Teldok

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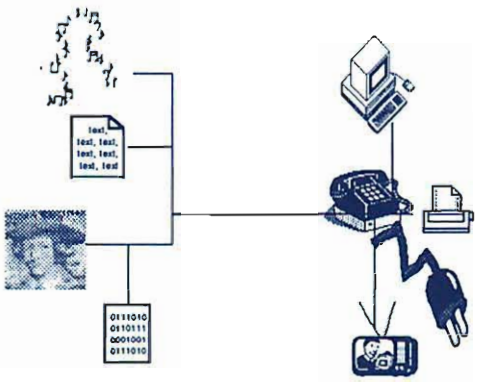
REPORT 86E 94

The Teldok Yearbook 1994



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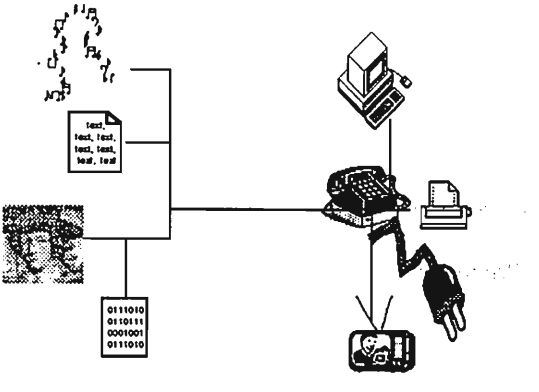

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Preface

TELDOK highly appreciates the kind of effort and devotion Gull-May Holst and her co-authors have put into the making of this, their and our fifth TELDOK Yearbook – the TELDOK Yearbook 1994.

Not only did the task of the Yearbook editor – to intelligibly capture the global state of information technology use – seem impossible already from the start; the TELDOK Editorial Board and other reviewers of previous drafts drowned Gull-May Holst in enthusiastic pleas for more data, more comments, more graphs, more of everything. Of course, eventually this couldn't prevent Gull-May Holst from – again! – creating a TELDOK Yearbook that is even more worth reading than any of its predecessors.

The TELDOK Yearbook 1994 in some ways is an updated and revised version of earlier editions. Trends and developments in the production and use of information technology, computing, and telecommunications are shown in a large number of interesting graphs, the most important of which also are discussed in the various text sections of the Yearbook.

Yet, in important aspects this Yearbook is different. Here's how.

This TELDOK Yearbook also appears in English! Partly this is in response to discussions and collaboration TELDOK has initiated with the OECD Commission for Information, Computers and Communications Policy (ICCP). Parts of the contents of this Yearbook are based on the high-quality OECD ICCP Outlook reports and thus form a basis for comparison to other statistics in the Yearbook. We are very happy that the OECD have agreed to share their findings with us. Consequently, the TELDOK Yearbook will be distributed to ICCP as well as to the European Commision (EUROSTAT and other bodies) and other international bodies that share our interest in current statistics on information technology and telecommunications.

The Swedish Crown (SEK) was depreciated in late 1992 – as compared to the ECU, with 29%; the US dollar, 66%; and the Japanese yen, 88%. This greatly impacts any comparison of international rates and prices; while goods exported from Sweden now may seem cheap, services consumed within Sweden (and paid for in Swedish currency) now will appear much dearer than before. Bear this in mind when perusing "ranking lists" of countries whose exchange rates may have changed considerably, or when comparing how Sweden fared in 1992 and 1993, respectively!

It may also be confusing to the casual reader that some of the data seem contradictory. The many splendid sources that Gull-May Holst has consulted don't always agree on how certain phenomena should best be defined and measured in an emerging field such as that of computers and telecommunications. Why publish a Yearbook filled to the brim with dicrepancies and contradicitions, even if there is a splendid source behind each interpretation? could the casual reader well ask. TELDOK's answer is: Only publication makes it possible to discuss how we should best be able to proceed in making future observations more accurate and adequate!

The "target" for the TELDOK Yearbook – the entire information technology community and all of its output–moves and changes more rapidly than most other subjects. The TELDOK Yearbook has the proud ambition to be "least hazy" image of that moving target. We hope that the Yearbook will inspire others to capture and share sharper images of global information and communications technology usage.

We wish you pleasant reading.

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Introduction

On the Noble Art of Comparing Apples to Oranges

This is the fifth issue of "The TELDOK Yearbook", though the first one to appear in an English language version. The earlier issues, in Swedish only, covered 1987, 1988, 1989/90 and 1992. In general, seven years is not a long time. But looking back, and running through the contents of the first yearbook, from 1987, it is inevitable to start wondering if we still live in the same era! So fast are the technological and the creative business developments in telecom and IT, that there are few opportunities for direct comparison between the state of affairs in 1987 and 1994.

Considering this rapid growth, and the obvious impossibility of comparing old technologies and services and new ones, why should anyone bother with telecom and IT statistics at all? Why is TELDOK spending a large part of its annual budget on a document like "The TELDOK Yearbook" just in order to disseminate whatever information is available in the field to the Swedish and foreign decision makers?

There are several answers to these questions. Here we concentrate on just a few. First of all, we are experiencing a rapid integration of formerly separate industry sectors: telecom, computer hardware, software, cable TV, services, and so on merge, they grow and generate an ever larger part of the GNP in country after country. It may well be that the major worldwide growth in the next few years will be related to telecom and IT in one way or other. Consequently, the financial effects and the economical implications are important.

At the same time, there are few areas in which there is such a confusion over definitions and what exactly can be compared as in the one of telecom and IT. This is no news. Similar statements appear in statistical books and tables on telecom and IT from organisations all over the world. "Public" organisations like EU and OECD and "private" ones like IDC and Eurobits, find the same difficulties – there is no discrimination. The common definitions, the explicit and implicit objective statements, and the comparability we looked for in our 1987 yearbook are missing, still. We are comparing apples to oranges.

It is inevitable to ask oneself why it is so difficult to create a consensus on terminology, definitions and comparative methods. This lack of consensus, standards if you so wish, seems to be so penetrating that it becomes a next to impossible task to decide the size of the telecom and IT market in Europe, as one rather blatant example. Let alone any attempts to compare market size for Europe, Japan, North America and the rest of the world. So how do we decide

the size of the European telecom and IT market? Is it ECU 695 billion or 225? It seems to depend on to whom you are talking, who your source of information is. Just have a look at figures no. 1 and 2.

Another factor that contributes to these kind of difficulties is the unstable situation in international currencies. Just consider the following developments of the Swedish crown rate compared to US$, ECU and ¥, yen, some key days during the period we collected the background information for this book:

	1 Jan 92	1 Sep 92	1 Jan 93	1 Jul 93	1 Dec 93	%
US$	5,56	5,14	7,06	7,74	8,51	53
ECU	7,43	7,40	8,55	8,89	9,53	28
100 yen	4,42	4,17	5,67	7,18	7,84	77

The table shows the Swedish crown rate compared to the most important currencies for the telecom and IT market during some key days during the period the editorial board gathered information for this book. The dates of important source material have decided which currency days were picked. The reader of this book thus has to consider the date of the material he/she wishes to analyze and pick the currency date closest to the source date. The last column in the table shows the change in percent between the first and the last date compared.

Source: SE-Banken

Another difficulty stems from the fact that everyone seems to have their own definition of telecom and IT. In Sweden, the largest purveyor of statistics is SCB Statistics, Sweden. They use the following definition:

"In this context information technology (IT) means technology using micro electronics for collection, storage, computing, retrieval, communication, and presentation of data, text, images and sound. Consequently, computer technology as well as telecommunications are included."

Source: "Informationsteknologi", SCB 1992, translation by editor

The very same definition is used by the Swedish standardisation committee, SIS-ITS. But here the agreement stops. The telecom operators sometimes describe themselves as suppliers of telecom, sometimes as suppliers of IT, and sometimes as suppliers of telecommunications and IT. The computer suppliers, however, take a different look at the world and describe their activities as those of IT suppliers. Some of them do it referring to the OECD definition of IT according to the "Information Technology Outlook 1992":

"Information technology is defined in detail in the methodology contained in the back of the Outlook, but in short, it includes computer hardware, software and services but excludes telecommunications hardware and services, and information services."
Source: Information Technology Outlook 1992

A newly issued collection of European IT statistics, "The European Information Technology Observatory 93", states that it covers ICT – Information and Communication Technology, which is being defined in the following way:

"ICT includes every type of information a person is accustomed to managing, given that any piece of information can now be expressed by a sequence of bits which can be processed and encoded."
Source: European Information Technology Observatory 93

What standpoint does an editorial board of a book like the "TELDOK Yearbook" pick in this world of so many choices? After all, everybody is right. Well, for the "TELDOK Yearbook 1994" we have decided to work with the merged concept "telecom and IT" in order to include and integrate as much information as possible in our book. All of us seem to believe in the power of language and logic in the long run, that is, we believe that IT somehow will become the comprehensive concept, according to the definitions given by SCB and ITS. Telecommunications, data networks, computers, programs, software, services, and all those new ideas struggling to establish themselves in the shadow of the "Information Super Highway" will be recognized as branches of the IT industry. However, it will be interesting to see in a few years time to what extent we are right!

There certainly are many challenges involved in putting together a book like the "TELDOK Yearbook 1994". Comparing apples to oranges has been a greater struggle than ever before, since the apples and the oranges are growing so much faster than they were back in 1987. Moreover, they look even more different than before, and new varieties that are difficult to identify as either one appear continuously. Because of this, we want to send extra thanks to TELDOK for deciding to confide in us once more. Especially, we would like to extend our thanks to Göran Axelsson, our patient and encouraging "godfather", who never gets tired of supplying us with new challenges in the form of new stimulating background material every time we think we have finished a chapter! We also want to thank all of those people in a large number of organizations, who very generously have contributed to the contents, either by writing new texts or by allowing us to use existing materials.

"The TELDOK Yearbook 1994" appears for the first time in two language versions. The Swedish one appeared in January 1994, and the English one

about three months later. We believe that the English version will help to make the yearbook more useful, in particular for those who try to learn about and understand our country and its telecommunications industry, which by tradition is strong in Sweden.

Should you wish to comment on the contents of this book, we will be happy to hear from you. Please feel free to call, write or fax to the editorial board via its editor, Gull-May Holst, Metamatic AB, Sturegatan 50, S-114 36 Stockholm, Sweden, telephone: + 46 8 660 35 85, fax number: + 46 8 661 28 00. Enjoy the content of this "snap-shot" of IT and telecom Sweden from late 1993!

We look forward to hearing from you.

The Editorial Board

Comparing Apples to Oranges – Both or Neither?

Telecom and IT in Europe 1990
The Total Market Value Based on Relations

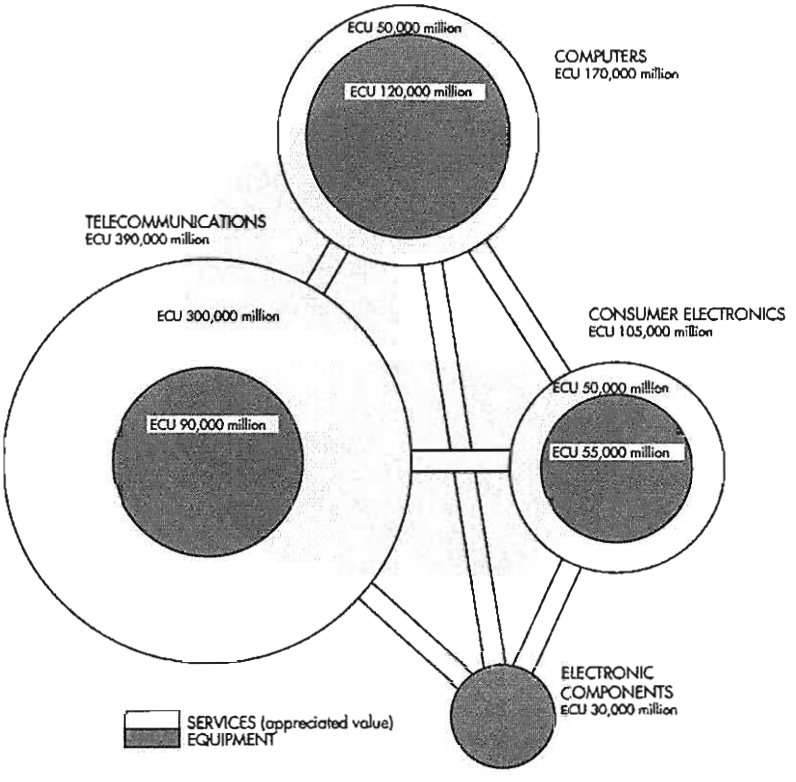


Fig. 1: The total value of the European telecom and IT market was estimated at ECU 695,000 million in 1990. The estimation is based on the technical and economical relations between telecommunications, computers, consumer electronics and electronics, and related services. Since 1990, the political, economical, and technological development, such as the integration of the former Eastern Block countries, the currency changes, and the appearance of CTI products (Computer Telephony Integration) and their tenfold growth, have radically changed the situation. However, the relations seem to stay the same. Compare this diagram to the following one, and to figures 34, p. 49 and 91, p. 109.

