Information and communications Technology in

Finland and Sweden

Addicted users pushing creative engineers to "Killer Applications"

Gull-May Holst

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Preface

When VINNOVA (The Swedish Agency for Innovation Systems) recently submitted, to the Swedish government, an improvement program for the IT and telecom area, to spur user-driven development of new applications and services, the agency suggested Finland as a guiding example. VINNOVA observed that the Finnish budget for ICT research at universities and research institutes is twice as large as the Swedish.

News of technical advancement moves fast. Yet, history shows considerable differences in the adoption and use of innovations, even between industrialized countries. For example: in the late 1800s, five years after the telephone had been patented, there were more telephone users in Stockholm, Sweden, than anywhere else in the world; more even than in the much larger metropolises of London and New York.

In the 1990s, Sweden and Finland took turns in displaying the largest penetration in the world of cell phone users, Internet users, and users of Internet banks. Nokia and Ericsson were globally regarded as icons; even more importantly, the breadth and depth of all kinds of ICT services continued to astonish international observers and seemed to catalyst a new kind of economy.

One cannot but feel that there are important lessons to derive from a closer comparison of the conditions for the ICT industries in Finland and Sweden, in particular the essential discrepancies between these small neighboring Nordic countries. Thus, we were delighted to accept Gull-May Holst's suggestion that TELDOK – an independent, non-profit organization – should commission a review of the ICT area in Finland and Sweden.

Such an inquiry is valuable even considering that the growth in the industry now has slowed down; much can be learned during the current, hopefully productive and creative, hiatus in the development of ICT products and services. We are confident that this report will prove to offer informative, and pleasant, reading.

Bertil Thorngren
Chairperson, TELDOK

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Introduction cum Executive Summary

When we think, talk, and write about today's communications and information technology society, it is almost without exception in terms of today, tomorrow, and the future. More seldom, we find reason to ask: What role does the past play for our present information society, the modern ICT (information and communications technologies) community? After all, path dependence is a well-known phenomenon, the timing of events influencing decisively what follows. This report aims at showing the differing political and historical developments of two neighboring nations, Finland and Sweden, small of size when it comes to populations, and global economic impact, and at the same time, enjoying worldwide attention among information and communications technologies specialists. Diverging industrial structures and developments paired with constant competition but also collaboration are some of the reasons behind the Nordic phenomenon.

The present structures of information and communications availability and utilization easily may be traced back to political decisions made at the very infancy of telecommunications. Historical developments also explain the success of the current information and communications technology industries. Our comparison of the two IT nations at the very edge of Europe, Finland and Sweden, draws attention to some such political decisions dating back more than 100 years. These decisions have led to two nations with differing information technology structures and political strategies, yet similar competitive positions. It may come as a surprise to those who take for granted that the Nordic countries are all the same. The tradition in the high tech world is to regard the Nordic countries – Denmark, Finland, Iceland, Norway, and Sweden – as one single market. This may be practical from the marketing point-of-view, when organizations are considering establishing themselves in the Northern area of the globe. The insignificant size of the populations of each country as

compared to those of the large European nations, Germany, Spain, France, Italy, and the UK is often mentioned as the major reason for this approach. Moreover, it may well be an obvious consequence of the parliamentarian collaboration of the Nordic Council, established in 1953. Anyway, any perception of homogeneity of the countries is a misunderstanding, based on little knowledge. As for size, it is true that the five Nordic countries have less than 25 million inhabitants together (24,120,000 by the end of 1999). As for the homogeneity of the peoples, their cultures, languages, and histories, Danes, Finns, Alanders, Greenlanders, Faeroese, Icelanders, Norwegians, and Swedes and ethnic minorities such as the Sami certainly have overlapping infrastructures. Part of the history is common, and even some traditions are. But the peoples differ in language, in the case of Finnish and Sami to such an extent that no speaker of any of the other Nordic languages like Danish, Icelandic, Norwegian, and Swedish understands what a Finnish- or Sami-speaking person is saying without interpretation. The same goes for Greenlandic and Icelandic, in spite of the latter being a Nordic language. So we have to face a number of close similarities but also many and deeply rooted differences, at the same time joining and separating the Nordic peoples. Some of these similarities and differences become obvious when describing the development of information technology dissemination and utilization in Finland and Sweden. Or, as Ms. Tarja Halonen, Finland's president, explained the relationship between Finland and Sweden when she inaugurated the new Finnish embassy in Stockholm in April 2002:

"We are not twins. We are only brothers and sisters."

First some similarities between Finland and Sweden. A very obvious one is that both countries are represented in the global information and communications technology markets by two of the industry's largest companies. The mobile telephone providers Finnish Nokia and Swedish Ericsson are the global flagships of each country. Nokia held some 37 percent of the global market for mobile telephones by the end of 2001, Ericsson almost 7 percent. Even if the Finns have more mobile telephones per capita than any other nation, the Finnish market represents less than 0.5 percent of the total global market for mobile phones. As for Sweden, the mobile phone users represented barely 1 percent of the global number of users. Thus, together the two companies controlled 44 percent of the global market for mobile telephones during 2001, while their home market users stood for less than two percent of the global mobile telephone users. Other similar-

ities can be found in technology distribution, educational systems, and social welfare, this to mention the most important ones.

Then some differences. Finland has a recent history dominated by war and revolution, Sweden one of peace and evolution. The Finnish history is partly a result of the ambitions of its neighbors, Russia and Sweden, partly a consequence of fiercely fought wars for independence, the last ones in 1939-40 and 1941-44. The Finns have seen several revolutions, forcing them to create their modern welfare state from chaos and turbulence and to do so quickly, as of the early 1950s. While Finland was at war, Sweden went out of its way to stay at peace. The last war Sweden fought was in 1815, so the Swedes have been fortunate enough to enjoy peace in their own territory for almost 200 years. During these years the Swedes were able to develop a nation of welfare, stability, social security and education for all its inhabitants. This served as a model – at times much disputed – for the Finns when they at last could build their own welfare state.

At present, there are – perpetually? – on-going national championships in everything between Finland and Sweden. It all started out with national athletics championships in 1925, taking place in Helsinki. In the early 1990s, the championships spilled over to the ICT industry and the economic spheres, this time triggered by media. Journalists were challenging journalists. At that time, Finland as well as Sweden experienced an economic slow-down just like both of them were doing by the end of 2001. As the politicians, economists, industrialists, and the rest of the population struggled to get back on more progressive tracks again, these "national championships" in economics between the two countries evolved. Economists of the one nation challenged the economists of the other. The new national championships in economics and ICT, bearing the same name as the original ones, Ruotsi - Suomi maaottelu, Finnkampen, between Suomen Tasavalta and Kungariket Sverige, The Republic of Finland versus the Kingdom of Sweden, Suomi - Sverige, have since then been reflected in all kinds of aspects of life, as will be seen.

This report presenting the current status of the new championships is based on official statistics, media reporting, Internet research, discussions with several knowledgeable persons, and my own experiences from the ICT industry. It should offer some background information and some explanations to the present situation.

Opinions expressed in the following pages are my own. I have tried to be as reasonable as possible, staying with facts. But it should be known that I have a very positive bias to both countries. After all,

Sweden is the country where I grew up and Finland is the home of some of my very best friends. In spite of my two-sided inclinations, I have tried to compare equivalent facts, although this has not always been possible. I hope all the same that my comparisons make some sense. Because, what better way is there of understanding our neighbors than by comparing them to ourselves, and vice versa?

To summarize, the overall objective of this report is to map and compare user statistics, historical facts, current statistical and economic data, important to the developments of the national ICT structures and industries of Finland and Sweden. In particular, the goal is to pinpoint the particular factors that have turned these two small nations at the northernmost corner of Europe into some kind of leadership in mobile communications. I have had access to a large amount of facts and data. However, I am the only one to blame for any inaccuracies appearing, the worst one being that, to my deep regret, I do not master the Finnish language.

My thanks go to a large number of people, but most of all to Bertil Thorngren, the chairman of TELDOK, who came up with the idea for the report in the first place and "sold" it to me. The task turned out to be a formidable one. Thank you very much to Göran Axelsson of the TELDOK editorial board and to PG Holmlöv for their many suggestions to sharpen the report. Many thanks also to Ronny Lundström, head of the IT unit of the government of Åland, and Stig Selander, president of Ålands Mobiltelefon AB, who both went out of their way to explain the way the Ålanders have chosen to cope with their position in between Finland and Sweden, and still being Ålanders, neither Finns, nor Swedes, just Ålanders. Thanks also to my husband Bengt-Arne Vedin for his support, encouragement, and numerous suggestions for improvement.

Part of this report was written before the terrorists' attacks on the United States of America on September 11, 2001. Many figures appearing in the text relate to the situation before these terrible actions. For the time being we do not know all the implications of this blind and senseless destructiveness. The global tissue, already rather threadbare in places, was torn to fragments all of a sudden. Will we be able to put it together again?

Ljusterö and Stockholm, May 2002

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New National Championships Scoreboard Finland–Sweden 2002

Results of 16 selected "sports" as described in this report

Activity	Finland, ranking	Sweden, ranking	Score based on best ranking
Loss of stock market trading value Jan. 2001 – Jan. 2002	51.4%	25.1%	0 – 1
GDP per capita 2000	25,000 Euro	23,500 Euro	1 – 0
GDP per capita rate of change 1990 - 1998	1.1%	0.6%	1 – 0
Ranking in UN survey of quality of life 2000	5	10	1 – 0
Ranking in the foreign policy globalization index, Jan. 2001	5	3	0 – 1
Ranking in the 2001 corruption index	1	6	1 – 0
Basic IT-skills in % of workforce by Eurostat	69%	82%	0 – 1
Long term growth potential acc. to the Global Competitiveness Report 2001-2002	1	7	1 – 0
Current competitiveness acc. to the Global Competitiveness Report 2001-2002	1	6	1 – 0
Most competitive nation in 2002 by IMD	2	11	1 – 0
National readiness for the future index, July 2000	0.71	0.87	0 – 1
IDC leading IT nation index 2001	5,953	6,496	0 – 1
Economic Freedom of the World 2001, ranking & index	14 8.1	20 7.9	1 – 0
Entrepreneurial activity rate acc. to the Global Entrepreneurship Monitor 2001	9.3% of the adult population	6.7% of the adult population	1 – 0
Percent of households having PCs	50%	66%	0 – 1
Number of mobile telephones per 100 inhabitants, Jan. 2001	76.9	74.9	1 – 0

Score: Finland – Sweden: 10 – 6! The data included in this scoreboard can be found in the report, where all sources are given. It must be stressed that the scoreboard is the result of a subjective selection by the author of those economic "sports" that are relevant to this report. Many other selections influencing the scoreboard could have been made.

1.
Finland vs. Sweden – Perpetual Competition, Two Winners

The fall of 2001 saw a slowdown of the economic development in the world. USA announced that its GDP shrank by 0.4 percent in the third quarter of 2001. This was the first decline the most important market in the world had experienced since 1993. IDC made an assessment of the US economy on October 11, 2001, one month after the terrorists' attacks in New York City and Washington, D.C. The analysts predicted a slowdown for the next five quarters, but at the same time they estimated that there would be pent-up needs to replace destroyed computer and IT hardware to an appreciated value of USD million 500 to 750. From the IDC viewpoint, the world ICT expenditure would amount to USD 1,300 billion during the five quarters surveyed.

In consequence of the American situation, economists all over the world revised their growth expectations downward during the fall of 2001. The ministers of finance of the European Union predicted that EU growth to some 1.5 percent for 2001 and the same for 2002. And Europe's largest countries predicted slowdowns in 2001 as compared to 1999 and 2000. According to EITO[1] of October 2001, Germany predicted a growth of 2.2 percent for 2001 and 2.4 percent for 2002. France expected its GDP to expand by 2.6 percent in 2001 and by 2.7 percent in 2002. UK forecast its 2001 growth to 2.5 percent and 2.6 percent for 2002. These estimates were lowered later on, in early December, in some cases to figures below one percent.

[1] EITO = European Information Technology Observatory

In this general context, Finland experienced a sudden and unexpected stop in its economic growth. For August 2001, Statistics Finland reported that the total output fell by 0.6 percent as compared to the same period in 2000. The Finnish Ministry of Finance stated in early November 2001 that growth would be close to zero for the next twelve months. In Sweden, the specialists estimated GNP growth for 2001 to 1.2 percent and to 1.3 percent for 2002. A few weeks later GDP growth was adjusted downwards to more or less the same level as the one earlier announced by Finland. Private consumption in Sweden is predicted to grow by a meager 0.9 percent for 2001 – it amounted to 4.1 percent in 2000 – and by 1.3 percent in 2002. The stock markets reacted to the negative news. The Helsinki stock exchange had lost 51.4 percent of its trading value from the beginning of 2001, while the Stockholm stock exchange, OMX, had lost 25.1 percent during the same period. They are not alone. The global stock market has lost as much as half its value as compared to January 2001.

The revised estimates by the ministers of finance caused the more frequent gurus to lower their estimates for future growth and the economists to start a discussion about how to define economic decline. The consolations to the Finnish analysts in these dark days were the positive effects the country can enjoy from its EMU membership, the transition from markka to Euro by January 1, 2002, and the success of Nokia. The Swedish analysts find some comfort in lower individual tax levels and the weak krona, which is thought to keep exports going, but also threatening to bring inflation along because of high import prices.

National Championships in Everything

These are the general settings of an ongoing economics championship between Finland and Sweden. It goes back to the economic slump by the end of 1980s. From 1990 until 1993 Finland experienced a deep depression. The annual growth of GNP decreased by 9.9 percent, which was the largest decrease in any of the OECD countries after World War II. By 1994,16.6 percent of the work force were without jobs. By the end of September 2001, the figure was 8.7 percent. The 1990 depression was mainly caused by the fall of the Soviet Union, the most important trading partner of Finland until then. The Finnish-Russian trade had its roots in

the so-called friendship and assistance agreement from earlier decades, which in turn had its origins in the huge war reparations the Finns had to pay to the Soviet Union. When the large neighbor no longer could afford to buy goods from Finland, the economy went through its worst crisis since the 1930s. However, the Finnish politicians solved the problems by modernizing the social structures, and aided by a general economic expansion in the mid-90s, the Finnish economy recovered in a remarkable way. Sweden also experienced a regressive economic development, only less extreme. The country muddled through by reining in the costs of the oversized public sector. Once the recovery started, the 'economics championship' between the two countries took off again.

The following basic data describes the situation of the two countries at present.

Some basic information about Finland and Sweden

	Finland	**Sweden**
Inhabitants (2000)	5.5 million	8.9 million
Surface	338,000 square km	449,964 square km
Inhabitants per square km	17	22
GDP 1999	785.1 billion FIM (2000)	1,995 billion SEK
GNP per capita (2000)	25,000 Euro	215,000 SEK (equivalent to 23,500 Euro)
Foreign investment, 2000	147.2 million FIM	Ca 22 billion SEK 1999 – 2001
R&D, percent of GDP, 1999	3.2%	3.9%
Business-funded R&D, in percent of GDP (1998)	1.98%	2.85%
Rates of change of GDP per capita 1980 – 1990	2.7%	1.7%
Number of companies	291,516 (1999)	814,722 (2000)
Number of employed persons	2,335,000 (Sept. 2001)	3,589,364 (2000)
Rates of change of GDP per capita 1990 – 1998	1.1%	0.6%
Ranking in UN survey of quality of life, 2000	5	10
Ranking in the Foreign Policy globalization index, January 2001	5	3
Ranking in the 2001 corruption perceptions index	1	6

Sources: Statistics Finland/Statistics Sweden/OECD/Eurostat/Transparency International

The figures above show that the Finns have overtaken the Swedes when it comes to GNP per capita. This has to do with a fact mentioned above – Finnish politicians chose to straighten up the public finances during the meager years of the 1990s with the austerity program introduced by Prime Minister Paavo Lipponen's government. They took control over and paid back the public national debt. Sweden, to the contrary, chose to stimulate the national finances by borrowing money to grow the already over-sized public sector. By the end of the year 2000, the national debt of Sweden was 1,277.9 billion SEK, by September 2001 1,145.6 billion SEK. The debt of the central Finnish government was 385.1 billion FIM by the end of the year 2000 according to the national accounts. For more information see: http://www.tilastokeskus.fi.

Comparing the changes in GDP volumes of the US, Finland, and Sweden for the last seven quarters as rendered in the *"OECD Main Economic Indicators of November 2001"* is interesting. This does not support the claim frequently made by Swedish media that *"Sweden is the leader of this or that"*, rather to the contrary. Some of the following tables, figures, and analyzes are based on these data.

GDP Volume in USA, Finland and Sweden Q4 1999 – Q2 2001
1995 = 100

Country	Q4/1999	Q1/2000	Q2/2000	Q3/2000	Q4/2000	Q1/2001	Q2/2001
USA	120.0	120.7	122.3	122.8	123.3	123.7	123.8
Finland	123.2	125.7	127.1	129.4	130.0	129.8	127.6
Sweden	112.7	113.6	114.7	115.5	116.3	116.7	116.9

Source: OECD: Main Economic Indicators, November 2001

During 2000, growth in Finland was more rapid than in Sweden. Moreover, total production per capita in 2000 was larger in Finland than in Sweden. This is important since growth of any country is largely dependent of changes in labor productivity. According to the OECD, Finland had a growth of 5.8 percent for the period 1995 – 1998 while Sweden showed a growth of 2.4 percent for the same period. However, Sweden was more successful in controlling the rate of unemployment, the total level being some seven percent compared to 16 percent, for Finland in 2000.

The inhabitants of the two countries do not belong to the wealthiest ones according to the OECD purchasing power index,

published during Q1 2002. Sweden ends up number 16 and Finland number 17 in the latest survey of 2001. The citizens of the three other Nordic nations Norway, Denmark, and Iceland do belong to the world's richest six nations, however, following Luxembourg, USA, and Switzerland.

Of importance in the context of quality of productivity and economic success is the level of educational attainment of the two nations. In Finland, more than 65 percent of the population have an upper secondary education and some 13 percent hold a university degree, while in Sweden more than 75 percent of the population have an upper secondary education and about 12 percent hold university degrees, according to the OECD. In comparison, in USA almost 86 percent of the population has an upper secondary education and some 27 percent hold university degrees. Important? Yes, educational qualifications measure human capital, and human capital is what triggers economic growth and increases productivity of the national corporations and enterprises.

By the end of 1999, Finland had 219,500 registered companies, employing 1,269,000 persons. 29,600 of these companies having 436,600 employees were involved in manufacturing. In Sweden, 4,068,000 persons were employed in public and private organizations. There were 797,340 registered enterprises, employing almost 3,600,000 persons.

