users to 248.68 million, with a regional distribution as shown above. In late 1999, there were 153.2 million users. Among these, almost 7 million were Chinese. Among the users in February 2000, there were 5.4 million Russian Internet users. By the end of June 2000 the number of global on-line users grew by 84.05 million. 16.9 million were Chinese.

Source: Nua, www.nua.ie

There are about 1 billion subscribers to fixed telephone lines and there were 454 million subscribers to mobile telephones by the end of 1999. Just as a reminder – there are more than 6 billion inhabitants worldwide.

As mentioned above, "global" is one of the many buzzwords attributed to the Information Society; "furthering competitiveness" is another one. The Swiss business school *IMD, International Institute for Management Development*, ranks economies of the world based on 290 variables, collected from official statistics and survey data. The world competitive index for 2000 may be used to confirm the second attribute. The United States is the most competitive state in the world, Russia the least competitive one. Singapore, Finland, The Netherlands, Switzerland, Luxembourg, Ireland, Germany and Sweden follow next to the USA.

The IMD world competitive index 2000

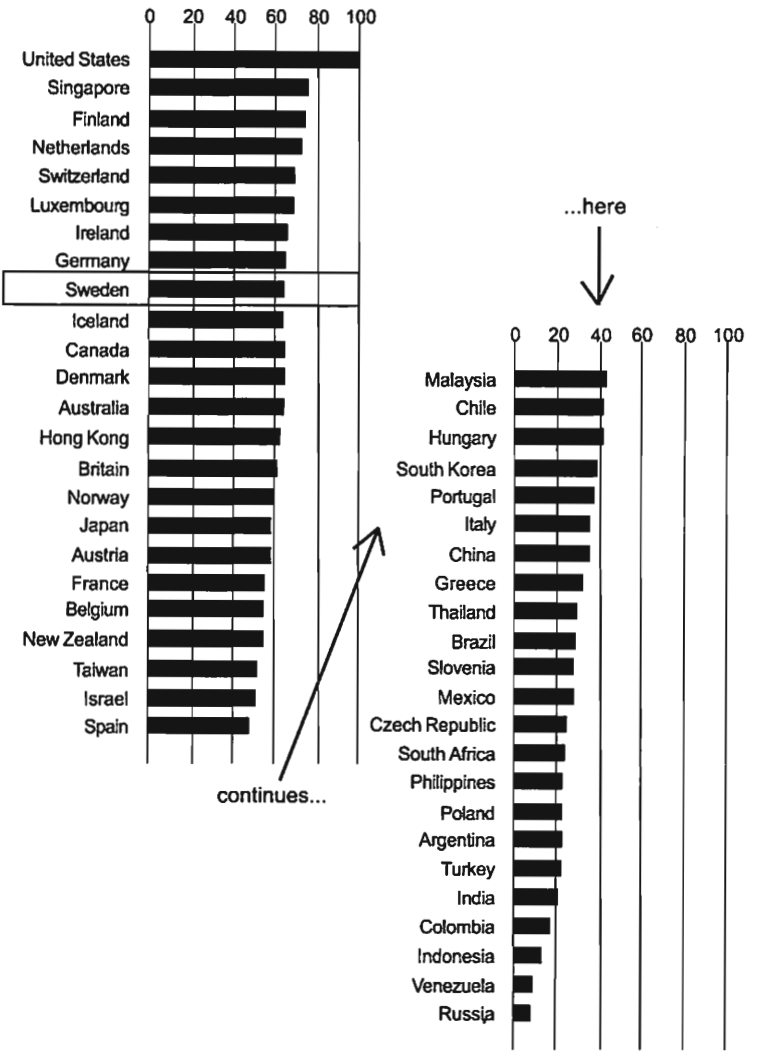


Figure 16: Does T.I.M.E. further competitiveness as often is stated? IMD's world competitive index for 2000 can be seen to confirm this. It is the more or less the same countries topping international statistics on telecom, IT, Internet, etc. as those heading this ranking list. USA is at the top as the world's most competitive country, while Russia is the least competitive nation among the 47 nations listed here. Sweden is number 9.

Sources: IMD/The Economist April 22nd 2000

Not only companies compete in the global market – nations also need to stay competitive in order for them to generate the sort of welfare state their inhabitants are looking for. Thus nations are competing for people with know-how, knowledge and education, for capital and for investments. They are moreover competing to attract the global companies in order to create jobs, among other things. Some countries have special agencies with missions to generate foreign investments in their country. In Sweden it is called *'Invest in Sweden, ISA'*. ISA sees information technology and the information society industry as one of Sweden's strong competitive factors. This is one of several reasons for indexes like the IMD ones being important. In 1998, 1999 and 2000, the IMD competitive index looked as follows – the data appear in *'The World Competitive Yearbook'*, published by IMD:

The 10 most competitive nations 1998–2000

Country	Ranking 2000	Ranking 1999	Ranking 1998
1. USA	1	1	1
2. Singapore	2	2	2
3. Finland	3	3	5
4. The Netherlands	4	5	4
5. Switzerland	5	6	7
6. Luxemburg	6	4	9
7. Ireland	7	-	-
8. Germany	8	9	14
9. Sweden	***9***	***14***	-
10. Iceland	10	-	-

Figure 17: The ranking describes the 10 most competitive countries in the world in the spring of 2000 as compared to 1999 and 1998. Finland is number 3, following the US and Singapore, an advancement from 5, and Denmark keeps its position as number 8. Sweden was ranked as number 9 in 2000, up from number 14 in 1999.

Sources: The Economist April 24th 1999/IMD

According to the competitive index of the World Economic Forum and the *'Global Competitiveness Yearbook'*, which ranks the industrialized nations every year, Sweden was ranked number 23 in 1998 and 19 in 1999. Singapore, USA, Hong Kong, Taiwan, Canada,

Switzerland, Luxembourg, UK, the Netherlands, and Ireland were the top 10. Finland was number 11. This organization makes its ranking based on the following factors:

Ranking factors of the World Economic Forum

The financial openness
The quality of the government
The financial market
Infrastructure
Technology availability
Leadership
Labour market
Legal system and corruption

Figure 18: According to this ranking, Sweden is number 2 when it comes to leadership, number 8 regarding infrastructure, and number 10 when judged for technology availability. The quality of the government earns Sweden position 49.

Source: The World Economic Forum

According to most current research results, Asia is the continent increasing IT investment-spending most. At least this was the case according to the IDC report *"World Times Information Society Index"* in 1998 based on data from 55 countries. From 1997 to 1998, IT investments increased by 10% for Asia, while the USA increased their spending by 7.9% during the same period. USA is still leading the total investment league in real money. Europe increased their IT spending by 7% and Latin America theirs by 5.5%. On February 14th 2000, IDC declared Sweden as the globally leading IT nation according to the same *"information society index"* for 1999. The IDC specialists had analyzed 23 variables from four categories related to information availability, Internet penetration, computer dissemination and social data, including education.

The IDC ranking of the leading IT nations, February 2000

Country	Ranking index 2000	Ranking in 1999
1. Sweden	*5.06*	2.
2. USA	5.04	1.
3. Finland	4.58	3.
4. Norway	4.48	5.
5. Denmark	4.34	6.
6. Canada	4.32	10.
7. The Netherlands	4.23	7.
8. Switzerland	4.17	-
9. Australia	4.13	8.
10. Japan	4.09	9.

Figure 19: The IDC information society index ranking of 1999 placed Sweden at the top among the world's leading IT nations.

Sources: IDC/Computer Sweden April 12th 1999

According to sources like the OECD, EITO and IDC, IT as a percentage of total GNP was second largest in Sweden in 1997, second only to USA. Norway, USA and Ireland have more PCs per white collar employees than Sweden, but only USA and the Netherlands have more PCs per 100 inhabitants than Sweden. Equivalent data for Western Europe and the European Union are very close to one another, for obvious reasons.

Information technology in percent of GNP and PC penetration in industrialized countries 1997

Country/region	IT in % of GNP	IT per capita in ECU	PCs per 100 office workers	PCs per 100 inhabitants
Western Europe (= EU + Norway and Switzerland)	2.34	460	55	18
EU	2.31	445	54	18
Germany	2.13	492	51	22
France	2.51	526	54	18
UK	3.35	627	57	22
Italy	1.45	268	46	10
Spain	1.41	168	50	8
Austria	2.08	463	62	20
Belgium/Luxemburg	2.38	495	52	15
Denmark	2.96	803	68	34
Finland	2.64	520	63	29
Greece	0.88	84	37	6
Ireland	2.05	333	84	16
The Netherlands	2.92	578	64	30
Norway	2.65	778	110	36
Portugal	1.41	128	27	7
Sweden	**3.45**	**782**	**85**	**35**
Switzerland	3.19	1 012	83	34
USA	4.53	1 075	105	47
Japan	2.61	745	24	13

Figure 20: Sweden had the second largest IT sector in percent of GNP among the industrialized countries in 1997, while Norway, USA and Ireland had more PCs per white collar workers, and USA and the Netherlands more PCs per 100 inhabitants. Later data were not available when this document was created.

Sources: OECD/EITO/IDC

European Telework Online published an interesting analysis in May 2000 comparing investment made in the USA and in Europe from 1992 to 1998, based on data from EITO. In 1992 average investment as a percentage of GDP in USA was 50% higher than average investment in Europe, Europe defined as the EU countries. In 1998 investment in the USA was double that of Europe. USA's cumulative level of investment per head of the population over 1992 to 1998 was 2.15 times that of the EU countries. In addition, US GDP growth is

faster than the accumulated European one and US GDP is considerably larger. The gap between USA and Europe is getting wider in spite of what European politicians like to tell their electors.

Source: http://www.eto.org.uk.

The Information Society of the European Union...

The European Commission's Information Society Project Office, IPSO, has asked Eurostat to carry out some 15 000 interviews annually in conjunction with EOS-Gallup in order to keep track of the development of the information society among the EU member states. The first report is for 1998 and covers data for mobile telephone penetration, home computers, Internet access penetration and the most popular IT services. As a result of telecom liberalization in the EU, one third of all Europeans had a mobile telephone. Finland had the highest penetration rate, 64.4% of the population had mobile telephones. Sweden followed next – 60.3% of the population had mobile telephones. Germany was the nation having the fewest mobile phones 19.4% of the population. According to the report Sweden had the most Internet users, 39.6% of the population, followed by Denmark, the Netherlands and Finland. The Southern European countries are the Information Society laggards. On an average 10% of the Southern Europeans had Internet access. The most popular usage for personal computers with Internet access is electronic contacts with local and regional authorities. 47.8% of the interviewees said they download information and documentation from the local community. 11% consider the electronic media a good way of increasing democracy. More than half did not find any use at all of the services of the Information Society. The ISPO reports can be downloaded from: **http://www.ispo.cec.be/polls**

...and eEurope

During the Lisbon summit meeting of the European Council March 24 – 25, 2000, the heads of governments agreed on an IT program covering ten areas with the objective *"for Europe to become the most competitive and dynamic economy in the world"*. By 2002 the Member States should:

1. Bring the European youth into the digital age
2. Work in the new economy
3. Provide cheaper and faster Internet access
4. Accelerate e-commerce
5. Provide faster Internet for researchers and students
6. Secure electronic access and communication
7. Create opportunities for participation for all in the new economy
8. Provide electronic access to public services
9. Create health online services
10. Provide digital content for global networks.

Information technology is assumed to play a major role in achieving all these objectives. eEurope is to provide the necessary benchmarking to measure the achievements along the route. Number of ECDLs (European Computer Driving Licences) per 100 inhabitants, number of computers per 100 pupils in the schools, number of public Internet access terminals per 1 000 inhabitants are but a few examples of how to measure the progress of eEurope. More information about this project is available at the following web sites: http://europa.eu.int/comm/information_society/eeurope/documentation/index_en.htm, http://europa.eu.int/comm/commissioners/diamantopoulou/infosoc_en.htm, and http://ue.eu.int/en/Info/eurocouncil/index.htm

A direct consequence of this is the Swedish Agency for Administrative Development's efforts to create a digital service society, a society where all contacts with public administrative services can happen 24 hours via the Internet. The development of the so called "soft infrastructure" needed for the 24 hours e-society, accessible to all, is in focus.

Footnote

5. Ecu is used by EITO and sometimes by the OECD to indicate market values. €, Euro, is used by several other analysts to in this document. The two currencies are equivalent.

3. Fixed telecommunications

The basic facts about the worldwide dissemination and use of telecommunications, the first technology to go global, are the following:

1 billion fixed telephone lines globally

- In 1960, there were approximately 100 million telephone fixed lines in the world. Since then, the number of connections has grown between 4 and 7% annually. By the beginning of 2000, there was some 1 billion fixed lines globaly - see also figure 22 following
- By the beginning of 1997, 62% of all global telephone connections existed in 23 developed countries, together representing 15% of the global population
- 90% of all households in the industrialised countries have at least one telephone connection. In the developed part of the world, 16% of the households have one telephone connection. 65% of all households, equivalent to 950 million, have no telephone at all
- 84% of all mobile subscribers, 91% of all fax machines, and 97% of all Internet host computers were installed in the industrialized countries by the beginning of 1997

Figure 21: The Information Society tools and their applications are rather unevenly distributed across the global society as is evident from the data above.

Source: ITU World Telecommunication Development Report 1998

In 1960 there were not quite 100 million fixed telephone connections. By the turn of the millennium there was almost one billion, a tenfold increase over 40 years. The average annual growth has varied from 4% to 7% as is described in the following figures. Please note that the period from 1960 to 1995 are divided into five years periods, while the period from 1995 to 1997 is described in one year periods, and that the estimate until 2000 describes a three years period. The estimate is based on data from the previous years.

1 billion fixed telephone connections in 2000

Millions of telephone connections 1960–2000

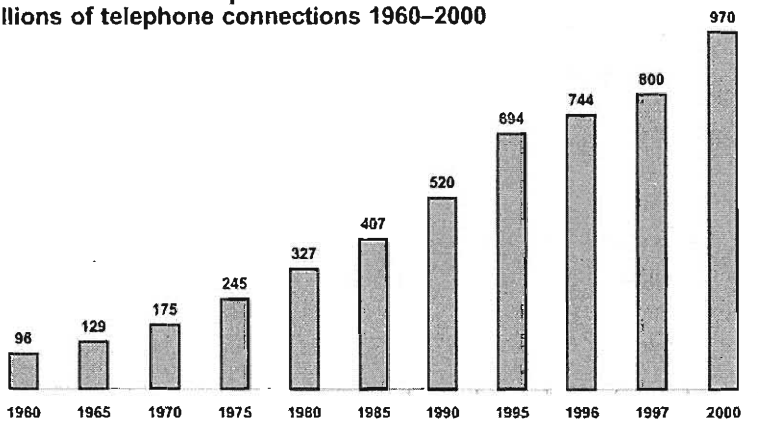


Figure 22: In 1960 there were almost 100 million fixed telephone connections in the world. By 2000 that number had grown tenfold so there are 1 billion fixed connections globally.

Sources: ITU World Telecommunication Development Report 1998/ITU World Telecommunication Indicators Database

Global growth of fixed telephone connections 1960–2000

In percent

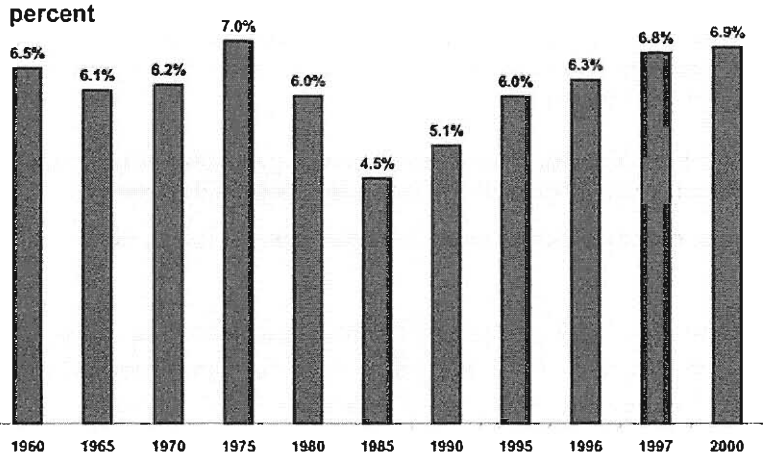


Figure 23: The average growth of fixed telephone connections from 1960 to 2000 has varied from 4% to 7% annually. The estimate from 1997 to 2000 is based on data from previous years.

Sources: ITU World Telecommunication Development Report 1998/ITU World Telecommunication Indicators Database

In 1960 the penetration rate for fixed telephones were 3.2 per 100 inhabitants. According to a prognosis from ITU the rate will be 15.6 fixed telephones per 100 inhabitants. Annual growth measured in percent has decreased despite the fact that the factual number of installed fixed lines per annum has grown. This discrepancy is related to the overall population growth.

Number of fixed telephones per 100 inhabitants 1960–2000 in the world

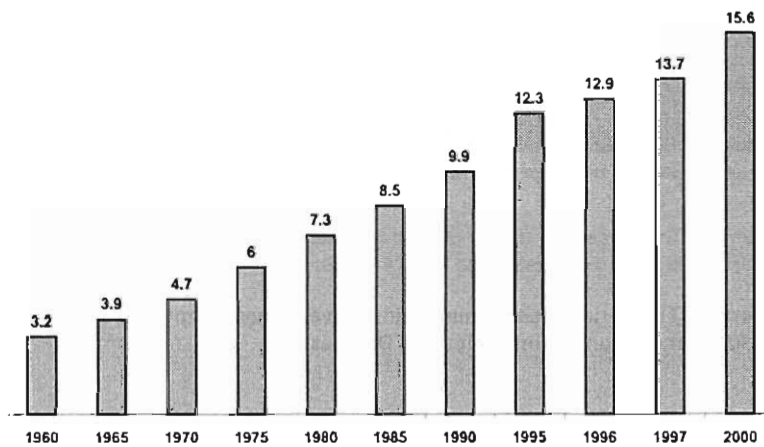


Figure 24: In 1960 there were 3.2 fixed telephones per 100 inhabitants in the world. According to the ITU, there will be 15.6 fixed telephones per 100 inhabitants by the end of 2000. At present some 40 million persons are queuing up for a fixed telephone at this very moment, according to the World Bank.

Sources: ITU World Telecommunication Development Report 1998/ITU World Telecommunication Indicators Database/The World Bank

Annual growth in percent of fixed telephones globally 1960–2000

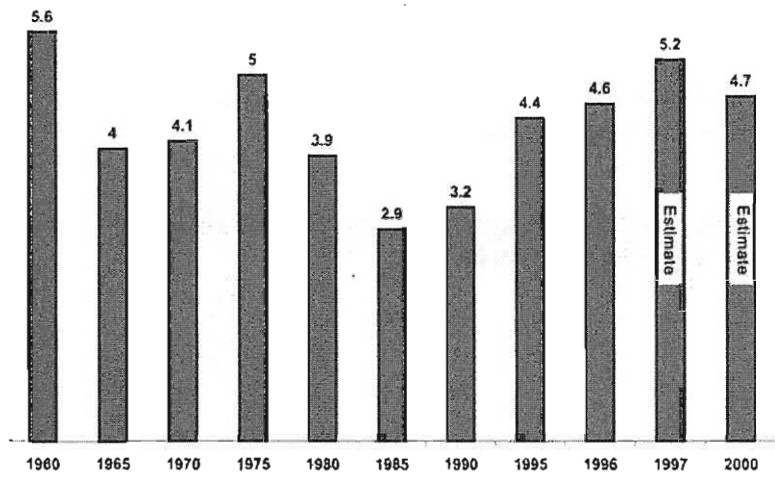


Figure 25: The percentual growth of fixed telephones on a global basis has varied from 5.6% in 1960 to an estimated 4.7% in 2000.

Sources: ITU World Telecommunication Development Report 1998/ITU World Telecommunication Indicators Database

Teledensity distributed among the nations in the world for 1996 were approximately as follows:
46 nations had 27.8 – 68.3 fixed telephones per capita
45 nations had 8.6 – 27.8 fixed telephones per capita
47 nations had 1.4 – 8.6 fixed telephones per capita
48 nations had 0 – 1.4 fixed telephones per capita.

The map below shows the global, geographical distribution of fixed telephones based on data collected in 1996.

Global geographical distribution of fixed telephones in 1996

In number of main lines per 100 inhabitants

Teledensity 1996			
27.8	–	68.3	telephone main lines per 100 inhabitants (46 nations)
8.7	–	27.8	telephone main lines per 100 inhabitants (45 nations)
1.4	–	8.6	telephone main lines per 100 inhabitants (47 nations)
0	–	1.4	telephone main lines per 100 inhabitants (48 nations)

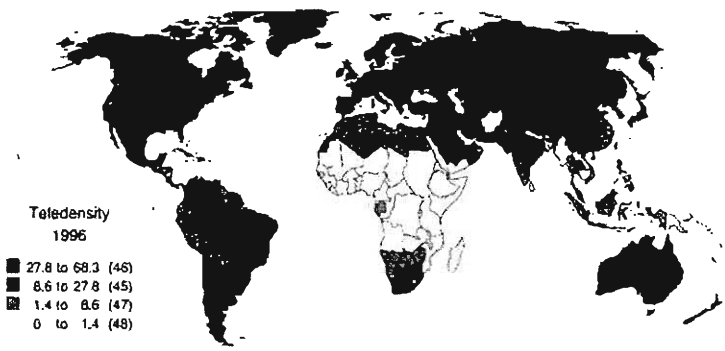


Figure 26: The global teledensity varied from 0.07 fixed telephones per 100 inhabitants in Cambodia to 99 phones per 100 inhabitants in Monaco in 1996. By early 1997 62% of all fixed telephones were installed in 23 countries, representing 15% of the global population.

Source: ITU World Telecommunication Development Report 1998

68.4% of the fixed telephones in the world are installed in the OECD

The inhabitants of the 29 OECD member countries had by the end of 1997 68.4% of the installed base of fixed telephones. Since 1990 125 million fixed phones were installed. Only six among the member states have less than 40 fixed lines per 100 inhabitants. Sweden has had a high penetration rate since 1990 – the rate has not grown at all during the period 1990 to 1997. The majority of the OECD countries have saturated their markets for fixed telephony. Growth takes place in other parts of the world. All the same, 17.5 million new fixed telephones were installed in the OECD area in 1997. In China only, some 15.4 million fixed telephones were installed. The heavy growth figures are related to mobile telephony, as described above.

The following figures describe the development of the number of fixed telephones per 100 inhabitants in the OECD member countries during the period 1990 to 1997, as well as the compound growth per country. In 1990, Sweden had almost 70 fixed telephones per 100 inhabitants. Since then, growth in fixed telephony has been marginal and moved to mobile telephony. Hungary is the country demonstrating the fastest in the number of fixed telephones growth during the period 1996–1997, but it has to be remembered that this country started at a very low level once the communist system was replaced by a more liberated state system. Hungary still has no more than 30 fixed telephones per 100 inhabitants. The following figure does not describe how the availability of mobile services and IP telephony, for example, have influenced IT-services.

Fixed telephones per 100 inhabitants within the OECD 1990 to 1997

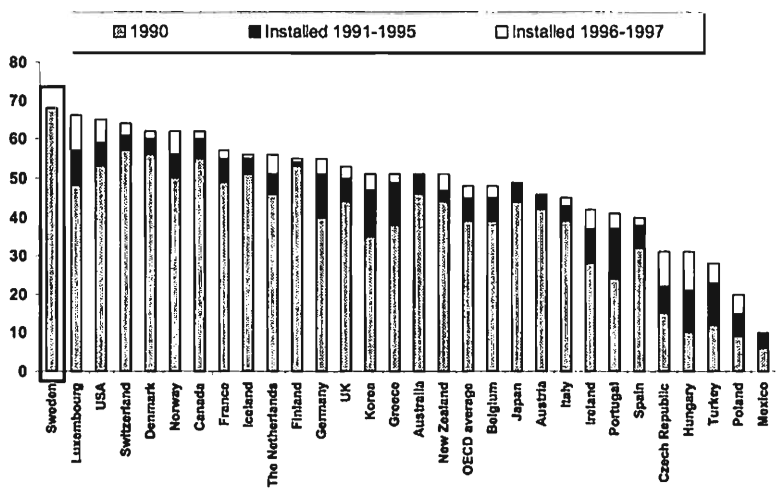


Figure 27: The figure shows the number of fixed telephones per 100 inhabitants in the OECD countries from 1990 to 1997, and the number of installations made during the following periods of time: 1990, 1991–1995, and 1996–1997. Sweden had almost no growth at all from 1990 to 1997, while Hungary had the most substantial growth of all countries from 1996 to 1997. Sweden still has the highest number of fixed telephones per 100 inhabitants, 70, while Hungary still has rather few, 30.

Source: OECD Communications Outlook 1999

We can see that there will be new players of many kinds in the future T.I.M.E. markets. But who were the key players a few years ago and who are the leaders today? Below follows a list of the 25 largest telecommunication operators in the world in the OECD countries in 1997.

The 25 largest telecom operators in the OECD in 1997

Operator	Country	Turnover million USD	Main lines	Mobile subscribers	Employees
1. NTT	Japan	78 099	60 186 000	19 890 000	226 000
2. AT&T	USA	51 319	0	6 000 000	127 800
3. Deutsche Telekom	Germany	38 957	45 200 000	3 752 000	196 943
4. Bell Atlantic	USA	30 194	39 700 000	5 356 000	141 000
5. France Télécom	France	26 851	33 700 000	3 000 000	156 620
6. BT	UK	25 597	27 651 000	3 077 000	124 700
7. Telecom Italia	Italy	25 168	25 698 000	0	126 097
8. SBC Communications	USA	24 856	33 440 000	5 493 000	118 340
9. GTE	USA	23 260	27 670 000	5 701 000	114 000
10. Bell South	USA	20 561	23 201 000	4 105 000	81 000
11. MCI	USA	19 653	0	0	60 409
12. Telefónica	Spain	16 141	16 737 000	3 269 400	64 109
13. Ameritech	USA	15 998	20 544 000	3 177 000	74 359
14. US West Inc.	USA	15 235	16 033 000	2 600 000	67 461
15. Sprint	USA	14 874	7 000 000	1 000 000	51 000
16. Cable and Wireless	UK	13 588	1 110 000	1 015 000	46 550
17. Telstra	Australia	11 866	9 350 000	2 777 000	66 109
18. DDI Corporation	Japan	9 738	0	7 800 000	2 927
19. KPN Telecom	The Netherlands	7 931	8 860 000	1 185 000	32 708
20. Telmex	Mexico	7 663	9 253 715	1 113 000	54 758
21. Worldcom	USA	7 351	0	0	20 300
22. Swisscom	Switzerland	6 775	4 690 000	1 044 000	22 145
23. Bell Canada	Canada	6 676	10 607 000	0	39 328
24. Telia	Sweden	6 083	6 010 000	1 935 000	32 549
25. TIM Telecom Italia Mobile	Italy	5 553	0	9 277 904	7 104
Total		**509 988**	**426 640 715**	**92 567 304**	**2 054 316**

Figure 28: Here is a listing of the 25 largest telecom operators in the 29 OECD member states, their country of origin, turnover for 1997 in million US$, number of fixed telephone lines, number of mobile subscribers, and number of employees.

Source: OECD Communications Outlook 1999

The accumulated turnover of the top 25 telecom operators was almost 510 billion US$ in 1997. They had almost half of the subscribers to fixed telephone lines in the world, 427 million, and almost 93 millions mobile subscribers. More than 2 million persons earned their living in these companies. It is worth noting that the most densely populated nations of the world were not included – China, India, and Russia are not members of the OECD and not represented.

In 1996 the 50 largest telecom operators had an accumulated turnover of 550 billion US$, to be compared to the 510 billion US$ in turnover for the largest telcos in 1997. OECD experts point out the fact that even if the turnover for the 25 is increasing from year to year in real numbers, they represent a decreasing market share as a direct function of the liberalization and deregulation of telecommunications. In 1992, the 25 largest operators generated 92.4% of the total industry turnover – in 1997, they were responsible for 84.4%. Not only liberalization and deregulation are the reasons for this. In 1997, some 60 countries were deregulated compared to 30 in 1994. And digitalization results in integration of equipment and services, which generates new market segments.

The top 10 telecom companies by market capitalization, March 2000

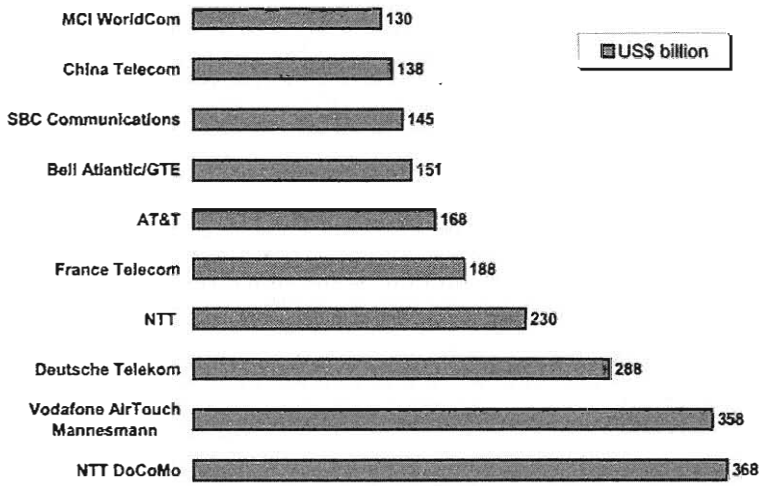


Figure 29: The top ten telecom operators ranked by the market capitalization in March 2000 puts Japanese NTT CoCoMo at the very top with a market value of some US$ 370 billion, followed by recently merged Vodaphone/AirTouch/ Mannesmann and Deutsche Telekom. Thanks to mobile Internet services, DoCoMo attracted some 12 million users to its i-mode service in less than 18 months. The Japanese seem to love the entertainment applications.

Source: MSCI/Primark Datastream/The Economist March 11th 2000/ Näringsliv October 6th 2000.

In the 29 OECD countries there were 64 telecommunication companies having an annual turnover of more than 1 billion US$ each by the end of 1997. These companies together employed 2 706 888 persons. The mobile operators within the OECD employed 243 565 persons, but that was only part of the story. Sweden, Iceland, Japan, Luxembourg, Mexico, New Zealand, Poland Switzerland, and Turkey had not provided any figures at all, since most operators in these countries provide fixed as well as mobile telecommunications.

According to the ITU website early March 2000, the ten leading telecom equipment manufacturers in the world were the following:

Top 10 telecom equipment manufacturers in the world 1998

Rank	Company	1998 telecom equipment revenue in billion USD
1	Lucent	26.8
2	Ericsson	21.5
3	Alcatel	20.9
4	Motorola	20.5
5	Nortel	17.3
6	Siemens	16.8
7	Nokia	14.7
8	NEC	12.6
9	Cisco	8.4
10	Hughes	5.7

Figure 30: The top ten telecom equipment manufacturers had accumulated revenue of 165.2 billion US$ in 1998.

Source: ITU

Regarding employment by the IT and telecom companies, it is in the context interesting to note that the T.I.M.E. industry in the US has created some 7 million new jobs during the period from 1992 to 1997. In a report commissioned by the European Commission, *BIPE Conseil 1996*, the effects of the liberalization of the telecommunication industries and the converging technologies will create some 1.3 million new jobs. When compared to the USA, this figure gives some food for thought.

According to the 1999 yearbook of Statistics Sweden, SCB, there were 3 812 841 persons employed in the country by November 1996. Counting the industries included in the T.I.M.E. industry as defined in this book as telecommunications + information technology + media/contents, three of the SCB tables are applicable, publishing and the graphics industry, post and telecommunications and consulting and service bureaus. These three industries employed 4.9% of the total employed population. But there are several flaws with this one being that manufacturers like Ericsson are not included. Neither are the Internet companies and specialist consultants like providers of e-services. However, some data are available. The National Board for Industrial and Technical Development, NUTEK, in collaboration with Statistics Sweden, SCB, produced a number of reports, so far in Swedish only, about the status of the information society industry in Sweden. The first report which

appeared in 1993, is called *"Data- och elektronikindustrin i Sverige 1993"*, and follow-up reports appeared in 1994, 1996, 1998 and 1999. The content of the last one includes data about the service industries as well. These reports contain interesting data collected according to the OECD definition of the T.I.M.E. industry, the so-called NACE classification[6]. 25 219 companies were classified as belonging to the industry according to this definition, and they employed 169 480 persons (data from 1997).

In 1985 the telecommunication industry generated 1.83% of the Swedish GNP. In 1990 the percentage was 2.32%, in 1995 3.02% and in 1997 3.03%. The average for the OECD-countries was 2.71% of the accumulated GNP in 1997. The figure below shows the telecommunication income per capita in the OECD countries for 1980, 1985, and 1990.

Telecommunication income per capita in the OECD countries in 1980, 1985, and 1990

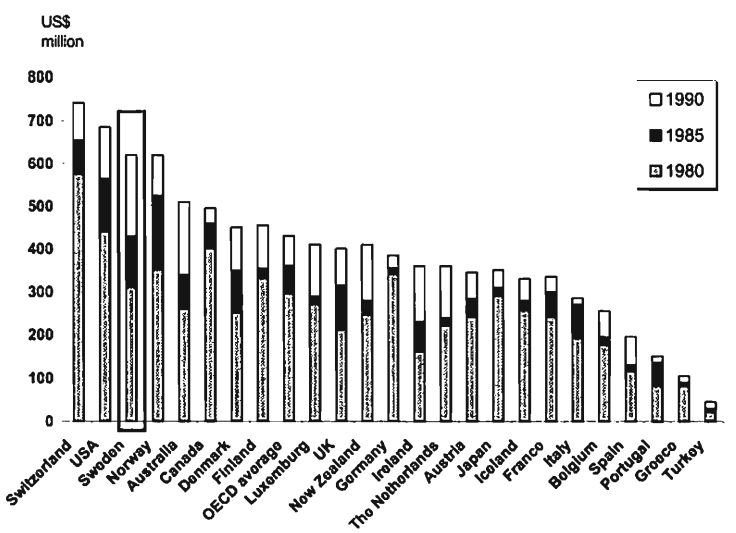


Figure 31: The distribution of the telecommunication income per capita in the OECD countries in 1980, 1985, and 1990. All figures are in million US$, in the monetary value of 1990. Switzerland and the US generated the highest income in actual figures; Sweden was in third position.

Source: OECD

In 1998, exports of telecommunication products from Sweden amounted to 10.3 billion US$, which placed the country as number four in actual figures on the list of the global exporters. Only USA, UK, and Japan exported products for a higher value.

Export of telecom products in 1998
In actual figures, in billion US$

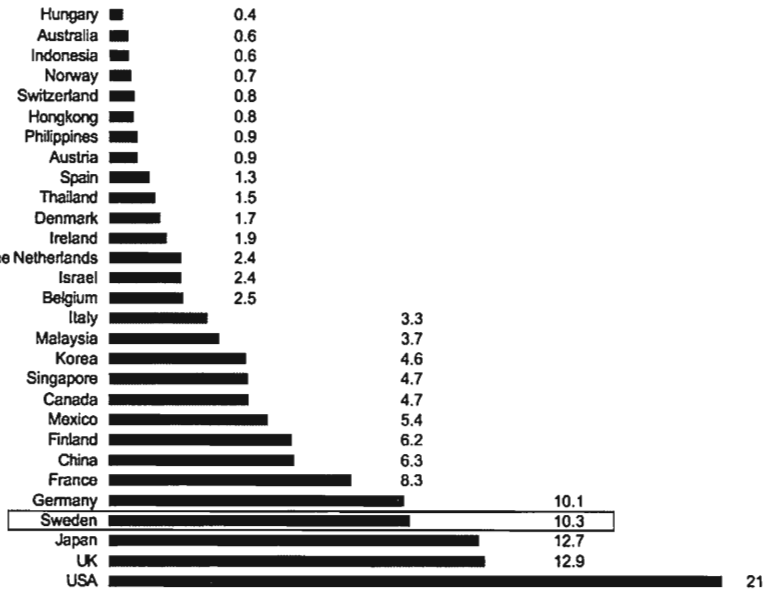


Figure 32: The figure lists the most important global exporting nations of telecommunication products in 1998. The figure for each country is expressed in billion US$.

Sources: WTO SITC 764/Anders Rune, VI

High speed transmission – ISDN and after

During fall 1999 the slogan *"broadband for all"* hit Sweden like fire. The Swedish market place rapidly became a broadband market. Late March 2000 the Swedish government launched its proposition regarding the construction of a new national broadband infrastructure, see Regeringens proposition 1999/2000:86: *Ett informationssamhälle för*

alla (Government proposition 1999/2000:86: *An information society for all*). Also see part II for an introduction to the contents of the proposition. Now, high speed transmission has long been a subject of great attention in many countries. In Germany the telcos have gone into specific efforts to make ISDN available. Norway was early in promoting ISDN. Sweden belonged to the laggers and started late. Thus ISDN penetration per 100 inhabitants is modest. Once the proposed broadband network has been rolled out all over Sweden, the situation is likely to change. The network should be in place around 2004–2005. As technology developments speed up many feel more and more certain that ISDN is an old technology that is being replaced by more modern and faster applications. ASDL is one proposal and more are likely to come. Whatever turn technology takes, broadband mass availability is likely to stay high on the top ten list of IT issues during the coming months. The following figure shows ISDN penetration per 100 inhabitants in five European countries.

ISDN connections per 100 inhabitants in five European countries 1997–2001

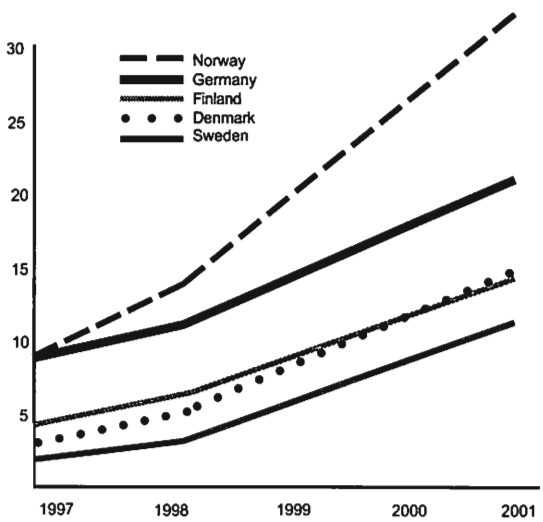


Figure 33: The figure shows the number of ISDN connections per 100 inhabitants in Norway, Germany, Finland, Denmark and Sweden from 1997 to 2001, 1999 to 2001 being estimates.

Source: Computer Sweden # 36 Friday April 9th 1999

Almost running out of frequencies?

Radio frequencies are running out, once more. Those available are already booked and overbooked by manufacturers of wireless devices such as door openers, FM radio advertisers, mobile telephones, radio linked devices, and communication satellites. In the beginning of mobile time it was all a matter of longwave transmission. For instance, Radio Sweden broadcast in the bandwidths from 149 to 283 kHz. In the high frequency bandwidth 87.5 to 108.5 kHZ, the so called FM bandwidths, FM for Frequency Modulation, there are today 885 radio stations broadcasting in Sweden only. Satellite based mobile telephony, like the now defunct Iridium[7] network, disturbed among other things the radio navigation systems of the Swedish Defense as well as the work carried out by radio astronomers in the bandwidth areas 1 600 to 1 626.5 MHz. GSM based mobile telephones are using frequencies in two areas, 1 710–1 785 MHz and 1 805–1 880 MHz. Third generation mobile telephony, the UMTS system, causes conflicts of interest both with the US defense systems and the US mobile network PCS. UMTS is working within two frequency areas, 1 900–2 010 MHz and 2 110–2 200 MHz. PCS works in the 1 850 to 1 990 MHz area. The new national Swedish broadband network is planned for 3.4–3.6 GHz. General radar systems work in areas above 100 GHz. In Sweden the Ultra High Frequencies, UHF, are used only by SVT2, the national Swedish television broadcasting corporation for digital TV broadcasting, i.e. so far. Recent discussions between Ericsson and American Qualcomm, resulting in Ericsson buying the patent rights to the CDMA 2000 standard, were caused by the fact that both corporations wanted to use the same frequencies. At the same time as there is a lack of frequencies, new technology makes it possible to cram more and more applications into the same frequency areas thanks to smart digital coding and intelligent systems finding their own unoccupied frequencies, like for instance the Bluetooth technology from Ericsson.

Source: Ny teknik 13/99, Erik Mellgren

Global satellite navigation

Satellite navigation systems make it possible for aircraft, ships and all kinds of motor vehicles as well as for ordinary individuals to decide their exact position via mobile telephones, among other devices. The European market for satellite navigation equipment was estimated to 340 billion SEK from 1998 to 2007. The figure includes sales of hardware as well as services. The Europeans bought GPS hardware for some 1.8 billion SEK in 1997, and are estimated to buy such equipment for a total of 7.6 billion SEK by 2007. The global navigation systems are replacing the traditional AGA lighthouses along the coastlines of the world. Two such systems were deployed by the beginning of 1999, one American one, called GPS, Global Positioning Satellites, and one Russian one, GLONASS.

The global satellite navigation systems by 1999

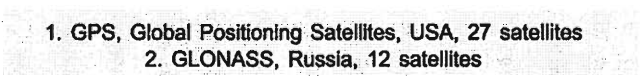


Figure 34: Two global satellite systems existed early 1999. In total 39 satellites are serving the global transportation systems.

Source: Dagens Nyheter Thursday April 29 1999

A third system, a European one, called Galileo, has been decided upon by the European Commission. As a start ESA, the European Space Agency, will launch 15 satellites. 20 satellites and their earth-based stations are estimated to cost the equivalent of 26 billion SEK. Once the system is terminated it will consist of somewhere between 21 to 36 satellites. Galileo is planned to be able to operate independently, but shall also be able to collaborate with and work as a complement to the American GPS system.

Inmarsat offers satellite telephony, Globalstar to come

Since the autumn of 1999, Inmarsat, the global organization for maritime satellite communications, offers satellite based mobile telephony. The communication equipment is a portable computer sending and receiving data at ISDN speeds, i.e. 64 kbit/sec., all over the globe with the exception of the polar areas. The computer telephone must be directed towards the geostationary satellites of Inmarsat in order to work. But the computer solves this problem on its own – it has built-in compasses. An Inmarsat user can tranfer and receive pictures as well as text, data and voice. E-mail, e-conferencing, e-trade and intranet access are some of the services offered. These services are provided by BT, France Télécom, T-Mobile Germany and Telenor, among others. The international consortium Globalstar have placed some 30 of their planned 48 satellites in space. The consortium plans to offer mobile telephone services to the non-industrialized countries. Services will be offered on a regional level as soon as the satellites are in place.

Sources: New Scientist, 3rd July 1999, http://www.newscientist.com/Mobile Europe July/August 1999

Footnote

6 NACE is an acronym for Nomenclature Génerale des Activités Economiques dans les Communautés, Européennes, which in turn is based on the ISIC defintion of the United Nations.

7 The Iridium Consortium spent more than US$ 2 billion in order to offer satellite based mobile telephony on a global basis. By July 1999 the consortium had sold only 10 000 telephones, and in early 2000 the project was abandoned. The LEO satellites are to be scrapped, shot down at an estimated cost of US$ 70 million.

4. Mobile Communications – the Platform of Tomorrow

The greatest push behind new technology development at this moment is the ever-increasing demand for mobility – we are becoming a new race of info nomads. Already in 1997 the American analysts the Yankee Group reported that about one third of the inhabitants of the United States, i.e. equivalent to 43 million persons, is mobile, meaning that these people have mobile jobs. In 1999 the same report said there would be 66 million mobile telephone users in the country. Their estimate for 2001 is 100 million mobile phone users. By December 31st 1999 there were 91 million subscribers to mobile telephones in North America, i.e. USA and Canada, according to EMC World Cellular Database. A high mobile penetration rate is also what has made Sweden one of the leading IT nations of the world.

Most of the industry experts believe that there will be more mobile telephones in the world by 2001, i.e. more than one billion, than fixed ones. Finland may serve as aanother model for this development – by the end of 1998 there were 58 mobile telephones per 100 inhabitants, and the total number of mobile telephones exceeded the number of fixed ones, according to the Finnish secretary of traffic administration. However, so far it is difficult to fully understand the implications of this mobility. Some alarming reports about potential medical dangers of mobile telephony appear now and again, in spite of research carried out so far indicating no such dangers. The technical solutions for mobile Internet access are not very impressive so far, due to, among other things, the puny screens of the mobile phones, and to the fact that the large majority of the Internet content is text. The social implications of total mobility are

also rather unknown. Most employers still seem to want their employees to report in to an office on a regular basis, so called tele communting has not been a great success according to some recent research reports. An interesting evidence of the many difficulties in understanding the development of mobile telephony is the following prediction made by the Swedish Research Institute of Trade, Handelns Utredningsinstitut, in December 1997.

Prognosis for Sweden in December 1997: Mobile culmination in 1998

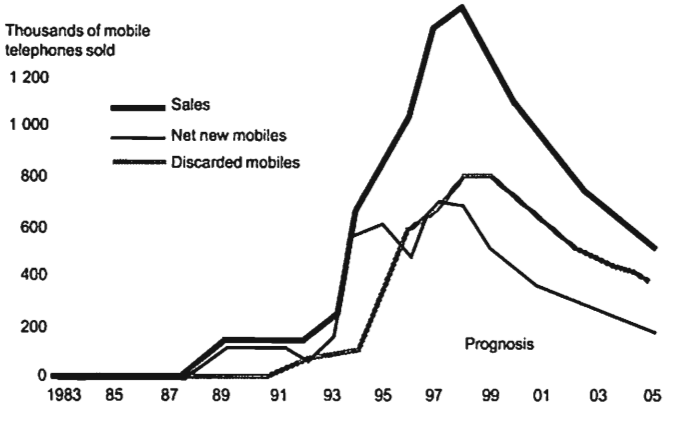


Figure 35: The Swedish Research Institute of Trade, Handelns Utredningsinstitut, HUI, presented the above prognosis for sales of mobile telephones in Sweden until 2005. They were convinced that sales of mobile telephones would decline as off 1998 and continue to decline until 2005.

Sources: HUI/Svenska Dagbladet Tuesday December 9th 1997

At the same time the same institute predicted that TV sets, video recorders, video cameras, and micro ovens would increase in sales. By 1997, there were in total 6.6 million TV sets among some 8 million Swedes. In 2005 there will be 7.2 million TV sets, and by then the population is just above 9 million. Swedes will increase their total numbers of video recorders from 3.7 million in 1997 to 4.7

million in 2005, and video cameras from 740 000 to 1.2 million in 2005. During the same period the total number of micro ovens in the country will increase from 3.2 million to 4.3 million.

Total number of mobile telephone subscribers in Sweden in 1998 and 1999

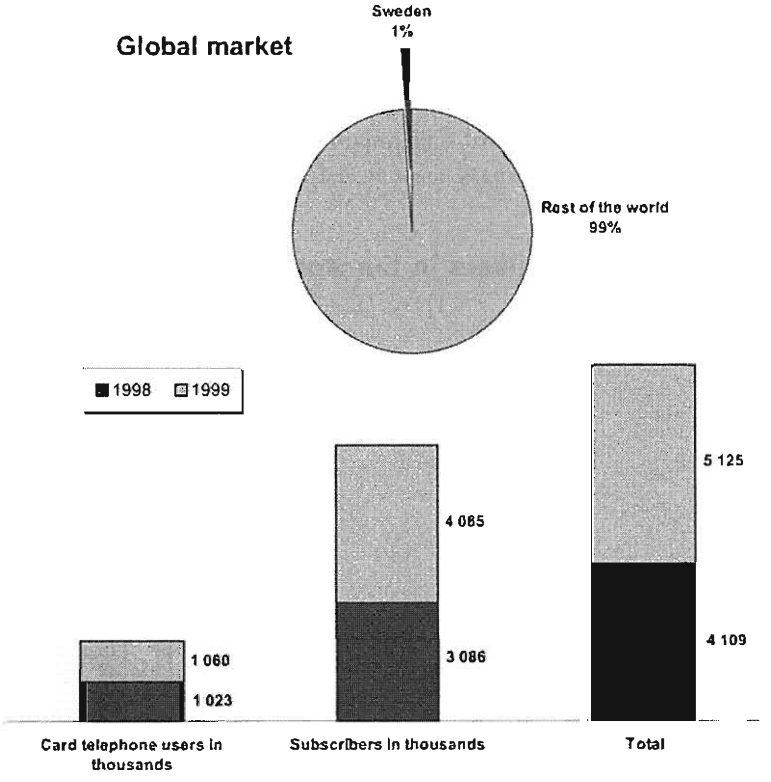


Figure 36: By the end of 1998, there were 4.109 million mobile telephone users in Sweden. By the end of 1999, the number had increased by more than one million to 5.125 million.

Sources: Several/Svenska Dagbladet, Näringsliv, Friday March 3rd 2000

The example only shows how very difficult it is to predict the developments of the information technology and its users. By the end of 1999 Sweden had 5.1 million mobile telephone subscribers and a penetration rate of 57% of the population. Mobile telephony is

one of the most important industries for Sweden's industrial growth and its industrial future. Kista some kilometers to the North of Stockholm, a place where Ericsson, Nokia, and a large number of other IT companies are developing mobile solutions, proudly calls itself 'Wireless Valley' alternatively 'Mobile Valley'. The industry gurus predict that the human race will want to become even more mobile and wireless and will want 'wireless everything'. This trend is confirmed by the fact that in some countries like Finland and Sweden, mobile telephone subscriptions long ago outnumbered fixed telephony subscriptions. The telecommunications industry expects there to be more than one billion mobile telephone users during the first couple of years in the third millennium. The number of mobile telephone users will surpass the number of fixed telephony users.

Mobile telephone users in the world 1989–2005
In million users

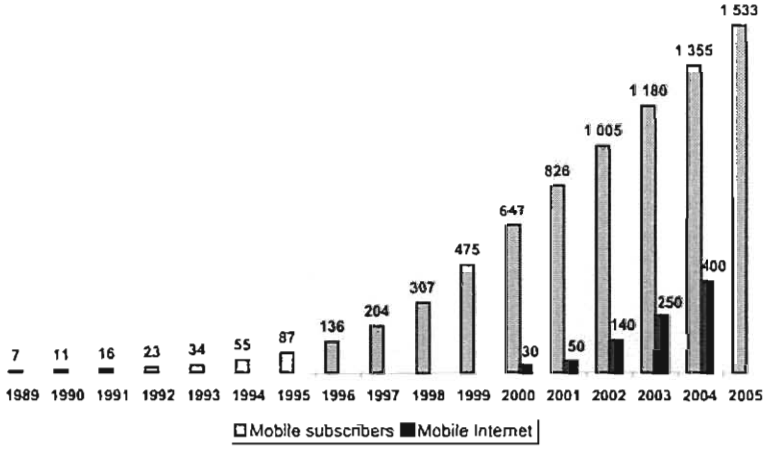


Figure 37: In 1989 there were some 7 million users of mobile telephones in the world. By the end of 1999 more than 475 million persons had subscriptions to mobile telephones. According to common forecasts this figure will grow to 1 533 million by 2005. By that point of time it is estimated that there will be 400 million users of the mobile Internet.

Sources: Several industry sources

Current market studies, most of them from north America, estimate that a large number of people working in sales, customer services and other services are becoming more and more mobile. They keep moving from customer to prospect and hit the home office only rarely. Thanks to mobile telephones, palmtops and portable computers they can easily get access to the home office and their collaborators via the Internet and corporate intranets and thus carry out their office work from almost anywhere. One example of such a study is one from the American analysts of the Yankee Group, a report named *"The Impact of the Internet on Mobile Computing and Wireless Data"*. The Yankee Group states that 33% of the largest corporations of the US will have provided all their employees in service and sales functions with wireless intranet access before the end of 2000.

The following two figures give an overview of the nations having the most subscribers to mobile communications. Only Swedes are more mobile than the Americans are when it comes to Internet penetration, and Sweden, Italy, Japan, and UK are more mobile than the Americans are when it comes to mobile phone penetration. Note that the data include professional as well as private users. Data are from 1999.

Mobile Internet including applications for m-banking, m-shopping and other m(obile) functions are seen as the next move for the Information Society. M-products and services are in focus of R&D in the Kista Wireless Valley and at the Center for Information and Communication of the Stockholm School of Economics, just to mention two centers of mobile excellence in Sweden.

Internet penetration in percent of the total population in 1999

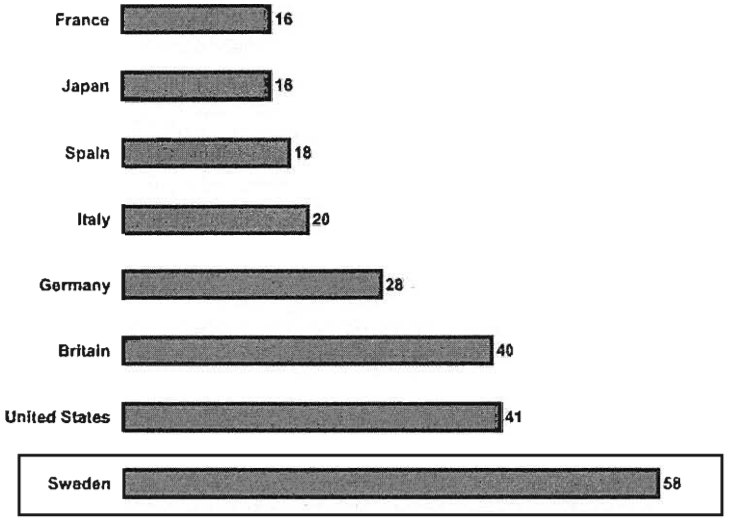


Figure 38: This figure lists the nations having the highest Internet penetration in the world. In Sweden, almost 60% of the population use their Internet access. Women are as frequent users as men. In the United States just above 40% of the population are Internet users. Britain has almost as many while not quite 30% of the Germans use the Internet. According to figures from June 2000 from USA women are more frequent users of the Internet than men. There seems to be certain gender-related differences in what applications are utilized.

Sources: IDC/Morgan Stanley/The Economist April 29th 2000

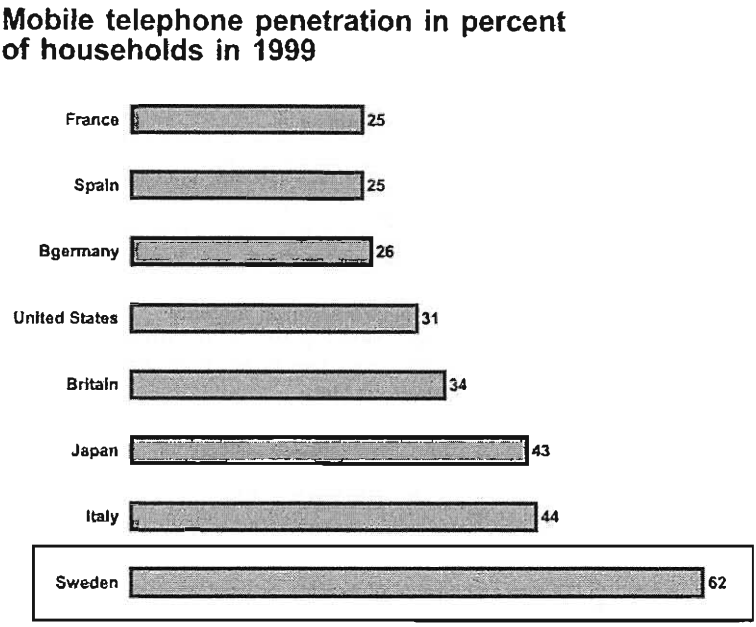


Figure 39: Also when listing mobile telephone ownership, Sweden is ahead of the United States, and so are Italy, Japan and Britain. One reason for the United States having a lower mobile telephone penetration rate than several European nations is that there are several standards deployed in the country while most European countries and Japan have stayed with one standard only, the GSM.

Sources: IDC/Morgan Stanley/The Economist April 29th 2000

"Info nomads" and "mobile generations" are two hot life style concepts, closely related to mobile telephony. Less hot is the once so much talked of "tele commuting" or "tele work" concept. However, this seems to be a matter of terminology rather than a matter of real life. The mobile tools provide large number of persons with opportunities to carry out their work without necessarily having access to office buildings and fixed offices, thus making small business activities possible without incurring large overheads. They also make close customer relations a fact of life for large businesses. Palmtops, laptops and mobile telephones are just the start of the new mobility, of which there are, and will be, many kinds. In a report called *"Internet Unplugged"* written by Michelle Pineda, STATT, the Swedish Office of Science and Technology, the following kinds are listed:

Mobility – the platform for tomorrow

Geographical mobility

Physical mobility between two or several locations

Social mobility

Mobility between different contexts, i. g. from home to office; to the schools of the children; to meetings with different associations; to hospitals and care institutions; to sports events; entertainment etc

Electronic mobility

Mobility between communication utits and systems, i. g. from modem communication to Ethernet

Three different kinds of electronic mobility

Personal mobility

Voice communication on-going while moving

Terminal mobility

Staying connected while a terminal is moved from one place to another within the same network or to a different network altogether

Session mobility

A session moves from one terminal to another in order to include more individuals in a conversation or a telephone conference

Figure 40: The future will see many kinds of mobility, at least according to the report "Internet Unplugged" by Michelle Pineda, STATT.

Source: STATT Utlandsrapport USA 9812: Internet Unplugged by Michelle Pineda

Services available via mobile telephones are constantly growing. Analysts at Datamonitor estimate that the installed base of mobile telephones is so large that these telephones in the very near future will become important tools for e-banking, e-trade and e-shopping as soon as the telephones can be combined with smart cards for payment. This will be a reality as soon as it becomes easy to surf the Internet from a mobile device. However, other industry specialists are more careful in their predictions of the future. One expert from Ericsson says that it will not be possible to download a complete home page to the miniature screen of a mobile handset, not even in a more distant future.

For a start, let us all have a look at the conventional data, such as headcounts, percentual annual growth, and penetrations rates for mobile , describing the mobile world. The following figures describe the global growth and penetration per 100 inhabitants of mobile subscriptions during the period of 1990 to the end of 1999. Note that the sources are different, thus data are not directly comparable between the figures.

Global annual growth of mobile subscriptions 1990–1997

In percent

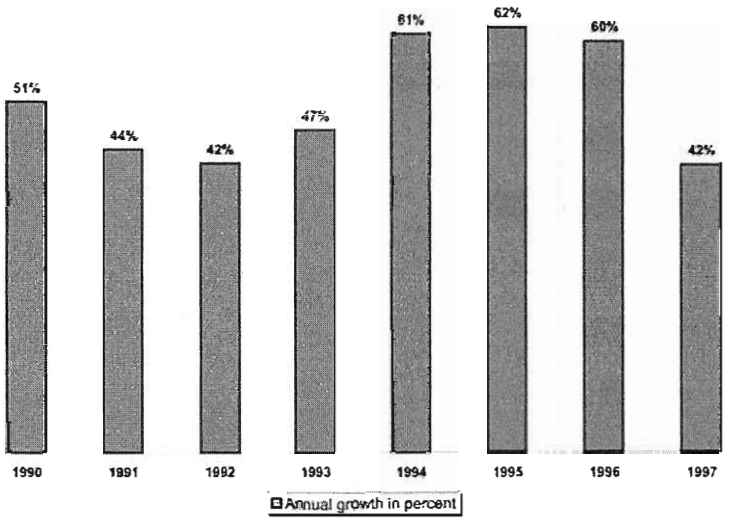


Figure 41: The annual growth of global subscriptions for mobile telephones from 1990 to 1997, as seen by ITU. The value for 1997 is an estimate.

Source: ITU World Telecommunication Indicators Database

Global penetration of mobile subscriptions 1990–1997

Number of mobile subscriptions per 100 inhabitants

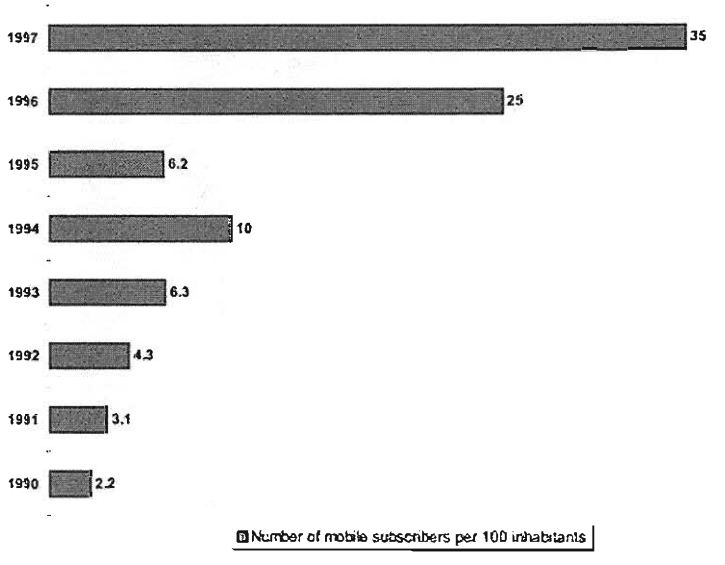


Figure 42: The changes in the penetration rate of global mobile subscriptions from 1990 to 1997 are described in this diagram. The figures give the number of subscriptions per 100 inhabitants as seen by ITU. The data for 1997 is estimated.

Source: ITU World Telecommunication Indicators Database

Global growth of mobile subscriptions 1998–1999

Subscribers Dec 1998 in million		Increase 1999, million	Increase 1999 %	No of subscribers Dec 1999
North America	74	17	23%	91
Latin America	21	14	67%	35
Europe	104	60	58%	164
Asia (excl. China) and Oceania	77	34	44%	111
China	25	15	60%	40
Rest of the world	8	5	63%	13
Total	**309**	**145**	**47%**	**454**

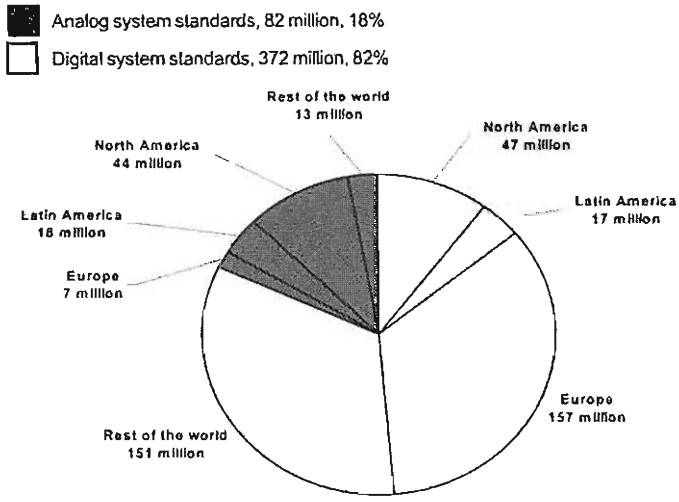
Figure 43: This figure describes the growth of mobile telephone subscriptions from December 1998 to the end of December 1999 on a global basis. It gives the actual number of mobile subscriptions as well as the percentual growth, which was 47%. Latin America and China represent the strongest growth areas, more than 60%.

Sources: EMC World Cellular Database/Allgon AB, Annual Report 1999

In 1990 there were 0.22 mobile subscriptions per 100 inhabitants in the industrialized countries. For 1997 the penetration rate was estimated to 3.5 subscriptions per 100 inhabitants. The percentual annual growth has been more than 40% per annum for the whole period, with a marked increase in 1993 when the digital systems hit the market. By the end of December 1999 there were 454 million mobile subscribers in the world, counting all system standards. Some analysts estimate that there will be more than one billion mobile subscribers by the end of 2000. Should this happen subscriptions to the mobile telephone systems will overtake the number of fixed telephone subscriptions. The hypothesis launched by some mobile optimists that countries lacking traditional telecom infrastructures should jump ahead has not quite taken place yet. In fact, it was not until 1996 that more mobile subscriptions than fixed ones were bought.