Sources: CEC Study/Telecommunications in Europe 1990

Europe (= EU and EFTA)
The World's Largest IT Market

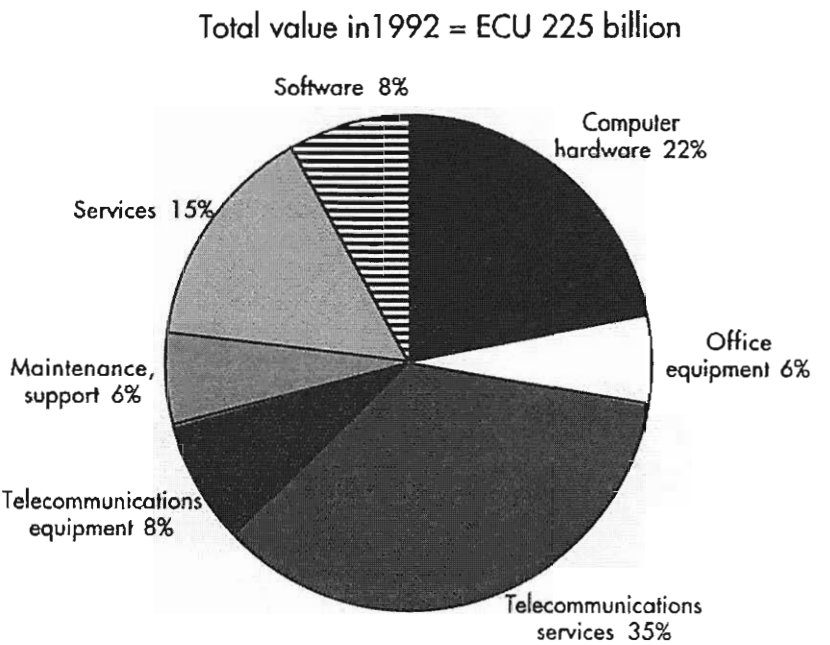


Fig. 2: The European (= the EU and the EFTA countries) market for communications and IT was estimated to have a value of ECU 225 billion in 1992. 57 percent or ECU 128 billion, was generated by the IT segment, including office equipment, computers, services, maintenance and support. The remaining ECU 97 billion were generated by the telecom equipment and telecom services segments, all according to IDC/Eurobit. The chart shows the distribution per segment in percent. This should be compared to the values of the previous chart. One obvious difference in the fundamental definitions, apart from the fact that electronic components and consumer electronics are included in the first figure, is the wider definition of services in the first diagram.

Sources: IDC/European Information Technology Observatory 93

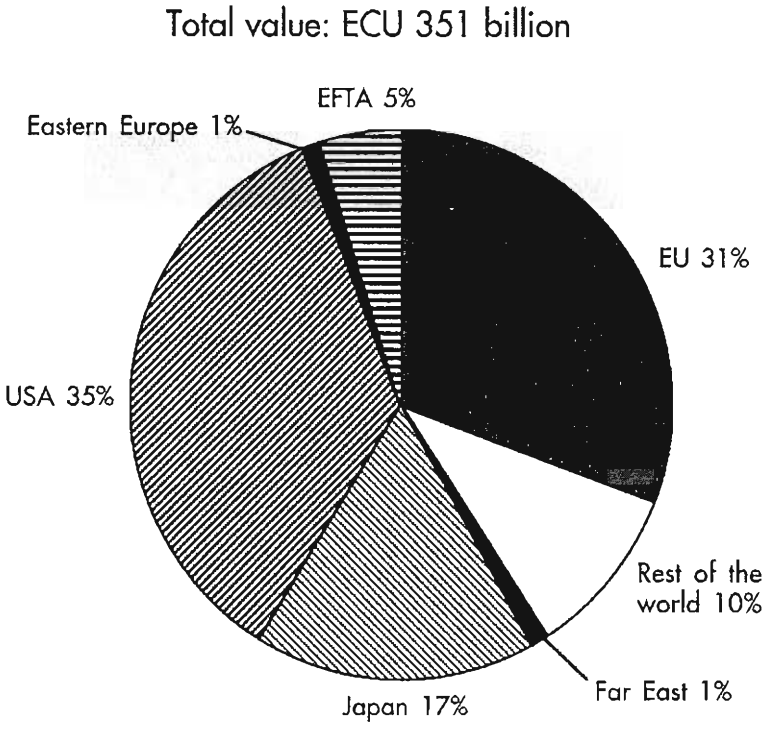


Fig. 3: The global IT market totalled ECU 351 billion in 1992. USA had the largest market share, 35 percent. The EU countries had 31 percent between them, and Japan 17 percent. The remaining 17 percent are shared between the EFTA countries having five percent, Eastern Europe and the Far East having one percent each, and the rest of the world nine percent. According to our fig. 2, the EU and EFTA countries market shares had a total value of ECU 225 billion. Should we choose to agree with the figure above, the total market value for those countries is ECU 129.87 billion. In this particular context, no definition of IT is available.

Source: "The European IT Forum 1993", IDC

Telecom in the OECD Countries
Income per Service Area in 1980 and 1990

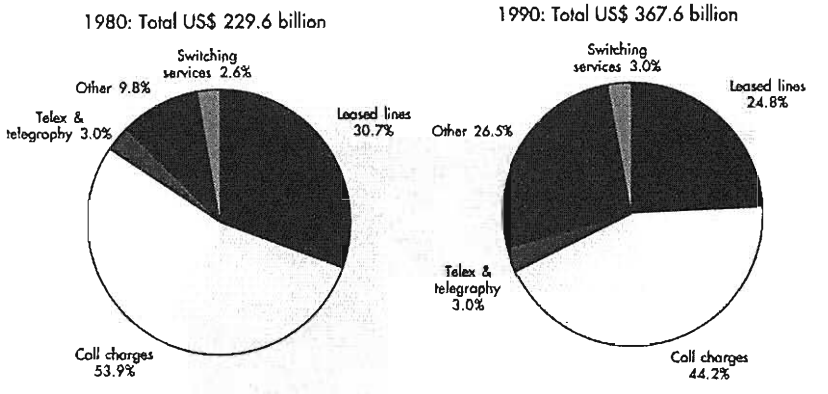


Fig.4: The distribution of telecom service income in the OECD countries in 1980 and 1990. The total income grew by US$ 138 billion from US$ 229.6 billion in 1980, to US$ 367.6 billion in 1990, but the total share provided by telephone charges decreased from 53.9 percent in 1980 to 44.2 percent in 1990. The area "Other", which includes data communication and mobile communication increased over the period from 9.8 percent to 26.5 percent. This more than doubled increase is an indicator of areas in which operators can generate new telecom revenues.

Source: "Communications Outlook 1993", OECD

Personal Computers in Sweden
As Analysts See it

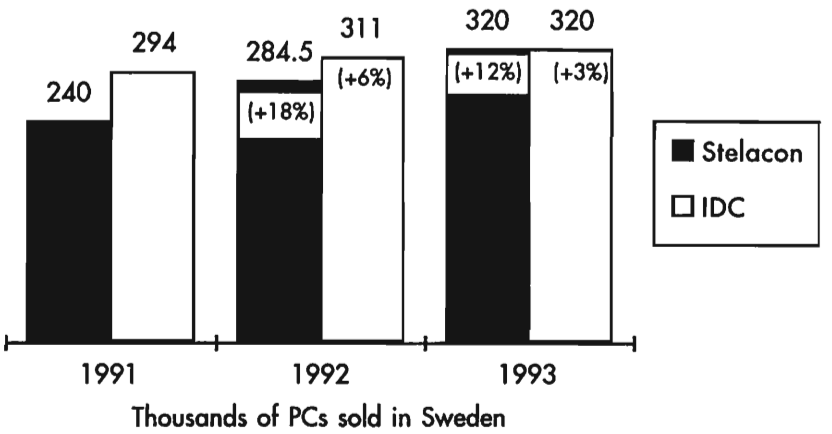


Fig. 5: An interesting example of the situation those looking for facts have to face: the figures for PCs sold in Sweden vary greatly for the period of 1991–93 (prognosis). Our diagram shows the interpretations of collected data made by two analyst groups, IDC and Stelacon. Differing definitions, differing number of persons interviewed, different interviewing methods and statistical methods, are some of the factors influencing the results and explaining the differences.
Sources: IDC and Stelacon/Computer Sweden, February 26, 1993

IT in Europe – 1988–94
Annual Growth Rate in Percent

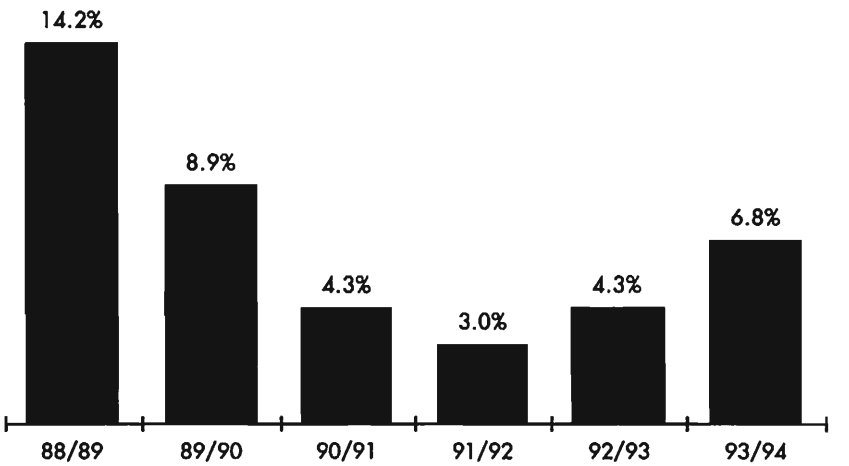


Fig. 6: During the twelve month period of 1988/89, the European IT market (computers + data communication) grew by a total of 14.2 percent. for the same period of 1991/92 the annual growth rate decreased to three percent. For 1992/93 EITO and IDC predict that the market will grow by 4.3 percent and for 1993/94 by 6.8 percent. What the actual value of this growth represents in today's currency rates depends on the departure point chosen by those interpreting the figures – the one presented in fig. 1, the one in fig. 2 – or a totally different one.

Sources: EITO/IDC 1993/CEC Study/Telecommunications in Europe 1990.

The Relations Between the ICT Market Segments

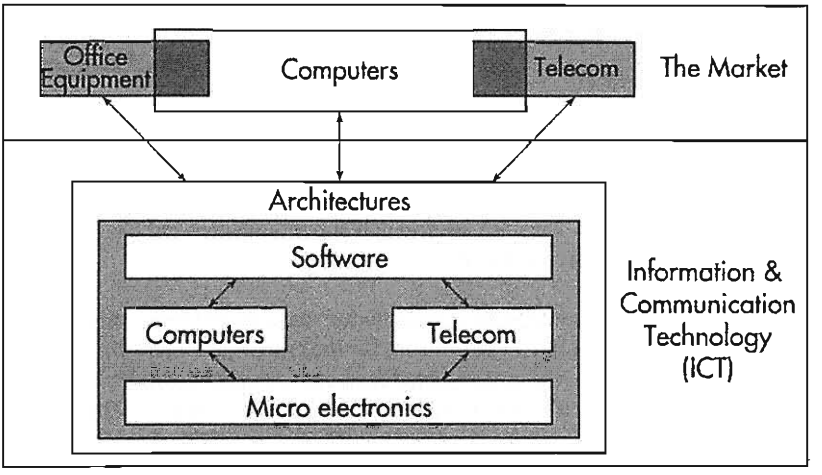


Fig. 7: The diagram is a description of ITC, by EITO defined as "Information & Communication Technology." The segments are office equipment, computer systems and telecom. The development in four technology areas are their basis: micro electronics, computer hardware, programming, and telecommunications. A different view, and a different way of presenting the relations, are found in fig. 1.
Sources: EITO/European Information Technology Observatory 93

1. Networks in Synergy General IT Development Tendencies

by Bengt-Arne Vedin

"A ghost is haunting the world", Karl Marx once wrote, hoping that this false ad would become self-fulfilling. Within the world of IT, no less than two ghosts haunt the world. They are information super highways and the merger between cable, telephony, and media.