Number of enterprises and employees 1999

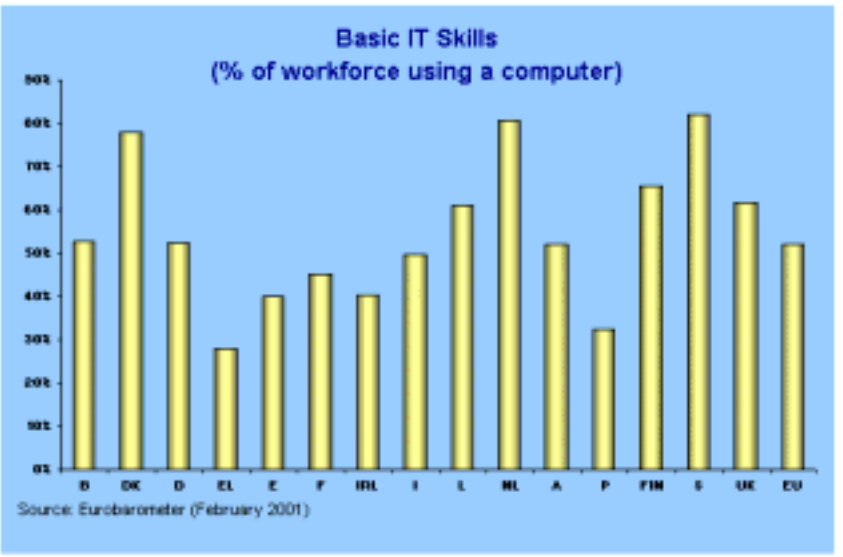
	Number of registered enterprises	Number of employed in industry	Number of ICT companies	Number of employees in ICT companies
Finland	219,516	1,269,000	14,500 (1999)	142,000 (1999)
Sweden	797,340	3,523,843	36,837 (2000)	225,070 (2000)

Sources: Statistics Finland/Statistics Sweden

In 1999, 142,000 persons in Finland were employed in some14,500 ICT-companies. They generated a turnover of 203 billion FIM. Information technology exports accounted for more than 25 percent of the total value of Finnish exports. By the end of 2000, 225,070 persons worked for 36,837 Swedish ICT-companies, by the end of 2000. These companies accounted for 19 percent of the Swedish exports. For the period 1993 – 1999, the ICT industries generated 25 percent of the GNP growth in Sweden.

Annual costs for the smallest companies for corporate administration according to labor market, environmental and taxation rules are slightly higher in Sweden than in Finland, some USD 3,200. The medium sized companies in Sweden pay double of what their Finnish colleagues pay, USD 2,000 in Sweden, USD 1,000 in Finland. Large corporations pay USD 500 in Finland and USD 700 in Sweden. Both countries follow the general trends that the smaller the company the higher the costs. The figures are from the OECD. Such costs affect the number of new players entering the markets, in the long turn affecting the output of new and creative products and contents needed by Nokia as well as Ericsson. 493 companies in Sweden have Finnish owners, employing more than 42,000 persons. Relate these figures to the Innovation Index and the Global Entrepreneurial Monitor, quoted in the following chapter.

The high level of education in Finland and Sweden and the early implementation of information technology in administration as well as in corporations contributes to a highly computer literate workforce, and, in consequence, high productivity. The following diagram shows the distribution of basic IT skills as a percentage of the total work force in the EU countries. Almost 70 percent of the Finnish workforce is computer literate, as compared to 80 percent of the Swedish one.



Finland, a Leader in Power of Long-term Growth

In many of the international economic comparisons made by the world's most prestigious institutions, Finland is often ranked before Sweden. Finland's rapid recovery after the crisis at the beginning of the 1990s and the on-going global success of Nokia are the two main reasons for its advanced position. Sweden gets positive rankings for its innovations in the ICT area and its R&D efforts, but macro economic factors like the high tax levels and the very large public sector are judged as obstacles for future economic development. These differences are mirrored by the World Economic Forum, which appointed Finland the world leader in power of long-term growth and in current competitiveness in October 2001. This is reported in *"The Global Competitiveness Report 2001–2002"* written by the leading Harvard researchers Jeffrey Sachs and Michael Porter. According to the same report, Sweden is placed number nine when it comes to long term growth potential and has position number six for current competitiveness. In the 2000 ranking, Finland was ranked before Sweden as well. It was number five in long term growth potential, and Sweden number twelve, while Finland was number one in current competitiveness and Sweden number seven.

The conservative Swedish morning paper *"Svenska Dagbladet"* had a slightly derisory editorial on October 18, 2001, felicitating Finland to these leading positions while chiding the Swedish state secretary of industry for Sweden not being more competitive than Norway, and a far cry below Finland. National pride was obviously hurt. Some Swedes even find it difficult to understand that Finland, which as late as during the post-world war II period needed assistance to rebuild the country, now has overtaken its western neighbor. After all, half a million Swedes participated in all kinds of voluntary assistance activities in order to support their Finnish brothers and sisters during those difficult times.

But that is history, let the latest statistics and rankings describe the current situation. The *"World Competitive Yearbook"* by IMD, the International Institute for Management Development, ranked Finland as the third most competitive nation in the world in 1999 as well as in 2000, after USA and Singapore. In 2002, Finland was number 2 after USA. Sweden was ranked number 14 in 1999, number 9 in 2000 and number 11 in 2002. Finland advanced while Sweden regressed.

The following tables give the appreciated long-term growth potential as well as an index of the current competitiveness for the ten leading nations according to the latest account.

Global Competitiveness: Potential for Long Term Growth and Current Competitiveness 2000–2001

	Potential for long term growth			Current competitiveness	
Country	**2000**	**2001**	**Country**	**2000**	**2001**
Finland	**5**	**1**	**Finland**	**1**	**1**
USA	1	2	USA	2	2
Canada	6	3	Netherlands	4	3
Singapore	4	2	Germany	4	3
Australia	11	5	Switzerland	5	5
Norway	15	6	**Sweden**	**7**	**6**
Taiwan	10	7	UK	8	7
Netherlands	3	8	Denmark	6	8
Sweden	**12**	**9**	Australia	10	9
New Zealand	12	9	Singapore	10	9

Source: World Economic Forum

When it comes to competitiveness, Sweden has regressed and lost three places in the ranking from 2001 to 2002. There is a paradox involved in this, since Sweden is exceedingly dependent on exports by a number of large companies. Exports fall and the Swedish economy recedes. Moreover, the average Swede is also a shareholder, Sweden having the largest number of shareholders as a proportion of the total population. The stock exchanges drop and the average Swede becomes poorer. This only shows the complexity of the dependencies in this world.

The most competitive nations 1998–2002

Country	**Ranking 2002**	**Ranking 2001**	**Ranking 2000**	**Ranking 1999**	**Ranking 1998**
USA	1	1	1	1	1
Finland	**2**	**3**	**3**	**3**	**5**
Luxembourg	3	4	6	4	9
The Netherlands	4	5	4	5	4
Singapore	5	2	2	2	2
Danmark	6	15	13	-	-
Switzerland	7	10	5	6	7
Canada	8	9	8	-	-
China/Hong Kong	9	6	12	-	-
Ireland	10	7	5	-	-
Sweden	**11**	**8**	**9**	**14**	**16**

Source: IMD: "The World Competitive Yearbook" 1998, 1999, 2000, 2001

Finland and Sweden alike are placed among the countries in the world best prepared for the future. The *'readiness for the future'* index has been developed by the *Europe 2050 Task Force of Global Leaders of Tomorrow* to assess how well 21 European countries are prepared for the twenty-first century as compared to USA, Canada and Japan. In this comparison, Sweden ends up number two after Norway and Finland number four after Switzerland.

National readiness for the future index, July 2001

The 10 leading nations

Nation	Index
Norway	1.03
Sweden	**0.87**
Switzerland	0.72
Finland	**0.71**
USA	0.67
Denmark	0.66
Japan	0.60
Canada	0.50
Netherlands	0.48
Germany	0.44

Source: Global leaders of tomorrow, World Economic Forum, July 2001

Finland and Sweden have been considered as model countries in many international contexts, not least so when in comes to mobile and wireless telecommunications. Infrastructure, research and development, design, technology availability, network access, production, marketing, user acceptance – these are areas where Finns and Swedes like to think of themselves as world champions. In any of these fields Finns and Swedes are not only good neighbors but also ferocious competitors, a competition that plays an important – and beneficial – role for the success of the countries.

Nokia Creates The Third Leg of Finnish Industry

Finnish economists have often pointed to the fact that the success and growth of the national economy to a large extent is linked to the success of one single company, Nokia. Nokia and its spin-offs are described as the third leg of the Finnish industry, along with the forest-

ry and metal and engineering industries. In all, there were 142,000 persons employed in the information industries by the end of 1999. 42,900 were involved in hardware production. 55,100 developed and produced services and 43,700 produced content. In total, Finland had 1,785 companies employing 63,876 persons involved in manufacturing electrical equipment.

Sweden being a slightly larger nation has a broader base of companies in the ICT field in particular, and in other areas as well. By the beginning of the 1990s, Ericsson stood for 0.5 percent of the Swedish GNP. By the turn of the millennium, Ericsson's share had grown to 2.6 percent of the total production. Also, the company was responsible for 15 percent of all goods exported from Sweden. By the end of 2000, Sweden had 36,837 ICT manufacturing and services companies, employing 225,070 persons. This relatively broad base of information and communication technologies-based companies earned the country a leading position in the IDC/World Times Information Technology Index, ISI. Sweden was appointed the leader in 2000 as well as in 2001 and 2002, while Finland was ranked number 3 in the 1999 to 2001 rankings and number 8 in the 2002 ranking.

The IDC Ranking of the World Leading IT Nations 1999–2002

2002	2001	2000	1999	Country	Score 2001	Index 2000
1	**1**	**1**	**2**	**Sweden**	**6,496**	**5.06**
2	2	4	5	Norway	6,112	4.48
8	**3**	**3**	**3**	**Finland**	**5,953**	**4.58**
4	4	2	1	USA	5,850	5.04
5	5	5	6	Denmark	5,837	4.34
7	6	-	-	UK	5,662	-
3	7	8	-	Switzerland	5,528	4.17
9	8	9	8	Australia	5,382	4.13
-	9	-	-	Singapore	5,269	-
6	10	7	7	Netherlands	5,238	4.23

Source: IDC/World Times Information Society Index, ISI

Since January 2000, the once highflying ICT industries have been hard hit and many companies have gone bankrupt. Nokia and Ericsson were part of this maelstrom, and also laying off people, but both companies showed comparatively strong figures for their third quarter of 2001, Nokia more so than Ericsson. All the same, the industry

picture was pretty dark. Stock values plunged and many of the spectacular dot.com-start-ups went bankrupt. The 10 largest ICT manufacturers in the world announced that they were laying off almost 300,000 employees. In Sweden only, more than 600 ICT-companies had filed for bankruptcy up to the end of October 2001. Some 6,000 persons lost their jobs. Thus many of the companies belonging to "the new economy" have been wiped out. Now the obvious question is what this experience will bring to the future growth of the ICT industry. The long-term outcome of the slower economic growth and the consequences of the September 11 events have to be evaluated at a later date. Now our sight needs adjustment to the immediate survival of Finland and Sweden in an unusually turbulent world.

Championships, Everywhere Championships

The current championships between Finland and Sweden go not only for athletics, winter sports, and ice hockey, but also for economics and information technology leadership as stated above. The language used in business media as well as in more popular contexts reflects upon the situation by often talking of Ericsson vs. Nokia, Finnish GPRS models of mobile telephones as competing with Swedish ones, etc. There are plenty of examples of even serious business reporters using the jargon of sport journalism when comparing Finland to Sweden and vice versa. Some examples of this will appear in the following chapters.

In October 2000, Hannu Leinonen, editor-in-chief of the leading Finnish business paper *"Kauppalethi"* defined the economics competition between the two nations as follows:

> *"In economics, the latest national championships between Finland and Sweden already have been going on for more than ten years, or since the economies of the two countries were hit by recession in the early 1990s. The countries came back on track but through different methods and political choices, which have lead the economists to declare war."*
>
> (Translation by the author)

However, Mr. Leinonen was not certain about who was leading. Some basic facts, statistics and international rankings may help us to an answer. It could well be that the result is – a tie, as was announced

by the Swedish equivalent to *"Kauppalehti"* on August 7, 2001 *"Dagens Industri"*[2]. One headline read: *"Tie Ericsson vs. Nokia"*. The article was about Nokia and Ericsson each having sold third generation mobile telephony systems to a value of 30 billion SEK. The cause for the statement was a list of operators having chosen the one or the other 3G system as explained by the following list:

- Telia Mobile had chosen Nokia and Siemens supplying their UMTS network for the Nordic countries, Sweden excluded, not Ericsson. Telia intends to invest 8 to 11 billion SEK over the next ten years. Telia intended to build networks in Finland and Norway and had an option for Denmark as well;
- Europolitan had decided on Nokia and Ericsson for their UMTS infrastructure;
- Hi3G was choosing between Nokia, Ericsson, and Siemens;
- Orange was trying to decide between Alcatel, Nokia and Ericsson;
- Tele2 said they would buy their UMTS infrastructure for the Swedish market together with Telia via their new joint venture for infrastructure. So far, Telia had bought its GRPS network from Ericsson. – GRPS technology is close to UMTS;
- Europolitan has bought GRPS from Nokia, and Tele2 from Motorola;

When this was written, Nokia had sold 60 GRPS networks, 20 were in commercial use. For Ericsson there were no figures.

The message in quoting this article is to convey an idea of the kind of bantering language used by media when describing the competitive situation of the two countries.

Is there darkness only? Well, there are optimists in the ICT field. In spite of the information and telecommunications technology companies being hard hit during the last half of 2001, EITO, European Information Technology Observatory, saw an overall western European growth for the information technology industry to be 8.6 percent and for the telecom industry to be 5.7 percent for the year to come. This is in line with the global IT spending predicted by IDC above. The major reason for this optimism was that everyone was convinced that the 3G networks will take off. Only, nobody can say when. By the beginning of summer 2002 there was little optimism

[2] "Dagens Industri" is Sweden's leading business paper, an FT counterpart.

left. Ericsson reported continued loss for Q1. Nokia reported more profit that predicted but turnover and net profits were down compared to the same period last year. It became obvious that the optimistic predictions about everyone wanting 3G telephones did not come true.

Dry facts like the ones quoted in this chapter are part of the background picture of the similarities and differences between Finland and Sweden. But so much more should be included in the image. Several Finnish and Swedish companies representing all kinds of industries and services have merged during the past ten years. These mergers have been rather successful, at least when regarded superficially. Some examples: The Finnish confectionery maker Fazer merged with Swedish Cloetta, a traditional chocolate manufacturer; the Finnish Merita Bank merged with the Swedish Nordbanken. Now they are called Nordea, constituting the largest Nordic bank, also including Norweigan and Danish banks. The Finnish and Swedish paper and pulp giants Enso and Stora merged in order to better compete in the international markets. Tieto Enator, the presently most successful ICT consulting group, is the result of the merger of a Finnish and a Swedish company back in 1991. The former PTTs of Finland and Sweden, Sonera and Telia, decided to merge in April 2002. These are a few of the more spectacular cases.

The Finns and the Swedes seem to be able to collaborate without too many problems, this in spite of their different backgrounds, languages and values. The Finns have their roots in the east, somewhere in the vicinity of the Ural. The Swedes have their beginnings in the Scandinavian Viking society. Their languages are totally different – often they communicate in English! – and so are many of their approaches to life. How come these two peoples are able to work together?

There are many reasons, of course. Consider the following for a start. The geopolitical situation at the very northern corner of Europe, the small populations in vast countries of harsh climates, surrounded by water, water used for communication since the beginning of times, coupled with easy access to energy and raw materials like lumber and ores make up the Finnish and Swedish realities alike. Tough physical conditions have forced individuals to collaborate for survival from the very beginnings of time. A common history of at least six centuries is also part of it. However, collaboration fosters competition as well. Difficult living conditions coupled to scarce resources force innovation. Small national populations end up looking

for larger markets and taking active part in globalization. The archeologists and historians of the sub-polar and temperate areas keep finding traces of human activities including long distance trade going back to the last glacial period, some 11,000 years ago.

Collaboration, innovation, and globalization have become natural components of survival to these peoples living close to the permafrost areas of northern Europe. And competition. It is their way of living.

2.
Innovative, Competitive, and Global

On October 1 2001 Mr. Erkki Liikanen, the EU Commissioner for Enterprise and Information Society, and a Finn, announced the results of the commission's Innovation Scoreboard. He said among other things:

> *"The scoreboard provides a tool for policy-makers and opinion-formers to drive home the message about innovation in their Member State and to plan more effectively to create an innovation culture."*
>
> Source: http://www.trendchart.cordis.lu

Sweden and Finland topped the Innovation Scoreboard ranking as number 1 and 3. USA ranked number 2.

Tentative Summary Innovation Index 2001 **Index = +10 – –10**

Ranking	Country	Index
1.	**Sweden**	**+6.5**
2.	USA	+5.6
3.	**Finland**	**+4.7**
4.	UK	+4.4
5.	Japan	+3.8
6.	Denmark	+3.5
7.	Netherlands	+2.9
8.	Ireland	+1.2
9.	Germany	+0.6
10.	France	-0.6
11.	Austria	-2.5
12.	Belgium	-2.5
13.	Luxembourg	-4.4
14.	Spain	-5.9
15.	Italy	-5.9
16.	Greece	-7.9
17.	Portugal	-8.7

Source: http://www.trendchart.cordis.lu

The Commission's innovation scoreboard is one of several components in the framework used by the European Commission to identify areas of strengths and weaknesses in comparison to other global economic regions, such as USA and Japan. The scoreboard is made up of 17 statistical indicators measuring different factors relevant to the innovation process. Sweden took the lead getting a summary innovation index of +6.5 out of +10 possible. The index runs from +10 to -10. Finland along with Denmark has moved ahead of most of the other countries in the EU.

Since innovation is seen as the generator of future growth and wealth, the importance of the scoreboard is evident. High rankings on the Innovation Scoreboard, such as those of Sweden, USA, and Finland, inherently suggest positive economic development.

One important component of the innovation scoreboard is the total national investment in knowledge. Costs for post-college education, R&D, and investment in software are measured in percent of GNP. The OECD uses this compound as a measurement of investment in knowledge. Sweden invests more than any other country, according to the organization, 6.5 percent of GNP. USA follows next, investing 6 percent, and Finland and South Korea each invest 5.2 percent of their respective GNP in knowledge. Part of the picture is constituted by the school systems. Sweden is said to have the most expensive school system in the world. In spite of this, Swedish pupils do not belong to the best ones. Finnish 15 year old students were better than the Swedish ones in mathematics, reading, and science according to one international study, PISA, Programme for International Student Assessment. The results were published on December 5, 2001. Canadian, Japanese, and New Zealand students also displayed better skills than the Swedish ones.