Global distribution of mobile telephony system standards by December 1999

Total number of subscriptions: 454 million



Digital system standards

North America: US TDMA-800/1900, CDMA-800/1900, GSM-1900, iDEN

Latin America: CDMA-800/1900, GSM-900/1900, US TDMA-800/1900

Europe: GSM-900/1800, US TDMA-800

Rest of the world: PDC-800/1500, GSM-900/1800/1900, CDMA-800/1700/1900, US TDMA-800

Analog system standards

North America: AMPS

Latin America: AMPS

Europe: TACS, NMT-450/900, AMPS

Rest of the world: TACS, AMPS, NMT-450/900

Figure 44: Analog system standards are used by 18% or 82 million of the global mobile subscribers, in total 454 million. The rest are using digital standards, which means that 82%, representing 372 million users, still use analog mobile telephones.

Sources: EMC World Cellular Database/Allgon AB, Annual Report 1999

Mobile telephone subscribers in the OECD countries in 1995 and 1997

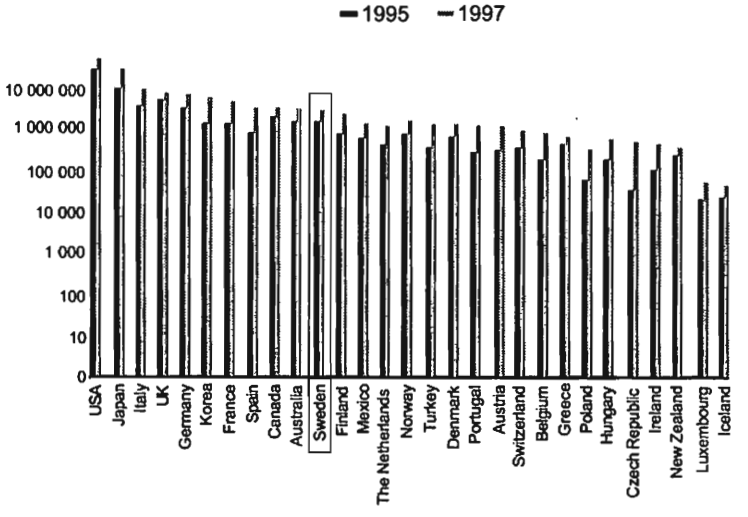


Figure 45: The figure shows the number of mobile telephony subscribers in the OECD countries in 1995 and 1997.

Source: OECD Communications Outlook 1999

The following figure shows the mobile penetration rate in selected countries by December 31, 1999.

Mobile telephone penetration in selected countries 1999

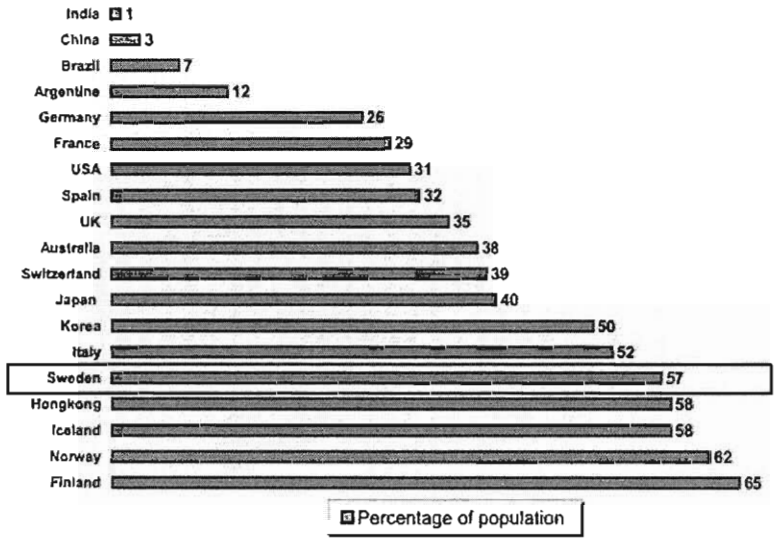


Figure 46: The figure shows the mobile telephone penetration rates as a percentage of the total population for selected countries.

Sources: EMC World Cellular Database/Allgon AB, Annual Report 1999

Mobile operators in Europe

By the time the proposed and aborted merger between Deutsche Telekom and Telecom Italia was in the hotair, the British weekly *"The Economist"* made the following listing of the largest mobile telephone operators in Europe according to their number of subscribers. This was by April 1 1999.

Leading mobile operators in Europe April 1999 and June 2000

Operator	Ranking April 1999	Ranking June 2000	Number of subscribers April 1999	Number of subscribers June 2000
Telecom Italia	1	1	15 000 000	20 000 000
Omnitel	2	4	7 000 000	12 500 000
Mannesmann	3	2	6 500 000	13 800 000
Deutsche Telekom/T-Mobil	4	3	6 300 000	13 400 000
France Télécom/Itineris	5	5	6 000 000	11 700 000
Telefónica	6	6	5 000 000	11 000 000
Vodaphone	7	7	5 000 000	9 400 000
SFR	8	8	4 900 000	8 500 000
Cellnet	9	9	4 000 000	8 100 000
Telia	10	16	3 500 000	2 760 000
Turkcell	-	10	-	7 200 000
Total			63 200 000	118 360 000

Figure 47: The figure gives the ranking of the leading European mobile operators based on the number of subscribers by the end of April 1999 and by the end of June 2000. In total, the 11 companies ranked had 63.2 million subscribers in 1999 and 118.36 million in June 2000. The fastest growth has happened in Germany, where Mannesmann and T-Mobil have grown by 9 million subscribers – each! Estimates made early 2000 said that the very same companies would have 86.6 million subcribers by the end of 2000.

Sources: FT Mobile Communications/Datastream/ICD/The Economist May 29th 1999/Public Network/ComputerSweden, September 27th 2000

In the first quarter of 2000 the merger between German Mannesmann and British-American Vodafone AirTouch took place, caused one more reshuffling of the Top 10 ranking list among mobile operators.

Four new GSM subscribers per second

By the year-end of 1998 the top 10 GSM operators in Europe had 55.1 million subscribers. By late summer 1999 the global headcount of GSM subscribers passed 200 million. Every second four persons become GSM subscribers, i.e. there are more new GSM users per second than persons born. Only some four years ago specialists announced that the number of GSM users would amount to 100 million by 2000. The double number was achieved well before the

new millennium even started. According to *"Public Network Europe's"* bi-annual European GSM survey published in February 2000, vol. 10 # 2, there were in total145 million GSM subscribers all over the continent, representing a growth of 71.5% since the beginning of 1999. The highest growth markets are in the Czech Republic, Hungary, Poland, Romania and Slovakia. Average mobile penetration in the largest five West European markets of France, Germany, Italy, Spain and the UK has passed 37% according to the same source. The global GSM Association announced on 1 January 2000 that the number of worldwide GSM subscribers exceeds 250 million. This makes GSM the definitive mobile standard of the world. As stated above, there were 454 million mobile telephone subscribers by the end of 1999 worldwide, all standards included. Predictions from mid 1999 by the GSM Association state that there will be somewhere between 700 million and 1 billion GSM subscribers by 2005. The largest single market is China – China Telecom has 25 million subscribers. Second is NTT Japan, having 24 million subscribers. Third is AT&T having 10 million subscribers. By mid 1999 there were 369 GSM operators in 137 countries sharing annual revenues of the equivalent to100 billion SEK.

Sources: GSM Association/Public Network Europe, February 2000, vol.10 #2/Göran Ahlqvist

Mobile growth in the EU

A report called *"Wireless Europe – Wireless Data Prepare to Take Wing"* published on March 30 1999 by the analysts firm Salomon SmithBarney describes the growth of mobile telephony within the EU countries and compares it to the growth for fixed telephony. The report compares the relationship between mobile and fixed telephony by the end of 1998 and estimated growth for the end of 2000. According to this report, Finland already had more mobile subscribers than fixed ones, Sweden was well on its way to a similar situation. Italy, Norway and Portugal also belonged to the contenders of having more mobile subscribers than fixed ones by the end of 2000.

Fixed and mobile penetration rates in the EU countries in 1998 and 2000

Estimates for 2000

	Belgium	Denmark	Finland	France	Germany	Greece	Italy	Netherlands	Norway	Portugal	Spain	Sweden	UK	EU-average
98 mobile telephony	17	37	58	18	16	18	35	22	49	32	18	47	22	24
98 fixed telephony	47	67	55	57	55	54	45	53	51	43	41	69	66	52
00 mobile telephony	32	48	74	35	30	35	54	42	42	50	34	60	41	41
00 fixed telephony	51	72	59	62	60	60	50	58	58	46	46	74	61	57

Figure 48: Ever more Europeans subscribe to mobile telephony. Finland already has more subscribers to mobile telephones than to fixed ones. Sweden was getting there at the time of this description – almost all new subscriptions are to mobile telephony. Italy, Norway and Portugal follow next. The figures are the penetration rate per 100 inhabitants.

Source: SalomonSmithBarney: "Wireless Europe – Wireless Data Prepare to Take Wing", March 30 1999

There are several reasons for the phenomenal growth of mobile telephone subscriptions on a global basis. One is the most recent mantra "wireless", and "wireless" is available globally which Internet is not, as have been demonstrated earlier on in this chapter. In 1990 only 60 of the UN member nations had mobile networks. Today, early 2000, 175 countries have working mobile networks. Another reason for people rapidly adapting mobile telephony is the unreasonable waiting time for a fixed telephone in many countries. So, for instance, in Russia and Moldavia you have to wait for more than 10 years for a fixed telephone to be installed. In remote areas of India, in northern Pakistan and in some parts of China you have to wait forever. It is simply not reasonable to install fixed networks. A

third reason for mobile telephony growth is that countries without working fixed networks relatively easily can have mobile ones installed.

New ways of measuring: Revenue-per-subscriber

We have remarked several times so far that measurements when it comes to the Information Society technology and its users often are uncertain and offer only one side of the coin, not the complete story. Mobile telephony is a very good example of the need for new methods of accounting. The case is as follows: So far we have measured success largely by counting heads – number of subscribers, numbers of users, number of calls, number of minutes, etc. But this is not sufficient, specially not when it comes to mobile users and Internet surfers. Take the Italian operators Telecom Italia and Omnitel Pronto. They have the largest number of subscribers in Europe, but the majority of their customers are so called pre-paid subscribers. Approximately 75% of their massive customer base are on pre-paid packages, while Deutsche Telekom only has a very low percentage of pre-paid subscribers and a majority of contract customers. Pre-paid customers are conventionally described as having a lower customer value since they are prepared to spend less than contract customers. It is evident that real success in the mobile telephony business only can be judged on a different basis, **revenue-per-subscriber**. This goes for the hyped Internet businesses as well. Revenue-per-subscriber is presently the more precise method of measuring the success of any T.I.M.E. business, not headcount, unique hit counts and similar arcane accounting methods.

Pre-paid and contract subscribers of European mobile operators per December 1999

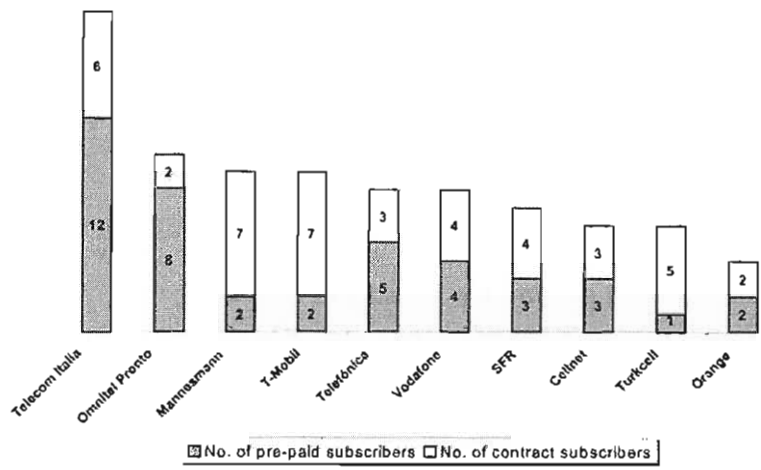


Figure 49: Telecom Italia, Omnitel Pronto, Telefónica and Vodafone have a majority of subscribers on pre-paid packages. The German operators Mannesmann and T-Mobil (Deutsche Telekom) have a majority of contract customers, generating higher revenues-per-subscriber.

Source: Public Network Europe February 2000, vol. 10, # 2

We noted at the beginning of this section that portable Internet will play an important role for future mobility. Access is already available via mobile telephones, palmtops and portable computers, the latter being seen as a tool for increased productivity. Let us have a look.

Portable computers increase productivity of travellers

Portable computers contribute to increased productivity by people travelling. This is the conclusion of an indepth analysis undertaken by The Gartner Group. One reason is that any person having a portable computer tends to work at least a couple of hours extra per week. In spite of this the experts predict that sales of portable computers will decrease. First of all, portables are seen as very expensive and judged "tools and toys for the very rich". Second, palm tops, smaller and lighter, and costing considerably less, are selling

very well. In 1998 some 92.2 million personal computers at a total value of US$ 158.7 billion were sold worldwide. Stationary computers answered for 83% of all sales while portable ones for 17%. By 2002 158.2 million personal computers at a total value of US$ 253.7 billion will be sold globally. Only 16% will be generated by sales of portable computers. This goes for everywhere except Japan, where living space is scarce and 60% of all PCs are portable ones. For the rest of the world palm top sales is growing fast. This is according to The Gartner Group.

Portable and stationary PCs 1998 and 2000

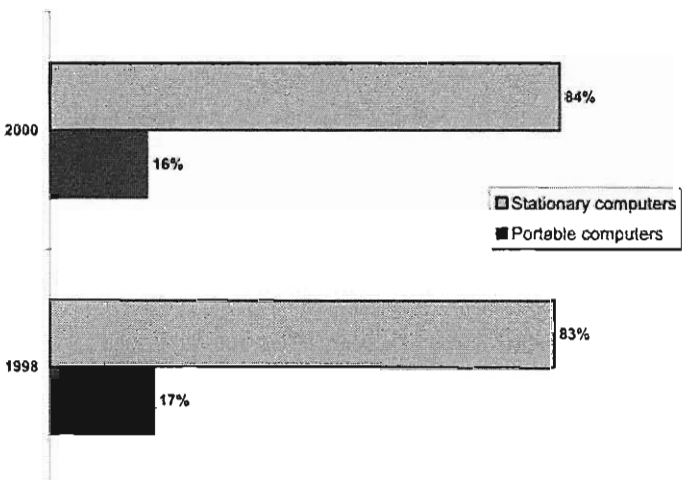


Figure 50: In 1998 92.2 million PCs at a value of US$ 158.7 were sold worldwide. Stationary PCs generated 83% of the total value and portable ones 17%. By 2002 158.2 million PCs are estimated to be sold at a total value of US$ 253.7. 16% of the value will be generated by portable sales.

Sources: Computer Sweden April 28 1999/The Gartner Group

However, some analysts hold a different opinion. Not least American experts report that more people become increasingly dependent on wireless and mobile communications which will result in many more portable computers being sold in the near future at considerably lower prices. Wireless access will be a commodity to provide all users with simple and fast communications and information retrieval. At present two types of wireless access networks are the dominating ones:

1. Wireless networks optimized for speech transmission, for instance AMPS, Advanced Mobile Phones System, and GSM, Global System for Mobile Communications. Both are implemented in the USA. A third one is DECT, Digital European Çordless Telecommunication, which started out as a European network.

2. Wireless networks optimized for data transmission, for instance RAM/Mobitex developed by Ericsson; Ardis/Modacom developed by Motorola and IBM; Metricom/Ricochet Network, a relatively new packetswitching network developed in Silicon Valley, California, USA.

Mobile Internet fast growing in the US 1999 to 2004

Estimated number of users of mobile Internet access in the US

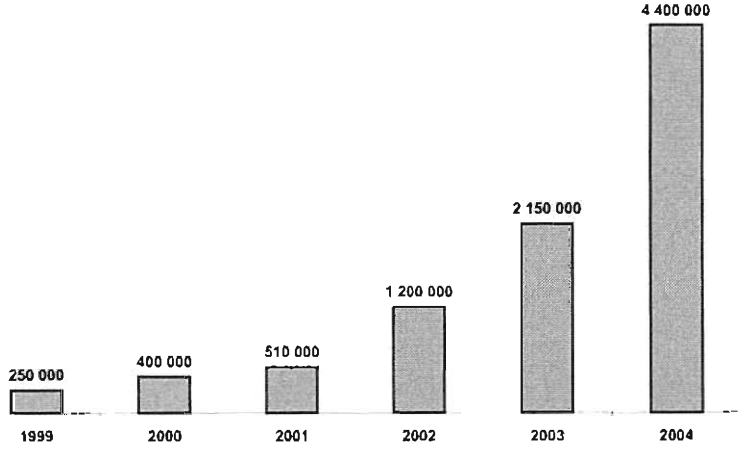


Figure 51: During 1999 some 236 820 users were estimated to access Internet via wireless devices in the USA. By 2002 there will be more than one million users of wireless access to the Internet, and after that growth will be very rapid, at least according to the analysts at the Strategis Group.

Sources: The Strategis Group/Computer Sweden no. 20, Friday February 26 1999

The Gartner Group estimated in late summer 2000, mobile e-shopping will be worth US$ 1 800 billion by 2003, and that two out of three mobile telephones will have Internet access. IT Research reported that 100 000 WAP telephones and 107 000 palm tops were sold during the first two quarters of 2000.

5. The on-line Information Society

According to a report from Datamonitor from early 1999, there would be 64 million European households with PC based Internet access by 2004. Early 2000 the data said that 25 million European households had PC based Internet access. 97% of all European households have at least one television set, and 20% have access to interactive services. The annual growth was the strongest in the Southern parts of Europe, 85% for Spain while the equivalent growth for Sweden was 28%. Internet access had skyrocketed in Germany, growing by more than 50% during the last six months of 1999. Data from the Irish analysts Nua from June 2000 presents the number of European Internet users as 91.28 million. However, they do not tell how many access the Internet via PCs.

Data like these can be taken as proof of the conclusion of the US Department of Commerce, DoC, from 1998 that the Internet has demonstrated a faster global growth rate than any other IT tool ever before. It took the wireless 38 years to pass more than 50 million listeners worldwide. Television needed 13 years to reach the same amount of viewers. The Internet passed 50 million users after four years of dissemination. By the end of 1998, after six years as a public "commodity" the Internet had more than 100 million users and by the beginning of 1999 153.2 million. According to the DoC the Internet traffic doubles every 100 days. But the Internet, like the rest of the Information Society tools, is not yet a tool for everyone. By the end of 1997 the people of the rich countries had access to 31 046 Internet host computers per one million inhabitants while the people of the poorest countries had access to 9 Internet host computers per one million inhabitants. The global average of Internet host computers per one million inhabitants was 5 104. Several analysts' reports on Internet usage are available on the web. Interesting information can be found at Jupiter Communications and the Irish consultancy Nua. Eurostat, ITU, the OECD and EITO are other sources recommended for those with a particular interest in Internet

usage. There are EU web sites reporting on the eEurope-project, which has as its objective to create an information society for all. A typical eEurope initiative is the proposal for last mile local loop unbundling to be launched by December 31 2000.

During 2000 it is believed that the global Internet economy will surpass 196 billion US$, equivalent to 1 700 billion SEK, this according to estimates from Forrester Research. The largest part will be generated by e-business to e-business.

The global Internet economy in 2000
Total estimated value: 196 billion US$

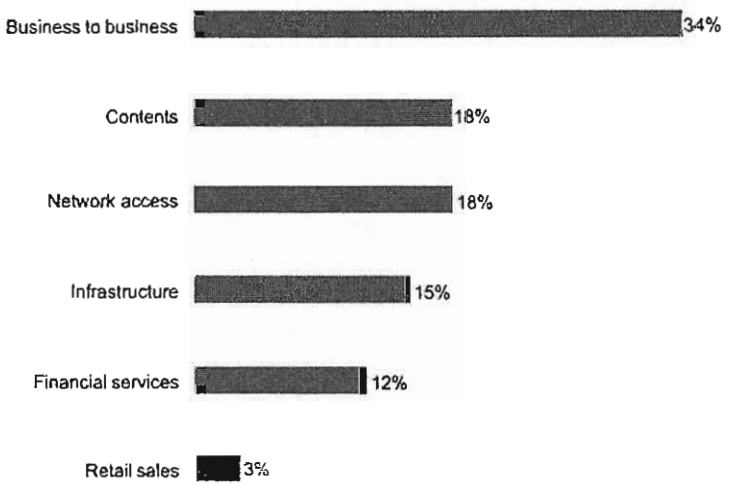


Figure 52: During 2000 the global Internet economy will generate some 196 billion US$, equivalent to almost 1 700 billion SEK, according to an estimate by analysts Forrester Research. Some 34% will be generated by business to business activities, 18% by contents and equally much by network access services. Infrastructure will generate 15%; financial services 12% and retail sales some 3%.

Sources: Forrester Research/David Philipson, Academy of Copyright, 1999-03-02

The backbone of the global Information Society is made up of IP networks and related services. One example of a modern IP network is the one Telia has opened in order to connect Stockholm to the most important information centers of Europe. But in order for

the global Internet economy to be successful, more that mere IP networks is required. A number of customer demands related to the Internet economy will have to be fulfilled. One such demand is security for all kinds of financial transactions, in particular so for financial transactions. A second demand, relevant to interactive services, is high transmission speeds. A third demand is easy-to-use interfaces and a fourth high quality transmission of pictures, still ones as well as moving ones, of voice and sound. In most corners of the world the best engineers are making efforts to find ever faster transmission technologies, even faster access methods, better standards for the third and fourth generations of mobile telephony, encryption solutions and so on. These are supposedly just around the corner. Some products and new technologies will be with us tomorrow, others will be presented within six months, and others again in the future. Let us start with the present situation and the growth of the number of Internet users.

Global number of Internet users 1997 to June 2000

1997	102 million
1998	120 million
1999	153.2 million
Feb 2000	248.68 million
June 2000	332.72 million

Figure 53: The actual number of Internet users grew from 102 million by the end of 1997 to 332.72 million by the end of June 2000.

Sources: http://www.nua.ie et alt.

By the beginning of 1999 there were 153.2 million Internet users in the world. Most of them, 87 million, lived in the USA; 33.3 million were in Europe, 27.3 in Asia, 4.5 million in Latin America and 1.1 million in Africa. 45% of Iceland's population surfed the Internet, 33% among the Swedes, 28% of the Finnish and American populations and 26% of the Canadians. By the end of February 2000, there were 248.68 million online users in the world. In thirteen months, almost 100 million users had decided to become Netizens. During the five months from February 2000 to June 2000, an additional

84.05 million got online. Most of these were inhabitants of the Asian and Pacific regions – 32.9 million. Analysts of Datamonitor estimate that there will be 545 million Internet access accounts by 2003 globally. The following figure shows the distribution of Internet users over the traditional geographical continents in February 2000 and in June 2000.

The inhabitants of the "global" online world, February 2000 and June 2000

Global region	Number of online inhabitants, millions	
	February 2000	June 2000
Africa	2.36	2.77
Asia/Pacific	42.60	75.50
Europe	64.23	91.28
Middle East	1.29	1.90
Canada and USA	131.10	147.48
South America	7.10	13.19
Total	**248.68**	**332.73**

Figure 54: By the end of February 2000 the Irish analysts NUA estimated the global number of online users to 248.68 million, with a regional distribution as shown above. In late 1999, there were 153.2 million users. Among these, almost 7 million were Chinese. Among the users in February 2000, there were 5.4 million Russian Internet users. By the end of June 2000 the number of global on-line users grew by 84.05 million. 16.9 million were Chinese.

Source: Nua, www.nua.ie

As one comparison of this rather impressive growth, the IDC estimated by mid 1999 that there would be approximately 233 million Internet users by the end of 2000. An interesting comparison between Internet hosts, users and PCs was made by the ITU, the Internet Consortium and RIPE in 1998.

Global Internet and PC distribution in 1998

Continent	Internet hosts, total number	Hosts per 10 000 inhabitants	Users, total number
Africa	157 309	2.07	1 647 100
Americas	32 009 278	401.29	73 671 600
Asia	2 610 386	7.38	29 910 800
Europe	7 728 825	96.80	39 208 800
Oceania	890 224	302.69	3 614 500
World	***43 486 022***	***73.43***	***148 052 700***

Continent	Users per 10 000 inhabitants	PCs, total number	PCs, per 100 inhabitants
Africa	21.90	4 626 000	0.84
Americas	921.40	149 738 000	19.66
Asia	87.78	6 973 400	2.18
Europe	491.01	106 528 000	13.89
Oceania	1 236.46	8 802 000	38.40
World	***255.84***	***339 427 000***	***6.40***

Figure 55: The table shows the distribution and the penetration of Internet hosts and PCs in the five conventional continents as well as the total figures for the world. Considering the total number of global inhabitants, more than 6 billion, we are just at the very beginning of a globalization process, as these figures so clearly demonstrate. Particularly interesting are the penetration rates, hosts per 10 000 inhabitants, Internet users per 10 000 inhabitants, and PCs per 100 inhabitants.

Sources: ITU, Internet Software Consortium, RIPE

In early 1999 Internet usage grew by some 1 000% annually, while voice traffic via the telecom network grew by its traditional 10%. One consequence of this is that Internet traffic will be larger than voice traffic in early 2000, according to the American analysts Datamonitor's report *"The Future of the Internet"*. The ever-increasing interest of Internet users is one factor behind this breathtaking growth. Another one is the availability of new technologies such as DSL, Digital Subscriber Lines, and cable-based modems. Datamonitor predicts that the two strongest push factors for the Internet into the mass markets will be digital television and mobile communication via the Net.

Voice telephony overtaken by the Internet in 2000
Volume in petabyte = 10^{15}

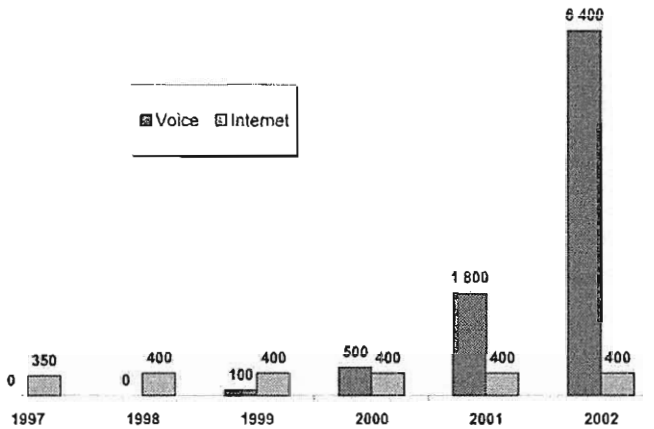


Figure 56: Early 1999 saw a growth of Internet usage exceeding 1 000% per year while traditional voice traffic over the telecom network grew by 10%. Thus the Internet traffic volume overtakes voice traffic volume already during 2000 as is shown in this figure.

Sources: Computer Sweden, February 24th 1999/Datamonitor

IP telephony – calling in the future via the Internet

IP telephony, i.e. voice via the Internet Protocol and the PC with built in modem, sound card, microphone and some specialized software is forecasted to become a major competitior to fixed telephony. The main argument is the costs. Independent of from where you call to wherever in the world, the cost is just for one local call – the Internet access cost. Technology has developed to such an extent that the quality of the transmission is the same as for fixed telephony.

IP telephony forecast for Europe 1996 to 2005

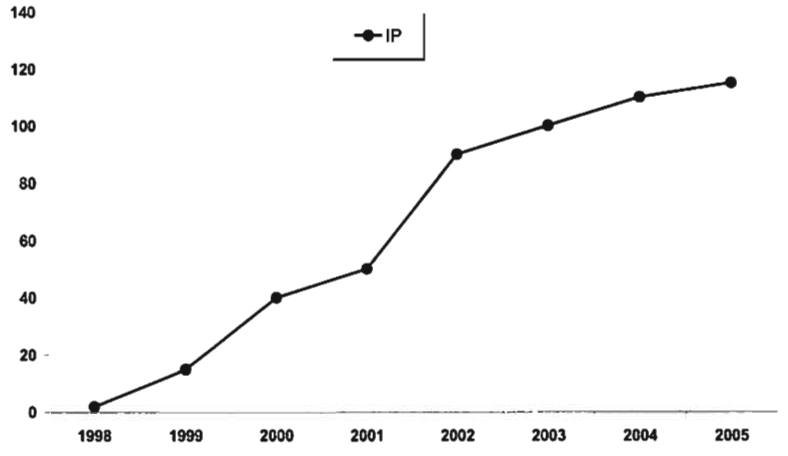


Figure 57: The analysts Frost & Sullivan made the above prognosis for IP telephony in Europe early 1999. They are convinced that IP telephony will have an annual turnover of some 100 billion SEK by 2005. The Scandinavian countries made the largest investments for IP telephony in Europe during spring 1999, but this will decrease as a part of the total European investment as soon as the countries with large populations introduce IP telephony.

Sources: Computer Sweden no. 39 Friday 16th April 1999/Frost & Sullivan

Modems to be replaced by ADSL and cable

ADSL offers presently the fastest access method to the Internet, at least if you are living in a large city in Sweden and not too far away from a DSL station. Those having access to CATV get fast access via a cable modem, which allows access speeds of 10 Mbit/sec, according to Telia AB. ISDN is a third possibility but the technology is slightly antiquated. Source: Computer Sweden no. 39 Friday 16th April 1999

In 1985, Sweden had nine web addresses. Early 1999 there were 64 882. The following figure describes the growth of the total number of Internet host computers in the world from 1991 to 1998, and the penetration rate per 1 000 inhabitants. The numbers are in millions of computers. By 1991, there were some 400 000 host computers, and in 1998 roughly 29 700 000. Internet density, or

Internet host computer penetration i.e. the number of host computers per 1 000 inhabitants, grew from 0.005 to 5.1 during the period.

Internet host computers in the world 1991–1998
In millions of computers per 1 000 inhabitants

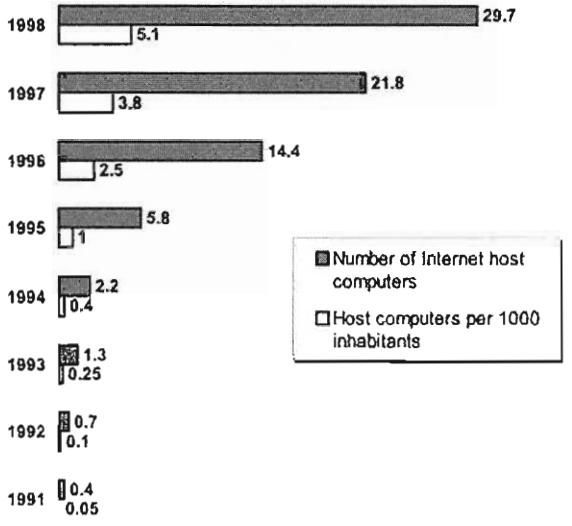


Figure 58: The upper bar shows the growth of the actual number of Internet host computers in the world, while the lower bar shows changes in the Internet host computer penetration per 1 000 inhabitants during the same period.

Sources: ITU World Telecommunication Development Report 1998/Network Wizards

The following figures clearly shows the rather astonishing growth of the Internet as a mass communications tool, from the very early days starting in August 1981 running until January 1999. During this period of time the Californian company Network Wizards collected and published data on the Net. Every six months they counted the active Internet host computers, the last figures being collected for July 1999. It should be noted that these figures are all approximations and in no way exact. But they describe adequately the rapid dissemination of the new technology application called the Internet.

Internet host computers August 1981–July 2000
In number of computers globally

Point of time	Number of host computers
August 1981	213
May 1982	235
August 1983	562
October 1984	1 024
October 1985	1 961
February 1986	2 308
November 1986	5 089
December 1987	28 174
July 1988	33 000
October 1988	56 000
January 1989	80 000
July 1989	130 000
October 1989	159 000
October 1990	313 000
January 1991	376 000
July 1991	535 000
October 1991	617 000
January 1992	727 000
April 1992	890 000
July 1992	992 000
October 1992	1 136 000
January 1993	1 313 000
April 1993	1 486 000
July 1993	1 776 000
October 1993	2 056 000
January 1994	2 217 000
July 1994	3 212 000
October 1994	3 864 000
January 1995	4 852 000
July 1995	6 642 000
January 1996	9 472 000
July 1996	12 881 000
January 1997	16 146 000
July 1997	19 540 000
January 1998	29 670 000
July 1998	36 739 000
January 1999	43 230 000
July 1999	58 281 000
January 2000	72 398 092
July 2000	93 047 785

Figure 59: In August 1981 there were 213 Internet host computers in the world. In July 1999, the figure had grown to 93 047 785.

Sources: Network Wizards http://www.nw.com/Internet Software Consortium, http://www.isc.org

The leading Internet nations in the world based on the number of Internet host computers per 1 000 inhabitants were as follows in January 1999. USA had the leading position having one web site per nine inhabitants. Finland turned up as number two, having 106 web sites per 1 000 inhabitants. Norway, Sweden and Denmark followed next. The total number of host computers was 43.2 million in January 1999. Growth over January 1998 was 46%.

The leading Internet nations by January 1999
Number of host computers per 1 000 inhabitants

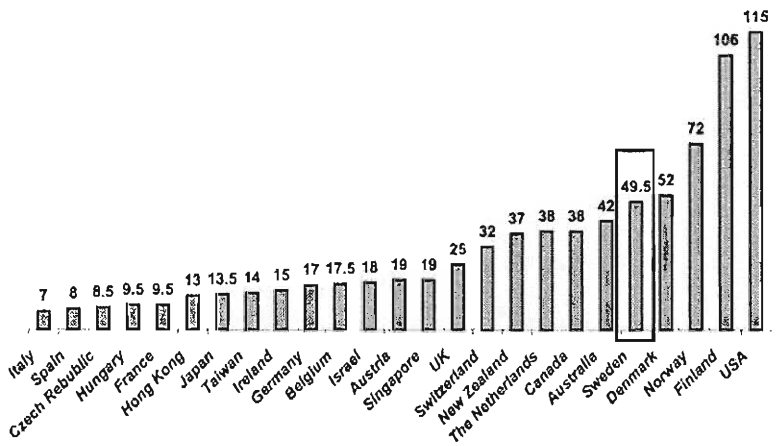


Figure 60: In January 1999 USA held the leading position among the Internet nations, reporting 115 web sites per 1 000 inhabitants. Small countries like Finland, Norway, Sweden and Denmark followed close, while large European countries like Italy, Spain, France and Germany were far behind. This picture is however changing very rapidly. Internet is coming of age in southern Europe as well.

Sources: The Economist, March 27th 1999/Network Wizards

Internet penetration as a percentage of the total population gives a slightly different picture. The following figure based on data from the *"European Information Technology Observatory 2000"* shows Internet penetration in the EU countries as a percentage of the total population by the end of 1999.

Internet penetration in the EU countries 1999
Internet users in percent of the total population

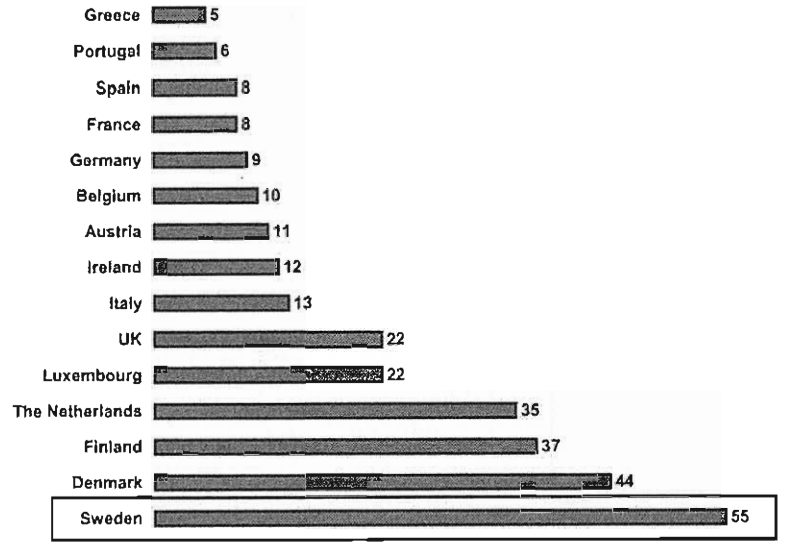


Figure 61: Sweden, Denmark and Finland had the highest percentage of Internet users among the countries within the European Union in 1999. The data in this diagram confirms what we learned from the one above – the southern European countries are slower in adapting the new technologies but once they take off their growth rates are higher than in the northern countries.

Source: EITO European Information Technology Observatory 2000

The Swedish SEB Bank presented an interesting five-country comparison between E-users, i.e. users of mobile telephones, the Internet, PCs and broadband access, in their Annual Review 1999. The countries included were UK, Germany, France, the Netherlands and Sweden. By 2003 the accumulated population of these countries is estimated to some 176 million. 100 million will be mobile telephone users, 77 million Internet users, 60 million PC users, and 24 million will have broadband access. The time frame for the comparison is from 1993 to 2003. The projections for 2000 to 2003 are estimates.

E-users in the UK, Germany, France, the Netherlands and Sweden 1993–2003

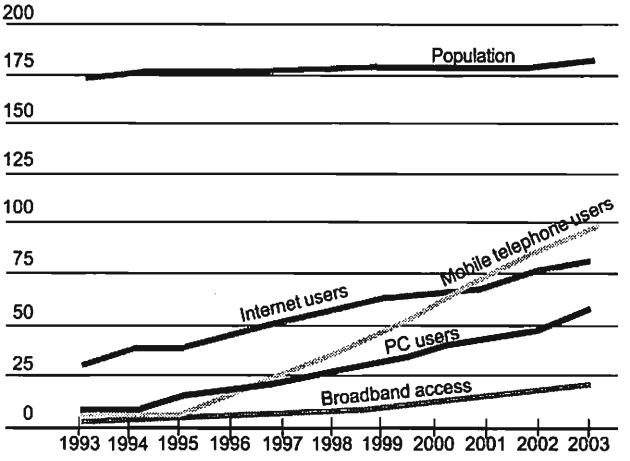


Figure 62: UK, Germany, France, the Netherlands and Sweden together will have some 176 million inhabitants by 2003 according to estimates made by the SEB Bank. 100 million will be mobile phone users, 77 million Internet users, 60 million PC users and 24 million will have broadband access.

Source: SEB, Årsöversikt 1999

Content – the heart of the Information Society

The very heart of the information society is its content. But there are several aspects of content to be considered. By content we may intend the traditional type of content, produced by the content producers of this world. We may intend our own production of content such as texts, home pages, web sites, databases, documents, e-mail, link guides, and catalogues, just to mention a few. In some cases we may also think of content as the IT content of the services of the information society. For instance, the services of the banks are more and more IT related and IT based. Health care is another example, as are several public services. And our photographs belong to the content market – they are delivered on CD-ROMs and can be handled and manipulated and distributed from our PCs and laptops via the Internet. There is 'content' of sorts in the several microprocessors

included in our present household devices, dishwashers, micro ovens, toasters, mixers and other electronic devices. Our cars have several computer networks included for all kinds of purposes that it takes some time to understand unless you are a specialist of modern cars.

From this it is evident that there are certain difficulties in defining what content really is. Several attempts have been made but more often than not they include rather vague concepts like the following ones:

Information economy
Information quality
Communications quality
Communications investments
Knowledge management
Knowledge handling

One of the consequences of the Internet revolution, related to the content, is the increased visibility of every single person's competence when it comes to reading and writing and language knowledge, because the Internet is so far almost totally text related. You have to be able to read and write and to cope with a few languages as well, should you want to surf the global Internet and you are not born into the English speaking world. It is also becoming evident, as the web is growing – by now there are more than two billion documents available – that badly presented and unreliable web sites do not get any visitors in the long run. So how are we to know what type of content is interesting? Search motors are only a small part of the answer. The rest is with the users. In September 1999, people accessing and surfing the Internet occupied 40% of the total transmission capacity of the national Swedish telecommunications network. One conclusion of this could be that text is taking over from speech. But from the US there are different signals. A research report from the Internet database marketing firm Cyber Dialogue warns that the US stampede onto the Internet is slowing. Among the facts presented are:

1. It takes money to get connected and many of those off-line cannot afford Internet access

2. A third of all American adults believe that they have no need for the Internet and do not intend to get connected

3. 27.7 million Americans have tried the Internet and dropped it – this is three times as many as when an equivalent study was carried out in 1997.

Sources: Cyber Dialogue, November 1999/Cyber View by Wendy Grossman in Scientific American March 2000

One question is how do data like these affect the content? Once more we are faced with several possibilities without clear-cut answers. But we can get some indications by reviewing the new companies that are dedicated to the content production for CD-ROMs and the Internet. The Swedish researcher Dr. Åke Sandberg carried out a study of the budding content companies in Sweden, He describes his findings in a report called *"New Media in Sweden. The Swedish New Media and Internet Industry Survey"* from 1998.

The value and content of new media productions in Sweden 1996–1998

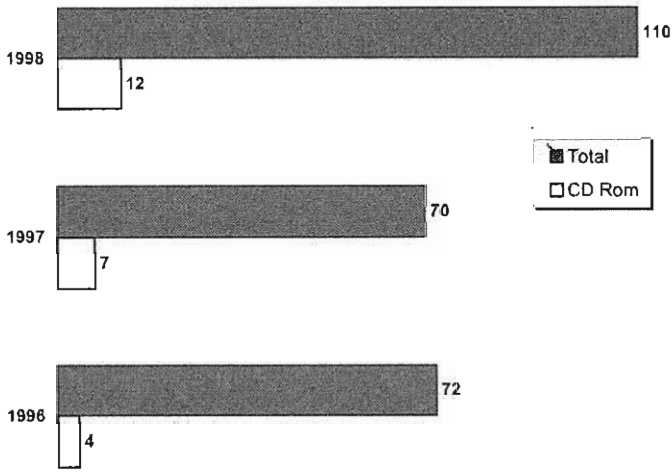


Figure 63: Dr. Sandberg regards new media as CD-ROMs and the Internet. The figure shows the value of the productions in millions SEK for CD-ROMs and for the industry in total for 1996, 1997, and 1998. The total turnover of this budding industry made up of many small and new companies amounted to 110 millions SEK in 1998. Not shown is the distribution of content, which was 5% of the total production was games and entertainment; 26% for advertising; 26% for corporate presentations, and 26% for training and education.

Source: Åke Sandberg: New Media in Sweden. The Swedish New Media and Internet Industry Survey, Arbetslivsinstitutet 1998/via TELDOK 34E

We have to concede that our knowledge about content and quality of content still is at its very beginning. Content has been the constant subject of a number of interesting experiments since the first days of existence of telecommunication and radio technology based devices. One example is from Hungary by the end of the 1800s. On the 14th of July 1892 and the 4th of February 1893 the Hungarian inventor and universal genius Tivadar Puskás had two patents registered by the patent authority in Budapest for *"the telephonic news dispenser"*. Bell's invention, the telephone, rapidly found its way around the world. Puskás' idea was to create a news agency, which would dispense news from all over the globe via the telephone. In 1894 there were 700 subscribers to the agency; by 1896 there were 6 185. The reason for the increase was that the news agency had included entertainment in its offer – lectures, theater, opera and concerts. Then the broadcast radio was invented and Puskás became the father of Hungarian broadcasting. The content industry adapted to new technologies but the themes remained the same – news, weather forecasts, entertainment, education...

For information on research efforts, see chapter 16.

6. Computers and related technologies

There will be about 649.5 million PC users in the world by the end of year 2000 if the estimates of the gurus turn out as expected. During 2000, IT analysts expect that some 200 million PCs will be shipped to the users of this world. The annual growth is estimated to 18.5% over 1999. The Japanese market is growing by 35%, the western European market by 14.5% and the Swedish market by 9%. Apple is doing quite well in Europe and sold 270 000 Macs during QI 2000. In 1999 some 110 million PCs were sold according to the same analysts. In 1998 the PC manufacturers of this world produced roughly 93 million personal computers. 65% of these were sold to users in the US and Europe. The American manufacturer Compaq held its position as the global market leader, having 13.8% of the market. During 1998 the company increased its production by 20%. Dell, having 7.9% of the global market, reported an increase of 65% of the number of machines produced, while IBM, holding the second rank among the global PC manufacturers, increased its production by 9.5%. In spite of this, Big Blue reported a financial loss on its PC sales. In global terms the market grew by 15% during 1998. The European market growth was reported to 22%. According to the analysts of Dataquest the European PC sales growth was a direct consequence of Internet access prices decreasing considerably during the year. In 1996, there were five large PC manufacturers in Europe, ICL, Bull (Zenith), Siemens-Nixdorf, Olivetti and Tulip. ICL was acquired by Fujitsu. Bull sold Zenith to Packard-Bell. Siemens-Nixdorf bought Olivetti and later sold the PC business to Acar. Tulip was acquired by Acar. By 1999, there was no European PC-manufacturers left.

Global market shares per PC manufacturer in 1998 and 1999

In percent of the total market, 1998 = 93 million PCs
In percent of the total market, 1999 = 112.7 million PCs

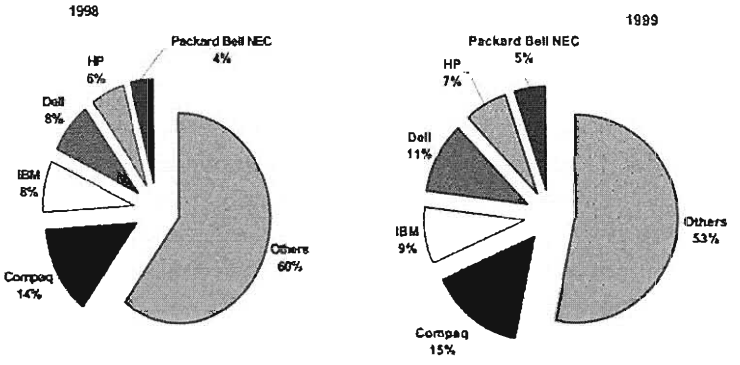


Figure 64: The global market share for PCs sold in 1998 and 1999 per manufacturer. The figure shows that the five largest manufacturers had 40% of the total market share, while the European, Japanese, other Asian and ROW manufacturers shared the remaining 60%. In total 93 million PCs were sold in 1998 and 112.7 million in 1999. 65% were bought by persons living in the US and Europe.

Sources: Dataquest/Computer Business Review March 1999/IDC

By the end of April 1999 the analysts of IDC reported that PC sales worldwide increased by 19% for the first quarter of the year. In the US alone, the sales increased by 24%. The largest PC manufacturers were:

	Q1 1999	Q2 2000
Compaq	13.4%	13.2%
Dell	9.2%	11.4%
IBM	7.9%	7.4%
Hewlett-Packard	6.0%	7.4%
Gateway	4.3%	-
Fujitsu Siemens	-	4.6%
Others	59.2%	55.9%

Sources: IDC/Reuters/Dagens Nyheter April 27th 1999, ComputerSweden, September 13th 2000

By the end of July 1999 IDC reported figures for Q2 global PC sales, which had increased by 27% over the second quarter of 1998. Sales in the US market grew fastest, by 35.3%, basically thanks to a concept called *"nearly free PC"*, which means that basic and cheap PCs are part of Internet subsciptions, like modems could be bought for nothing once you singed up for a year's subscriptio to the Internet. The leading manufacturers are still the American companies Compaq, Dell, IBM, HP and Japanese NEC. They sold 46.6% of all PCs. But the so called *"no names"* PCs are increasing their market share, not least so in the low price segment in Asia. These lowpriced devices are sometimes called *"Internet computers"* in Sweden. The IDC estimate for 1999 was more than 100 million PCs sold worldwide.

PCs sold globally 1996-1999

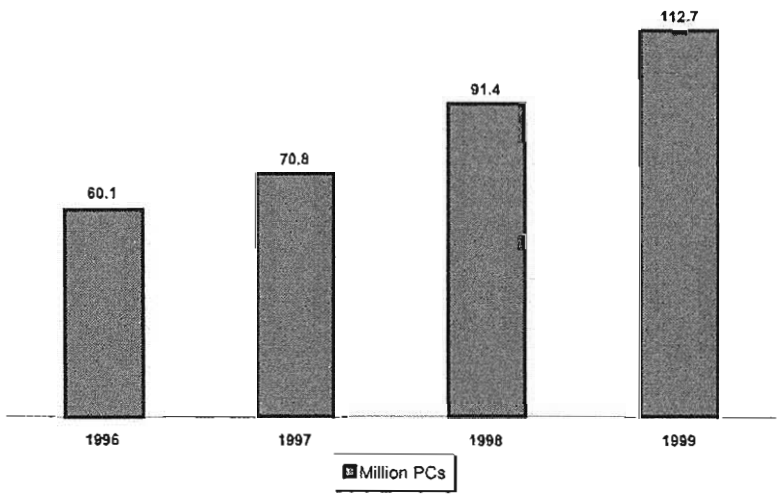


Figure 65: In Q2 1999 Compaq was still the largest PC supplier in the world but Dell was approaching rapidly. The five best known corporations shipped 47% of all PCs during the second quarter 1999. Other manufacturers delivered 53%.

Sources: IDC/Computer Sweden, Wednesday August 30, 2000

One conclusion of the facts above is that PCs are becoming a very cheap commodity, so cheap that within soon it will be given away for free to anyone willing to sign an Internet subscription. As mentioned we are back to the modem case – buy a modem for 1 SEK (≈US$ 0.11) and sign and Internet subscription for 12 months. Another conclusion is that PC pricing no longer has any lowest price limits. According to Wall Street analysts, the indications are there – Compaq is reporting decreasing profits and IBM has continued great difficulty in creating a profitable PC division.

More users option for cheap PCs
In percent of sold PCs

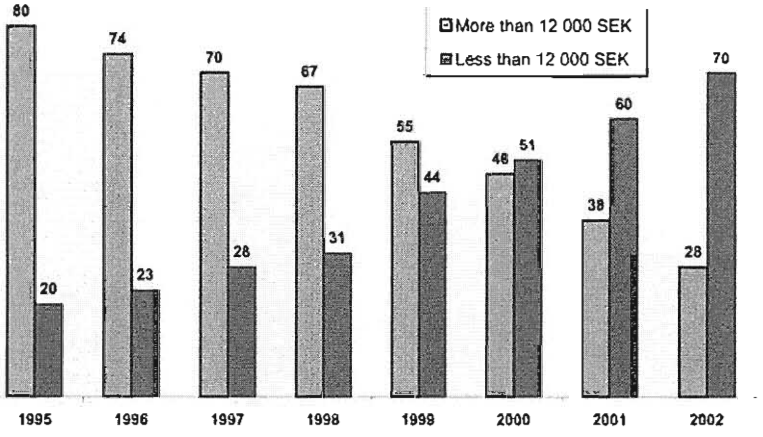


Figure 66: A growing percentage among computer buyers opt for cheaper hardware versions, in particular PCs costing less than US$ 1000. The gemeral trend is to buy standardized hardware. The data of this diagram covers the period of 1995 to 2002, 1998 to 2002 being estimates.

Sources: IDC/Ny Teknik1998:18 part 3/Regina Richter

Why is this development interesting? Because it is obvious that more and more persons become aware of what they want to use their computers for and thus become less and less willing to pay for functions they will never use. We are likely to see a trend that software and hardware loaded with all the bells and whistles engineers

tend to find so useful will find fewer takers – after all the number of people with sufficient knowledge to use them are limited – while devices with userfriendly interfaces and functional, flexible software will be the winners. IDC has confirmed this trend in the US as well as in Sweden by analysing quarterly sales figures.

Sources: Several, among others Dagens Nyheter April 19th 1999/Ny Teknik IT, week 18 1999

Global market shares of the five PC leaders in 1997 and 1998

Market shares in percent of global

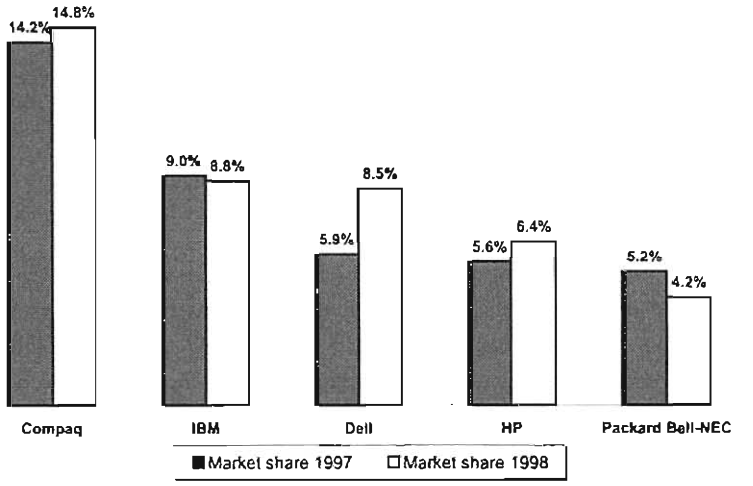


Figure 67: The figure gives the shares of the global market for the five largest PC manufacturers in the world for 1997 and 1998. The five kept their position also in 1999, and seem to be doing so in 2000 as well.

Sources: Computer Business Review, March 1999/IDC

The market for PCs in Europe grew by 15.5% during the second quarter of 1999. This was a surprise because sales of PCs actually dropped by 2.9% in Eastern Europe. Counting Western Europe only, PC sales grew by 18.4%. France was the country reporting the strongest growth during the quarter, 27%. Growth in Europe was evenly distributed between home computers, professional work-stations and stationary computers, servers and portables.

PC suppliers in Europe in Q2 1998

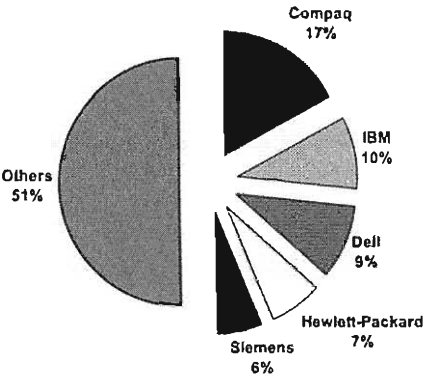


Figure 68: 49.6% of all personal computers sold during Q2 1998 in Europe were supplied by the five most important manufacturers Compaq, IBM, Dell, HP and Siemens.

Sources: Svenska Dagbladet Thursday July 29th 1999/IDC

Sales of personal computers have been growing ever since 1985, and most of all in the US. However, experts from Forrester Research warn that the sales peak was reached during 1999. After that sales will decrease. One reason is that many US households bought new hardware in 1999 in order to avoid any millennium bugs. Moreover, the expert think that the market is becoming saturated, 52% of all American households having PCs. This is contradicted by other analysts who expect that more than 200 million PCs will be sold during 2000, most of them in Asia.

But the PC market is a complex one. First of all there may be an over capacity in PC manufacturing resulting in a price war. Secondly, Internet service providers such as AOL give away PCs for free to anybody signing a subscription. This results in lower profits for the PC companies and the consequences of low profits are well known. Thirdly, software providers are not capable of producing programs attractive enough for the large masses of users, programs demanding new and more powerful computer models. Software upgrades have been the major reasons for hardware exchange during the past decades. Nowadays, most software has the functions demanded by the majority of users, and the hardware of yesterday as well as the one

of today is powerful enough for the average user. In addition to this Internet is in head on competiton with the hardware. The servers are made more powerful and intelligent and thus replacing many of the PC functions. All the PC has to do is to look after the access and connection to the Internet. The remaining functions are available on the Net. So in the future the user will spend money on buying higher speed transmission, bandwidth, and thus faster Internet access, and time to surf the Internet.

The forecasts for development in Europe and Asia have been similar to those for the US, but Europeans and Asians will follow later. In all cases it will be of interest to watch the PC manufacturers and their strategies for the future. Some may plan to become Internet Service Providers, ISPs. Others like Apple may choose design and function as their trademarks. And some like IBM may decide to concentrate on selling knowhow and technology to other manufacturers – IBM provides Dell with technology. Others again, among them Ericsson, are developing devices that are a cross between a playstation, a palmtop and a WAP mobile telephone and Sony's playstations are becoming more intelligent. The future will be interesting.

PC development in the USA 1998 to 2002

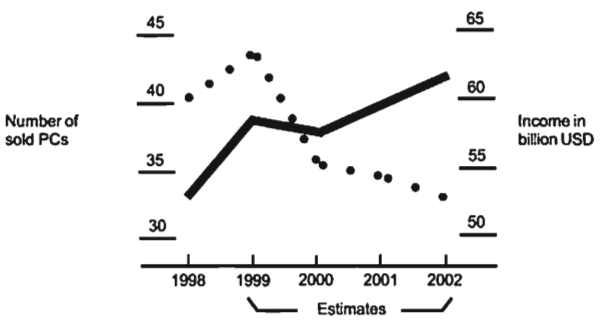


Figure 69: The right hand scale and the dotted curve in the figure above indicate the development of income in US$ of the PC manufacturers. The left hand scale and the fat Black curve indicate the number of PCs sold in the US during the period 1998–2002. Should these predictions made by Forrester Research come true PC manufacturers like Compaq may face more problems ahead. Dell announced early on their intentions to enter the Internet business.

Source: The Economist July 3rd 1999

PC sales in the USA during the second quarter of 1999 increased by 35.3% compared to the same period of 1998. The five largest suppliers Compaq, Dell, IBM, Gateway and Hewlett Packard sold 56.5% of all PCs.

PC suppliers in the USA in Q2 1999

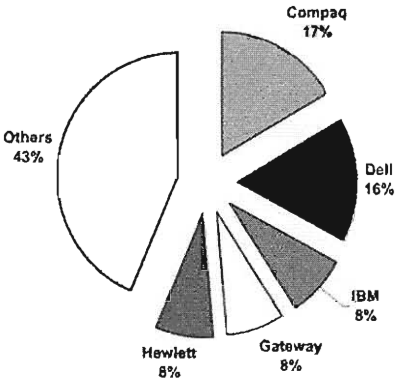


Figure 70: 56.5% of all PCs sold in the USA during Q2 1999 were delivered by the five large manufacturers, Compaq, Dell, IBM, HP and Gateway. Compare the proportions to those for Europe as shown in figure 140 above.

Sources: Svenska Dagbladet Thursday July 29th 1999/IDC

System failures and the human factor cause 76% of all system crashes

Most computer users sooner or later become aquainted with the "bomb" symbol, warning that the system has failed. Normally it all happens without any comprehensible reasons. The analyst firm Ontrack has decided that the main reasons why computers suddenly decide not to function are system failures, human mistakes, software conflicts, viruses and natural catastrophes. System failures cause 44% of all problems. Human mistakes are the reason behind 32% of all system crashes and conflicting software causes another 14%. Viruses cause another 7% of malfunctions and natural catastrophes such as hurricanes and earthquakes are responsible for 3% of all computer crashes and destroyed files.

Major reasons for system crashes
In percent of total number of crashes

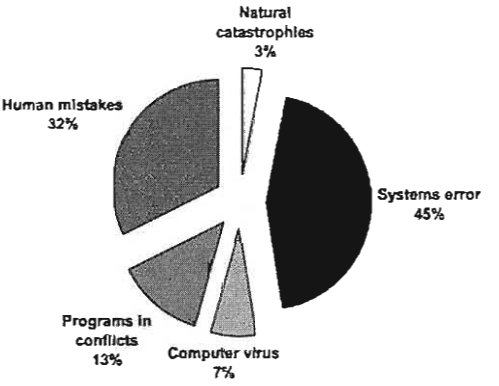


Figure 71: System failures and human mistakes are the major reasons behind a majority of all system crashes and destroyed files.

Sources: CBR Special Report Series 1999/Ontrack Data

The global semiconductor industry

Estimates of the early 1990s predicted that the global semiconductor industry should report sales equivalent to US$ 325 billion. In 2005 the total manufacturing was valued to exceed US$ 800 billion. However, reports from 1998 support a different picture. Total global semiconductor sales amounted to US$ 125.6 billion, which means a decrease in sales by 8.4% over 1997. Analysts at Dataquest predicted that for 1999 sales would increase to US$ 154.5 billion because a majority of people depending on their computers and other electronic systems would exchange old ones for new ones in order to avoid Y2K bugs. The 20 global leading companies in semiconductor manufacturing are listed below.

20 global semiconductor manufacturers in 1999

Intel (USA)
NEC (Japan)
Hitachi (Japan)
Samsung (Korea)
Toshiba (Japan)
Texas Instruments (USA)
Motorola (USA)
IBM (USA)
Mitsubishi (Japan)
Fujitsu (Japan)
LG Semicon (Korea)
Hyundai (Korea)
SGS-Thomson (France)
Philips (The Netherlands)
Micron (USA)
Matsushita (Japan)
AMD (USA)
Siemens (Germany)
National Semiconductor (USA)
OKI (Japan)

Figure 72: The 20 leading semiconductor manufacturers in the world by 1999.

Source: ITU

As already stated above, the early 1990s were overly optimistic times for those predicting the future growth of the semiconductor manufacturing of the world. Sales predicted by the following figure confirms this. Predicted sales of US$ 325 billion are rather far from real sales of US$ 125.6 billion. So far there are no analyses made of why the estimates were so far off track, but among the free speculations generated by the discrepancies are that users are slower to adapt new electronic devices than the wishful thinking of the manufacturers hope, and that there is a certain saturation among the computer users for the time being. Now, once figures for the full years of 1999 and 2000 become available, it will be possible to see the reasons.

Global semiconductor sales 1960–2010
Based on data and estimates from 1990, in billion US$

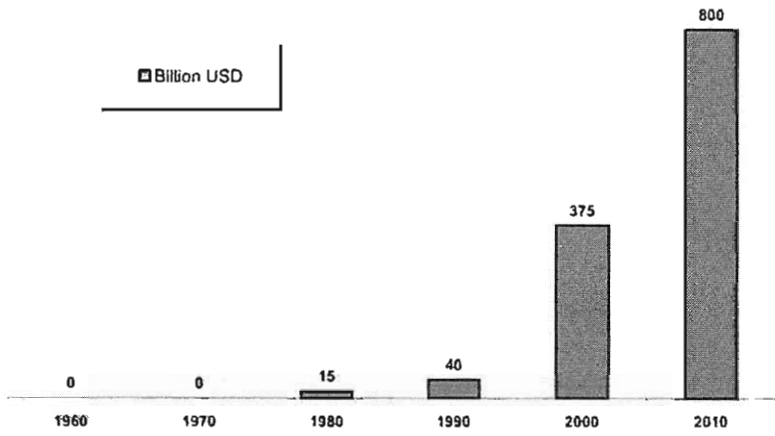


Figure 73: One part of the semiconductor industry picture in early 2000 is that the sales predictions from 1990 to 2010 are rather optimistic. Another part is the fact that certain chips are lacking as users ask for ever-increasing performance.

Sources: Ny teknik 1996:41/SGS-Thomson

The following figure shows the global semiconductor sales during the six last months of 1998, month by month. Sales decreased in December, but on a semiannual basis sales increased by 10.5% compared to the equivalent period of 1997.

Global processor sales 1999

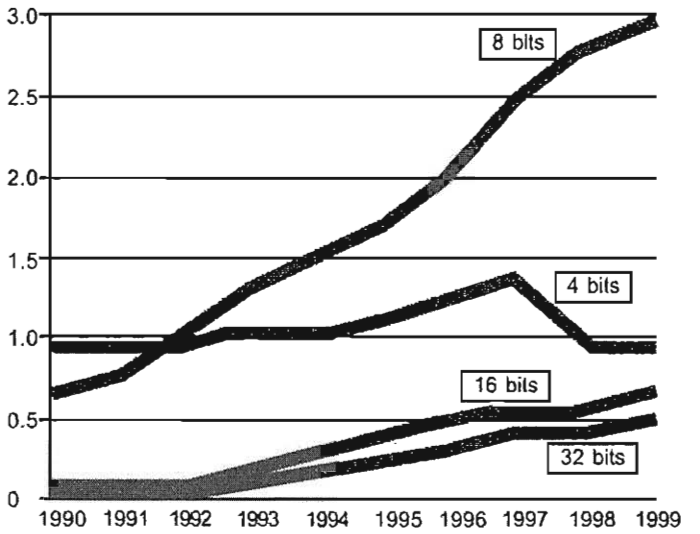


Figure 74: The 8 bit processors dominate the processor market in number of units sold. They are used for embedded systems. By July 2000 the total value of global processors for embedded systems was US$ 17.3 billion.