When Bill Clinton chose Al Gore as his running mate, he got two ready-made programs in the bargain. One was concern for the environment and an environmental program, the other a broadband network encompassing all of the US. The idea seemed self-evident: the economy needed a stimulus, which government may give through infrastructural investments. But why continue investing in the infrastructure of the past, i e, highways, railways, and harbors? Future, thy name is telecom and computers.

Teleports, intelligent buildings, and tele-cottages have already scored some success in the US, especially in places such as New York, where space is expensive, highrises create problems for radio transmission, and the ground is full of copper cable, expensive to extract. The tele-cottages are found in pleasant environments, such as Colorado, particularly Telluride and Fort Collins.

A similar idea is transforming Singapore into a large teleport, and one with the prerogatives and the action latitude of a sovereign state, this one with a huge trade volume through the transit harbor.

The broadband network would transform the US into an intelligent nation, extrapolating the metaphor of "intelligent building". Already the Clinton-Gore election manifesto provided a detailed plan of the network and its development. Quite a few of the ideas and models emanate from the powerful electronic mail network Internet.

The first reactions abroad have been to join the bandwagon. The Americans must not be allowed to get a unique competitive advantage. In a number of countries, including the EU, Japan, and Sweden, the idea has been in the spotlight.

The installation of the network has not advanced as fast as the rhetoric might seem to indicate. No presidential suggestion has been voted down in Congress, which is something that might happen. First it is the question of addressing two fundamental problems. Firstly, in the US, the telecommunications business is a private one, in free market competition. What then is the federal role – if any?

In Japan by the way, the MPT, Ministry of Post & Telecommunications, has launched its own plan for cabling the country with fiber – extremely confusing for the recently privatised NTT, previously in a monopoly situation, who thought this to be their task. In Japan, the code word is even "fiber to the home".

The second problem is: what information to transmit on the highways?

Employment creation, economic stimulus, what at least to Republicans is a bad word: industrial policy – all of this constitutes inputs to the American political equation. At the same time, technology has a card up the sleeve. Will all this new enormous capacity be necessary after all? Or might one not get much more out of existing cables, relying upon new technology, even allowing for the transmission of video on pair cable, reducing the information transmitted through clever encoding procedures? And bringing radio transmission into the picture?

The upshot seems to be that the total investment calculated, in the vicinity of US$ 50 billion, will have to be made by the private sector with specific tax and other advantages. Government will be responsible for research and other activities of a general and fundamental nature – including a coherent telecommunications policy.

Much of this is already being implemented, for exampe by the Regional Bell Operating Companies, RBOC's, which, e. g., transmit cable-TV through ordinary pair cable. Thus we get into the second ghost which is very much flesh and blood, economy-wise.

Money is obvious in the enormous sums paid in mergers between cable TV, telecommunications, electronics, and media software companies.

The merger between Time and Warner, and the Sony and Matsushita acquistions of strongholds in Hollywood, were relatively early examples of this development. All over the world, RBOC's have established bridgeheads, some in phone book production, but primarily in cable TV and other telecommunications linked services. In the US, it's the mergers between telecommunications and cable companies that have been the real eye-openers.

The cable people talk of almost unbelievable numbers of channels, five hundred or more. That many programs, that much production capacity and creativity does not exist, is the reaction. But they may perhaps exist, when the viewer is invited to compose his or her own tailor-made programs, interactively. The viewer may, for example, download video games from the satellite or the cable, and then not just as a distribution channel, but as the door to a world of play with other game enthusiasts. There are many other possibilities, such as teleshopping, education, database access, travel bookings, AV cookbook browsing, video on demand, etc.

As always, it is impossible to claim this to be an entirely new trend, but its volume gives it a new dimension. Not all efforts are successful, but there are many examples of synergies between different media, from the Ninja Turtles with their comic book origin, over Jurassic Park with its multimedia launch, to the Disney movie Aladdin which also exists in video games and other formats.

The concept of multimedia should not be missed in any list of current trends, and it may be interpreted as a combination between media, all relying upon the same program, or popular TV, or other characters. It may also be interpreted as a combination of several different types of messages in the same medium. When home computers are employed as video telephones, when CD discs are used for sound, video, data and simulations (based on computer software) – well, that counts as multimedia too.

In the US particularly, the mega-mergers call forward queries of too much concentration of media power and consequent anti-trust measures. Similar concerns may emerge in Europe. At the same time, the prior restrictions on the RBOC's are being relaxed.

The trend towards more competition – de-regulation, privatisation, globalisation – is certainly both distinct and important. Every country has its own profile, Sweden as well. Here, several international giants compete for a foothold on what is probably the world's most open telecom market. To accompany Swedish corporations abroad – much like Swedish banks – Telia has – much like Scandinavian Airlines System – established alliances and created Unisource in collaboration with its Dutch and Swiss counterparts.

With global networks, network management emerges as a key function, both for service quality and resource economy.

A literature search points toward a stepwise increase in the interest in network based collaboration, supported by groupware. New functions are being developed in conjunction with existing software, such as Lotus Notes. Specialised groupware is also being developed, such as for quality programs or

research and development. Methods are adapted to evaluate the economic effects and conditions for productivity enhancement with such methods.

Another literature search points toward ATM as being central to future networks. *Asynchronous transfer mode* is a means of communicating with digital data packaged in small standardised units. The content may differ between the packages, sound, image, data. Thus the same network, switches, and other equipment, may transmit very different messages – all at the same time.

New microprocessors characterize the development about every second year – a new generation. Recently Intel launched Pentium and IBM, Motorola, and Apple, the PowerPC. As with every new generation, speed is enhanced as is capacity, with the RISC architecture, reduced instruction set computer, also resulting in higher speed. Among large computers, parallel processing is steadily growing.

Broadband networks, information highways, and multimedia – in previous volumes of the TELDOK Yearbook we called this integration. Such trends make trouble in getting accurate statistics and in distinguishing one industry from another. Movies now receive higher video income than from theatres. Perhaps the production cost should be included? This is no problem in tele-communications – not just yet. But it is hardly brave to suggest that it will be.

And who may distinguish if a "telephone call" transmits data, perhaps in the form of CAD drawings, or money, or software, or a movie – or just an ordinary conversation? Or if my home computer is a typewriter or a fax or perhaps a fax switchboard?

The intention is that this yearbook should serve as a switchboard too. Just like in front of the home computer, the user should be free to make the most surprising but productive links in his or her interest!

2. Telecom and IT in Statistics

Do you Know This about Telecom?

* The telecom market is judged to be the most expansive industry sector of the 1990s. In July 1993, the worldwide growth rate was estimated to be 50 million new telephone subscribers per year. By the turn of the century some 90 million subscribers per year will apply for new telephone lines, according to estimates by Ericsson and other firms.
  Source: Kontakten no. 4, 1993

* The Swedish IT and telecommunications market was estimated to have a total value of SEK 80 billion in 1993, assuming a wide interpretation of the two terms.

* For the period of March 1992 – February 1993, telecommunications equipment made up five percent, equivalent to SEK 26.9 billion, of the total value of Swedish export.
  Source: Svensk Export no. 5 1993

* The number of new telecom services is increasing rather dramatically. Some examples, serving as indicators for future trends, are:
  - In 1980, fax machines were rather scarce – by mid 1993 some 30 million were installed in the OECD countries;
  - In 1980 there were very few users of mobile communication services – by mid 1993 there were more than 11 million subscribers to mobile telephones in the OECD countries, and 21.5 million worldwide.

  Consequently, the new services will generate an ever increasing portion of the revenues of the operators. In 1980, the OECD reported that 87 percent of the revenues of the then mainly public telecom operators, were generated by common telephone conversations. By mid 1993, they generated less that three-quarters of the total revenues – data communication, leased lines, and, especially, mobile communications are the fastest growing individual sectors. (*See also* fig. 4, p. 14).
  Source: Communications Outlook 1993

* ATM-based services are introduced country by country in Europe. The first operator to offer such services was Finnish Telecom, only one day ahead of France Télécom. The Finns are offering a direct link between Finland and Brussels. The French offer service within France, starting with universities and research venues, since these are supposed to help evaluate the system as well. Swedish Telia is also prepared to offer services to those wanting to evaluate ATM.
  Source: Nätvärlden no. 7, 1993

* Productivity in the telecom area has increased in the OECD countries since 1990. An overall estimate shows that the utilization of the networks, as well as individual productivity, has increased by some five percent in real terms.
Source: Communications Outlook 1993

* In 1990, the telecom industry generated a total turnover of US$ 367 billion, and it is counting on an annual growth of 4.5 percent, a figure considerably higher than that of the general economies of the OECD countries during the same period.
Source: Communications Outlook 1993

* For the period 1980 to 1990, telecom services increased their share of total GNP of the OECD countries from 1.8 percent in 1980 to 2.3 percent in 1990.
Source: Communications Outlook 1993

* International telecom traffic, the most profitable of all telecom services, increased by 43 percent during the last 24-month period. The two major reasons for this surprisingly large growth are the ever increasing fax usage, and the dropping prices of telephone calls.
Source: Communications Outlook 1993

* For a long time, the European Commission has had as its objective to liberalize the telecommunications markets in the 18 EES countries in Western Europe. The total value of the markets may well be close to SEK 1,000 billion annually. (*See also* the figures of The Introduction, p. 7). The German Bundespost Telekom is convinced, that the telecom market can not become totally open earlier than the year 2000.
Source: Svenska Dagbladet, March 12, 1993

* American manufacturers estimate that the total consumer market for telecom equipment will grow from the present US$ 8 billion to US$ 70 billion by the turn of the century. The reasons for this optimism? Among others, technology offering opportunities to integrate telecommunications, entertainment, and computer services.
Source: International Business Week, July 13, 1992

* Persons suffering from impared seeing and other handicaps, making it difficult to use telephone books, are offered a special service called "account calls". This Swedish service includes, among other things, free calls to telephone directory service.
Source: Dagens Nyheter, January 14, 1993

* The international satellite organization INMARSAT has decided to develop a new, global, digital telephone system, making it possible to make calls, and to send and receive faxes and data, from a small, portable pocket telephone from anywhere on the globe. The telephone is equipped with a special antenna. The objective is that this new service will be available no later than the year 2000.
Source: Svenska Dagbladet, July 29, 1993

* The global value of telex terminals is decreasing, but only slowly. For 1988, the estimated, total value was US$ 680 million, the equivalent for 1993 was US$ 590 million, and for 1994 it is US$ 570. Even if Europe, the US, and Japan have replaced telex by fax and data communications, it seems as if Africa, a large part of Asia, Latin America, and most likely also Eastern Europe, are sticking to the old technology. At least, this it the opinion of the American firm Datapro Research Corporation. Moreover, they believe that the number of telex subscribers in Western Europe will decrease by 45 percent during the period 1988–94.