Innovation on its own does not create new companies that can provide new jobs and new, attractive products. Entrepreneurship is needed in order to take innovations to the markets. *The Global Entrepreneurship Monitor, GEM*, states in its global report 2001 that there are significant relationships between entrepreneurship and national economic adaptation and expansion. Made by a number of international researchers, the report is the third assessment of 29 countries, covering 1.4 billion employees in the age groups 20 to 64 years. Almost 10 percent of the employees, or 150 million individuals, work as entrepreneurs, having started and run their own companies in the 29 countries. Three percent of the working populations have invested their private money in new companies. Finland and Sweden belong to the as-

sessed countries. In Finland, the entrepreneurial activity rate is 9.3 percent of the adult population. In Sweden the rate is 6.7 percent of the adult population. GEM 2001 assesses several factors influencing the rate of entrepreneurship. Among those are the fact that the greater the proportion of economic activity of a country is conducted in the private sector, the greater the potential for entrepreneurship activity. Finland and in particular Sweden have high levels of their economic activities in the public sector. The report also identified government regulatory burdens as a major deterrent to higher levels of entrepreneurial activity. Reducing and simplifying the regulatory burden, minimizing taxation, and lowering non-wage labor costs should be the specific tasks of governments. At least according to the GEM 2001 report.

A High Tech Based Knowledge Industry

Late October 2001 *"The Financial Times"* presented a ranking of nations best positioned to cope with the knowledge based high-tech industry of the future. The FT journalists analyzed OECD statistics and composed a ranking index of the countries best situated to succeed as high technology nations. The ten most important factors were included in the index. Among these factors are the knowledge intensity of production of goods and services production, the number of high tech related patents, productivity, investment in R&D, knowledge, software ICT investment, and foreign investment share in high tech industries. According to the FT index the twelve leading nations were the following:

High Technology Leaders of the Future

12 leading nations according to FT, October 2001

Ranking	Country
1.	Switzerland
2.	**Sweden**
3.	USA
4.	Ireland
5.	The Netherlands
6.	Hungary
7.	Belgium
7.	Canada
9.	UK
10.	**Finland**
10.	South Korea
12.	Germany

Source: The Financial Times, October 29 2001

Ideally, innovation activities lead to products and services, accepted and bought by the market. An early step in the process towards new products is patent applications filing. Finland, Japan, and Sweden are filing the most patent applications to the US Patent Office. This is one way of measuring innovation. A possible method for measuring user acceptance of innovative products and services in the ICT area is by the amount of money each inhabitant of a nation spends on ICT annually. Finns and Swedes belong to the big spenders, along with the Americans and the Swiss. In 2000, the average Finn spent 1,534 Euro on information and communications technology. The average Swede spent 2,060 Euro that same year. Average western European expenditure was 1,390 Euro per capita and the average American spent 2,603 Euro. The figures are taken from the *"European Information Technology Observatory 2001"*.

One more measurement used to appreciate the value of innovation is the assessment of its influence upon the gross domestic product. Now, information and communications technologies being the result of research and development translated into innovation, ICT as a percentage of a nation's GDP is also regarded as a relevant measurement of success – or lack thereof. So the following table presents ICT in percent of GDP from 1994, when recession was still not quite overcome, until the bull year of 2000. ICT made up 6.43 percent of the Finnish gross domestic product, GDP, in 2000. In Sweden, ICT percentage of GDP amounted to 8.27 percent. For western Europe ICT made up 6.33 percent and for the US, 8.75 percent. The following table shows information and communications technology in percent of gross domestic product for some of the nations leading technology and services development. In 1994, ICT contributed 4.62 percent to the Finnish GDP, in 2000 it was estimated to contribute 6.43 percent. In 1994, ICT was responsible for 5.79 percent of the Swedish GDP, and in 2000 for 8.27 percent.

ICT in percent of GDP, 1994–2000

Selected countries

Country	1994	1995	1996	1997	1998	1999	2000
Denmark	4.74	4.97	5.22	5.56	5.62	5.90	6.20
Finland	**4.62**	**4.70**	**4.96**	**5.54**	**5.83**	**6.29**	**6.43**
Germany	4.14	4.30	4.23	4.50	4.96	5.32	5.71
Italy	3.76	3.67	3.70	3.92	4.49	5.04	5.49
Netherlands	4.90	5.12	5.47	5.85	6.10	6.56	6.94
Norway	4.47	4.65	4.83	4.88	5.46	5.72	5.14
Spain	3.34	3.40	3.68	5.00	5.53	6.21	6.82
Sweden	**5.79**	**5.90**	**6.05**	**6.49**	**7.36**	**7.83**	**8.27**
Switzerland	5.34	5.46	5.74	6.28	6.74	7.23	7.80
UK	5.46	5.77	6.09	6.37	6.38	6.81	7.40
Western Europe	4.35	4.48	4.61	5.00	5.42	5.87	6.33
USA	6.13	6.47	6.81	8.28	8.47	8.69	8.75
Japan	4.02	4.30	4.54	5.65	5.95	6.10	6.49

Source: EITO 1998 – 2001

In 1999, the total value of the IT market in Finland amounted to 4,475 million Euro according to EITO, the European Information Technology Observatory 2002. The equivalent figure for Sweden was 11,221 million Euro. For 2001, the figures were 5,060 million Euro for Finland and 12,663 million Euro for Sweden. The following table gives the market size for IT and telecom in Finland and Sweden for 1999 to 2001 in real value and estimates for 2002 and 2003.

Information Technology and Telecommunications markets values in Finland and Sweden 1999–2003

1999–2001 – real value in million Euro, 2002–2003 estimates

Country/region	Information technology					Telecommunications				
	1999	**2000**	**2001**	**2002**	**2003**	**1999**	**2000**	**2001**	**2002**	**2003**
Finland	4,475	5,070	5,060	5,153	5,549	4,060	4,292	4,552	4,756	5,022
Sweden	11,221	12,550	12,663	12,944	13,791	8,126	9,146	9,961	10,775	11,586
Fin+Swe in % of W.E. total	5.6	5.6	5.4	5.3	5.2	4.6	4.4	4.5	4.6	4.6

Source: Data from EITO, European Information Technology Observatory 2002

The figures show us that information technology is more important to the two nations than telecommunications. They also show that there was next to no growth from 2000 to 2001. As a matter of fact,

information technology had a negative growth 0.9 percent from 2000 to 2001 in Finland, while the same market grew by dismal 0.9 percent in Sweden. Telecommunications had a stronger growth during that same period, 6 percent in Finland and 8.9 percent in Sweden. Average Western European growth was 3.9 percent for information technology and 6.4 percent for telecommunications. This can be compared to earlier growth figures. The information and telecommunications industries in Sweden grew on an average by 20 percent annually during the period 1993 – 1999. During that same period, these industries accounted for 25 percent of growth in real terms in Sweden, according to the Ministry of Industry. The electronics and electrotechnics industry of Finland makes up 20 percent of all manufacturing in Finland. Mechanical engineering and metal industry contribute the largest part of Finnish manufacturing, 26 percent, and the forest industry 21 percent.

The populations of Finland and Sweden make up less than four percent of the Western European population. The countries contribute more than five percent to the IT market and more than four percent of the Western European telecommunications market.

Exporting Countries

As can be seen from the following table, Finland and Sweden belong to the leading export countries of telecom equipment within the OECD, in spite of the small size of their economies.

Export of telecom equipment by leading OECD countries 1998
In percent of the countries' telecom export and in percent of total OECD export

Country	Telecom export in percent of OECD telecom export	Telecom export in percent of total OECD export
USA	18	19
UK	13.5	12
Germany	10.5	8
Sweden	**10**	**2**
France	8	9.5
Japan	8	8
Finland	**7.5**	**1**
Canada	5	5
Mexico	4	2
Italy	3.5	6

Sources: OECD/The Department of Industry: "IT – an Engine for Growth", Ds 2000:68

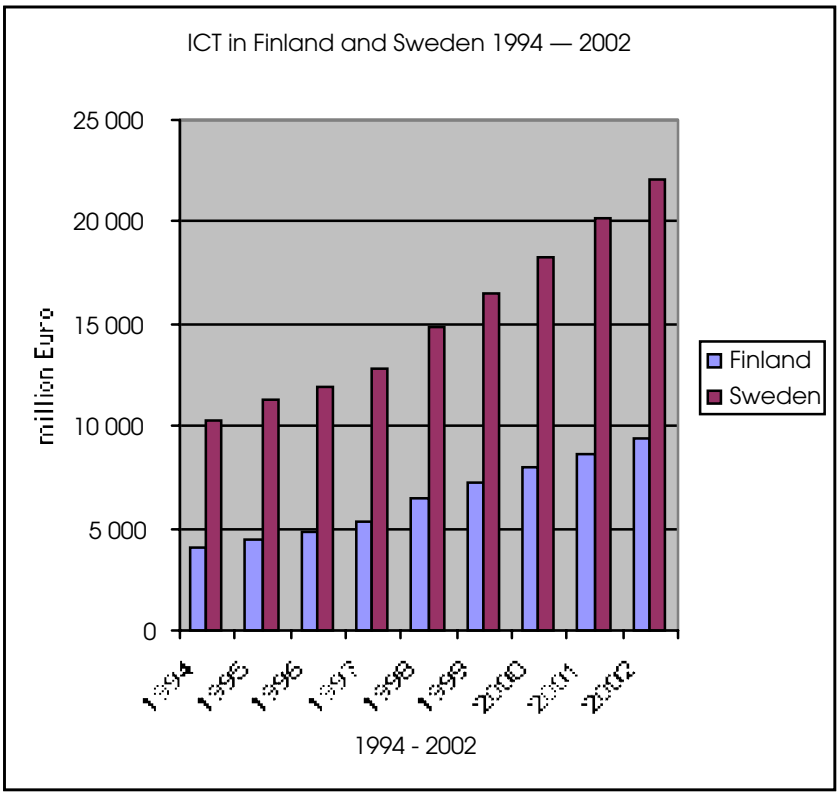
55.8 percent of Finland's exports are absorbed by the EU countries, while 54.4 percent of the import is generated by EU members. Electro-technical products make up 31.0 percent of total Finnish export pulp and paper generated 21.7 percent of the country's exports in 2000. Machinery and equipment contributed 10.2 percent and timber and wood for 5.4 percent. The largest import sector was raw materials and production equipment, making up 40.8 percent of total imports to Finland. Energy products made up 12.3 percent and investment goods 24 percent.

In 2000, Germany was the largest trading partner for Finland. 14.3 percent of the goods imported at a total value of 218,153 million FIM came from the German market. Sweden was second largest, selling 10.3 percent of the goods imported, and Russia third, contributing 9.4 percent of the Finnish import. Germany and Sweden were also the largest buyers of Finnish products during the year. The electrical industry generated 31 percent of Finland's total exports, wood, paper and pulp 26.4 percent. In these figures for export and import we find the basic reasons for the Finnish Ministry of Finance's zero-growth GDP predictions for the year 2002.

In March 2002, analysts at Forrester Research predicted that Europe's IT expenditures will dip to 0.7 percent during 2002 and flatten out to an annual growth of 7 percent in 2004. The reasons for this slowdown, according to the analysts, are the slow population growth, years of excessive demand for IT skills, and low penetration of the Internet. Finns and Swedes, enjoying a high Internet penetration may turn out more successful than its fellow Europeans. We get an indication of the importance of the Internet to national and corporate finances in an announcement made by the Swedish Ministry of Industry in March 2002. The ministry was responsible for 30 state owned corporations. It had made an index of what was called e-maturity in order to measure the savings the state corporations can make by using the Internet. 17 of the 30 corporations had saved 12 billion SEK in 2001 by replacing traditional sales staff. In both countries, the administrations are heavily involved in developing e-goverment, offering 24 hours services. This should turn out a good business for the national finances, a development to watch.

The following diagram compares the sizes of the information and communications markets in Finland and Sweden expressed in million Euro from 1994 to estimated values for 2002.

The Information and Communications Markets in Finland and Sweden 1994–2002



Source: EITO 1998 and 2001

The information and telecommunications markets in Finland and Sweden have grown by more than seven percent per year over the past ten years. During 1999, these markets grew by 12.8 percent in Finland and by 11.2 percent in Sweden as compared to 1998. The value of information technology is expected to grow by 7.7 percent in Finland for 2002 over 2001, and by 8.5 percent in Sweden. The value growth for telecommunications is expected at 2.5 percent for Finland and to 5.8 percent for Sweden for the same period. The value of the western European ICT market for 2001 is estimated at a total of 677 billion Euro.

As already stated, Nokia and Ericsson are the two most important players in the national as well as in the global markets for mobile telephones and systems. Both nations are dependent on the companies' success – what is good for Nokia, is good for Finland. What is

good for Ericsson is good for Sweden. And what is good for both is good for the Nordic countries. In April 2002 the immediate future looked dark for both companies, An Ericsson executive said that the telecom industry was stuck in the middle of a very long tunnel, with only the faintest glimmer of light ahead, far ahead.

Two Superpowers in a Small Format

So, two of Europe's smallest nations are among the leaders in mobile information and communications technologies. The figures above point to that conclusion. Moreover, these figures are one reason why the Finnish Ministry of Transport and Communications proclaims Finland to be a communications superpower and the Swedish Prime Minister, Mr. Göran Persson, states that Swedes have such a passion for new technology that it takes the country to the position as the world's leading IT nation.

This is how the Finnish Ministry of Transport and Communications words its statement about Finland being a Communications Superpower, see: http://virtual.finland.fi.

> *"In the past couple of years, Finland's position as a communications superpower has been recognized worldwide… In mid-February 1999 there were 3.1 million cellular telephones in use in the home country of mobile phone maker Nokia, a country having a population of just over five million.*
>
> *Finnish mobile phone penetration exceeded 50 percent of the population in August 1998 – also a world first – and in December the number of cell phone subscriptions outnumbered fixed-line phone connections…"*

The web site goes on by claiming:

> *"Another fast-growing sector is the use of the Internet. According to the latest figures of Network Wizards July 1999, Finland had more than half a million Internet connections, i.e. over 110 per 1 000 inhabitants. This figure, too, is the highest in the world. The Finns are not only connected, they also use Internet services."*

The major reasons for Finland's leading position are explained to be the success of Nokia, the flagship of Finnish communications, the deregulation of telecommunications during the 1980s, when the large

number of local telephone companies started competing in data communications, and a wide public support for the information society.

Mr. Göran Persson, the Swedish Prime Minister, describes the reasons for Sweden's leading position as follows:

> *"Sweden has a number of unique assets in an economy that is global and fast moving, competence and technology driven, and deregulated. Among the most important of these assets are an international openness, a passion for new technology, and non-hierarchical society that favors an entrepreneurial spirit."*
>
> (The Prime Minister's introduction to "Invest in Sweden Report 2001", ISA, see: http://www.isa.se)

Accordingly, the reasons for Sweden's leading ICT positions over the last few years can be explained by user acceptance and competence, innovative engineers, and Ericsson, the technology leader.

In the ICT area, Finland and Sweden, although competitors, obviously have much in common. Investments in research and development, in innovation, in educating the majority of the populations, in infrastructure as well as in integrated, mobile services, and availability and affordability for all, and, in consequence, quickly arriving at critical mass, are factors that favor the two countries alike. Early on, governments of both countries have adapted progressive ICT policies and opted for deregulation.

In Finland, the Information Society Advisory Board to the Government issued its report *"Finland as an Information Society"* in 1996. Information society policy papers have been published regularly by the Ministry of Transport and Communications since 1995. The Finnish government took a decision on the implementation needed to turn Finland into an information society. The theme of the reform is *"Finnish society – a network of people"*. The current Programme of the second government of Prime Minister Paavo Lipponen highlights the role of the information society when it comes to reforming the economy, to strengthen the content industry, and to improving the efficiency of the public services. Some interesting aspects of the programme, which was published in April 1999, are that content production has been assigned a central role in Finland's road to the information society.

In Sweden, the IT commission has published a number of policy papers and statements since the early days of the 1990s. The former Prime Minister, Mr. Carl Bildt, set an example by being one of the first public persons in Sweden to use the Internet and e-mail as tools in his political functions. He became a role model to many administrators, teachers, politicians, and ordinary people who had not dared to use the new technologies before. Mr. Bildt got many followers, and the Internet and e-mail became acceptable also in the public context.

In 1999, the Ministry of Industry published the ICT policy of the present Swedish government, called *"IT för alla"(IT for all)*. The report included the government plans for a national high-speed infrastructure so that every Swedish household should have fast access to the e-society. Most of the public administration services are available via the Internet. To all Finns as well as to all Swedes, the politicians, including members of government and parliament, and the public administrations' services are accessible via the Internet. Now there are several projects going on, aiming at making local democratic processes more attractive by using information and telecommunication technology. The dissemination of technology and network access is wide enough to make e-democracy and access to efficient public services available to everybody. For the time being, personal computers are the main access terminals but as the third generation's networks for mobile communications are implemented, 3G mobile telephones or terminals will become major access tools.

Some Key Figures

Sometimes it is said that eager and interested users have been pushing the ICT development in the Nordic countries. Let us look more closely at technology availability to the inhabitants of the two Nordic information and telecommunications technology superpowers Finland and Sweden. We will start out by perusing the ICT statistics, then try to understand what they tell us.

Information and communications technology key figures in Finland and Sweden 1999 (unless otherwise stated)

	Finland	Sweden
ICT, % of GDP (2000)	6.43%	8.27%
IT, % of GNP	2.88%	4.51%
IT spending per capita, Euro	645	1 072
Main lines per 100 inhab. %	55	69
Mobil telephone density, % of pop. Dec. 2000	73%	71%
Number of mobile telephones per 100 inhabitants Jan. 2001	76.9	74.9
Number of subscribers to mobile telephone services	3,952,000 (2001)	6,646,000 (2001)
Households with CATV, %	40%	53%
Digital mainlines, %	95%	94%
Number of national operators, fixed lines, (with licenses)	Ca 130	13
Number of international operators (with licenses)	13	13
Number of mobile communications operators (with licenses)	3	5
Number of UMTS licenses	4	4
Number of PCs per 100 inhabitants	36	44
Internet hosts per 1000 inhabitants (1999)	121	67
Internet users 2000	1.3 million	4.6 million
e-shoppers, 2000	1.4 million	3.1 million
e-shoppers, 2005 (est.) percent of population	25%	35%
B2B as percentage of total national trade, 2000	6%	7%
SMS messages sent 2000	1 billion	494,000,000
Industrial robots per 10,000 employees (2000)	61	79
Persons employed in the ICT industries	142,000 (1999)	225,070 (2000)

Sources: EITO/INRA Europe Eurobarometer/Eurostat/Jupiter/idg/emarketer/Financial Times/Statistics Finland/Statistics Sweden/Post- och telestyrelsen, PTS/World Robotics 2001/Mobile Communications

It is obvious from the figures above that information and communications technologies as well as the necessary infrastructures are evenly disseminated across the populations of both countries. The majority of the inhabitants are active users of mobile telephones, personal computers, and Internet services, the younger generations more so than the older ones. A majority of the users is also interested in trying out new services and happy to use them should they prove useful and good value for money. So far, the newest technologies for mobile tel-

ephones have been slow to take off in Sweden, while Finland is planning for the introduction of the third generation mobile system in early 2002. During the spring of 2002 it became obvious that there is likely to be several creative solutions to the problem of making the next generations of mobile communications financially viable. What solutions will be offered the users is far from clear.