Sources: World Semiconductor Trade Statistics/Computer Sweden, September 13, 2000

A growing technology area is the development and manufacturing of components for fiber networks and optical transmission. Global sales amounted to US$ 8 156 million in 1996. The two largest manufacturers, Lucent and Fujitsu, produced more than 50% of the total sales. Our diagram shows sales per manufacturer as a percentage of total global sales.

The global providers of equipment for optical communication in 1996
In percent of total sales US$ 8 156 million

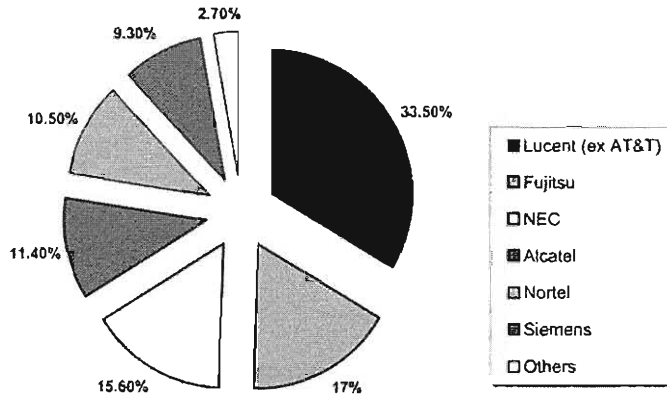


Figure 75: Global annual sales of equipment for optical communication in 1996 amounted to US$ 8 156 million. The figure shows the distribution per manufacturer in percent of total sales.

Source: Dataquest

UNIX – a global view

Since the early 1990ies great efforts have been made to create one single UNIX standard. So far the result of these standardization efforts is a fragmentation into five different standards. There is the Monterey standard including IBM, Santa Cruz Operation (SCO), Sequent, Unisys, ICL and Bull. And there is the Solaris standard supported by Sun, NCR, Siemens, Fujitsu and Toshiba. The HP-UX standard is supported by HP, Stratus, Hitachi and NEC, while Compaq, Digital and Tandem support Tru64. Specialists of the Gartner Group are convinced that only three of these standards will survive the first year of 2000. Linux is not commented. The distribution of UNIX based operating systems of the world is described in the following figure. Data given is in percent of the global market per type of UNIX system. Solaris UNIX took the lead in 1998 and answered for 18.6% of all sold UNIX licenses.

Global UNIX market per standard version in 1998
In percent of the global market

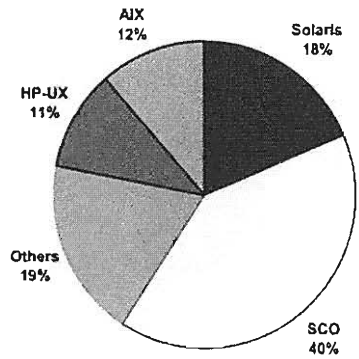


Figure 76: The distribution of the five present UNIX standards during 1998, measured in number of licenses sold, as a percentage of total sales.

Source: Computer Business Review, March 1999

In May 2000 Netsearch reported that every third Internet server sold runs on Linux, which has turned out to be a very stable and bugfree operating system, that just keeps running. IBM and Oracle are among the Linux supporters. It is also interesting to note that Apple's next operating system Mac OS X is UNIX-based.

7. Converging Technologies and Merging Providers

Since the early 1970s we have been using concepts like integration to describe the future of the many information technologies and their functions as well as the services provided. The background of these descriptions are normally to be found in a need by those responsible for the technology development to explain to their users the total context of the many components of the IT complexity and what the future will look like. Since the very first edition of the TELDOK Yearbook in 1987, these concepts have been described in many ways. The following is a condensed version of how integration and convergence have been accounted for during the years.

In the beginning of the 1980s, one of the leading persons in the Swedish IT society, Mr. Nils-Göran Svensson, made the following insightful description of what by then was called the integration of the information resources. He related the traditional channels for communication – voice, data, text, and picture – to the work methods and tool of the information technology.

1980 – integration of the information resources

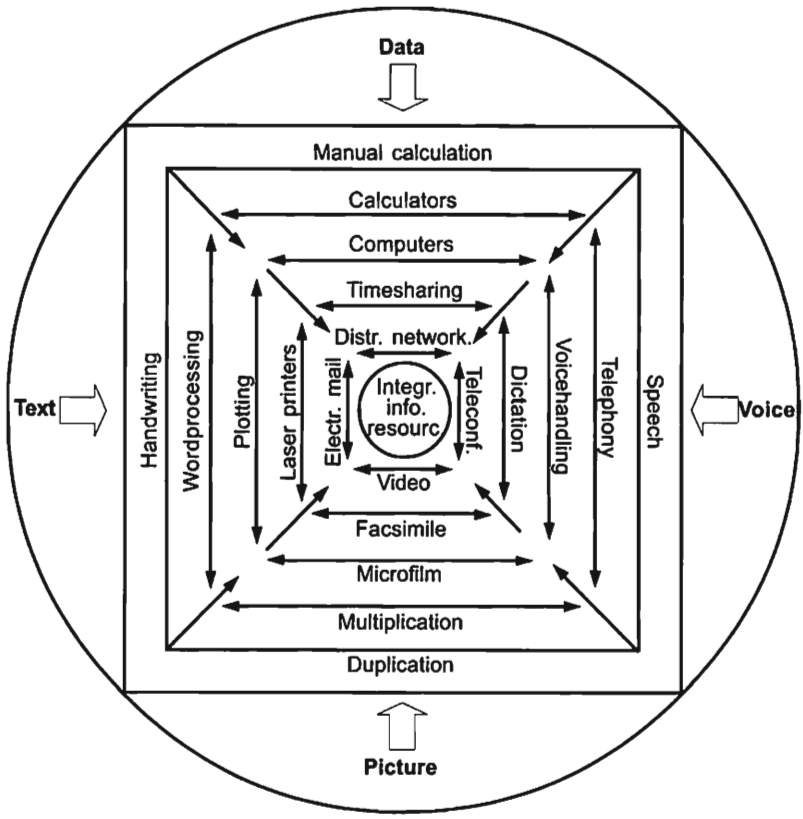


Figure 77: The integration of the information resources as seen in 1980 by Nils-Göran Svensson.

Source: Nils-Göran Svensson, RDF 1983

A few years later, in 1984, Nicholas Negroponte, the famous head of the equally famous MIT Media Lab, described the integration of technology and media as follows. Telecommunications integrated with microelectronics and computers, which in turn are integrated with moving pictures and television. Researchers at the Harvard University had tried to map the ecology of the information technology as well as possible competition between different media. The newspaper and the book were not regarded as part of information technology, while telex and television were. Moreover, Negroponte

was a proponent of videomatic, the convergence of television and video technologies. Now, in 2000, the very same professor is convinced that we will use the Internet for everything.

1984 – the integration of technologies and media

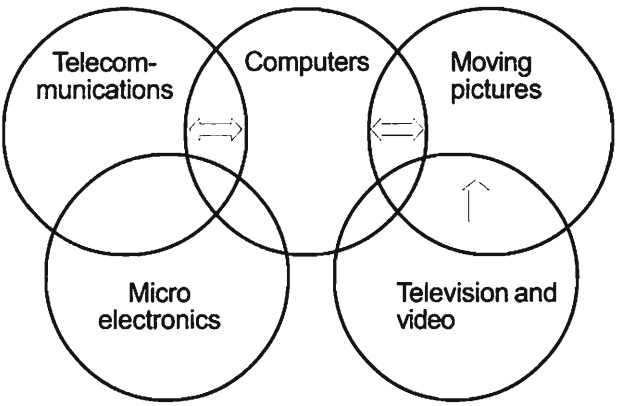


Figure 78: The description of the integration of technology and media presented by Nicholas Negroponte in 1984.

Source: N. Negroponte, MIT 1984

Towards the end of the 1980s and at the beginning of the 1990s, information technology was all about devices and devices only. Slowly it became clear that it was the provision of services that was going to promote the whole industry. At that period of time, the then Televerket, today Telia AB had its own school for training its employees, Teleskolan. This school presented the future integration of technology and services in the following tree diagram.

1990 – technology integration towards services

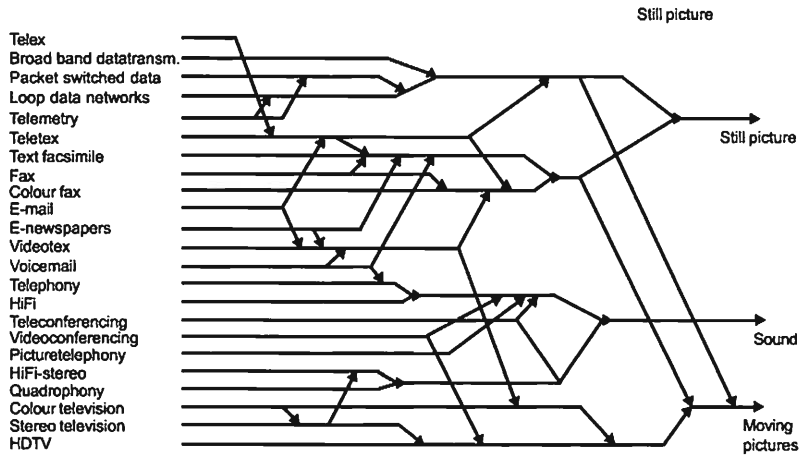


Figure 79: Devices and devices only – but the technology integrates towards services. The positions of the nodes are of interest for a detailed analyzis.

Sources: AITT/Teleskolan March 18th 1991

Four different technologies make up the basis of the following model of the market for what was then called ICT, "information & communications technology" – microelectronics, computer hardware, software, and telecommunications. The three market segments for office equipment, computers, and telecommunications generally were treated as separate entities, however closely related.

1992 – office equipment, computers, and telecom

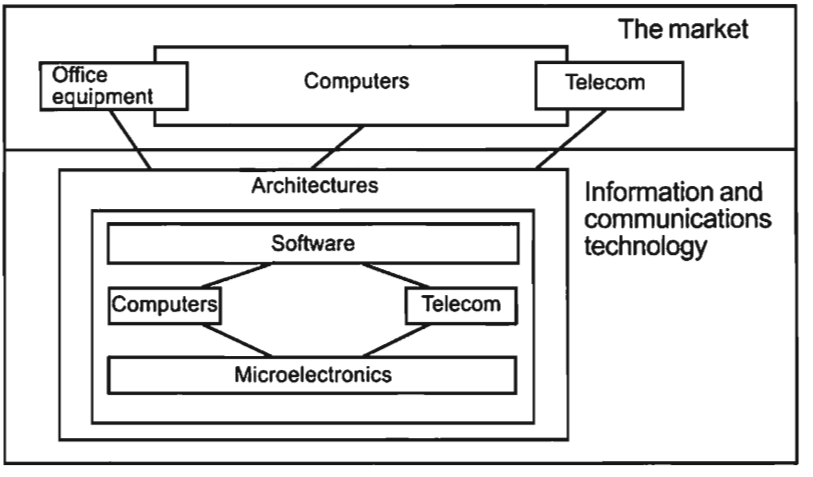


Figure 80: Four technologies are the basis for this model of the ICT market of the early 1990s – microelectronics, computer hardware, software, and telecommunications.

Source: EITO

By the middle of the 1990s the market until then segmented merged into one – that of the Information Society. The convergence of computers, telecommunications, and content as well as information services became a fact, as shown by the following figure.

1995 – the emerging information society

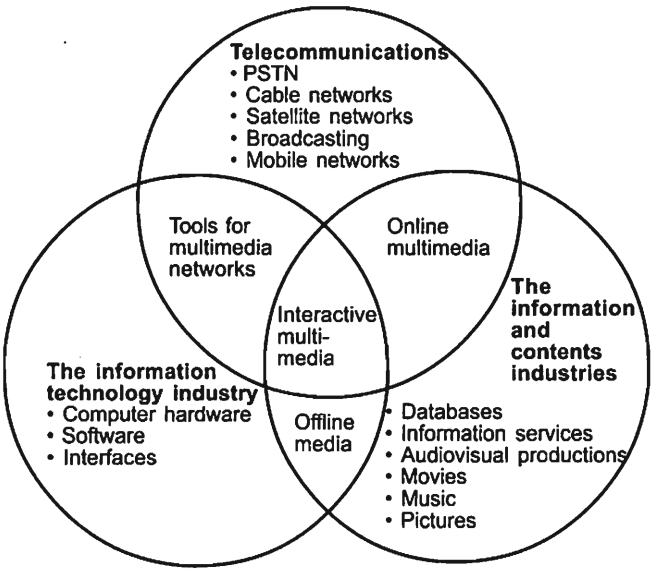
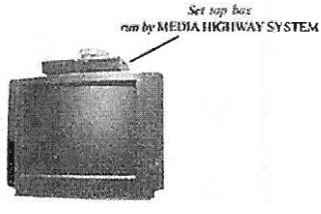


Figure 81: By the middle of the 1990s the market segments merged into one market, that of the information society. Content and services became an important part of this market.

Sources: DTI/OECD/Devotech

By the end of the 1990s the total convergence of all the information technologies and the resulting Information Society were taken more or less for granted. Ever-new technologies, new services and new infrastructures converge into integrated industries, making it possible to tailor the technology to every personal request. But what will converged devices look like? During the IBC'98 exposition for TV and motion picture technology, the French TV channel Canal+ demonstrated their ideas for a set top box run by a media highway system. There has long been suggestions floating around that we will want devices with all functions in one box, as the following picture shows.

Technology convergence: A multifunctional device from 1998



This is
a phone,
a supermarket,
a computer,
a movie theater,
a bank,
a game station,
a radio,
a video club,
a mail box

and also
a TV-set.

Figure 82: A multifunctional device presented by the French TV channel Canal+ at the IBC'98 expo. It is particularly intriguing that the device also is a TV set.

Source: Teknik och människa nr. 5/98

This idea of technology convergence seems slightly antiquated nowadays. Few people seem to believe in anything that is not mobile and not wireless. Moreover, many gurus are advocating a great number of single or dual functional devices rather than one box for everything. Another basic idea is that every user should need one single mobile terminal only, a terminal that is small and easy to handle and that can provide all kinds of functions – telephony, computing, transmission, Internet access, and so on. In order for this to happen on a mass basis, two requirements must be fulfilled – the terminals must be cheap and the services, subscriptions, access and traffic costs must be low. Ericsson's WAP telephone is a first step towards a mobile, multifunctional terminal, serving as telephone, Internet access terminal, mobile computer... In this spirit Telia proposed the solution presented below in 1998.

1990, 1998, and 2003 – the demand for mobility and services is increasing

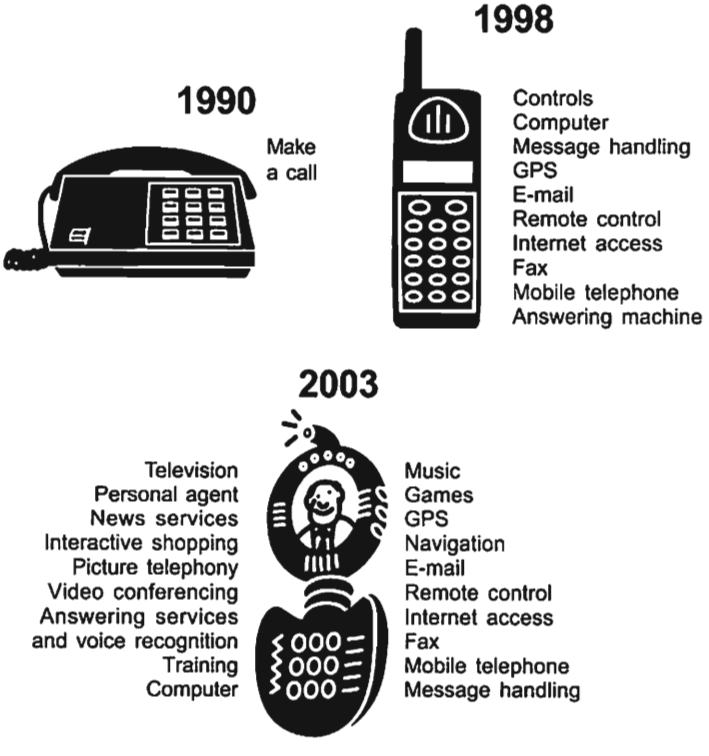


Figure 83: In 1998 Telia described the development of the mobile service demands from 1990 to 1998 and then to 2003. One single terminal can handle all communications needs at reasonable tariffs.

Source: Telia: IT och telekom som drivkraft, 1998

However, convergence is not only related to technologies. The various sub industries developing and manufacturing the Information Society devices are also subject to convergence, only in this case the phenomenon is called mergers. 'Mergers and acquisitions' is a frequent headline in media in 2000. These mergers are one result of the integration of the information technology industries, as can be seen from the following figure.

2001 – the total integration of the IT industries

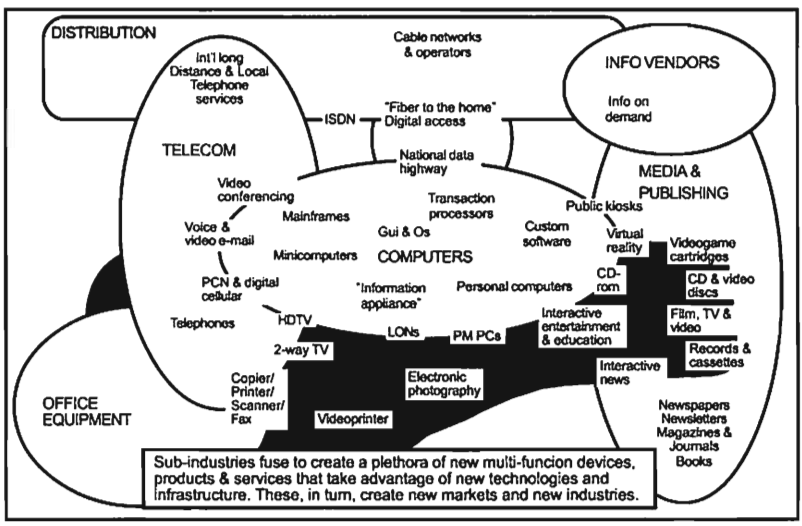


Figure 84: By the end of the 1990s the total integration of all the information technology sub industries was taken more or less for granted, this as a result of convergence. Ever-new technologies, new services and new infrastructures are integrated into the integrated industries, making it possible to tailor the technology to every personal request.

Sources: CyberMedia/STATT

The most merger prone industries in 1999 were the banking and insurance businesses that were responsible for 37% of all mergers worth more than one billion US$, followed by the chemical and pharmaceutical industries, responsible for 17% of the mergers made during that year. Companies representing other industries generated 40% of all mergers, while the telecommunication and media industries were responsible for 6% of the mergers in the category. The value of cross-border mergers rose by 60% in the first half of 2000 compared with 1999 according to the consulting firm KPMG. British companies were the big spenders, buying for US$ 254 billion. France, USA, Germany, Canada, Spain, The Netherlands, Italy, Finland and Sweden followed next.

The largest proposed mergers in the world 1997–1999

	Acquired company	Country	Buyer	Country	Billion US$	Year
1	Telecom Italia	Italy	Deutsche Telekom AG	Germany	82	1999
2	Mobil Corp	USA	Exxon Corp	USA	79	1998
3	Citicorp	USA	Travelers Group	USA	73	1998
4	Telecom Italia	Italy	Ing C Olivetti & Co	Italy	67	1999
5	Ameritech Corp	USA	SBC Com	USA	63	1998
6	BankAmerica Corp	USA	NationsBank Corp	USA	62	1998
7	MediaOne Group Inc	USA	AT&T Corp	USA	61	1999
8	AirTouch Com Inc	USA	Vodafone Group	UK	60	1999
9	Media One Group Inc	USA	Comcast Corp	USA	59	1999
10	Tele-Communications	USA	AT&T Corp	USA	54	1998
11	GTE Corp	USA	Bell Atlantic Corp	USA	53	1998
12	Amoco Corp	USA	British Petroleum Co	UK	48	1998
13	MCI Com Corp	USA	WorldCom Inc	USA	42	1997
14	Chrysler Corp	USA	Daimler-Benz AG	Tyskland	40	1998
15	Astra AB	Sweden	Zeneca Group	UK	35	1998

Figure 85: The table shows the largest proposed mergers during the period of 1997 to 1999. The value is the merged value in billion US$. The largest of these proposed mergers, that between Telecom Italia and Deutsche Telekom, did never happen. Olivetti managed to outbid Deutsche Telekom at the very last moment. See also following chapter about the corporations of the Cyberworld.

Source: Dagens Nyheter, Friday May 14th 1999/Securities Data

The former telecommunication monopolies of Europe, most of them now public companies, are looking for global partners as a direct consequence of the liberalization of the various local markets. Swedish Telia made its IPO to the public in May 2000. The first country in Europe to sell out the state telecom monopoly was the UK, which in 1984 saw to it that the BT stock became the most widely distributed stock in the country. A couple of years later the Japanese state sold out NTT. In 1996 the German public was offered to buy shares in Deutsche Telekom in the largest IPO ever so far. Some 18 months later France Télécom followed suit. When the Japanese state sold NTT in 1986, the IPO had an estimated value of just above 15 billion US$. The IPO of Deutsche Telekom was worth almost as much, 13 billion US$. Similar IPOs for British Petroleum, British Gas, and East Japan Railway have all been in the order of size 8 to 12 billion US$, while BT, being the first one out, was sold for the equivalent of 6 billion US$.

The largest IPOs in the world 1984–1996
In billion US$

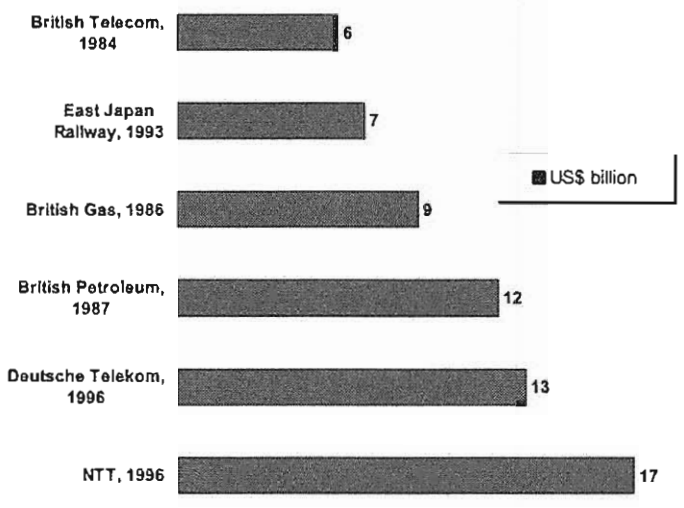


Figure 86: The values of the largest IPOs in the world from 1984 to 1996. Several megamergers have happened since.

Sources: Privatization International Database/The Economist November 23rd 1996

Norway and Sweden had a bout of merger mania in 1999, when Telenor and Telia AB were supposed to become one single provider of Information Society services in the Nordic area. For several reasons it did not work out, and the rest is history. However, liberalization is one of the many factors influencing technology development.

8. Liberalization

The key concepts of information technology development in the 1990s were the technology convergence, which we have described above, the liberalization of earlier telecommunication monopolies, and the privatization as a consequence of liberalization. In turn, an indirect consequence of these concepts are the many mergers between telecom operators, Internet and other service providers, content producers, and other IT companies in order to create global companies, or at least companies that can offer as many products and services as possible.

Liberalization, or maybe better, deregulation and reregulation, is seen as the major force behind the fast growth of the T.I.M.E. market. In 1990, only New Zealand and Japan were open for competition in main line telephony. During the following five years, Australia, Canada, Finland and Sweden joined these two nations. Since January 1 1998, all EU countries are open to competition. Only in 1995 and 1996, shares of a total value of 26 billion US$ in former state owned telcos like Deutsche Telekom in Germany, STET in Italy, KPN in the Netherlands, Telefónica de España in Spain, Matev in Hungary, and UK Cable in the UK were sold to the market. By the end of 1999, six among the 29 members in the OECD still had telecommunication monopolies – the Czech Republic, Greece, Hungary, Poland, Portugal, and Turkey, but all of them had decided a latest date for the opening of the markets for fixed telephony. All OECD countries

were open for competition in mobile telephony by the beginning of 1998. According to ITU, deregulation is fast almost all over the world, as shown in the following figure.

Number of countries allowing free competition 1994–1997

Per market segment

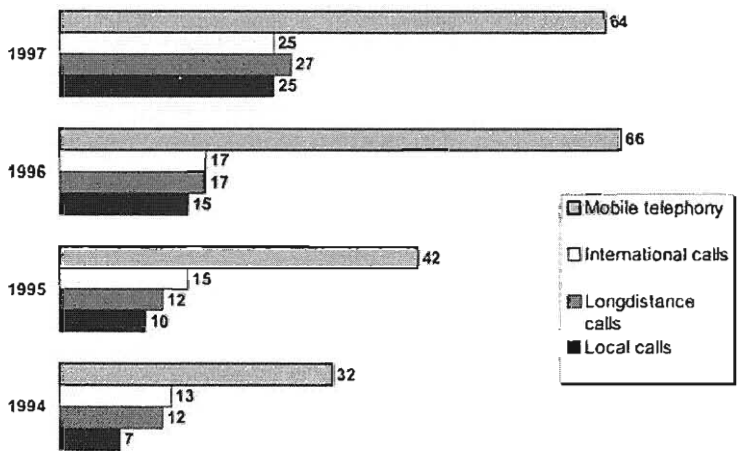


Figure 87: In 1994 some 30 countries were open to competition in mobile telephony. By 1997, the number had doubled to 64. The slowest market segment to open up has been the one for local calls, which by all means trebled during the period, only from a very modest start. But the ones for international and long distance calls are not doing much better.

Source: ITU: World Telecommunication Development Report.

There were six nations among the OECD countries still having monopolies providing the fixed telecommunication services, while all countries within the organization had at least two competing mobile operators by the end of 1998.

Number of OECD countries allowing competition in fixed telephony 1989–1998

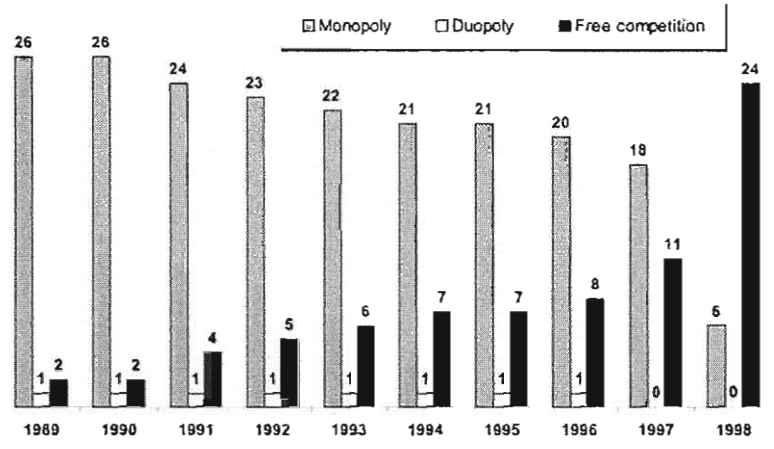


Figure 88: The figure shows the move from a regulated market to a liberalized one within the OECD member states. Only two nations allowed competition of fixed telecommunications in 1989. By 1998, 24 out of 29 members had free competition.

Source: OECD 1999

In 1989 there were two mobile telephony operators in 23 of the OECD countries. In 1993 the markets of another three countries were opened, and by 1998 there were duopolies in eight of the OECD countries. However, the field of mobile telephony is still somewhat messy due to the many different technologies and standards in use. At the time of the following description, a number of countries were still in a mode of transgression from analog to digital systems. In some countries there are operators having a license but not using it. The following figure should be seen as an indication only.

Number of OECD countries with mobile telephony competition 1989–1998

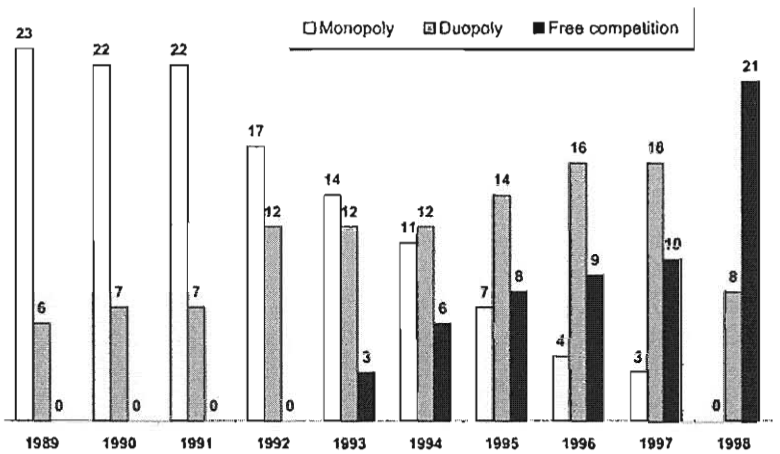


Figure 89: In 1989, 23 OECD countries had mobile telephony monopolies and six had duopolies. By 1998, 21 countries had free competition, 8 had duopolies and there were no monopolies left in the area.

Source: OECD 1999

If we consider the global aspect, 60 of the members in the United Nations had mobile telephony networks in 1990. By the beginning of 2000 there are 175 countries having fully functional mobile telephone networks. This is the reason for the current catch phrase of mobile telephony:

It took fixed telephony 100 years to move from zero users to one billion, it has taken mobile telephony 20 years to cover the same ground, from zero users to one billion.

We are not quite there yet, but mobile telephony has an estimated global growth rate of 900 000 new subscribers/users every three days, according to Telia Mobile AB.

So, to sum up, liberalization and the new legal frameworks implemented so far in the industrialized world have opened the markets for free competition. The rapid diffusion of the communication technologies to large numbers of users is also due to the develop-

ment of user friendly interfaces – in most cases it is easy to use the new equipment in a rewarding way. Because of this, we can make the following addition to the catch phrase above:

– And it has taken less than ten years to have some three hundred thousand users access the Internet.

Part II

The Swedes and the Information Society

Chapters 9-15

Time frame

Telia 1853–2000

1853	Kongliga Elektriska Telegrafstyrelsen, The Royal Electrical Telegraph Board, is founded
1855	New name for the Board – Kungliga Telegrafstyrelsen, The Royal Telegraph Board
1880	The first telephone station for some 100 subscribers is installed in Stockholm
1889	The first national telephone directory is published – it has 32
1901	pages
1914	The first public telephones are installed
1923	170 000 telephones are installed in Sweden
1932	The Telegraph Board broadcasts radio
1934	The Telegraph Board launches the first bakelite telephones from LM Ericsson
1949	Miss Time, Fröken Ur, starts her service
1953	The national network is automated
1956	The Telegraph Board becomes Televerket, the Telecommunications Board
1956	The Telecommunications Board starts its first TV-transmitter
1962	The first mobile telephones subscribers, 26 in Stockholm and Gothenburg
1965	The first data transmission via the telecom network and modem takes place
1970	The telecom satellite "Early Bird" is in function
1972	The first color TV transmissions are stared
1976	The Swedish national network is automated
1977	Stereo radio transmissions are inaugurated
1978	The first AXE station is in use
1981	Systems for radio paging are initiated
1982	NMT, the Nordic Mobile Telephone system, is in operation
1986	"The Hot Line" is opened
1992	NMT 900 is completing the older NMT system
1993	GSM for digital mobile telephony is introduced
1999	Televerket becomes Telia AB, is no longer a state board but a corporation PTS, Post- och telestyrelsen, the National Post and Telecom Agency, the first regulatory body, is formed
2000	The merger between Telia AB and Norwegian Telenor is aborted IPO of 30% of the shares of Telia AB

Sources: Svenska Dagbladet, Sunday June 13th 1999/Radio Sweden March 2000

9. The Information Society in Sweden

The Information Society took its first steps in Sweden with the foundation of the Royal Electrical Telegraph Board in 1853. The time frame above shows the development of this royal board into the Telia corporation, which in May 2000 made an IPO of 30% of its shares and finally left the state monopoly era behind. Telia AB continues to be the dominating actor in the deregulated Swedish telecommunications market. However, this market is rapidly changing – to what extent and how is described in this chapter.

In spite of Telia's late arrival to the public market, Sweden was one of the first countries dominated by state telecom monopolies to open its market to competition. This was a result of the fact that Sweden never has had a monopoly regulated by law. Sweden got its first regulatory body in 1993, PTS, Post- och telestyrelsen, the National Post and Telecom Agency. However, the de facto monopoly has so far been strong enough to keep competition at bay. Some of the market segments have been slow to open up to competition, such as local calls, and network transmission capacity. In spite of these circumstances, Sweden is at the time being looked upon as the leading IT nation of the world! IDC, Wired, Newsweek, Der Spiegel, and the EIU all have appointed Sweden the leading IT nation. We will try to explain some of the reasons for Sweden's success in the Information Society in the following pages. It all started more than 100 years ago.

Ever since Mr. Bell patented his invention of the telephone in 1876, the Swedes became eager users of his innovation. By the year end 1899, there were 2 million telephones installed in Sweden. This fact was the sign of an inclination that has stayed with the Swedish people, that of quickly adopting and using new technology. So Sweden ended up appointed the leading information technology nation in the world by IDC in February 2000 according to the IDC information society index. The index is made up of 23 variables in four categories and data is collected from 55 countries. The ranking looked like this in February 2000.

The IDC information society ranking of February 2000

Ranking 2000	Country	Ranking Index 2000	Ranking 1999
1	Sweden	5.06	2
2	USA	5.04	1
3	Finland	4.58	3
4	Norway	4.48	5
5	Denmark	4.34	6
6	Canada	4.32	10
7	The Netherlands	4.23	7
8	Switzerland	4.17	–
9	Australia	4.13	8
10	Japan	4.09	9

Figure 90: Swedes as eager users of information technology ever since the very beginning of telegraphy and telephony has resulted in Sweden being among the global leading nations when it comes to dissemination and utilization of telecommunications and information technologies.

Source: IDC

Newsweek proclaimed in a cover story of February 7, 2000, Sweden as the most wired and most wireless country in the world. And the Internet magazine *Wired* appointed Stockholm the equivalent to Silicon Valley. To these pictures belong facts like Finland and Sweden having the most mobile telephone subscribers, the most personal computer users, and the most Internet users, all counted as percentages of the total populations. Moreover, Swedish tariffs for fixed telephony are among the lowest in the world, Sweden has more Internet Bank users than any other country, and Sweden has the most stock investors per capita in the world. The Swedes are also among the heaviest consumers of dailies. The following list of data gives some of the basic numbers on Sweden in the Information Society. Data has been extracted from the various statistical sources listed in the reference list.

The Information Society in Sweden in 1999
As compared to 1997

	1999	1997
Inhabitants	8 862 000	8 848 000
Households	4 704 800	4 665 000
Persons employed	3 918 678 (1998)	3 692 676
Persons employed by the electronic industry	57 987 (1998)	57 685
Persons employed by the IT services industry	111 493 (1998)	114 765
GNP, SEK	1 973 421 800 000	1 739 000 000 000
Value of telecom equipment exports, SEK	n.a.	5 423 000 000 (1996)
Value of telecom equipment imports, SEK	n.a.	1 051 000 000 (1996)
Number of mainlines	6 010 000	6 010 000
Mainlines per 100 inhabitants	66.5	67.93
Mobile telephone subscribers	5 123 000	3 169 000
Mobile telephony subscribers per 100 inhabitants	57.8	35.82
Telecom traffic minutes	n.a.	37 billion
Television sets		4 700 000
Cable television subscribers, (households)	1 960 000 (1998) = 70% of total households	1 930 000
Nationwide television channels	12	12
Nationswide cable television channels	11	11
Regional cable television channels	27	27
Satellite disc receivers in private homes	750 000	720 000
Personal computers	5 728 450	3 100 000
Personal computers in percent of households	58%	-
Internet access via modem, total	2 000 000	1 540 000
Internet access via modem, corporate users	400 000	307 000
Internet access via modem, private users	1 600 000	1 230 000
Internet host computers per 1 000 inhabitants	66.8 (May 2000)	33.4 (July 1997)
Web addresses	64 882 (January 1999)	-

Figure 91: The data in the table are mainly from 1997 and 1999, except where otherwise indicated. Note that the number of mainlines does not increase, to the contrary, there is a tendency for stagnation and decrease as mobiles take over.

Sources: ITU: Yearbook of Statistics, Telecommunications Services 1988 – 1997/Statistics Sweden: Statistisk Årsbok '99/Statistisk Årsbok 2000/SIFO/ Nordicom/SIKA/NUTEK/PTS

In the spring of 1999, Swedes were the EU members having the most access to PCs as well as Internet access according to estimates from the EU and its Eurobarometer # 51.

Percent of population over 15 years having access to PCs and the Internet at home in selected OECD countries in July 1999

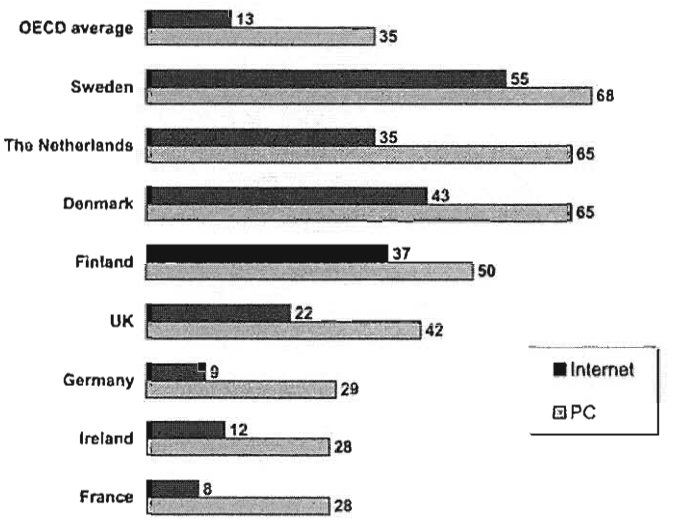


Figure 92: The Swedish population of 15 years and older have more frequently access to PCs and the Internet at home than any other OECD nation. The data in this figure are estimates made by the European Commission in July 1999.

Sources: NUTEK: Svenskt näringsliv och näringspolitik 2000/EU's Eurobarometer # 51, July 1999

Studies made by NUTEK, the Swedish National Board for Industrial and Technical Development, show that 80% of all work places in Sweden used computers and datacommunications in the daily work in 1997. Every single company in Sweden with more that 250 employees has computers. For the very small enterprises, having 5–9 employees, every second company is computerized.

In spite of Sweden being among the leading IT nations in the world, it must be remembered that in comparison, the nation is a small one having barely 9 million inhabitants. So in spite of Sweden having among the most mobile telephone users in the world, the 5.4 million Swedish mobile telephone subscribers make up one percent of the global market.

Swedish mobile users 1% of global market in 1999

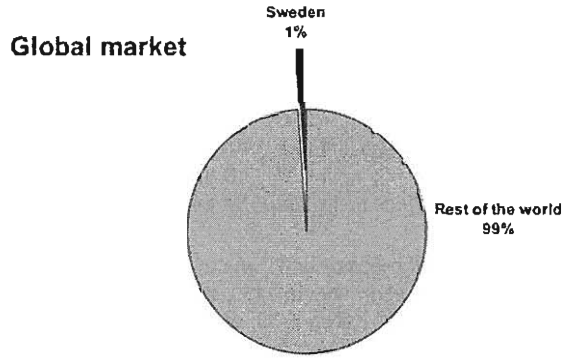


Figure 93: By the end of 1999 there were some 5.1 million mobile telephone subscribers in Sweden. They make up 1% of the global number of users.

Sources: Several/Svenska Dagbladet Näringsliv, Friday March 3rd 2000

In 1997, the Swedish combined information technology and telecommunications market had a total value of 13 126 million ECU; in 1998 the value was 14 648 million ECU; in 1999 16311 million ECU and the estimated value for 2000 is 18 035 million ECU, according to EITO. The distribution between the various market segments is as follows:

IT and telecom market value in Sweden per segment 1997–2000
In million ECU

	1997	1998	1999	2000 (est.)
Computer hardware	3 145	3 446	3 684	3 918
IT hardware	3 853	4 209	4 512	4 791
Software products	830	933	1 061	1 230
Services	2 823	3 289	3 803	4 319
Software and services	3 653	4 222	4 864	5 549
Total IT market	7 506	8 431	9 376	10 340
Telephone sets	174	177	177	181
Mobile telephone sets	472	656	851	1 060
End-user equipment	732	922	1 118	1 331
Network equipment	611	643	663	715
Telephone services	2 407	2 497	2 582	2 658
Mobile telephone services	1 078	1 239	1 542	1 827
CaTV services	350	438	521	630
Carrier services	4 277	4 652	5 154	5 650
Total telecom	5 620	6 127	6 935	7 696
Total IT + telecom	13 126	14 648	16 311	18 035

Figure 94: The total value for the combined IT and telecom markets in Sweden in 1997 was 13 126 million ECU, equivalent to 113.2 billion SEK. In 1999, the corresponding values were 16 311 million ECU, or 143.7 billion SEK. According to PTS, the market for fixed and mobile telecom services in Sweden increased by 8% during 1999 to a total value of 38.7 billion SEK.

Sources: EITO: European Information Technology Observatory 2000/PTS: svensk telemarknad 1999

According to the report *"Svensk telemarknad 1999"* published by PTS in June 2000, the turnover for fixed and mobile telephone services was 38.7 billion SEK during 1999. This represents a growth by 8% over 1998. The average growth for these market segments has been 10.2%. In 1994, the market value was some 24 billion SEK. Since then, the Swedish market for telecom services had grown by 62% by the end of 1999. See following figure. More information is available at the web site http://www.pts.se.

The market values for fixed and mobile telephony services in Sweden 1994–1999

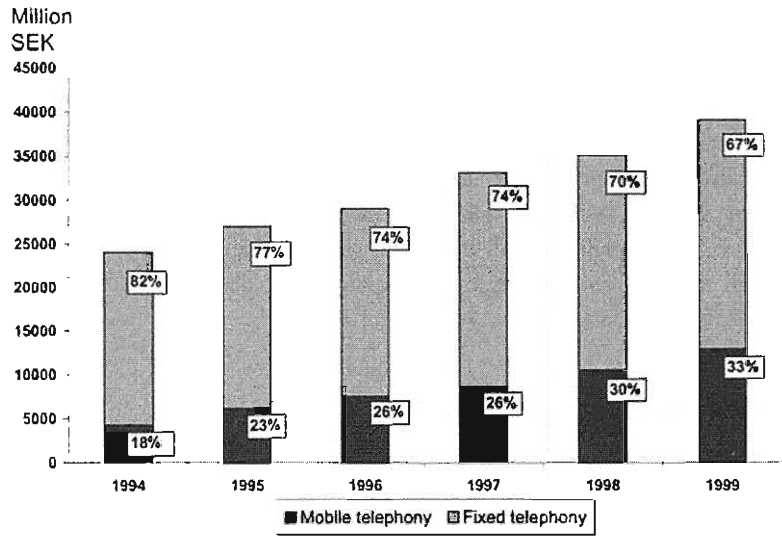


Figure 95: In 1994, mobile telephony services generated 18% of the total market value for fixed and mobile telephony in Sweden. By the end of 1999, mobile services generated 33% of the total revenues of 38.7 billion SEK.

Source: PTS: Svensk telemarknad 1999

Stockholm has become the center for Swedish activities in the area called *T.I.M.E. – Telecommunications, Information Technology, Media and Entertainment*. Greater Stockholm is considered *"Europe's hottest spot for high-tech jobs"*, at least according to the Financial Times, May 17th 1999. This was confirmed by Newsweek in February 2000 and once more a few months later by the Internet magazine Wired. The media and entertainment industry is located to the center of Stockholm with a large number of web design, content producers and e-services companies, most of them small. Thus central Stockholm has become the equivalent of New York's *"Silicon Alley"* to the Swedish information technology sector. The smart people, the know-how, and the infrastructure are in place. The Swedish capital has two parallel fiber networks, providing the city with some 140 000 kilometers of optical cables. 50 telecom operators, most of them global, offer the inhabitants their telecom

and IT services. Those requiring Internet access can choose from many different technologies – radiobased broadband, ADSL, ISDN, cable television, or leased lines via modem. Many operators offer their users direct connections to the US via the Internet, providing transmission capacities of 155 Mbit/sec. 130 000 people are employed by the T.I.M.E. companies, and they in turn are generating 75% of all T.I.M.E. activity in Sweden. 750 companies are specializing in new media. The Stockholm stock exchange is trading with some 70 companies active in the T.I.M.E.-industries, making it the highest percentage of telecom/IT/media companies of all European stock exchanges. More than 50% of all research and development activities take place in greater Stockholm, where Kista Science Park is the focus.

ISDN[8] in Sweden 1994–1999

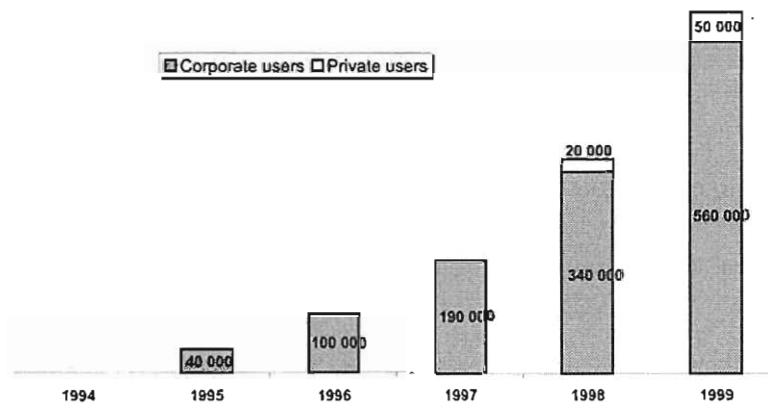


Figure 96: By the end of 1999, there were 645 000 ISDN connections in Sweden. This represents a growth of 70% over 1998. 8% of the connections are to private users, 92% to corporations. All ISDN connections are used for Internet access. So far, Telia is the only provider of ISDN.

Source: PTS: Svensk telemarknad 1999

Gothenburg, Sweden's second largest city, on the west coast, and Malmö in the south, are also important centers for Swedish information technology development. Both have several important universities and research institutions, which attract competent people. Industrial, entrepreneurial and science parks, most of them including activities related to the Information Society, are Ideon Science and

Technology Park, Lund; SoftCenter, Ronneby; Mjärdevi Science Park, Linköping; Chalmers Science Park, Gothenburg, and Aurorum Science Park, Luleå, and more are likely to make themselves known in the near future. The Swedish Computer Association, Dataföreningen, provided these data.

These rapidly growing and changing hotspots distributed from south to north, from east to west, all contribute to the growth of the country. According to a report from consultants Temaplan, presented in August 1999, the industry growth was 20% from 1997 to 1998. The fastest growth took place in Gothenburg and in university cities like Linköping and Umeå. In Gothenburg, growth was 32%, in Stockholm 23%. Temaplan has measured growth by comparing the salary statistics employers have filed with the tax authorities. In an international perspective comparing GDP per capita within the OECD, Sweden ranks 15 out of 29 – see following figure.

GDP per capita in the OECD countries 1999
In US$, based on PPPs

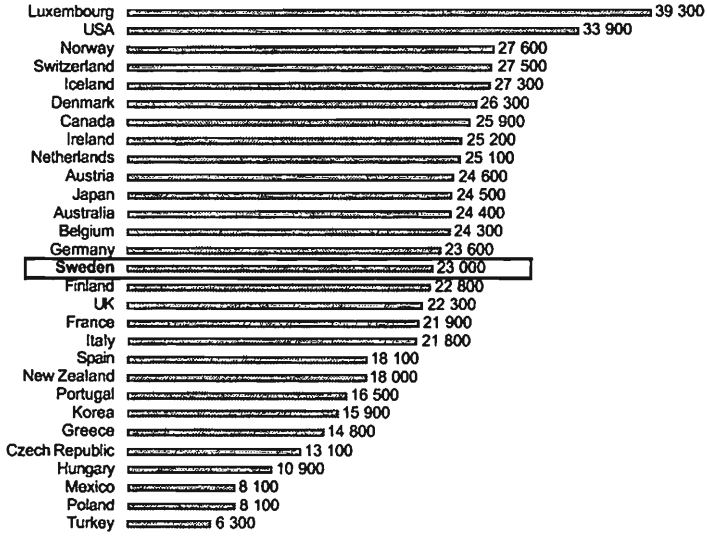


Figure 97: From an international perspective, comparing GDP per capita in US$ based on PPPs, Sweden ranks 15 out of 29 countries.

Source: OECD

In international comparisons of IT and telecom penetration and utilization, it is customary to calculate per capita consumption of products and services. From 1995 to 1998 the Swedes have increased the per capita IT expenditures by more than 20%, the telecom expenditures by 19%, and the accumulated expenditures by some 20%.

In 1995, the annual per capita IT and telecommunications expenditures in Sweden were equivalent to 1 256 ECU, in 1999 they corresponded to 1 837 ECU/Euros. The following figure gives the per capita expenditures for information technology and telecommunications for 1995 to 1999.

IT and telecom expenditures per capita in Sweden 1995–1999

Year	1995	1996	1997	1998	1999
IT expenditure per capita, Euro	705	733	840	952	1 056
IT expenditure per capita as a percentage of GNP	3.28%	3.35%	3.71%	4.17%	4.44%
Telecom expenditure per capita, Euro	554	587	629	702	781
Telecom expenditure per capita as a percentage of GNP	2.59%	2.68%	2.78%	7.08%	3.28%
Accumulated IT + telecom expenditures per capita, Euro	1 256	1 320	1 469	1 653	1 837
Accumulated IT + telecom expenditures per capita as a percentage of GNP	5.88%	6.03%	6.49%	7.25%	7.72%

Figure 98: The figure gives the annual per capita IT and telecommunications expenditures for 1995 to 1999 in actual value, ECU/Euro (1 ECU/Euro = 8.80764 SEK in December 1999), as a percentage of GNP, and accumulated for the two calculations. In 1995, the Swedish GNP amounted to 1 496 951 million SEK, in 1996 to 1 489 885 million SEK, in 1997 to 1 529 659 million SEK and in 1999 to 1 973 421.8 million SEK. The annual average growth of the T.I.M.E. expenditure was 20%.

Sources: Data from European Information Technology Observatory 1999 and 2000/Statistics Sweden Yearbook'99/ The Swedish Bank/own calculations based on these sources

Looking further back in Statistics Sweden's databases we find that in 1985 the turnover of the Swedish telecommunications industry made up 1.83% of GNP. In 1990, the figure increased to 2.32%, in 1995 to 3.02%, and in 1997 telecom generated 3.03% of the GNP. The average for the OECD countries was 2.71% in 1997. By 1999 the Swedes' accumulated expenditures for IT and telecom were 7.72% of GNP, which amounted to 1 973 421.8 million SEK.

Looking into the future with EITO, we find that the European information technology industry predicts a general growth of 5.8% for telecom in 2000. The predictions for information technology were 9.3% for 2000. According to EITO, the total IT and telecom industry for Sweden in 2000 will amount to 16 020 000 ECU/Euros. The equivalent figures for Western Europe are 456 118 000 ECU/ Euros for 2000.

The Swedish commercial banks predicted in March 2000 that the overall growth of the Swedish GNP for 2000 will be 3.9% and that 2001 will see a GNP growth of 3.3%. Some important push factors behind this growth are related to the Information Society industries. Mobile communications are important to the growth of the Ericssons of this world. Internet business concepts generate direct jobs in the Internet industry but also indirect ones in almost all other industries. Mobile communications and Internet business in their turn generate business for the operators, and so on. And international trade in what is called high technology industries such as aerospace, computers, telecom, pharmaceuticals etc. is growing by 7% annually in the OECD countries. The following figure shows the coverage ratio between exports and imports – exports from USA just cover the costs of its imports, while Sweden's exports generate a surplus of 47% related to its imports.

OECD high technology trade in 1998
Coverage ratio in percent

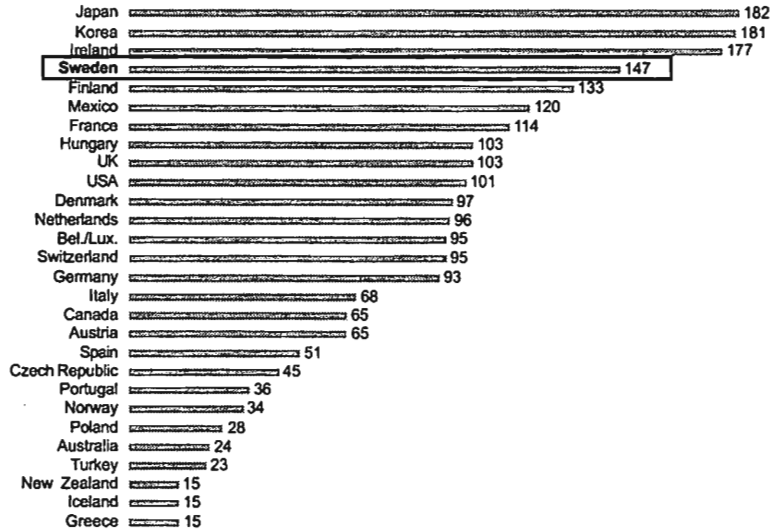


Figure 99: International trade in what is called high technology industries such as aerospace, computers, telecom, pharmaceuticals, etc. is growing by 7% annually in the OECD countries. The figure shows the coverage ratio between exports and imports – exports from USA just cover the costs of its imports, while Sweden's high tech exports generate a surplus of 47% related to its imports.

Source: OECD

Consumer spending is seen as the overall push factor. This may indicate that the growth of the Swedish economy will become faster as consumers get access to broadband communications, and mobile Internet. Access networks, broadband, IPv.6, UMTS, and maybe WAP technologies are seen as the ones most important to growth in the immediate future. New infrastructures for broadband and UMTS are part of the growth. However, in the introductions of new technologies, there is reason to count on caveats. For instance, WAP may well be outdated before it is introduced to the larger public, the iMAC from Apple killed the future of the discettes, and CD-ROMs are on their way out, as is ISDN. Whatever will come, or not come, from the laboratories and development departments of companies and research institutions, the only certain thing is that we will see a number of converging and converged technologies developing in parallel.

An Information Society for All

Engaged and spending consumers, creative developers of products and services, entrepreneurs, and available risk capital are contributing to Sweden's success in the Information Society. But there are also several political decisions and actions directly influencing the situation. In March 2000 the Swedish government presented its proposition on information technology, *Regeringens proposition 1999/2000:86 "Ett informationssamhälle för alla,"* (An Information Society for All), which was accepted by the parliament. The main points are:

1. 8.3 billion SEK will be invested in building a broadband infrastructure. Of these, 2.5 billion SEK will be used by Svenska Kraftnät to build a national highway; 2.6 billion will be used for regional networks; and 3.2 billion SEK will be used to support access networks. Companies as well as households will be granted tax deductions for some of the access costs;
2. 49% of the Telia AB shares will be sold to the public. The IPO will include 20 to 30% of the shares. All those who want shall get the opportunity to buy;
4. The government plans to increase the IT competence among the small companies, SME. There is also an ambition to map how women use IT. Moreover, KTH in Stockholm, the Royal Institute of Technology, will be given means to take on 1 275 new students and to create an Internet competence center;
5. In May 2000 a law regarding electronic signatures for secure e-trade will be presented;
6. All public services will be made available 24 hours.

The objective of the government is that 98% of all Swedish households should be able to install highspeed access to the communication networks, so called broadband defined as transmission speed of no less than 2 Mb/sec., by 2002. For further information, see the government proposition. Also explore the government website: http://www.regeringen.se.

On September 1, 2000, ten companies and company groups filed their applications with the PTS, the National Post and Telecom Agency for a so called "beauty contest" for a licence for the third generation mobile network, UMTS, (Universal Mobile Telephone System). Four UMTS licences and two GSM licences were at stake. Licences will be granted according to a ranking system, under which every contestant is judged according to financial strength, technological capacity, commitment to nationwide coverage, speed of implementation, etc. The applicants were – in alphabetical order:

Broadwave Consortium = Tele 1 Europe, Rix Telecom, Western Wireless, 2G/3P Group, You Communication
Europolitan
HI3G Access = Investor, Hutchison Whampoa
Mobility 4 Sweden = T-Mobile, Utfors, ABB Energy Ventures
Orange Sverige = France Télécom, Bredbandsbolaget, Skanska, Schibsted
Reach Out Mobile = Sonera Industrikapital, Telefónica
Tele 2 (Netcom)
Telenordia
Telia (Telia mobile)
Tenora Networks = Ratos, Nomura, Teracom

All ten applicants had commited to total national coverage by 2003. This should mean that 99.90% of all persons living in Sweden could have UMTS access by end-of-2003, which is a more extensive coverage than the GMS network offers at present. The UMTS network will give the Swedes the widest such network in Europe and provide everyone with wireless Internet access, among other things, by the beginning of 2002. Ericsson is the most likely provider of the UMTS technology systems.

On December 16, 2000, PTS awarded UMTS licences to Orange, Tele2, Europolitan and HI3G. Telia and other operators were refused licences, Telia's application on the grounds of "deficiences in the technical implementation". In January, 2001, Telia and Tele2 agreed to build a joint UMTS network; at the same time, Telia and others appealed the PTS decision.

However, the Information Society market is not made up by devices and networks only – the content, so difficult to separate from its channels, the media, is the raw material and thus the very heart of the services the users get access to via their devices. Considering this, content should be the industry on which we spend most of our efforts to understand by quantifying, qualifying, and developing. So far, this market segment is rather poorly investigated in Sweden but a start has been made by Statskontoret, The Swedish Agency for Public Management. Among other things, this agency carries the public responsibility for developing the digital service society, the 24 hours public services society, and also for Sweden's participation in *"eEurope – An Information Society for All"*, an initiative by the European Council and the European Commission. The objective is to create *"a comprehensive eEurope Action Plan"*.

The former project, stated in the current IT proposition – see above – includes mapping and defining so called "soft infrastructures" and their values. See part I.

Statskontoret moreover participated in the second study of the European market for electronic services, carried out within the framework of the EU program INFO 2000. In order to gather data, the organization carried out the most comprehensive investigation in Sweden so far of PC and Internet utilization. The investigation is based on 6 185 interviews with Swedes in the age groups 18 to 64 years. It was carried out by Statistics Sweden in May 1998. Statskontoret also investigated the Swedish markets for online and web services, CD-ROM productions and audiotex. Since then, no equivalent study has been published, so we will refer to the 1998 one immediately below and in the following chapters.

In 1997 the largest segment within online and web services was financial services and real time services, generating a total turnover of 623 million SEK and an annual growth of 9% for the period 1994 to 1997. The market for audiotex decreased during the same period by 19% annually. The following figure shows the distribution of the different services.

The electronic information services market in Sweden in 1997

Type of service	Turnover in million SEK	Annual growth 1994–1997 in %
Online- & web services (Swedish and foreign)	1 250	11
CD-ROM (Swedish and foreign)	200	80
Audiotex (Swedish providers)	60	- 19

Figure 100: The largest single market for online and web services in Sweden in 1997 was financial services and realtime services. The two segments had an accumulated turnover of 623 million SEK. The total electronic services market had a turnover of 1 250 million SEK.

Sources: Statskontoret, The Swedish Agency for Public Management /Lars Klasén, SEMA Group Infodata

As stated above, IT and telecom are important factors in the trade balance between the nations of the world. The following figure show the per capita trade balance for communications equipment in 1996 for the OECD countries, while the next figure shows the export of telecom products per capita for 1998. The majority of the OECD countries, 17 out of 29, had a negative trade balance. 12 countries of the 29 reported a surplus, Sweden presented the largest one, almost 700 US$ per capita. Finland reported + 500 US$ per capita. Ericsson and Nokia once more manifest their importance for the national economies of Sweden and Finland.

Communications equipment trade balance for the OECD countries in 1996

Per capita, in US$

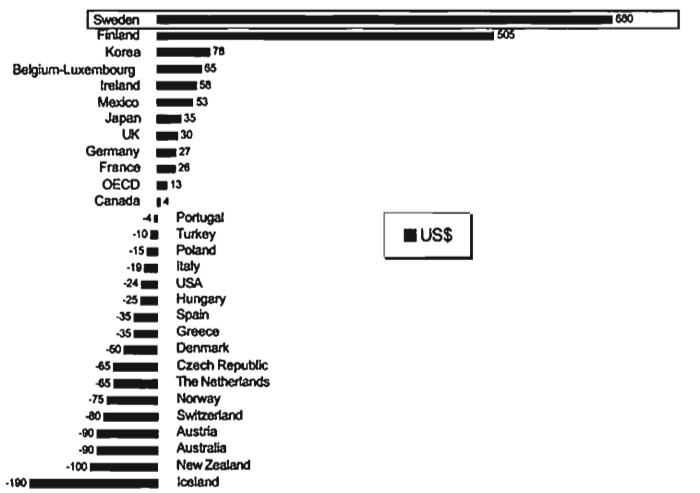


Figure 101: The figure shows the per capita trade balance for importation and exportation of communications equipment in US$ for the OECD countries in 1996. Sweden and Finland report the largest surplus while Iceland and New Zealand report the largest deficit.

Source: OECD

In 1998, Singapore exported telecom products for 1 214 US$ per capita, while Finland exported for 1 205 US$ per capita, and Sweden for 1 169 US$ per capita. Japan generated telecom exports to a value of 101 US$ per capita and USA 79 US$ per capita.

Export of telecom products in 1998
In US$ per capita

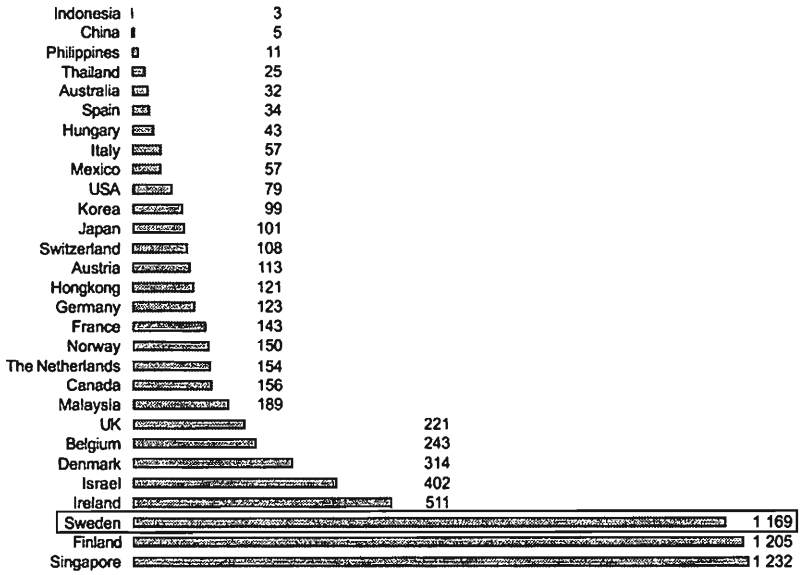


Figure 102: In 1998, Singapore, Finland, Sweden, Ireland and Israel, all small nations, were the top five exporters of telecom products per capita. Singapore is dominated by Singapore Telecom and a large number of foreign manufacturing companies. Finland and Sweden are profiting from Nokia and Ericsson. Ireland is particularly successful in software development (Ireland is now the largest software manufacturer in the world), and Israel in advanced telecommunications and security equipment.

Sources: WTO SITC 764/Anders Rune, VI

3 918 678 persons were employed in Sweden by the end of 1998. In 1996, the equivalent number was 3 692 676 persons. 189 626 were employed in the electronics industry in 1997, which can be compared to 172 441 in 1996. Thus, almost 5% of all employed persons in Sweden had IT related jobs in 1997, compared to 4% in 1996.

These figures are generated by Statistics Sweden in collaboration with NUTEK, the Swedish National Board for Industrial and Technical Development (see the publications *"Elektronikindustri och IT-relaterade tjänsteföretag i Sverige 1999"*, SCB & NUTEK, R 1999:15 and *"Elektronikindustri och IT-relaterade tjänsteföretag i Sverige 1998"*, R 1998:25).