* A telephone calling card is a credit card for telephone services carried out from telephone booths and hotel telephones, and paid for via the regular telephone bill. The most widely used card is the AT&T Calling Card, used by some 40 million people. Swedish Telia offers a similar service via the Telia Access Card.
Source: Svenska Dagbladet, May 28, 1993

* "Smart Cards", i. e. intelligent cards plastic cards having a built in microprocessor, were invented by a Frenchman in 1973. By now, the French company Schlumberger, manufacturing these cards, has sold more than 200 million cards and some 65.000 card machines worldwide.
Source: TeleJournalen, no. 1 1993

* In 1992, the turnover in the European WAN (Wide Area Networks) market was about SEK 45 billion. France Télécom is the largest operator, having 20 percent of the market. Second largest is German Telekom, with 13 percent, and Spanish Telefónica follows as third, with 10 percent. The telecom operators thus dominate the large networks.
Sources: OVUM/Computer Sweden, April 30, 1993

* During the summer of 1993, the Swedish telecom links to continental Europe, in particular to Germany, were very much improved thanks to a new fiber optical cable for digital transmission. The total cost of this new link is SEK 100 million. The cable replaces three old cables, increasing the transmission capacity more than tenfold.
Sources: Svenska Dagbladet and Dagens Nyheter, June 4, 1993

Telecom in the OECD Countries
The Markets for Public Telecom Services in the OECD Countries in 1980, 1985, and 1990

	Public telecom services in the OECD-countries in % of GNP			GNP per capita in US$
	1980	1985	1990	1990
Australia	1.61	1.98	2.94	17,282
Austria	1.52	1.73	1.79	20,391
Belgium	1.09	1.32	1.40	19,303
Canada	2.02	2.25	2.29	21,418
Denmark	1.18	1.54	1.80	25,478
Finland	1.58	1.51	1.62	27,527
France	1.35	1.68	1.59	21,105
Germany	1.77	1.85	1.69	23,536
Great Britain	1.54	2.16	2.40	16,985
Greece	1.37	1.63	1.96	6,505
Iceland	1.22	1.32	1.45	22,875
Ireland	1.75	2.51	3.04	12,131
Italy	1.12	1.49	1.53	18,921
Japan	1.71	1.61	1.48	23,822
Luxembourg	1.61	1.61	1.81	22,895
The Netherlands	1.37	1.53	1.96	18,676
New Zealand	2.04	2.18	3.20	12,656
Norway	1.47	2.00	2.42	24,953
Portugal	1.84	3.16	2.48	6,085
Spain	1.23	1.51	1.70	12,609
Sweden	**1.39**	**1.84**	**2.33**	**26,652**
Switzerland	2.07	2.23	2.18	33,085
Turkey	0.73	1.32	1.90	1,896
USA	2.36	2.81	3.23	21,449
OECD average	1.82	2.21	2.27	19 346

Fig. 9: The table shows the percentage of GNP for telecommunication services in the OECD countries in 1980, 1985, and 1990. The fourth column shows the GNP per capita in 1990 in US$. In this context, it is interesting to note that nine out of the 24 OECD countries demonstrated a surplus in their export of telecom equipment in 1990, compared to 11 in 1980. In 1990, the OECD countries exported telecom equipment totaling US$ 21 billion compared to US$ 6.8 billion in 1980. During the same period, Sweden doubled its trade surplus in telecom equipment.

Souces: From data in the OECD and ITU/Communications Outlook 1993

Telecom in the OECD Countries
Percentage of Turnover per Region in 1990

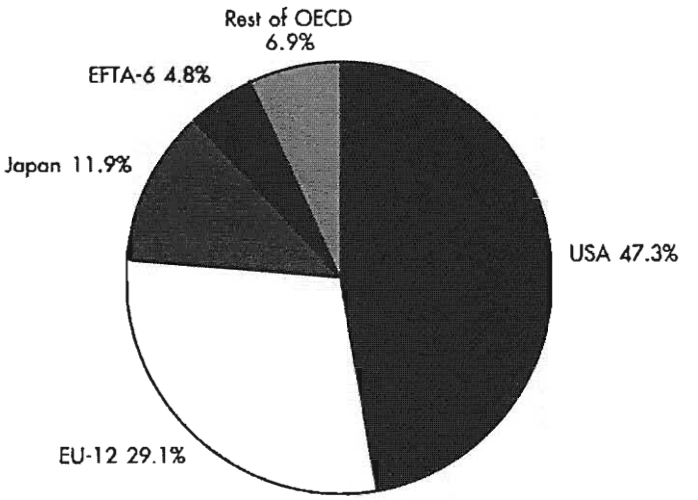


Fig. 10: The total turnover of the telecommunications industry in the OECD countries in 1990 was US$ 367.6 billion. The figure shows the distribution in percentage per region. (*See also* fig. 4, p. 14).
Source: Communications Outlook 1993

Telecom in the OECD Countries
Telecommunications Revenues per Capita
in 1980, 1985, and 1990

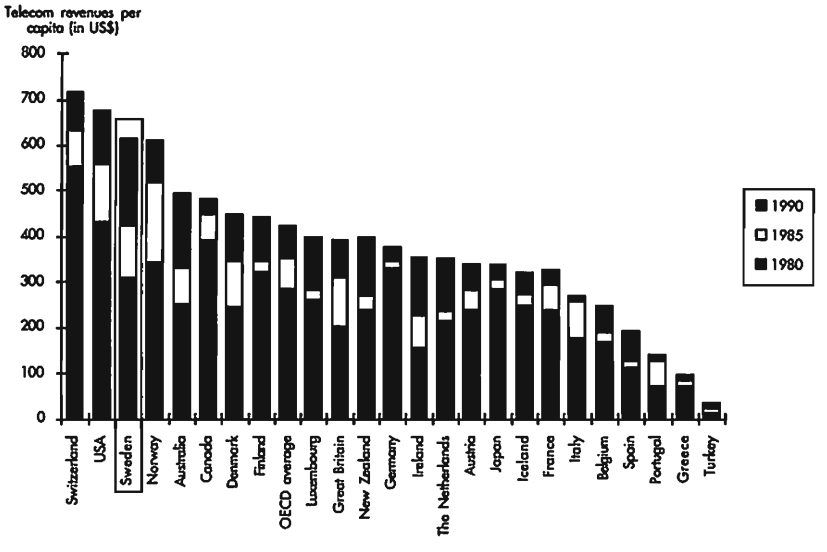


Fig. 11: The diagram shows the distribution of telecommmunications revenues per capita in the OECD countries in 1980, 1985, and 1990. In 1990, the average OECD inhabitant spent US$ 438 on telecom services. The average Swiss spent more than US$ 700, the average American just less than US$ 700, and the average Swede a little more than US$ 600. The reasons for the Swedish revenues being the third highest are the high penetration rate of mainlines, the low usage costs, and the high penetration of more "expensive" services such as mobile communications.

Source: Communications Outlook 1993

Telecom Revenues and Liberalization in the OECD Countries
Percentage of GNP in 1980, 1985, and 1990

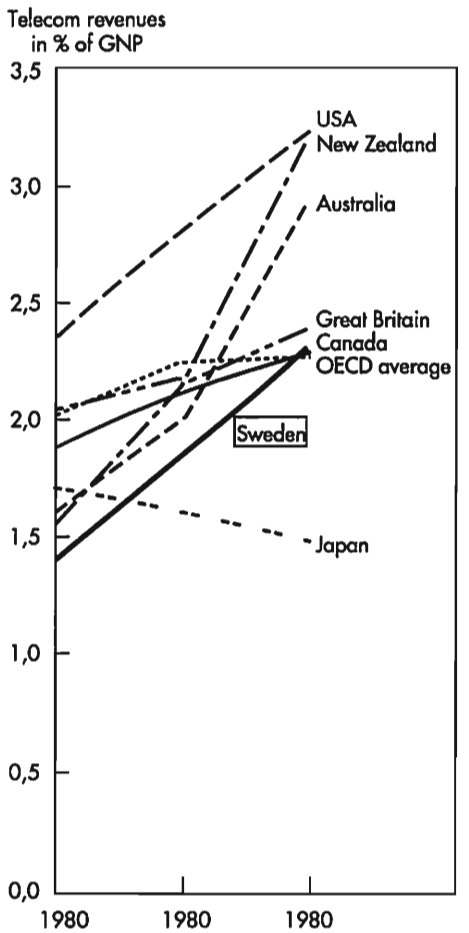


Fig. 12: The OECD has carried out several studies, showing that countries with a high index of liberalization (= OECD index > 9) in the telecom area, rapidly show a larger increase in telecom revenues than countries having more regulated markets. The curves show the telecom revenues in percentage of GNP in the most open OECD markets in 1980, 1985, and 1990. See also Appendix in the back of the book.
Source: Communications Outlook 1993

Telecom in the OECD Countries
Telephone Mainlines per 100 Inhabitants
in 1980, 1985, and 1990

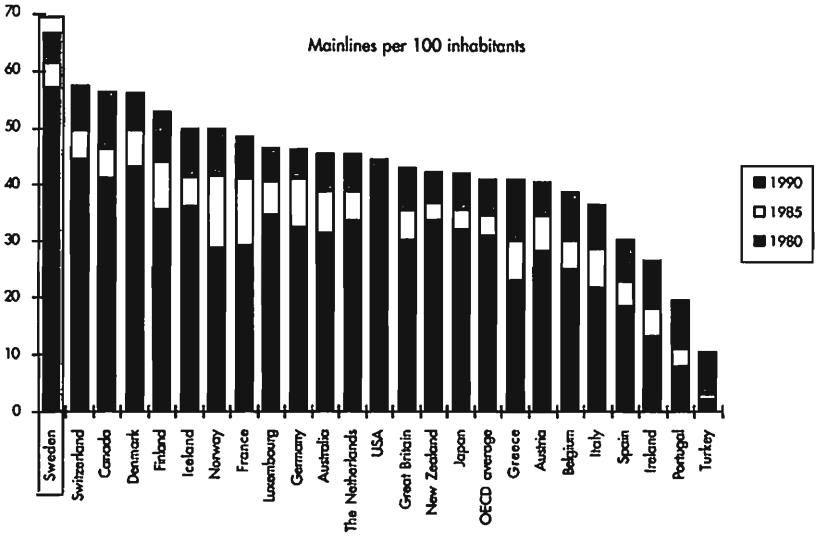


Fig. 13: In the beginning of 1991, the OECD countries had in total, 357 million telephone mainlines. USA had the largest number, 114 million. Japan had less than half that, 56 million. Sweden showed the highest penetration rate, i. e. the largest number mainlines per 100 inhabitants – or, to word it differently, three Swedes shared two mainlines. According to figures from 1991, Sweden had 683.3 telephones per 1,000 inhabitants; Switzerland had 587.6; Canada 576.8; Denmark 566.4; USA 545.4; Finland 535.2; Norway 502.9, and France 489.9 telephones per 1,000 inhabitants. In reality, any household in Sweden wanting a telephone has at least one – many actually have two connections. Eight percent of the inhabitants in Sweden had mobile telephones by mid 1993. During 1993, the growth rate for new subscriptions in Sweden decreased.