But there is more to the data presented above. For instance, fixed telephony rapidly is losing out to mobile telephony. Finland was the first country having more mobile telephones than fixed ones in 1999. Sweden followed in 2000. As the populations become more and more mobile, demands for mobile services are increasing, including mobile Internet. This makes mobile Internet services the hotspot of innovation and product development. Finns and Swedes will continue to compete even more eagerly in developing innovative products and services. This competition is likely to be as mutually beneficial as the competition in mobile telephony has proven to be to Nokia as well as to Ericsson. Analysts estimate the new mobile market to amount to some 100 billion SEK for Sweden alone in 2001. To what extent competition can help the companies out of the predicaments showing up during the first half of 2002, remains to be seen. We are still waiting for the rosy estimates of the overconfident market gurus of 2000 to turn into reality.

3.
Users with a Passion for New Technology

Active, well educated users, eager to adopt new technologies and new applications, is frequently mentioned as one of the major reasons for Finland's and Sweden's leading IT positions. In addition, the competitive situation at the beginning of telephony services made the new technology affordable and created the well-known "critical mass" of users in Finland as well as Sweden at a very early date. By the turn of the 20th century, Stockholm had the most telephones of all cities in the world. By 1914, there were 170,000 telephones in Sweden. Finland remained an agrarian society till the end of World War II. Almost half of the economically active population still earned their living from agriculture in the late 1940s. Telecommunications networks were run by a large number of local operators. All networks became inter-linked early on. By the end of the year 2000, there were 2,848,000 subscribers to fixed telephony in Finland, or 55.1 lines per 100 inhabitants. The equivalent figures for Sweden were 5,829,000 subscribers to fixed telephony, or 73.8 fixed lines per 100 inhabitants.

Ever since the early beginnings, Finns and Swedes have been quick to pick up new technologies in general and telecommunications in particular. They share this with the rest of the Nordic countries. The citizens of Denmark, Finland, Iceland, Norway, and Sweden figure among the most frequent users of fixed and mobile communications technologies in the western world as well as within the European Union as can be seen from the following table. Fixed telephones, radio and later television were used by almost 100 percent of the populations in Finland and Sweden already by the end of 1980s. Next came mobile telephones, personal computers, and Internet access. Broadband access is in the pipeline for the immediate future and already a reality for an increasing number of users. Mobile, wireless Internet services are lurking around the corner, but difficulties in designing interesting services are casting shadows over the dissemination of this technology.

The following table describes the diffusion of information and communications technologies in EU households in May 2000. All figures are in percent of the populations aged 15 years and older.

ICT diffusion among the EU households in May 2000.
In percent of the population 15 years and older

Country	Mobile telephone	PC	Internet access	Digital TV	ISDN
Belgium	50	42	20	10	4
Denmark	61	59	45	4	9
Finland	**80**	**45**	**28**	**1**	**6**
France	52	29	13	7	2
Greece	52	15	6	3	0
Holland	63	66	46	4	13
Ireland	50	28	17	5	1
Italy	73	35	19	9	3
Luxembourg	64	45	27	2	12
Portugal	47	20	8	1	1
Spain	57	34	10	12	1
UK	57	36	24	15	4
Sweden	**71**	**56**	**48**	**6**	**4**
Germany	39	32	14	7	12
Austria	51	32	17	7	8
EU average	**55**	**35**	**18**	**8**	**5**

Source: INRA Europe Eurobarometer

From OECD figures on fixed telecommunications, it is obvious that the average annual growth was first to recede in Finland in 1998, and then to stagnate at a low level. New subscribers to telephone services chose mobile ones. Existing users replaced fixed phones with mobile ones. Sweden saw a similar development, only less drastic and also occurring two years later, but recent numbers show an increase in fixed telephone communications. The guess is that private subscribers have become aware of the high costs of mobility.

Mobile communications

In November 2000, 3.2 million Finns, i.e. 83 percent of the total population, had mobile telephones. By the end of June 2001,

6.545 million Swedes had mobile telephones, equivalent to 75 percent of the total population. ITU, the International Telecommunication Union, provides the following figures for the distribution of mobile telephones and PCs in Finland and Sweden by the end of 2000: Finland had 75 mobile telephones per 100 inhabitants and 40 PCs, while Sweden had 72 mobile telephones and 52 PCs per 100 inhabitants. In comparison, USA had 37 mobile telephones and 58 PCs per 100 inhabitants. Again, according to the ITU, there was on an average 36 mobile telephone subscribers per 100 inhabitants in Europe by the end of 2000. Austria had the highest density of mobile telephone subscribers, Italy the second highest, followed by Finland and Sweden. See following table.

Mobile telephone subscribers per 100 inhabitants in selected European countries December 2000

Country	**Mobile telephone subscriber per 100 inhabitants**
Austria	78.6
Italy	73.7
Finland	**72.6**
Sweden	**70.3**
Norway	70.3
The Netherlands	67.1
UK	67.0
Portugal	66.5
Denmark	66.5
Switzerland	64.5
Spain	60.9
Germany	58.6
Greece	55.9
Belgium	54.9
France	49.4
Hungary	29.3
Poland	18.1
Russia	2.0
European average	36.0

Source: ITU, International Telecommunications Union, May 2001

In both countries, GSM networks are the dominating ones for mobile telephony, although NMT is used in some areas where GSM coverage is not available. Finland has nationwide digital GSM 900 mobile telephone networks, operated by Radiolinja and Sonera. Sonera and Finnet/Ålands Mobiltelefon AB also operate in the autonomous region of Åland. Licenses for national GSM 1800 networks have been granted to Radiolinja, Sonera and Swedish Telia. The latter had more than 200,000 subscribers in Finland by the end of 2001. In addition, several local telephone companies belonging to the Finnet Group have their own regional GSM 1800 networks.

In Sweden, Telia was the dominant provider of mobile telephony in 2000, competing with Europolitan, Tele2/Comviq, Orange, and Hi3G. Mobile telephones have rapidly become the dominating communications medium for Finns and Swedes alike. Some applications have taken on rapidly, while others take longer to become accepted. SMS, Short Message Service, is an example of a service that took off rapidly in Finland, while it for tariff reasons was slower to take off in Sweden.

The Finns were before the Swedes to get hooked on sending SMS messages via their mobile telephones. Short text messages are very popular, in particular so among the young persons, because they are cheap and fast. In 1999 more than one billion SMS messages were sent and received by Finnish users of mobile telephones. In 2000, Swedish mobile subscribers sent 494 million SMS messages. During the first six months of 2001, Telia subscribers sent 171 million SMS messages, in spite of each message costing 1.5 SEK. At that time Sweden had the highest SMS tariffs among the Nordic countries. But SMS is here to stay. For 2001, about one billion SMS were predicted for Sweden only. By the end of September 2001, the world's population sent 750 million SMS messages every single day, corresponding to 275 billion for one year. In 2000, 50 billion SMS, messages were sent in the world.

In the mobile world, the young users are setting the trends, which Nokia realized a long time ago. The SMS craze is just one example. There is a rather attractive story about shy Finnish boys causing a lot of worry to the network operators and telephone suppliers alike by sending SMS. Traffic control reported that a great number of empty messages flew through the networks. The engineers could not understand why these messages were empty, not until they actually asked the young people. The senders of the empty messages were

young boys trying to communicate with young girls. The boys were simply too shy to write anything, all the same they wanted to tell girls they liked that they were interested in contact with them. What to do? Why not send an empty SMS message? The receiver could see who the sender was and react. Whether this is true or not, it makes for a nice story.

Now, the Finnish population is so addicted to their SMSs that sending them has become a health problem! The SMS thumb. Finnish doctors report that they get more and more young patients with worn out thumbs – they simply send so many SMSes and use their mobiles so frequently that their thumbs cannot take the strain. Thumbs? Just watch how the young people dial numbers and enter SMS messages on their mobiles. The phenomenon is not unknown in other parts of the world. Mouse elbows and vulture necks preceded the SMS thumbs.

By the end of July 2001, sales of mobile telephones in Finland had dropped by 8.9 percent as compared to the same period of the previous year. Total sales for the seven months were 602,758 mobile telephones. In total, 1.4 million mobile phones were sold to the Finnish users during 2000. For 2001, sales have reached more or less one million. In March 2002, 86,930 mobile telephones were sold in Finland, which represented an increase by two percent over the same month in 2001. But for the three first months of 2002 sales dropped by 12.8 percent as compared to 2001. Due to the high mobile penetration level in Finland, the Finnish market is judged as an important indicator by the rest of the world.

One of the more recent crazes among Finnish Internet and mobile phone users is chatting via television. The TV viewer has become the program producer in the so called GSM shows, broadcast during weak viewing day time and throughout night time, after regular broadcasting hours. Via the mobile telephone, any Finn can send an SMS message to the commercial TV channels, MTV3, TVTV and Channel 4, and to the text TV pages. After a little while the SMS message can be seen on the TV screen by all viewers. A program director comments and leads the chatting program according to whatever subjects are brought up by the viewers. These programs have become a success from the financial as well as from the viewer aspect. MTV3-Tele processes some 1,000 SMS-based messages every operating hour. The charge for each message is equivalent to 7.50 SEK per message, which is added to the telephone bill. The TV channels share the income with the telecom operators, at present Telia,

Sonera and Radiolinja. The technology is very simple and not a lot of staff is needed to help the viewers create the GSM shows, making it a veritable gold mine for TV channels and telecom operators alike. Once more, the Finns were first in exploiting this simple and genial idea.

Old Infrastructures and New Regulation

In the 1980s and 1990s the mobile communications markets were changing dramatically. Companies once having to comply with regulation became free to replace government-owned and regulated businesses with private sector ones. So far, neither Finland nor Sweden had ever had telecommunications regulations. The Finnish market was in the hands of a very large number of local telecom operators many of them competing for the same users. Telecom Finland, later Sonera, had the role of the government controlled PTT. In Sweden, Televerket, the Swedish PTT, dominated the market. Televerket had built a de facto monopoly in the Swedish market since the early 1920s. Only a few large corporations had their own leased lines. By the end of 2000, Telia still had 76 percent of the Swedish market for fixed telephony. Tele 2 had 11 percent, Telenordia 3 percent, and other operators 10 percent. Telia provides 59 percent of all international calls, 72 percent of calls from the fixed network to mobile networks, and 82 percent of all national calls, including Internet access calls. The regulating body, PTS, the Post and Telecommunications Board, is proposing various steps to increase competition in the Swedish market.

In 1988 Finland got a new telecommunications act. According to this act, the Finnish IT companies were granted licenses for telecom services. Datatie, a joint venture between several local telephone operators, was among the first companies outside the telecom sector to get such a license. Competition in mobile telephony started in 1990. Radiolinja obtained a license to build its own GSM network, which competed not only with the two Nordic networks, NMT 450 and NMT 900, but also with the GSM network of Telecom Finland Ltd., nowadays Sonera and after April 2002, Telia Sonera. In 1994, competition in long-distance services started with a number of new services offered by Kaukoverkko ysi, which is the long-distance network of the regional telephone companies, and Telivo. International services, finally, became deregulated in 1995. By

2001 13 operators offered their Finnish subscribers national long-distance and international telecommunications. In 1994, once the telecom deregulation driven by the European Commission was in place, Sweden got its first regulatory body ever, Post och Telestyrelsen, PTS, the Post and Telecommunications Board. Comviq, Europolitan, and Telia were the dominant players in mobile communications, although others were straining to increase their market shares.

In January 2002, local loops were unbundled and exposed to competition in Finland and Sweden as well as in the rest of the EU, in accordance with the EU telecommunication liberalization plans.

The Finnish Ministry of Transport and Telecommunications (Likenne- ja viestintäministeriö) issues licenses for mobile networks in Finland as well as network and service operators notifications. Dealing with policies and future development is the Telecommunications Administration Centre, responsible also for type approvals of equipment, telephone numbers, and frequency licenses.

In Sweden, outmost responsibility for ICT is held by the Ministry of Industry, Employment and Communications, Näringsdepartmentet. The ministry is responsible for no less than 18 different areas of action, including competition, energy, gender equality, IT, the labor market, sport, postal services and telecommunications, and state-owned companies. Three ministers share the responsibilities. Curiously enough, IT is assigned to one minister, and telecommunications to another one. Frequency licenses, operating permits, tariff control and the like, is handled by PTS, the Post and Telecommunications Authority, reporting to the minister in charge of telecommunications.

The structures of the telecom markets in the two countries have very little in common. Finland has 46 major local operators, three providers running long distance services, three operators running international telecommunications services, and three organizations offering mobile telephony services. In 2000, Sweden had 13 operators of fixed telecommunications on all levels, and three operators running their own networks for mobile telecommunications. Four operators have UMTS licenses in Sweden, Europolitan, Hi3G, Orange, and Tele 2. Tele 2 and Telia agreed to collaborate in building a common UMTS network.

In Finland, there are 46 operators running local telecom services. In Sweden, local telephony had competition only since 1993. The reason behind this is basically historical as described

earlier. In the later half of the19th century, when telephone technology was new, users in Finland formed cooperative organizations to run the telecom services for them. These operators were local ones, set up by the subscribers in a city or a village and its hinterland. This structure still remains in place, with some minor changes.

New Infrastructures, New Competitors?

Finland was the first nation to issue UMTS licenses (UMTS=Universal Mobile Telecommunications System) in a so called "beauty contest" in 1999. 15 operators applied and four licenses were granted. In Sweden, a similar contest resulted in four licenses being granted in late 2000. 16 operators had applied. In December 2000, the results of the"beauty contest" held in Sweden were announced by the Post and Telecommunications Board, PTS, the regulatory body of Sweden. Europolitan, Hi3G, Orange, and Tele2 had their applications granted. Telia, which was not granted a license much to general surprise, formed a joint venture with its most fierce competitor in Sweden, Tele2, in order to create a 3G network as a joint venture. At the same time, these companies started a trend and similar alliances have formed all over the globe, once the operators started calculating the costs of establishing the new infrastructure. The license granting authorities in Finland and Sweden decided that the new networks were to be in operation by the beginning of 2002. Since, there have been intense discussions about the realism in this, but at least one Finnish operator, Ålands Mobiltelefon AB, was convinced that they were be able to fulfil their commitment. The others have announced delays.

A total of 63 licenses for 3G operation were sold or distributed in Western Europe from 1999 to 2001. The operators paid in total some 100 billion Euro for their licenses.

3G licenses in Europe 1999–2001

Country	Mean of acquisition	Number of licenses	Total license fees
Belgium	Auction	4	Not available
Denmark	**Auction**	**4**	**Not available**
Finland	Beauty contest	4	0
France	Beauty contest	4	0
Italien	Auktion	5	13.8 billion Euro
Luxembourg	Beauty contest	Not decided	0
The Netherlands	Auction	5	2.7 billion Euro
Norway	Beauty contest	4	96 million Euro
Portugal	Beauty contest	4	400 million Euro
Switzerland	Auction	4	128 million Euro
Spain	Beauty contest	4	520 million Euro
UK	Auction	5	34 billion Euro
Sweden	**Beauty contest**	**4**	**0**
Germany	Auction	6	50.5 billion Euro
Austria	Auction	6	704 million Euro

Sources: European Information Technology Observatory 2001/Ovum

In all nations having distributed 3G licenses there is a condition that they should operate by January 1, 2002. The one exception was Greece.

The coming technology generation for mobile communication is looking for revenue generating services. According to a number of market studies, the mobile users want services for communications and productivity generating. Another hot issue with users is entertainment for the very young. Analysts at Datamonitor estimate the global market for mobile contents to USD 31.7 billion in 2003. In 2001, the market will amount to USD 2.4 billion.

In Sweden, during late autumn 2001 the government, the regulatory body PTS, and the 3G operators started discussions on how to regulate the new mobile market and what might be done to stimulate the market and provide users with interesting content. In this context, Sweden is considered as a technology driven nation, lacking content providers who concentrate on developing user oriented content-based services. New companies developing contents and services had to be created. In order to achieve this, the Swedish Minister of telecommunications, Ms. Mona Sahlin, held several meetings with the players in the mobile market. She announced that the Swedish state should explore how to exploit

its competence as a user in order to push demand for content services.

The new infrastructures need to be filled with services that the rather critical and competent Finnish and Swedish users will be willing to pay for! SMS services, even MMS[3] ones, are just a start. E-mail functions and data base search functions from the mobile telephone are on their way, along with mobile Internet and entertainment.

Computers

But not only telephones have gone mobile. Computer networks are following and the merger between radio based technology and IP-based networking is presently the biggest challenge to all the providers and operators. During the first quarter of 2001, 686,060 computers were sold in the Nordic area. This was down by two percent, or 11,690 units, compared to the same period of 2000. Computer sales in Denmark were down by eight percent, by four percent in Norway, and by seven percent in Finland. Only in Sweden, sales increased by seven percent. Sweden accounted for 39 percent of total Nordic computer sales after Q1 2001. Global sales of personal computers are estimated to 130 million for 2001 as compared to 132 million for 2000. In 2000, the year that the personal computer celebrated its 20th anniversary, 1,145, 000 PCs were sold in Sweden. 83,000 were so called home-PCs that employees could buy via their employers. The PCs were tax -deductible. According to estimates by IT-Research some 1,100,000 new PCs will be sold in Sweden in 2001. 23,000 of these are "tax deductible" home-PCs. In 2000, a total of 130 million PCs were sold in the world. The global PC population was estimated to 603 million by the end of 2001. During 2000, some 11 million palm computers were sold in the world.

This may indicate that the PC market is going to stagnate and even decline. Users get more and more addicted to mobility, so other access devices, much less cumbersome than the present PC, for instance handheld computers, smart laptops, palms, mobile telephones, etc. are predicted to offer the very services large groups of users will want in the future. Once all the problems presently related to

[3] MMS, Multi Media Message Service, makes it possible to include still and moving pictures in the messaging service.

mobile Internet access, including most of the security problems, are solved, a majority of the users will not want an ugly PC at all.

That mobility is going to take over from fixed installations can also be understood from the fact that WLAN, wireless local area networks, are well on their way in Finland as well as in Sweden. These can be based on the 802.11b standard. According to a British consultancy, BWCS, Telia provided about 400 so called hotspots in Denmark, Norway, Finland, and Sweden by the end of 2001. The two Finnish WISPs, Wireless Internet Service Providers, Sonera and Jippi provided 200 each in Finland. It is estimated that there will be 115,000 hotspots in the world by 2006, according to BWCS. A "hotspot" is a place where users can connect to WLANs via the wireless 802.11b standard. By the end of 2001, Telia, Sonera, and Jippi, were the leading WISPs in Europe. But there are more "hot spot" standards waiting out there. Specialist working on 4G mobile communications, which is expected to be implemented by 2012, are aiming at global wireless networks for voice as well as multimedia and data transmission.

The slow progress of high speed infrastructures, often called broadband access, to the average home is another reason for people not buying more potent PCs. And why would they? A high speed PC can do nothing much connected to a slow copper line via a 57 Kb modem. It is like driving a Ferrari along a dirt track. Online services find it hard to take off because of the slow speed of fixed access Internet connections and the lack of widely disseminated competing technology to modems. Last on this list of reasons for the decline and fall of the PC is the fact that the PC industry has not been very successful in finding new and easily accessed applications, useful to many. Engineers keep doing as they have done for the last 20 years, adding a few more bells and whistles to existing products, which by the way already are too complex for the average user. But by now users have experience and know what they need and use. Neither more of the same, nor useless functions are any longer enticing them to up-grade their PCs. All these weaknesses of the standard PC are becoming evident to the users in the most advanced countries. Finns and Swedes, being among the more computer and Internet literate in the world, are looking to functionality based on mobility related to costs.