Ericsson and Telia were the dominating employers, having 36% of all employed in the IT industry in 1997. Almost two thirds of all employed persons in the industry worked in companies having more than 250 employees.

Number of employees in the 10 largest IT companies in Sweden in 1996 and 1997

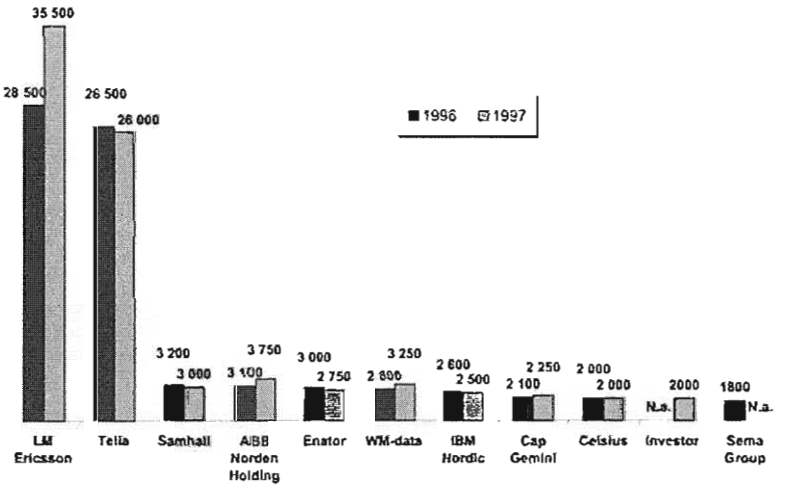


Figure 103: Telia is the largest single employer among the ten largest IT companies in Sweden, Ericsson consisting of several companies, but in this context counted as one.

Sources: Statistics Sweden and NUTEK: "Elektronikindustri och IT-relaterade tjänsteföretag i Sverige 1998", R 1998:25/"Elektronikindustri och IT-relaterade tjänsteföretag i Sverige 1999", R 1999:15/CFAR

Ericsson dominated the electronics industry by far in regard to the number of employees. Six Ericsson companies are among the ten largest electronics companies employing two thirds of all persons employed within the industry. These six employ 80% of all employees. See the following figure.

Number of employees of the 10 largest electronics companies in Sweden 1996 and 1997

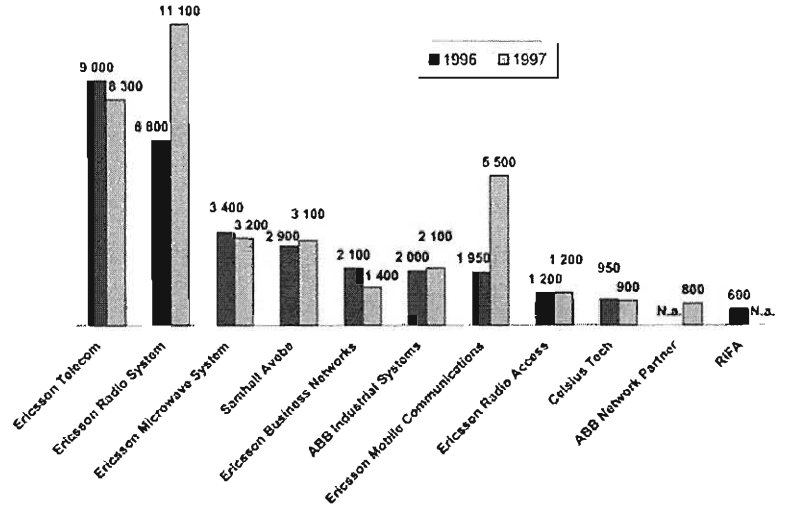


Figure 104: Six Ericsson companies employed 80% of the total number of employees in the Swedish electronics industry.

Sources: Statistics Sweden and NUTEK:"Elektronikindustri och IT-relaterade tjänsteföretag i Sverige 1998", R 1998:25/"Elektronikindustri och IT-relaterade tjänsteföretag i Sverige 1999", R 1999:15CFAR

Swedish industry has been successful in using information technology tools right from the beginning in order to run more effective and efficient organizations. Telephones and computers are regarded as indispensable work tools. For a long period of time, Sweden was the country having the highest computer density. The current situation is described by the extensive research carried out by Statskontoret, The Swedish Agency for Public Management, which was described above. Statistics Sweden maps computer users at work in such a way that they are comparable to earlier surveys. In 1984, 24% of the Swedish work force used computers. In 1998 the equivalent percentage was 66%. IT literacy is a prerequisite for ever more professionals. The following figure shows the percentage of the total work force having computers at work in 1984, 1989, 1995 and 1998. These figures invite to a number of interesting reflections: So is the difference between males and females as computer users relatively small right from the first mappings made by Statistics Sweden in

1984. Now the following figures must be read as rather inexact levels rather than exact growth figures. In 1998, Statistics Sweden posed the question *"Do you have a computer at work?"* which is seen as the equivalent to questions posed in earlier surveys.

Computer users at work in Sweden 1984–1998
In percent of the total number of employed persons

Year	1984	1989	1995	1998
Men	25%	34%	54%	66%
Women	21%	31%	48%	65%
Total	24%	32%	51%	66%

Figure 105: The table above gives the percentage of the total working population having a computer at their desk at work. The figures are for men and women for 1984, 1989, 1995 and 1998.

Sources: Statskontoret, The Swedish Agency for Public Management/ Statistics Sweden

The OECD states that the IT diffusion among workers can be measured by the number of PCs per 100 white-collar workers. In 1997 the personal computer distribution was as follows in 23 of the 29 OECD countries, according to the *"OECD Information Technology Outlook 2000"*. In Sweden there are more than one PC per employee in business and government.

Statistics Sweden carried out a new study of computer usage during 2000. The results were not available when this manuscript was closed.

PCs per 100 employees in selected OECD countries by the end of 1997

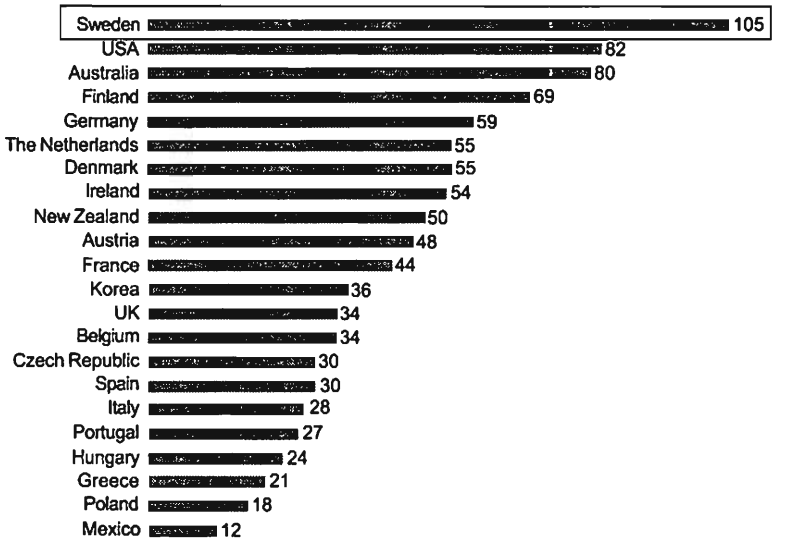


Figure 106: The installed base of personal computers used in government agencies and businesses within selected OECD countries.

Sources: OECD Information Technology Outlook 2000/IDC/Eurostat/US Bureau of Labor Statistics/ILO

To sum up the Swedish Information Society success story, let us quote yet another magazine. The American business magazine *"Forbes"* presented by the middle of 1999 a ranking of the Western European countries based on the per capita availability of personal computers, telephones, and Internet access, among others. USA served as the reference country, having 100 points. Sweden was number 2. The Swedish leadership has been around for some time. Some reasons why Sweden most likely can keep its position are given in a later chapter.

Forbes' ranking of the Western European IT nations in 1999

Ranking	Country	Points
1.	USA	100
2.	Sweden	95
3.	Norway	91
4.	Denmark	90
5.	Finland	87
6.	Switzerland	85
7.	The Netherlands	78
8.	UK	76
9.	Germany	68
10.	France	66
11.	Austria	65
12.	Belgium	64
13.	Ireland	60
14.	Italy	53
15.	Greece	42
16.	Spain	42
17.	Portugal	39

Figure 107: The Forbes Magazine ranked the Western European nations according to the per capita availability of personal computers, telephones, Internet access and access to computer power. USA served as the reference having 100 points. Sweden got 95 in this ranking.

Sources: Ny teknik # 15/99/Forbes

By mid-September 2000 several Swedish papers and magazines, including *"Computer Sweden"*, quoted *the World Economic Forum's* list over nations offering the best so called corporate climate. Finland is ranked the leader for 2000, USA number 2, Germany number 3 and Sweden number 7.

The most competitive nations in September 2000

Nation	Ranking 2000	Ranking 1999	Ranking 1998
Finland	1	2	2
USA	2	1	1
Germany	3	6	4
The Netherlands	4	3	3
Switzerland	5	5	9
Denmark	6	7	8
Sweden	7	4	7
UK	8	10	5
Singapore	9	12	10
Australia	10	13	15

Figure 108: "Computer Sweden" quoted the above ranking of the nations offering the best so called 'Corporate climate' in 2000, based on data from the World Economic Forum. Finland has a very strong position over the past three years and is ranked the best country for corporations in 2000. Sweden was number 7.

Sources: The World Economic Forum/Computer Sweden, September 15 2000

Anyone interested in the developments of corporate activities in Sweden should visit the web site of the Invest in Sweden Agency at http://www.isa.se.

Public information about ICT in Sweden

SIKA, the Swedish Institute for Transport and Communications Analysis, is responsible for providing the public institutions and political decision-makers of Sweden with statistics about the development of information and communications technologies and their utilization. In September 2000, SIKA published a status analysis called *"Informations- och kommunikationsteknik i Sverige. En lägesanalys 2000"* (ICT in Sweden). A more comprehensive report is announced for early 2001 and a follow-up report is planned for 2003. SIKA reports to the ministry of industry, as does the Swedish IT commission, which has published a large number of interesting reports, not least on e democracy. See the following web sites: for SIKA: www.sika-institute.se; for the IT commission: http://www.itkommissionen.se.

Statistics Sweden, SCB, looks after the official statistics materials and published *"Statistisk årsbok"* every year. The yearbook contains masses of information on demographics, economics, education, etc. See www.scb.se for further information.

PTS, the National Post and Telecom Agency, is the regulatory body of Sweden. Each year the agency presents a survey of the Swedish telecom market and one of the Internet market. The most recent reports are *"Svensk telemarknad 1999" (The Swedish Telecom Market in 1999)* and *"Internetmarknaden i Sverige" (The Internet market in Sweden)* presented in October 2000. The latter contains an analysis of ISP providers in Sweden, among other things. For more information, see: http://www.pts.se.

Footnote

8. ISDN stands for Integrated Services Digital Network.

10. Fixed Telecommunications

The Swedish market for telecommunications and information technology is one of the less regulated in the world. Sweden never had a formal telecommunications monopoly, but a de facto one until the privatization of the Televerket on July 1 1993. Then the former telecommunications board became a stateowned company, Telia AB. In May 2000, the Swedish government made an IPO of 30% of the Telia shares – Telia entered the free market. For current state ownership in former European telecom monopolies, see following figure.

State ownership in former European telecom monopolies, May 2000

Operator	Country	Percentage of state ownership
Austria Telecom[14]	Austria	100%
Belgacom	Belgium	100%
British Telecom	UK	0%
Deutsche Telekom	Germany	67%
Eirecom	Ireland	3%
France Télécom	France	62%
OTE	Greece	51%
Portugal Telecom	Portugal	11%
Sonera	Finland	55%
Swisscom	Switzerland	66%
Telecom Italia	Italy	3%
Telefónica	Spain	0%
TeleDanmark	Denmark	0%
Telenor	Norway	100%
Telia	Sweden	70%

Figure 109: Austria, having decided on an IPO, Belgium and Norway, whose government also has decided on an IPO of Telenor, were the only western European countries having fully state owned telecom operators by May 2000, when the Swedish government made its IPO of 30% of the Telia shares. UK, Spain, and Denmark have sold out their old monopolies to the very last share.

Source: Svenska Dagbladet Näringsliv Thursday May 18th 2000

In 1993, Sweden got its present telecommunications law, based on a number of EU directives. These are being reviewed and the PTS will present a proposal for a new telecommunications law in 2001. More information about the EU directives can be found at the web site: http://www.ispo.cec.be. From July 1993 and onwards the number of operators applying for operating licenses for fixed and mobile telephony, transmission capacity and other telecom services in the Swedish market by the National Swedish Post & Telecom Agency, PTS, has increased from 31 companies in October 1996 to 71 in April 1998.

From July 1997 until May 2000, 176 companies had registered with the PTS as providers of telecom services as defined by the Swedish telecom law. In total 31 licences have been granted. For detailed information, see http://www.pts.se. In 1999, some 100 companies were active in the Swedish market. 80 offered network capacity. 30 corporations offered fixed telephony services and 4 provided mobile telephony services. In September 2000, four UMTS licences and two GSM licences were being offered in a so called beauty contest to those operators willing to offer nationswide cover of their mobile services fastest. The value of the market for fixed and mobile telephony services increased by 8% in 1999 over 1998 to 38.7 billion SEK.

The fact that Sweden has had an unregulated market since the very beginning of IT, does not mean that the Swedish market is fully liberalized. According to a report by the Gartner Group called *"Liberalization Milestones"* made for BT, Sweden ends up number eight in comparison to ten EU countries regarding the degree of deregulation. In spite of Sweden and UK being the first countries in Europe to open their markets, Sweden has turned into a laggard in several areas related to liberalization. Some of the reasons for this can be found in the inefficiency of the legal structure, equal rights in interconnection agreements, and discrimination of new operators. UK still has the most deregulated market, followed by the Netherlands, Germany and France. Only Italy and Spain are slower than Sweden when in comes to liberalization. This is according to *Computer Sweden* # 9, Monday February 1st 1999.

As a consequence of this, the regulatory body, PTS, the National Post and Telecom Agency, together with the Swedish Competitive Board, Konkurrensverket, have been reviewing the rules regulating

the Swedish market. The objective is that a new set of regulations will guarantee an open market in all segments. PTS is also constantly reviewing the tariffs for mobile telephony. These tariffs have been very stable and relatively high in Sweden in comparison to those of other countries over the past five years. The providers of mobile services have been requested to restructure their tariffs and are doing so. Swedish mobile telephony tarriffs are getting cheaper but remain high in international comparisons. See the following chapter for details.

The most important event for the Swedish telecom services consumers in 1999 was the introduction of unbundled access (LLUB = Local Loop Unbundling) to local as well as national networks and an individual choice of preferred operators. After a number of initial problems Sweden finally got a free telecom market for all. The status of Swedish telecom is described in the annual PTS report on the Swedish telecom market. However, the PTS report of 1999 is limited to describing only those companies subject to the telecommunications law. Organizations active in fixed and radiobased infrastructures, network capacity, and telecommunications services, including data communications services, Internet services, and telephony services are included in the PTS survey of 1999, while the content providers are not. This slightly different way of describing the Swedish telecommunications market in 1999 by PTS has as a consequence that the data of 1999 are not directly comparable to data from previous reports. PTS has also decided to report on telco operator income from end consumers only. Thus, revenues from operator to operator business, for instance revenues generated by interconnections, are not included in the 1999 market figures.

The value of the Swedish market for fixed and mobile telephony services according to the PTS was 38.7 billion SEK in 1999.

The value of the total Swedish market for fixed and mobile telephony services per operator 1994–1999

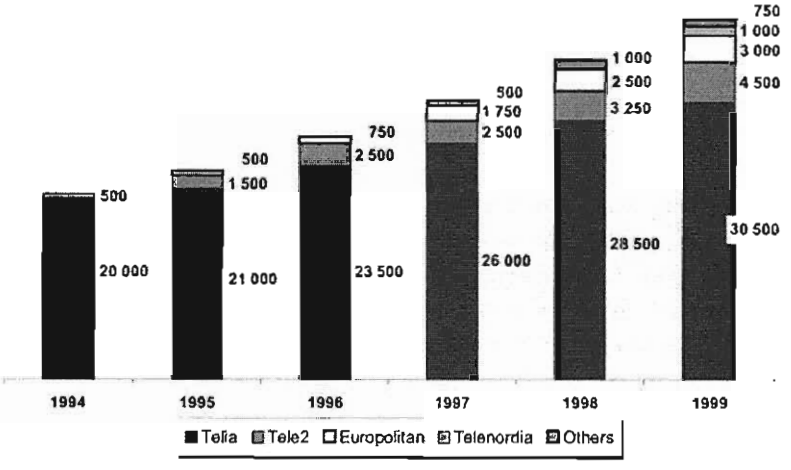


Figure 110: The total number, 38.7 billion SEK, includes the operators' income from end-user services only. By the end of 1999, Telia had 77% of the total Swedish telecom market, compared to 81% in 1998. Tele2 had 11%, Europolitan 8% and Telenordia 2%. The rest of the operators had some 3%. Telia is loosing market share to other operators, as expected.

Source: PTS: "Svensk telemarknad 1999"

The competitors in the Swedish Information Society market have multiplied and the total market has grown by some 10% annually during the past few years. In November 1997 there were 299 companies active within the telecommunications industry according to Statistics Sweden's special database CFAR. The telecommunications industry is made up of three subindustries, network operations including mobile telephony; broadcasting and television; and cable television operations. 78% of all companies registered, i.e. 240 corporations, belonged to the first subindustry, network operations. Statistics Sweden and the Swedish Institute for Transport and Communication Analysis, SIKA, have reported on the state of the telecommunications industry in *"Telekommunikation 1997"*, a report that can be ordered from SIKA.

The following figure shows the distribution of the number of companies in the telecommunications business in Sweden according to their type of operations for 1995, 1996 and 1997.

Telecommunications companies in Sweden 1995–1997

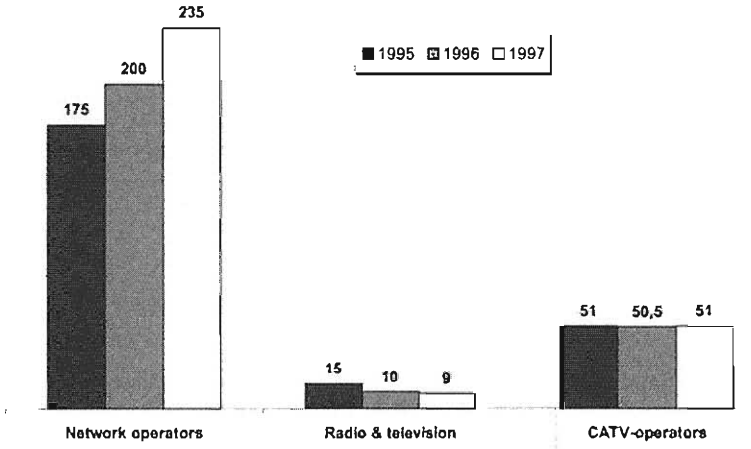


Figure 111: The great majority of telecommunications companies in Sweden are involved in network operations. There are some 50 CaTV operators and less than 10 companies active in broadcasting and television. By the end of 1997, 299 companies held licenses issued by PTS.

Sources: SIKA Kommunikationer # 2 1999/SCB

In 1997 these companies had a turnover of 53.8 billion SEK, which represented an increase by 3 billion SEK over 1996. Fixed telephony generated 42% of the income, while mobile telephony generated 16%. Income from other telecom and network services such as the Internet increased from 9% to 11% from 1996 to 1997. This represents a very modest increase compared to the rapid increase in Internet growth in 1999.

Telecommunications revenues per service in Sweden 1997

In percent of total revenues = 53.8 billion SEK

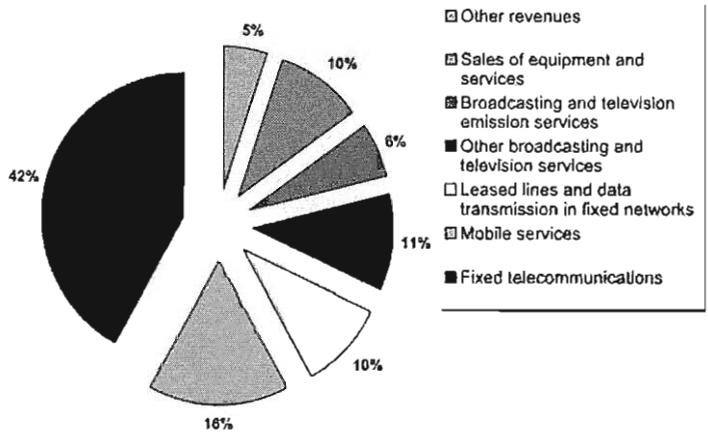


Figure 112: Fixed telecommunications generated 42% of the total telecommunications industry revenues in Sweden in 1997. Mobile telephony generated 16%. Leased lines and data services, including the Internet produced 11%. Broadcasting and television services amounted to 6%. Sales of products and services were 10% and the remaining 5% were generated by other services.

Sources: SIKA/Statistics Sweden

According to Statistics Sweden and the Swedish Institute for Transport and Communication Analysis, SIKA, the number of traffic minutes were almost 37 billion minutes in Sweden in 1997. The number of traffic minutes for mobile telephony was estimated to 2.6 billion.

For 1998 the Swedish analysts AB Stelacon estimated the national market for fixed telephony to a total of 25.5 billion SEK excluding the revenues for interconnections. This represents an increase of some 2 billion SEK compared to 1997. The market for mobile telephony was estimated to 10.5 billion SEK for the same year. EITO estimates the total Swedish telecommunications market including equipment, hardware, services, etc. to the equivalent of 6 311 000 ECU/Euro for 1999 and to 6 679 000 ECU/Euro for 2000. Competition for the subscribers to fixed telephony will develop gradually.

In April 2000, there were 13 operators offering fixed telephony services as defined by the Swedish telecommunications law. More detailed information is available at: http://www.pts.se.

Market value of fixed telephony per service area in Sweden 1994–1999

In percent of total value = 26 billion SEK

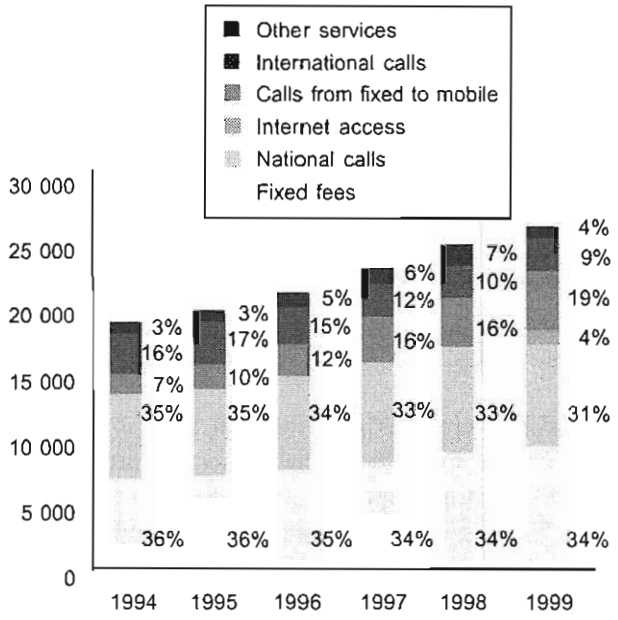


Figure 113: Fixed fees and national calls were still the major income generators in 1999. They generated 65% of total market value. But calls from fixed telephones to mobile ones and Internet access, generating in total 23% of the total market value in 1999, are likely to show the most rapid growth. Note that annual values do not add up to 100% due to: a) decimals are omitted, b) Internet connection fees are declared separately for 1999 only.

Source: PTS: Svensk telemarknad 1999

Telia's total market share is decreasing with the entry and growth of competing operators, just as predicted. The following figures are indicating the changes per market segment from 1994 to 1999.

Market shares per operator and fixed telephony market segment in 1998 and 1999
In percent of total values

Operator	National calls		International calls		Calls from fixed to mobile	
	1998	1999	1998	1999	1998	1999
	Value: 8.2 billion SEK	Value: 9 billion SEK	Value: 2.5 billion SEK	Value: 2.2 billion SEK	Value: 4.1 billion SEK	Value: 4.9 billion SEK
Telia	93%	86%	63%	62%	88%	80%
Tele2	3%	7%	15%	15%	7%	11%
Telenordia	1%	4%	4%	5%	2%	3%
RSLCOM	-	-	-	6%	-	-
GTS	-	-	-	-	-	2%
Others	3%	3%	18%	12%	3%	4%

Figure 114: The values for national calls and calls from fixed telephones to mobile ones are increasing, while the total value of international calls is decreasing. In each segment Telia is loosing market shares as competition becomes more established and the Swedish users more aware of the opportunities.

Source: The table is based on data from PTS: Svensk telemarknad 1999

Telia succeeded in keeping 86% of the total Swedish market for national calls in 1999 and 62% of the market for international calls. Tele2 is the second largest operator and Telenordia the third one. The following figure gives the change in fixed telephony from the first days of a reregulated Swedish market until 1998, to be compared to the figures above.

Fixed telecommunications market shares per operator in Sweden 1994–1998

As a percentage of the total market value = 25.5 billion SEK

Operator	1994	1995	1996	1997	1998
Telia AB	99%	96%	94%	92%	88%
Tele2	1%	4%	6%	6%	6%
Telenordia	0%	0%	0,5%	1%	2%
Others	0%	0%	0,5%	1%	4%
Total	100%	100%	100%	100%	100%

Figure 115: Competition for subscribers to main lines will develop gradually and Telia's total market share will decrease. Tele2 is the second largest operator in the segment for fixed telephony.

Source: Göran Hedström, AB Stelacon

Consultants of ÖhrlingsPricewaterhouseCoopers, PwC, carried out the yearly PTS telecommunications market survey in Sweden in 1998. According to PwC the total market value for fixed telephony to endusers was 25.05 billion SEK. This represents an increase of 7% over 1997. The total Swedish market for fixed and mobile telephone services grew by 15% between 1997 and 1998, and amounted to a total of 36.4 billions SEK. The market value of Internet access via modem for 1998 was 1.7 billion SEK and the market for net capacity reached 650 million SEK.

The market value of fixed telecommunications in Sweden 1994–1999

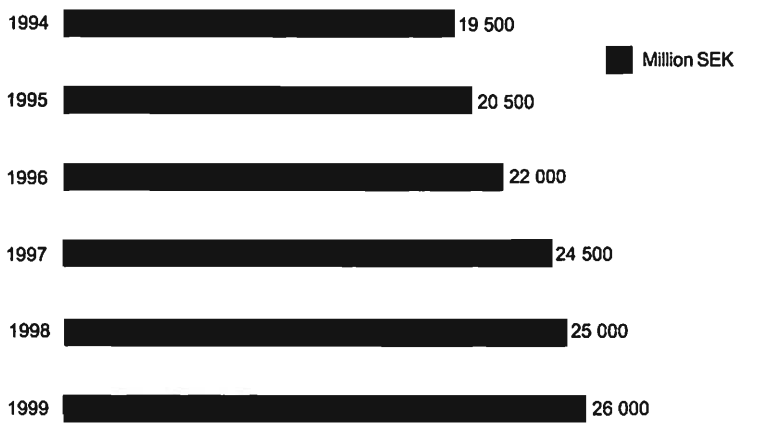


Figure 116: The total value of the Swedish market for fixed and mobile telecommunications services grew by 15% from 1997 and 1998 to a total of 36.4 billion SEK. In 1999 the equivalent value was 38.7 billion SEK. The figure shows the value of fixed telecom services to the endusers from 1994 to 1999 – the total value then was some 26 billion SEK.

Sources: PwC/PTS: Svensk telemarknad 1999

Fixed fees made up the largest part of the 1998 market value, 34% out of 25.02 billion SEK. Local calls generated 23%, long-distance calls 10%, international calls another 10%, calls to mobile telephones 16%. The remaining 7% were generated by "other services. From the ÖhrlingsPricewaterhouseCooper PTS report it is made clear that the non-competitive segments of the telecommunications market are the ones growing the fastest, i.e. services like local calls and services paid for by fixed fees. Telia AB was dominating in both these segments, resulting in a growth of Telia's total market share during 1998 as compared to 1997 as is shown in the following figure.

Telia stronger in the Swedish market in 1998

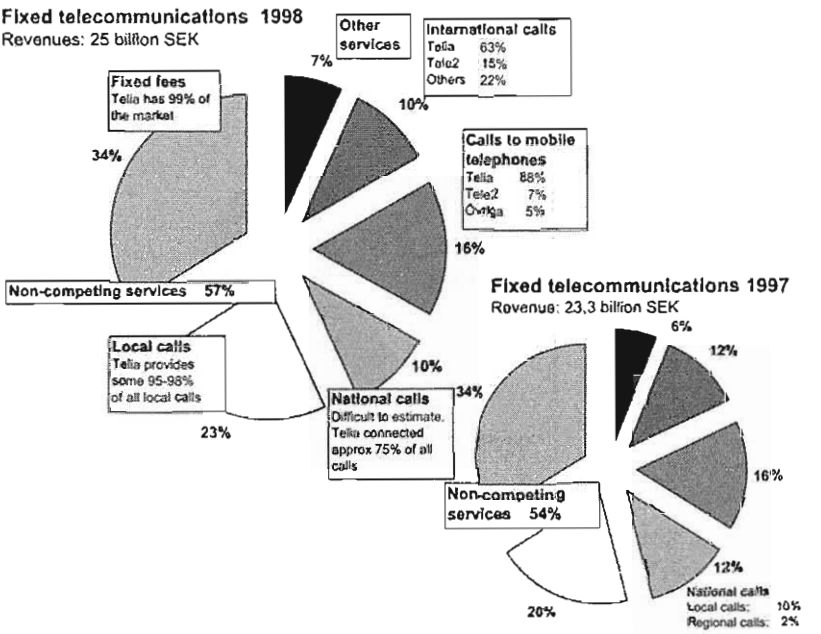


Figure 117: During 1998 Telia grew stronger in the Swedish market, basically due to the growth of two non-competing areas, fixed charges and local calls. The reason for this is that there were no regulation of the access networks, all owned by Telia. New regulation has taken care of the matter.

Sources: ÖhrlingPricewaterhouseCooper/PTS/Computer Sweden # 68, Friday, July 16th, 1999

There were some 6 000 000 fixed telephone subscriptions in Sweden by the end of 1999. Four million private users, and two million corporate users had subscriptions. There were about 140 000 corporate switches. In spite of Swedes being offered a choice of several operators, the great majority still have Telia as their preferred operator. 4 000 users are direct subscribers to other operators, some 2 000 private ones and 2 000 corporate ones. By the end of 1998, there were about 750 000 indirect subscribers to other operators than Telia and by the end of 1999, 1.4 million Swedes had indirect subscriptions to other operators than Telia. The indirect subscriptions are distributed among the operators as follows:

Distribution of subscriptions for indirect connection for fixed lines in Sweden in 1999

As a percentage of the total number of subscriptions = 1.4 million

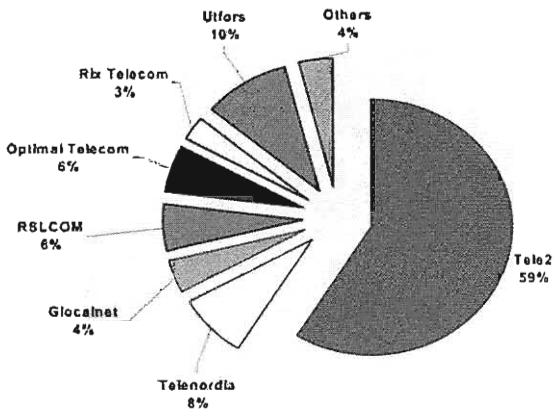


Figure 118: Tele2 had 59% of the 1.4 million indirect subscriptions to fixed telecom by the end of 1999. Utfors had 10%, Telenordia 8%, Optimal Telecom and RSLCOM had 6% each, Glocalnet 4%, Rix Telecom 3% and other operators in total 4%.

Source: PTS: svensk telemarknad 1999

In spite of not all regulation being in place, historically Sweden has done fairly well in international comparisons regarding prices for fixed telephony. According to the OECD Sweden had the fourth lowest pricing for professional subscribers in August 1998 among the 29 OECD countries. And the tariffs for private subscribers also were the fourth lowest. The following figures show the tariffs for professional and private subscribers in the OECD countries in August 1998. It is cheapest to make calls in Iceland and most expensive to call in Mexico. Data in the following figures are calculated before taxes, based on PPP, purchasing power parities, in US$.

Corporate tariffs within the OECD in August 1998
Before taxes, in US$, based on PPPs (purchasing power parities)

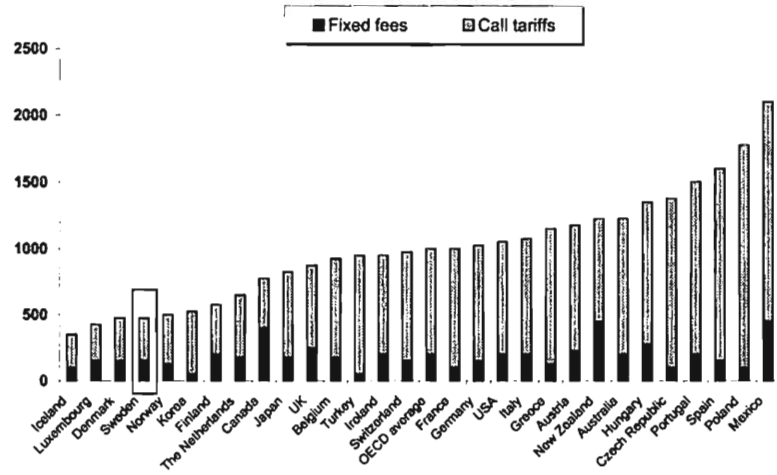


Figure 119: The total costs for fixed telephony in Sweden i.e. fixed charges + telephone minutes, are the fourth lowest for corporate users within the OECD.

Sources: OECD/Eurostat

Swedish private subscribers to fixed telephony had the fourth lowest total costs according to data from Eurostat and OECD in August 1998. The data in the following figure are calculated before taxes, based on PPP, purchasing power parities, in US$.

Private subscriber tariffs within the OECD in August 1998

Before taxes, in US$, based on PPPs, (purchasing power parities)

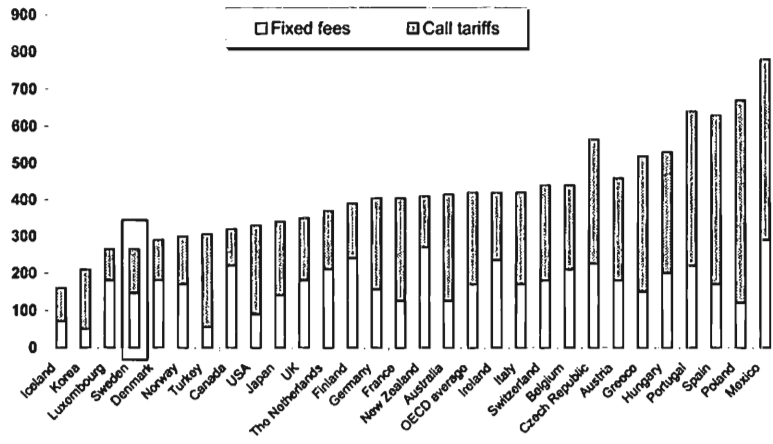


Figure 120: Swedish private subscribers to fixed telephony access have the fourth lowest total costs within the OECD nations. The data are from August 1998.

Sources: OECD/Eurostat

The pricing picture for Swedish users of the Internet is not as favorable in an international comparison as the one for fixed telephony. In the Eurostat/OECD survey from August 1998 Sweden was the eighth cheapest nation. In a survey from March 2000, Sweden in right in the middle of the 29 OECD nations. The differences in Internet tariffs for private users are amazing. In August 1998 a user in Finland paid less than 20US$, while a user in Germany and the Czech Republic paid almost four times as much, 68 US$ in Germany, and 73 US$ in the Czech Republic. The following figure irefers to data from August 1998.

Internet tariffs within the OECD in August 1998

Off peak time tariffs, in US$, based on PPPs (purchasing power parities)

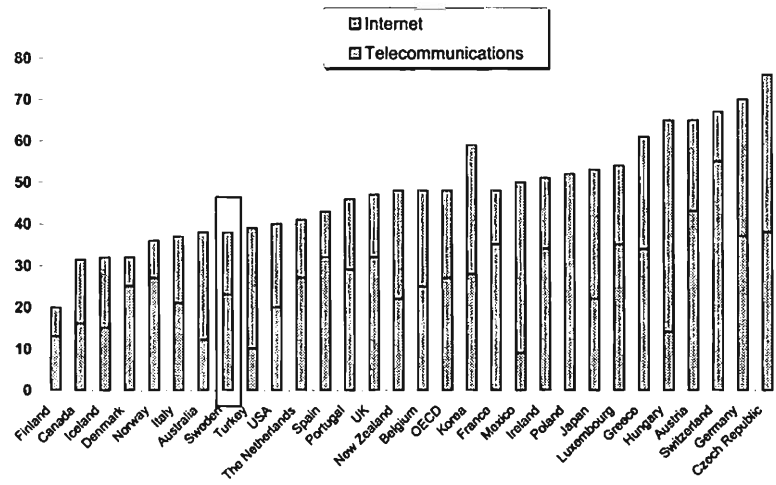


Figure 121: Internet tariffs for private users within the OECD countries, in US$, based on PPP (purchasing power parities). There are larger differences for the Internet users across the nations than there is for fixed telephony.

Sources: OECD/Eurostat

From August 1998 to March 2000 several of the countries having high Internet tariffs in 1998 have lowered their tariffs, while Sweden has stayed at the same tariff level. Thus Sweden finds itself in the middle of the list over tariffs in March 2000. This in spite of the fact that more than half of the Swedish population use the Internet.

Internet tariffs within the OECD in March 2000
Costs for 40 off-peak hours of Internet access in US$

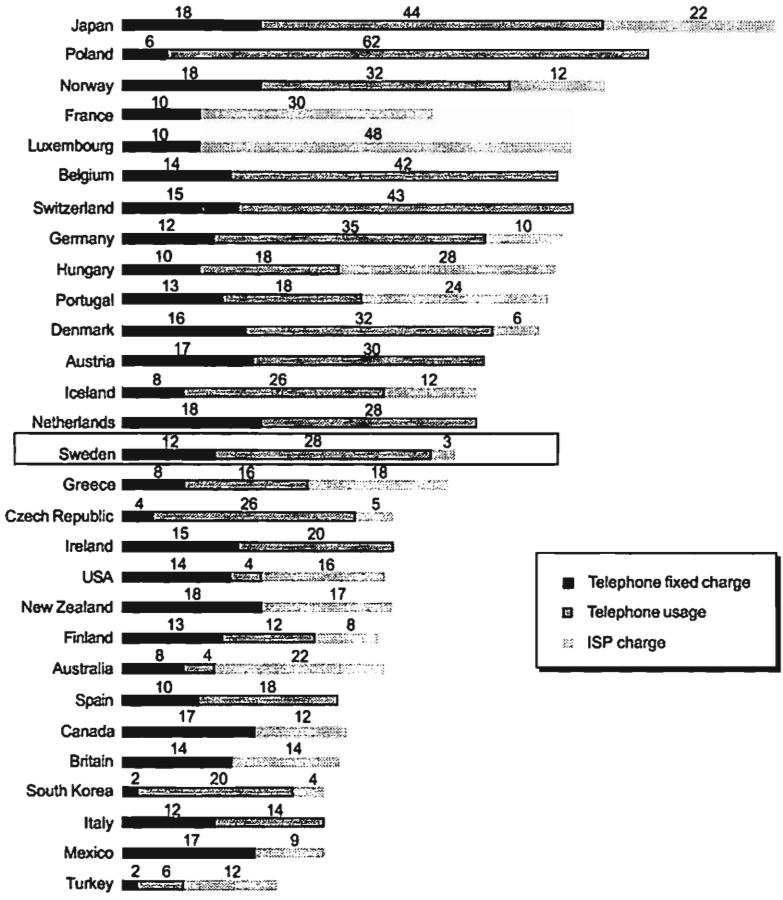


Figure 122: The three main components of the Internet charges in the OECD countries are a monthly fixed fee of a telephone subscription, charge for telephone usage, and charge for Internet access. In the United States, Canada, Mexico, Australia and New Zealand users pay only a fixed charge for any amount of time of Internet access. In this comparison, Internet tariffs in Sweden are comparatively high.

Sources: The Economist, March 18th 2000/OECD

In 1998, the Australian Productivity Commission, a government agency, made a benchmarking study of the telecommunications industry in nine nations, including Sweden. The report is called *"International Benchmarking of Australian Telecommunications Services"* and is among other things comparing tariffs for different segments of the telecom market in the nine nations – Finland, Sweden, UK, Australia, Canada, France, Japan and New Zealand. The following figure from the report shows the costs of local telecom services for private subscribers. The costs are related to price index. Local phone services are the cheapest in USA. The inhabitants of Finland and Sweden enjoy the second and third lowest costs. People living in New Zealand pay nothing at all for local calls and for Internet access only a fixed fee. This is however higher than the total price paid by Finns and Swedes, fixed charges, local call charges, and Internet access included.

Comparison of local telecom tariffs in 9 nations, February 1998

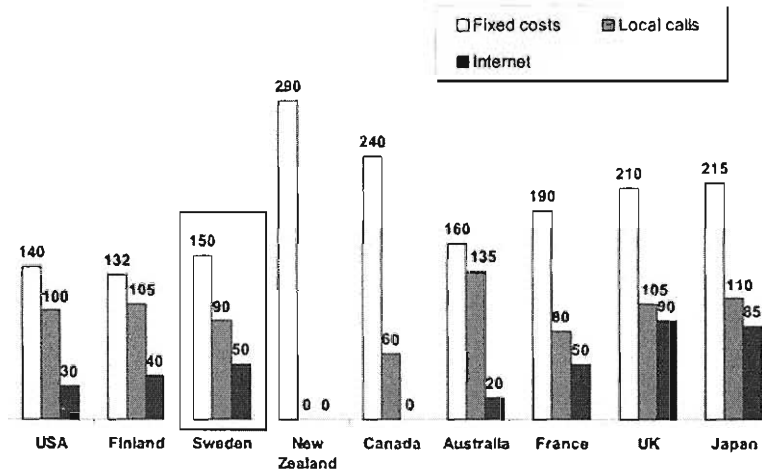


Figure 123: A Swede had the third lowest costs for local telecom services according to the Australian Productivity Commission and its benchmarking report.

Source: International Benchmarking of Australian Telecommunications Services, Reseach Report, AusInfo, Melbourne, and March 1999

The report of PTS on the status of telecommunications in Sweden in 1998, the ÖhrlingsPricewaterhouseCooper's one, states that the value of mobile telecommunications service to the endusers was 11.4 billion SEK. This represents an increase of 35% from 1997. By the yearend 1998 there were 4 108 000 mobile telephone subscriptions in Sweden. This is 939 000 subscriptions more that 1997, or an increase by 30%. Mobile telephones with prepaid cards represented 25% of the total numbers by the end of 1998.

By the end of 1999, the number of subscribers to mobile telephony had grown to 5.1 millions, i.e. the annual growth in real figures was one more million subscribers. GSM services are available all over the country. The value of the total market for mobile telephony was 17.7 billion SEK by the end of 1999. 2 000 000 users had prepaid cards. By the end of Q1 2000, there were 5.4 million users of mobile telephones in Sweden.

Mobile telephony subscribers in Sweden 1994–2000

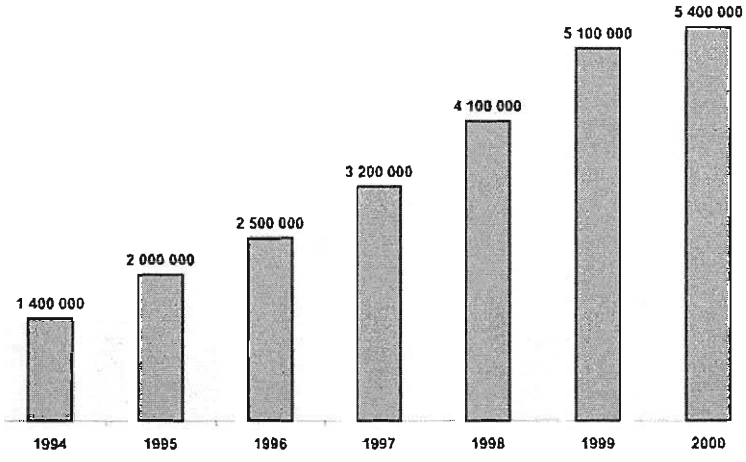


Figure 124: By the end of 1999 the penetration rate for mobile telephones was 57%. By the end of Q1 2000 the penetration rate was 60%. I.e. 60% of the total Swedish population have a mobile telephone. From 1994 to Q1 2000 4 million Swedes have become mobile telephone users.

Sources: ÖhrlingPricewaterhouseCooper/PTS

The market share for mobile telephony of the three major operators, Telia AB, Netcom/Comviq, and Europolitan changed rather insignificantly from 1998 to 1999. Telia had 54% of the market in 1998, 51% in 1999; Netcom/Comviq 31% in 1998 and 32% in 1999; Europolitan had 15% in 1998 and 17% in 1999.

Market shares of Sweden's major mobile operators in 1998 and 1999

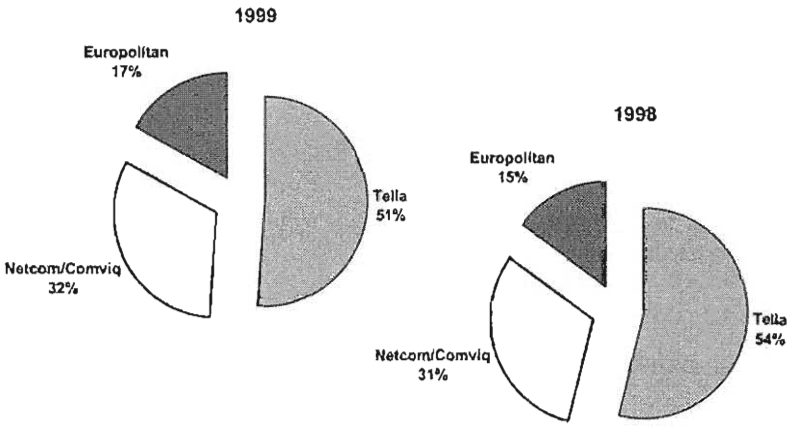


Figure 125: In spite of the rapid growth of the total market for mobile telephone services in 1998 and 1999 the relative distribution of market shares in per cent between the three major operators changed only little.

Sources: Several/Svenska Dagbladet, Näringsliv, Friday March 3rd 2000

PTS reports that the license area that has grown the most is the one for network capacity. In April 1998, 39 companies were registered as network operators. From January 1998 to May 1999 the number of companies having notified PTS about later applications for licenses increased from 33 to 97. Most of these notified for network capacity, in total 60 companies. Notifications for telephony services grew from 15 to 34, for mobile services from 7 to 9, and for other telecommunications services from 10 to 22 during the same period.

Licenses granted by PTS in December 1998

Fixed telephony services	Mobile telecom services	Fixed lines/-network capacity
Telia AB	Telia AB	Tele2 AB
Tele2 AB	Europolitan AB	Global One Services AB
Global One Services AB	Tele2 AB	Telia AB
MFS WorldCom AB	Telia AB (TFTS)	Banverket RSLCOM
Sweden AB	Telia AB (ERMES)	MFS WorldCom AB
Stjärnan Multimedia Invest AB	Tele Danmark int. (ERMES)	Telenordia AB
Telenordia AB	Netcom Systems AB (GSM 1800)	Sonera Sverige AB
Facilicom International Sweden AB	Telia AB (GSM 1800)	AB STROKE
Tele 1 Europe AB	Europolitan PCN AB (GSM 1800)	
Sonera Sverige AB	Tele8 Kontakt AB (GSM 1800)	
TeliTel AB		
CalMedia Telecom CMT AB		
Netnet International S.A.		

Figure 126: Companies holding operating licenses in Sweden by the end of 1998.

Sources: ÖhrlingPricewaterhouseCooper/PTS

An interesting development regarding infrastructure is taking place in Sweden as a direct result of the government's desire to push broadband capacity to all homes and to place Sweden permanently on the map as one of the world's leading IT nations as reported earlier in this chapter. In March 2000 the government filed its IT proposition to the parliament. One part of the proposition is that every Swede should be able to connect to broadband Internet from just about any place in the country.

Broadband has been discussed for at least three years as an opportunity for Sweden to grow in the IT industry. And in many communities various actors are already developing local broadband networks. Electricity producers are offering their clients telephony and Internet access via their networks and grids. Construction companies include broadband into their new apartment houses. Cable TV providers offer broadband services via their networks. So called city networks are providing broadband services to local communities all over Sweden.

Among the local electricity boards developing new services, half of them are owned either by local councils or by private entities. Swedish companies and organizations owning network capacity in the form of either copperbased networks, fiber based networks, radio linked networks or satellite based networks are presented in the following figure. The turnover figures are from 1997, in million SEK. "Black fiber" simply means empty fibers, i.e. fibers not utilized for information transmission or communication.

Swedish owners of network infrastructure
Turnover in million SEK

Company	Networking capacity for sale		Turnover 1997 (million SEK)	Technologies
	Black fibre	Other type of capacity		
Telia	Yes	Yes	>1 500	all
Banverket	No	Yes	105	fibres
STOKAB	Yes	No	50	fibres
Svenska Kraftnät	No	No	30	fibres
Teracom	No	Yes	20	radio link
Rymdbolaget	Yes	Yes	15	satellite
Local councils (10)	Yes - partly	Yes - partly	<15	fibres and other
Sydkraft	Yes - partly	Yes	<10	fibres
Vattenfall	Yes	No	<5	fibres

Figure 127: Swedish organizations owning net capacity either copperbased networks, radio linked networks, fiber based networks or satellite based networks and their turnover in 1997.

Sources: PTS/AB Stelacon: Kartläggning av den svenska telekom-marknaden 1998

Operators leasing networking capacity in Sweden
In million SEK

Company	Networking capacity for sale		Turnover	Service
	Black fibre	Other type of networking capacity	1997 (million SEK)	
Telecom Finland	No	Yes	<10	network leasing
MFS Worldcom	No	Yes	<5	network leasing
Global One	No	Yes	<5	network leasing
Telenordia	No	Yes	<5	network leasing

Figure 128: Some of the companies offering their customers leased connections at transmission speeds below 2 Mbit/sec. These companies do not have an infrastructure of their own. The turnover is for 1997.

Sources: PTS/AB Stelacon: Kartläggning av den svenska telekom-marknaden 1998

In 1996, Telia AB had 71% of the total telecommunications market in Sweden. The three largest operators after Telia were Comviq, Tele2 and Europolitan. Together they had 9% of the market while other operators had the remaining 20%.

Swedish telecom operators in 1996
In percent of total market value = 45 billion SEK

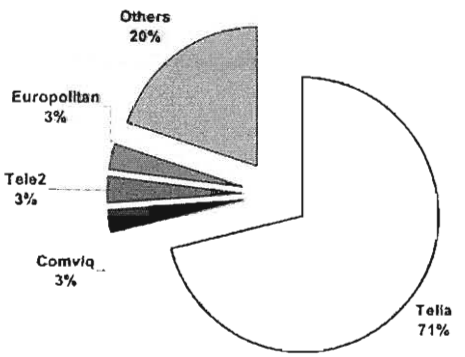


Figure 129: The market shares of the leading telecommunications operators in Sweden in 1996. Telia was dominant having 71% of the market.

Sources: AB Stelacon/PTS

Also in 1996 there were 20 operators having the PTS license to work a telecommunications operators in the country. Their accumulated turnover was 36.6 billion SEK. In total 103 companies kept busy in the telecom market during the year. They generated an accumulated turnover of 45 billion SEK.

Licensed telecommunications operators in Sweden in 1996
Turnover in million SEK

	# of companies	Turnover 1996
Licenced companies according to PTS	20	36 600 million SEK
Companies with similar activities	14	1 000 million SEK
Other companies adhering to the SNI-kod 642	69	7 400 million SEK
Total	103	45 000 million SEK

Figure 130: In 1996 there were 20 companies having PTS licenses to function as telecom operators in Sweden. The figure shows the number of companies having licenses, those reporting similar services, and those adhering to the SNI code 642.

Sources: AB Stelacon/PTS

The size of the turnover of the operators in the Swedish market tells its own story. Among the 103 companies having applied for PTS permits and licenses in 1997, there were two having a turnover larger than one billion SEK, Telia AB and Tele2. The following group had turnovers from 50 to 200 million SEK, while the vast majority turned over less than 50 million SEK.

Telecom operators in Sweden according to turnover in 1997

Two operators had a telecommunication services turnover larger than 1000 million SEK in 1997:

Telia AB
Tele2 AB

These operators had a telecommunication services turnover between 50-200 million SEK in 1997:

Telenordia AB
Global One Services AB
Telecom Finland AB
MFS Communications AB (MFS WorldCom AB)
RSLCOM Sweden AB
NetSource AB (telecommunication services broker, needing no licence)

These operators had a telecommunication services turnover of less than 50 million SEK in 1997:

NETnet International S.A.
Nordiska Tele8 AB
Tele 1 Europe AB
TeliTel AB
CallMedia Telecom CMT AB
Singapore Telecom Int. Sv. AB
Viatel Sweden Inc
Linenet Oy
Oy Finnet International AB
NetSystem International AS
T.M.I. Sweden
Europolitan AB
Long Distance International Ltd
GLOCALNET AB
Utfors Datakommunikation AB

Figure 131: In 1997 the majority of the telecommunications operators in the Swedish market had an annual turnover of less than 50 millions SEK.

Sources: PTS/AB Stelacon: Kartläggning av den svenska telekom-marknaden 1998

The financial success of an operator can no longer be deduced from the number of subscribers it has. Neither can success be measured in "traffic minutes" and similar esoteric measurements of the past centuries. Success has to be judged by the more precise measurement *"revenue-per-subscriber"*. So far few data based on this measurement exist, but they will be frequent in the future. Until then we will have a look at the development of fixed telephony tariffs in

Sweden, such as it has been with Telia from 1994 to 1998. Tariffs for long distance calls halved during the period in order to be replaced by local tariffs early 2000. On the other hand, local tariffs more than doubled. The reason for this development is the tough competition in the market segments of long-distance and regional calls, which have been open to competition, while local calls have not been subject to any competition at all until the LLUB (Local Loop Unbundling) was applied. Moreover, the fact is tariffs in Sweden generally are so low that the margins for the operators are too small – some have already left the Swedish market.

Tariff development for fixed telephony at Telia 1994–2000

Average price per minute for calls lasting five minutes, in SEK

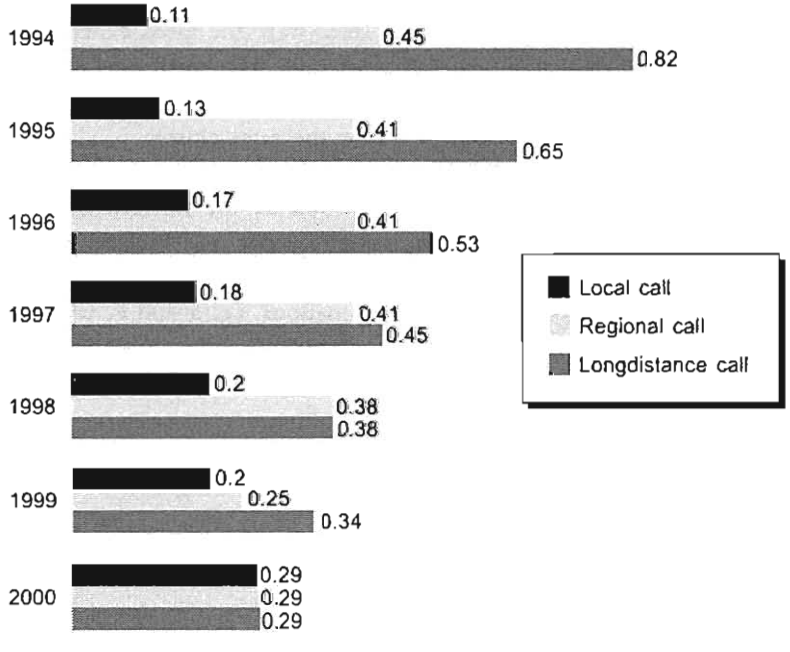


Figure 132: The figure shows the development of tariffs for fixed telephony at Telia from 1994 to 1998. Early 2000 all calls within the country have one tariff the local call tariff.

Sources: Telia AB/AB Stelacon/PTS

The data in the following figure show the measures taken by Telia in order to adapt the fixed telephony tariffs for different types of calls. This can be compared to the previous figure. Since then, Telia have introduced the same tariffs for all calls within the national borders. This happened early 2000. All tariff comparisons show the obvious relation between competition and tariffs. For the period described in the figures, 1994 to 1998, it is evident that long-distance calls have become cheaper while local calls have become more expensive and regional calls have fluctuated down and up. The ÖhrlingsPricewaterhouseCooper 1998 report makes it very clear: the areas without free competition, local calls and the fixed charges, generate 57% of the total turnover for fixed telephony. In these segments Telia still had an "almost" monopoly position. The two segments have not diminished in importance in spite of competition. In a study presented by Svenska Dagbladet Näringsliv on August 26 2000, it was reported that Telia and Tele2 were the most expensive operators in Sweden on all categories of calls. The small operators had the best offers, but since the tariffs are very volatile at the moment, the consumer is adviced to follow the rates closely.

The following figure shows the monthly costs in € for leasing a 2 Mbps connection, covering 300 km in some of the Western European nations. The costs are before taxes. Sweden and Finland have the lowest charges. Among the sixteen nations compared, half are charging more than the average for the nations, i.e. 5 300 €, while the other half is charging less for broadband access.

Leased broadband charges in Europe, February 1999
Monthly charges for a 2 Mbps transmission line over 300 km, in €

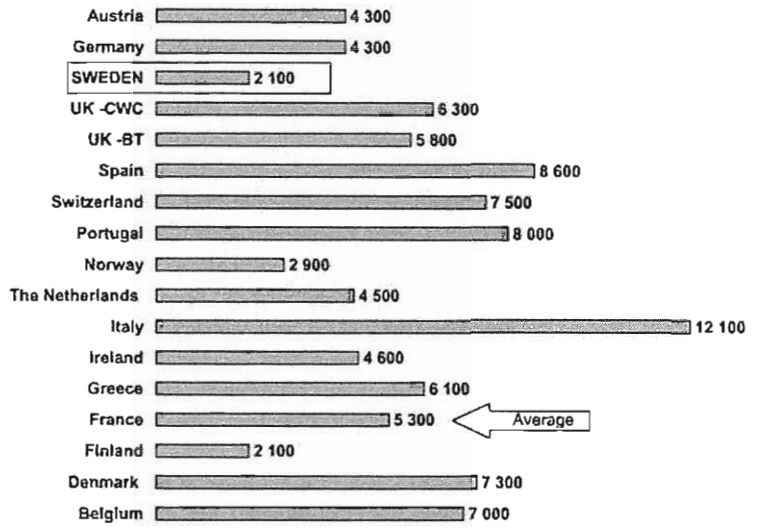


Figure 133: Half of the sixteen European countries compared in the figure above have monthly charges for broadband transmission exceeding the average charge, 5 300 €, while the other half charges less than the average. The comparison is made for transmission rates of 2 Mbps over 300 km.

Sources: Public Network, February 1999/Eurodata Foundation

To conclude, there is no doubt the development in the Swedish telecom market is just as rapid as in the rest of the world. Some small and recent changes indicate that the Swedish telecom market is one of the liberalized ones. So, for instance, on September 11 1999, Sweden changed its prefix for international calls from 009 to 00, which is the international standard. More important is that during the autumn 1999 the Swedes finally got an opportunity to choose their preferred telecom operator. The different operators have prefixes made up of four figures, all starting in 95. According to the PTS, there were 16 operators to choose from, available to the private subscriber.

Telecom operators available to private subscribers in Sweden, July 1999

CNE Affärskommunikation
Global One
GTS Sverige AB
NETnet AB
Optimal Telecom
Rix Telecom AB
RSLCOM Sweden
Stockholm Telecom/Glocalnet AB
Tele 1 Europé
Tele 2
Tele8/Facilicom International
Telegroup Ltd/NemTel
Telenordia
Telia
Telitel AB
Utfors Datakommunikation

Figure 134: When the Swedes finally had their own choice of telecom operator in July 1999, there were so many offers from the operators that it was difficult to evaluate and compare the services offered. According to some sources, 75% of the subscribers for fixed telephony made an active choice.

Source: PTS

In July 1999, number portability became regulated by law. By January 1, 2000, full number portability must be applicable to fixed telephony in Sweden.

11. Mobile Telephony

In April 2000, there where four mobile network telephony operators in Sweden: Telia AB, Europolitan AB, Tele2 AB and Tele Danmark International AB.

By the end of Q1 2000 together they provided 5 400 000 Swedes with mobile NMT and GSM services all over the country. The penetration rate was 60% of the total population. 2 000 000 users had pre-paid card phones. In 1999, some 1.75 million mobile telephones and about 1 million new subscriptions were sold in Sweden. The total market value was some 17.7 billion SEK by the end of 1999. Total income from interconnect services was 5 billion SEK, or 28% of the total income. The market grew by 18% over 1998. Two more GSM licences will be distributed to other GSM operators during the fall of 2000 by the PTS. The market value per operator is shown in the following figure.

Total market value of mobile telecom services in Sweden 1994–1999
Per network operator

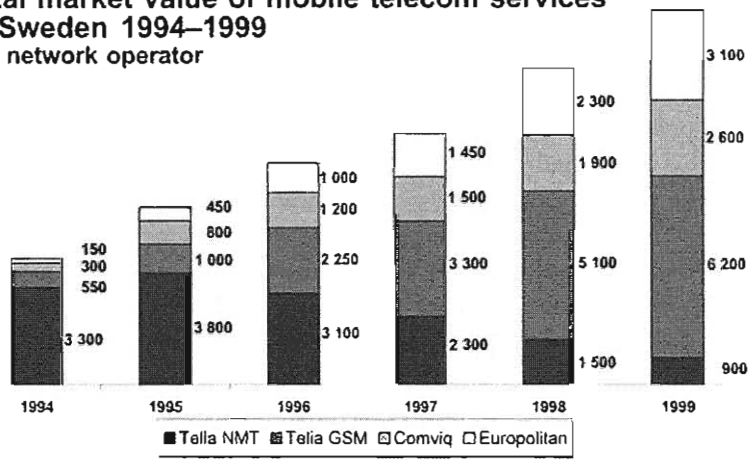


Figure 135: The total market value of mobile telecom services in Sweden for 1999 was 17.7 billion SEK. The figure shows the distribution of the market share of the total value per network operator. Note also that values are given for the two networks run by Telia, NMT and GSM. The NMT is in the process of being discontinued.

Source: PTS: Svensk telemarknad 1999

Since May 1, 2000, mobile network owners are by law required to sell any free network capacity to those requesting it. This is order to open the Swedish market to so called Service Providers. In April 2000 there were three providers of mobile services without their own networks:

Tele1 Europe
Wireless Maingate
Sense Communications

The market analysts at AB Stelacon estimated that 40% of the Swedish population had a mobile telephone by the end of June 1998. This translates to 3 561 000 subscriptions in real numbers, the total population amounting to 8.8 million at that point of time. In the case it is preferable to include grow-ups only, the penetration reaches 60% according to the same analysts. According to Telia AB, 60% of the total population had a mobile telephone in September 1999. By the end of 1999, there were 5 125 000 mobile telephones in Sweden. 4 065 000 were regular subscriptions, 1 060 000 were mobile telephones with pre-paid cards. By the end of Q1 2000, there were 5.4 million users. An interesting fact is that the utilization of pre-paid card phones increased very rapidly towards the end of 1998. By then there were some 3.8 millions mobile telephones in Sweden. 700 000 users had pre-paid card phones, replacing traditional subscriptions. Once the pre-paid card is finished it can either be replaced or reloaded. By the end of 1999 there were 2 million users with pre-paid card phones out of a total of 5.1 million active mobile phones as already mentioned above.