Source: Communications Outlook 1993

Telecom in the OECD Countries
Revenues, Investment, and Telephone Mainlines
in 1980–90

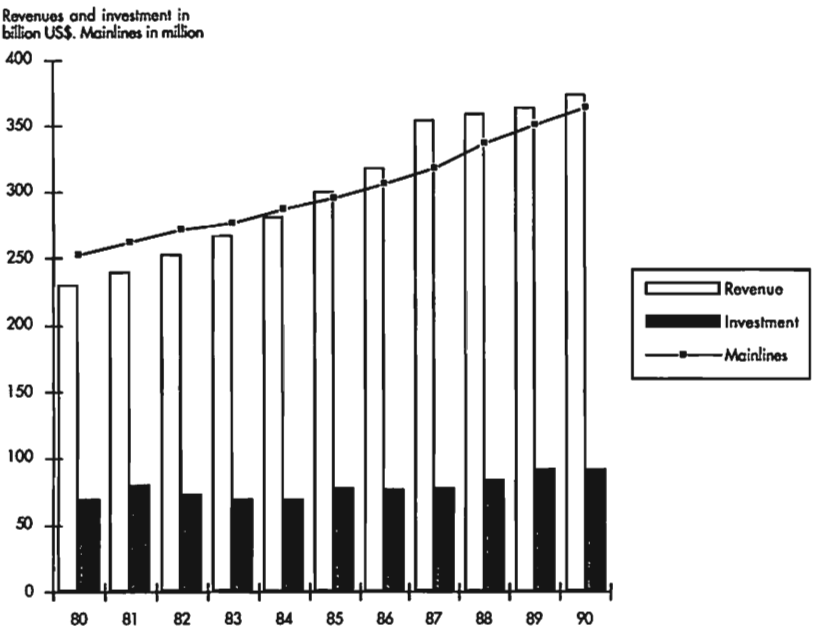


Fig. 14: The diagram shows the collected trends in the telecommunications area for revenues, investment, and the number of telephone mainlines in the OECD countries for the period 1980–90.
Source: Communications Outlook 1993

Telecom in the OECD Countries
Telephone Mainlines per 100 Inhabitants in 1990

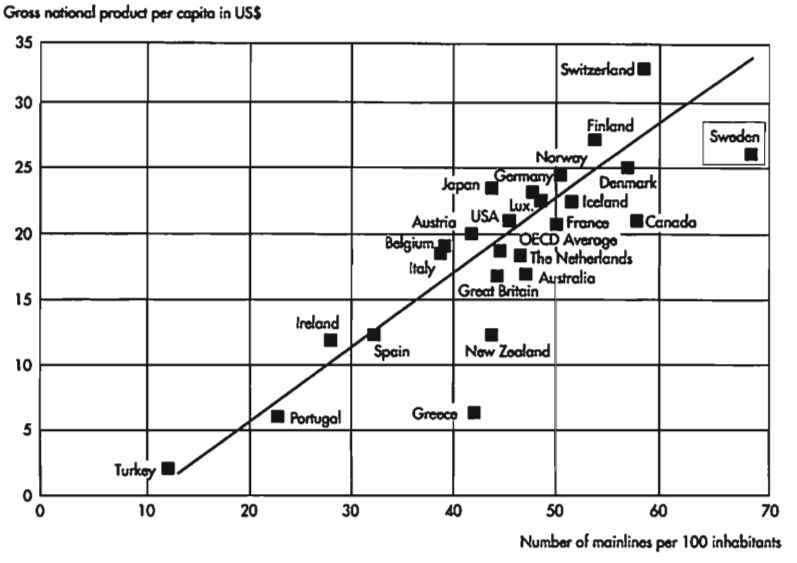


Fig. 15: The curve shows the relationship between gross national product in US$ per inhabitant, and the number of telephone mainlines per 100 inhabitants in 1990. A growth rate in GNP of US$ 1,000 per capita, corresponds to a growth rate of 1.36 mainlines per 100 inhabitants.
Source: Communications Outlook 1993

Telecom in the OECD Countries
Investment per Mainline Related to the Number of Mainlines per 100 Inhabitants in 1990

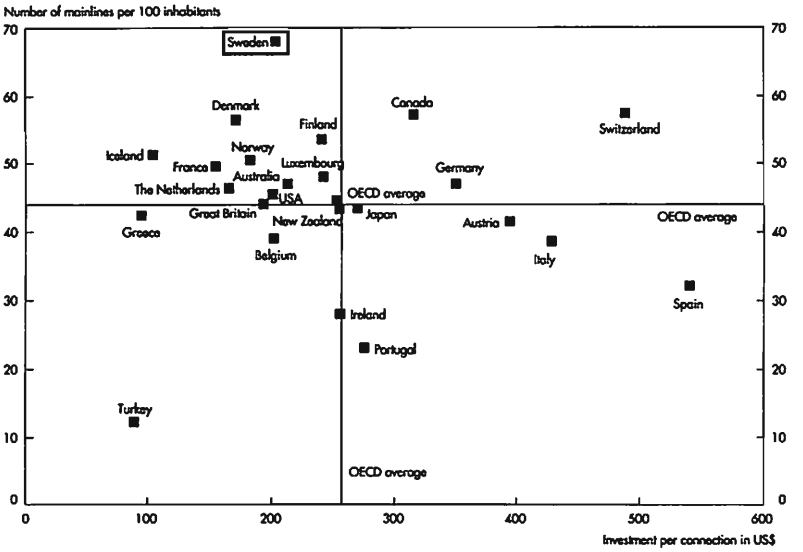


Fig. 16: Our figure shows the relationship between the invested sum per connection, and the number of telephone mainlines per 100 inhabitants. One of many reasons for large sums being invested in telecommunications during the latter part of the 1980s is the transgression from analog to digital technology.
Sources: Communications Outlook 1993/Telekom i OECD-länderna

Telecom in the OECD Countries
Investment per Region in 1980–90

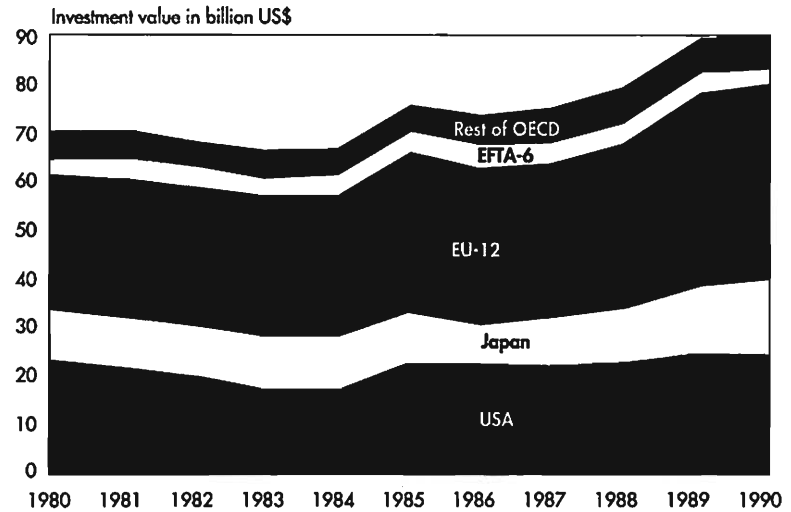


Fig. 17: In 1990, the total capital invested in public infrastructure for telecommunications in the OECD countries was US$ 90 billion. This is equivalent to US$ 100 per inhabitant, all categories included. Not included in the figures are investments in private networks, these investments being difficult to estimate correctly. Had exact and correct methods for measuring existed, the total investment figure is very likely to exceed US$ 100 billion. The diagram includes capital invested in the modernization of infrastructure such as networks, digitalization, renewal, and technology. Ground and buildings are not included.

Source: Communications Outlook 1993

Telecom in the OECD Countries
Turnover Growth Rates of the Public Operators
in 1980–85 and 1985–90

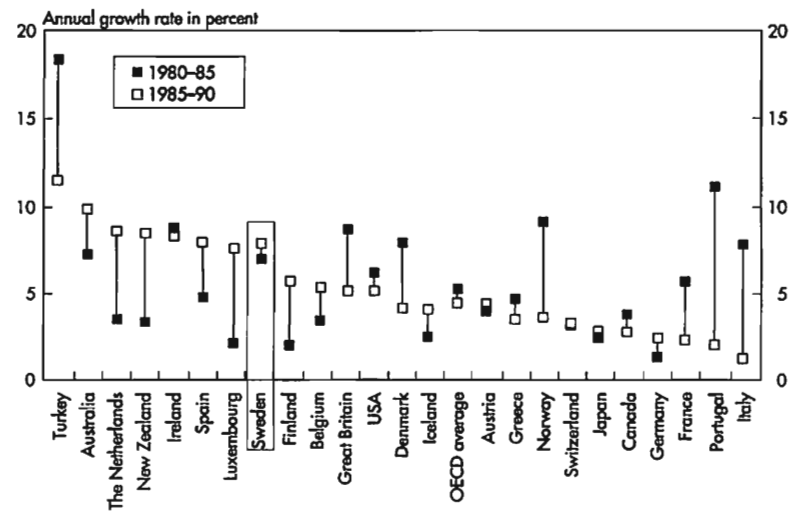


Fig. 18: Telecommunications services are generally considered to be high growth markets in the OECD countries. However, the annual growth rate per country is changing, depending on, among other things, the local economic situation, the number of introductions of new products and services per year, and on the saturation level of the market. In many OECD countries, the growth rate has decreased between the two periods compared above. Nowhere has it totally stagnated, however.

Source: Communications Outlook 1993

Telecommunications Equipment in the OECD Countries – Export and Import in 1990

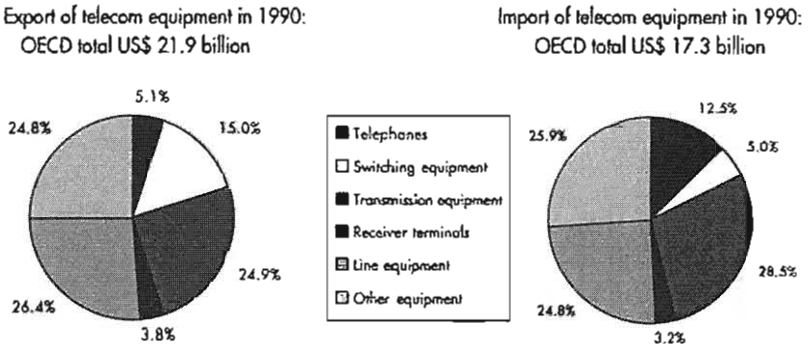


Fig. 19: In 1990, the total export of telecommunications equipment from the OECD countries reached US$ 21.9 billion. The same countries imported telecommunications equipment with a total value of US$ 17.3 billion during the same period. Thus, the telecommunications industry generated a trade surplus of US$ 4.6 billion. The diagram shows the distribution of the total percentage for the different kinds of equipment imported and exported.
Sources: OECD NEXT Trade Database/Communications Outlook 1993

Digitalization in the OECD Countries in 1991/92

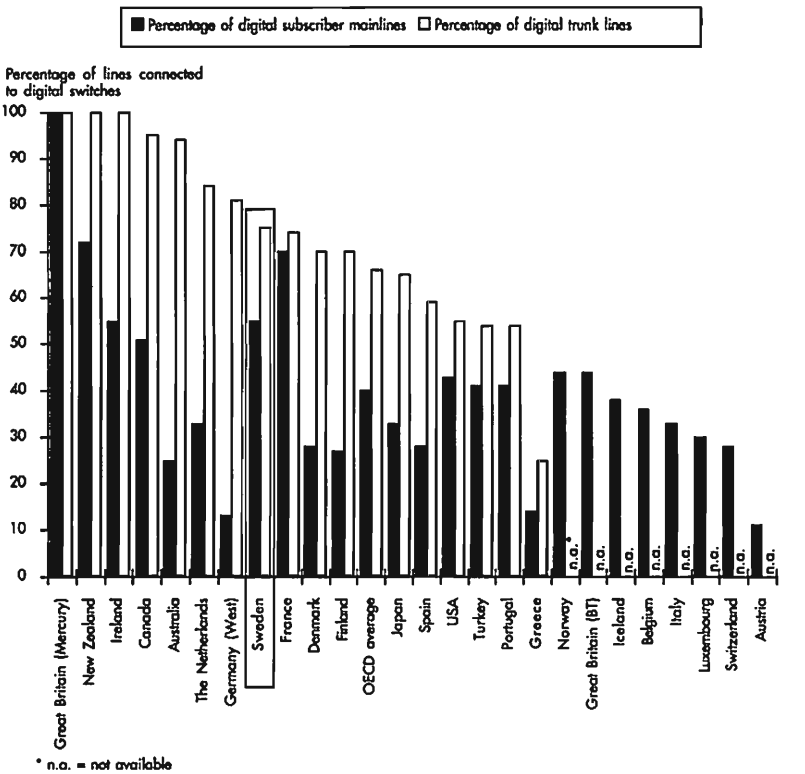


Fig. 20: The digitalization of the telecommunications infrastructure, i. e., trunk lines and subscriber mainlines, is making good progress in the OECD countries. The percentage of subscriber mainlines connected to digital switches, mainlines, and trunk lines, per country, for 1991/92 is shown in this diagram. Sweden had not yet finished its digitalization of the trunk network.
Source: Communications Outlook 1993

Telecom in the OECD Countries
Minutes of International Telecommunications Traffic in 1990