Regarding infrastructure, Finland is by tradition strong in the data transmission field. The technology was developed on demand from companies and public administration alike. The numbers of users, the data transmission volumes and usage times have increased

many times over the last few years and will continue to grow in the near future. Users keep demanding faster and more reliable transmission links, in particular those involved in graphics-based applications. But not only LANs are used for data transmission in Finland. Public telephone networks, ISDN networks, GSM mobile phone networks are also used for data transmission. Nokia is one of the movers when it comes to integrating all the different kinds of networks to seamless infrastructures in Finland, just as Ericsson and Telia are in Sweden. Sweden had a fiber based high speed national backbone network by 1995. Since then, local network operators have built community networks, which local private and professional users can access. Satellite communications are used in some cases. Companies with widely dispersed sites having poor data communication links use VSAT stations for their internal, international communications. Some very large Finnish and Swedish companies use that technology as a complement to their intranets.

Satellite communications also provide global coverage for the mobile telephone service providers. There are at present three global providers for mobile satellite transmissions – Inmarsat, Globalstar, and Iridium, the consortium that filed for bankruptcy in the US in 2000 and now has been resurrected in a slightly more modest shape. Telia provides Iridium in Finland, and Sweden and Sonera ICO, the Inmarsat system. One more issue for the new Telia Sonera to sort out.

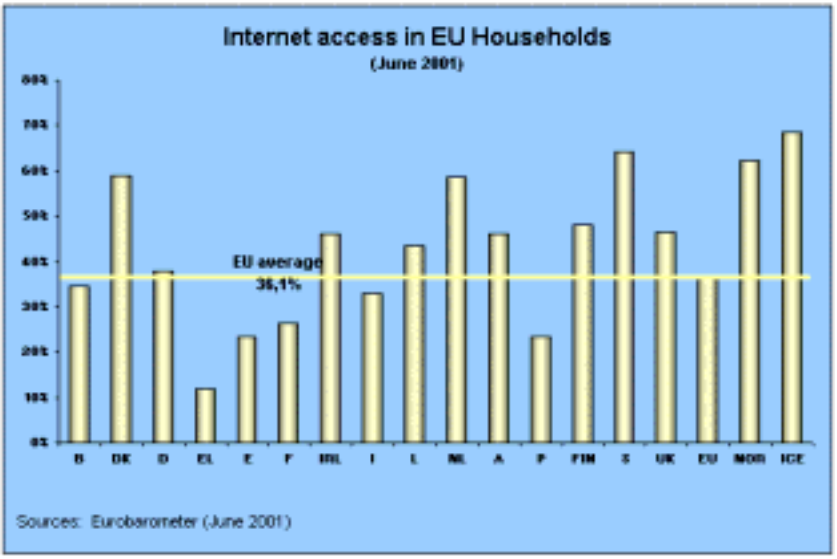
The General Public and the Internet

By the end of February 2002 there were approximately 500 million Internet users in the world. Some 308 million users accessed English speaking web sites in 2001. For the time being, the overwhelming majority of users access the Internet via PCs. The diagram below shows Internet access in EU households in June 2001 as presented by the Eurobarometer by Eurostat. 36.1 percent of all European Union households have Internet access. 70 percent of the Icelandic households, more than 65 percent of the Swedish ones, some 63 percent of the Norwegian ones, 59 percent of the Danish ones and almost 50 percent of the Finnish ones had Internet access by June 2001. The growth of Internet usage seems to have reached a certain level of saturation in both countries. The growth rates are fairly moderate and new applications that appeal to users are few. The following diagram

compares Internet access availability in EU households by June 2001, in percent of the total number of households. Finland and Sweden are well above the EU average of 36.1 percent.

Internet Access in EU Households, June 2001

In percent of total number of households



Finland had some 1.4 million Internet users accessing the Net from their homes. A large number of service providers and some of the lowest prices for Internet services within the OECD countries are two of the factors behind this high level of Internet acceptance. The most important ISPs are Sonera/Inet, HTC/Finnet/Kolumbus and Samalahden Serveri. By the beginning of 1999 these three providers controlled 80 percent of the market to private users. The prevailing Internet pricing practice is 'flat rate pricing' – the user is charged a fixed monthly fee regardless of how long they are on line.

By the end of 2001, 86 percent of all Swedish men aged 16 - 64 had Internet access from their homes, while 85 percent of all women of the same age groups could access the Internet from home. Among persons over 65, almost 60 percent are using the Internet regularly. This means that Sweden has more than 4.4 million Internet users.

In July 2001, the current Internet host count, reported for Finland by RIPE, was 771,725, while in July 2000 the equivalent figure was 461,230. These figures mean that there were 149 Internet hosts

per 1,000 inhabitants, the highest figure in western Europe. Sweden had 764,011 Internet hosts in July 2001, as compared to 605,783 in July 2000. There were 85.9 Internet hosts per 1,000 inhabitants in Sweden, the third highest figure after Finland and Norway, the later country featuring 117.8 Internet hosts per 1,000 inhabitants.

According to a survey presented by Jupiter MMXI in March 2002, 42 percent of the Finnish population, and 57 percent of the Swedish population, i.e. more than 5 million Swedes, used the Internet on a regular basis by the end of 2001. On a global basis, the Internet has grown by some 5 percent over the last quarters.

Media Consumers Prepared for a Mobile Knowledge Society?

In 2000, there were 935 public libraries in Finland and published 13,173 book titles were printed. According to statistics from 1999, Finland had 56 daily papers and 5,129 periodical publications. The total circulation of newspapers is 3.3 million. The largest daily in Finnish is Helsingin Sanomat, having a circulation of 473,000 copies, the largest daily in Swedish is Hufudstadsbladet, having a circulation of 59,000 copies. There were 343 cinemas in the country, offering 58,000 seats. Sweden had 390 public libraries, and 10,976 book titles were printed. In 2000, Sweden had 169 daily newspapers having a total circulation of some 4 million copies, the largest ones being Dagens Nyheter and Aftonbladet. 1,131 cinemas had 17 million visitors. 419 weeklies and magazines had a net circulation of over 22 million copies.

In 2000, the average Finn watched television 168 minutes per day, the average Swede 150 minutes. And on an average day that same year, the average Swede used 58 minutes at work or in school to search for and read news, magazines, and general information. Nordicom, a research institute sponsored by the Nordic Council provided the figures.

To what extent will media help develop the new content and services so badly needed in Finnish as well as in Swedish? The question is of vital interest to any media producer in the two countries (as in many others!), because Internet is little by little infringing on the time dedicated to the traditional media. So far, according to Swedish surveys, Internet has replaced telephone calls and to some extent television.

Enterprises and the Internet

By the end of 1998, more than 21 percent of the small and medium-sized companies within the European Union used the Internet for commercial purposes. 34 percent of all Swedish SMEs used the Internet, while 21 percent of the Finnish SMEs did so.

This picture changed dramatically during 1999, as can be seen from the following diagram.

SMEs and the Internet in the EU in 1998

In percent of total number of enterprises per nation

Country	SMEs using Internet in % of total number of enterprises
Sweden	**34**%
Austria	33%
Germany	32%
Luxembourg	28%
France	24%
Ireland	22%
Italy	22%
Finland	**21%**
The Netherlands	21%
Denmark	20%
Spain	17%
Belgium	15%
UK	15%
Greece	11%
Portugal	6%

Source: EU, 2000

In early 2001, Statistics Norway presented a survey of how information and communications technologies are employed in Nordic enterprises. The report is called *"Use of ICT in Nordic enterprises 1999/2000"* and contains data from Denmark, Finland, Norway, and Sweden. The following figures are based on this report.

By the end of 1999, 85 percent of all Finnish enterprises had Internet access, while 49 percent used web sites. In Sweden, 78 percent of all enterprises had Internet access and 57 percent had their own web sites. 17 percent of the Finnish enterprises and 14 percent of

the Swedish ones could receive orders via their web sites. In 2000, 94 percent of all Finnish companies and 88 percent of the Swedish ones had Internet access. In 1999, 30 percent of all Finnish enterprises and 38 percent of the Swedish had intranet, 38 percent in 2000, while in Sweden 32 percent of all enterprises had intranets in 1999 and 44 percent in 2000. 11 percent of the Finnish companies had extranets in 1999, and 25 percent in 2000. 10 percent of the Swedish enterprises had extranets in 1999 and 19 percent in 2000. EDI, the accepted standard for electronic business, in particular so among government agencies and their subcontractors, was used by 17 percent of the Finnish enterprises in 1999 and by 11 percent of the Swedish ones. In 2000, the figures were 24 percent for Finland and 17 percent for Sweden. 93 percent of all Finnish companies used their web sites for marketing in 1999, while 91 percent of the Swedish ones did. 14 percent of the Finnish enterprises received electronic payment for their products via the Internet, while only 4 percent of the Swedish ones did so in 1999. 19 percent of the Finnish companies sold products in digital form while 6 percent of the Swedish ones did. Also see the table below.

Internet, intranets, extranets, and EDI in Finnish and Swedish enterprises in 1999 and 2002

In percent of total number of enterprises

	Finland		Sweden	
	1999	**2000**	**1999**	**2000**
Internet access	85%	94%	75%	88%
Own web site	N.a.	49%	N.a.	57%
Intranet	30%	38%	32%	44%
Extranet	11%	25%	10%	19%
EDI	17%	24%	11%	17%
Marketing via the Web	93%	N.a.	91%	N.a.
Electronic payment	14%	N.a.	4%	N.a.
Sales of products in digital form	19%	N.a.	6%	N.a.

Source of data: Statistics Norway "Use of ICT in Nordic enterprises 1999/2000"

Some Popular ICT Applications

Many are the research organizations trying to understand what the average user of all the information and communications devices are doing with their machines. What applications are they using and which ones do they not use? And what do the Internet home users do on the Internet? Most researchers come up with the same applications – obtaining news, sending and receiving e-mail, playing games, and shopping. During August 2001, 57 percent of all Swedish households had Internet access and used the Internet for some six hours and twenty minutes per household, on an average. 42 percent of the surfers were women, the rest men.

E-mail is used by almost 60 percent of all Finnish Internet users, www browsing by 60 percent. More than 30 percent use Internet banking services. 10 percent of the Finnish users made purchases over the Internet in 1999, according to Statistics Finland. The Finns like to buy books, magazines, and newspapers, and items like clothes, shoes, music, travels, gambling services, theatre, concerto, and cinema tickets, via the Internet. In this respect, the Finns are acting like most other nationalities. But the Finns prefer to make their purchases from Finnish speaking sites. Less that 30 percent of all Internet purchases were made from foreign sites.

Among the Swedes, e-mail and information search are the most frequently used Internet applications. More than 80 percent of the users communicate via e-mail and search for information. Banking comes next, 45 percent of the Internet users. News via the Internet are less frequent. All the same, there were 73 Internet newspapers in Finland and 80 in Sweden in the spring of 2000. The five largest Finnish Internet papers had almost one million readers is September 2000,while the six largest Internet papers in Sweden had almost 729,000 readers in April 2000. 30 percent of the Swedes had purchased something via the Internet.

The Finns along with the Britons are the most diligent users of public Internet access points, i.e., Internet access via public computers in libraries and similar public places. Some eight percent of the Britons and just above seven percent of the Finns used so called PIABs, Public Internet Access Points, in October 2000, according to the Eurobarometer. The EU average was 2.9 percent of the population. 2.6 percent of the Swedes used public Internet access.

Banking and broking

The Nordic peoples are addicted to (or forced by the banks?) Internet banking. On October 30, 2001, the Financial Times described the situation as follows:

"Finland and Sweden have some of the highest levels of Internet banking and broking penetration levels in the world, and Norway and Denmark are not far behind. The trend reflects the tech-enthusiasm of the Nordic people, as well as bank pricing strategies that are designed to get customers to switch transactions, such as bill paying, out of the branch and onto the net."

The largest among the Nordic Internet banks is Nordea, operating in Denmark, Finland, Norway, and Sweden, having 1.2 million Internet customers in Finland and Sweden alone. 22 percent of these are Net users. Merita-Nordbanken is the leading European Internet bank. Number 2 in Europe is Citigroup with some 850,000 customers, followed by Deutsche Bank with 750,000. Swedish Föreningsbanken had 600,000 Internet customers and SEB of Sweden 400,000. 40 percent of the SEB customers use the Intenet bank, and 30 percent of the Swedish Handelsbanken users. In total, the Swedish banks have some 1.6 million Internet clients.

These leading banks offer ever more sophisticated services, such as electronic shopping malls and banking via mobile WAP (Wireless Application Protocol) telephones – paying bills is the bread-and-butter service. It is possible to trade shares, make changes in portfolios and make new investments, just as a few examples.

When it comes to broking, Sweden with 245,000 accounts had the second largest number of Internet brokerage accounts in Europé, after Germany and just ahead of the UK by the end of 2000. One reason is that Sweden has one of the highest levels of share and mutual fund ownership in the world. Dealing costs are lower than in any other country due to fierce competition between some fifteen banks and brokers vying for the attention of the nine million Swedes.

An interesting development is under way in Sweden. The country will have one more bank in 2002. The Coop Bank is owned jointly by the cooperative consumer society, Coop, the dominating telecom operator Telia, and an international insurance company, Skandia, which at the same time has its own Internet department Skandia Bank. The new bank has stated that its intentions are to offer the established banks competition through low service fees and many banking service offices in the food stores and warehouses of the

coop consumer society. Its competitor, the private ICA chain, already offers this service, as does the furniture giant IKEA.

In Helsinki, a pilot project has involved testing the possibility of replacing cash as well as credit cards by use of the mobile telephone as an electronic wallet. Partners were Nordea, Nokia, and Visa. They faced a number of problems such as finding a cheap bluetooth chip allowing for communication with the mobile telephone. The idea was that the user should enter his/her pin code rather than sign a receipt or enter a personal code in an ATM. Moreover, a new infrastructure for wireless communication between cash registers, ATMs and mobile telephones would be needed. The electronic mobile telephone wallet is already used for payment of parking fees, soft drinks, and similar small expenses.

e-commerce

Below follow estimates of how large parts of a number of countries' populations are shopping on-line during the years 1998 to 2002. Only figures from 1998 are factual, the others are estimates. It is interesting to note the similarities between the figures for Finland and Sweden.

Internet Users Shopping on the Net 1998–2002

Selected countries. In percent of the Internet users

Country	1998	1999 (est)	2000 (est)	2001 (est)	2002 (est)
USA	20.2	26.1	31.2	35.7	40.5
Germany	13.1	19.5	25.3	30.3	38.3
UK	17.2	18.5	24.1	28.6	35.9
France	11.7	17.0	21.5	26.1	33.6
Denmark	10.9	17.6	22.7	28.8	36.8
Italy	7.7	13.6	18.1	23.5	28.7
The Netherlands	14.0	17.5	22.0	27.5	34.5
Finland	**13.2**	**18.4**	**22.7**	**28.7**	**36.8**
Sweden	**13.6**	**18.4**	**22.7**	**28.7**	**36.8**
Norway	15.1	17.4	22.5	28.4	36.4
Spain	11.8	14.7	17.7	23.7	30.8
European average	12.5	17.4	22.0	27.1	34.2

Sources: Jupiter/Merrill Lynch/ FT.Com – Nordic Information Technology

Online retailing revenues in the Nordic countries represented about 0.4 percent of total retail sales in 1999. In Sweden, online retailing accounted for 0.7 percent of total sales, well ahead of other European countries but behind the US, where online sales are estimated at 1.2 percent of all sales. The total figures for the Nordic countries reveal their small size – IDC estimates total Nordic e-commerce to reach some 22,230 million USD by 2002. This may be compared to estimated 62,810 million for Germany alone according to the Boston Consulting Group.

Some of the early start-ups, like Boxman, by the fall of 2001 Europe's largest e-retailer of CDs and home entertainment products, Dressmart, a clothes retailer, and Letsbuyit, a co-operative buying company, have expanded all over the globe from their Nordic roots. Boxman as well as Letsbuyit are in deep trouble.

Business-to-business sites are challenging the American gigantic sites. Steelscreen of Sweden, an online market place for steel products, and Finnish-Swedish Accesspaper, an online market place for paper products, are in head-on competition with American sites.

The following table shows e-commerce figures for the EU countries and Switzerland during the period 1998 – 2002. Only figures from 1998 are factual, the rest are estimates, made by IDC and Merrill Lynch.

Total e-commerce spending in Europe 1998–2002 **In million USD**

Country	1998	1999 (est.)	2000 (est.)	2001 (est.)	2002 (est.)
Austria	141	490	1,300	2,970	5,800
Belgium	92	330	890	2,130	4,400
Denmark	135	450	1,180	2,660	5,190
Finland	**140**	**410**	**960**	**2,010**	**3,740**
France	380	1,500	4,580	12,260	28,450
Germany	1,696	5,620	14,480	32,350	62,810
Greece	34	120	340	800	1,660
Ireland	39	140	360	840	1,690
Italy	377	1,370	3,750	8,870	18,090
Netherlands	364	1,190	3,010	6,600	12,620
Norway	138	450	1,140	2,490	4,740
Portugal	35	130	360	860	1,770
Spain	178	640	1,750	4,040	8,000
Sweden	**261**	**840**	**2,110**	**4,570**	**8,650**
Switzerland	194	660	1,740	3,960	7,790
UK	1,406	4,560	11,470	25,050	47,610
Total Europe	5,611	18,900	49,420	112,460	223,010

Sources: IDC/Merrill Lynch/FT.com – Nordic Information Technology

m-commerce next

In Japan, 72 percent of all Internet users have gained access to the Net from their mobile telephones. 16 percent of the German Internet users, 10 percent of the UK users and 6 percent of the Finnish users have connected to the Net via their mobile telephones. However, m-shopping – or m-commerce – is far from becoming a popular service – should you want to buy something from Amazon.com via your mobile telephone, some 360 clicks are needed, while you "only" need 150 clicks from a stationary computer. According to a study called *"The Future of Wireless"*, by research firm Accenture about how people intended to use their mobile telephones should they have access to the Internet, 64.6 percent of 3,562 interviewed individuals wanted to know about delayed flights, 60.6 percent wanted to find the lowest price for a product, while 53.6 percent wanted to find a special location. According to the same survey, 45.6 percent of the respondents wanted to know about discounts, 34.6 percent were interested in getting one invoice for several services and products, 31.2 percent were interested in electronic payments, and only 19.5 percent in actual purchases.

In spite of this, the Nordic countries are e-commerce leaders, they are also well on their way into exploiting the opportunities offered by mobile Internet for m-commerce, mobile commerce. In Finland, Nokia and Sonera, the largest operator, are pioneering the development. Our Finnish sisters and brothers may pay for a car wash, a soft-drink from a vending machine, and order CDs from their mobile telephones, as mentioned above. Paying parking fees via the mobile telephone looks like a promising application. In short, our mobile telephones will become our wallets. At least if we are to believe some of the most frequent gurus.