The following figure shows the number of subscribers per operator – there were three operators of mobile telephony networks in Sweden by the end of 1999, Telia, Netcom/Comviq and Europolitan, all of them offering GSM services. Telia was by far the dominant operator, having almost one million more subscribers than number 2, Netcom/Comviq. The data are shown for subscribers and users of pre-paid cards.

Mobile users per operator in Sweden 1998 and 1999
Total number: 5.125 million

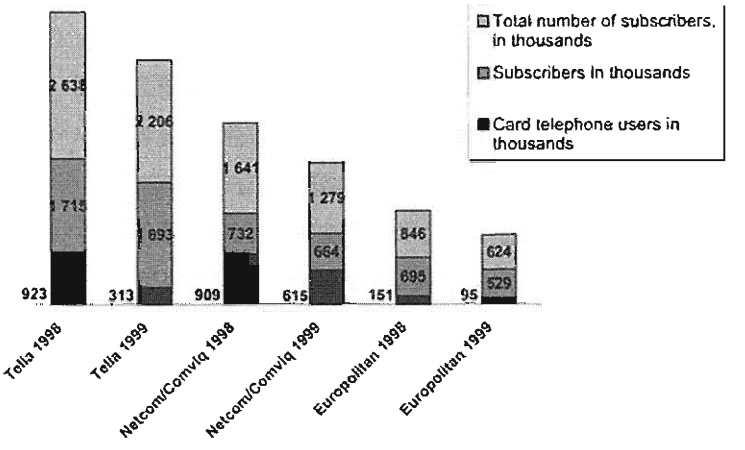


Figure 136: Mobile telephone users in Sweden by December 1998 and 1999 per operator, and the distribution between subscribers and pre-paid card users.

Sources: Several/Svenska Dagbladet, Näringsliv, Friday March 3rd, 2000

By the end of 1997 Sweden had 3.1 million mobile telephones according to ITU. Another source, *Mobile Communications* reported that more than half of the Swedish population had a mobile telephone by the yearend of 1998. Sweden became the second country in Western Europe after Finland to reach a level of penetration of more than 50% of the population, 51.1% to be precise, which could be compared to 57.8% for Finland. In these two countries as in numerous others the mobile telephones are growing faster than the fixed ones, and mobile phones are growing more frequent than fixed ones.

The following figure shows the growth of the number of mobile subscribers in Sweden from December 31 1994 until December 31, 2003 in a Stelacon projection made in 1998. The Swedish households would have some 4.4 millions of mobile telephones, and there would be another 500 000 machine-to-machine connections by the end of 2003. This projection should be compared to the data from December 1999 – 5.1 million mobile telephones in Sweden! It is difficult to predict the future!

Estimated mobile telephone subscribers in Sweden 1994–2003

Total number of subscribers per December 31

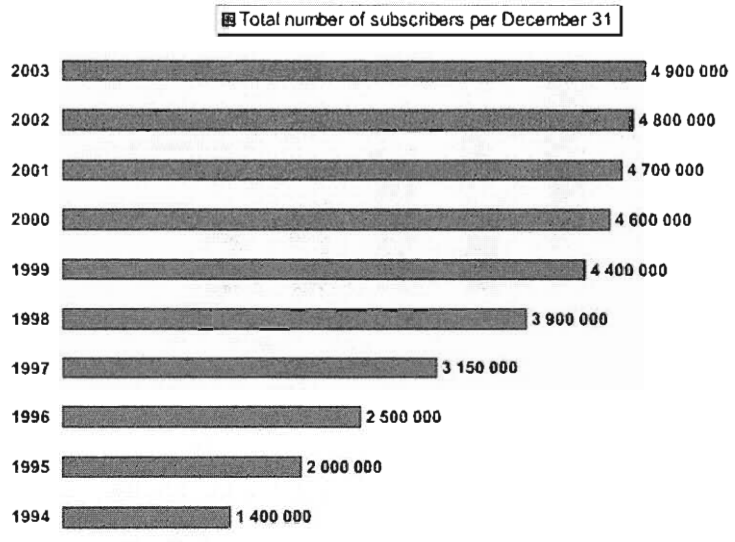


Figure 137: The growth of the total number of mobile telephones in Sweden in actual numbers from December 31 1994 to December 31 1998. The numbers from 1999 to 2003 are estimates as seem in 1998 by analyst Göran Hedström, AB Stelacon.

Source: AB Stelacon, Göran Hedström

The annual net growth of mobile subscriptions in Sweden from 1994 to 2003 in real numbers, the data from 1999 to 2003 being estimates, as seen by Stelacon is shown in the following figure. For 1999 the analysts predicted a decrease in actual numbers of new subscriptions as a result of the previous very high penetration rate and as a consequence, a certain market saturation. Another factor leading to this projection was the fact that no major breakthrough services were seen in the pipeline.

Annual net growth of mobile telephone subscriptions in Sweden 1994–2003

In actual figures and as a projection for 1999 to 2003

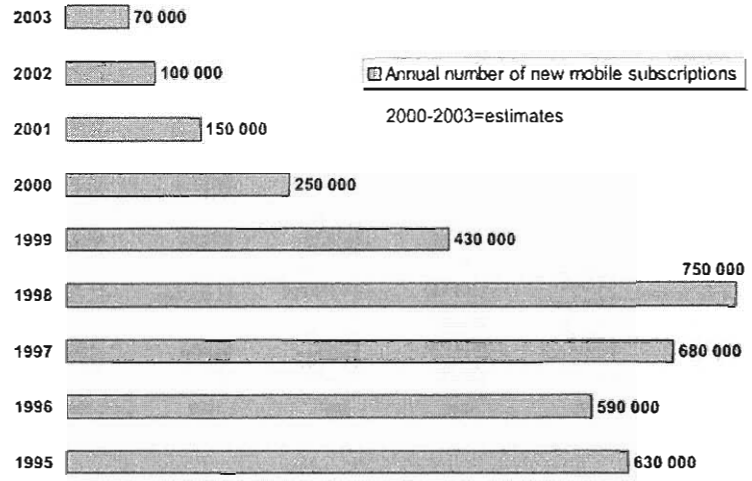


Figure 138: The annual net growth of mobile telephone subscriptions in Sweden from 1994 to 2003, the data for 1999 to 2003 being estimates. In actual numbers according to the market analysts of AB Stelacon.

Source: AB Stelacon, Göran Hedström

The following figure differentiates between the two mobile systems operated by Telia, the NMT and the GSM systems. The reader is reminded that the NMT system is being phased out and taken out of operation during 2000. Thus the differentiation has little interest for the future but for those interested in technology history. In reality there are two analog NMT systems, both run by Telia Mobile. NMT is short for Nordic Mobile Telephony. The first one, NMT 450 operating in the 450 MHz band, was launched in 1981. By the beginning of 2000 there were some 260 000 subscribers. NMT 450 has nationwide coverage and is used in little populated areas and by boating people. It will be in operation at least until 2004. The second analog system, NMT 900, operating in the 900 MHz band, was introduced in 1986. It will be taken out of operation by the yearend 2000, one reason being that it uses the same frequency as the digital GSM systems that operate in the 900 and the 1800 MHz band. In September 1999 there were 395 000 subscribers in Sweden to the NMT 900 system.

Market share per mobile network operator in Sweden 1994–1999

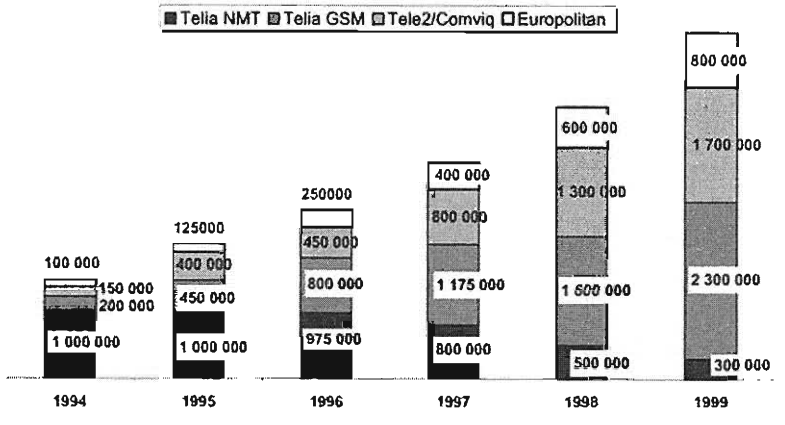


Figure 139: This figure shows the changes in market shares of the mobile telephony network operators from 1994 to 1999. Pre-paid telephones are included. The Telia market share includes the two NMT- systems, one of which is being discontinued as of 2000, and the GSM network. It is the NMT 900 system that will be discontinued.

Source: PTS

In the near future, the third generation mobile systems, including UMTS and WAP telephony, will be introduced to the mass market. By 2003 there should be fully implemented nation wide UMTS networks if the PTS' conditions for giving away UMTS licenses are fullfilled.

According to PTS, the National Post and Telecom Agency, the Swedish Consumer Agency, Konsumentverket, and the Swedish Competition Authority, Konkurrensverket, the costs for mobile subscriptions as well as the costs for mobile calls are far too high in Sweden. Competition between the three operators is not working as desired. It is more expensive for the Swedes to make telephone calls to and from their mobile phones than it is for the inhabitants of the other Nordic countries. The three agencies formed a group to investigate and analyze the reasons for the situation. This was announced by the Stockholm-based morning paper *"Dagens Nyheter"* on March 31st 1999. The collaboration between the agencies resulted

in a report – in Sweish only – called *"Den svenska mobiltelemarknaden ur ett konsument- och konkurrensperspektiv"* (the Swedish mobile telephony market as seen from a consumers' and a competitive perspective, in very rough translation).

Telia's tariffs for mobile services 1995 – May 2000

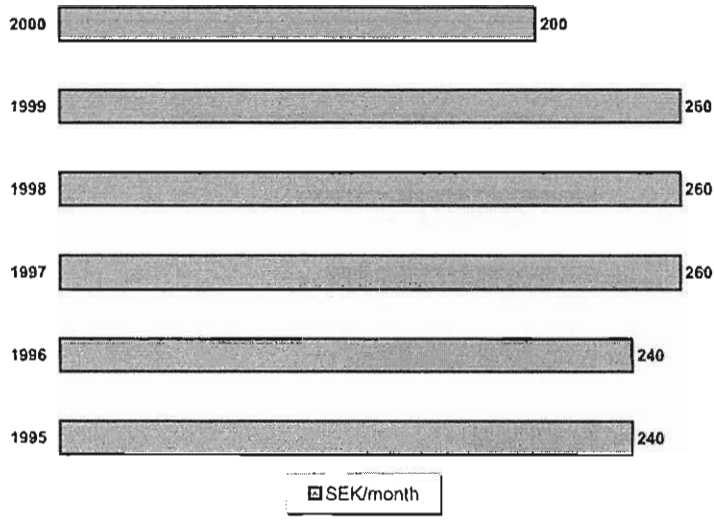


Figure 140: The figure shows the charges per month for mobile telephony services offered by Telia to an average small user during the period 1995 to May 2000. "An average small user" is identified as a person using her/his mobile for 60 calls a month.

Source: PTS: Svensk telemarknad 1999

Early March 2000 the three operators in the Swedish market announced that they are restructuring their tariffs. Telia lowered their tariffs for calls from fixed phones to mobile ones by introducing operator independent tariffs. Europolitan also reviewed their tariffs. More is likely to happen to the Swedish mobile tariffs during the coming months.

Tariffs for SMS, Short Message Service, are also high in Sweden, 2.5 SEK per message, in international comparison – see following figure. Competition had some effect during the second quarter of 2000, when Sense entered the market, offering a tariff of 1.50 SEK per messsage. We are likely to see more competition in this area.

Tariff index for SMS in selected countries 1999

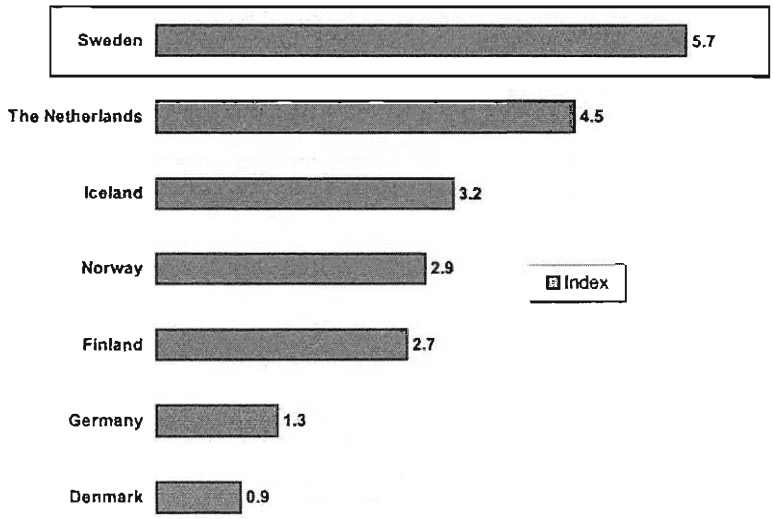


Figure 141: This tariff index for SMS in selected countries in 1999 shows very clearly the high costs for SMS in Sweden in an international comparison.

Source: PTS: Svensk telemarknad 1999

According to the EU Commission report on mobile telephony penetration in 1998, Sweden was ranked number two as the nation having the second highest level of mobile penetration. 60.4% of the population had a mobile phone according to this report. Only Finland had a higher penetration rate, 64.4% of the Finnish population used mobile telephones.

Selected populations having mobile telephones 1993–1998

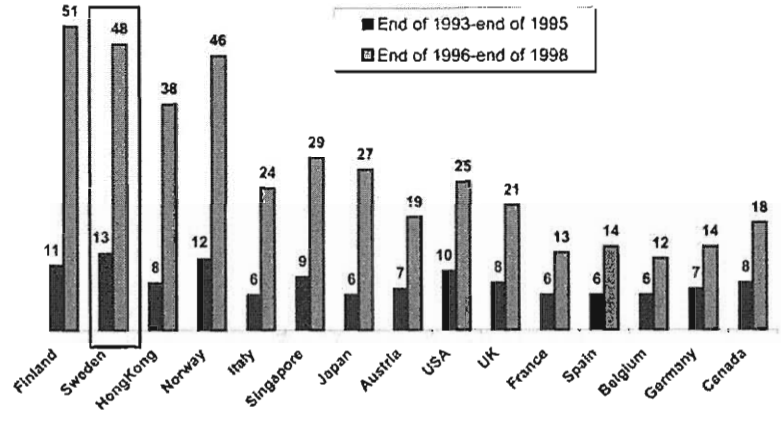


Figure 142:These data from selected countries having high levels of mobile telephone subscriptions give the penetration in percent of the total populations at two periods of time, from the end of 1993 to the end of 1995, when few countries had penetration levels above 10%, and from the end of 1996 to the end of 1998, when Finland, Sweden and Norway had penetration rates of almost 50%, Finland having 51%. The growth rate was largest in these three countries.

Sources: Nokia/Financial Times/CBR Special Report Series

Development of third and future generations of mobile communications is concentrated to Sweden's Mobile Valley situated just north of Stockholm. But R&D is going on in many other locations as well. See part III. UMTS licenses were to be granted in November 2000 by PTS.

12. Internet Access, CaTV, Digital TV, Satellite Communication, Radiobased Networks

The Internet can be accessed via several technologies – leased fixed line, PSTN, ADSL, ISDN, CaTV, radio link, just to mention a few access methods. By the end of 1999, there were 3 800 leased fixed lines for Internet access and 2 million modem based Internet accesses in Sweden. 400 000 were subscribed to by companies and organizations, 1.6 million were subscribed to by households. 150 000 of these were ISDN connections, the rest PSTN ones. According to analysts at Stelacon, 74% of all Swedish corporations had Internet access by the beginning of 2000, and 45% of all households had their own Internet accesses. The growth rates over the previous year are more than 50%. The total value of the market was 2 billion SEK in 1999.

Modem based Internet accesses per Service Provider in Sweden 1999
In percent of total number of subscriptions = 2 million

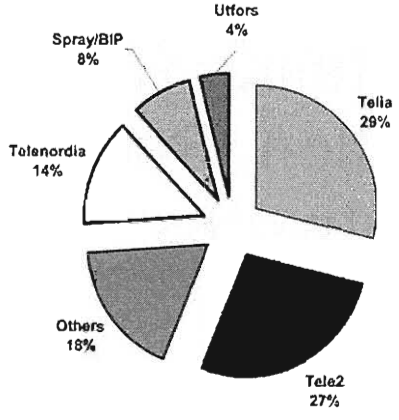


Figure 143: The three largest operators of fixed telephony, Telia, Tele2 and Telenordia are the leading providers of Internet access to the Swedes. The figure shows the distribution of the market in percent of a total of 2 million Internet subscriptions.

Source: PTS: Svensk telemarknad 1999

CaTV in Sweden

CaTV networks are an infrastructure that can be developed into alternative access networks to households, offering not only cable television services but also telephony and Internet access. Since the Swedish government presented its proposition to develop an national infrastructure for high speed transmission in March 2000, a number of various providers are developing local networks for access to be offered to the large majority of the Swedish population.

The analysts AB Stelacon estimated that by the end of 1997 some 55% of all Swedish households, i.e. 2.3 million, had access to CaTV. About 60% are paying for services offered by the groundbased channels, i.e. SVT 1, SVT 2 and TV 4. SVT is the Swedish Television AB, a public service provider, and TV 4, owned by the Modern Times Group. In 1997 the number of new subscribers to CaTV increased only marginally – people moving into new department houses made up the new users.

CaTV penetration per operator in Sweden 1997
2.3 million households were subscribers

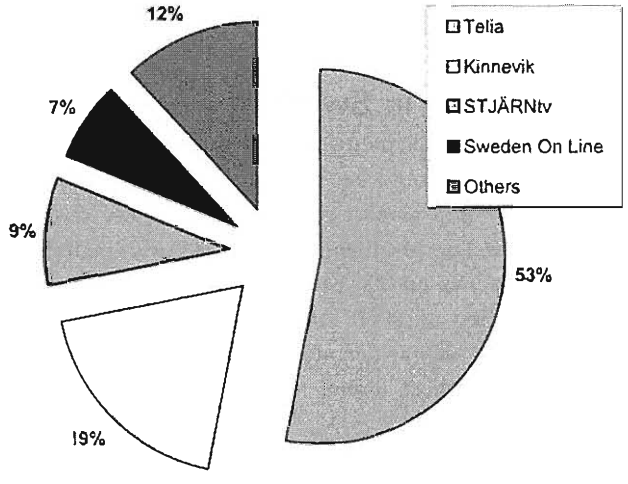


Figure 144: The market penetration of CATV providers in Sweden in 1997. The penetration is given as a percentage of the total number of households, 2.3 million, subscribing to CaTV. All services offered are included for each provider.

Sources: PTS/AB Stelacon: Kartläggning av den svenska telekommarknaden 1998

From 1996 to 1997 several of the large CaTV operators started to digitalize their networks, the idea being to improve the CaTV services and to prepare for new future services, such as Internet access, video on demand, interactive services and telephony. Several providers offer IP telephony with or without Internet access. Investments were made by the operators in the transmission networks and in the local access networks. Users of interactive services need modems. Telia may serve as an example of this development, although there are many operators all over Sweden. In July 1999, 300 000 subscribers to Telia's CaTV services in Stockholm were offered fast Internet access via the CaTV network from their personal computers via a special CaTV modem.

The leading CaTV operators in Sweden in September 2000 were Tele2, Telia and UPC. Digital CaTV services were offered only by Comhem, the Telia CaTV provider. Some 60 000 households sub-

scribed to the digital top set box from Comhem. Some operators have plans to offer fast Internet access and IP telephony via their CaTV networks, but so far there are few implementations in operation.

Digital television in Sweden

In 1997 the Swedish parliament decided that digital groundbased television technology should be introduced to all Swedish households step by step as part of the public service charter. The introductory period lasts until the end of 2002 and includes five broadcasting areas. Digital TV broadcasting is made available via 18 channels in the spring of 2000. According to government data, new leasing contracts for digital decoders were increasing by 1 000 a week (March 2000). Three digital technologies are offered:

Groundbased digital television, distributed via the traditional TV towers – 50% of the population is covered;
Digital cable television. One provider, Telia's Comhem, covers 1.3 million households;
Satellite based digital television via disc antennas, covers the whole nation.

In September 2000, just before the kick-off of the Sydney Summer Olympics, 28 000 households had digital TV set top boxes to receive via the groundbased network. 60 000 households paid for digital TV via the Comhem CaTV network, and 80 000 households received digital television via satellite. Thus, 168 000 households of the 4 million Swedish households had made an effort to get the digital television services by September 2000. According to the Swedish Broadcasting Corporation, SR/SVT, there were some 200 000 households using digital television technology.

There are some two millions households living in detached houses in Sweden. 550 000 of these have installed disc antennas to receive via satellite. This situation has been rather stable since the early 1990s. From the introduction of the possibility to lease digital satellite decoders to the end of August 1999, 5 000 Swedish households had leased and another 20 000 had bought a decoder in order to be able to receive the digital television emissions broadcast by Canal Digital. 14% declared that they were willing to invest 5 000 SEK in order to acquire the necessary decoder for digital television.

But the raw facts conveyed a different message. By the beginning of July 1999, 250 program cards and their belonging set top boxes had been sold. Each box is sponsored by tax money, some 4 000 SEK per box. The groundbased digital television broadcasting cost the taxpayers 1.5 billion SEK up to that date. By the end of August 1999 state-owned Teracom responsible for the digital television network in Sweden annonced its intentions to collaborate with Nokia in order to produce 100 000 decoders for the Teracom daughter company Boxer. The idea is to lease the decoders in order to generate an interest among the viewers to watch digital television.

Sources: Computer Sweden August 30th 1999/Regeringens proposition 1999/2000:86 *"Ett informationssamhälle för alla"* Out of the 100 000 decoders Teracom subsidiary Boxer intended to sell in 2000, 28 000 had been sold by the end of August that year.

There are several reasons for digital TV being so slow to the Swedish market, although no proper investigation of the reasons have been made yet. First of all, most people find the service too expensive. The least expensive alternative costs about 4 000 SEK a year. Second, the program selection too narrow – Sweden has several public service TV channels and only few private ones. This is reflected in the fact that households having access to satellite based digital TV have access to the widest number of channels, and thus have been the most eager to go for the service.

Satellite communication

According to a survey of communications devices used by Swedish households in 1997 there were 700 000 households having a disc antenna. This is equivalent to 18% of all households. A possible communications link to these households – and most probably to companies as well – is to communicate via satellite directly to these parabolic antennas. At present it is only possible to receive data and telecom signals, not to transmit. In order to do this a transmission link is needed, and such links are expensive. Moreover, a license from the PTS is needed for anyone wanting to use a transmission link. Satellite technology can be combined with other technologies, such as the telecommunications networks. Thus, Tele 2, one of the operators of fixed telephony in Sweden, is offering Internet access

in collaboration with the Swedish Space Corporation, which owns the Sirius 2 satellite. This solution is based on the fact that the user is sending his/her messages via the telecommunications network and receiving data via the parabolic antenna. The new digital satellites can offer bandwidths at more favorable tariffs than the analog satellites, but none of them can be used for two-way communications and thus they are regarded as a complementary technology to the access network, not as an alternative.

There may be some developments in satellite communication in the future as complements to the national broadband network, which was under construction in September 2000. The Swedish Space Corporation (state owned) may play an active role in this development.

Radiobased access networks

Many actors in the information technology markets have concentrated on offering their users radiobased direct net access. This solution is used in areas where physical infrastructures are nonexistent and where new operators want to establish themselves without having to rely on infrastructure belonging to dominant operators, ex-monopolies. In Sweden there are very few areas that cannot be reached by the infrastructures. But as a consequence of the liberalization of the market, in particular new operators in the Swedish market are using radiobased access. Globally this technology is very important, in particular so in countries with no infrastructure at all. An interesting development is going on in Japan where NTT DoCoMo is planning and installing the fourth generation of mobile technology, including wireless broadband capacity. Within a few years, the fixed networks will not be needed according to some local specialists.

At present there are three main raidobased access technologies available on the market:

1. Fixed radio link point-to-point

Fixed radio links have been used for many years and the technology is regarded as very reliable. It is however expensive and is mainly used by the operators in their own backbone networks and in

private networks. The demand for more bandwidth during the past few years mainly including fiber networks have resulted in a stagnating market for radio link based solutions,

2. Fixed point-to-multipoint

This technology is used to handle most of the access network. The NetCom-company Interloop introduced an ISDN service based on radio access in the frequency range 3.4–3.6 GHz back in 1998. Telia AB and Telenordia also hold licenses to use this frequency range. Via radio access of 128 kbit/sec Interloop offers fixed telephony services and Internet access in the cities of Stockholm and Gothenburg. The telephony service is cheaper than indirect connections and the Internet access is priced after user volume, not access time. Packet switched technology is the explanation for this. Interloop offers its services mainly to small and medium sized companies needing fast Internet access but not willing to invest in fixed connections. AT&T offers households in the USA this kind of service.

3. Fixed/mobile hybrid point-to-multipoint

GSM technology can be used for different kinds of radiobased access networks. The speed of GSM transmission is increasing, and the technology can offer circuit switched transmission speeds of 57.6 kbit/sec with packet switched transmission speeds of 171.2 kbit/sec as a next step. Improved sound quality makes GSM based access networks viable. The analyst firm AB Stelacon estimates that services based on GSM access to the fixed networks will grow in the Swedish market during 1999, mainly in the household market.

13. Information Technology

Time frame

IT 1931–2000

1931	Konrad Zuse introduced the relay based machine Z1
1944	Howard Aiken of the Harvard University built Mark I
1946	John Tukey introduced the concept Binary Digit, bit Eniac was introduced to the public
1949	John von Neumann constructed the first computer
1950	Bark, a Swedish made relay based calculator, was introduced
1953	Besk, the first Swedish computer was built
1955	Grace Hopper developed the compilator Math-Matic
1956	The first transatlantic telecommunications cable was installed between Scotland and Newfoundland
1960	Cobol was defined
1962	Telstar, the first telecommunications satellite was launched
1980s	The groundwork for the Information Highway is laid
2000	248.6 million people are connected to the web
2002	Global e-consultancy services will be worth US$ 44 billion (IDC)

This chapter gives some data on information technology distribution and some of its usages in Sweden. As we have already stated the computer industry and the peripheral and services industries of today are integrated parts of the Information Society industries. However, the technology integration with telecommunications and media is not quite complete just yet, even if it is becoming more and more difficult to differentiate the one from the other. Computers in their raw forms, i.e. integrated circuits and processors, are built into most of our electronic devices, household machines and media devices, but also into our cars and garden tools. Only we tend not to think of them as 'computers'. In most people's minds, a computer still is a PC or an iMac which is used for rather specialized work tasks such as word and picture processing, playing games, keeping one's books, paying the bills, not to mention Internet access and e-

mail. The number of different tasks carried out from the home computers is growing rapidly. Now it is believed that a lot of the PC tasks will be moved to our new, third and fourth generations' mobile telephones, the UMTS phones, the WAP phones, 4G phones. Mobile Internet is seen as the next big service offer. So let us have a look at the distribution of the Internet and mobile telephony. The 1999 data below are from Western Europe and USA.

Internet and mobile telephony penetration in Western Europe and USA 1999

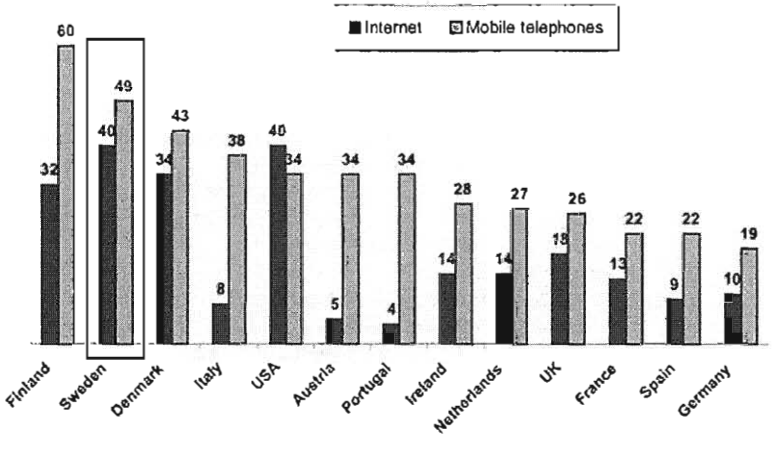


Figure 145: One way of visualizing the integration of telecommunications and computer technologies is by comparing the close relationships between Internet usage and mobile telephone consumption. The 1999 data above compares the penetration of the two as a percentage of the total population in the western European countries and the USA.

Sources: www.nua.ie/OECD/Teligen/EITO

Will the mobile telephones become our future computer generations? Computers of today are said to represent the sixth computer generation, which means that the computers have ultraintegrated processors such as Intel 80386 and Motorola 68000. These processors are built to multiprocess, i.e. carry out several processes simultaneously, and function as graphic workstations.

The concept of computer generations is a difficult one. There are almost as many suggestions for generations as there are experts in the field. The consensus is that a generation is described from the types of components used in a computer. Below follows a suggestion made by the Swedish magazine *"Computer Sweden"* in July 1999. It can serve as a starting point for those who want to explore the field.

Seven computer generations according to "Computer Sweden" in July 1999

Pre stages
Mechanical calculators, the differential machine, the analytical machine, punch cards
First generation
Relay machines, digital, programmable calculators, i.g. Z1 and Mark1
Second generation
Computers based on electronic valves i.g. ENIAC and Colossus. Programs and data share memory
Third generation
First computers with transistors, i.g. TX-0, PDP-1, IBM 1401
Fourth generation
First integrated computers, i.g. IBM 360 och PDP-11
The computers become multi user systems
Fifth generation
Integration continues, the computers become personal workstations, i.g. Apple II och IBM PC.
Sixth generation
Modern computers with ultra integrated circuit such as Intel 80386 and Motorola 68000 and their successors. These computers can run several processes simultaneously and are powerful enough to serve as graphic work stations
Seventh generation
The computers are equipped with hyperintegrated circuits, including capacity for multimedia and global broadband communication

Figure 146: A proposal for how seven computer generations from the very beginning until now may be defined. These definitions are based on the major types of components on which each generation is constructed.

Source: Computer Sweden # 66, July 2nd 1999

By December 30th 1997 Sweden had a population of 8 848 000 persons. By the end of 1998 in total 4 560 250 personal computers had been acquired by this population. It is true that some of these

PCs have been scrapped, but several surveys made during 1998 show that every second household is equipped with at least one personal computer. Growth from 1997 to 1998 was particularly impressive thanks to a favorable special tax rule. 1 460 250 personal computers were sold in 1998 according to IT Research. This represents an increase by 55% over 1997. It means that almost half of all Swedish households, 48.5%, had a personal computer and Sweden became the country having the highest computer density in the world as a percentage of household penetration. IT Research also estimated that 60% of all households would get a PC during 1999.

Total number of personal computers in Sweden 1985 to 2000

1985	150 000
1986	235 000
1987	335 000
1988	500 000
1989	700 000
1990	900 000
1991	1 100 000
1992	1 200 000
1993	1 300 000
1994	1 600 000
1995	2 200 000
1996	2 600 000
1997	3 100 000
1998	4 560 250
1999	5 728 450
2000 (est.)	6 244 010

Figure 147: By December 30th 1997 the Swedish population was 8 848 000 persons. By the end of 1998, 4 560 250 personal computers had been acquired by the population. 48.5% of all households had a PC. By the end of 1999, another 1.1 million PCs were sold in Sweden. The recycling and scrapping rate is not known. Thus the accumulated value does NOT signify that there are 6.2 million PCs in actual use.

Sources: IDC/IT Research/SCB/ITU/Ny Teknik/Datateknik

In 1997 almost 1 million PCs were sold in Sweden. 16.9% of the computers were made by Compaq. IBM had 12.95% of the market, and HP 10.3%. Dell, having 7.4%, Fujitsu, 6.8% and Siemens 6.1% followed after the leaders in market share. The rest was shared between many PC manufacturers.

The development of Sweden to a top ranking IT nation with an impressive PC penetration has been rapid. In December 1980 it is estimated that 3 000 Swedish households had personal computers and almost no Internet access. In August 1981 there were in total 213 Internet host computers in the world, most of them with military organizations and a few with some of the most advanced research organizations like CERN. In 1990, ten years later, the Swedish households had some 350 000 PCs, but still no measurable amount of Internet connections. By the end of 1999, Sweden had the highest computer density in Europe. During 1998, the PC market in Sweden grew by incredible 70%, due to a special taxation benefit. It is estimated that 1.4 million PCs were sold. During 1999 PC sales fell by 20% over 1998, and "only" 1.1 million PCs were sold. For 2000, sales will increase by 9% over 1999 and some 1.2 million new PCs will be sold according to IDC. Should one wish to count the accumulated number of PCs sold in Sweden since the beginning of the Information Society, 7 million is an estimate as good as any. But it must be remembered that computers are *"outmoded"* rather rapidly, so many households, companies and individuals have consumed several PCs. How many of the old ones that are recycled each year is not known.

The following estimate of the PC development in Sweden was made in 1998. It predict that by December 2000 the Swedish households will have 2 600 000 personal computers and some 1 900 000 will have Internet access according to smoe estimates. It turns out that PC sales and Internet access are as difficult to predict as mobile telephony distribution!

PCs and Internet access in Swedish households 1980–2005

Number of households having at least one PC and Internet access

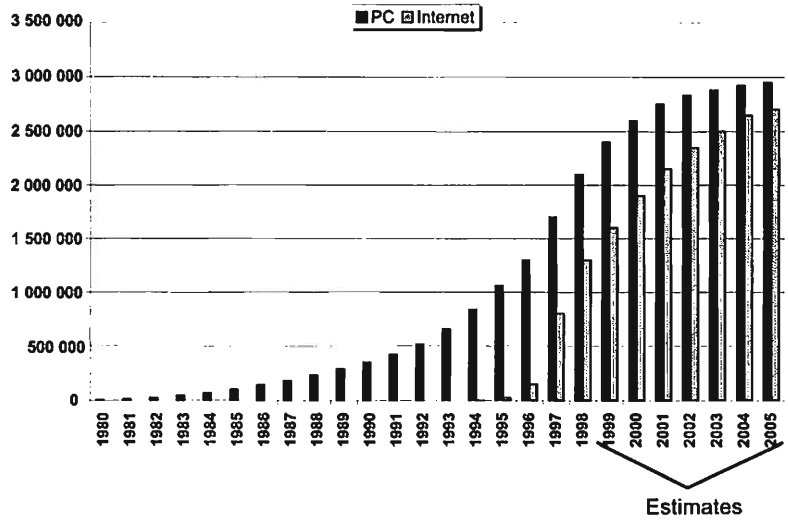


Figure 148: This figure shows the rapid penetration of personal computers and Internet access in Swedish households from 1980 to 1998. The data for 1999 to 2005 are estimates.

Source: Göran Hedström, AB Stelacon

During Q1 2000, 232 200 PCs with a total value of 3.37 billion SEK were sold in Sweden. Annual growth is estimated to 9%, which means that another 515 560 PCs will be sold during the year. The 9 million Swedes will have some 6.2 million PCs.

Public e-services

Early in 1998 Statskontoret, The Swedish Agency for Public Management, asked Statistics Sweden to find out to what extent the Swedes have the technical possibilities to profit from the electronic services presently offered by the Information society. Statistics Sweden interviewed 6 185 persons in the age groups 18 to 64 years about their access to PCs and the Internet at home, at work and at school.

The results show how Internet access is distributed geographically, socially, and demographically and the relationship between Internet usage at home and at work. One purpose of the survey is to identify groups running the risk of being left out. This is important to understand not least from a democratic point-of-view, since more and more of the public services are available via the Internet. Those interested in the democratic processes in Sweden can find out more from the democracy commission and its proposal *"En uthållig demokrati"* (A sustainable democracy), SOU 2000:1, presented to the government in February 2000. The proposal was remitted to almost 300 agencies and organizations in public Sweden for their comments.

PCs and Internet access in Sweden per county, May 1998

In percent of the county population aged 18–64

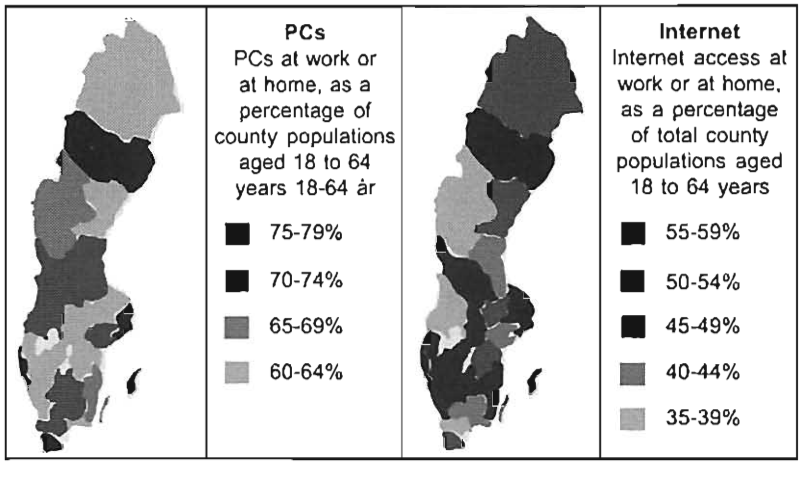
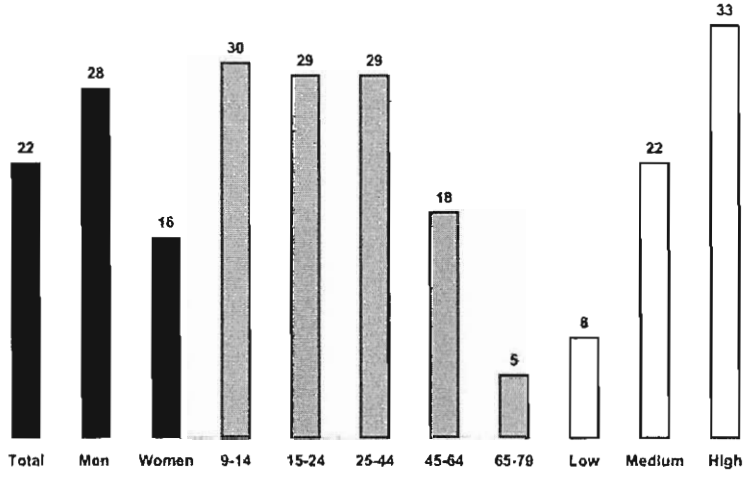


Figure 149: The two maps compare the distribution of personal computers and Internet access at work or at home as a percentage of the total population in each county in Sweden. Persons aged 18–64 years are included. The maps and all data are from the Statistics Sweden's survey for The Swedish Agency for Public Management in May 1998.

Sources: Swedish Agency for Administrative Development/Statistics Sweden

The survey of May 1998 shows that 76% of the men and 71% of the women interviewed have access to a personal computer either at home or at work. This makes up 73% of the total population. One out of five computers was bought with the financial support of the employer. And 51% of all Swedes had Internet access at that point of time, 53% of the men and 48% of the women interviewed. This is equivalent to 2.6 millions individuals. More than 34% of all grown up inhabitants, i.e. 1.8 million persons, said that they used to download documents from the Internet, search databases and follow questions that interest them at least once a week. The researchers at the Nordicom institute at the university of Gothenburg also posed questions about personal computers, Internet access and usage for their annual survey *"Mediebaromentern"* (The Media Barometer) 1998. The following figures are from the media barometer.

PC users in Sweden 1998

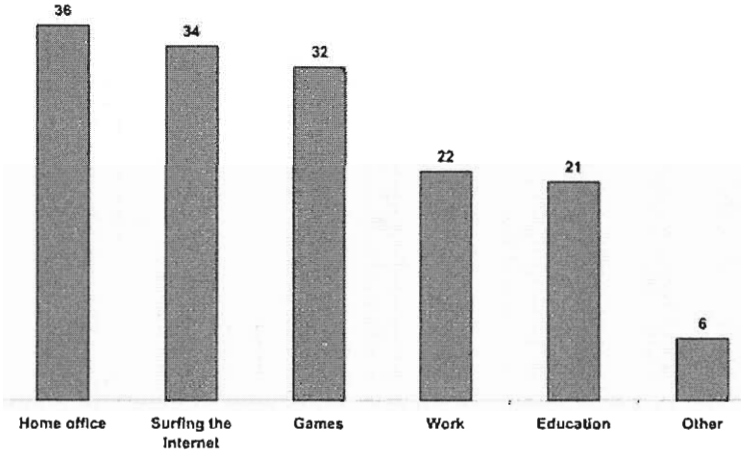


	1996	1997	1998	Average week	Average month
Total	13	14	22	39	46
Sex					
Men	18	18	28	19	52
Women	8	11	16	32	40
Age					
9-14	18	19	30	58	67
15-24	18	16	29	52	60
25-44	15	17	29	51	57
45-64	11	14	18	32	40
65-79	1	2	5	8	9
Education					
Low	5	7	8	17	21
Medium	14	13	22	42	50
High	19	22	33	53	60

Figure 150: Some 50% of all Swedish households have personal computers. 22% use their computer at least once during an average day, i.e. less than half of those possessing computer. The most frequent users are men with academic education. The least frequent users are among the older inhabitants, which can be seen from the table above.

Source: MedieNotiser 1/99, Mediebarometern, Nordicom-Sverige

PC usage among the Swedes 1998

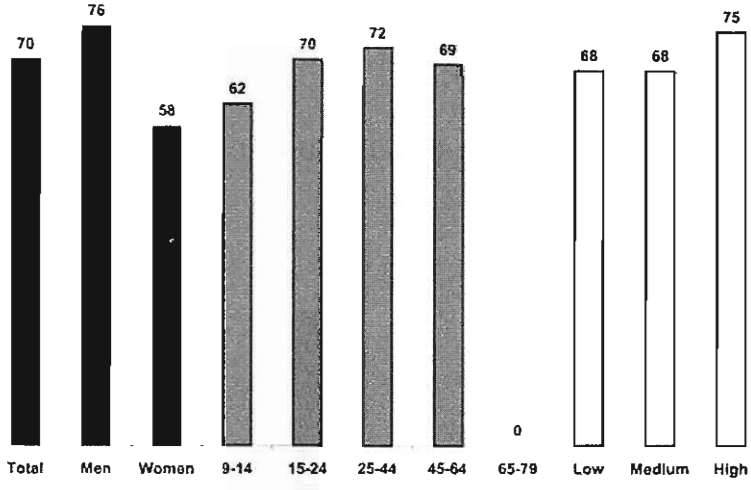


	Home office	Work	Games	Training education	Internet applications	Other
Totalt	36	22	32	21	34	6
Sex						
Men	38	25	36	19	37	7
Women	33	18	25	24	29	3
Age						
9-14	3	2	35	20	19	5
15-24	11	6	19	42	42	4
25-44	47	29	33	17	37	4
45-64	35	35	12	14	35	7
65-79	-	-	-	-	-	-
Education						
Low	44	11	28	15	30	4
Medium	40	20	28	20	39	4
High	41	38	17	21	36	7

Figure 151: 36% of the population having computers at home use it most frequently for home office purposes. 34% use it for Internet access, 32% for games. Home office usage is most frequent among the middle aged, while the young ones use the PC for games and schoolwork.

Source: MedieNotiser 1/99, Mediebarometern, Nordicom-Sverige

Minutes of daily PC usage in Sweden 1998



	1996	1997	1998
Total	61	74	70
Sex			
Men	62	77	76
Women	58	70	58
Age groups			
9-14	43	60	62
15-24	62	82	70
25-44	57	75	72
45-64	74	71	69
65-79	-	-	-
Level of education			
Low	67	70	68
Medium	58	72	68
High	70	79	75

Figure 152: Those Swedes using computers at home are connected one hour a day on an average. The variations among the age groups are small.

Source: MedieNotiser 1/99, Mediebarometern, Nordicom-Sverige

The Gothenburg researchers also mapped the availability of PC peripherals. Printers and CD-ROM players are the most frequent ones. Two thirds have a modem and 59% of all PC owners had Internet access at home. Young users and those of academic education process more peripherals than all other groups.

PC peripherals among Swedish users 1998

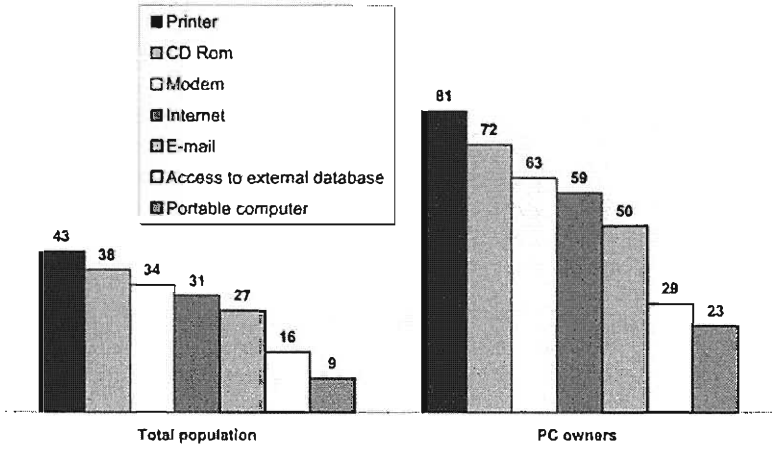


Figure 153: The most common PC peripherals among Swedish PC users are printers and CD-ROM players. Some two thirds have a modem and 59% have Internet access. Young users and those of academic education own more peripherals than other groups.

Source: MedieNotiser 1/99, Mediebarometern, Nordicom-Sverige

In June 1999, LO, the Swedish Trade Union Federation, reported that 51% of all their members have a computer at home. This means more than one million members. During the last twelve months the percentage of LO members owning computers have increased from 36% to 51% 26% of the computerowners have Internet access. 7 out of 10 do not use computers at work. And – 49% do not have any computer at all. These figures should be compared to those of the members of Saco, the Swedish Confederation of Professional Associations – 53% of the computer users also have Internet access. The equivalent percentage for the members of TCO, the Swedish

Confederation of Professional Employees, is 46%. Every fifth member of LO is using Internet at least once a week. More information is available in the LO report *"Datorer och Internet"* (Computers and the Internet). Also see the web sites: http://www.lo.se and http://www.saco.se and http://tco.se.

The following figures demonstrate clearly that young men with an academic education living in cities were the most frequent users of the information technology tools. Sweden followed the rest of the industrialized world in this pattern. Low income earners living in small communities, women and people with short education, many of them LO members were using the IT tools less frequently. So there is reason for a deep concern that the differences between IT users and non-IT-users will deepen, not least so since more and more of the public information is available via the Internet only. LO has developed a personal computer for their members, because they are also concerned about those without computer literacy and their constrained opportunities for employment. By the beginning of 2000 several factors indicated a change in the Internet usage pattern. The monthly SIFO/MMDX surveys of Internet usage showed that more than half of all users were women – some are attracted by e-shopping, it is said. The SeniorNet, an organization for taking computer competence to the elderly (= 65+), is overrun by eager learners, a number of whom are 80+.

IT utilization related to annual income in Sweden

Regular usage of www and/or e-mail at least once a week

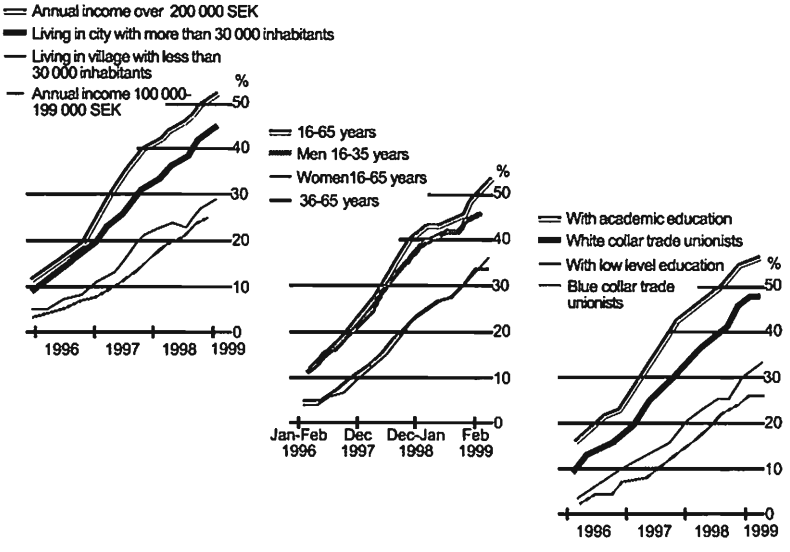


Figure 154: This figure confirms that the most frequent Swedish users of IT tools are young men with an academic education, living in cities. Low-income takers living in small communities and those having short education are the least frequent users. The figure also stresses the fact that women are less frequent users than men are, but this fact is contradicted by other surveys, according to which women are as frequent users as men. The user patterns are changing rapidly.

Sources: IFS/LO/Dagens Nyheter, Thursday, May 6th 1999

According to EITO 2000, *European Information Technology Observatory 2000*, more than 60% of the Swedish population were IT-users, and 40% of these described as heavy users according to EITO's use classes for Europe. Denmark is the only other European country having more than 50% of the population as IT users. The EU average is some 26%. See page 356 figure 15 in the EITO publication.

One way of gaining computer literacy is to pass the tests for the European Computer Driving License, ECDL. In Sweden this training program is controlled by the Swedish Computer Association, Data-

föreningen. 150 000 Swedes have so far applied for the program. ECDL is becoming the standard certificate for computer competence in Europe. A number of the very large private and public organizations in Sweden encourage their employees to get an ECDL. By the beginning of 2000, some 45 000 Swedes had passed all seven stages and received their ECDLs. In Denmark 60 000 employees have started their training and in Norway 25 000. For further information see: http://www.df.se.

In 1998 and 1999 information technology grew considerably faster in Sweden as compared to the rest of Europe – the growth was five percent higher than the one in the other countries, according to IDC. For the next few years, it is estimated that the number of personal computers sold will decline and stay at the same level as in the rest of Europe, while the growth potential for servers and software will be higher in Sweden. The following figure shows the number of sold units per product area in Sweden 1996–2000 according to EITO and IDC.

IT hardware sold in Sweden 1996–2000
Number of units

Product	1996	1997	1998	1999 (estimate)	2000 (estimate)
Servers, all kinds	20 585	26 886	37 245	42 479	45 075
Workstations	13 090	13 455	11 532	10 634	9 902
Portable PCs	126 120	138 781	152 027	169 232	168 894
Stationary desktops	586 230	632 559	739 292	802 478	898 306
PC printers	476 217	559 974	606 452	624 039	635 896
Copying machines	31 324	31 895	32 469	32 988	33 648
LAN insertion card	478 000	577 000	628 930	696 854	746 331

Figure 155: The data above shows that the Swedes have been purchasing increasingly more hardware during the period 1996 to 2000. The only product line decreasing is work stations, which is related to the fact that most modern personal computers are powerful enough to serve as workstations. The data for 1999 and 2000 are estimates.

Sources: Data from IDC and EITO

Palms and PDAs, sometimes combined with mobile telephones are becoming the mobile generations work tools. WAP technology and the fourth generation mobile networks will handle text as well as voice. But so far the sales figures for pocket computers are relatively

insignificant. In 1998 PDAs sold in Sweden amounted to 69 100. The estimate for 1999 is 140 000. Source: Svenska Dagbladet Thursday March 25th 1999

Judging from the data presented in this chapter, it is reasonable to assume that Sweden will hold its position as an IT nation with high penetration rates for all kinds of hardware and services. However, quantity is only one side of the coin. The other one is quality, that is, the most important is to what we use our computers. Playing games does not generate anything new while creating new games does. One such qualitative factor reported upon by several analysts is that the Swedish industry in general has utilized information technology in order to run it more efficiently. One way of proving this is by looking at the number of industrial robots installed.

Industrial robots in Swedish industry 1983–1998
In actual numbers

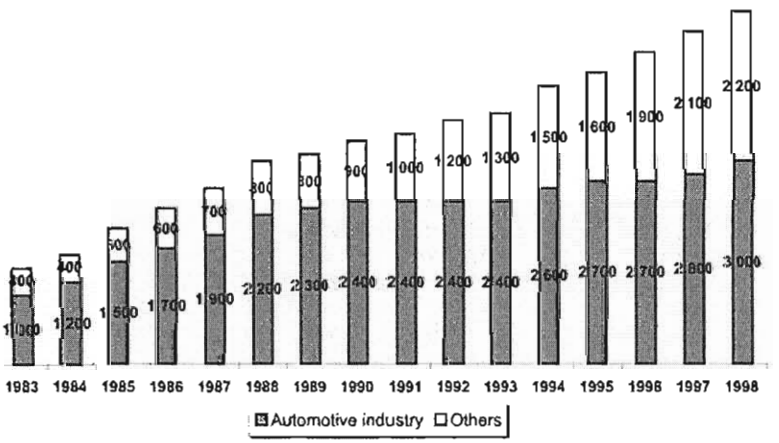


Figure 156: The actual numbers of installed industrial robots in Sweden from 1983 to 1998. In 1999 the number of industrial robots sold worldwide increased by 20% compared to the previous year. In North America the growth was 60%, in Europe 12 %. And in Sweden 12% as well. The automotive companies represent the single industry investing most in robots. to most current research results, Asia is the continent increasing IT investment-spending.

Sources: UN/ECE/IFR/Ny teknik 2000:9 del 3

IT investment is, as already told, one important factor for the success of the Information Society. According to the IDC report *"World Times Information Society Index"* in 1998 based on data from 55 countries Asia is the continent increasing IT investment-spending most. From 1997 to 1998, IT investments increased by 10% for Asia, while the USA increased their spending by 7.9% during the same period. USA is still leading the total investment league in real money. Europe increased their IT spending by 7% and Latin America theirs by 5.5%. On February 14th 2000, IDC declared Sweden as the globally leading IT nation according to the same *"information society index"* for 1999. The IDC specialists had analyzed 23 variables from four categories related to information availability, Internet penetration, computer dissemination and social data, including education.

The IDC ranking of the leading IT nations, February 2000

Country	Ranking index 2000	Ranking in 1999
1. Sweden	*5.06*	2.
2. USA	5.04	1.
3. Finland	4.58	3.
4. Norway	4.48	5.
5. Denmark	4.34	6.
6. Canada	4.32	10.
7. The Netherlands	4.23	7.
8. Switzerland	4.17	—
9. Australia	4.13	8.
10. Japan	4.09	9.

Figure 157: The IDC information society index ranking of 1999 placed Sweden at the top among the world's leading IT nations.

Sources: IDC/Computer Sweden April 12th 1999

In September 2000, the American consultants A.T. Kearney reported that a majority, 78%, of the top executives of global corporations, saw investement in information technology as extremely important for the future.

14. The Surfing Swedes

Time frame

Sweden 1975–2000

1975	Electronic cash registers are introduced in Sweden
1976	The AXE system for digital telephone switching is inaugurated
1978	The first Swedish ATM (Automated Telling Machine) is inaugurated
1980	Fax machines become generally accepted
1981	NMT, the Nordic mobile telephone system, becomes the first platform for mobile telephony
1985	The Swedish parliament introduces the first PCs
1987	The first telephone bank opens
1990	TV4 starts broadcasting
1992	GSM, the first digital mobile telephone system, is introduced
1994	Aftonbladet, an evening paper, launches its first web site
1996	Two banks, Östgöta Enskilda and SEB introduce their Internet Banks
1997	Interflora, NK and Bokus start e-commerce via Internet
1999	In August 1999, 3 179 000 Swedes surfed the Internet – 49% of the population aged 12–79
2000	In July 2000, 3 752 000 Swedes surfed the Internet; they paid 1 484 000 visits to web shops where they spent on an average 19 minutes per visit (Source: MMXI Nordic/Sifo Interactive Media)

The breakthrough of the Internet brought not only a new mass medium for everything from business to entertainment. It also brought *"the new economy"*. Economists, journalists, and business gurus started to develop their thoughts on *"the new economy"*, often in rather wage terms. By now, in September 2000, numerous books, articles, seminars, etc. have treated this interesting subject, still suffering from many and inexact definitions, specifically so when it is compared to the *"old economy"*, which in turn is frequently defined as the economy of the industry society. This is not the place for a discussion of these fascinating topics, but as they are important to the Information Society, it is necessary to bring them into focus, just to recapitulate.

The *"new economy"*, which is not the same as the *"e-economy"*, has developed as a result of several factors converging in a beneficiary way. Some of these factors are:

globalization of trade, and ever increasing opportunities of free movements of people, goods, services and capital (although most obstacles still remain)

liberalization/deregulation of the formerly strictly regulated monopoly industries such as telecom, electricity, water distribution, etc.

standardization of all the various infrastructures the Information Society relies on – telecom and data infrastructures; transportation infrastructures; utility infrastructures; financial infrastructures; learning and educational infrastructures; corporate, political and scientific infrastructures – these intellectual ones probably more important than the physical ones for the future development of the Information Society

distribution of IT to more and more individuals – for instance, 3.4 billion of a total of 6.1 billion inhabitants had access to television so that they could watch the Sydney Olympic Summer Games in September 2000; 600 million have mobile telephones; some 400 million have Internet access, etc. — Mass is the king

creativity in applying IT to any kind of business, old as well as new, and activity to increase productivity.

A few American examples, borrowed from the Swedish IT consultant Pär Ström will explain the importance of the last point:

The most successful American PC manufacturer Dell generates more capital than the company can recycle by exploiting IT in order to adapt its production lines to 100% customization, to avoid storing goods and unwanted and unneeded administration — you can follow your order by the hour on the Internet;

The American Wingspan bank grants — or rejects — loans via its web site in 60 seconds, while keeping to its strict rules for future credit holders. Wingspan achieved this by cutting away all "dead meat" administration;

The American cement distributor Cemex equipped all its large lorries with GPS systems and centralized computer control — the number of lorries could be cut by 35% and delivery time from three hours to 20 minutes. Needless to say — the customers willingly paid more.

There are many more examples of old businesses putting on new IT robes. In Sweden, some banks are closing most of their traditional offices and providing their customers with all kinds of banking services via the Internet. Some 2 million Swedes use the Internet bank. There are more than 500 000 shareholders in Sweden trading via the Internet. Large corporations like ABB, Ericsson, Volvo and Scania may well be seen as the beacons of the new economy long before the phrase was used thanks to their awareness of the possible

productivity gains of IT implementation. So, to sum up, changes in the way wealth is generated by increasing productivity based on IT solutions have been on their way for some time. These changes are now so visible that we all of a sudden see them as a new paradigm which we call *"the new economy"*.

In a way *"the new economy"* got into focus thanks to the *"e-economy"*, the electronic economy, i.e. services based on IT solutions. This ties in with — sometimes conflicting — concepts like e-commerce, e-business, e-learning, e-competence development, e-marketing, e-anything and Internet hype, young and smart e-entrepreneurs, finding new areas of business activity, global market activities, creativity, early IPOs, and "get-rich-quickly". During spring 2000 Internet hubris, dot.com-companies and fast-talking e-people shook the global financial society and most of the stock markets. Internet consultancies like Swedish Spray and Framfab and some 70 more in Sweden only were valued in the order of size of billions of SEK and US$, in spite of the fact that they produced little or no profit. In general, the Nordic e-companies were among the leading ones along with the US-based ones. They have won many prizes and trophies in the "e-world", and it is assumed that they will be very important for the development of the service industries of the future. The amazing evaluation of the e-companies in spite of their not very profitable businesses so far caused the British analysts at Salomon Smith Barney to comment on their own analysis of the British Internet service provider Freeserve in the following way:
– *Our analysis is limited by bounded rationality.*

By the beginning of 2000, one of the most respected management consultants of the Boston Consulting Group predicted that almost all of the present dot.com companies would disappear. One reason was that they did not have effective business strategies. Boo.com became the first dot.com operation to go under. Quite a few have followed. In a way, the dot.coms mirror the minicomputer boom companies of the 1970s, only the pace is much faster.

There are many aspects to the growing e-economy. One that gives extra food for thought is the implication of the fact that the Internet for the first time offers us an application before the technology is fully there. The e-economy is now creating the ASPs, Applications Software Providers, so badly needed to generate real

business on the Internet. So we have to remember that we are just seeing the start of the Internet technology – what we have today is very primitive.

Whatever the e-future holds, the analysts of International Data Corporation, IDC, estimate that the global market for Internet related consultancy services will be worth some US$ 44 billion in 2002. Cyber business is described and analyzed in great detail in *"The OECD Information Technology Outlook 2000"*, visit: http:// www.oecd.org, and in the *"European Information Technology Observatory 2000"*, web site: http://www.eito.com.

Those wanting detailed information about Internet Service Providers, ISPs, in Sweden are recommended to see the PTS report *"Internetmarknaden i Sverige" (The Internet Market in Sweden)* of October 2000, http://www.pts.se.

Note that "The Economist" had an interesting supplement on the New Economy in the September 23rd 2000 issue.

Is the world ready for it, the brave new e-world? And is Sweden? Let us have a look at some basic data and start with a look at the number of Internet host computers per 1 000 persons in 1999 and then at the worldwide Internet infrastructure investment by region.

Internet hosts per 1 000 persons in 1999

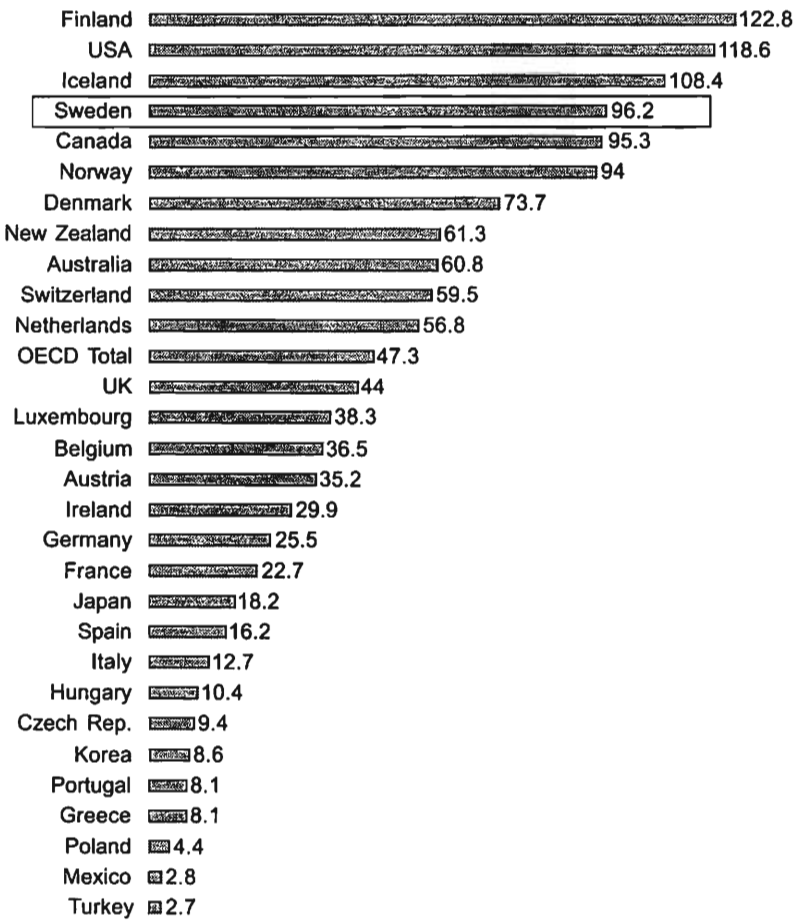


Figure 158: In 1999, there were 52 million Internet host computers in the 29 OECD countries, which represents more than 90% of the world total. Finland had the most hosts, 122.8 per 1 000 inhabitants, USA had 118.6, Iceland 108.4, and Sweden 96.2. The OECD average was 47.3.

Source: OECD

A few years ago, the Internet and surfing were seen as the toys of wellpaid, young men of the upper middle classes, those we called "yuppies" some ten years ago. Recent data show that women are the most frequent web surfers, at least in two of the leading Net nations, USA and Sweden.