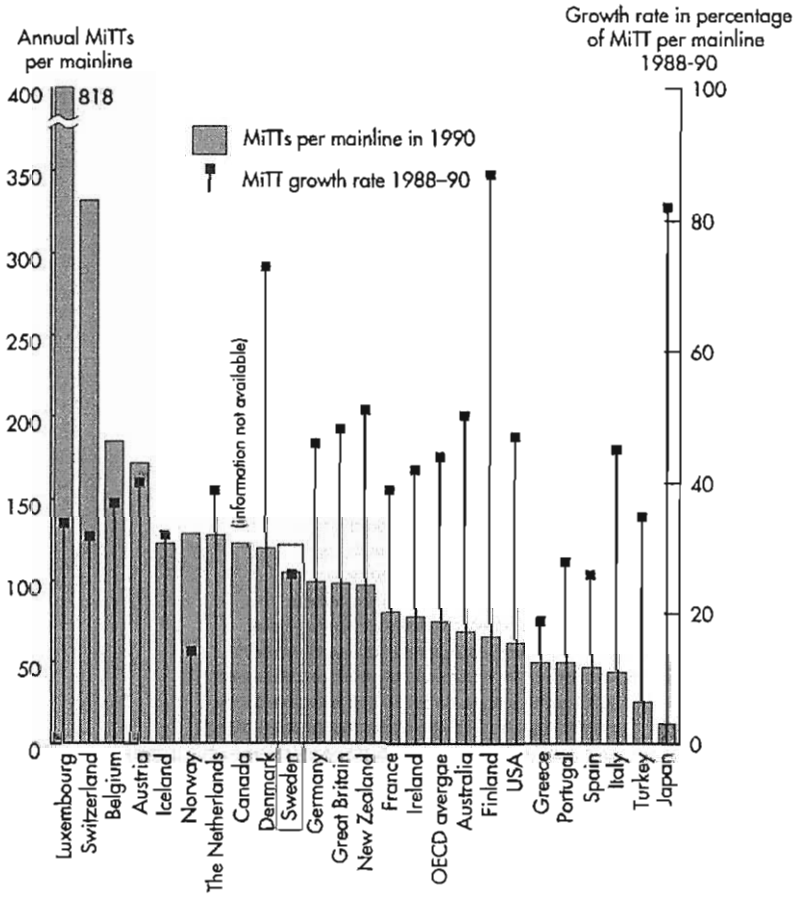


Fig. 21: Internationalization, which generally speaking, is a concept that is difficult to measure, is for telecommunication purposes measured in "minutes of international traffic", or, more precisely, "Minutes of International Telecommunications Traffic," abbreviated MiTTs. The number of MiTTs per mainline, per OECD country, in 1990 is shown in our figure, as well as the growth percentage of MiTTs per country for the period of 1988–90. Looking at the overall picture, however, many large and international companies and organizations run their own networks, which are not included in the MiTTs count. MiTTs only show traffic over public networks.
Source: Communications Outlook 1993

OECD Basket of Telephone Charges in 1992
A Summary of Residential and Business Charges

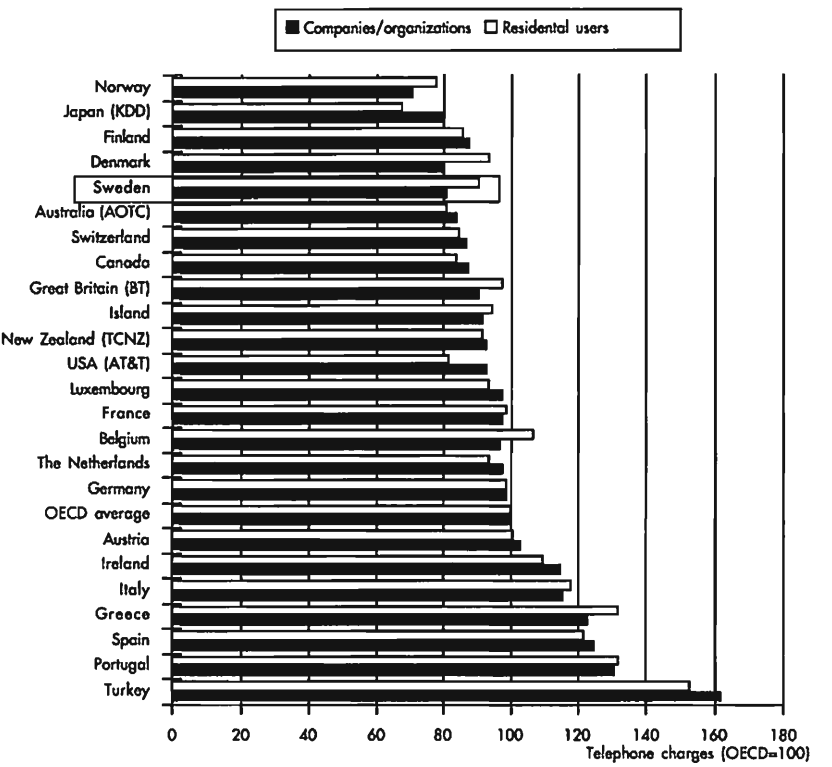
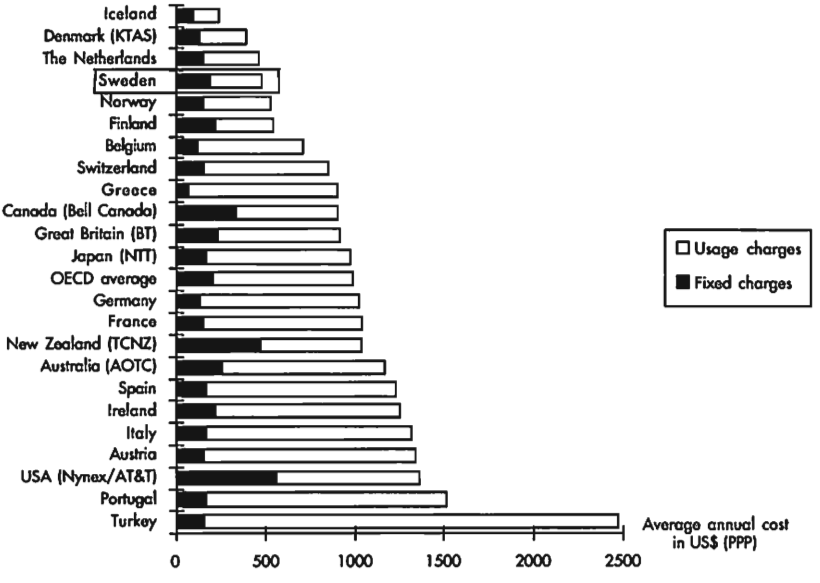


Fig. 22: Described here is the relationship between the telephone charges for companies and organizations on the one side, and those for residential users on the other, taken together, per OECD country in January 1992. The OECD average = 100. The reader is reminded that the evaluation is based on the currency rates of December – January 1992.
Source: Communications Outlook 1993

OECD Basket of Telephone Charges in 1992
Business Charges

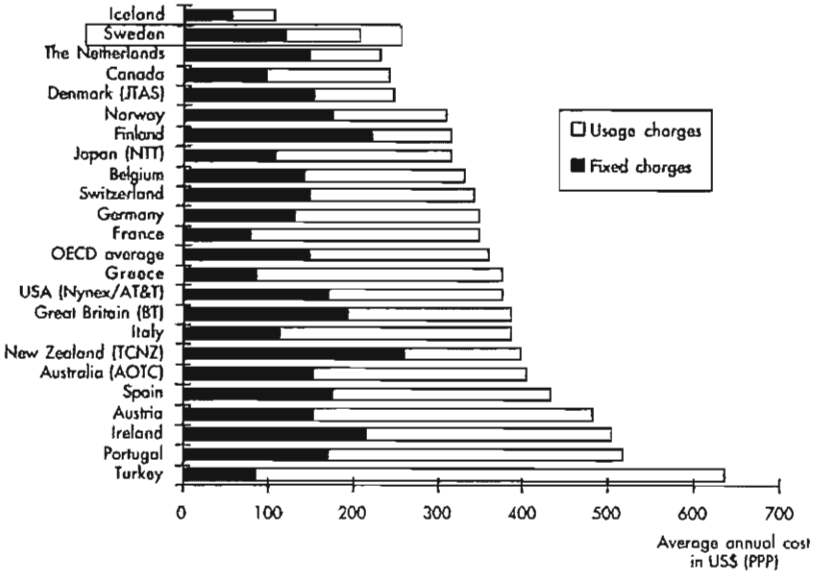


(PPP= Purchasing Power Parties is a measurement for the relative value of international currencies expressed in buying power.)

Fig. 23: Sweden holds the fourth position in this OECD overview of levels of telephone charges for so called professional users, for instance corporations, and organizations. The costs are divided into fixed charges and usage charges. It is important to bear in mind that the definitions of "fixed charges" may vary from country to country. Thus, in New Zealand, for example, local calls are included in the "fixed charges". (See also fig. 40 p. 55.)

Source: Communications Outlook 1993

OECD Basket of Telephone Charges in 1992
Residential User Charges



(PPP= Purchasing Power Parties is a measurement for the relative value of international currencies expressed in buying power.)

Fig. 24: Sweden has the second lowest telecommunication charges for residential users within the OECD. The average user pays higher fixed charges in Sweden, Finland, Denmark, and Norway, in percentage of the total telecommunications costs, than users in most other countries. However, the usage charges are considerably lower in these countries.
Source: Communications Outlook 1993

Tariff Changes of the OECD Basket
Professional Users
November 1989 – January 1992

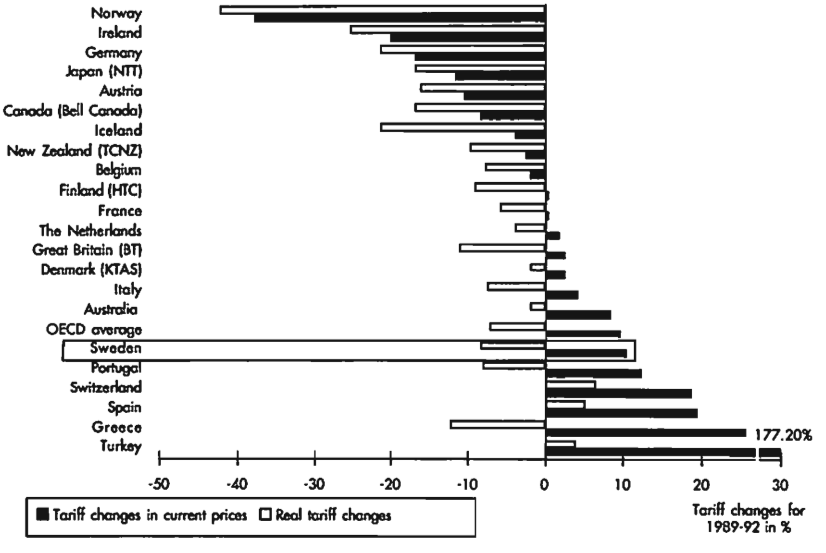


Fig. 25: During the period November 1989 – January 1992, the OECD countries dramatically changed their telecommunication tariffs – in most countries the tariffs decreased in real terms. Increased liberalization and competition are regarded as the main reasons for these changes.
Source: Communications Outlook 1993

Telecom in the OECD Countries
Waiting Time for Telephone Installation
in 1980 and 1990