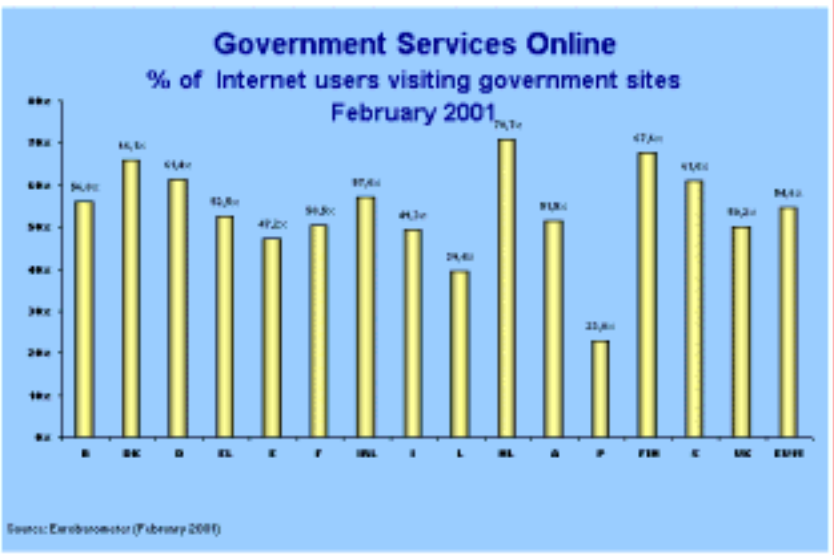
The most knowledgeable experts predict that already in 2003, more mobile telephones will be linked to the Internet than personal computers. If that will be so, the potential for m-commerce is quite interesting. People looking for apartments in Sweden often search the Internet. But good apartments disappear quickly, so most likely the home-hunters will demand that the service goes mobile.

e-government

To what extent information and communications technologies can be used to improve the democratic processes and, moreover, to con-

vince larger groups of people to participate in political decision making are topics of great interest to politicians as well as to any citizen. There is a belief that technology may be utilized to encourage individual participation in decisions relevant to not least the local community. E-voting has been tested in some councils in northern Sweden, in the community of Kalix with positive results. The inhabitants of the Åland archipelago have discussed using the Internet for voting but concluded that it is not quite up to the security needed and demanded, at least for the time being. On a central level, the Finnish as well as the Swedish governments have been pushing all public offices to "go Internet". That means that Finns and Swedes alike can retrieve any information needed from different public offices via the Internet. As may be seen from the following diagram on government services online within the European Union, Finland, Sweden and Denmark along with the Netherlands had the most Internet users visiting the public sites. This was in February 2001.

Government Service Online in the EU Countries, February 2001



The development of e-government services is aimed at providing the general public access to all services for 24 hours out of 24. On-

line services have taken off when it comes to information search and downloading forms. Whatever else will come remains to be seen.

4.
Competitive Advantage for the Future – Research and Development

Finland and Sweden are among the most innovative countries in the European Union as can be seen from Mr. Erkki Liikanen's Innovation Index 2001 described in chapter 2. Research and development have been political priorities for both nations during the last 20 years. Finland has a stronger focus on the various forms of joint European R&D than Sweden. It has internationalized and Europeanized its priorities, and the volume of European cooperative R&D in Finland amounted to almost 1 billion FIM or 170 million Euro in the autumn of 2001. One example of these Europeanized R&D projects comes from the Turku School of Economics. The school participates in a research project called active-ad, co-founded by the European Commission, which will investigate the drivers of interactive advertising, the Internet, and interactive television, an area of vital interest, not least for the media conglomerates and the content producers. Digital technology makes it feasible for more and more groups to broadcast over more and more channels. At the same time, there are fewer advertisers. A theme for discussion during the Mip-TV show in Cannes…

For the future, Finnish Tekes, the Technology Development Center of Finland, is planning to create R&D collaboration with the global leaders in information and communications technologies, Japan and USA. Tekes is the principal organization for implementing technology policy. It reports to the Ministry of Trade and Industry. The Tekes support for R&D activities at companies, universities, and research institutes in 1999 amounted to 2.3 billion FIM, 390 million Euro. Tekes was founded in 1983. Extensive funding is also provided by Sitra, the Finnish National Fund for Re-

search and Development, and Finnvera, the Foundation for Finnish Inventions.

Investment in R&D in Finland amounted to 3.0 percent of GNP or 19.7 billion FIM (3.3 billion Euro) in 1998. Corporations contributed some 13.3 billion FIM (2.2 billion Euro) while the public sector answered for 6.3 billion FIM (1.1 billion Euro). Investments in corporate research have increased by 15 to 20 percent during the past years. In 1999, R&D in Sweden amounted to almost 76 billion SEK, or 3.8 percent of GDP. According to Eurostat and OECD, Finnish companies spent the equivalent of 1.36 percent of the national GDP on R&D, while the Finnish government spent 0.8 percent of its total GDP on R&D at Finnish research institutions and universities in 1998. The Finnish GDP amounted to 3,335 million Euro that year. In Sweden, business financed R&D amounted to 2.87 percent of GNP while government expenditure was 0.9 percent of GNP in 1998. The Swedish GNP was reported as 8,000 million Euro. The first figures are from Statistics Sweden.

As we have stated above, even several times, Nokia and Ericsson are the most important contributors to national research and development in both Finland as well as in Sweden. In 2000, Nokia spent 2.6 billion Euro on R&D, which is equivalent to 8.5 percent of net sales. R&D spending in 1999 amounted to 1.8 billion Euro, 8.9 percent of net sales. That same year, Ericsson spent 39.9 billion SEK, equivalent to 14.5 percent of corporate revenue, on research and development. 45 percent of the sum was spent in Sweden. Ericsson contributed 32 percent of all R&D expenses in Sweden that year. In comparison, Telia, spent 1.2 billion SEK, or 2.9 percent of its revenue on R&D, equivalent to 1.2 percent of total R&D in Sweden.

Finland and Sweden File many Patents and Export Electronics

The relative inventiveness of a company or a nation is sometimes measured by the number of patents filed and accepted. Finnish inventors, research teams, and companies file close to 2,500 patent applications annually. Half of the applications results in patents. Finland takes the fourth position in the world after Japan, Germany, and USA when it comes to the number of patents per capita per year. The single largest number of patents are filed by Nokia Telecommunications. In 1998 the company filed 305 applications. Val-

met Corporation filed 203, Nokia Mobile Telephones 141, and Sonera 54, all in 1998 alone. Finland and Sweden were together with Switzerland and Japan the foreign nations holding most patents granted in the US.

One of the more interesting early patents filed by a Finnish inventor is an application from 1917 for "a pocket-size, folding telephone with a very thin carbon microphone." The application was filed by Eric Tigerstedt, probably Finland's best known and most prolific inventor.

Knowledge, IT-investments, and high quality research and development helped companies like Microsoft, Nortel, Motorola, Sun Microsystem, Oracle, Intel, Nokia, and HewlettPackard to invest in R&D facilities in Sweden, most of them in Kista north of Stockholm, Kista the center of mobile Internet.

Nokia as well as Ericsson and many of the other Nordic players are involved in several research projects concerning the next generations of mobile communication, offering users wireless high speed networks at the price of today's fixed ones. These networks will be global, meaning that the user will have access wherever she/he happens to be. The Nordic countries and Japan are leading the development of the new networks. Some are planned to be available by 2012, but the same question prevails as for 3G – what services will the users be willing to pay for, and how much? As Mr. Mäkitalo, the Swedish "father" of mobile telephony, puts it:

– All the technologies are there now, We have to find useful applications that people will subscribe to and want to use.

In that same interview in relation to Telecomdagarna 2002 (the Telecom Days) in Stockholm, he also points out that it took NMT ten years to reach a penetration rate of 10 percent. The technology for SMS has been available in the telecom system since 1992. The service took of by the end of the 1990s. Technology penetration takes more time than the optimists want to see.

The exports of high-tech products amounted to 1,027 million Euro per million Finns, i.e. 1,027 Euro per head, and to 1,387 million Euro per million Swedes in 1998, i.e. 1,387 Euro per Swede. In 1988, high-tech products accounted for 4 percent of total exports from Finland, in 1998 it accounted for 19 percent of the total export value. Finnish high-tech exports amounted to 43 billion FIM (7 billion Euro) in 1998. Electronics and electrical goods have become the third pillar of the Finnish economy, the others being traditional forest and metal and engineering industries. Electron-

ics and electrical goods made up 26 percent of total Finnish exports. In Sweden in 1999, total exports of goods had a value of 700 billion SEK. Of this, electronics made up 19 percent, equivalent to 132 billion SEK.

Science Parks for ICT

Three Finnish areas, Uusimaa, Pohjois-Suomi, and Etelä-Suomi belonged to the 15 EU top regions in R&D expenditure as a percentage of GDP in 1997. Stockholm and Uusimaa were ranked 1 and 2 within the EU when it came to R&D personnel as a percentage of the labor force. In Sweden, there are several so-called science parks, where publicly supported R&D institutes collaborate with enterprises. Most university cities have concentrated their efforts in areas such as mobile Internet. The center of this research is located in Kista to the north of Stockholm. Or in bioinformatics, also in Stockholm. The science park of the city of Linköping is specializing in medical technology, the one in Uppsala in pharmaceuticals. In 2015, Kista is projected to have 50,000 work places, all of them in knowledge based industries. It is called the Kista Science City. The City of Stockholm, the Royal Institute of Technology and the University of Stockholm are involved in the project. Twin towers called *"Kista Science Tower"* and *"Kista Residence Tower"* are growing from day to day in this construction area. The IT University is already in operation, a joint venture between the Royal Institute of Technology and the Stockholm University. And in late October 2001 "Wireless@KTH", the new research center for wireless communications at the Royal Institute of Technology in Stockholm, opened its doors in Kista, Sweden's Wireless Valley. Ericsson, Nokia, Microsoft, and Telia have invested money in the center. The first project is called "wireless foresight" and its task is to develop four scenarios for 2015. The results will provide platforms for further research at the center.

As one example of a common Finnish-Norwegian-Swedish ICT research project, I will mention *"Wireless Kids"*. It was started in 1997 and included researchers from Finland, Norway and Sweden. Researchers from Tampere University, Gothenburg University, and the Polytechnic University of Bergen looked into the future of young users of mobile technology.

There are so many more interesting collaborative projects and efforts going on, just like there are many dynamic ICT areas in the two countries described. It will take us away from our main subject to delve with them. Let us just assume that they will be one more item for the future national championships, Ruotsi-Suoimi maaottelu, Finnkampen.

Educating for the Future

In 1997, there were 226,458 students participating in tertiary education programs in Finland. In Sweden, there were 275,217 students in equivalent programs. 51,000 Finnish students followed a tertiary engineering education, and some 14,600 studied mathematics and computing sciences in Finland. In Sweden, there were 49,000 engineering students and some 17,500 mathematics and computing sciences students. The data are from Eurostat/Unesco and the OECD.

According to recent data from the Swedish educational board, there are 30 percent fewer applicants to the computer science university courses for the autumn 2002 than there were for the same period 2001. At the same time, figures from the Eurostat Labour Force Survey for 1999, show that employment in high tech sectors grew by some 8 percent in Finland, while it decreased by 1 percent in Sweden. Employment in knowledge intensive services grew that same year by almost 4 percent in Finland and 8 percent in Sweden.

"Forbes Global Magazine" of May 28, 2001, ranked Finland as the ninth best nation in the world in which to start a business, while Sweden got ranking number 13. In 1998, the Finns had 1,097 scientific publications per million inhabitants, while the Swedes had 1,429.

This chapter can be concluded by stating that the Finnish education system has a high international ranking. Young persons are attracted to study technology and science to a larger extent than their Swedish counterparts. Finland has been more successful in eliminating the stumbling blocks for startup companies than the Swedes have been. Or as Lasse Virén, Finland's most distinguished long distance runner in the 1960s and 1970s, once commented upon the Swedish male athletes every year being beaten by the Finnish team in the national championships:

– I believe we Finns still have some "sisu", while you Swedes have grown very comfortable. Mr. Virén has won several gold medals

by outdoing many Swedes in 10,000 meters in the national championships, Ruotsi-Suoimi maaottelu, Finnkampen. However, in 2001, the two Swedish athletic teams, male and female, beat the Finns…

5.
The Early Beginnings

To understand how Finland and Sweden started on their roads to the Information Society, we have to step back to the first part of the 19th century, to the days of the electric telegraph and even further. Samuel Morse invented the electrical telegraph in 1837. But communications between the three entities around the Baltic area, Finland, Åland, and Sweden, whatever their political relationships, go back so much longer. Trading ships and men of war, rowing boats and small sailing boats carried goods, soldiers, letters, information, gossip, and people across the Baltic waters. This traffic of people and goods is of great economic importance even today. Fleets of large modern ferries transporting people as well as goods and vehicles continue the Baltic seafaring tradition. Some 4.2 million persons use the ferries between Finland and Sweden every year. Air borne transportation is a modern complement.

In the early days, fire was one medium for communication. Messages have been sent from certain points along the coast by fire since days immemorial. We know for certain that fire carried signals from Signildsskär next to Grisslehamn in the Eastern Swedish archipelago to mainland Åland in medieval times. Some centuries later other types of optical signals took over. In 1808–1809 Russia and Sweden were at war with each other. This war ended in Sweden losing what is now Finland to Russia. An optical telegraph, a Chiappe telegraph system, in frequent use between Eckerö in Åland and Grisslehamn in eastern Sweden is said to have played an important role in the early part of the war. But evidently this technology was not reliable enough. The Chiappe telegraphs carried messages from 1796 until March 24, 1808, when it was discontinued. The reason was the serious problems in interpreting the optical messages due to bad weather conditions above the Åland Sea. Rowing boats equipped with sails had to fill in and carry the messages across the waters.

Once the electrical telegraph was introduced by 1837, authorities in Russia and the Russian great principality of Finland as well as its Swedish equivalents hurried to create state monopolies and state telegraph boards. The telegraph was seen as a communications system of strategic importance and had to be controlled by the ruling authorities. In 1853, the Royal Electrical Telegraph Board was founded in Sweden.

In the meantime, the American painter Samuel Finley Breese Morse had improved the telegraph by inventing a fast way of conveying messages as short and long signals, the Morse system. He introduced the prototype of this new system in 1843. Rapidly it became dominant globally. The electrical telegraph was of major importance during the Crimean war 1854–1855, when France, Great Britain, the Ottoman Empire, and Sardinia, opposed Russia. Sweden was not involved in the conflict. However, the telegraph was quickly adapted to civilian applications and became an important supplement to the national bad road and poor railroad infrastructures for greater parts of the country, not least to those areas exporting iron ore, wood, paper and pulp. The telegraph also became of great economic importance to the herring fishing industry in Bohuslän in western Sweden. So there were good reasons, strategic as well as economic, for the Swedish government wanting to control the telegraph. The telegraph board was renamed The Royal Telegraph Board in 1855. In Finland, the Russian authorities controlled utilization as well as distribution.

In 1876, an underwater cable from Nystad in Finland to Djupvik-Geta in Åland took care of the telegraph traffic between Finland and Mariehamn, now becoming the main city of the Åland archipelago. In 1877 the cable was continued to Sweden, where the Royal Telegraph Board took over. Norrtälje became an important hub for communications between Finland and the countries to the east and west of it, not least so Russia and Sweden. Stockholm and Uppsala were the Swedish centers of business, economical transactions, and education. St. Petersburg was the seething western center of the vast Russian empire as well as its capital. The city had at that time important Finnish and Swedish populations, most of them business people, military officers, artisans, administrators, and artists. Business transactions between St. Petersburg and Stockholm were intense.

But back to the Morse system. Any person wanting to send a telegram had to be in contact with at a telegraph station. The message was conveyed by Morse signals to the receiving station. Young men delivered telegrams to the receivers' homes, at least in the big cities. In the country side, the farmer living closest to the telegraph

station was paid per delivery, either by horse or on foot. Later, bicycles became the main means for telegram distribution. The first telegraph line for the Morse system in Sweden was built between Stockholm and Uppsala in 1853.

Bell's Telephone and Russian Politics

Such was the communications technology status in 1876, in Finland and in Sweden, when Alexander Graham Bell had filed his patent for the telephone. In December 1877 Helsinki got its first telephone line, constructed by Daniel Johannes Wadén, who worked for the imperial telegraph company. In Sweden, a self taught man, Lars Magnus Ericsson, who had a telegraph repair shop in central Stockholm, was contacted by the engineer Henrik Thure Cedergren late 1876. Mr. Cedergren wanted a telephone line between his home and his office downtown Stockholm. He asked Mr. Ericsson to build the new communications device.

In 1882, the first local telephone companies appeared in Finland, still under Russia. The cities of Turku, Tampere, Helsinki, Viborg, Vaasa, and Oulu formed operating companies owned by the subscribers. This type of company is called "andelsbolag" in Swedish, its literal meaning is "partnership company". The imperial Russian authorities did not pay much attention to the telephone technology at that time. The obvious reason was that the telephone was seen as an instrument for entertainment. You were supposed to listen to lectures, operas, concertos, and similar entertainment broadcast from studios, via your telephone. But people soon found out that their telephones could be used for two-way communications, for talking to one another over a distance, at a reasonable price. So more and more users formed local telephone companies to set up networks for the community, all without much fuss. Soon, these telephone companies started competing with one another. As soon as a sufficiently large group of subscribers were unhappy about tariffs, the quality of service of their operator or anything else, they formed a new company to serve them as they wished. The procedure is still much the same, but now each operator has to apply for a license. The history of the formation of each of the Finnish local telephone companies is an interesting one, well worth a study in its own right.

By the time Finland gained its independence in 1917, it was too late for any kind of regulation of the telecom operators. During the

first century of operation, the Finnish operators became more and more competitive. So the lack of understanding of the potential of telephony by the political authorities resulted in nonintervention. The unintentional choice of nonintervention by the Russian authorities is one of the fundamental reasons why there are more than 130 competing local telephone operators existing in Finland today.

By the end of 2000, there were 46 telecom operators judged as having *"significant market power"* in Finland, according to the Finnish Ministry of Transport and Communications. Sonera was the largest operator, and also the former PTT, still government owned to 53 percent. Three operators ruled the long distance operations within Finland, and there were three dominant operators of international telecommunications. Kaukoverkko Ysi Oy, Sonera Oy, and Ålands Mobiltelefon AB dominated the internal long distance traffic, while Oy Finnet International AB, Sonera Oy and Ålands Mobiltelefon AB looked after the larger part of the international telecommunications traffic. Oy Radiolinja AB, Sonera Oy, and Ålands Mobiletelfon AB were the leaders in cellular operations.

A parenthesis is needed regarding Telia and Sonera: In late March 2002, the long awaited announcement came that Sonera and Telia were to merge. Sonera's major strength is in the mobile field, while Telia is strong in fixed communications. The merger is thought of as the first step towards building a strong Nordic presence by Telia. Denmark is next in turn. Then the TeliaSonera will go east. After Telia's not so successful almost-merger with Norwegian Telenor, there are many skeptics to the operation. Sonera has very large debts after buying 3G licenses in Europe. Moreover the company owns a large part of the Turkish mobile operator Turkcell. End of parenthesis.