The Net surfers per gender in USA and Sweden 2000
In percent of the Net inhabitants

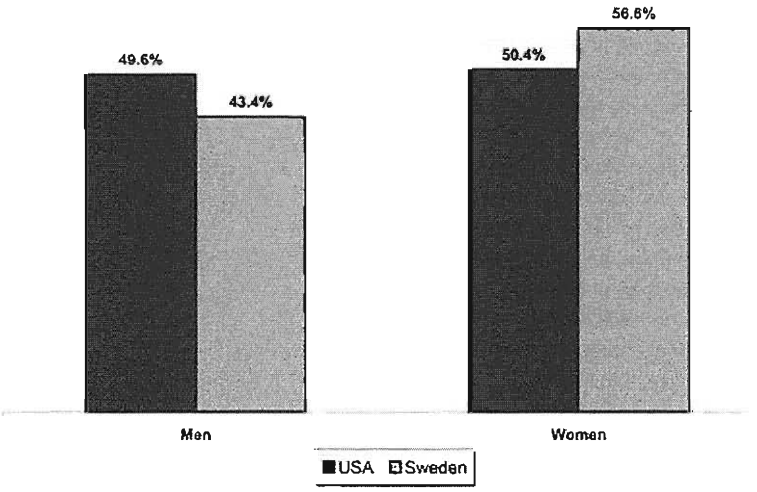


Figure 159: In USA almost as many men, 49.6% of all surfers, as women surf the Internet. In Sweden, considerably more women, 56.6% of all surfers, than men surf the Net.

Sources: MMXI Nordic/Näringsliv, August 11, 2000

In January 2000, there were 72.4 million top-level domain names in the world. 34.3% were .com, 23.2% were .net, 8.4% were .edu, 3.6% were .jp, while 30.4% had other types of domain names, this according to the Internet Software Consortium.

Several interesting facts can be learnt from the following figure of global Internet infrastructure investment and its distribution across the regions of the world. Among other things, it explains why USA and North America are leading the development. Without high capacity and effective infrastructure no successful Information Society.

Europe as a region is a latecomer but has realized the need for transnational infrastructure investment. Asia is facing all the problems, in a sense.

Global Internet infrastructure investment by region in 1998 and 2003

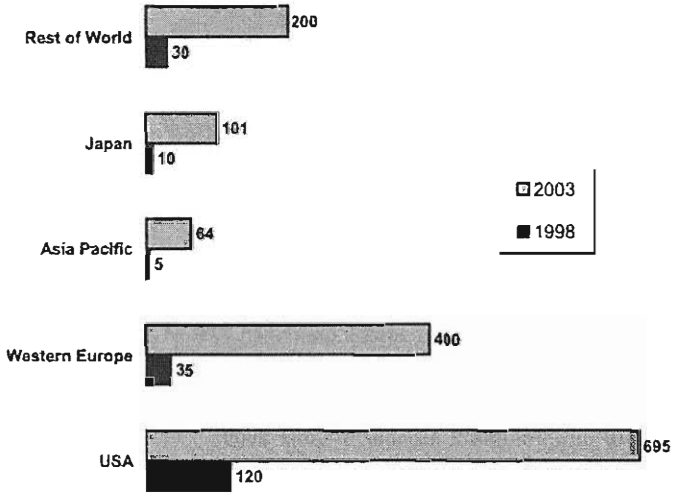


Figure 160: There are several interesting things to be learnt from this figure. The most striking one in the difference between Internet infrastructure investment in the US, estimated at almost US$ 700 billion by 2003, Western Europe with some US$ 400 billion, and the rest of the regions. In particular Asia has reason for concern because of huge problems like a total lack of regional collaboration and transnational infrastructures. Not even the backbones are regional — they all run to Europe and the US. So there are no opportunities to build the critical mass needed for e-commerce, for instance.

Sources: IDC/Info volume 2 number 3, June 2000

The distribution of e-commerce consumer revenue in 1998 confirms that Asia is the true laggard when it comes to e-business, in spite of the fact that sales figures of mobile telephones and PCs are very high – see earlier chapters. Apart from the lack of transborder, regional infrastructure, regionally accepted and functioning e-payment systems is yet another complication.

Global e-commerce consumer revenue distribution in 1998

In percent per region

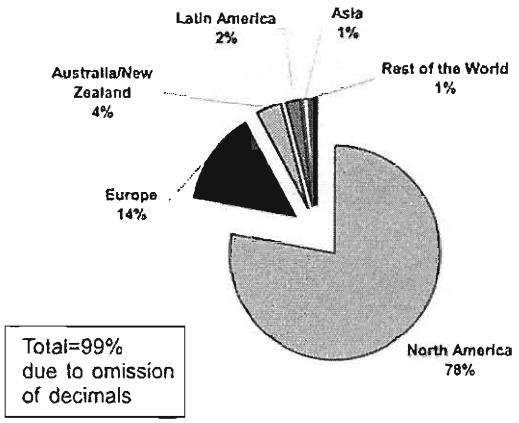


Figure 161: In 1998, the North Americans generated 77% of all e-commerce to consumers, while the Europeans generated 14%. Asia having the largest part of the global population, generated 1%.

Sources: ITU/ Info volume 2 number 3, June 2000

The Economist Intelligence Unit, a sister organization of *"The Economist"*, made a survey of the readiness for e-business during the first half of 2000. America was at the head of the field. Sweden, Finland and Norway followed next. Switzerland was number 10. The bottom ten nations out of 60 were China, Sri Lanka, Ecuador, Vietnam, Pakistan, Kazakhstan, Algeria, Iran, Nigeria and Iraq. The countries were assessed by their general business environment and communications infrastructure.

Top ten e-business readiness ranking in the world, 2000

Country	Ranking
United States	1
Sweden	**2**
Finland	3
Norway	4
The Netherlands	5
Britain	6
Canada	7
Singapore	8
Hong Kong	9
Switzerland	10

Figure 162: United States headed the field of the nations most ready for e-business in the world according to a survey made by the Economist Intelligence Unit during the first half of 2000. Sweden was 2, Finland 3 and Norway 4.

Sources: Ebusinessforum.com/The Economist June 10th 2000

e-Sweden and the Internet

Sweden in e-Europe in 2000

Percent of populations with Internet access

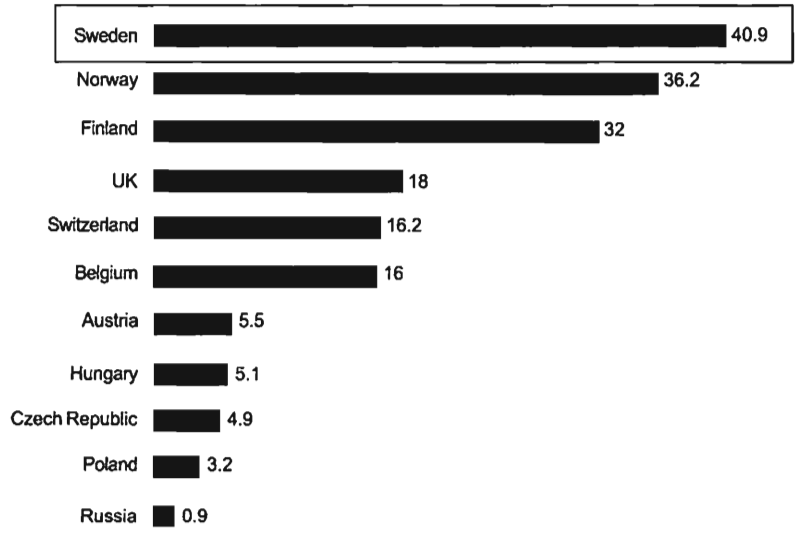


Figure 163: In Sweden, Norway and Finland more than 30% of the total population have direct Internet access. The figure above compares these three Nordic countries to some of the leading western European nations and Eastern European nations like Hungary, the Czech Republic, Poland and Russia.

Sources: NUA/CEEBICnet/Carnation Consulting

For Sweden, specialists at The Swedish Agency for Public Management, Statskontoret, regard the potential for qualified interactive public service applications via the Internet as huge. Mobile applications are also growing fast, even in the short term. Once digital television is accepted by more than the 200 000 users it had in September 2000, interactive public services may well be offered via different access networks, such as CaTV. The specialists think that the users will want more interactivity, more digital services and more self-services in public as well as for commercial services. See more below.

Several analysts' reports show that about half of the Swedish population of just below 9 million surfs the Internet on a regular basis. By the end of March 2000, MMXI Nordic/Sifo Interactive Media reported that 3 794 000 Swedes surfed the web. 1 694 000 paid visits to web shops and stayed on an average 26 minutes in the shops – in 2000, during July, the traditional summer month in Sweden, about the same number of people surfed but they stayed only 19 minutes per visit in the e-shops.

By the end of 1999, data from Nordicom show that 47% of the Swedish population had Internet access in their homes. The equivalent figure for 1998 was 31%. The number of homes with Internet access has trebled since 1997; the growth from 1998 to 1999 was 16%. Wide variations in Internet usage can be found between the age groups and the educational backgrounds of the population. Among the oldest group, those aged 65 to 79 years, 11% have Internet access, while among the youngest group, from 9 to 17 years, 61% have Internet access at home. In blue-collar workers' homes, 42% have Internet access, while in the homes of white-collar workers with academic degrees 72% have Internet access. During an average day 31% of the Swedish population used the Internet. This represents a growth of 10% over 1998. For a summary of the Swedes on the Internet, see the following figure.

Source: MedieNotiser 1/2000, Nordicom-Sweden

In April 2000 a survey presented by Temo reported that 200 000 Swedes found Internet too complicated and too boring so they simply decided to refrain from further Internet access. That means

that 6% of all Internet users in Sweden actively have taken steps to avoid using the Net. Source: Svenska Dagbladet Näringsliv, Thursday April 13th 2000

Swedes and the Internet in 1998 and 1999
In percent of the total population

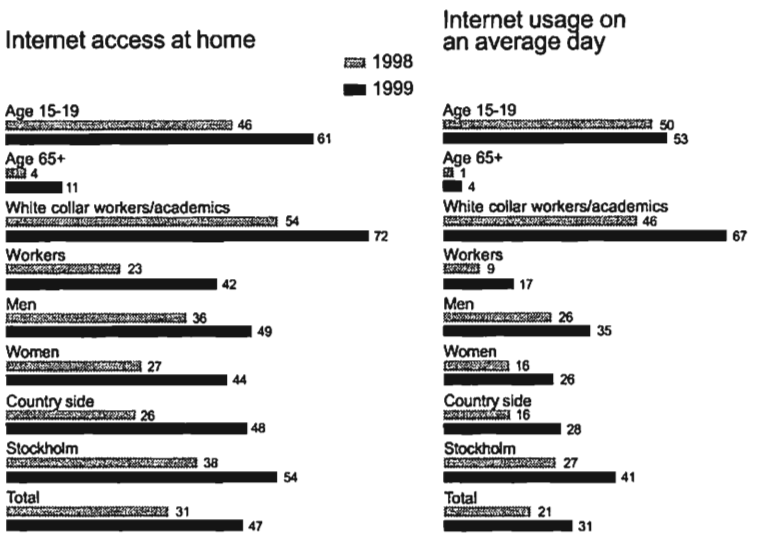


Figure 164 : This figure gives some of the data for Swedish Internet users in 1998 and 1999 as presented by Nordicom-Sweden in Mediebarometer 1999, which was introduced on May 15, 2000. The youngest and the oldest age groups are represented, as are two professional groups, workers and white-collar workers and academics. Men and women are reported and people living in the countryside and in Stockholm. Bo Persson, Dagens Nyheter, selected the data in this figure.

Sources: Mediebarometer 1999, Nordicom-Sweden/Dagens Nyheter May 15th 2000

The following figure shows the number of Internet users per month from December 1998 to December 1999. The variations between the months are fairly small, showing the largest differences for the traditional summer vacation months in Sweden, July and August. It is interesting to note that the numbers seem stable over the year.

Internet surfers in Sweden from December 1998 to December 1999
In thousands, aged 12 to 79 years

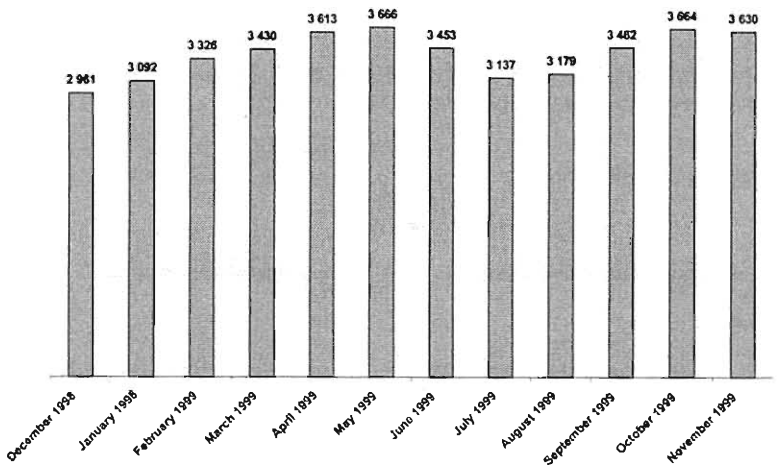


Figure 165: By the end of December 1999, 51.7% of the Swedish population surfed the Internet. That meant that 3 666 000 persons used the Net. The majority used the Internet every day, just above 60% of the users. Women are almost as frequent surfers as men are. These numbers have stayed stable with only moderate changes until late 2000.

Sources: MMXI Nordic/Sifo Interactive Media

Data from the end of April 2000, showed that 54% of the Swedish population surfed the Internet. 55% of the Swedish surfers were men, 45% women.

The most comprehensive research project regarding PC ownership and Internet usage was carried out by Statistics Sweden, SCB, on behalf of The Swedish Agency for Public Management. The analysts interviewed 6 185 Swedes from 18 to 64 years and posed questions regarding PC usage and Internet services, among other things. Some of the results from this survey and other reports are discussed in the following pages.

Those interested in comparisons of Internet usage in ten European countries should visit the ECaTT web site, see www.ecatt.com/ecatt. *"The EcaTT Benchmarking Program on Electronic Commerce and New Methods of Work"* is a research project within the EU programs, concentrating on telework and electronic commerce. Data

are collected on subjects like Internet usage, online shopping, online banking, etc. from the following European countries: Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Spain, Sweden and the United Kingdom.

According to a survey presented by MMXI Nordic in August 2000, Swedes spent 9 hours and 44 minutes a month surfing from their jobs, while they spent 5 hours and 53 minutes surfing the Internet from home. Most of the job surfing was related to visits to business and financial sites and news sites.

Yet another survey of the Swedish Internet market was made on behalf of PTS, the National Swedish Post and Telecom Agency. PTS presented the results in October 1998. According to this report 46% of the Swedish population aged 18 to 74 years had Internet access and 40% used it regularly. However, as is evident from above, much has happened during the past 24 months.

September 1998: 43% of all Swedes use the Internet at work

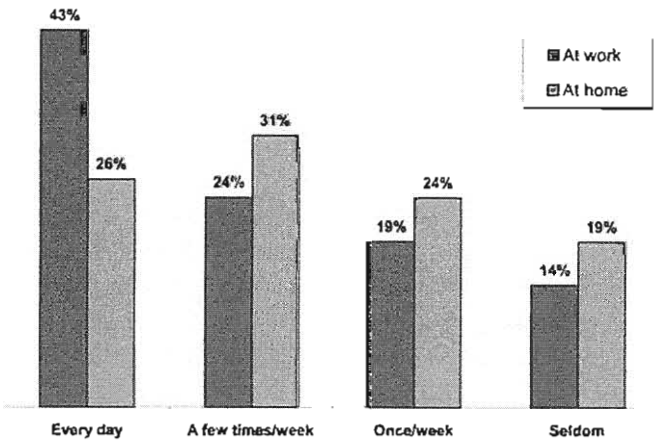
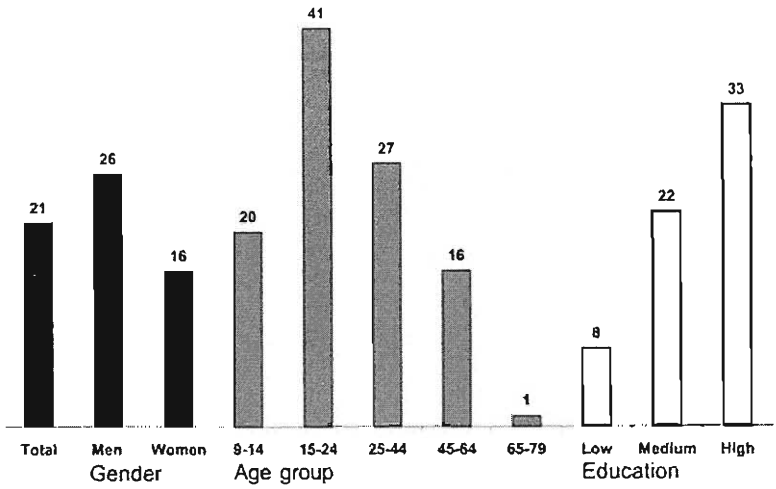


Figure 166: The figure gives the percentage of Swedish Internet users at work in September 1998. 43% used the Internet every day. Just above 23% used the Net a few times a week and some 19% once a week.

Sources: PTS/Öhrlings Coopers & Lybrand/SIKA Kommunikationer no. 4 1998

The Nordicom research project at the Institute for media and communications research of the University of Gothenburg, each year taxes Internet usage among its regular mapping of media consumption in Sweden. The following figures contain more detailed data about Internet usage in1998.

Internet usage in Sweden in 1998
As a percentage of the total population



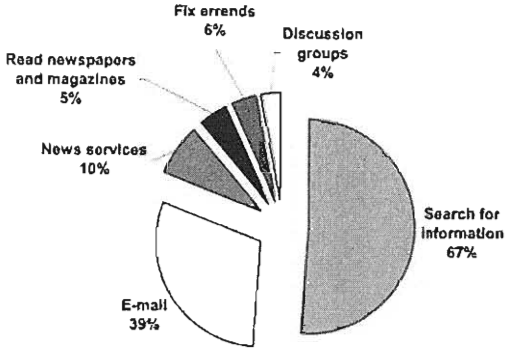
	Has used the Internet sometime
Total	55
Gender	
Men	60
Women	50
Age group	
9-14	61
15-24	87
25-44	70
45-64	45
65-79	10
Education	
Low	26
Medium	62
High	74

Figure 167: The percentage of Swedes who used the Internet during an average day in 1998 was 21% of the population aged 9 to 79 years. At this point of time there were more men using the Internet than women, more younger users than older ones and more users having a high level of education than users of low level education. The conventional picture is confirmed. But since then much has changed.

Source: MedieNotiser 1/99: Mediebarometern 1988, Nordicom-Sweden

Swedes on the Internet – this is what they did at work and at school in 1998

As a percentage of the total population



	Searched for data and information	E-mail	News services	Fixed errends	Read news-paper and magazines	Participated in a discussion- or chatt group
Total	67	39	10	6	5	4
Gender						
Men	65	40	10	8	6	4
Women	71	38	11	5	5	3
Age group						
9-14	62	19	2	5	-	10
15-24	73	37	10	5	3	7
25-44	69	42	11	8	6	2
45-64	61	44	13	6	9	-
65-79	-	-	-	-	-	-
Education						
Low	60	41	14	7	5	5
Medium	68	39	12	5	5	2
High	57	55	16	14	12	1

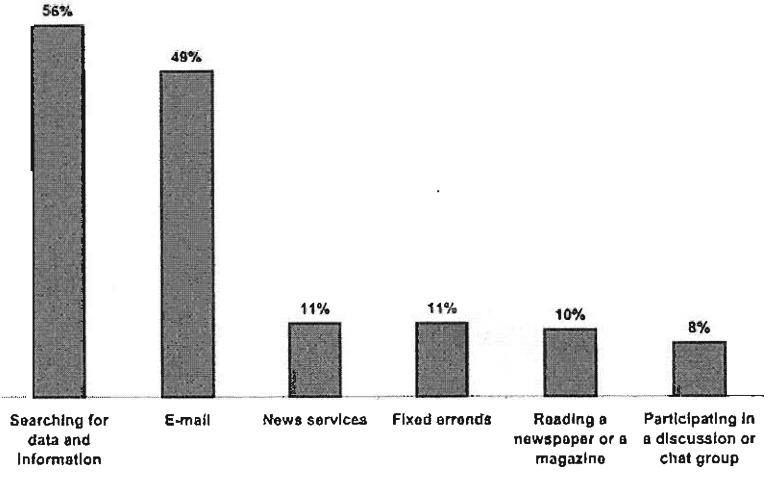
Figure 168: Most of the time spent on the Internet by the Swedes at work and at school is used for data retrieval and information search. In all, 67% of the Internet users looked for some kind of information. 39% handled e-mail. Between 4 and 10% of the population used other Internet services. Internet usage differs between the age groups, which is not surprising.

Source: MedieNotiser 1/99: Mediebarometern 1988, Nordicom-Sweden

The Nordicom researchers also looked into what the differences between Internet usage at work and at home might be. See following figure.

Swedes on the Internet at home in 1998

On an average day, as a percentage of the total population



	Data and information	E-mail	News	Errands	Newspaper/ magazine	Discussion or chat group
Total	56	49	11	11	10	8
Sex						
Men	59	52	13	11	11	8
Women	49	41	7	11	9	7
Age group						
9-14	63	37	5	-	5	26
15-24	44	56	9	3	3	12
25-44	58	45	16	13	11	7
45-64	60	50	8	18	18	-
65-79	-	-	-	-	-	-
Education						
Low	54	42	-	8	4	17
Medium	53	47	11	11	11	7
High	57	55	16	14	12	1

Figure 169: Internet usage at home did not differ very much from Internet usage at work and at school among the Swedish population in 1998. The most frequent usage was information search and e-mail handling, 56% and 49%. Interesting to note is that 11% used the Internet to fix errands, among those banking, invoice payment, etc. Also note the differences between the age groups.

Source: MedieNotiser 1/99: Mediebarometern 1988, Nordicom-Sweden

For 1999 the picture did not change a whole lot. Again, according to the Nordicom researchers, the Swedes used the Internet most frequently for information search and data retrieval. Searching for information and e-mail handling are more frequent at work than at home, while reading newspapers and exploring news sites are more frequent at home than at work.

Swedes on the Internet in 1999
As a percentage of total number of users

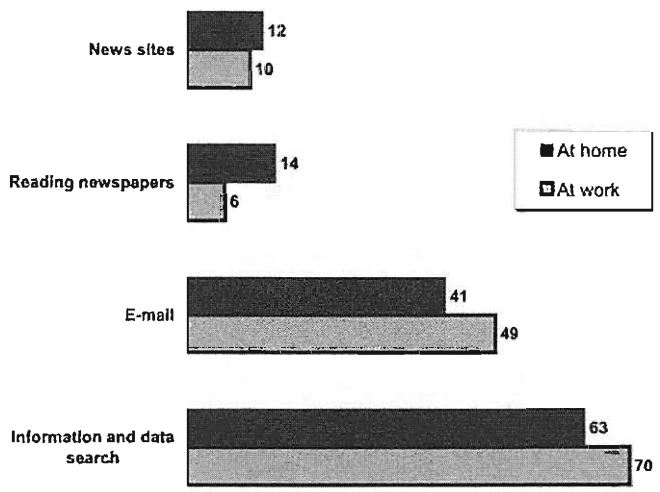
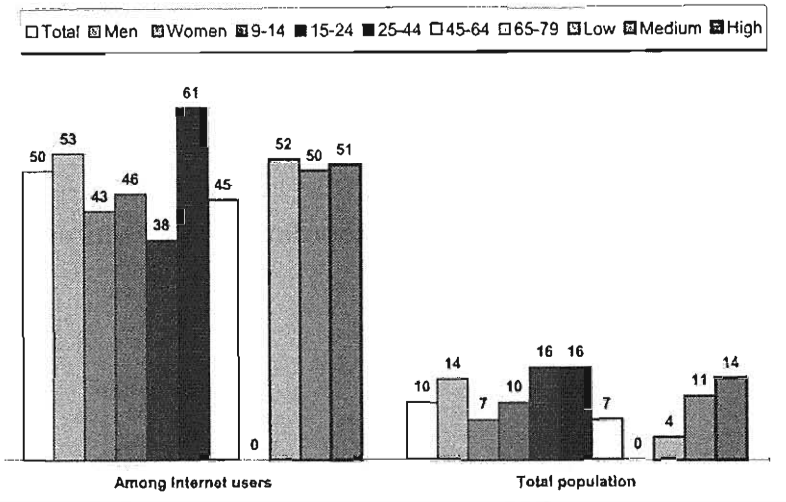


Figure 170: As the Swedes become more accustomed to the Internet we may start seeing new trends in the utilization patterns and greater difference between usage at work and at home. This figure may be the first to mark such a difference.

Source: MedieNotiser 1/2000: Mediebarometern 1999, Nordicom-Sweden

Minutes spent on the Internet by the Swedes in 1998
On an average day



	Total		At home		At school/at work	
	Among Internet users	Among the total population	Among Internet users	Among the total population	Among Internet users	Among the total population
Total	36	22	32	21	34	6
Sex						
Men	38	25	36	19	37	7
Women	33	18	25	24	29	3
Age group						
9-14	3	2	35	20	19	5
15-24	11	6	19	42	42	4
25-44	47	29	33	17	37	4
45-64	35	35	12	14	35	7
65-79	-	-	-	-	-	-
Education						
Low	44	11	28	15	30	4
Medium	40	20	28	20	39	4
High	41	38	17	21	36	7

Figure 171: The total number of minutes spent on the Internet by the Swedish population, independent of usage area was 10 minutes on an average day in 1998. Persons aged 15 to 44 years spend the most number of minutes surfing the Net. Counting only the Internet users the average time was 50 minutes on any day. Once more, there were differences between the groups.

Source: MedieNotiser 1/99: Mediebarometern 1988, Nordicom-Sweden

The surveys reported above are not the only ones about Internet usage in Sweden in particular and in the world in general. In May 1999, the Swedish specialist magazine *"Internetworld"* reported on a project called *"IT Futures" ("IT-Framtider")*, which stated that more than 51% of the total Swedish population had used the Internet. According to the results Internet utilization had the following distribution across the Swedish population during the first two quarters of 1999.

The Swedes on the Internet according to *"IT Futures"*, first half of 1999

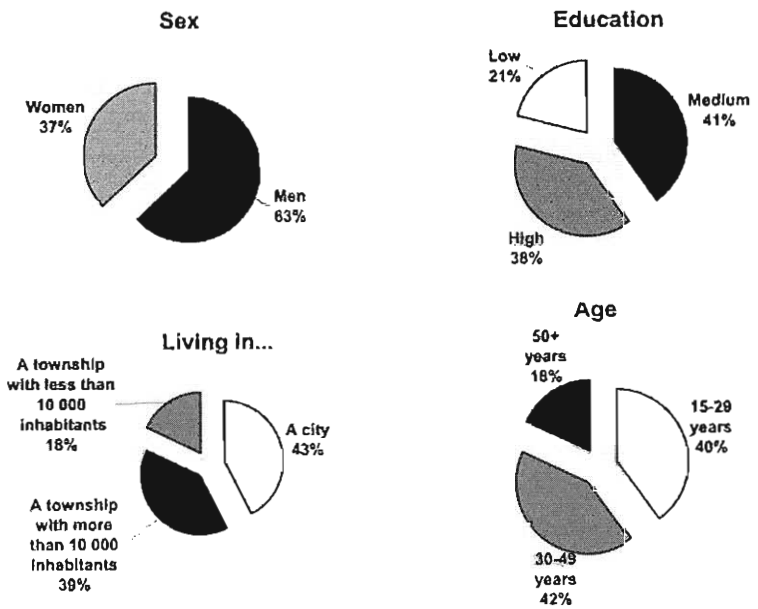


Figure 172: The figure shows the distribution of Swedish Internet users over sex, age group, level of education and place of living according to the results of the "IT Futures" project. The most frequent Swedish Internet user was a man aged 30 to 49 years with a medium level education, living in a city. Once more the stereotype was confirmed!

Sources: Internetworld May 1999/SIFO

Anyone wanting to watch the international Internet development will find details about the global usage at the Irish IT knowledge site http://www.nua.ie/surveys. Statistics as well as data are available on the site. Other sources are the OECD, the ITU and EITO, all of which publish interesting analyzes and reports regularly. The Californian consultancy Network Wizards, which used to publish data on the global number of Internet host computers, have passed on the service to the Internet Consortium. According to Network Wizard data there were 43 230 000 Internet host computers in the world by January 1999. Six years earlier, in January 1993, there were 1 313 000 host computers. Those wanting to know about Internet servers are recommended to follow The Netcraft Web Server Survey and the web site http://www.netcraft.co.uk.

Not only did *"IT Futures"* map Internet distribution and usage in Sweden in 1998. Related analysts of SIFO mapped the attitudes of the Swedish public towards information technology. In an extensive survey carried out during the spring of 1999 the SIFO experts found out that a broad majority among the Swedes is convinced that information technology is important to the creation of new jobs. Moreover, most of the persons interviewed were going to learn how to use information technology. 10% announced that they were scared of the development and 20% found it too fast for their own abilities to absorb new knowledge. 60% were convinced that there must be some restrictions in the usage of mobile telephones in public places. Among those already well equipped with information technology devices, a CD burner was the next investment. The majority wanted number displays in order to know who is calling.

The international research project called *"The World Internet Project"* initiated by UCLA, has reported some initial results, stating that netsurfers in the US, Sweden and Singapore watch TV less, make fewer telephone calls and read fewer papers.

Swedes' attitudes to the Internet in 1999

81% of all Swedes believe that school is important to Internet usage

77% agree that the Internet means important changes to learning

74% of all Swedish Internet users trust people in general but not people on the Net

18% trust people they only met on the Internet

37% of the Internet users profit from the Net by working overtime from home

31% of the daily users of Internet watch TV less

29% of the users got their first Internet access from home

24% had their first Internet access at work

20% got access to the Internet for the first time at school

10% were introduced to the Internet by a friend

26% of all Swedish Internet users have visited the web site of a political party

16% have looked for information on an important subject

6% have participated in a Net action

2% have tried to influence other people over the Internet

Figure 173: The Swedish Internet users are made up of three types – those using the Net for entertainment and social reasons, those using the Internet for information search and communication, and those using the Net in order to shop and visit the bank.

Sources: "IT Futures"/Datateknik no 1, January 28th 1999

According to the magazine *"Datateknik"*, # 1 January 28th 1999, the SIFO general Internet survey of March 1999, reported that 1 161 000 Swedes participated in a chat site. About the same number visited a web shop. During this very month women made up 80% of the total growth over February 1999. 42% of all surfers were women. The most popular web site in Sweden was Passagen having 1.6 million visitors.

The Swedish Agency for Public Management in May 1998: Adult Swedes and their Internet usage

According to the survey made by Statistics Sweden on behalf of The Swedish Agency for Public Management in May 1998, which we introduced earlier in this chapter, 51% of all Swedes have Internet access at work or/and at home. The 51% are equivalent to some 2.6 million persons aged 18 to 64 years. The difference in Internet access among the age groups is important – 80% of the youngest groups have Internet access while only 30% among the oldest have the same facility. 53% of all adult men have Internet access and 48% of all adult women.

Distribution of Internet access among adult Swedes, men and women, at work and at home, in May 1998

	Internet access at work or at school		
	Total number having Internet access	% having PC	% of total population
Men	1 310	69	46
Women	1 072	61	40
Total	2 382	65	41
	Internet access at home		
	Total number having Internet access	% having PC	% of total population
Men	1 015	58	32
Women	789	54	26
Total	1 804	56	29
	Internet access total		
	Total number having Internet access	% of total population	
Men	1 667	53	
Women	1 465	48	
Total	3 132	51	

Figure 174: The distribution of Internet access among adult Swedes, men and women, at work and at home, as it appeared in May 1998.

Sources: Statistics Sweden/The Swedish Agency for Public Management

The Internet access facilities were used regularly among the respondents. 40% of all men used the Internet regularly and some 27% of the adult women. People living in the urban areas are dominant among the Internet users. So are those living close to university regions, for instance Västerbotten, having more than 38% of regular Internet users among its total population. In comparison the percentage of users in Blekinge in Southern Sweden is only 23%. More than 34% of all adult Swedes, i.e. 1.8 million persons, fetched documents, searched for information in data bases and followed issues of special interest on the Internet at least once a week. The following figure shows the Internet applications used from Swedish homes in May 1998.

Internet applications used from Swedish homes, May 1998

MEN	Age group									
	18-24		25-34		35-49		50+		Total	
	% pop	% acc	% pop	% acc	% pop	% acc	% pop	% acc	% pop	% acc
E-mail at home	30	79	26	81	27	76	16	68	25	76
Follows debates via the Internet (or similar)	34	88	27	83	28	76	16	67	25	79
Downloading documents and other materials	26	68	22	69	23	62	12	53	20	63
Accessing public service sites	11	28	7	23	6	18	4	17	7	21
Databases, information services	30	78	22	69	21	58	12	49	20	63
Internet banking	9	25	12	38	11	31	7	30	10	31
Shopping goods and services	17	45	12	38	10	29	6	25	11	34
Gambling and games	11	30	4	12	4	12	2	10	5	15
Ordering services	23	60	13	41	11	32	4	18	12	37

WOMEN	Age group									
	18-24		25-34		35-49		50+		Total	
	% pop	% acc	% pop	% acc	% pop	% acc	% pop	% acc	% pop	% acc
E-mail at home	18	67	19	73	15	46	9	51	15	57
Follows debates via the Internet (or similar)	19	71	18	70	17	52	8	46	15	58
Downloading documents and other materials	15	56	12	47	12	35	5	33	11	41
Accessing public service sites	3	11	4	16	3	9	2	10	3	11
Databases, information services	15	57	13	49	12	35	6	33	11	42
Internet banking	3	12	7	27	5	16	2	13	5	17
Shopping goods and services	6	21	6	25	7	22	3	16	6	21
Gambling and games	5	17	5	18	3	8	2	11	3	12
Ordering services	11	42	8	32	6	19	2	14	7	25

Figure 175: These two tables, one for men, and one for women, show the percentage of users of information and communication applications at home in Sweden in May 1998. The percentages are of the total population and of the Internet users. This survey confirms earlier ones by stating that men more frequently than women have more Internet access and that men spend more time surfing the Net.

Sources: Statistics Sweden/The Swedish Agency for Public Management

Internet applications used at work in Sweden, May 1998

MEN	Age groups									
	18-24		25-34		35-49		50+		Total	
	% pop	% acc	% pop	% acc	% pop	% acc	% pop	% acc	% pop	% acc
E-mail at home	34	61	31	71	27	69	22	69	28	67
Follows debates via the Internet (or similar)	32	58	30	69	26	66	23	66	27	65
Downloading documents and other materials	32	57	28	64	26	66	20	66	26	62
Accessing public service sites	9	17	11	25	9	22	8	22	9	22
Databases, information services	6	10	8	18	7	18	4	18	6	15
Internet banking	40	71	32	72	26	68	21	68	29	69
Shopping goods and services	15	26	14	31	10	25	5	25	10	25
WOMEN	**Age groups**									
	18-24		25-34		35-49		50+		Total	
	% pop	% acc	% pop	% acc	% pop	% acc	% pop	% acc	% pop	% acc
E-mail at home	26	46	19	53	19	56	12	52	15	52
Follows debates via the Internet (or similar)	28	48	18	60	19	57	13	56	15	55
Downloading documents and other material	23	40	12	47	17	50	12	51	11	47
Accessing public service sites	8	14	4	17	8	23	6	28	3	20
Databases, information services	2	3	13	6	3	8	2	8	11	6
Internet banking	31	54	7	60	19	56	11	49	5	55
Shopping goods and services	7	12	6	19	4	13	2	10	6	14

Figure 176: The Internet applications used at work are more or less the same as the ones used by Swedish surfers at home. The differences between male and female users are smaller at work than at home. The differences in utilization between the age groups are also relatively seen small. Interesting enough there is a tendency towards more intense usage for older women at work than at home.

Sources: Statistics Sweden/The Swedish Agency for Public Management

According to the SIFO Interactive studies of the web habits of the Swedish people, web sites offering chat opportunities become ever more popular. But web sites are volatile and so is the loyalty of their visitors. The following ranking lists of the top 10 web sites in Sweden are from two sources and from 1999 and 2000. It is rather interesting to compare them and the changes over time.

Top 10 web sites in Sweden in March 1999, SIFO

Ranking	Name of web site	Web adress
1	Passagen	http://www.passagen.se
2	SEB	http://www.seb.se
3	Aftonbladet	http://www.aftonbladet.se
4	Dagens Nyheter	http://www.dn.se
5	Evreka	http://www.evreka.com
6	Buyonet	http://www.buyonet.com
7	Autobytel	http://www.autobytel.se
8	Leknet	http://www.leknet.se
9	Teletrade	http://www.teletrade.se
10	Spray	http://www.spray.se

Figure 177: SIFO did this ranking list over the Top 10 web sites in Sweden in March 1999.

Sources: SIFO Interactive/Dagens IT, April 21st 1999

Top 10 web sites in Sweden in 1999 and 2000, Internetworld

Ranking 2000	Ranking 1999	Web site	Web address
1.	10.	Spray	http://www.spray.se
2.	12.	Gula sidorna (Yellow pages)	http://www.gulasidorna.se
3.	4.	Dagens Nyheter	http://www.dn.se
4.	1.	Passagen	http://www.passagen.se
5.	11.	Arbetsförmedlingen	http://www.amv.se
6.	13.	Resfeber	http://www.resfeber.se
7.	New	Pricerunner	http://ww.pricerunner.com
8.	New	Bidlet	http://www.bidlet.se
9.	2.	SEB	http://www.seb.se
10.	New	Blue Marx	http://www.bluemix.se

Figure 178: In early 2000, the top 10 most popular web sites on the "Internetworld" ranking list looked as above as compared to the ranking of 1999. It is interesting to note that the Yellow pages of the telephone directory gets a second ranking and that another member of the Swedish public service, the Swedish Employment Service, which is part of the Swedish National Labour Market Administration, is ranked as number 5.

Source: www.idg.se/iworld

The success of the public administration agencies such as the Swedish Employment Service on the Internet could be an implication that the Swedish public cyber society may be on its way. But we are still very early in the process. True that more than half of the Swedish population has Internet access and PCs at home, but now we have to worry about those who do not have Internet access and are without computer literacy.

Finns and Swedes trust the Internet bank

The Investment banker Merrill Lynch reports that the Finnish and the Swedish banks are among the leaders when it comes to offering their customers services on the Internet. Among the Swedish banks, SEB was one of the early starters. In February 2000 25% of all private customers, i.e. 380 000 individual clients, used the SEB Internet Bank. The experiences from the Swedish market will be used to develop a pan-European Internet model, tailored to the customers. The objective of SEB is to have some 5 million e-bank users in Europe by 2004.

Swedish Internet Bank accounts, December 1996–December 2000

Number of accounts in 1 000

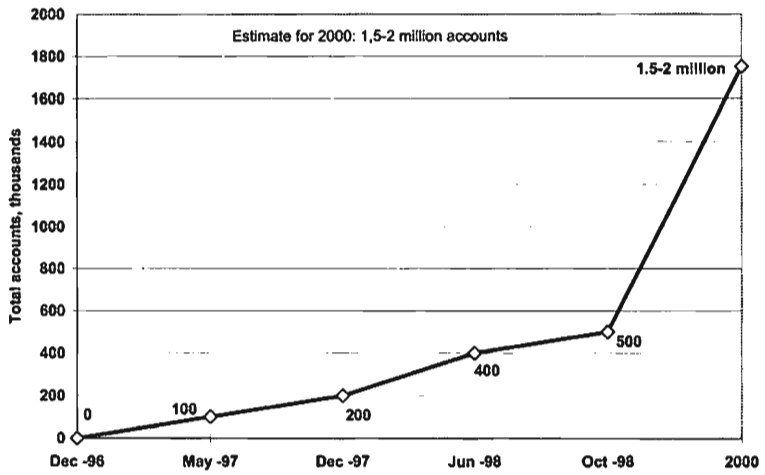


Figure 179: The Internet Bank has been a success in the Swedish banking market. There will be close to 2 million accounts by the end of 2000, according to this estimate presented in a KFB-TELDOK report from 1998.

Source: Sandén, Weje:"Nätet som marknadsplats", Telematik 2001, KFB-rapport 1998:35, TELDOK Rapport 123

In October 1998, there were some 517 000 Internet bank users in Sweden. This means that 13% of the Swedish bank customers used the Internet facility for their banking business.

The Internet Banks in Sweden, October 1998
Number of clients using the Internet Bank

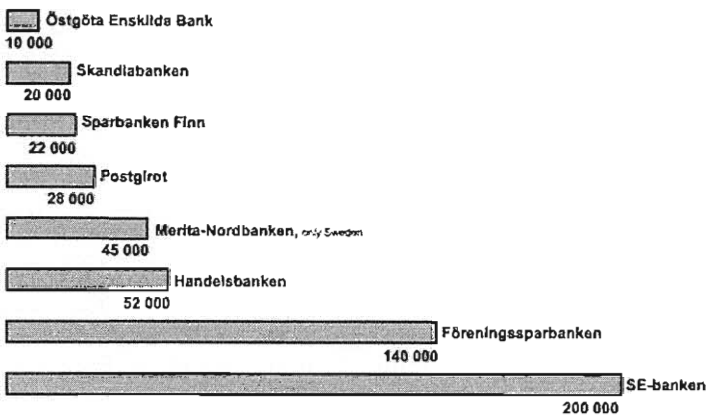


Figure 180: About 13% of the clients of the Swedish banks used the Internet banking facilities by October 1998. This means that 517 000 bank customers in the banks above had chosen to use the Internet for their banking business.

Source: Sandén, Weje: Nätet som marknadsplats, Telematik 2001, KFB-rapport 1998:35, TELDOK Rapport 123

Another leader in Internet banking is the Finnish-Swedish MeritaNordbanken, the largest Nordic retail bank. It has created a service called Solotorget, which is a e-commerce market for the bank's private customers. By the end of 1999, more than 300 shops from Finland and Sweden had signed up to join the Solo market. The bank clients can shop and pay in realtime from their accounts in the bank to the sellers' accounts. In Finland 61% of all stock transactions were made via Solo, 30% of all payments, 11% of all applications for credits and 11% of trading with funds.

The MeritaNordbanken Internet customers in Finland and Sweden 1996–1999

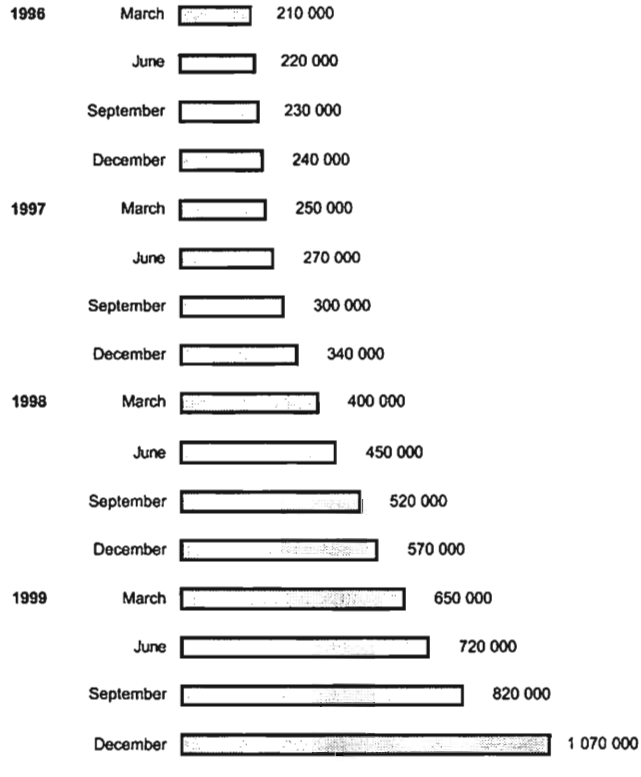


Figure 181: The Finnish-Swedish bank MeritaNordbanken has been very successful in promoting their Internet banking services. During 1999 more than 1 million customers used the Internet Bank and the Solo market services. Compare this to the data above for 1998.

Source: Verksamheten 1999 MeritaNordbanken

Swedish banking specialists warn that there is a lot of hot air in the Swedish Internet bank user data – about 150 000 registered clients have never logged in. In March 2000 SEB, Handelsbanken, Föreningssparbanken and Nordbanken reported in total 1 650 000 Internet Bank users in Sweden. SEB had 410 000, but the bank does not tell how many of the registered users that never logged in. It is known that although 30% of the total number of customers are registered Internet Bank users, more than 40% still paid their bills outside the Internet. Nordbanken had 455 000 users and 70% of these are reported active on the Net. Researchers at the Stockholm University report that many users find the Internet bank web sites difficult to use and rather uninteresting which may be one reason why so relatively many never get connected.

Sources: Merrill Lynch/Dagens Nyheter Sunday May 21st 2000/SEB Årsöversikt 1999/Verksamheten 1999 MeritaNordbanken/Dagens Nyheter Wednesday May 10th 2000

During 2000, the MeritaNordbanken has merged with the most important banks in Denmark and Norway as well, creating a Nordic e-banking market with several million users. For more information see: www.meritanordbanken.com.

15. e-commerce, e-trading, e-shopping...

USA is the leading nation when it comes to the volume of e-commerce as quoted in the previous chapter. Sweden is number two according to two reports presented in June 2000. The Economist Intelligence Unit, EIU, published its analyzis of 60 countries from the point of view of how well they are prepared for e-commerce. EIU ranked factors like the percentage of the population having Internet access, infrastructure for telecom and a number of economic factors. USA, Sweden, Finland, Norway and Holland are the five leaders in this report. UK, Canada, Singapore, Hongkong and Switzerland follow next. EIU comes to the conclusion that infrastructure just as important as a strong economic situation for e-commerce to take off.

Another issue important to the success of the "e-nations" is the complications related to starting new businesses. ASPs (Application Service Providers) are often creative individuals with ideas that they want to capitalize on. In order for them to succeed they need to start companies rapidly. The World Economic Forum surveyed the situation in some of the leading IT-nations. Every nation got a score from 1=difficult to 7=easy. USA scored 6.06, Sweden 4.9, and Austria 3.96. The EU Commission evaluated the member states in August 2000, and presented Sweden, Finland, Denmark and Germany as having the best climate for innovative businesses.

Starting new businesses, a complexity index in 2000

1=difficult
7= easy

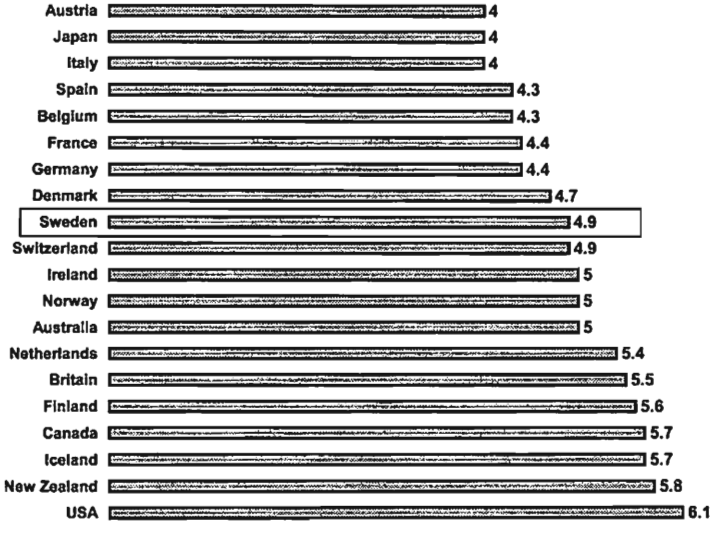


Figure 182: The World Economic Forum surveyed the complexities of starting new businesses in the leading IT nations. Entrepreneurs should start their companies in the US, scoring 6.06 out of 7. Sweden is somewhere in the middle, scoring 4.9.

Sources: World Economic Forum/The Economist June 10th 2000

B2B e-commerce The Swedish Internet economy, *"the e-economy"*, also got a high ranking from the *"Wired"* magazine in its July 2000 issue. Silicon Valley, Boston and Stockholm are topping the list of 46 digital hotspots across the world. So how is e-commerce doing in Sweden? Let us have a look back and forward and see what data can tell us. But first, some definitions. B2B and B2C, business to business and business to consumer, are common abbreviations in the context. B2B e-commerce based on the Internet is already an important part of most economies. In Sweden it is equivalent to 6% of GNP. There are already some 1 200 international B2B portals, which will handle some 30% of all trade between companies and organizations. In Europe there are 200 B2B portals and in Sweden 20. In the US there are 130 electronic markets for B2B. In the near future five will

remain according to specialists. Companies within the same industry tend to build common electronic markets. GM, Ford and Daimler Chrysler have a common market for all suppliers of parts. This is according to a study undertaken by the Swedish Export Council. For further information see www.emarketservices.com.

B2B e-commerce in Sweden in 2000 and 2004

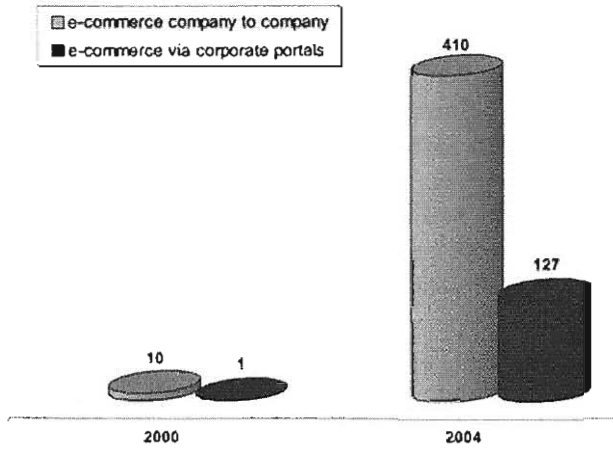


Figure 183: In 2000, B2B e-commerce in Sweden will have a value of 10 billion SEK. 1 billion SEK will be generated via the B2B specialized portals. In 2004, B2B e-commerce will generate 410 billion SEK, 127 billion SEK via the portals.

Sources: Exportrådet/Svenska Dagbladet Näringsliv Monday April 3rd 2000

Among the B2B portals, there are for instance:

Accesspaper, www.accesspaper.com, for the paper trade
SteelScreen, www.steelscreen.com, for the metal trade
CargoNow, www.cargonow.se, for transportation
PhoneTrade, www.phonetrade.com, for mobile telephones
Endorsia, www.endorsia.com, for the steel business
Timmerbörsen, www.timmerborsen.se, for timber
Mediway.net, www.mediway.net, for the health care industry

Large corporations have understood the opportunities offered by e-commerce and the Internet. This is not the case for the small and medium sized enterprises, SMEs, in Sweden. Several studies show that these companies are not considering the Internet at all. Only 6% of the SMEs see the Internet as a very important tool for future development. 56% say Internet is unimportant. It is true that as many as 71% of the Swedish SMEs use the Internet on a daily basis, but mainly for e-mail handling. Only 30% use the Internet for e-commerce. Among the SMEs not using the Internet at all, half say they have no plans to do so in the future. The data above are from a study carried out by Föreningsbanken, Företagarnas Riksorganisation and LRF Konsult. A report from the US called *"Value Strategy, Value Webs and e-business – Tomorrow's Procurement Excellence"* by the analysts A.T. Kearney state that 61% of all business leaders in the USA plan to make all their purchases electronically in 2001. That means that Swedish smaller suppliers will not be even considered if they are not on the Internet.

NUTEK, the Swedish Board for Industrial and Technical Development, interviewed 3 500 SMEs about their attitudes to e-commerce. Manufacturing companies find no or rather marginal advantages of e-commerce via the Internet in spite of the fact that they have utilized EDI, in some cases during 30 years. SMEs in trade and service industries are more positive. Those interested in more information should see the NUTEK report *"Nyttan av IT – i småföretagarnas ögon"* (The usage of IT as seen by SMEs). The report was published in April 1999. The following figure shows the attitudes of the different types of SMEs.

Attitudes of SMEs to e-commerce

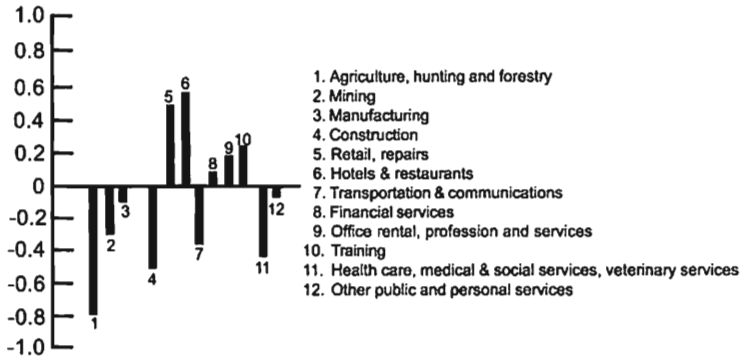


Figure 184: Different types of SMEs hold very varying attitudes to e-commerce. Least interested are SMEs involved in agriculture and related activities. Most positive are SMEs involved in traditional service industries like hotels and restaurants, retailing and training.

Sources: IT-affärer # 5 1999/NUTEK rapport: "Nyttan av IT – i småföretagarnas ögon"

However, all is not darkness even for the Swedish SMEs. There are several regional and local networks for e-commerce, and the Industriförbundet, the Swedish Federation of Industry, is starting up a benchmarking project over three years in order to entice some 100 000 small companies to learn about and try e-commerce. The project is called Svea and more information is available on: www.industriforbundet.se.

B2B e-commerce via different types of networks in Sweden 1998–2003

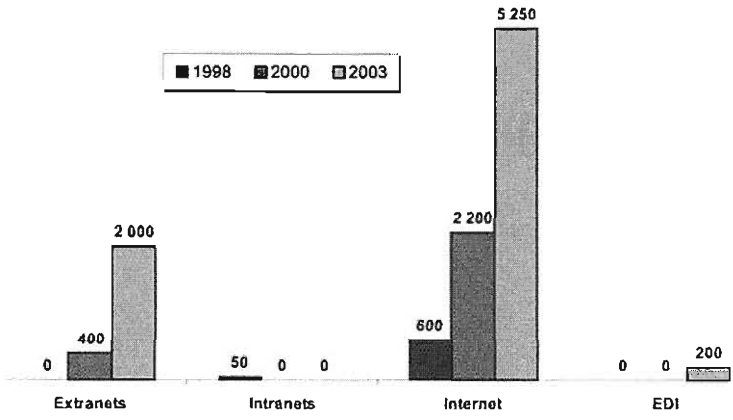


Figure 185: This figure shows the distribution of B2B e-commerce on different types of networks in Sweden, from 1998 to 2003. In 1998 B2B e-commerce had a value of 625 billion SEK. Estimates for 2003 are 8 000 billion SEK.

Sources: Computer Sweden # 30 Monday March 22nd 1999/Visa

Consumers on the Internet

By 2005, some 85 million Europeans, headed by the Germans, will be mouseklicking their way around the Internet shops. Englishmen, French, Italians, Spaniards, Dutch and Swedes will be sharing the e-shoppers' Cyberspace with them. Although only 3.1 million Swedes will be there, they represent 35% of the total population, while the 21.2 million Germans only represent 25% of the German population. The following data are from a study presented by Jupiter Communications by mid-2000.

Europeans in the e-shops in 2000
Total: 85 million

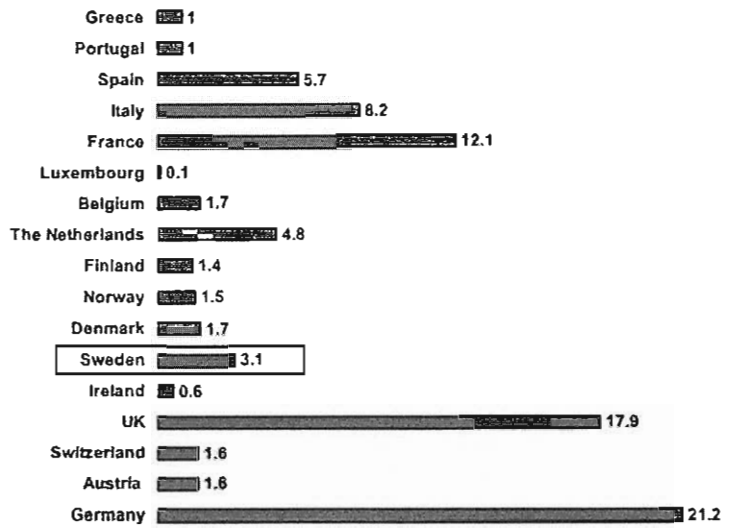


Figure 186: By 2005, 85 million Europeans will spend 144 billion SEK in the e-shops according to an estimate made by Jupiter Communications.

Sources: Jupiter Communications/Den Nya Ekonomin, http://www.dne.idg.se

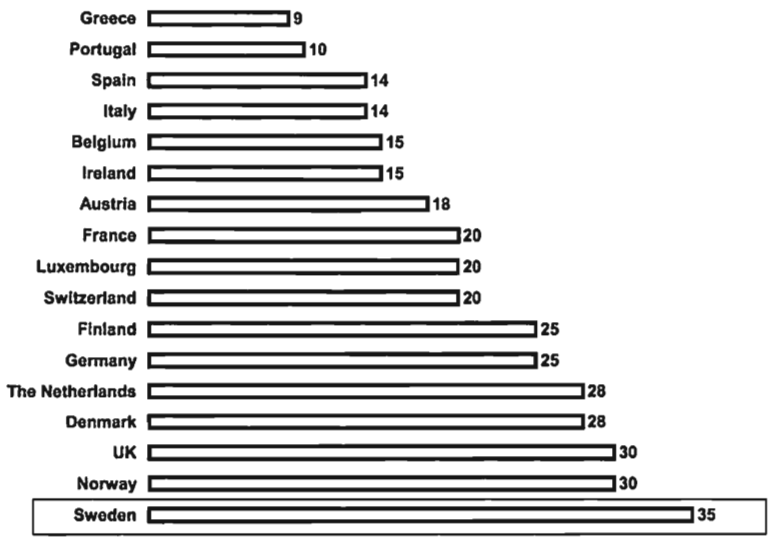


Figure 187: 35% of the Swedish population will be e-shopping by 2005, according to this estimate by Jupiter Communications.

Sources: Jupiter Communications/Den Nya Ekonomin, http://www.dne.idg.se

According to the analysts at Datamonitor, e-shopping, i.e. B2C, in Sweden will be worth some 3 200 million SEK by 2003. In 1997, it had a total value of 32 million SEK. See the following figure.

B2C, Swedes shopping on the Internet, 1997–2003
In million SEK

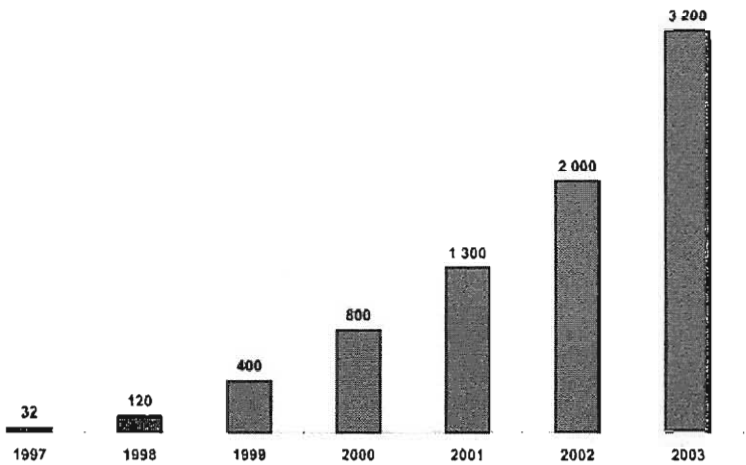


Figure 188: According to a report called "Smart Cards in European E-Commerce" published in July 1999 by the analyst firm Datamonitor, Swedes will spend 3 200 million SEK shopping on the Net by the end of 2003.

Sources: Computer Sweden no. 65, June 24th 1999/Datamonitor: Smart Cards in European E-commerce

Another report on e-shopping in Europe and Sweden, carried out by Jupiter Communications, stated that the Swedes spent 2.5 billion SEK shopping on the Internet in 1999. By 2005, the volume of e-shopping generated by Swedes is estimated to have grown tenfold to some 23 billion SEK.

Swedes' e-shopping to increase ten times in 2005

Total volume 1999 = 2.5 billion SEK
Total volume 2005 = 23 billion SEK (estimate)

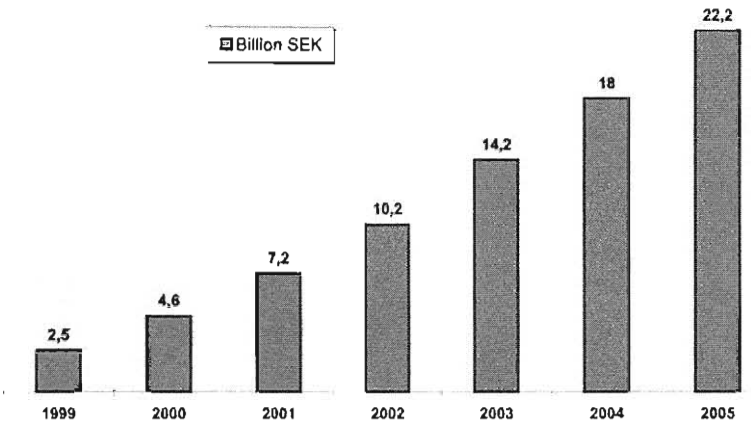


Figure 189: Analysts Jupiter Communications estimate that Swedes will spend 23 billion SEK shopping over the Internet in 2005. The data should be compared to data from HUI above.

Sources: Jupiter Communications/Den Nya Ekonomin, http://www.dne.idg.se.

The Swedish Research Institute of Trade, HUI, reported in early September 2000 that the prices of goods shopped on the Internet in Sweden are sinking. In most cases it is cheaper to buy things via the Internet than in the stores. E-shopping was estimated to a total value of 5.6 billion SEK for the year. This is equivalent to 1.6% of the total consumer shopping.

Cheaper to shop via the Internet in Sweden, September 2000

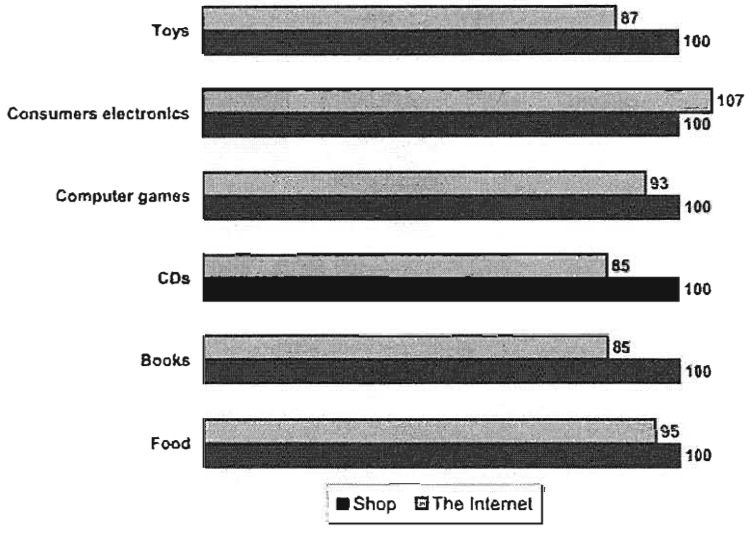


Figure 190: Internet shopping is on an average 1.4% cheaper in Sweden compared to buying the same items in shops. The Swedish Research Institute of Trade has compared shopping baskets containing goods from the six categories in the figure. E-shopping in Sweden is growing slowly but steadily by about 1% per year.

Sources: HUI/Näringsliv, September 7th 2000

The analysts at Jupiter Communications estimate that e-shopping in Europe will be worth 7.7 billion € by the end of 2000, and by 2005 it will total 64.4 billion €, equivalent to 144 billion SEK. On what will the Europeans be spending all that money? Well, most of it on travels, 27.3%. 14.9% will be spent on food, 12% on PCs, 6.1% on fashion, another 6.1% on software. See following figure.