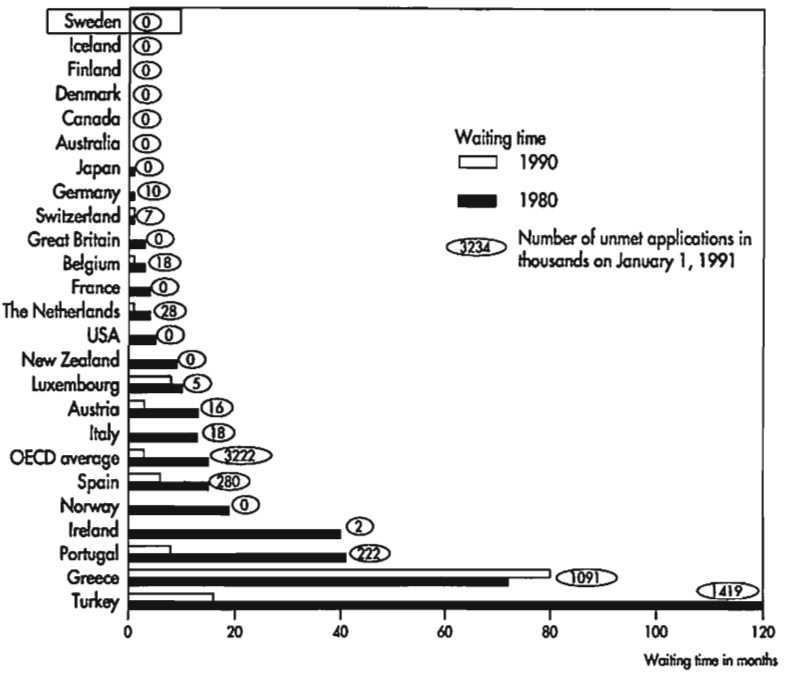
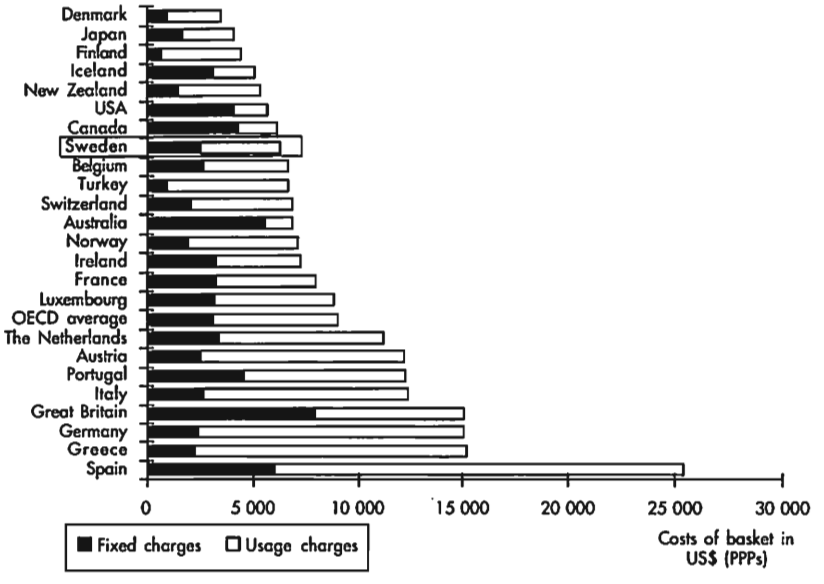


Fig. 26: In quite a few OECD countries, Sweden in the leading position, there is no waiting time at all once an application for a telephone has been filed. The diagram shows a comparison between waiting time in 1980 and in 1990, counted in number of months. The number of unmet telephone applications by January 1, 1991, is indicated by the figures.

Source: Communications Outlook 1993

Charges for X.25 Data Communication
The OECD Basket of January 1992



(PPP= Purchasing Power Parties is a measurement for the relative value of international currencies expressed in buying power.)

Fig. 27: The charges of X.25 packet switched data communications in the OECD basket in January 1992. The diagram stresses the distribution between fixed charges and usage charges.
Source: Communications Outlook 1993

9.6 kbit/s Leased Line Compared to PSTN
Break even Points by Distance, January 1, 1992

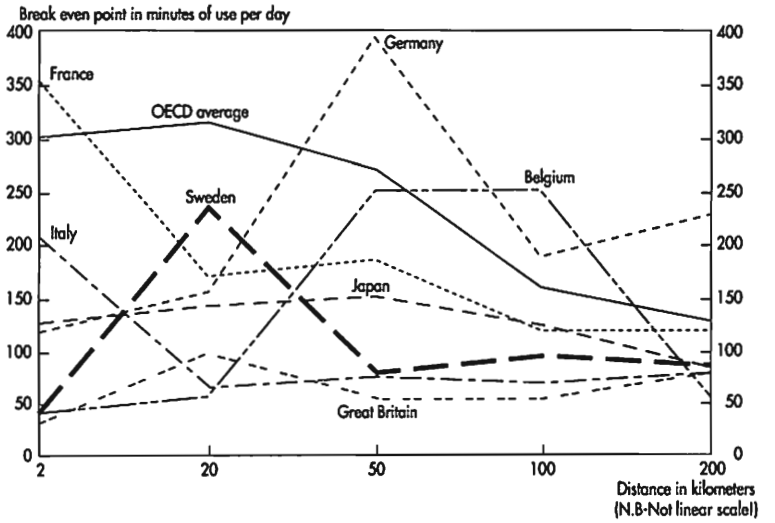


Fig. 28: The curves demonstrate at what distance, and how many minutes of usage per day, are needed for a leased line of 9.6 kbit/s to become competitive with the public switched telephone network. Seven OECD countries are compared to the OECD average.
Source: Communications Outlook 1993

Private Networks in Western Europe in 1990
Growth Rate 1988–90

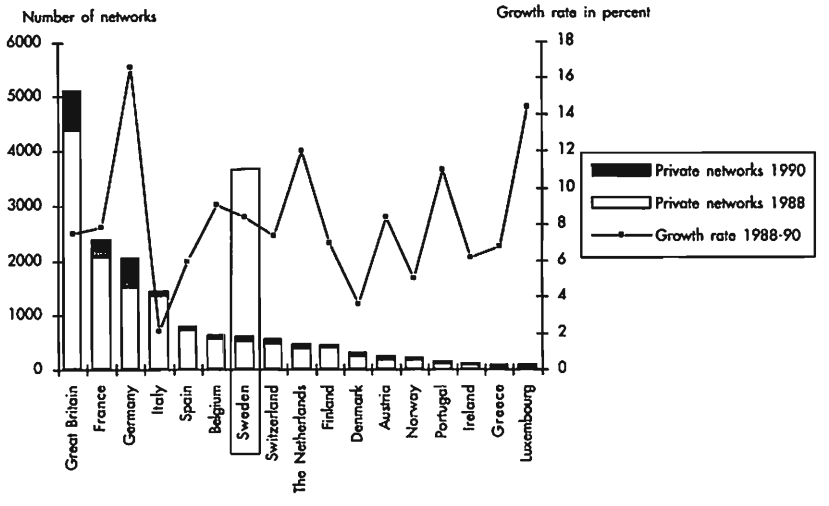


Fig. 29: In general terms the number of private networks in Western Europe has grown in the period 1988–90. Germany, The Netherlands, and Luxembourg show the highest growth rate, while business recession in Sweden is mirrored in a slower growth rate. To a large extent, it is a matter of organizations utilizing technology optimally, in order to gain time and security, and to cut costs.
Source: Communications Outlook 1993

ISDN in Europe 1992–97

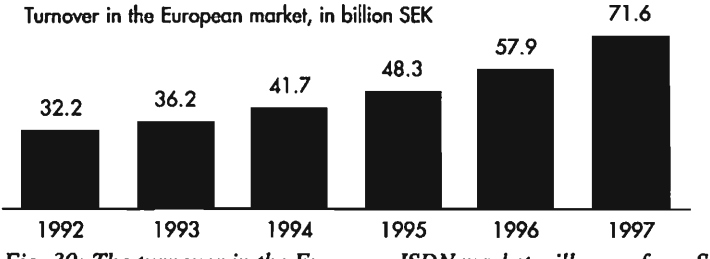


Fig. 30: The turnover in the European ISDN market will grow from SEK 32.2 billion in 1992 to SEK 71.6 billion in 1997, according to a prognosis by Frost & Sullivan. The background to the prediction is that more and more users realize the advantages of ISDN, and, accordingly, are buying equipment that can be utilized above all within Europe. Moreover, the development towards one single standard is unquestionable. At the same time, prices are decreasing and the number of applications is growing.
Sources: Frost & Sullivan/Computer Sweden, April 2, 1993

ISDN in Europe and Japan
Traffic Charges in January 1992

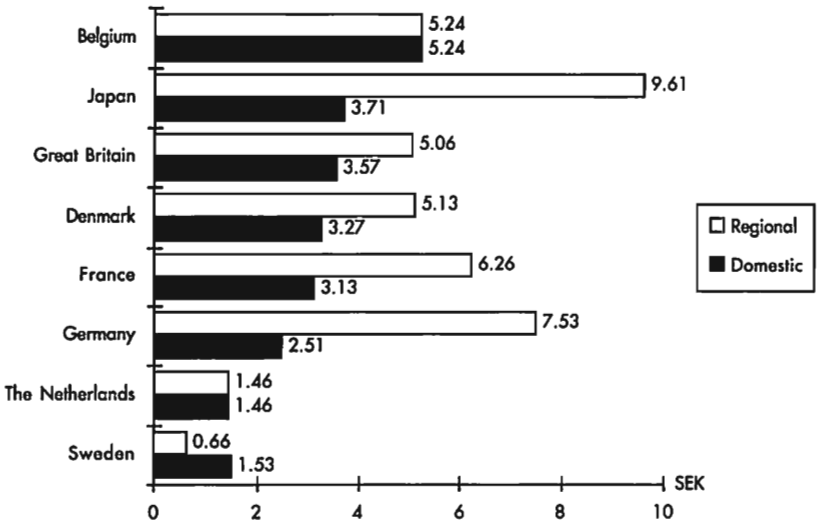


Fig. 31: This diagram compares, in SEK, the ISDN usage costs for three minutes in some European countries as well as in Japan. Japan, France, and Germany are showing large differences in charges for regional calls and domestic calls. The comparison was made by Deutsche Telekom.
Source: Televerket, "Tele" no. 2 1992

ISDN in Europe and Japan
Connection Charges

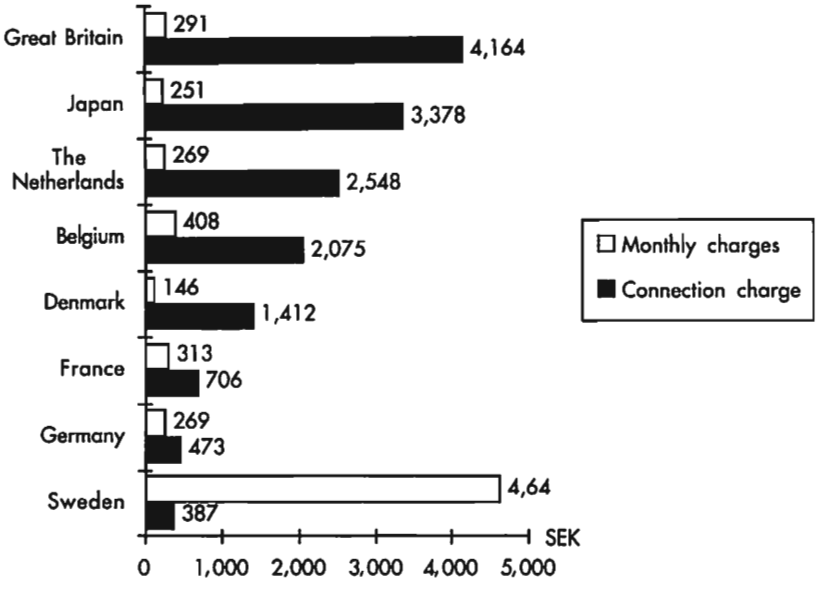


Fig. 32: This chart compares the connection charges, as related to the monthly charges for ISDN, expressed in SEK. Different countries have chosen different strategies – the UK has chosen a high, one-of-a-kind, connection charge, and low monthly charges, while Sweden has chosen the opposite strategy. Deutsche Telekom made the survey. See also fig. 48, p. 63.
Source: Televerket, "Tele" no. 2 1992