The result of tough competition initiated and controlled by the telephone subscribers, from the very beginning, is that Finland probably has one of the best telecom infrastructures in the world, the best service offering, and the lowest tariffs. Free local competition in a largely unregulated market has gained Finland the position as an information and communications technology superpower, just like the Finnish Ministry of Transport and Communications so proudly announces.

The Swedish State and Ericsson

Sweden took a slightly different way towards its leading IT-position. The first public telephone network in Sweden was operated by the

American Bell Company, which opened its first station on September 1, 1880. It could connect 100 subscribers in Stockholm. In 1881 the Royal Telegraph Board had started its own telephone operations. Two years later, in 1883, Mr. Cedergren started a competing operator, Stockholms allmänna telefon a.-b., SAT – Mr. Cedergren became a successful telecom executive. In 1891, the Bell company was constituted into Mr. Cedergren's company. Competition between the two operators was fierce and the direct cause for Stockholm having the highest telephone density in the world during the first two decades of the 20th century, and also the lowest tariffs. In 1891 SAT even offered its subscribers free telephone calls, after the Telegraph Board of Stockholm lowered its tariffs to well below those of SAT's. In 1900, Mr. Cedergren expanded his operation by forming the Swedish-Danish-Russian Telephone Company Incorporated and Telephone Inc. The first one, Swedish-Danish-Russian Telephone Company Incorporated, controlled telephone operations in Moscow, the second one, Telephone Inc., was looking after the Warsaw telephone network. Ericsson as well as Cedergren saw the business potential of Russia and established their own production units in St. Petersburg. Cedergren had started his own production of telephone equipment in 1896 in direct competition with Ericsson. The former business partners became bitter competitors. The conflicts between the two were solved by L M Ericsson acquiring AB Telefonfabriken from Cedergren in 1901. The payment was Ericsson shares to a value of 400,000 SEK,

Again, there is a fascinating piece of history to tell, and it has been told, recently by the Swedish journalist Lasse Åsgård and his analyst friend Christer Ellgren in the book *"Ericsson. Historien om ett svenskt företag"*, Stockholm 2000 *(Ericsson. The history of a Swedish company)*. The book makes for good reading.

The situation outside the Swedish large cities was similar to that in Finland. Local users started partnerships to establish local telephone companies. Early on, the Telegraph Board established itself in the countryside since the competition in the cities, in particular in Stockholm, made it difficult for the board to gain a foothold. It started something called "Rikstelefon", which was a national telephone network.

In 1902 the powers of the centralized telecom administration, in the form of he Royal Telegraph Board, proposed to the Swedish government that the state should buy the Cedergren companies. Parliament rejected the proposal. A renewed proposal made in 1906 was

also rejected. Cedergren died in 1909. His companies were merged in the Royal Telegraph Board on July 1,1918, the state paying 46,664,111 SEK to the owners. Since this day and until 1994 Sweden had one telecom operator only, although no formal telecommunications regulatory body was formed. Regulatory questions as well as supervision was controlled by the operator, although without the formal exclusion of others. A true monopoly. In 1956, the telegraph board became the Telecommunications Board, and in 1993 the board became incorporated as Telia AB,100 percent owned by the Swedish state. In 2000, Telia AB was privatized. The state sold 30 percent of the shares in an IPO in the largest Swedish IPO ever. Some experts say, tongue in cheek, that regulation came with deregulation in 1994. Then the first independent regulatory body in the country, PTS, the Post and Telecommunications Board, was formed. In 2002 Telia AB merged with Finnish Sonera.

By the end of 2000, 17 operators had licenses for operation in Sweden. 13 companies had licenses for fixed telecommunications, five for mobile communications and eight for network operations. Telia, the ex-PTT, was still the dominating operator, having 73 percent of the total Swedish market for fixed and mobile communications. Tele2 had 13 percent of the market, and Europolitan 9 percent. In 2000, the total value of the Swedish market for fixed and mobile communications amounted to 39.9 billion SEK, an increase of 4 percent over 1999.

The Northeners go Mobile…

Mobile communication and mobile telephony have their own history in both countries. It started out in a similar way. In Finland, research work on point-to-point communications initiated by the Finnish military and the State Railways was well on its way in the 1970s. In Sweden, Ericsson had been involved in military communication technology for several decades. The company had developed and sold mobile communication stations to the Swedish military forces since 1890. Ericsson delivered its first mobile communications devices abroad, cavalry telephones, to the British troops during the Boer War in South Africa 1899 – 1902.

Each country developed its own incompatible standards. In late 1960s, the Nordic PTTs decided to look into the possibilities of collaborating in order to develop a common standard for mobile te-

lephony. The Nordic NMT (Nordic Mobile Telephony) group met in Stockholm in 1970 for the first time. Then and there the Nordic PTTs took the actual decision to make a joint effort to build one common system for mobile telephony. The basic requirement for this NMT system was that it should be open to equipment built by anyone who fulfilled the requirements of the Nordic PTTs. In 1976 they finally agreed that anyone could produce NMT equipment, telephones as well as base stations and switches. However, the PTTs kept their monopoly rights to operate the networks. NMT equipment was installed all over the world, by the world's largest telecom equipment manufacturers. In Finland, Nokia and Televa decided to collaborate in order to challenge this formidable competition. In Sweden, Ericsson kept several projects going, concentrating on its professional users, the military, the police, the public authorities, etc. To cut a long story short, once the NMT network started operating, two Nordic manufacturers, LM Ericsson and Nokia, found that they were ahead of competitors such as Siemens, Motorola, Hitachi, NEC, and Mitsubishi. And NMT networks were built across the world.

The first mobile telephones to reach the consumer were simplex car telephones. Duplex, i.e. two-way, phones followed and in 1971 direct dial car telephones were introduced. NMT phones were introduced in 1982, and the digital GMS system in 1992. In 2001 GPRS telephony was available in the metropolitan areas of Finland and Sweden and all over Åland.

In 1981, the Nordic countries had a well working mobile system, several years ahead of the competitors in the US and the UK. These countries were then struggling with their own proprietary standards. The first NMT standard launched in 1981 was the NMT 450, operating in the 450 MHz band. NMT 450 was introduced in Finland one year later, in 1982. Thanks to NMT, analog mobile telephony became possible between users in all the Nordic countries. The telephones were expensive, heavy and cumbersome, weighing some ten kilograms (20 lbs), more luggable than portable. In 1982, 70 percent of all mobile telephones in the world were sold in the Nordic countries. The remaining 30 percent were sold in Japan. Among the users were – and still is – various corps like the police, the coast guards, and fire brigades. But also many persons living in isolated areas where fixed telephony was very expensive to install used the NMT 450. People needing communications in cars and boats at sea, out of reach of the modern GSM base stations, still subscribe to the NMT 450 system. By the end of 2000 there were in Sweden some

140,000 subscribers to NMT, mostly people living in insulated areas with no or few neighbors. To people working at sea the NMT 450 is indispensable. GSM is working close to the coastline but not when a ship is sea bound. Most NMT users are Russians, however, living in scarcely populated areas. In that country, 350,000 users subscribe to the system.

A second analog NMT system was introduced in the Nordic countries in 1986, NMT 900, operating in the 900 MHz band. Since this is the frequency also used by the digital GSM systems, the service was discontinued by the end of 2000. There were some 395,000 NMT 900 users in Sweden in September 1999. Ericsson still delivers up-dates to the NMT system hardware. Nokia was the first manufacturer to produce pocket mobiles for the NMT system and still is the largest supplier of handheld telephones for all the NMT users all over the world. These are found in several nations. So NMT triggered enough challenges to Ericsson and Nokia to make them take the lead in mobile communications. It also demonstrated the benefits of standards. In 1982 a number of European PTTs got together to create a group called Groupe Spéciale Mobile, GSM. This became the GSM standard, which by now is the most frequent standard for mobile telephony in the world. The rest is well documented history.[4]

... and Global

Nokia decided right from the beginning that the Finnish and the Nordic markets, and even the European markets, were not large enough for their mobile telephony operations. To become global, Nokia had to be present in USA and Japan as well. Ericsson was already well established in the major markets, selling and installing telephone systems and switches. Throughout the 1980s, the users of mobile telephony were still basically professional people in the categories mentioned above. However, Nokia had made a market study which conveyed to them one very clear message: The average citizen wanted a mobile telephone. She/he was fed up with public telephones that never worked and always were vandalized. Or, once she/he found a working one, the required coins were lacking. Finnish Mobira, partly owned by Nokia, launched the most popular handsets, the Talkman and Cityman models, in 1984. Ericsson still targeted the

[4] See for instance Bruun/Wallén: Boken om Nokia and Åsgård/Ellgren: Ericsson. Both books are in Swedish.

professional users, but these also wanted small and easy to use handsets, which Ericsson Radio Systems, ERA, provided along with its systems.

So this is how the success of the Nordic information societies started, in a very abbreviated version. Combining what we learn from history, the technological development, and what we can read out of the basic facts of information and communications technology dissemination in the Nordic countries, we see several reasons why Finland and Sweden are among the leaders in the information society. Competition as a result of collaboration in the very early days of telephony in Finland as well as in Sweden is one reason. The comparatively late involvement by regulating bodies has brought Finland and Sweden to leading positions when it comes to service offerings and low tariffs. Services are well functioning and affordable in both countries, in spite of differences in competition. This, in turn, has resulted in POTS and radio and television coverage of almost 100 percent of the populations in both countries. The average citizen is accustomed to technology and willing to test the usefulness of new devices and new services introduced in the market. Mobile telephony has been a success in both countries. There were 76.9 mobile telephones per 100 Finns and 74.9 mobile telephones per 100 Swedes in 2000. SMS[5] messages are sent in the billions in both countries. Finns as well as Swedes have taken to Internet banking services and pay most of their bills from home. Our two small nations are leading Internet banking in actual numbers for the time being, just like they bought the most mobile telephones way back. And so on.

Price basket comparisons of telephone charges in Finland and Sweden

	Finland	Sweden
National call charges price basket, households, March 2001, Euro, including VAT	299	297
International call charges, households, August 2000, USD, PPP	1.05	0.56
GSM charges price basket, households, February 2001, USD, PPP	158 (Sonera)	248 (Telia)

Sources: OECD/Teligen/Statistics Finland

[5] SMS = Short Message Service, text messages sent from mobile telephone to mobile telephone.

Sweden features lower charges for fixed telephony, while Finland has considerably lower tariffs for mobile telephony, in fact the lowest within the OECD except for Iceland. The same goes for SMS[6] tariffs – Sweden has the highest SMS charges of all the Nordic countries. This could be one explanation why Finnish users are more eager to use their mobile telephones and SMS than Swedes are.

Now, all of what has been explained above does not mean that Finns and Swedes are technology freaks, they are merely addicted users. As willing as they are to try those new ICT technologies that they judge useful, just as unwilling they are to pay for new technology only. The current prime example of this is digital television. In Finland, it has been decided that the analog service will continue another five years, because the users are not interested in paying for digital services. In Sweden, the government is running into problems when it tries to convince the public of the benefits of digital television via a ground network. This digital television service has had very few takers so far, in spite of heavy state subsidies. But this is an entirely different story.

The technology has been user driven from the start, at least to the some extent – it has never been difficult to find eager users sharing their experiences. To that should be added an early awareness by the authorities, the PTTs, of the importance of ICT technology standards, resulting in such standards as the NMT, among others. The Finns and the Swedes have in common an awareness of the importance of technology standards in order to create mass markets. Nokia started developing attractive handsets to NMT, Ericsson continued to develop the system technology.

An interesting footnote for the future of mobile telephony with built in Internet browsers – the telephone started out as an instrument for entertainment back in 1876, but it was rejected as such by the users. They wanted to talk. Today, the mobile service providers are very keen on developing entertainment via mobile Internet. Is there reason to ask if they have anything to learn from the first days of telephony?

To sum up – there are many good reasons why Finland and Sweden are among the leading nations of ICT. Creative engineers and business minded entrepreneurs saw the technology's potential before anybody else. Small national markets with many competitors forced the players to look for business anywhere. Some of the largest

6

markets, USA and Germany, were already monopolized by Bell and Siemens respectively, and thus closed to foreign competitors. It became a way of life to sell Nordic products to countries at the other side of the globe.

6.
Vast Geography and A Painful History

Finland and Sweden have a lot in common. They belong to the same geological entity, Fennoscandia. The Baltic Sea separates Finland from Sweden in the middle, while up north Finland is linked by land to Norway and Russia. But in spite of the land connections in the north, the Finns and the Swedes of the eastern part of the country most frequently have had contacts across the water, and that is going back several thousand years. The archipelago of Åland with its 6,500 islands, situated between Finland and Sweden, is one important reason for this long-term relationship – the voyage across the water from the last Swedish island to the first Åland one is a short one. Åland has played, and still plays, an important role as a middleman and negotiator, in particular regarding shipping and trade. In our days the archipelago is a tourist attraction of importance. Swedish-speaking.

But Finland is also part of the enormous Eurasian landmass, which since medieval times has been dominated by the Russians and their associates. The country had the advantage of having access to the Baltic Sea, which Russia envied the Finns until the days of czar Peter I, called the Great (1682 - 1725). For geopolitical reasons like these, Finland has been torn between its two power-broking neighbors Russia and Sweden, at times enemies at war, at times allies. Eastern Sweden, with trading places and ancient cities like Birka, Uppsala and Stockholm became the center of the national power from the 11th century and onwards. This power expanded its territory into mainland Finland via Åland. Uppsala and Stockholm are still regarded as educational and business centers by many Ålanders and Finns.

With the arrival in Finland of the first Christian missionaries in 1155, enticed to go there by a Swedish king, the region was made part of Sweden. Crusades initiated by Swedish kings during the 13th century confirmed the relationship. The Swedes built fortresses in

Tavastehus in the 1250s and in Viborg in the 1290s in order to impose their power. When Håkan Magnusson was elected king of Sweden in February 1362, Finland got its first fundamental political rights. It was decided that Finland should participate the future Swedish elections of kings and that the Finns should enjoy the same rights as the people of the other regions of the Swedish kingdom. At this time there was no distinction between Finland and Sweden.

The protestant reformation developed in parallel in Finland and Sweden during the first half of the 16th century. These were particularly important times for Finland, because Michael Olavi Agricola, bishop of Åbo, created a written Finnish language by translating the New Testament into Finnish. The book was printed in Stockholm in 1548. The first university of Finland was Swedish-speaking, the Åbo Academy, which was inaugurated in 1640 in Turku. The academy later moved to Helsinki and became the Helsinki University. The present day Åbo Academy is still a Swedish-language university dating back to 1917 when Finland declared its independence.

Many wars between Sweden, Russia, and the other neighbors followed the reformation and the status of the territory of Finland changed with each peace treaty – at Teusina in1595, at Stolbova in 1617, at Nystad in 1721, at Åbo in 1743, at Fredrikshamn in 1809 and 1811, at Dorpat in 1920, at Moscow in 1940 and, finally, at Paris in 1947. Anyone with a specific interest in these events can easily find more information.

In 1809, Sweden surrendered Finland to the Russian czar, Alexander I, who made Finland a semi-autonomous principality and himself its constitutional monarch. Nicolai II, who was executed in 1917, was the last Russian to formally govern Finland. On December 6, 1917, Finland declared its independence from Russia. The new nation was officially recognized by Sweden and the Soviet Union in January 1918, and shortly afterwards by Germany, France, and several other states.

From the Meadows to High Tech

In 1930, 17 percent of the working population were employed by Finnish industry. Before World War II, the paper and pulp industry dominated, but after 1945 the heavy war damage demands made by the Soviet Union forced Finland into other industries as well, in particular into metal tooling and machinery industries. The peace treaty in Paris of February 10, 1947 stated that Finland should pay the equivalent of 300 million USD to the Soviet Union in war repara-

tions. The sum should be paid in goods. In 1948, Finland and the Soviet Union agreed on their first so-called friendship and assistance agreement, valid for ten years. In 1955, the agreement was prolonged for another 20 years. By 1952, Finland had sent goods to a total value of 226.5 million USD to the Soviet Union. The Soviet government decided that the reparations were paid in full.

The president of Finland for a quarter of a century, Urho Kekkonen played an important role in taking Finland through the close and from time to time strained relationships with the Soviet Union. By the way, that same Mr. Kekkonen was also involved in some intense quarrels between Finns and Swedes regarding the national athletics championships in the late 1920s. During the 1950s, the Finnish industry became totally dependent on the Soviet market and developed and produced what the Russians asked them to develop and manufacture. It did so, as pointed out earlier, rather successfully until the fall of the Soviet power in 1994. Then, all of a sudden, Finland found itself stranded with an industry structure adapted to the needs of the Soviet Union but not so much to the rest of the world. Icebreakers, after all, have a limited market. But there was one exception. There was Nokia.

Under these circumstances, it was important to Finland to approach and become part of the rest of the industrialized world. In 1955 Finland became a member of the United Nations. In 1961 it joined the EFTA, the European Free Trade Association. Today, Finland is more integrated into Europe than Sweden is.

Constitutional Revolutions and Evolution

A striking difference between the two nations is their past involvements in war and peace. The Finns have been forced to fight wars in modern times while the Swedes have opted for peace. Finland has been forced to become an active and interested member of the global society. Sweden participates on invitation only – the world needs Sweden more than Sweden needs the world is sometimes an attitude reflected in current politics and opinions. These diverging attitudes are mirrored in the constitutions of the two countries. The constitution of Finland from 1 March, 2000 has an opening paragraph stating:

> *"Finland participates in international cooperation for the protection of peace and human rights and for the development of society."*

The Swedish constitution consists of four parts, *"The Instrument of Government", "The Riksdag Act", "The Act of Succession"*, and *"The Fundamental Law on Freedom of Expression"*. The version cited here is the amended one of January 1996. The first article of *"The Instrument of Government"* states:

> *"All public power in Sweden proceeds from the people. Swedish democracy is founded on the free formation of opinion and on universal and equal suffrage."*

Relations to the global society are mentioned in chapter 10 of the Instrument.

Finland is a republic. The president of the republic is elected by direct popular vote for a period of six years. The same president can only serve for two consecutive terms, i.e., twelve years. Sweden is a kingdom, a hereditary kingdom. The Swedish head of state inherits his/her position according to *"The Act of Succession"*.

Finland has two official languages, Finnish and Swedish. Six percent of the population have Swedish as their mother tongue. Finnish belongs to the Baltic-Finnic group of the Finno-Ugrian languages, while Swedish is a Germanic language. Finns and Swedes cannot understand the language of one another. The reason for Swedish having the status of official language in Finland goes back to medieval times, when Finland was made part of Sweden, as described above. All Finnish schoolchildren still have to learn Swedish, and they do not necessarily like it. They would rather spend their time learning more widely used languages. Sweden has one official language and, as of 2000, a number of minority languages such as Finnish, Laponian, Tornedalian, Romani, and Jiddisch. A very small minority of ethnic Swedes has any knowledge of these languages. The average Finnish pupil in primary and secondary education learns 2.8 foreign languages, while the Swedish pupil 1.7 foreign languages, according to Eurostat.