Europeans to spend 64.4 billion € e-shopping in 2005

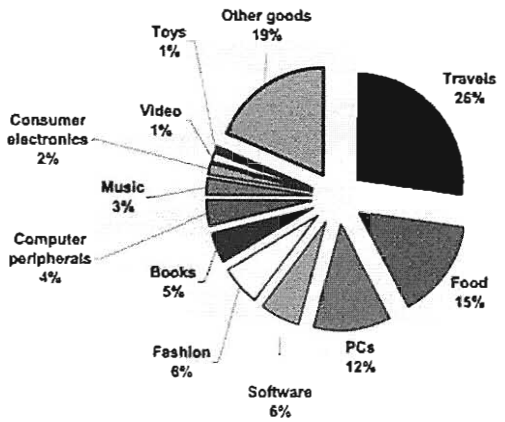


Figure 191: The Europeans will spend 64.4 billion € e-shopping by 2005. Most of the money, 27.3%, will be spent on travels. The figure shows the percentual distribution per type of goods.

Source: Jupiter Communications

E-commerce and e-shopping are seen as the motors of the new economy and thus some of the hottest Internet topics. However, analyzes, estimates and predictions about the e-commerce habits of the Swedes, among others, have abounded for the past five years, at least. Thus we learn that Swedes bought Christmas gifts on the Internet in 1998 to a total value of 260 million SEK. The problem was that three out of four gifts arrived after Christmas. For the whole of 1998 the Swedes spent for something close to 600 million SEK on e-shopping, which is equivalent to 0.2% of the total retail business in Sweden. According to the Swedish Research Institute of Trade, HUI, e-shopping had a moderate growth in 1999 and was equivalent to 0.7% of all retail expenditure. In late 2000, it was equivalent to 1.6%. Several surveys rating the quality of the Swedish shopping sites state that most of them are bad at delivery.

Most popular shopping sites December 1998 and January 1999

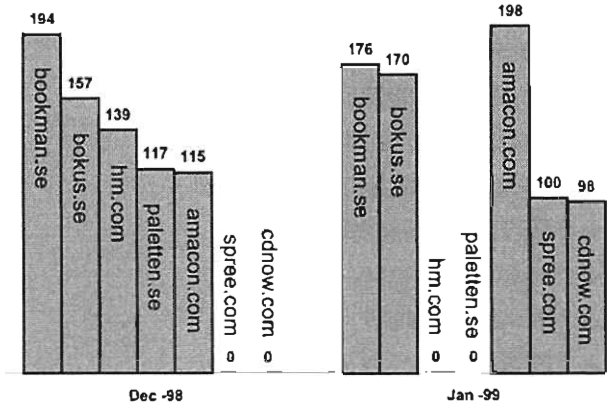


Figure 192: In December 1998 the most popular shopping sites among the Swedes were Swedish ones. In January 1999 the most popular ones were American.

Sources: SIFO/Computer Sweden Friday February 26th 1999

In May 2000 there were some 5 000 dot.com companies in Sweden involved in B2C, business to consumer, over the Internet. Specialists predict that 5% of these will survive in the long run. Mergers are likely in many cases. Boo.com was the first Swedish dotcom company to fail. This has caused problems for the whole e-commerce industry finding financing and risk money much more scarce.

Most popular e-shopping sites in April 2000
Number of unique visitors

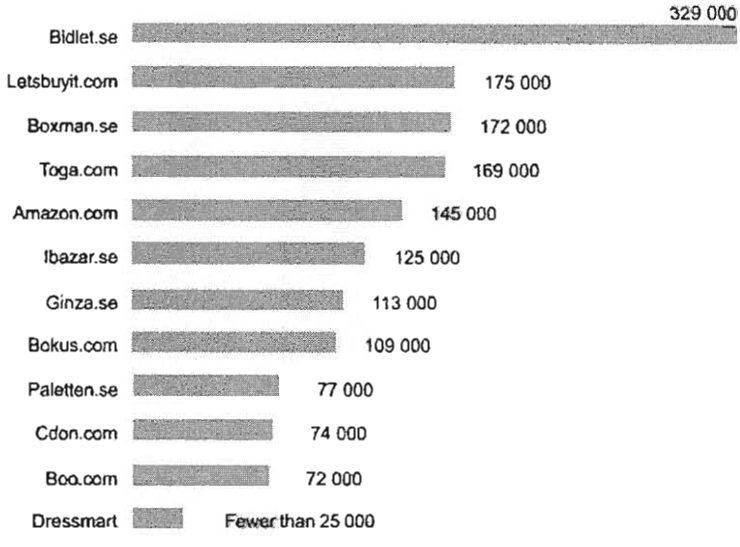


Figure 193: In April 2000 the most popular e-shopping site Bidlet got 329 000 unique Swedish visitors. "Unique Swedish visitors" in this context simply means people using the Swedish language to access the site. Most national sites in Sweden are bilingual, also offering their services in English. The figure above shows the most popular e-shopping sites for April. Boo.com folded in May.

Sources: MMXI Nordic/Svenska Dagbladet Näringsliv, Saturday May 20th 2000

Top 10 e-shopping sites in Sweden, July 2000
Number of unique visitors

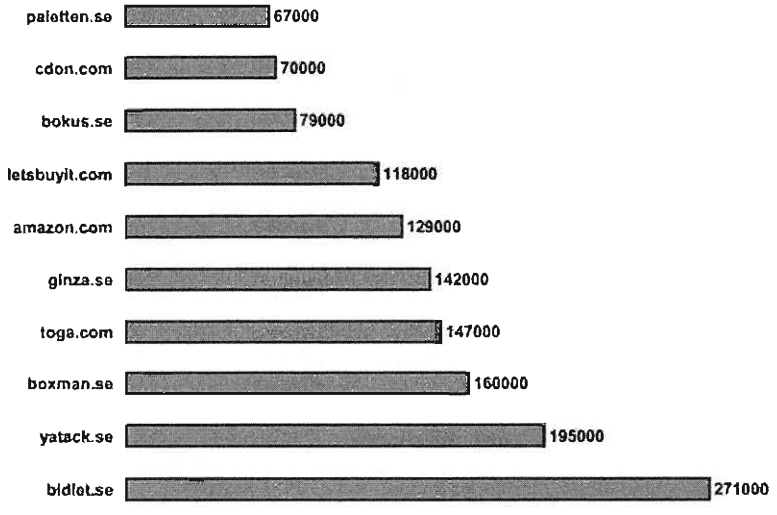


Figure 194: In August 2000, Bidlet was still the most popular e-shopping site in Sweden, but its number of unique visitors was down to 271 000 as compared to 329 000 in May, 2000. Number 2, yatack.se, is the Swedish version of a Norwegian site, and amazon.com of America ranks number 6.

Sources: MMXI Nordic/Näringsliv August 11th, 2000

Most popular e-shopping sites in May 1999
Number of unique visitors

Company	Products/ services	Country of origin	# of visits
1. Boxman	CDs	Sweden	213 000
2. Amazon	books	USA	193 000
3. H&M	fashion	Sweden	159 000
4. Reseguiden	travels	Sweden	110 000
5. SAS	travels	Sweden	110 000
6. Resfeber	travels	Sweden	104 000
7. Bokus	books	Sweden	100 000
8. Fritidsresor	travels	Sweden	98 000
9. Apollo	travels	Sweden	89 000
10. Ving	travels	Sweden	88 000
11. Travellink	travels	Sweden	88 000
12. Always	travels	Sweden	79 000
13. Cdnow	CDs	USA	78 000
14. Pc express	computer equipment & software	Sweden	67 000

Figure 195: The listing above shows the most popular e-shopping sites in May 1999, to be compared to the sites in figure 181.

Source: Dagens Nyheter Monday July 26th 1999

This is what Swedes bought over the Internet

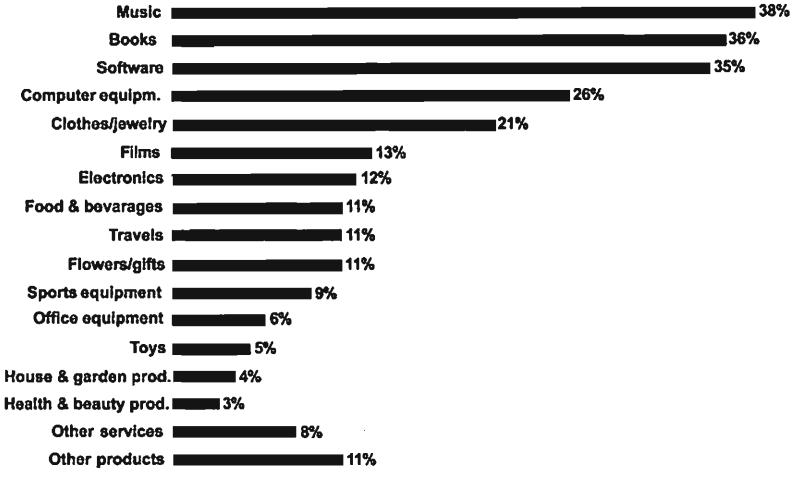


Figure 196: During Q1 and Q2 of 1999 the Swedes bought music, books, computer software and hardware most frequently over the Net. 12 months later, by the end of Q2 2000, travels are the single product area most frequently bought by the Sweden over the Internet.

Sources: Dagens Nyheter Monday July 26th 1999/Intelligence Web Survey February 1999

Swedish shoppers and their expenditure on the Internet, February 1999

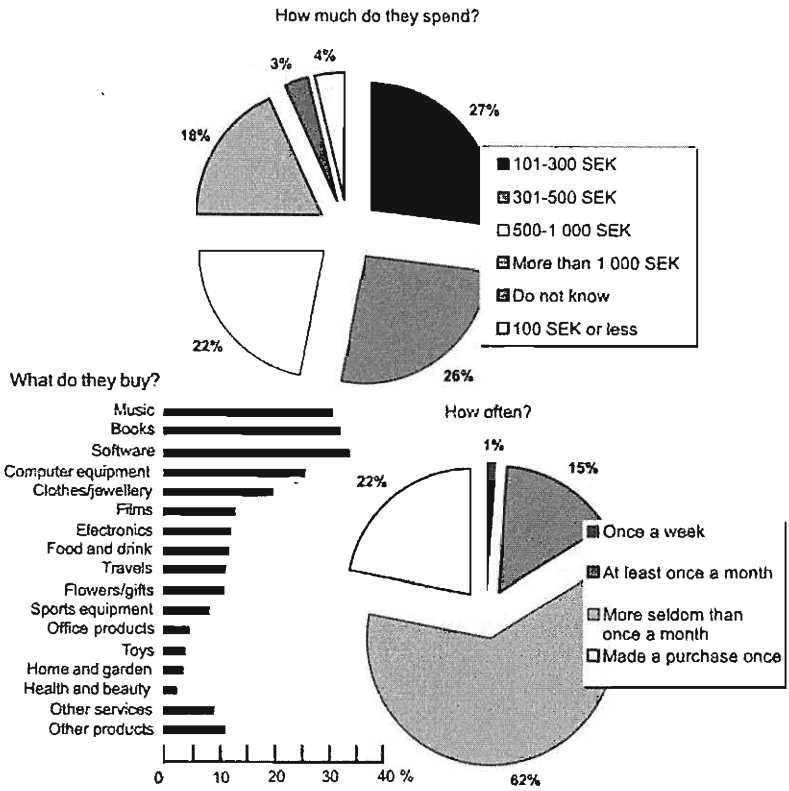


Figure 197: The figure shows the results of a survey made in February 1999 of what the Swedes bought and for how much over the Internet. Also the frequency was measured. Since then e-shopping has become more secure, there are more shops to visit and more products and services offered, as described above. And there are more people having tried it once successfully.

Sources: IT-affärer # 5 1999/Intelligence Web Survey February 1999

Retailing over the Internet as a complement to traditional shops is growing rapidly in Sweden. In April 2000 some 7 000 traditional retailers had an active shopping site. 42% of these were generating money via their e-shopping sites. All the same, only 1.6% of the total retailing value was generated via the Internet according to HUI, the

Swedish Research Institute of Trade. The total retail market in Sweden for Q1 in 2000 had a value of 81 billion SEK. 1.3 billion SEK were generated by e-shopping during the same period. According to the American analysts firm A.T. Kearney, e-retailing will generate 7 billion SEK in Sweden in 2000, compared to 3 billion SEK in 1999.

Swedish retail business on the Internet, 1999

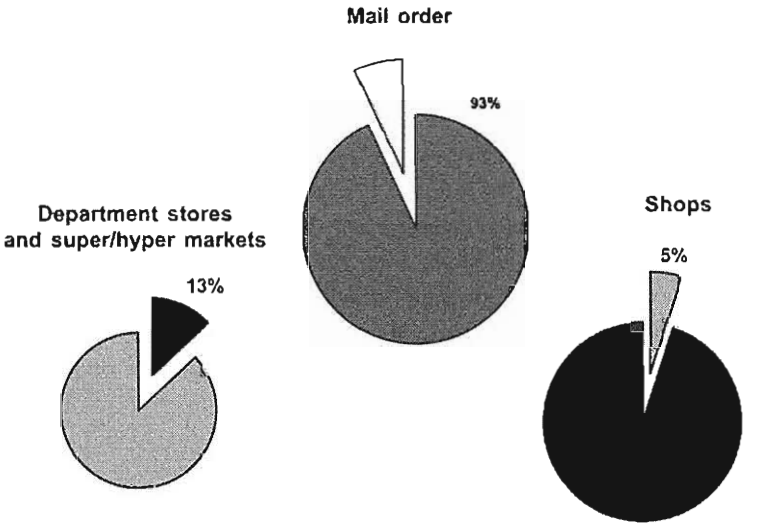


Figure 198: The large mail order companies in Sweden have an important presence on the Internet as well. Some of them make a profit also of their e-business. Many of the dotcom companies fail because they have not understood what business they are in – e-mail order.

Sources: IT-affärer # 5 1999/HUI, http://www.hui.se.

In April 2000 there were just 60 food markets offering shopping services via the Internet in all of Sweden. Less than 1% of the Swedish population buys food via the Internet. Handling and transport services are too expensive, and the shopping sites not just yet user-friendly enough. The Boston Consulting Group showed in a study earlier this year that 28% of all those who try to buy something over the Internet failed to buy what they wanted.

According to the analysts at Jupiter Research 16% of the Swedes have shopped on the Internet once. In 2005 they believe that 35% of all Swedes will have experience from e-shopping. In 2000 they predict that the Swedes will spend US$584 million and US$2.7 billion in 2005. Travels make up the fastest growing single market followed by hardware, CDs and books.

e-trading

There are 12 e-brokers active in the Swedish financial markets. These have approximately 1 million customers. Most of the brokers have had several problems with their sites and the Swedish Financial Supervisory Board, Finansinspektionen, has received complaints about the bad service. But the systems are improving and problems solved as they appear.

Trading stocks on the Internet is a popular occupation in Sweden. About 51% of the total population are stock owners. The stock is kept in some 250 000 individual accounts managed by banks and brokerage firms. The number of individual accounts are expected to double during 2000. The figure shows the percentage of stockholders in the populations in five European countries, based on data from JP Morgan.

Stockholders in five industrialized countries
In percent of the total population

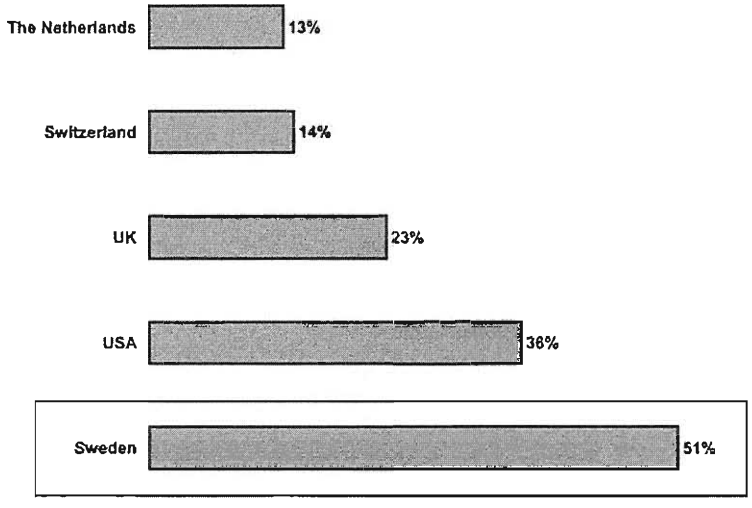


Figure 199: About 51% of the Swedish population are stockholders. The figure compares the percentage of the population in five European countries.

Sources: JP Morgan/Dagens Nyheter, Sunday August 20th 2000

Number of Internet stock accounts in Sweden, June 2000

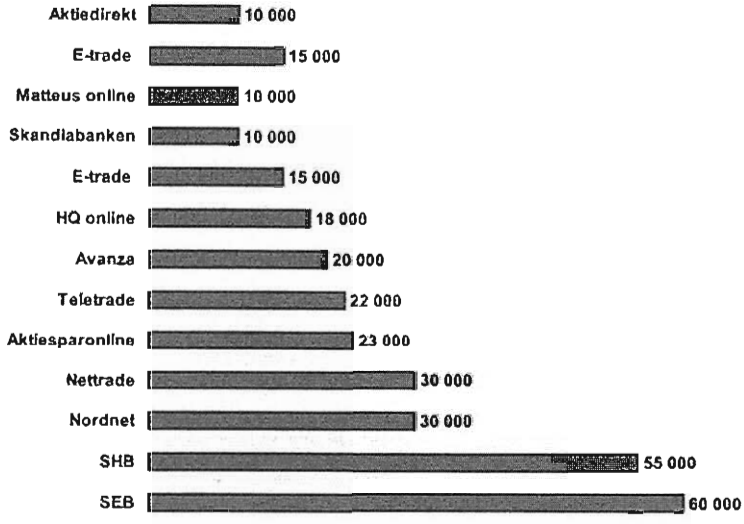


Figure 200: The figure shows the number of Internet stock accounts per institution in Sweden in June 2000. The total number was 318 000 accounts. By the end of 2000, there will be the double amount, due to the new pension fund system.

Sources: TT/ Dagens Nyheter, Sunday August 20th 2000

e-advertising

The Scandinavian advertising specialists believe that Internet advertising will grow by 100% during 2000. The total volume of Internet advertising in 1999 reached 510 million SEK. By the end of 2001, it should be equivalent to 1 180 million SEK. The equivalent figures for Europe are 4 120 million SEK for 1999 and 14 520 million SEK for 2001. This means, that Europe will not see a backlash similar to the one the US Internet advertisers are seeing. In the US, the dot.com-companies relied to a large extent on Internet advertising. These companies are now in deep financial trouble. In Europe, more traditional companies have tried out the Internet as a complementary advertising medium to the traditional TV, film, magazine and newspaper advertising. The experiences so far have been positive.

Internet advertising in Europe and Scandinavia 1999 and 2001
In million SEK

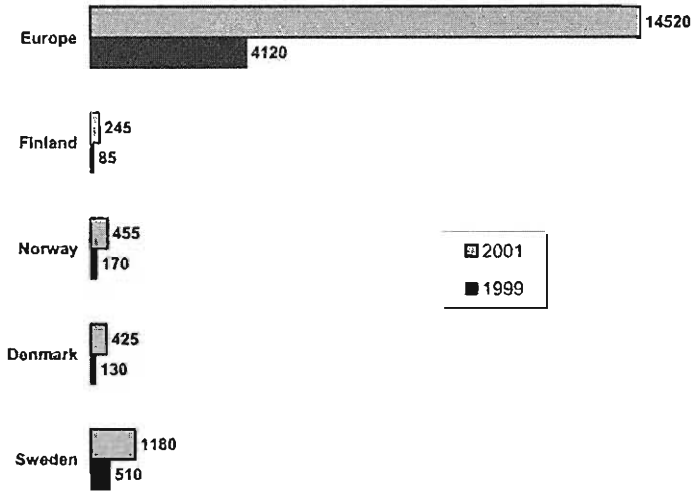


Figure 201: The total volume of Internet advertising in Sweden in 1999 reached 510 million SEK. By the end of 2001, it should be equivalent to 1 180 million SEK. The equivalent numbers for Europe are 4 120 million SEK for 1999 and 14 520 million SEK for 2001.

Sources: Jupiter Communications/Näringsliv August 31st, 2000

Banner advertising by Scandinavians 1998–2003
Billion SEK

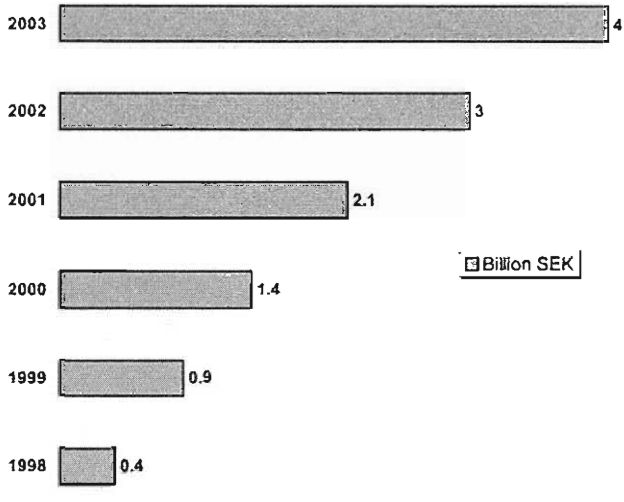


Figure 202: One of the web income generators is banner advertising, In 2000, some 1.4 billion SEK will be spent in the Scandinavian countries on banner advertsing. By 2003 the volume will be worth 4 billion SEK, at least according to Jupiter Communications.

Sources: Jupiter Communications/Den Nya Ekonomin, http://www.dne.idg.se

Some analysts see an increase in e-mail advertising by more than 40 times the present volume over the coming years. In 1999, the global value of e-mail-advertising was 1.5 billion SEK. By the end of 2005 it is estimated to 66 billion SEK. One reason for the interest in e-mail marketing is that the advertisers hope to open a dialogue with prospective customers.

Global e-mail marketing 1999 and 2005
In billion SEK

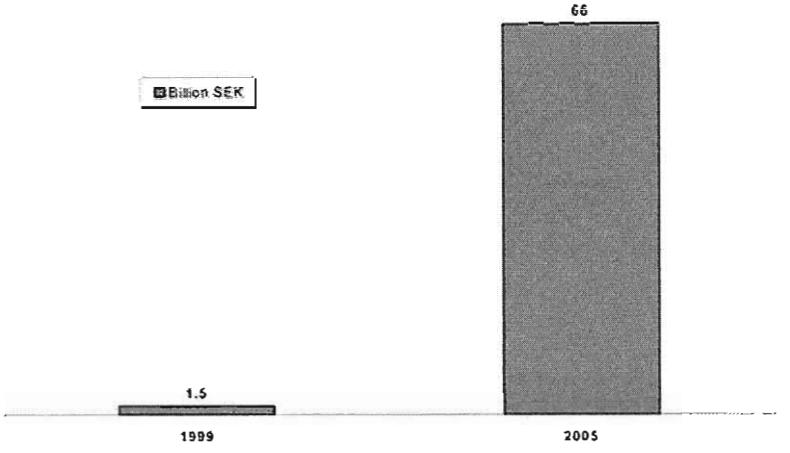


Figure 203: E-mail marketing is a rapidly growing market in the e-world. The figure shows the global volume in SEK in 1999 and an estimate for 2005.

Sources: Jupiter Communications/ComputerSweden, July 28th 2000

e-learning

e-learning together with e-commerce is a rapidly growing market in Sweden. Presently it is rather insignificant – there are only some ten companies specializing in e-learning active in the Swedish market. But the potential is enormous according to all gurus and analysts and more players will enter the market. Forecasts made by IDC for the US market tell us that e-learning will have a total value of 61 billion SEK in 2002.

Swedish companies having used interactive training

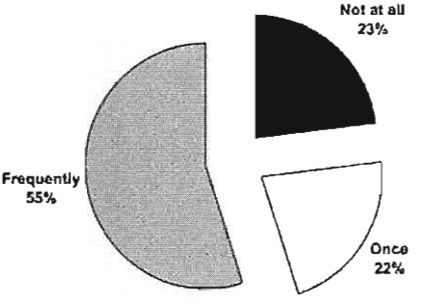


Figure 204: So far 55% of all Swedish companies have used interactive media in their training programs according to IDC.

Sources: IDC/Svenska Dagbladet Näringsliv Wednesday April 5th 2000

According to IDC 75% of the Swedish companies believe that less than 10% of all training will be e-based. 25% are convinced that 10 to 40% of all training is e-based. Within three years 32% of the companies believe that less than 10% of all training is e-based, while 46% believe that 10 to 40% of all training will be e-based, while 2% of the companies believe that more than 40% of all training will be e-based.

E-learning gains market in Sweden 1999 and 2003

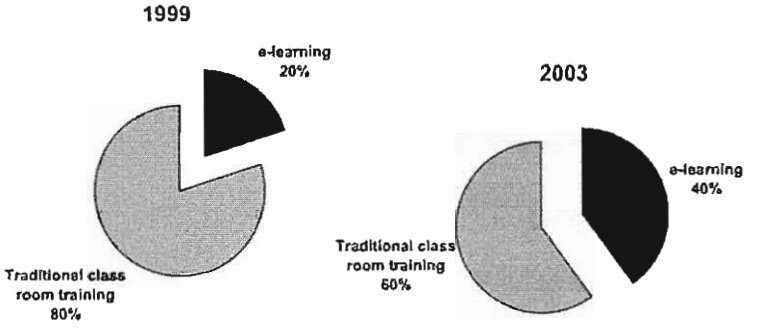


Figure 205: In 1999 20% of all corporate training was e-based, e-learning, while 80% was traditional classroom training. Estimates for 2003 predict that 40% will be e-learning, while 60% still will be classroom training.

Sources: IDC/Svenska Dagbladet Näringsliv Wednesday April 5th 2000

Internet based training in the USA 1998–2003
All values in billion SEK

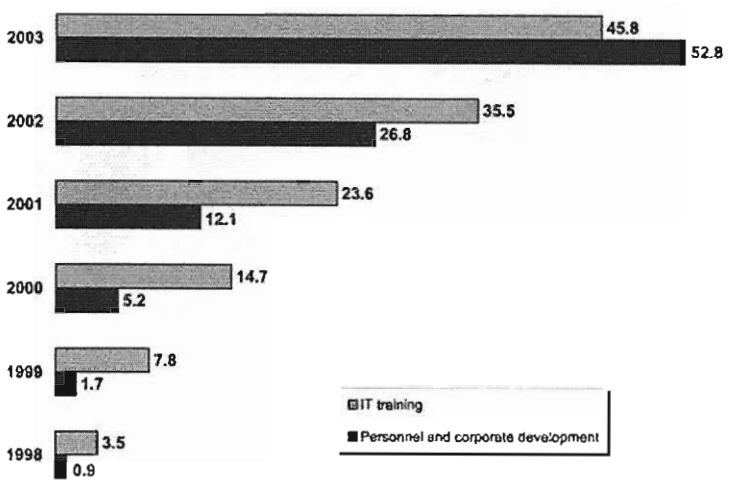


Figure 206: In 1998 Internet based training in the US had a value of 4.4 billion SEK. In 2003 the value will be equivalent to 98.6 billion SEK. IT training will pass personnel and corporate development training.

Sources: IDC/Svenska Dagbladet Näringsliv Wednesday April 5th 2000

Public e-services 24 hours

Statskontoret, The Swedish Agency for Public Management, which has been running continuously since 1680, is busily working to realize a vision of creating public services that are up and running 24 hours, seven days a week, all Internet based. Part of the vision is that each administrative problem should be solved through one single contact with the authorities even when a single errand involves several different agencies. This huge task is already well on its way. There are some 500 public agencies in total in Sweden handling all kinds of public administration on behalf of more than 9 million inhabitants. First to market, i.e. to the Swedish citizens, are the tax authorities, several school and childcare authorities and medical services as well as social support services. In the near future all authorities can be reached via a public portal. You will be able to

find solutions to your problems via the mousepad and the keyboard on your electronic devices. The public portal is based on so called SHS technology, which is a traditional system for information transmission, containing a large number of readymade solutions. The SHS system will be able to translate and understand all generally accepted Internet languages such as TCP/IP, http, SSL, MIME, XML and LDAP, to mention a few. The new Internet protocol Ipv6 will be used as it contains solutions for electronic signatures and encryption. SET, the existing banking system, will also be part of the electronic public service. All public sites in Sweden are in Swedish of course but many are also multilingual. English versions of the sites are a must. Local authorities also produce their sites in languages used by minorities. Several local communities already have electronic public services available to everyone. One objective of the project is to save a lot of the taxpayers' money. Another one is to improve public services – as is well known you have to take time off from your job whenever you need to contact any public agency. More information? Either you call Statskontoret or you follow the development via the Internet sites of the public agencies mentioned in this book. Most public agencies have home pages in English and other languages.

Part III

eSweden, Leader in the Cyber Future?

Chapters 16–19

Time frame

1642–2000

1642	Blaise Pascal builds the first mechanical calculator
1792	Claude Chappe constructs the optical telegraph
1843	The Swedish teenager Edvard Scheutz builds the world's first programme-controlled mechanical computer with a printer after the Babbage model
1878	The Swede Odhner constructs a compact, mechanical calculator
1886	Guglielmo Marconi develops the wireless telegraph, the radio
1903	Nikola Tesla secures a patent for logical electronic circuits Lee De Forest invents the triod
1926	The automatic cross bar switch, a Swedish invention, is impemented in the Swedish telecom network
1936	Alan Turing describes the Universal Turing Machine
1955	The first installation of a base station for land mobile telephony is installed
1956	Two commercial mobile telephony systems are operating in Sweden, one in Stockholm, another one in Gothenburg
1957	The Soviet Union launches the first Sputnik
1960	Cobol, the first user friendly programming language, is created
1962	Telstar I is the first telecom satellite connecting Sweden and the US
1967	The Nordic Mobile Telephone system, NMT, an analog system, is created. Development starts
1976	The digital AXE switch is introduced by Ericsson
1981	The NMT system is fully implemented in the Nordic countries
1988	The first specifications for a digital GSM system are presented
1991	Commercial GSM-systems for mobile telephony are introduced
1997	Bluetooth development work starts with Ericsson, Nokia, Intel, Toshiba and IBM
1999	57% of the Swedish population have a mobile telephone
2000	February – The first order for a 3G mobile system goes to Ericsson
2000	June – The first Java 2 system on a chip is introduced by a Swedish team in the US

16. IT Research and Development in Sweden

Time frame

R&D 2000

"Over the past years, R&D has ... become more market-oriented, and overall business funding of R&D has grown in many OECD countries, including the United States. Growth in business-funded R&D has been particularly rapid in a number of small OECD economies, such as Australia, Denmark, Finland, Iceland, Ireland, Korea and Sweden, where R&D intensity has risen significantly. In many OECD countries, business funding has gained in importance in overall R&D expenditure. Countries with large increases in the intensity of business R&D to GDP and in the share of business R&D in total R&D, including Australia, Denmark, Finland, Ireland and Sweden, appear to have experienced a pick-up in MFP (Multi-Factor Productivity) growth in the 1990s. Increased spending on knowledge and innovation goes considerably beyond spending on R&D, however, and includes spending on education and software."

Source: OECD 2000: A New Economy? The Changing Role of Innovation and Information Technology in Growth. Information Society

Research and development and its expenditure on a national level cannot be described without relating it to the general environment that will benefit from the results. Thus, in this chapter we will try to describe at least some of the factors that influence the development of Information Society R&D in the Swedish context. We have made an effort to provide you with facts that somehow influence the general direction of R&D in Sweden. However, the relations between taxation, education and innovation are not discussed here.

Those interested in these important issues are recommended to consult a doctoral thesis by economist Åsa Hansson called *"Limits of tax policy"*, Lund University 2000.

We will start out with a rough description of the global background to Sweden's investment in research and development in general and in information technology research and development in particular. For those with a specific interest in this subject, we also recommed a booklet printed by NUTEK, The Swedish National Board for Industrial and Technical Development, called *"Swedish Information Technology in Figures 2000"*. The booklet is one of the sources for some of the data presented below.

In 1999, the world export of goods amounted to US$ 5 610 billion. This represented a growth by 3% over 1998, when the value of world exports fell by 2%. United States exported goods at a value of US$695 billion, equivalent to 12.4% of the total value, the European Union exported goods at a value of US$798.6 billion, or 18.9% of the total. The value of goods exported by Sweden in 1999 amounted to some US$95 billion according to WTO. The OECD reported that GDP per person in US$ at purchasing-power parity for Sweden in 1999 was about US$23 000, which places the country as number 14 among the OECD countries. USA, Canada, Norway, Switzerland, Iceland, Denmark, Ireland, the Netherlands, Austria, Japan, Australia, Belgium and Germany had larger GDPs per capita than Sweden. IMF estimates that the Swedish GDP will increase by 4.2% in 2000 and by 3.6% in 2001. Much of the goods exported is the result of the nations' investments in research and development.

Trends in the intensity of business-funded R&D relative to GPD, 1990 and 1998

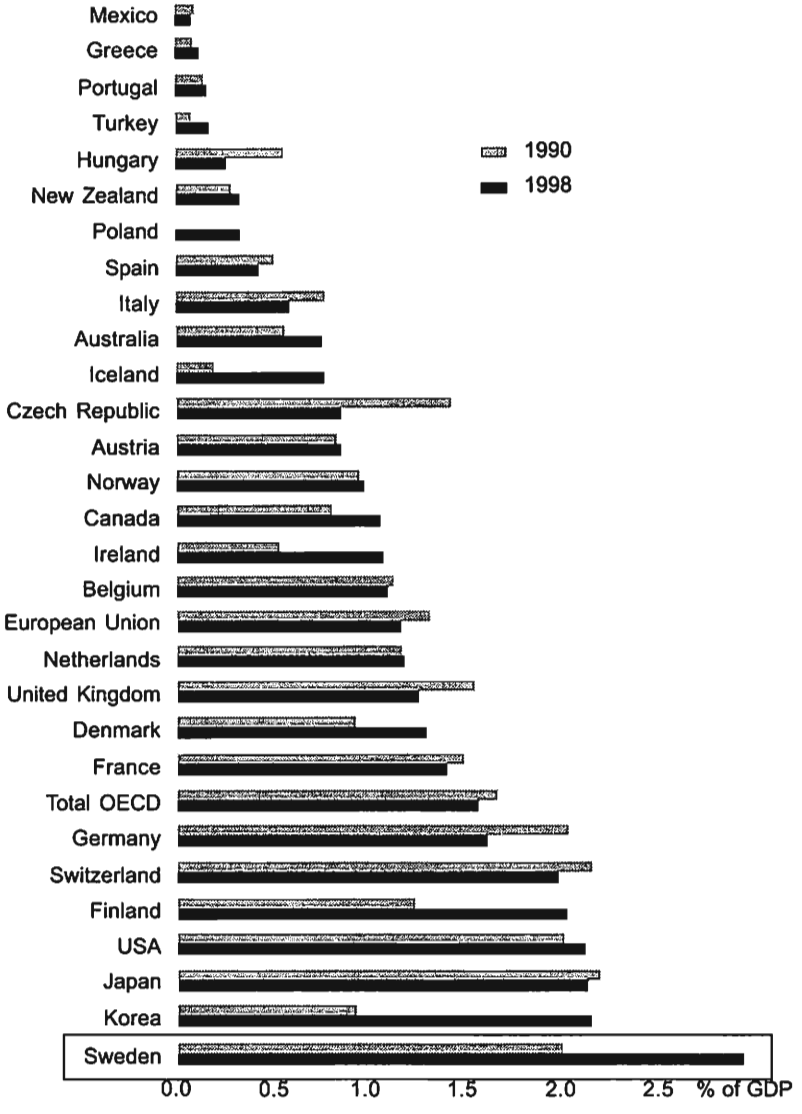


Figure 207: This figure shows that the larger part of Sweden's total R&D expenditure was business-funded, more so in 1998 than in 1990.

Sources: OECD, MSTI database, November 1999/ OECD 2000: A New Economy? The Changing Role of Innovation and Information Technology in Growth. Information Society

R&D spending in percent of GDP in the OECD countries in 1998

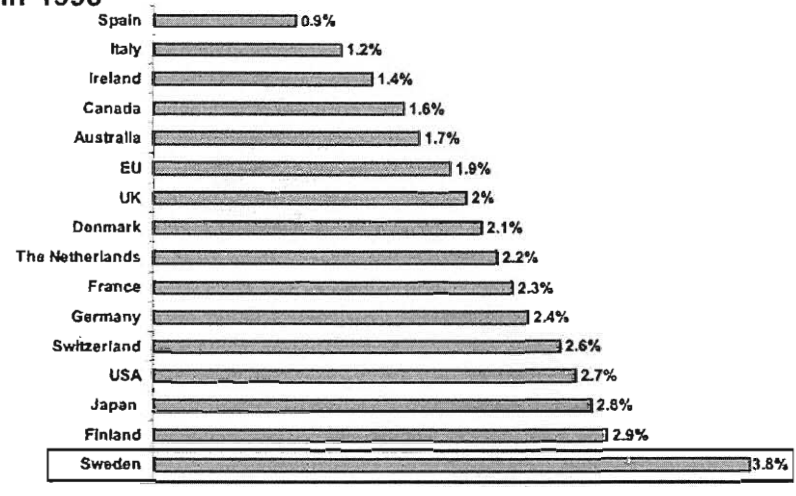


Figure 208: In 1998, Sweden spent 3.8% of GNP on research and development, and kept its leading position among the OECD countries. The EU average expenditure was 1.9% of GNP.

Source: OECD

Information and communication technologies are seen as some of the important factors for the future development of the world economy, the Swedish one included. The expansion of the Internet, mobile as well as fixed, e- and m-services, mobile communications and virtual networks are thus in the focus of interest of important research and development institutions in Sweden. Broadband expansion, the development of multimedia tools, content development and the role of small firms and start-ups are likely to become future research areas just as telemedicine and public e-services. Particularly important aspects of Swedish IT research are foci areas such as technology users and utilization, user interfaces and product adaptation.

The reasons for these particular areas of interest are to be found in factors such as the growth rate of the global population, which was by 213 188 new individuals per day during the period 1998 to 1999. During the same period the number of web pages grew by 1 917 188 per day, and 147 671 new Internet users went online per day. 4 422 unique web services were added to the Internet per day. The following figure shows the dynamism of the Internet and the WorldWide-Web.

Daily growth rate of the Internet 1998–1999

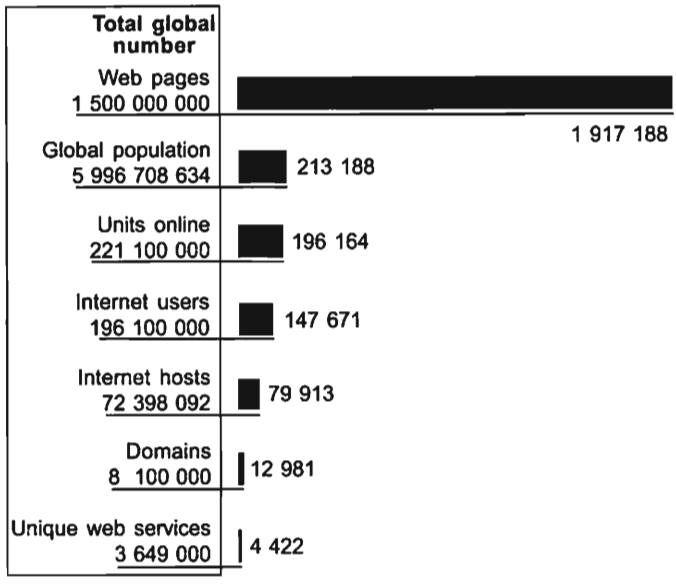


Figure 209: The figure shows the daily growth rate of the Internet during 1998 and 1999 related to the growth rate of the global population. The number of web pages is growing faster than the global population but the number of new Internet users are lower.

Sources: Industry Standard/ComputerSweden April 7th, 2000

55% of all web sites are American ones, while Sweden stands for 1% of the global number of web sites according to Online Computer Library Center. Germany has 6%, Canada 5%, UK 5%, Japan 3%, Australia 3%, Australia, Brazil, France and Italy 2% each.

The likelyhood for broadband to become a central future research area in Sweden is confirmed by the following facts. According to a report by Forrester Research, 40% of all households in Sweden will be connected to broadband by 2005. According to this report the two main players are Telia and Bredbandsbolaget. But for Sweden to become a true leader in broadband technology, more R&D resources are needed. A broadband competence center is being implemented in Kista North of Stockholm, and there is a proposal for an R&D consortium proposed to the government. There may be an embryo for such a new broadband consortium in a project called **Internet 42**, initiated by the S Lab of Telia and the Ericsson Medialab.

The objective is to look for cheap high speed infrastructure alternatives. The researchers are busy constructing a high speed transmission infrastructure operating at at least 100 Mps based on the communications standard Gigabit Ethernet and which can be operated at low costs. It gives users of Internet 42 access to communication speeds some 3 000 times faster than the usual 56.6 kb/s modems used today. Now, why Internet 42? See *"The Hitchhiker's guide to the Galaxy"*– 42 is the answer to the question "what is the meaning of life?"

In 1999, 0.2% of all European households were connected to broadband – in 2005 the equivalent number will be 18%. Consult the following figure for broadband distribution in households in 2005.

Broadband in households in Europe and the US by 2005

In percent of total number of households per nation

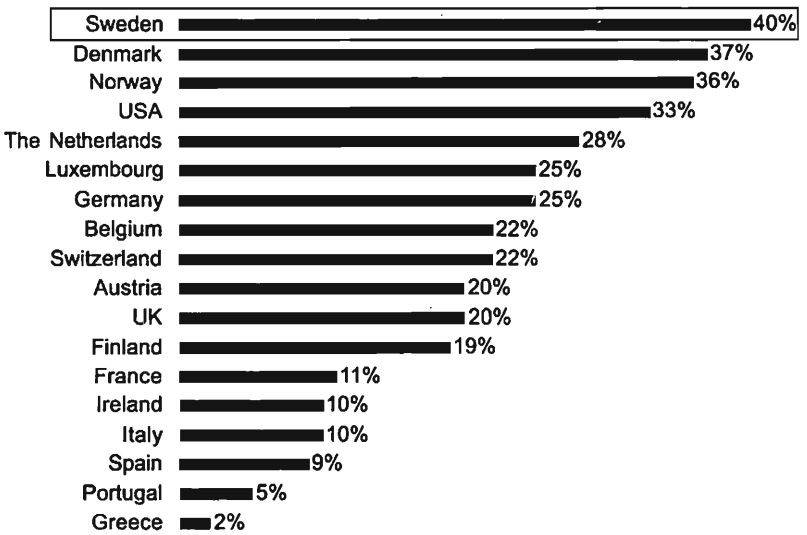


Figure 210: According to a Forrester Research analysis of the European market for broadband connections to households, 40% of all Swedish households will have such access by 2005. Sweden is predicted to become the leader in broadband in the world.

Sources: Forrester Research/Dagens Nyheter, August 1, 2000

Mobility already is at the center of interest for a number of Swedish researchers, many of them based at what proudly is called *Mobile Valley* in Kista, North of Stockholm. CIC, the Center for Information and Communication Research at the Stockholm School of Economics, is one of the competence centers, the Mobile Informatics group at the Viktoria Institute in Gothenburg is another. CIC is pursuing business research relating mobility to flexible work, communication and coordination, organization, security and efficiency. The Mobile Informatics group in concentrating on applied research related to new IT services for the 'nomadic networker' of the future.

The focus on mobility has several reasons. Mobile business is defined as the integration of mobility, IP platforms and electronic commerce. Thus mobile business is expected to become the working environment of the 21st century. Several studies indicate that mobile devices will constitute the foundation for future growth of the Information Society. Some data: 1.5 billion individuals will own a mobile telephone by 2006. 648 million of these mobile telephones will be equipped with microbrowsers for the Internet. 33% of the global mobile phone users will live in Europe. According to the Arc Group, m-commerce will take the lead in number of users by 2003, when there will be more mobile e-commerce users than fixed ones.

Active mobile Internet users by region 2006

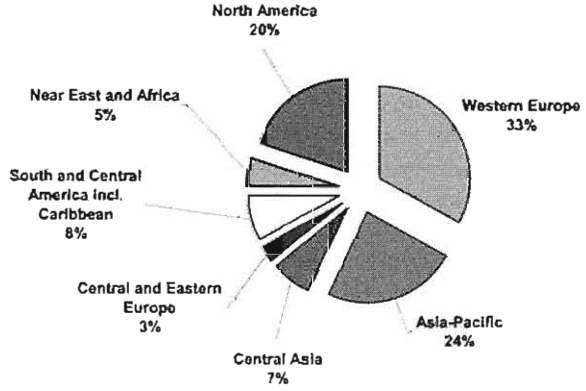


Figure 211: The figure shows the global distribution of active mobile Internet users by region in 2006. More than half of the users, 57%, will live in Western Europe and the Asia-Pacific region, at least according to estimates made by Ovum.

Sources: Ovum/Siemens

Ovum, a British consultancy, estimates that the number of users of mobile phones with mobile Internet browsers will be some 648 million worldwide by 2006. The global number of mobile telephone users is estimated at almost 1.5 billion. Europe and Asia-Pacific will have 57% of the active mobile Internet users.

Mobile telephones with mobile Internet browsers in the world 2000–2006

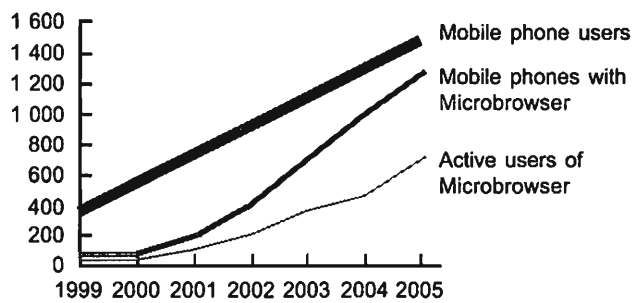


Figure 212: By 2006, some 80% of the mobile telephone owners in the world will posess a device with a microbrowser. Half of the owners is estimated to be active users of these mobile Internet browsers by 2006.

Sources: Ovum/Siemens

A recent international study by the Consumers International organization, *"An International Comparative Study of Electronic Commerce"*, looks closely into the details of e-commerce. Evidently there is room for improvement. In spite of this, the Arc group believes that m-commerce will take the lead over traditional e-commerce.

m-commerce takes the lead by 2004

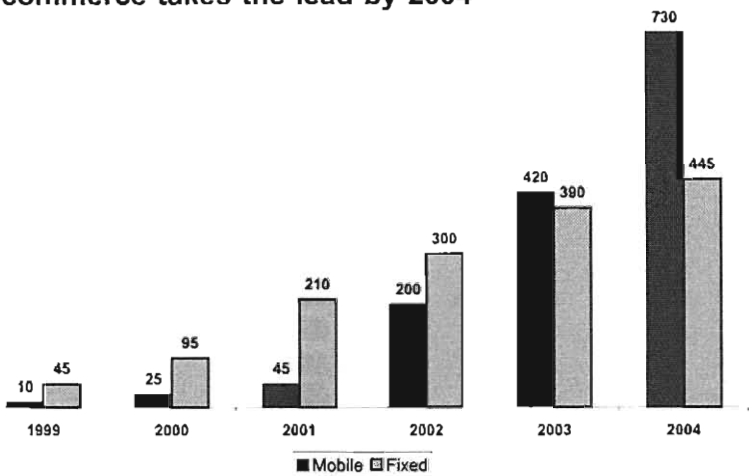


Figure 213: In 2003 there will be more mobile Internet users than fixed line Internet users in the world. Mobile enterprises are seen as the model of the future. Thus m-commerce and other m-services will be important to the majority of users.

Sources: The Arc Group/Siemens

So the rapid growth of the Internet, broadband, mobile devices, etc. encourage the need for IT research. Moreover, the growth of information available to anyone in the on-line society is also an important background factor, along with new life styles. The mobile generations of the future will need and want access to the global information and data banks from anywhere.

Creativity is a basic prerequisite rather important to national and international economic growth, also in the Information Society R&D. Thus, the World Economic Forum has created an economic creativity index, attempting to estimate countries' involvement in innovation. The index is based on observed data and survey results, and it measures the level of technology and the conditions favoring business start-ups. The most creative countries are also among the fastest growing over the past decade. USA owes its top ranking to rapid innovation, challenged only by Finland, and to the world's best start-up environment. The figure below describes the most innovative countries in the world – and some of the least innovative as well. For some reason Sweden was not included.

The World Economic Forum's Economic Creativity Index 2000

Figure 214: The World Economic Forum's Economic Creativity Index measures the level of technology and the conditions favoring business start-ups. USA has the most rapid innovation cycles and the world's best start-up environment, followed by Finland and Singapore. Sweden was not included.

Sources: World Economic Forum/The Economist, September 23rd 2000

Sweden is one of the great spenders on public education. The results related to the costs are much under debate at the present time. In spite of the nation's high spending on a public schooling system, relatively few Swedes are attracted to academic education, as data presented in the following demonstrate.

Investment in knowledge, 1995 % of GDP

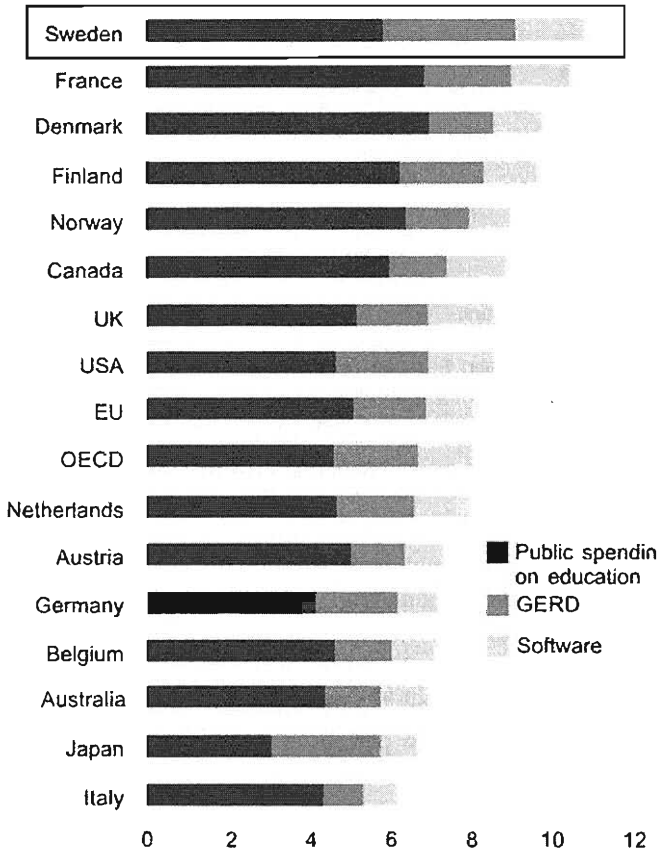


Figure 215: Investment in knowledge has grown faster than GDP in the OECD countries since the middle of the 1980s. Its value is almost equivalent to that of investment in equipment. The figure is based on data available for the OECD countries. Were the data to include investment in business training, about 1% of GDP, innovation, and private spending on education, for instance, the OECD overall investment in knowledge would be considerably higher than 10% of GDP.

Source: OECD

The figure above should be compared to the estimated intellectual capital of some of the world's leading telecommunications companies in the following figure.

Top 10 ranking of telcos and their intellectual capital according to *"Technology Review"* in 2000

Ranking	Company	Index
1	Lucent Technologies	2 592
2	Motorola	2 320
3	Ericsson Telephone	1 758
4	AT&T	1 551
5	BCE	754
6	Nokia	629
7	Qualcomm	541
8	MCI Worldcom	445
9	Alcatel	331
10	Cabeltron Systems	271

Figure 216: MIT's magazine 'Technology Review' has ranked the strength in technology of the telecommunications suppliers of this world. Lucent Technologies, Motorola and Ericsson Telephone are the strongest one according to this evaluation. The ranking is an index based on number of US patents and citations in other patent applications + citations in scientific journals.

Sources: Technology Review/Forskning & Framsteg 4/00

In 1999, 7.88% of all people employed in Western Europe, were employed in high tech manufacturing. Among the 15 EU member nations, 7.72% of all employed persons worked in high tech manufacturing. 1.27% of all employed worked in research and development in Western Europe and 1.28% in the EU member states. The average spending on R&D in percent of GDP was 1.81% for Western Europe and 1.85% for the EU 15 nations in 1999. The data are from Eurostat.

Sweden has increased its investments in research and development from 3.3% of GNP in 1993, to 3.7% of GNP in 1997, to 3.8% in 1998, and to 4.1% of GNP in 1999. In 1997, total expenditure for R&D was almost 67 billion SEK. The business sector accounted for just over 50 billion SEK. The electronics products industry spent 11 billion SEK, the IT-related service companies spent anopther 3 billion SEK, and academic research spent roughly 4.4 billion SEK, all according to NUTEK and Statistics Sweden.

According to statistics from the European Union, Sweden was leading the R&D spending league in 1995, and has kept its position since then. In that year the nation spent 3%, which is slightly lower than the1993 expenditure, but all the same it held the first position. The leading position is partly due to the fact that the large Swedish corporations in pharmaceuticals, telecommunications and information technology have important in-house departments for product development based on research, as we have seen above.

Scientific articles make up a part of the new information. Such articles are important since the findings and innovations resulting from research often are presented as scientific articles. Thus the number of articles published becomes one way of measuring R&D output as well as innovation. The Science Citation Index keeps track of articles published in the important scientific publications. According to a study carried out by the Department for library and information science at the University of Umeå in Northern Sweden, Swedish researchers are among the most prolific in the world measured in number of articles published per capita. The corporations are particularly successful. Only Swiss corporations are more successful than the Swedish ones when it comes to number of articles published. However, it is important to remember that the pharmaceutical companies, which often have important research organizations inhouse, use publication as part of the research method. This is not always the case for the IT researchers. Part of their research results is programming code and algorithms.

Scientific articles originating from Swedish corporations in 1996 and 1997

Company	Number of articles
1. Astra Zeneca	465
2. Pharmacia & Upjohn	334
3. ABB	77
4. Ericsson	55
5. Studsvik	37
6. Nobel Industries	23
7. Karo Bio AB	20
8. Perstorp	19
9. Gambro	17
10. Vattenfall	16

Figure 217: Compared to Ericsson, the Astra Zeneca researchers publish almost ten times as many articles per year according to the database the Science Citation Index.

Source: Ny Teknik 1999:18

The Swedish share of articles on IT-related subjects is not as high as on subjects related to other industries. The number has increased during the period 1994–1998 according to the database National Science Indicators on Diskette, NSIOD.

Number of articles in IT-related fields per million inhabitants, 1994–1998

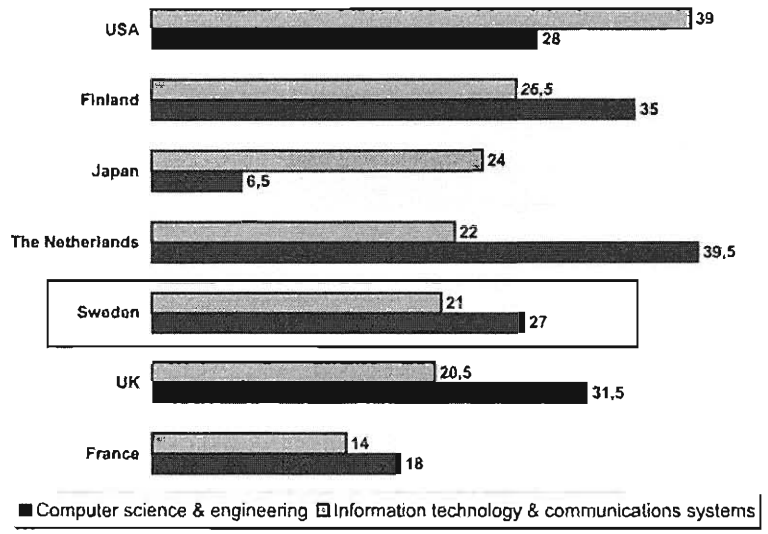


Figure 218: The figure compares the number of scientific articles in IT-related fields per million inhabitants produced in some of the leading countries during the period 1994–1998. Sweden produced 27 articles on computer science and engineering per 1 000 000 inhabitants, and 21 articles on information technology and communications systems. Finland is among the countries producing a higher output.

Sources: Institute for Scientific Information, ISI/NUTEK: Swedish Information Technology in Figures 2000

Swedish scientific articles in IT-related fields in relation to total world publication, 1984–1998

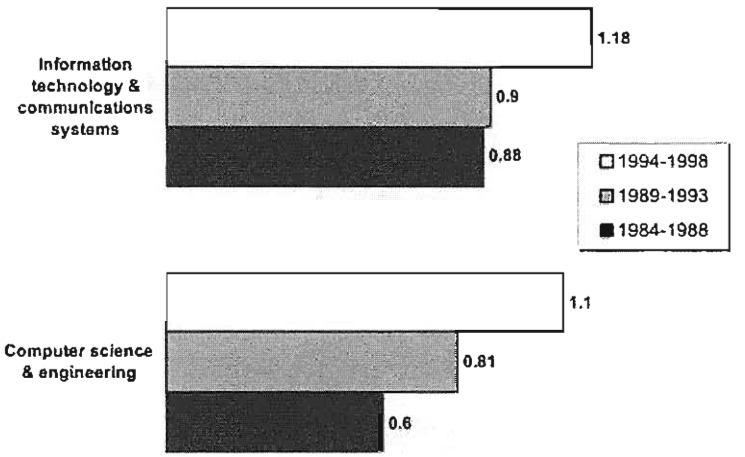


Figure 219: During the period 1984–1988, Sweden produced 0.6% of all published scientific articles on computer science and engineering. During 1994–1998, the output from Sweden was 1.1% of all articles published in the area. Swedish articles on information technology and communications systems were slightly more prolific.

Sources: Institute for Scientific Information, ISI/NUTEK: Swedish Information Technology in Figures 2000

Patents, another way of measuring R&D

A second way of measuring the R&D productivity is by number of patents applied for by an institution or an organization. According to a status report from the OECD in 1998, Sweden is holding forth in this area as well. Sweden was ranked number 3 in the global patents' league, following the US and Japan. The measurement used in this specific report was the number of patents per capita.

Patents resulting from R&D in Sweden per industry, 1989–1998

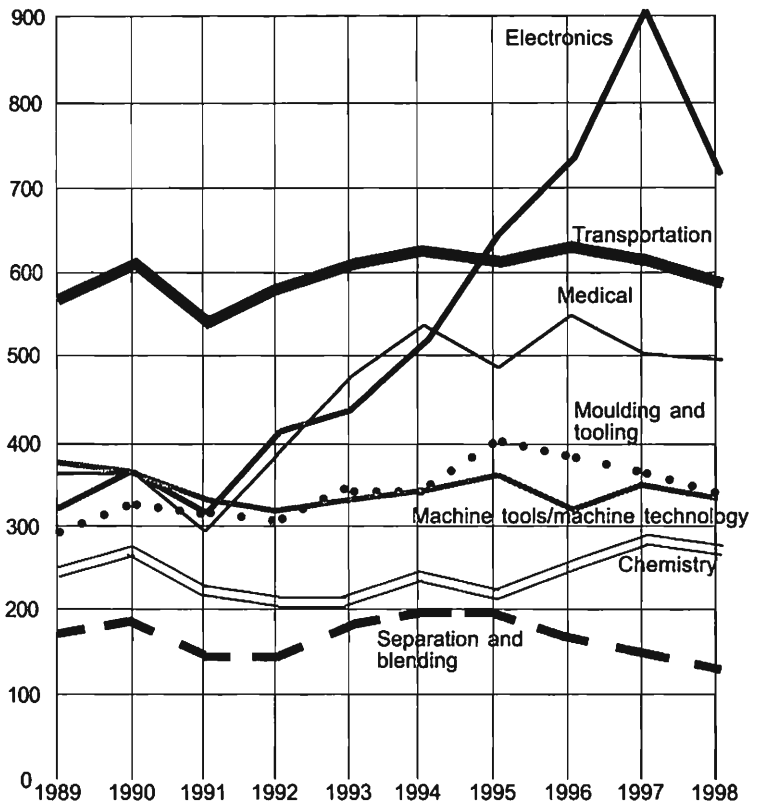


Figure 220: The figure shows the number of patent applications per research area as defined by IPC. The applications were registered by the Swedish patent bureau PRV from 1989 to 1998. Electronics was the strongest growing area until 1997.

Sources: PRV/Ny Teknik, week 11 1999, Ingemar Franzén

According to NUTEK, the Swedish share of patenting in the US is about 1%. However, the share is generally lower in the IT-related industries, with the exception of telecommunications. Only Finland, USA and Japan featured more US patents per capita.

Number of patents granted in USA per million inhabitants, 1994–1998

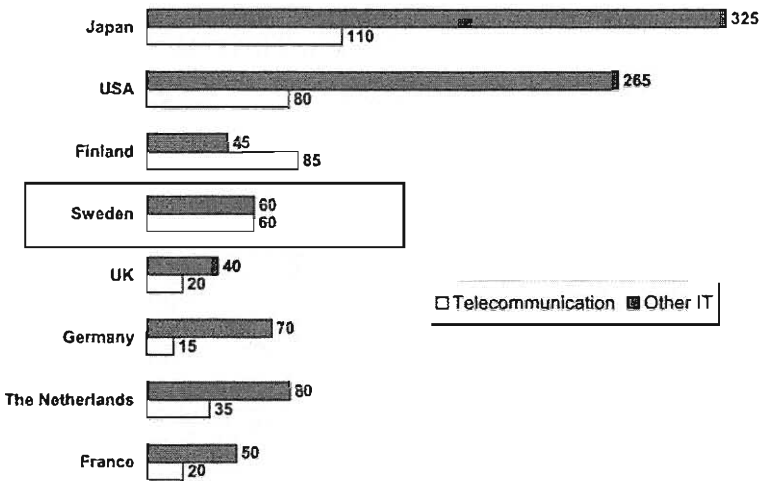


Figure 221: The figure shows the number of patents per million inhabitants granted some leading nations in the US from 1994 to 1998. The category "other IT" includes all fields except telecommunications.

Sources: CHI Research, International Technology Indicators Database/ NUTEK: Swedish Information Technology in Figures 2000

Ericsson is the leading Swedish company when it comes to patent applications in the US. NUTEK, The Swedish National Board for Industrial and Technical Development, has analyzed the development of Swedish technology in a report called *"The Swedish National Innovation System"*. According to this report, Swedes are doing well in areas like non-electrical machinery, metallurgy, motors and medical equipment as well as in electronics and components. The following figure shows the number of patent applications that some important countries made to the European Patent Office in 1999.

Patent applications in Europe 1999
In % of total applications = 89 360, per nation

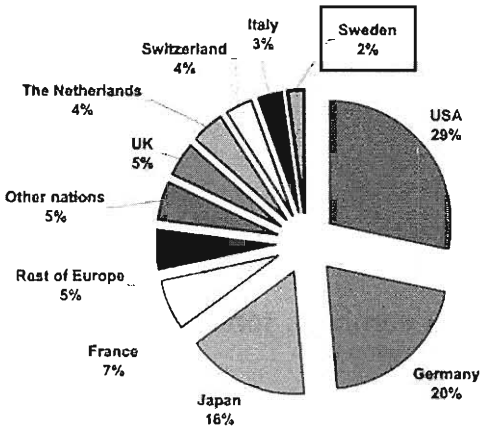


Figure 222: In 1999, Sweden had 2.21% of the 89 360 patents registered with the European Patent Office in 1999. USA had 28.3%, Japan 16.4% and Germany 20.4%. The rest of the countries had less than 10%.

Sources: European Patent Office/Näringsliv Thursday September 28th 2000

European inventors and developers have long seen the lack of a pan-European patent procedure as a disadvantage. They have to send one application to each country where they want their inventions protected. The European Commission launched a proposal for such a pan-European patent in September 2000. Once implemented, it should offer more effective patent protection as well as lower patent costs and, maybe, help innovation.