The National Championships of Design

Swedes living the closest to their Finnish neighbors on the eastern border of the country tend to be rather sentimental about their Finnish brothers and sisters, not least so for their heroic fight against Soviet supremacy. Swedes harbor a number of preconceived ideas about the Finns such as them being strong and silent, a people with many

special qualities, best described by the elusive term "sisu". They often consider Finland a very modern nation and a forerunner in modern design. Alvar Aalto, architect and designer, dead in 1976, was a forerunner in a large part of the world. The icon of modern Finnish textile design is Marimekko. Sweden's equivalent would be Inez Svensson and 10gruppen, the group of ten. They obviously influenced one another. Helene Schjerfbeck is a much admired painter and Jean Sibelius a composer even Swedes are proud of.

Nokia is the design leader enthralling the youngsters of the world with their mobile telephones, while Ericsson struggles to add more functionality to theirs. Nokia listens to the users, Ericsson to the engineers (though not to those few knowledgeable about design for manufacturing ease). The Finns are the marketers, the Swedes the engineers. The result is – national championships in design have started. Leading industrial designers even suggested in March 2002 that a Finnish-Swedish design academy should be constituted. This part of the championships will be particularly interesting to follow.

Pragmatism and the Euro

Many Swedes think of Finland as a country with politicians governed by pragmatism, flexibility, easy adaptation to and acceptance of the global world society. Finland as well as Sweden is a member of the European Union since 1995. Finland joined the European Monetary Union on January 1, 2002. Sweden is staying outside. A poll in August, 2001 concluded that 95 percent of the Finnish population were well aware of the entry of Euro-cash on New Year's Day of 2002. Most of them did not worry at all about the process of leaving the markka for the Euro. One reason for the easy shift to Euro may well be the fact than most Finns used the very advanced and extensive electronic banking system of the country. An increasing number of Finns pay for everything by his/her banking card. Thus Finland had the lowest value of cash money in relation to its GNP in the EU, only 2.3 percent, before the EMU.

Hannu Olkinuora, Finnish-borne ex-editor-in-chief of the Stockholm morning paper *"Svenska Dagbladet"* stated in an article called *"The price of realpolitik: one mark"* on August 4, 2001, that the Finns show their best sides facing external threats. His article is about giving up the Finnish mark to the Euro. He concludes:

"To sacrifice a large part of the history of the nation is an important decision, but true to the Finnish realpolitik that has proven a decisive success factor to Finland (but which the security fixated Swedes and their politicians find so hard to understand). To handle Euro notes will induce a double natured feeling to every Finnish citizen. Seldom will a historical break seem as concrete."

(Translation by the author)

Hannu Olkinoura refers to the fact that the Finnish mark dates back to the Russian times, when Finland was admitted to mint its own currency in 1860 but still remained an autonomous part of czarist Russia. One Finnish mark was then equivalent to a quarter of a ruble. The Bank of Finland was formed in 1811, but took on the role as a central bank only in 1917, after the declaration of independence. Ever since, the Bank of Finland has remained the people's bank, responsible only to parliament, not to the government like the Bank of Sweden (until recently). During the post-war period, the value of the Finnish mark was reduced to something like 1/250 of the value of the 1860 mark. A new currency law replaced the old mark by the new Finnish mark, FIM, in 1963.

Sveriges Riksbank, the Bank of Sweden, has its first origins in an institution formed in 1656, called Stockholms banco. In 1668 it was reformed and taken over by the government, then formed by the four ruling social groups of the country, the landed aristocracy, the clergy, the burghers, and the free farmers, the four estates of the diet. The bank became Riksens Ständers Bank. In 1897 the monetary system was reformed and the Swedish Bank became the central bank of Sweden. Since a few years back, the Swedish Bank is controlled by the auditors of the Swedish parliament and in principle free from politicians' influence.

"Folkhemmet", once the Model

The Finns seem to think of Sweden as a conservative country, governed by politicians anxious to stay with values rooted in the unstable times of World War II and the postwar period. The political vision of the ruling party, the Social Democrats, is still based on "building the country", and the security of "folkhemmet" (a flippant interpretation is that the Swedish Social Democrat government is looking after every single one of its inhabitants) is still seen as the ideal. The Finns make fun of what they call the "security obsessed" Swedes, unwilling to run any risks at all. These slightly old fashioned ideas of social engineering

by Swedish politicians wanting to control the lives of the citizens from birth to death make the Finns laugh. However, they are also stuck in a system of heavy social security blankets paid for by the world's highest taxation systems. But the Swedes lead when it comes to the size of its public sector – it is the world's largest. 35 percent of the Swedish GNP is consumed by the public sector, 52 percent of the gross domestic product, according to OECD. In the year 2000, costs for social security programs such as old age pensions, family support, child-support, and alike amounted to 615 billion SEK. The total income to the state via taxation was 796 billion SEK. The total tax burden in Finland in 2000 was 46.7 percent of the GDP, in Sweden 51.7 percent.

According to the OECD, Sweden has the largest government spending in the industrialized world. Finland has the tenth largest. The following table shows government spending in the EU member countries, plus Australia, Canada, Japan, New Zealand, and USA as estimates for 2001. This is one up for Sweden in the "championships".

Government spending in the EU, Australia, Canada, Japan, New Zealand & USA **Forecast 2001, as percent of GDP**

Country	Public spending 2001, percent of GDP
Sweden	**52**
Denmark	50.1
France	50.1
Greece	49.9
Austria	47.5
Japan	46
Belgium	46
Italy	44.9
Germany	44.9
Finland	**42.5**
Portugal	41
Netherlands	40.5
Canada	40.5
Norway	40
Iceland	40
New Zealand	39.9
Britain	39.8
Spain	39
Australia	34
Ireland	29.9
USA	29.8

Sources: OECD/The Economist August 4th 2001

This is how *"The Economist"* commented on the table above:

> *"Sweden has the biggest government among the rich countries, with public spending set to reach 52% of GDP this year (2001). Denmark and France are the only other countries where spending is more than 50% of GDP. Most countries have seen a sharp fall in government spending's share during the past decade. In 1991, for instance, Sweden's was almost 59% of GDP. The exception is Japan where spending has jumped from 38% to 46% of GDP."*

Thus, Finns and Swedes are paying among the highest income taxes in the world. The average Finnish "Pekka" pays just above 45 percent of his income in taxes, while the average Swedish "Lasse" pays more than 50 percent. In 2001, it took Swedish Lasse from January 1 until August 10 to earn enough to pay for all his taxes during that year.

54 percent of all Finns live in houses of their own, 42 percent of the Swedes have their own houses. Finland, which never has had one dominant political party like the Swedish Social Democrats, all the same has followed in the steps of Sweden in wanting to create a welfare state for all. In spite of the countries having followed different paths toward modern welfare they have ended up with the same problem – having to cut the tax burden on the individual. This became a priority for both governments just before the beginning of the new millennium. So the Finns and the Swedes sometimes find themselves in the same corner.

Åland – The Hub in between

There are many peculiarities to the Baltic Sea. The archipelago of Åland is one of the wonders with a certain mystique. To its attractions adds its great importance to communications and transportation, thanks to its strategic and geographical situation halfway between Finland and Sweden. Åland is to some extent Finnish, to some Swedish but most of all a "nation" in its own right.

The Åland Islands form an autonomous, demilitarized, and monolingual province of Finland, ruled by the Act on the Autonomy of Åland from January 1,1993. The Autonomy Act goes back to a decision made by the League of Nations in 1921. Swedish is the mother tongue of the archipelago, made up of some 6,500 islands, situated to the northeast of Stockholm and to the northwest of Helsinki. The to-

tal area of this autonomous county between Finland and Sweden is 6,784.2 square kilometers, 77.5 percent of which is water. The archipelago had 25,776 inhabitants by the end of 2000. The Ålanders, *"ålänningarna"* as the inhabitants call themselves in Swedish, have not only their own Parliament, *"Lagtinget"*, they also have economic autonomy and a special tax status within the EU, allowing the archipelago tax free sales to all visitors staying for more than 24 hours. The government, the county government, is called *"landskapsstyrelse"* in Swedish.

The Parliament decides on the budget of Åland. Finland still collects taxes and customs charges, each year allocating a sum amounting to 0.45 percent of the Finnish national budget to the Parliament. The money is used to manage such affairs that otherwise would be administered by Finnish state authorities. The Autonomy Act specifies the spheres in which the Åland Parliament has the right to pass laws. The most important sectors are: education, culture and preservation of ancient monuments; health and medical services; promotion of industry; internal communications; municipal administration; police service; postal service, and radio and television. Laws passed by the Parliament are submitted to the President of Finland, who may impose her veto. However, the President of the Republic has a veto only in two cases: if the Åland Parliament is exceeding its legislative competence, and if the law affects the external or internal security of Finland.

But there is so much more to Åland: it also has its own national flag, which has been in use since 1922. In 1954 the red-blue-yellow banner became officially approved. It has its own statistics board, *Ålands statistik- och utredningsbyrå, Statistics Åland*, which has provided most of the hard data in this chapter. There are two dailies published in Mariehamn, the "capital", a radio station and a TV-company. The local airport processed more than 96,000 passengers in 2000, and the ferries carried over one million passengers and 525,000 vehicles to and from the archipelago. Moreover, there are two local telecom operators of fixed lines, and one mobile telephone operator.

The first telecom operator in Åland was called Ålands Telefonaktiebolag, which started operating in 1887. There are two companies running fixed services in operation today, Mariehamns Telefonbolag AB, founded in 1892, and Ålands Telefonandelslag, ÅTA, dating back to 1910. The local mobile operator, called Ålands Mobiltele-

fon AB, is a joint venture between the two. In 1935 the first telephone directory for all of Åland appears in 2,700 copies.

As stated above, Åland has played, and is still playing, an important role as a telecommunications hub. During the days of optical communications, signals were relayed from Finland to Sweden and from Sweden to Finland via one or more Åland posts. The first underwater cables from Finland to Sweden passed via Åland and today the archipelago is on its way of becoming an important hub between Finland, Sweden, and the Baltic states.

Part of the ICT context is that Åland's politicians have taken the decision to employ information technology as a means to develop the archipelago for the future. The political ambitions of the local government are the following:

1. To provide equal infrastructural possibilities to all its inhabitants, no matter where they live;
2. To provide training and education in information technology utilization;
3. To develop a foundation for a growing and competitive IT industry;
4. To make the local government use information technology-based services as soon as there is a need for them.

In order to achieve this, the politicians have engaged *The Technology Center of Åland, Ålands teknologicentrum*, which is involved in introducing information and communications technologies to the users.

According to a recent survey, made by Statistics Åland, the archipelago belongs to the most global counties in the world.

So, for instance, way back in 1928, submarine cables linked Finland to Stockholm and Norrtälje in Sweden via Åland. In 1938 another cable was installed, this time in preparation for a war that might affect the archipelago. In 1974, 94 percent of the Finnish international telephone communications passed via Åland. In 1997, fiber optic submarine cables were installed between the two nations, using Åland as a hub. In 2001, all of Åland got broadband access, and GPRS technology was available via the GSM stations all over the archipelago. The availability and dissemination of ICT makes the miniature Åland one of the most global regions in the world according to a recent survey. How come, apart from the geographical situation and influences from two pioneer ICT nations?

What conclusions may be drawn from the fact that Swedish rulers and kings traveled to Finland to visit their subjects from heathen times until 1809? From the fact that the Baltic Sea linked Baltic peoples living in the various islands to Finnish and Germanic tribes? That trade across the gray waters started before Roman times and has been going on ever since, also during difficult times when political systems tried to sever the old ties? Still alive in the mind of people living along the Swedish east coast and on the Swedish archipelago islands are the many stories of smuggling hard liquor and other goods from one side to the other of the Åland Sea. Furthermore, there are stories about people crowded in small boats, trying to escape from Finland at war. Many boarded small rowing boats also in the then previously independent Baltic states to escape invading Soviet troops. There are persons still alive who can tell about the darkness and the cold at sea when they left occupied and ravished areas in order to escape imprisonment opting for a Sweden at peace. 500,000 persons, 11 percent of the Finnish population, lost their homes during World War II. Some came to Sweden across the water. Waters have been joining Finland to Sweden, and are still.

May any conclusions be drawn from all these facts? Are the Finns more modern than the Swedes? Are the Swedes generally more conservative than the Finns? Most likely, there are different answers to questions like these, depending on whom you ask, and what this issue may be. We have stated above that each aspect of life, however quaint, from the proper temperature in a sauna to the best brand of vodka and "snaps", may be subject to national championships between the two neighbors. Sometimes the arguments and discussions end in an agreement about being different, but without stating how, exactly. And the absolute conviction is, on that "next year we will be the winners". On both sides.

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Several sites on the Internet - see above

TELDOK Reports on actual IT use

A small number of recent TELDOK publications are presented below, while the back of the cover lists selected reports in English. More on the publications, both in Swedish and English, as well as the PDF versions of the 50 most wanted reports, can be retrieved at...

http://www.teldok.org

Via TELDOK 42

Tyskland och användningen av Interrnet – en jämförelse med Sverige

Stephen C Littlechild

Hur ska avreglerade marknader – gamla monopol – bäst övervakas för att konkurrens ska uppstå på riktigt? I sin rapport ”Regulators, Competition and Transitional Price Controls”, som här presenteras översatt till svenska, visar professor Stephen Littlechild bl a att hårda priskontroller kan begränsa uppkomsten av den konkurrens som egentligen eftersträvas.

TELDOK Rapport 146

Projekt Camelot. Rundabordssamtal och seminarier kringframtidens boende

Carolina Browall med Konrad Tollmar & Fredrik Petersson

Vad är framtidens boende? Vad är smarta hem och vad innebär IT i hemmet? Kan IT ge boendet kvalitetsförbättring? Fyra seminarier dokumenteras med. diskussion mellan olika intressegrupper, med olika erfarenhet, åsikter och infallsvinklar, om smarta hem”, ”intelligenta miljöer” och ”interaktivt boende”.

TELDOK Rapport 145

Tyskland och användningen av Interrnet – en jämförelse med Sverige

Magnus Brattgård & Lars Truedsson

Vidgas ”den digitala klyftan” mellan grupper och mellan länder? Rapporten visar hur användningen av Internet (och mobiltelefoni) utvecklats i Tyskland utifrån aktuella faktorer som politik, reglering, utbildning och företagande. Sverige ligger före – men hur länge?

TELDOK Rapport 144

Ny internationell reglering öppnar dörren för ny telekomexpansion

Göte Andersson

En grundläggande förutsättning för att marknadsföra nya teletjänster till flera hundra miljoner användare är nya internationella avtal och regler: om bredband, 3G-telefoni, WLAN, nya Internettjänster, IP-telefoni, digital-TV och en rad andra tjänster. EUs nya regelverk, klart före USA och Japan, bereder vägen för IP-telefoni, för flera Internet-tjänster och för positioneringstjänster i mobilnäten.

Via TELDOK 41

Interactive Media in Sweden 2001.
The Second Swedish Interactive Media, Internet and Multimedia Industry Survey
Åke Sandberg & Fredrik Augustsson
Visar i tabeller, diagram och kommentarer fakta om de unga småföretag som utgör den svenska branschen för interaktiva medier, Internet och multimedia: antal, storlek och omsättning; marknader, produkter och kunder; samarbeten och ”nätverk”. Även förhållandena för de anställda beskrivs.

TELDOK Rapport 143

Den nya och omedelbara ekonomin – ett Internet-perspektiv
Gunnar Eliasson
Existerade den Nya Ekonomin, när den hajpades i slutet på 1990-talet? Finns den i så fall kvar? Internet representerar något radikalt nytt som kan ge en industriell omvandling vars komplexitet saknar motstycke, och som åter ger Sverige en magnifik innovativ förnyelse – men då måste flera villkor uppfyllas.

TELDOK-Info 19

Trådlösa LAN
Inger Sundelin
Flygplatser över hela världen är fulla med människor som väntar. Nästa gång Du ska ut och flyga har kanske flygplatsen ett hot spot, ett trådlöst lokalt nätverk, så Du kan utnyttja väntetiden till att mejla, surfa eller logga in på företagets intranät. För det nya är att trådlösa LAN börjar dyka upp utanför företagen.

TELDOK Rapport 142

IT, demokrati och medborgarnas deltagande
Åke Grönlund
Demokratin blir aldrig vad den varit. IT kan ses som ytterligare en möjlighet att stärka medborgarnas delaktighet, kontakter och insyn, men e-demokrati är så mycket mer än omröstningar via Internet. Rapporten beskriver olika metoder på gång för e-demokrati, och deras förutsättningar att bli framgångsrika.

TELDOK Rapport 141

En föränderlig medievärld – teknik, ekonomi och journalistik
Börje Alström, Nils Enlund, Lowe Hedman & Håkan Hvitfelt
Medievärlden expanderar, medieformerna konvergerar, konkurrensen ökar liksom ägarkoncentrationen, traditionella mediaföretag tycks förlora sin roll, informationsströmmarna växer. Vad innebär det att mer information är tillgänglig gratis, t ex på Internet och i gratistidningar?

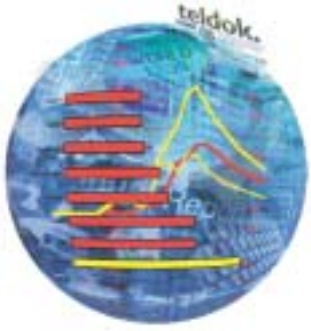
Information and communications Technology in Finland and Sweden

TELDOK Report 147: *Information and Communications Technology in Finland and Sweden* maps and compares user statistics, facts important to the development of the national ICT structures and industries of Finland and Sweden, and other statistical and economic data, to pinpoint the particular factors that have turned these two small nations at the northernmost corner of Europe into often-acclaimed leaders in mobile communications. The report is based on official statistics, media reporting, Internet research, discussions with several knowledgeable persons, and other background information. The author, Ms Gull-May Holst, is also the editor of the TELDOK Yearbook.

Via TELDOK 42: *Lagstiftare, konkurrens och övergående priskontroll* is the Swedish-language version of Professor Stephen Littlechild's recent treatise *Regulators, Competition and Transitional Price Controls*. He stresses the regulators' primary duty to facilitate competition. Relatively high profits are no evidence of monopoly power; instead, high profits could indicate "superior efficiency".

Via TELDOK 41: *Interactive Media in Sweden 2001* maps the situation for interactive media companies and employees, based on a questionnaire completed by the managements of roughly 350 companies. The industry is young and metropolitan. Typical companies have five employees. Most companies outsource, or collaborate with customers in the production.

The TELDOK Yearbook has been called "the most complete gathering of facts on telecommunications and IT in Sweden". TELDOK Report 139: *The TELDOK Yearbook 2001* is 370 pages bulging with facts and insights, graphs and tables, regarding states and trends in the turbulent IT, telecom & media ("TIME") markets, in Sweden and the world, in print and on the web (www.teldok.org).



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