Put in simple terms for the sake of context, patents protect innovations, innovations are the basis for new products, generating companies, generating jobs, generating revenue... In the kind of world based on global trade we have built, company earnings matter to most of us. In perspective of the very recent havoc among the Internet and e-businesses and the substantial losses of the "new economy" companies, there is reason to ponder the profitability of high technology based companies.

The fact is that many of the technology firms with the largest market capitalizations are very profitable and becoming more so. The fastest growth in corporate profits is expected from wireless telecoms, according to the London-based financial group HSBC. A rise of an average 45% in profitability a year for 2000 and 2001 is expected for these companies. Internet companies that survive will generate profits of 37%, computer hardware firms 23%, software firms 20% and 17% for computer-services providers. In comparison, the forecast for pharamceutical is 14.5% while the profits of the paper and pulp industry will increase their profits by 28%.

Global company earnings, forecast 2000–2001
Average expected increase in %

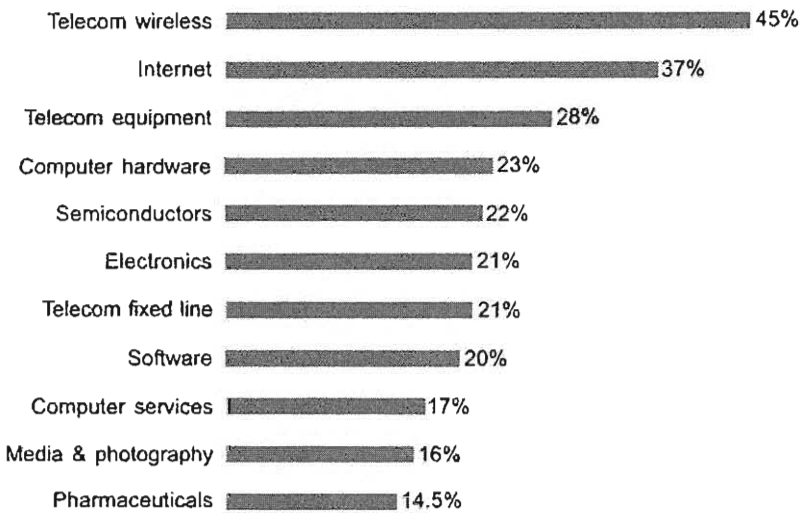


Figure 223: Forecast for high technology companies and their profitability in 2000 and 2001. The wireless telecommunications companies are expected to show the highest growth in profitability in the next few years.

Sources: HSBC/The Economist, August 19th 2000

In 1998, the Swedish IT industry had some 203 000 employees and a turnover of 448 billion SEK. The Swedish electronics products industry had 64 000 employees and a turnover of 162 billion SEK.

Swedish IT-related service companies had 140 000 employees and a turnover of 286 billion SEK. The value added by the IT industry was 123 billion SEK, and the value added by the electronics products industry was 39 billion SEK. The value added by the IT-related service companies was 84 billion SEK. In 1998, the exports of electronics products amounted to 112 billion SEK, while imports were equivalent to 91 billion SEK. In international terms, the Swedish IT industries are large in relation to the population, which is shown in the figure below. The data are from NUTEK and Statistics Sweden.

Production of IT goods per 10 000 inhabitants in selected countries in 1997
Million US$ per 10 000 inhabitants

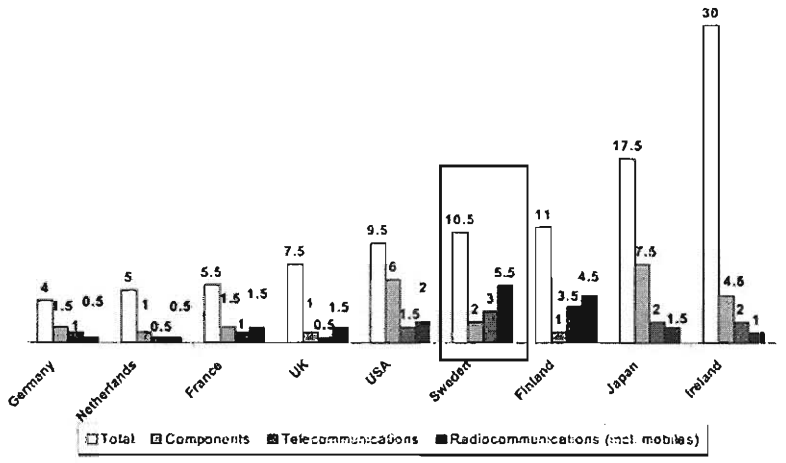


Figure 224: The IT industry is large in relation to the population in Sweden and Finland in an international comparison. In particular, the telecommunications industry is dominating.

Sources: OECD: Information Technology Outlook 2000/NUTEK

The Information Society is churning out a mass of paper, some 15 trillion pages per year. So the paper manufacturers are forecast to increase their profits by 28%, largely thanks to IT. This is not what we once thought. In the early 1970s, we had this dream of the paperless society. The Information Society would deliver us from

our burdens of paper and save the trees and forests in the process. Copying machines were less proliferate at the time. By the end of the 1970s some of us hoped for the less paper society. Our dreams were futile. The Information Society consumes more paper than ever. See the increase of paper consumption in Western Europe alone from 1950 to 1998 described in the figure below.

The Information Society in Western Europe increases paper consumption 1950–1998
In billion metric tons per year

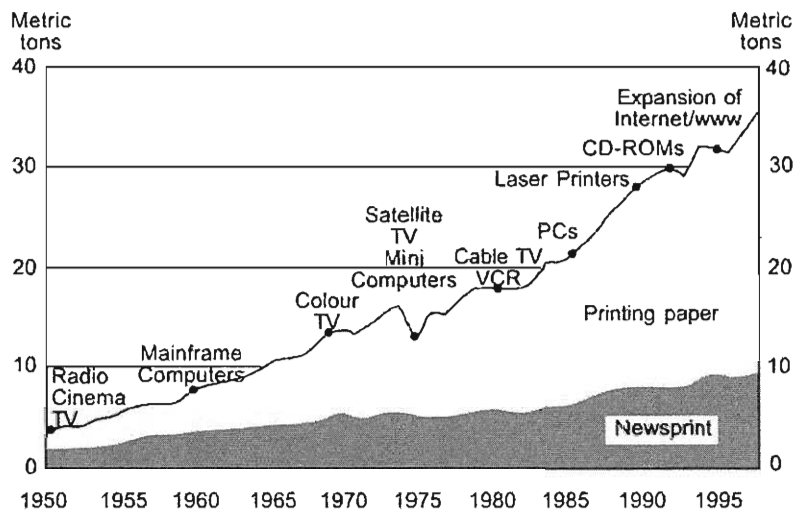


Figure 225: The paperless society was a myth. The more the devices of the Information Society proliferate, the more paper is consumed. Sales of paper for use in office equipment has doubled from 1990 to 1998.

Sources: Jaakko Pöyry/IVA Aktuellt # 2, 2000

The annual production of two exabytes of new information requires storage media. According to IDC, storage cost US$22 billion in 1999 and will grow to US$29 billion by 2001. For instance, the National Archives of Sweden contain 450 000 meters of shelved information. However, the National Archival Database, NAD, is nowadays available on CD-ROMs but much background information is considered lost, partly due to aging media such as magnetic tapes.

European telecommunications operators, their capital needs and the bond market

The telecommunications operators of Europe are big spenders on R&D. New technologies and innovations, improved services and better infrastructures are some of their most important competitive advantages. R&D as well as having to finance the introduction of the 3G mobile systems, require cash. Most European telecom operators are looking to the European stock markets for capital. New stock emissions worth 18 billion €, equivalent to 154 billion SEK, are to be expected in the near future. Acounting for around 23% of corporate financial insurance policies in 1999, telecommunications operators also make up an important industry sector of the European bond market, which we have seen from above. However, a report from Chase suggests that many European high-grade telecom operators are greatly exposed to so called "event risk", the risk that an unpredictable or unanticipated event could alter credit quality. The figure below shows the tendencies of event risks for a number of European telecoms. Telia is in the middle regarding risk but is judged to show a negative trend.

European telecom operators and their event risk, October 2000

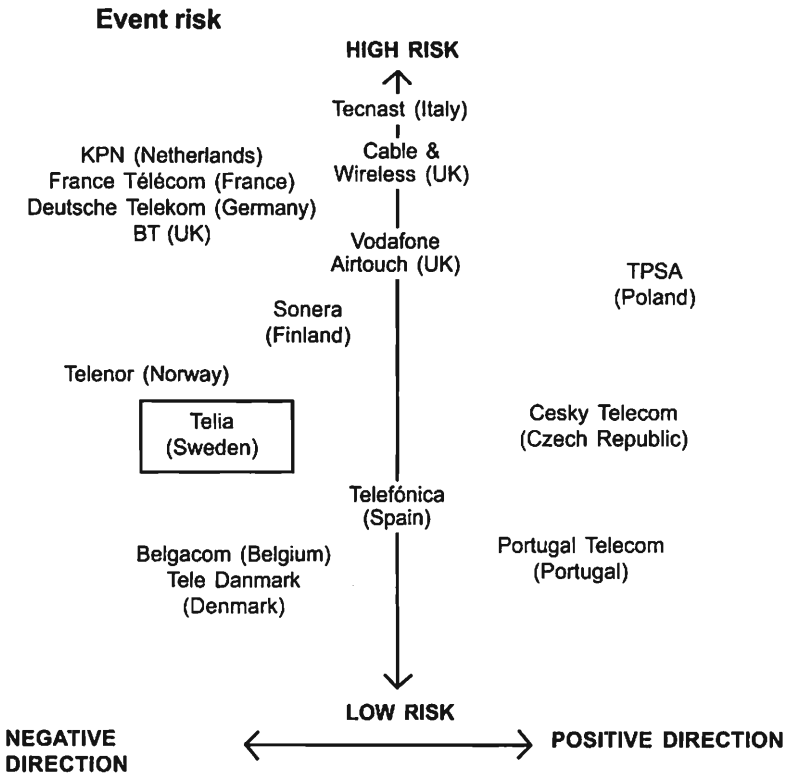


Figure 226: A core question for the European telecommunications operators, most of them ex-monopolies, is "build or buy?"In either case, credit is needed in order to finance the decisions taken. Chase has mapped the event risks, the risk that an unpredictable event can alter the credit quality of the European operators.

Sources: CMIL/CSL/CFO Europe October 2000

So it all ties together. R&D cannot do without profitability, competition, the market, the users... The users cannot do without the results of R&D.

More IT experts needed

As the information technology based industries grow, they need more skilled personnel, mostly university graduates. Although the Swedish government has run several programs in order to entice young people to select a future career in telecommunications technology, electronics, software design, computer science, etc, Sweden like most other countries is faced with a shortage of skilled people in the short and medium range. Sweden ranked number 10 among the OECD countries when it comes to share of population with university education in 1998.

Share of population with university education in the OECD, 1998

Percent of total population

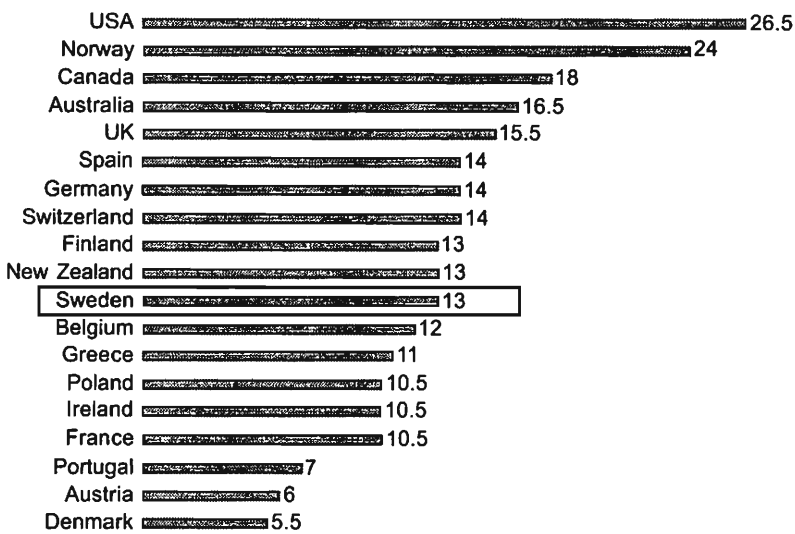


Figure 227: 26% of the US population had a university degree in 1998. In Sweden, 12.5% of the population held a university degree at that time. The figure compares the shares of the population with university exams in 19 of the OECD countries in 1998.

Source: OECD

Several special programs have attracted young people to the science and technology programs of the Swedish universities, and specialized programs for graduate students and postgraduate students arebeing filled, so there is an influx of talent, although there are not many enough for the needs calculated for the future. New universities like the University College of Karlskrona/Ronneby concentrate their curricula in IT and telecommunications. For more information see: http://www.telecomcity.org. More than 700 students were enrolled for IT curricula in the academic year 2000/2001. At Chalmers Lindholmen in Gothenburg some 2 200 students follow engineering curricula in mobile communications, vehicle and transportation technologies or art and media. These are just two examples of many new opportunities offered to the Swedes to obtain an IT-related education. The number of graduates from university education in electronics and IT is shown in the following figure.

Number of graduates in electronics and IT from universities in Sweden, 1997–1999

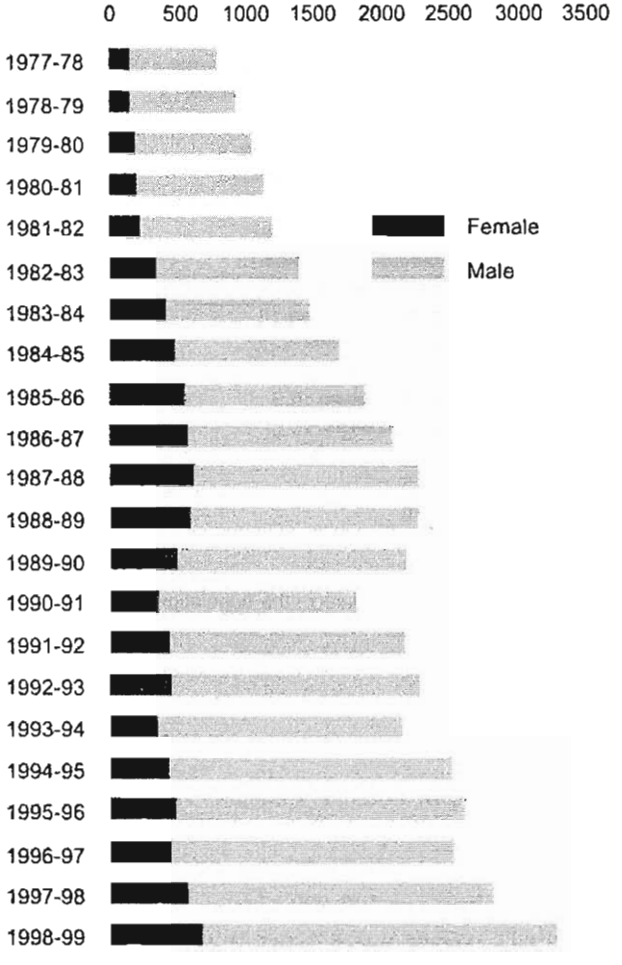


Figure 228: The figure shows the number of graduates from university education in electronics and information technology from 1977 to 1999. The share of female students is indicated. Generally, the share of female students in the IT fields is decreasing, which is causing concern as well as action.

Sources: Statistics Sweden/NUTEK

Share of population with university education in the OECD, 1998
In percent of age groups 25–64 years

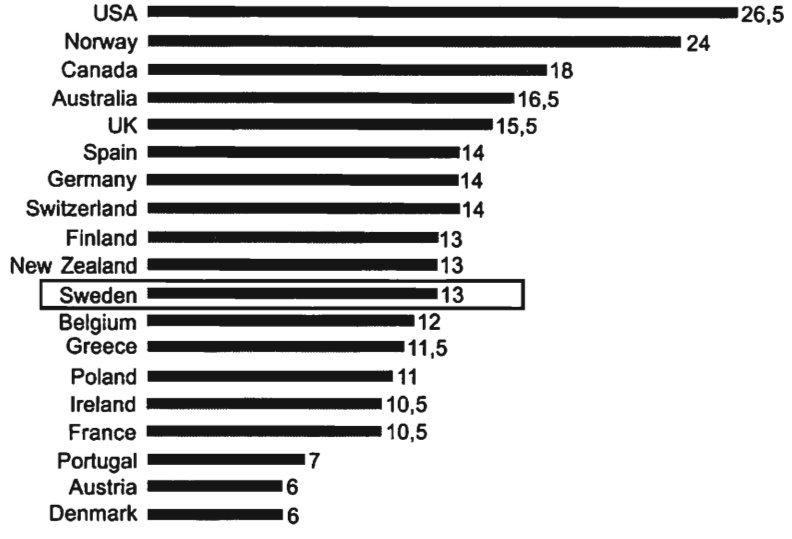


Figure 229: The figure shows the share of the population groups aged 25–64 years, having university education in some of the OECD countries in 1998. USA had the best educated population on an average.

Source: OECD

Sweden also is lacking of doctoral students. This is a fact that has been discussed in several reports of late. According to data from the OECD from 1995, Sweden had 670 new university graduates in science and technology per 100 000 persons in the age group 25–34 years. The OECD average was 831 per 100 000 persons. The following figure gives the rate of university graduates in some OECD countries.

Number of graduates per 100 000 persons with degrees in science and technology in 1995

Country	1995
1. Ireland	1 436
2. UK	1 296
3. Japan	1 196
4. Finland	991
5. Norway	981
6. USA	938
7. Denmark	924
8. Germany	813
9. Sweden	**670**
OECD	831

Figure 230: In spite of the fact that 87% of the total Swedish population had a college degree in 1995, only 11% among those in the age group 25–34 years held a university degree. This is equivalent to 670 individuals in 100 000 inhabitants. The reasons for this are some of the important political issues in Sweden by the end of 2000.

Sources: OECD/Ny teknik, 6 2000/I. Franzén

The Swedish government has initiated and run a special program for unemployed people called the national SWIT program, which aimed at training jobless persons with old or no basic knowledge in information technology for jobs in the Information Society. Some 11 000 persons have successfully completed the program.

Sweden to restructure the public organizations for research and industrial policies

The Swedish public organizations responsible for research and industrial policies are being restructured. This means that the present government agencies **KFB, The Swedish Transport & Communications Research Board, NUTEK, the Swedish National Board for Industrial and Technical Development, STATT, the Swedish Office of Science and Technology** and **RALF, The Swedish Council of Work Life Research**, will merge into the following new agencies:

KFB, part of NUTEK and one half of RALF will make up the new R&D agency Vinnova, Verket för Innovationssystem (directly translated to the Agency for Innovative Systems, which is not the official name in English). The task of Vinnova will be to contribute to the development of an internationally leading national innovation system for sustainable development according to the definitions made by the OECD. No web site available by November 2000.

The other half of RALF will make up the new research agency for social and work life issues;

The department for industrial policy of NUTEK and ALMI Företagspartner AB will form a new agency for industrial support and policies;

STATT will be part of Analysinstitutet, a new institute for analyzis, global watch and evaluation.

Several other changes involving the research councils are planned as well. We have reported only on those directly influencing IT and IT R&D. The new organizations are planned to be in place by January 2001.

Swedish R&D is generally funded by public and private foundations and the public research councils. Public foundations are for instance Strategiska Forskningsstiftelsen and KK-stiftelsen. The most important private foundation in Sweden is Knut och Alice Wallenbergs stiftelse. Moreover, as repeated several times, R&D also is funded by the Swedish corporations to a large extent.

Anyone interested in finding out more about publicly funded R&D in any subject in Sweden should explore the SAFARI web site. SAFARI is an exciting new linking system for disseminating Swedish research information on the Internet. It was initiated by the government and is run by the Swedish National Agency for Higher Education, Högskoleverket. The overall objective is to make research available to the general public. Each university has its own SAFARI database of research and development. The site is not completed but still has a lot to offer. For search and more information see: http://safari.hsv.se

Research on Information Society Technology in Sweden

Research on information technology is not necessarily an easily defined area. However, some studies of the subject have mapped ongoing research projects, at least partly. One of the areas of specific interest in Sweden is research about the utilization and distribution of information technology. KFB, the Swedish Transport & Communications Research Board, which is financing a number of user-orientated reseach projects, has mapped ongoing technical research and research on technology, humans and society. The report called *"Svensk forskning om användning av informations- och kommunikationsteknik"* was carried out late 1999 by dr. Britt Östlund.

The result is that publicly funded Swedish research on IT utilization is multidisciplinary and interdisciplinary. However, the majority of the research projects are technologically driven. Few are academic in the sense that they have their origins in theoretical hypotheses that should be verified. The conclusion is that there is a need for methodological development in this research area, as well in areas presently not being studied at all, such as the categorization of user groups, the impact of mobile communications and the role of users in the design process, to mention just a few.

An earlier report from 1998 called *"Finansiering av IT-FoU – Forskningsråd, sektorsorgan och stiftelser"* made by Christina Johannesson and Peter Kempinski, mapped how NUTEK, KFB, Strategiska Forskningsstiftelsen, KK-stiftelsen and KFB distributed 85% of all public resources, a total of 3.2 billion SEK from 1995 to 1997, to 2 100 research projects, most of them based at the prestigious universities like RIT in Stockholm, Chalmers in Gothenburg, and the universities of Linköping, Lund and Uppsala. They used 53% of all money allocated to the research area. During 1997, 1.2 billion SEK of public money were assigned to 1 600 projects.

Since the public R&D control and financing organizations are being restructured, those interested are recommended to look for current information on the Internet. Web addresses to the present organizations can be found in the following chapter.

Corporate R&D in Sweden

In 1998, NUTEK and Statistics Sweden reported on the size of R&D in Information Society technologies in *"Elektronikindustri och IT-relaterade tjänsteföretag i Sverige 1998"*, R 1998:25. According to this report, total expenditure for R&D in Sweden was 59.3 billion SEK, equivalent to 3.5% of GNP. Corporate R&D made up three fourth of the sum, some 44 billion SEK.

Manufacturing, in the Statistics Sweden classification, was responsible for 85% of the total industry R&D expenditure. The electronics industry spent some 11 billion SEK in 1995, equivalent to one fifth of the nation's total R&D expenditure, or one fourth of industry's R&D, or not quite one third of the manufacturing R&D expenditure.

Corporate R&D expenditures for electronic and other products in 1995

In % of total R&D expenses

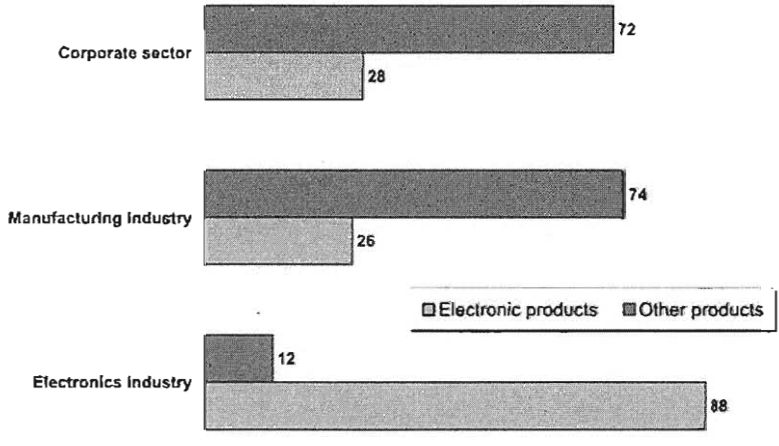


Figure 231: 85% of R&D expenses were related to electronic products in 1995. Three quarters of this was in turn related to telecommunications and one fifth to measurement. In manufacturing 30% are related to electronic products and the rest used for other purposes.

Sources: SCBs forskningsstatistik/NUTEK and SCB: "Elektronikindustri och IT-relaterade tjänsteföretag i Sverige 1998", R 1998:25

In 1995, 10 240 person-years were invested in electronics R&D, equivalent to 30% of the total. In 1997, a total of 44 000 person-years were invested in R&D in the business sector. 7 500 of these were dedicated to research, the rest to development.

The Top 10 companies in R&D expenditure in Sweden were mostly involved in product and hardware development, such as electronics and closely related and industry specific goods.

Top 10 R&D spenders in Sweden in 1999

Ranking	Company	R&D expenditure, Million SEK	R&D based in Sweden, % of total	R&D in % of total turnover
1.	Ericsson	28 300	50%	13.1%
2.	Astra Zeneca	22 761	50%	15.6%
3.	ABB	17 198	17%	8.4%
4.	Pharmacia	12 182	16%	19.8%
5.	Volvo	4 525	90%	3.6%
6.	Saab	3 081	Almost 100%	34.0%
7.	Celsius	1 714	Almost 100%	14.6%
8.	Autoliv	1 644	15%	2.2%
9.	Telia	1 570	100%	3.0%
10.	Scania	1 267	100%	2.7%

Figure 232: In 1998, Ericsson became the largest spender on R&D in actual money in Sweden. The figure ranks the top 10 R&D companies in 1999. The pharmaceutical company AstraZeneca followed Ericsson as the second most R&D intensive corporation. Telia, the "other"company in Sweden in the IT industry, ranked number 9.

Source: Ny teknik, 2000:16, I. Franzén

Systematic system development, i.e. software development, has its own ranking list in Swedish industrial R&D. Product development is of great importance to the companies in this league, but research is becoming more important and gets more money as the years pass. The research programs are about subjects like industrial and organizational change, the forces behind productivity, and efficiency. The following figure shows the growth of R&D spending in 1999 in percent over 1998.

Growth of R&D spending in the software industry 1999 over 1998

Growth in percent of 1998 value

Ranking	Company	Change in % over 1998
1.	IFS	85%
2.	Saab	45%
3.	IBS	45%
4.	Allgon	33%
5.	Pharmacia	26%
6.	AstraZeneca	20%
7.	Haldex	20%
8.	Höganäs	19%
9.	Intentia	18%
10.	Autoliv	17%

Figure 233: The Swedish software industry increased R&D spending by almost 33% on an average from 1998 to 1999. The table lists the top 10 spenders in the industry.

Source: Ny teknik, 2000:16, I. Franzén

In international comparisons made by OECD Sweden together with Japan, Germany and France make up the very bottom of the league when it comes to R&D spending on services and the service industry. Canada, Norway, Denmark and Australia are the leaders.

Ericsson is the one company spending most money in R&D among the Swedish corporations. In 1999, Ericsson sur passed ABB and took the lead in the Swedish R&D ranking list.

R&D expenses for Ericsson, 1994–1998
In billion SEK

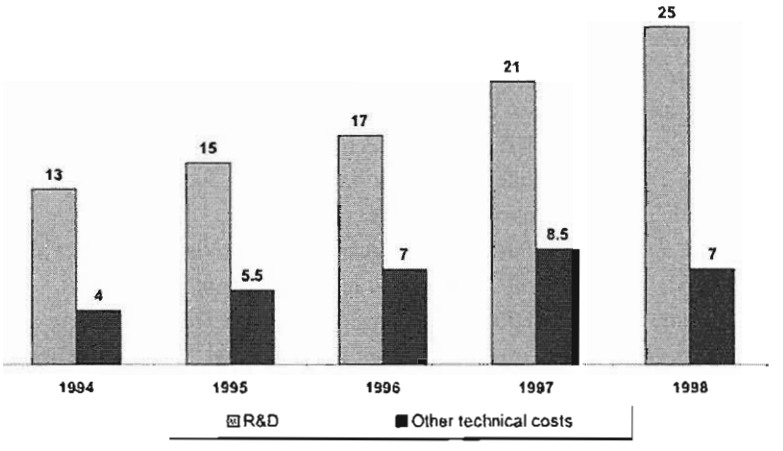


Figure 234: This figure shows Ericsson's R&D expenditures for the period 1994 – 1998, and the distribution per R&D and other technical costs.

Source: Ericsson

Some Swedish Research Institutions

R&D related to the Information Society and its technologies in Sweden is carried out at a number of public and private universities and university institutions, at more or less independent research institutes, often industry related, and at corporate R&D units. In the following we will describe R&D institutes and institutions directly dedicated to the Information Society technologies. By "independent" is most often meant that a research institute is not a direct part of a university, and that it is financed by the industry as well as by public means.

The most important Swedish R&D organization in the information and communication areas is without a doubt Ericsson as can be seen from the figures above. The company is involved in all kinds of research, from internal product development to the most advanced fundamental research like that at most of the universities. This is the only credit Ericsson gets in this description of the Swedish R&D environment, but the reader should always bear in mind that Erics-

son and its researchers are omnipresent – almost. Moreover, the company keeps developing interesting research methods and environments, which set the standard for the rest of the industry. Some exciting projects emerging from the Ericsson laboratories of recent are the Jalda and the Bluetooth systems. **Jalda**, a system for payment of small sums over the Internet, is under development by EHPT, Ericsson Hewlett Packard Technology, in Kista, Stockholm. The ambition is to make Jalda a global standard for cyber cash. Bluetooth is the standard for wireless devices.

Since information and communication technology nowadays is of importance to almost all R&D – not least so as tools – this description of the Swedish R&D landscape is far from complete. Science parks, incubators, academies and national resource centers are not described in any detail, although they constitute important parts of the picture. One example of a national resource center open to all researchers is the **National Supercomputer Centre in Sweden, NSC**, at the University of Linköping. The center is equipped with a number of supercomputers offering researchers calculating capacity in the gigaflop-area. Among the users are Saab and SMHI, Swedish Meteorological and Hydrological Institute. Most Swedish universities, not least the polytechnical ones, have good access to computer power. For more information about NSC, see: http://www.nsc.liu.se

Among the independent Swedish research institutes are – in alphabetical order:

CHACH, Chalmers centrum för höghastighetsteknologi, the Chalmers Center for High Speed Technology, is a competence center dedicated to the convergence of digital high speed technology and analog microwave technology by utilizing the latest research results of materials research and component technology. The objective of the research program is to create components for high speed and high frequency computing. The results will serve in future electromagnetical communications and sensor systems for radio communication, optical fiber systems and space applications. To obtain transmission speeds of 1 000 Gbit/s in optical systems is one of the goals. Students, researchers and industry participate in the programs. Several Ericsson companies are involved as are Saab Ericsson Space, Allgon Systems and Celcius. Note that this is just one example of

many of R&D carried out at the Chalmers Polytechnical University of Gothenburg. More information is available at the Chalmers web site: http://www.chalmers.se

CIC, The Center for Information and Communications Research at the Stockholm School of Economics, is an information and competence center coordinating and pursuing business research regarding the use of communications and information technology. The main research areas are e-commerce/e-business; e-management and learning, and e-markets along with the new mobile services. CIC is running a curriculum in collaboration with the Royal Institute of Technology covering business development and media technology, the so called AFM programme. See http://www.hhs.se/cic

CID, Centrum för användarorienterad IT-design, Center for User Oriented IT Design, at the Royal Institute of Technology in Stockholm, is a multidisciplinary competence center for the IT industry, users' organizations and academic researchers. Some exaples of research projects are "the digital worlds of the WorldWideWeb", and "design for digital network media". See: http://www.cid@nada.kth.se

Framkom Research Corporation for Media & Communications Technology, is a relatively new research institute made up from the former SISU, Swedish Institute of System Development, and IMT, the Institute for Media Technology. The Swedish graphic and printing industries own 60% of the corporation and IRECO 40%. For more information see: http://www.framkom.se

The Interactive Institue is a multidisciplinary reseach and development institute, working on the improvement of the interaction and communication between individuals, groups and organizations through innovative use of art and technology. The basic reseach field is digital media. Academia, industry and government support the institute, which also collaborates with the MIT AI Lab. See: http://www.interactiveinstitute.se

Nordic Interactive – the Nordic equivalent to MIT MediaLab, Nordic Interactive is a joint effort made by the governments of Denmark, Finland, Norway and Sweden in close collaboration with corporations and organizations. The objective is to create an important

research organization which can provide outstanding researchers with an interesting working development. The goal is to create a hot alternative to the MIT MediaLab. In 2002 some 800 to 1 000 researchers will be active at the institute, having a budget of some 100 million SEK. Nordic Interactive is represented by the Interactive Institute in Sweden, see: http://www.interactiveinstitute.se . This is an independent research center for arts, communication and technology. The institute collaborates with the research group called PLAY at the Viktoria Institute in Gothenburg – see http://www.viktoria.informatics.gu.se. The PLAY group is looking into subjects like "wearable computers", "active narratives", "amplified reality" and "information visualisation". For more information see: http://www.interactiveinstitute.se och http://www.viktoria.informatics.gu.se.

Nordicom, the Nordic Information Centre for Media and Communication Research at the University of Gothenburg regularly produces several reports on the status of the Swedish media industry and its users. The following are the most current publications confaining facts and data:

Media Trends 1997 in Denmark, Finland, Iceland, Norway and Sweden
Nordic Baltic Media Statistics 1998
Mediebarometer 1998
MedieSverige 1999/2000
The Nordic Media Market 2000, Denmark, Finland, Iceland, Norway, Sweden

For more information, see: http://www.nordicom.gu.se

The Royal Institute of Technology in Stockholm is running a large number of research programs under various departments. "4GW" is the acronym for one, interpreted as "4th Generation Wireless Infrastructures", which in turn is part of the research school "Personal Computing and Communications". The objective is to create technological opportunities to merge all networks, from the Internet, the mobile networks right to the television networks in order to offer the

user the possibility to use just any terminal for communication. The project is only one example out of many on-going at RIT. The reader is advised to explore the RIT web site at: http://www.kth.se

SICS, Swedish Institute of Computer Science, is another heavy-weight IT research laboratory, running research programs in the Kista Science Park to the North of Stockholm and in Uppsala. SICS is closely related to the Royal Institute of Technology, RIT. The institute is financed by industry and the public funds for R&D, NUTEK and KFB. Research areas are:

Computer and Network Architectures
Formal Design Methods
Intelligent Systems Laboratory
Neural Networks and Real-time Computing
Interactive Collaborative Environments
Human Computer Interaction and Language Engineering

For more information see: http://www.sics.se.

SITI, The Swedish Research Institute for Information Technology, is responsible for publicly funded national research programs in mobile informatics, Internet3, IT in energy, e-society and virtual information technology. See http://www.siti.se

The Super-IT-institute at the Uppsala University is part of the institute for information technology. It is the result of a merger of all Information Society related research and development institutions at the university, including among other research areas computer science, computer technology, man-computer interaction, systems technology, scientific computing and the centre of imaging. It is one of the most important IT research institutes in Sweden. For more information, see: http://www.it.uu.se/.

The SOM Institute of the University of Gothenburg is a research and conference center dedicated to studying society, opinions and media. SOM, an acronym for Society, Opinion, Media, carries out regular nationwide surveys about politics, society, media utilization, public service, environment, risks, new media technology and leisure-

time activities. The results are presented in comprehensive reports, the SOM reports. The surveys provide important information about IT users. For more information see: http://www.som.gu.se

The Viktoria Institute in Gothenburg was initiated in August 1997 by the Swedish Computer Association in Western Sweden, the University of Gothenburg and the Chalmers University of Technology. The research area of the institute is applied information technology. Some of the current projects are:

Mobile Informatics
IT & Organization
Interactive learning
PLAY, which is also involved
in Nordic Interactive – see above

For more information see: http://www.viktoria.informatics.gu.se

The IST program of EU: "The Information Society Technologies Programme"

NUTEK and KFB are the Swedish intermediaries of *"The Information Society Technologies Programme"*, IST , of the European Parliament, the EU Commission and the European Council, which was decided upon by the end of 1998. The research program was allocated 14 960 million € and will run until 2002. The program has a number of sub-programs with a budget allocated to each. The sub-programs have the following objectives:

Developing systems and services for the citizens – 612 million €
Multimedia contents and tools – 612 million €
New methods for work and e-commerce – 612 million €
Fundamental technologies and infrastructures – 1 296 million €
Future and growing technologies – 360 million €
Research networks – 180 million €

More information is available at the EU Commission, Information Society Project Office, ISPO: http://www.ispo.cec.be

Embryonic research projects

So far we have described what is actually going on in Information Society R&D in Sweden. There are a couple of embryonic projects going on that have the potential of becoming important to the Swedish R&D landscape. One such project maps and explores innovation on the Internet with the objective to better understand the innovation processes as these are influenced by a new medium like the Internet. More information is available at: www.teldok.org/innova.

Another research area well worth keeping an eye on is related to e-democracy and e-Sweden. For the time being the Swedish ICT Commission and its Observatories are trying to entice researchers to get involved with these projects. More information can be found at: http://www.itkommissionen.se

Part of eSweden is a development project in telemedicine called SJUNET. This is a virtual private network, including IP telephony, e-mail servers, e directories, video conferencing, and a private and specialized web for medicine, among other things. Seven county councils are involved in the development of the SJUNET by using it in their hospitals and care centers. There are plans to add further services such as e-commerce, connections to pharmacies and the local social security offices. Further information may be had from Landstingsförbundet, the association of Swedish county councils.

The Information Society creates a mountain of information

How much information is the world producing each year? Some researchers at the School for Information Systems and Management at the University of California, Berkeley, are trying to find out. They have estimated that the world currently produces two exabytes (roughly a billion times a billion bytes) every year. 80 billion photographs are taken each year, 4 250 movies are produced annually, and 2 billion x-rays. Individuals create and store 740 000 terabytes (thousand billion bytes) a year. Published information amounts to 285 terabytes. Information generated by telephone calls globally adds up to 576 000 terabytes. Copiers, printers and similar machines churn out about 15 trillion pages annually – so much for our dream of the paperless society! – and 2.5 billion CDs were shipped in 1999. The entire report (200 pages) can be downloaded from: http://www.sims.berkeley.edu/how-much-info/index.html

World production of data, in terabytes 1999 estimates

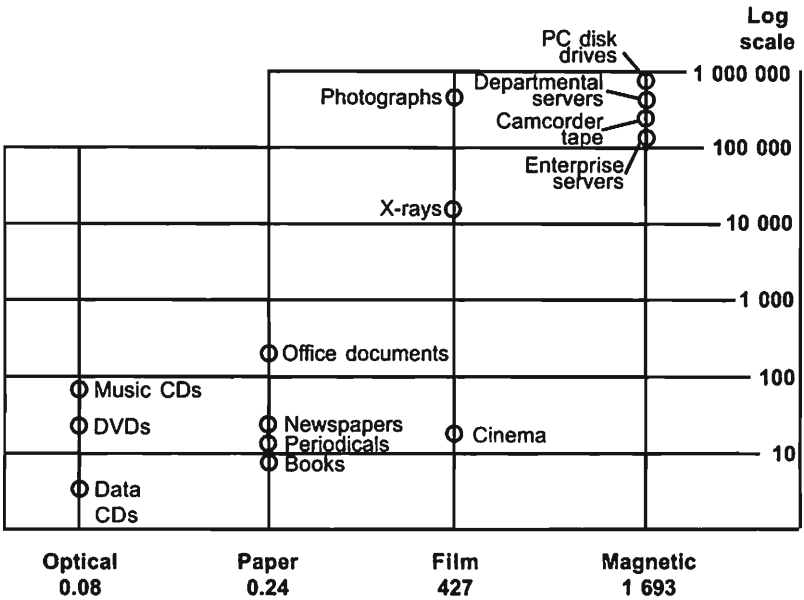


Figure 235: The diagram shows the amount of information produced by the world in 1999, in total 2 120 000 terabytes, distributed per medium. The calculations were made by researchers at the School for Information Systems and Management at the University of California, Berkeley.

Sources: University of California, Berkeley/The Economist, October 21st, 2000

Entertainment has long been predicted to make up the majority of the content. Music is an important part of this. But so far researchers have not been very good at understanding what exactly users find entertaining.

World music sales, 1999
In US$, per capita

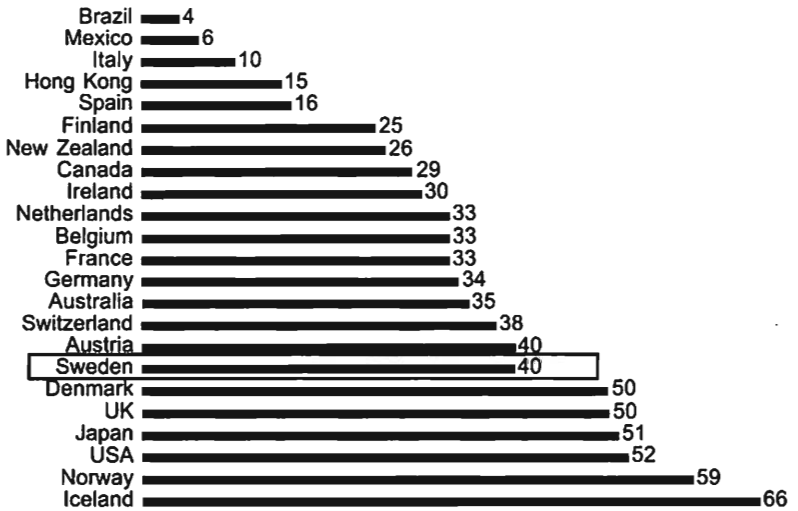


Figure 236: Global recorded music sales – CDs, cassettes, records – were worth US$ 38.5 billion in 1999. Swedes spent on an average US$ 40 on music, while the Americans spent US$ 53 per head. In 1999, Sweden exported music at a value of 4 billion SEK.

Sources: International Federation of the Phonographic Industry/The Economist, April 29th 2000

The Berkeley researchers also calculated that the American households on an average spend 3 380 hours a year reading, watching television and listening to music, inhaling 3 344 783 megabytes of information in the process. The average Swede consumes media during 2 190 hours a year. Based on the amount of information used by the average American, the average Swede inhales only 2 167 182 megabytes of information per year, using data about Swedish media consumption from Nordicom. Note that the US data relate to households while the Swedish ones relate to individuals.

An interactive Internet will require broadband. Broadband is also required by anyone wanting to download movies. A Swedish researcher made the following calculations over how much time is required to download one regular movie of approximately 90 minutes via technology available today, i.e. by the end of 2000.

Time required to download movies via present technology

Today's systems:	bps		
Mobile telephony (GSM)	9 600	=	15 days
Today's modem (v90)	50 000	=	2 days 18 hours
Telia Duocom (ISDN)	128 000	=	1 day 2 hours
CATV (slow)	512 000	=	6 hours 30 minutes
Electrical power grid (tests)	1 000 000	=	3 hours 15 minutes
Telia Flexicom (ADSL)	1 500 000	=	2 hours 10 minutes
Breaking point = faster than playing the film:			
Fixed connection	2 000 000	=	1 hour 40 minutes
Radio (old analog system)	4 000 000	=	50 minutes
Swedish university network	10 000 000	=	20 minutes
Radio (new digital system)	11 000 000	=	18 minutes
Sunet	34 000 000	=	6 minutes
CATV (fast)	40 000 000	=	5 minutes
Sunet (new system)	155 000 000	=	1 minute 17 seconds
Future systems, after year 2000:			
Fibers	2 500 000 000	=	4,8 seconds
Rainbow	2 600 000 000 000	=	All Bond films in 1 second

Figure 237: 2 hours 10 minutes would be required to download a movie of 90 minutes using the ASDL technology offered to Swedish Internet users by Telia.

Sources: Claes Magnusson, AcadeMedia AB/On demand # 13, 5 1999

Some more data about data quantity – the ten largest libraries in the world contain 136.9 million volumes, distributed as shown in the following table.

The world's largest libraries

Rank	Library	Location	No of volumes, million
1.	Library of Congress	Washington, DC, USA	23.0
2.	National Library of China	Beijing, China	16.0
3.	National Library of Canada	Ottowa, Canada	14.5
4.	Deutsche Bibliothek	Frankfurt, Germany	14.4
5.	British Library	London, UK	13.0
6.	Harvard University Library	Cambridge, Mass., USA	12.9
7.	Russian State Library	Moscow, Russia	11.8
8.	National Diet Library	Tokyo, Japan	11.3
9.	New York Public Library	New York, USA	10.5
10.	Yale University Library	New Haven, Conn., USA	9.5

Figure 238: The ten largest libraries in the world contain a total of 136.9 million volumes.

Sources: The Economist, April 8th 2000/Russell Ash: The Top 10 of Everything

17. Organizations shaping the Swedish Cyber World

The following is a listing of important organizations and associations, directly influencing the formation of the Swedish Information Society. Research organizationss are described in the previous chapter 16 and only exceptionally included here.

BitoS, Branschföreningen för innehålls- och tjänsteleverantörer på onlinemarknaden, is a Swedish organization for content providers and media distributors. See: http://bitos.org

CIC, The Center for Information and Communications Research at the Stockholm School of Economics, is an information and competence center coordinating and pursuing business research regarding the use of communications and information technology. The main research areas are e-commerce/e-business; e-management and -learning, and e-markets. See: http://www.hhs.se/cic

CID, Centrum för användarorienterad IT-design, at the Royal Institute of Technology in Stockholm, is a multidisciplinary competence center for the IT industry, users' organizations and academic researchers. See: http://www.cid@nada.kth.se

Dataföreningen i Sverige, The Swedish Computer Association, is organizing all computer professionals in Sweden. It has some 35 000 individual members and about 200 organizations are affiliated. Dataföreningen is responsible for the training and quality of the European Computer Driving License, ECDL, an idea, which once originated in the association. For further information, see http://www/dfs.se

Datainspektionen, the Swedish Data Inspection Board, is a state agency surveying privacy matters related to information technology, see: http://www.datainspektionen.se

Distansforum, the Swedish Teleworking Association, is an organization for those interested in and working with teleworking, distance education and distance commerce. See: http://www.distansforum.se

GEA, Gemenskapen för elektroniska affärer, (The community for electronic business) was founded in 1999 by a number of business associations and public agencies in order to advance Sweden in the e-business area. See: http://www.gea.se

The Interactive Institute is a multidisciplinary research institute in the field of digital media. It is supported by academia, industry and the goverment, and is a partner of the Nordic Interactive network. The institute collaborates with the MIT AI Lab. See: http://www.interactiveinstitute.se

ISA, the Invest in Sweden Agency, is a state agency responsible for attracting foreign investment to Sweden. See http://www.isa.se

IT-företagen, the Association of the Swedish IT and Telecom Industry, is an industry association for companies in the IT and telecom businesses. It is an important lobbying group and represents the Swedish IT-industry in several international organizations. For more information, see: http://www.sito.se, which is in the process of changing to: http://www.itforetagen.se

IT-kommissionen, The Swedish ICT Commission, is an advisory board on information technology and its impact on society to the government. See: http://www.itkommissionen.se

ITS, The Standardization of Information Technology, is the Swedish agency for standardization matters, see: http://www.its.se

KFB, Kommunikationsforskningsberedningen, The Swedish Transport & Communications Research Board, is a government agency responsible for the planning, initiation, coordination and support to Swedish transportation and communications research. KFB sponsors ongoing research programs in transportation vehicle, movement, postal services and telecommunications and information technology. For more information see: http://www.kfb.se

NTK, Näringslivets Telekommitté, was founded in 1973 in order to support Swedish companies in their ambition to create more efficient and effective telecommunications networks and telecom services in Sweden. This interest group has some 40 members. For more information see http://www.ntk.a.se

NUTEK, the Swedish National Board for Industrial and Technical Development, is Sweden's central public authority for industrial policy issues. NUTEK will be part of a new organization affecting several public agencies and boards, effective of January 2001. For more information see: http://www.nutek.se

PROMISE, Producers of Interactive Media in Sweden, is an association of multimedia producers in Sweden, founded in 1996. Some 130 companies working with multimedia productions belong. PROMISE belongs to the Swedish Industry Association. See: http://www.promise.se

PTS, the Swedish National Post and Telecom Agency, is the regulatory body for radio, telecommunications and data communications in Sweden. It is the Swedish representative of the Independent Regulators Group, IRG. See: http://www.pts.se

RALF, The Swedish Council of Work Life Research, is a central government agency for the long-term planning and funding of research and development. It is the major source of funding Swedish research on subjects related to the effects of information technology, among other things. RALF will be subject to a new organization as off January 2001. For more information see: http://www.ralf.se

SEIS, Säker Information i Samhället, Secured Electronic Information in Society, is an association working on implementing a common and open infrastructure for making communication via networks such as the Internet secure. See: http://www.seis.se

SI, The Swedish Institute, is a public agency charged with disseminating knowledge abroad about Sweden regarding in particular culture, education, research and general public life. See: http://www.se.si

SIKA, the Swedish Institute for Transport and Communication Analysis, is a government agency responsible for carrying out studies for the government, developing forecasts and planning methods. It is the authority responsible for official statistics. See: http://sika-institute.se

SINF, Svensk Industriförening, The Swedish Industry Association, is a national organization for small and medium enterprises. 1 700 companies are members, organized in 20 industry associations, such as PROMISE and SweSI. For more information, see: http://www.sinf.se

SICS, Swedish Institute of Computer Science, is a research institute working in the following areas:

Computer and Network Architectures
Formal Design Methods
Intelligent Systems Laboratory
Neural Networks and Real-time Computing
Interactive Collaborative Environments
Human Computer Interaction and Language Engineering

For more information see: http://www.sics.se

SITI, The Swedish Research Institute for Information Technology, is responsible for publicly funded national research programs in mobile informatics, Internet3, IT in energy, e-society and virtual information technology. See http://www.siti.se

SSNF, Svenska stadsnätsföreningen, is an interest organization for county councils involved in constructing their own metropolitan networks. See: http://www.ssnf.se

Statskontoret, The Swedish Agency for Public Management, provides support to the government and the government offices and conducts studies and evaluations at the request of the government. One of the tasks is to modernize public administration with the assistance of IT. The agency is the Swedish representative in the GOL International Group, OECD's Committee on Public Management, the European Evaluation Society, the International Council for IT in Government Administration. See: http://www.statskontoret.se

STATT, the Swedish Office of Science and Technology, provides Swedish institutions and organizations with information about technology developments from seven countries. The office is planned to be part of a new agency called Analysinstitutet. See: http://statt.se

SweSI, the Swedish Software Initiative, is an industry association for software producers, belonging to SINF. See: http://swesi.se

TELDOK is a foundation initiated by the Board of Telia, Sweden's largest telecom operator, in order to facilitate early documentation on new IT applications. See: http://www.teldok.org

Zedir is a web site for IT businesses and their agents — and for anyone interested in getting involved in the Swedish Information Society. It is sponsored by ALMEGA, and the employers' organization of IT companies, ITA. See http://www.zedir.se

IT standardization in Sweden

The organizations for standardization in Sweden are in the process of adapting to their international counterparts and thus in a state of reorganization. The new standard organization is planned to have three independent standardization bodies:

one for the ISO/CEN sector
one for the IEC/CENELEC sector
one for the ITU/ETSI sector.

The new organization is to be implemented by the beginning of 2001. For more information see **SIS, Standardiseringen i Sverige, the Swedish Institute for Standards,** at http://www.sis.se.

New standardization bodies

3GPP, Third Generation Partnership Project, is a new global standardization organization for system suppliers, network operators and standardization organizations supporting mobile standards like GSM, American TDMA/IS136 and Japanese PDC. Is an ITU partner.

3GPP2, Third Generation Partnership Project2, is also a new global standardization organization for system suppliers, network operators and standardization organizations supporting the American mobile standard IS95, known as CDMA One. Is an ITU partner.

18. Whither Sweden's pole position?

by Bengt-Arne Vedin

"Sweden is the most wired and most wireless country in the world."

Newsweek, February 7th, 2000

Sweden has figured prominently in a number of international comparisons, ranking countries on various measures of IT levels. Thus there is the claim, e g, that the world's "wireless valley" can be found in Kista in northern Stockholm. The Stockholm region is number two after Silicon Valley, Stockholm-Karlskrona-Göteborg are mentioned as Europe's hot spot, and the Öresund region is also seen as a leading contender. What is the sustainability of this Swedish or possibly Scandinavian wonder, if we take into consideration also the southern shore of the Öresund straits and the dynamic Finnish regions?

The answer should be 'pretty good', since the phenomena considered go back in time and represent structural features. Already in the 1880's, Stockholm featured the world's highest telephone penetration level, surpassing that of New York, for example. One reason was healthy competition between the Bell company, operating as a monopoly in most national markets, and several local Swedish competitors. In most countries, Bell enjoyed its monopoly by virtue of its control of patents, equipment production, and operations. In Sweden, however, the Ericsson company provided for equipment to those operators who would otherwise have been locked out by the Bell Monopoly. Likewise, in Finland operators were – and still are – 'subscribers' associations' providing competition for features and experimentation.

Only after several decades did the governmental telecommunications administration become a de facto monopoly in Sweden; many years later, it became, as Telia Inc., one of the first in Europe (after Britain) to be subject to competition again. In equipment production,

it kept up activities competing with Ericsson's, forcing this company to expand abroad, all the while obtaining breakthrough ideas from the administration (crossbar switching) and, later, collaborating in developing what turned out to be the world's best-selling switch of all time, the AXE system. It was thanks to the inherent flexibility of this switching system that Ericsson gained its strong position in mobile telephony systems.

In mobile telephony, the government telecommunications administration, together with its counterparts in the other Scandinavian countries, played another critical role in that it provided much of the impetus for the creation of an early state-of-the-art standard for mobile telephony, the NMT standard. Equipment producers like Ericsson were initially rather reluctant and did not think much of the prospects for such a service, but since the customer, the government administration, wanted it... The importance of first mover advantage is demonstrated both by the fact that there are NMT systems scattered in countries throughout the globe and that the momentum gained from this first generation system served Ericsson and others well into the second generation. In Europe, this is represented by a joint standard for digital mobile telephony, the GSM (Groupe Speciale Mobile/Global System for Mobile communication).

So we have an almost classical example of the effects of increasing marginal returns, much like the Silicon Valley phenomenon. Where there is a hot spot, it attracts attention and investment, and it regenerates almost automatically. 'Almost' is of course an important qualifier since taxation, international capital flows, and educational levels are important in the long run. The greater Boston area may not exactly be suffering but there is less talk about the Route 128 phenomenon now that minicomputers have all but vanished and defense budgets have been pared down.

The head start in mobile telephony might have been helped by the fact that the Scandinavian countries are relatively sparsely populated but also in a slightly weird way by the heavy taxation. Cellular phones allowed a great many people in small companies, or self-employed, to do without expensive support personnel, otherwise a very heavy cost indeed. Cellular phones were also tax deductible and if paying a salary is seen as costing a lot the search for attractive substitutes is on.

A similar mechanism is behind the fact that Sweden sports the world's probably highest penetration of PCs, investments that were actually actively supported through tax mechanisms. In addition, in the latter case the Swedish Association of Computer Professionals has developed a formula for a "PC driver's license" which implies a certification. The actual training and education is left to training companies competing in the market place but then with the positive effects for the pupil and education provider in a standardized certification model. This certification later became the 'European Computer Driving License', running in eighteen countries and supported by the EU. Every country gained from this joint standard but with the highest PC penetration initially, Sweden stand to gain most by having many more competent computer users in the other European countries to communicate with.

There can still be concerns about taxation, on companies but especially on individuals. Stock options are very unfavorably taxed, both for the firm and the individual, in an international comparison more unfavorably than in any other country. The availability of people with higher education degrees is also a problem. On the positive side, Sweden features a population with good proficiency in the English language, of course behind the UK but on a par with Denmark and the Netherlands, certainly ahead of Germany and Finland.

So this is the scenario of the self-reinforcing powers of increasing marginal returns. There have been a number of spin-off companies started with a pedigree in Ericsson or the telecommunications administration. A number of those spin-offs have been acquired by international giants such as Microsoft or Cisco but many are growing on their own. Such giants have also started joint ventures with Ericsson and some have started affiliations specializing in cellular telephony, mobile Internet, WAP etc. at Stockholm/Kista and Lund. Kista now features a specialized IT high school and the departments of the Royal Institute of Technology located there together constitute what is called an IT university.

In addition, Sweden has seen an almost explosive growth in venture capital in the last few years. Such but lesser spurts have happened before, only to be replaced by gloom and withdrawal at the next downturn. The important point, however, is that a mindset fixed singularly on large existing firms in mature industries has been re-

placed by a love affair with new IT companies. The pendulum may swing but it will not return to the outright hostility to new company formation that held sway for almost half a century.

Building upon strengths in radio telephony, conquering new avenues such as WAP, Bluetooth and other potential future vistas makes for a basis for forays into the intelligent home (where the strengths of mature businesses like Electrolux may come to the fore) and mobile Internet. Sweden's for a small country abnormally large number of large corporations in mature industries may be one reason behind the booming Internet economy in the country. There are a number of internationally active consultancies as well as firms launching particular Internet business ideas, like Jalda for payment systems (an internal venture of Ericsson's, later a joint venture with Hewlett-Packard), "the Counter" (the software counting the number of visitors to a web site – the Swedish startup company was acquired by an American one), and others.

Success breeds success, that is the simple formula suggested here. Network effects imply that in many win-win-situations, the first mover advantage prevails, like with the European Computer Driving License. Proximity is still of importance. Kista may be the capital of cellular telephony – those Internet companies are mostly found within a few blocks in downtown Stockholm, something like New York's Silicon Alley. There is no particular secret behind – just the combination of some very early roots with dedicated efforts to do something worth while like the NMT though with no views towards world impact, and then chance. You cannot be sure to achieve critical mass and increasing marginal returns, you can hope for it. And, like Bill Gates, on a company level, you can actively strive for it. That insight is one reason why you find Microsoft in several guises in Kista. Stay tuned, more will come. Sweden will, thanks to those virtuous circles, continue to hold forth in wireless. As to the Internet businesses, the verdict is less certain.

19. References and information sources

Time frame

– When will the next edition of the TELDOK Yearbook appear?
– Whenever time is overdue.

Statistical information sources in English and Swedish

EITO: **European Information Technology Observatory 99**
EITO: **European Information Technology Observatory 2000**
Eurostat Yearbook 2000
ITU: **Yearbook of Statistics, Telecommunication Services 1988–1997,** January 1999
ITU: **World Telecommunication Development Report 1998,** Genève, mars 1998
Nordicom: **Media Trends 1997 in Denmark, Finland, Iceland, Norway and Sweden,** Nordicom 1997
Nordicom: **Mediebarometer 1998,** Nordicom 1999
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Nordicom: **TV i Norden, Europa och Världen, En statistisk översikt,** Nordicom 1999
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Nordiska Ministerrådet: **Nordisk statistisk årsbok 1998**
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OECD: **Basic Science and Technology Statistics,** 1999 edition
OECD: **Communications Outlook 1999**
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OECD: **A New Economy? The Changing Role of Innovation and Information Technology in Growth – Information Society 2000**
OECD: **Education at a Glance 2000**

OECD: **Mobile Phone, Pricing Structures and Trend,** November 2000
PTS: **The Swedish Telecommunications Market, 1998,** June 1999
PTS: **Svensk telemarknad 1999,** June 2000
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ITU: http://www.itu.int
KFB: http://www.kfb.se
Nordicom: http://www.nordicom.gu.se
NUTEK: http://www.nutek.se

OECD: http://www.oecd.org
SCB med Sveriges statistiska databaser: http://www.scb.se
TELDOK: http://www.teldok.org

Stock, trading, and business information

Stock exchanges in Stockholm, London, Paris, Frankfurt, Oslo and Milan in Swedish: http://finans.yahoo.se
Dagens Industri: http://www.di.se
Stockholm Stock Exchange: http://www.xsse.se
Swedish stocks: http://www.aktieinfo.com

Telecom Operators in Sweden:

Banverket: http://www.banverket.se
Europolitan: http://www.europolitan.se
Glocalnet: http://www.glocalnet.se
MSC: http://www.msc.se
Netcom AB: http://www.netcom.se
NETnet International: http://www.netnet.se
Nordiska Tele8 AB: http://www.tele8.se
RSLCOM Sweden AB: http://www.rslcom.se
Rymdbolaget AB: http://www.ssc.se
Stokab: http://www.stokab.se
Tele2 AB: http://www.tele2.se
Telia AB: http://www.telia.se
Telenordia AB: http://www.telenordia.se
TeliTel: http://www.telitel.se
Teracom AB: http://www.teracom.se
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Some IT companies in Sweden

ABB Communications: http://www.abb.com
Axis Communications: http://www.se.axis.com
Bokus.com: http://www.bokus.com
DORO AB: http://www.se.axis.com

Ellemtel Utvecklings AB: http://www.ellemtel.se
Framtidsfabriken Netsolutions: http://www.netsolutions.se
Icon Medialab: http://www.iconmedialab.se
Industri-Matematik: http://im.se
Intentia: http://www.intentia.se
L.M. Ericsson: http://www.ericsson.se
MTG: http://www.mtg.se
Prevas AB: http://www.prevas.se
Spray: http://www.spray.se
WM-data: http://www.wmdata.se

Publishers and culture on the Internet

Beeoff, an artists' collective: http://www.beeoff.se
Books-on-demand: http://www.books-on-demand.com
Libris (register of all publications in Sweden): http://www.libris.kb.se
Serum: http://www.serum.nu
Swedish culture in general: http://www.kulturnat.se
Jazz via the Net: http://www.jazzcentralstation.com

The politicians' web sites

The Swedish parliament: http://www.riksdagen.se
The Swedish government: http://www.regeringen.se
Rixlex, the Swedish database of parliamentary decisions:
http://rixlex.riksdagen.se
The Center party: http://www.centerpartiet.se
The Liberal party: http://www.folkpartiet.se
The Christian democrats: http://www.kristdemokrat.se
The Green party: http://www.mp.se
The Conservatives: http://www.moderat.se
The Social Democrats: http://www.sap.se
The Left Party: http://www.vansterpartiet

Schools, educational authorities, universities

CIC, Stockholm Business School: http://www.hhs.se/cic/
CID: http://www.cid@nada.kth.se
The Stockholm Business School: http://www.hhs.se

Nada, KTH: http://www.nada.kth.se
Nordicom: http://www.nordicom.gu.se
Rinkebyskolan: http://www.rink.stockholm.se
SICS: http://www.sics.se
Siti: http://www.siti.se
Skolverket: http://www.skolverket.se
Super-IT-institutionen vid Uppsala Universitet: http://www.it.uu.se/
SweSI, Swedish Software Initiative: http://www.sinf.se
The Interactive Institute: http://www.interactiveinstitute.se
Viktoriainstitutet: http://www.viktoria.informatics.gu.se

Want to know more about IT in Sweden?

For those who want to know more about IT and the Information Society in Sweden, there are several web sites that may help. Below follows a select few. ISA, Invest in Sweden, is the state agency for attracting investment to Sweden. Its web address is: http://www.isa.se. The Swedish Ministry of foreign affairs, the Swedish Trade Council, the Association of the Swedish IT and Telecom Industry, Invest in Sweden, and the Swedish Office of Science and Technology are presenting part of the Information Society at the web site http://www.itsweden.com. General information about Sweden is available at the Swedish Institute, http://www.si.se, and at the VirtualSweden.net – the Official Gateway to Sweden, http://www.itsweden.com. Information about trade and business is provided by the Swedish Trade Council, http://www.swedishtrade.se. For information about exports, pay a visit to the Swedish Export Council, http://www.swedishexport.se. For specialized information see the references above.

More information about the development of the Information Society

For those who want to know about the general, historical development of IT, telecommunications, computers and the rest of the Information Society technology, there are several sites on the web. An interesting place to start is a visit to Jones Telecommunications & Multimedia Encyclopedia at http://www.digitalcentury.com

Cross references

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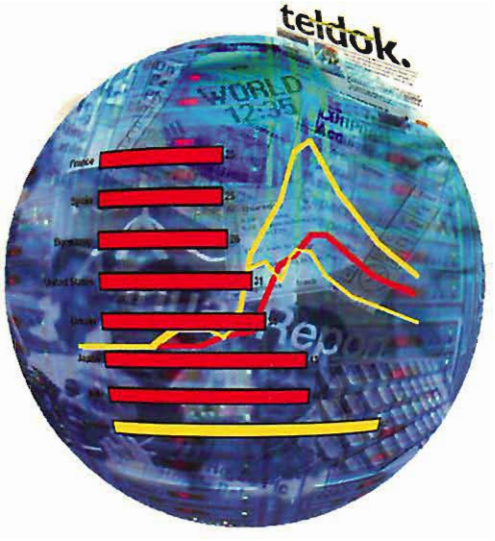

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