Electronic Mail in the World in 1991 and 1996

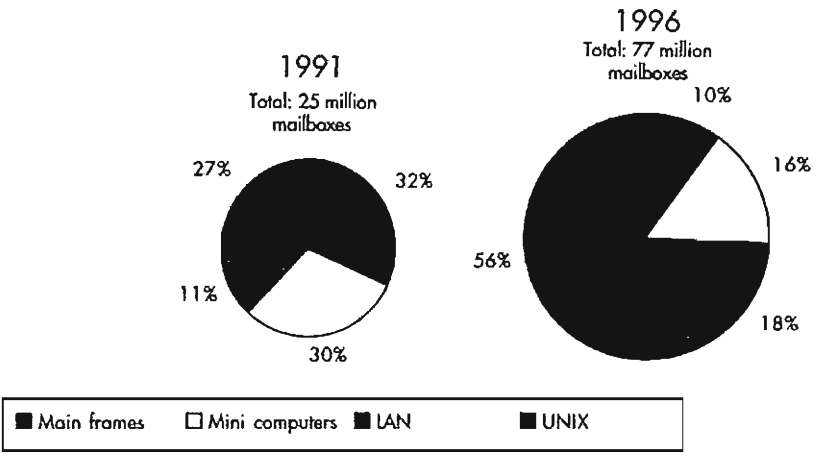


Fig. 33: In 1991, there were some 25 million electronic mailboxes worldwide. In 1992, they had increased to some 30 million. In this area, Sweden holds a rather modest position – there are not very many users of electronic mail in the country. The Memo system is the dominant one. About half of all PCs in Sweden are conected to a local network. The research company IDC believes that the number of mailboxes will increase to 77 million worldwide by 1996. The diagram shows the distribution between different segments in the world market, in percent for 1991 and 1996. According to this prediction, the UNIX segment will be the dominant one. Other market specialists believe that the OS/2 and Windows/NT segment will dominate, and the UNIX one will be very small.
Sources: IDC/Computer Sweden, January 22, 1993

CTI – The Integration of Telecom and Computers
European Market Tenfold Growth by 1997

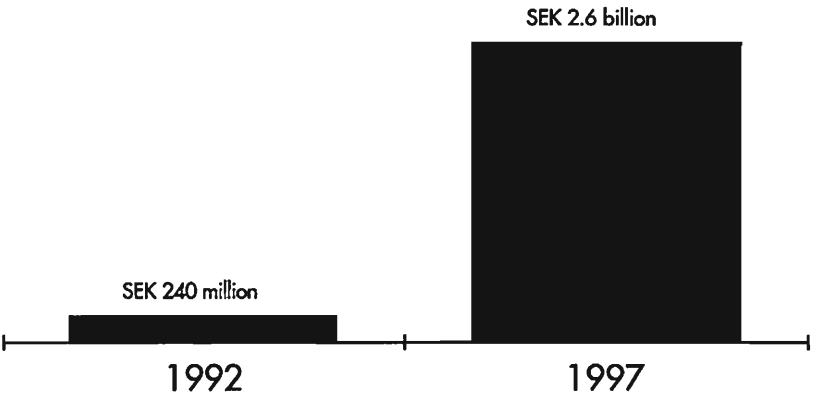


Fig. 34: The European market for CTI – Computer Telephony Integration – will have grown ten times by 1997, according to Yankee Group experts. In 1992, the total European CTI market value was US$ 30 million, or some SEK 240 million. In 1997, it is expected to have a total value of US$ 320 million, or SEK 2.6 billion. One of the fastest growing market segments is the integration of productivity tools for PCs and telephony. See also fig. 1, p. 11.
Sources: The Yankee Group/Computer Sweden, May 14, 1993

Broadband Communications in Europe
Revenue Forecast for 1993 and 1997

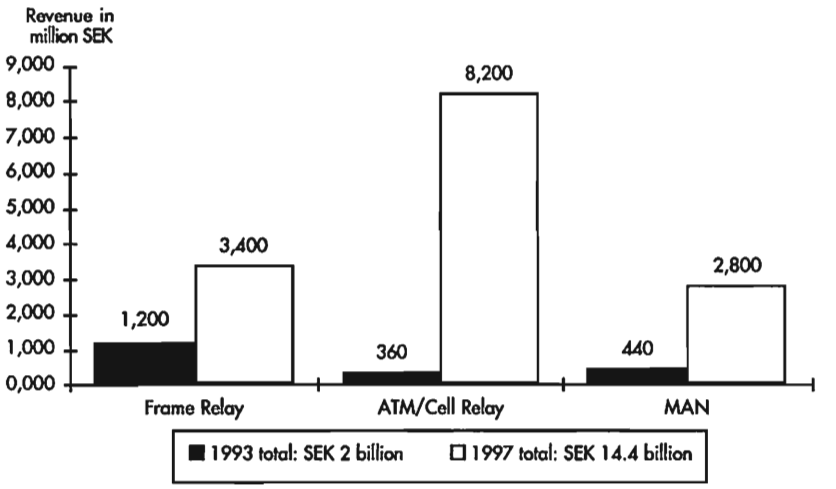


Fig. 35: Broadband communications are, according to some experts, ready for a final breakthrough in Europe. Frost & Sullivan estimates that the revenue growth will move from some SEK 2 billion in 1992, to SEK 14.4 billion in 1997. Special segments like ATM (Asynchronous Transfer Mode), Frame Relay, and MANs (Metropolitan Area Networks) will multiply during this period. Equipment for ATM/Cellular is predicted to see the largest increase, from SEK 360 million in 1993 to SEK 8.2 billion in 1997. Frame Relay will triple, to some SEK 4 billion.

Sources: Frost & Sullivan/Computer Sweden, April 16, 1993

Telecom in Sweden
Traffic Growth in Formerly Public and Fixed Network

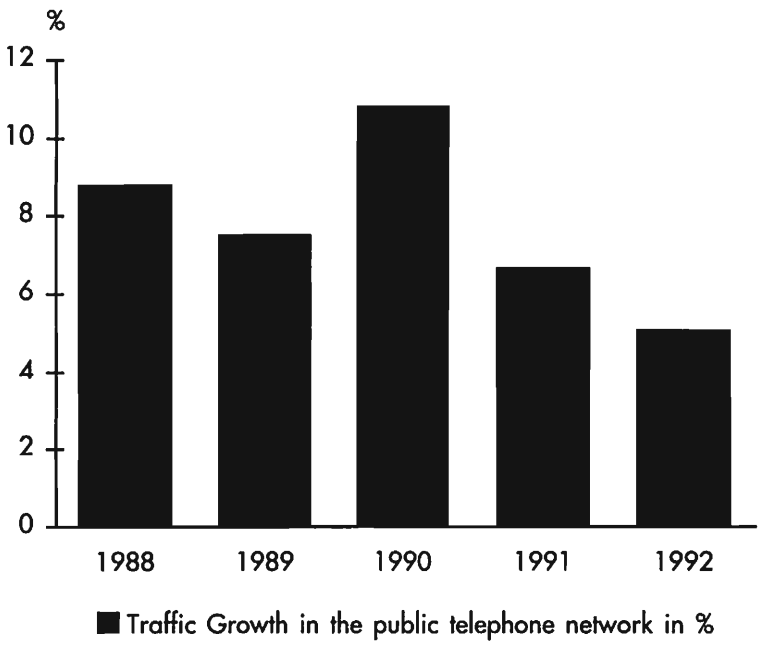


Fig. 36: In 1992, traffic growth in the Swedish formerly public, and fixed telephone network showed a small decrease in comparison to the preceeding years. The increase for the year was 5.1 percent, compared to 6.7 percent during 1991, and 10.8 percent during 1990. The diagram shows the overall growth rate, in percent, from 1988. Simultaneously, the traffic in the mobile network is rapidly increasing. At present, it is not possible to measure the percentage of traffic by-passing the formerly public network, now belonging to Telia, via for instance private networks, and so called VPNs, Virtual Private Networks, which means that private corporate switches can be used as a basis for internal networks.

Source: Televerket Årsredovisning 1992 (Annual Report from Televerket 1992)

Telecom in Sweden
Tariff Development 1980–92

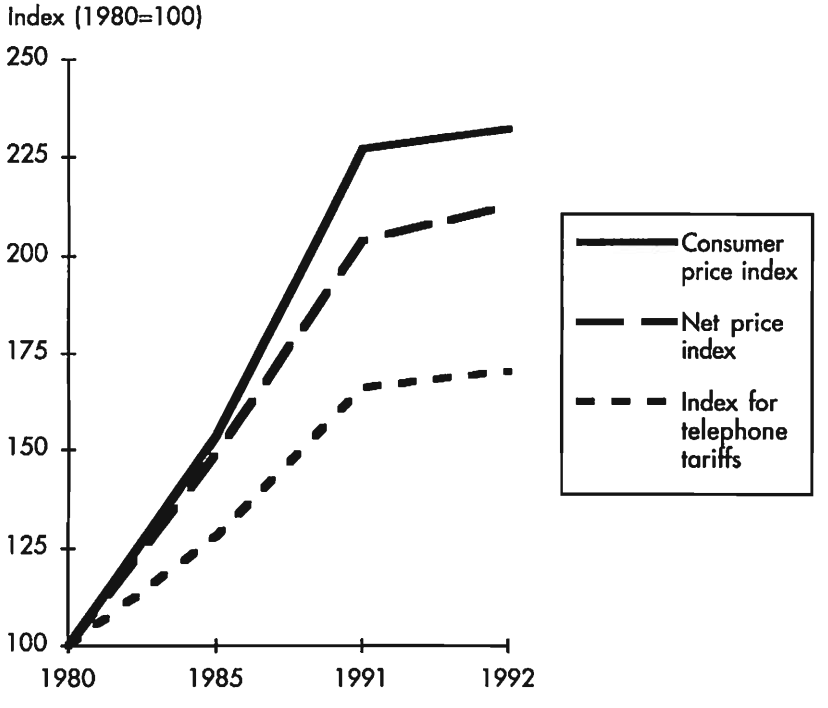


Fig. 37: In relation to consumer price index, as well as to net price index, the Swedish telecommunication tariffs show a very favourable development to subscribers. The curves show the tariff development for the period of 1980–90. 1980 = 100.

Source: Televerket Årsredovisning 1992 (Annual Report from Televerket 1992)

Telecom in Sweden
Overview by Televerket/Telia
As of December 31, 1991 and 1992

	1992	1991
Mainlines, in thousands	5,919	5,911
Mainlines per 1,000 inhabitants	675	680
Charge units, in millions	49,960	–
International telephone traffic, in million minutes	682	–
Fax machines, in thousands*	–	250
Datex connections, in thousands	41.2	–
Datapak connections, in thousands	9.5	7.3
NMT subscribers, in thousands	656	470
Cable TV, thousands **	1,195	1,122

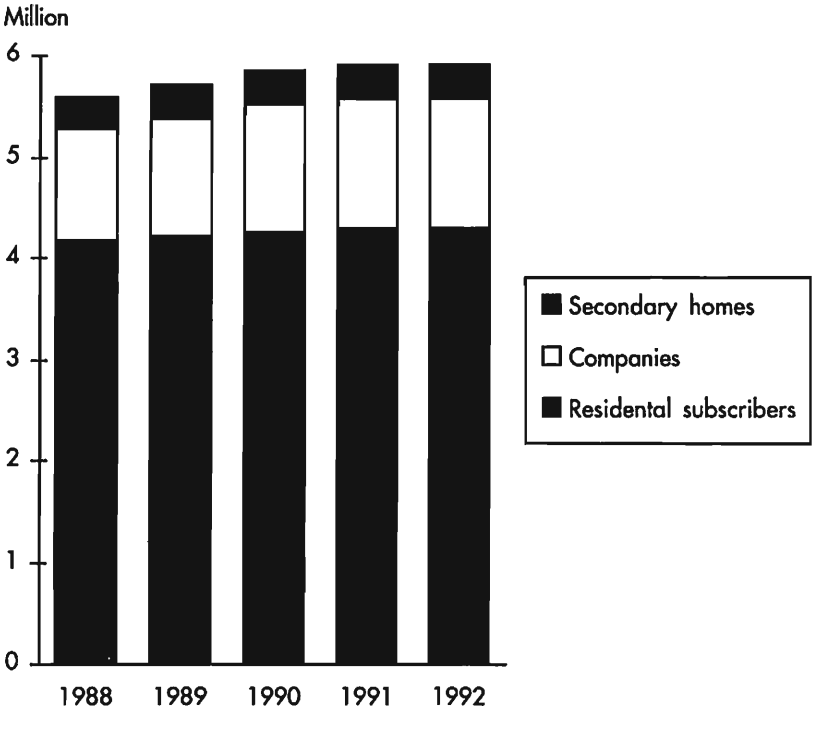
Fig. 38: An overview of the Swedish telecommunications market in 1992, compared to 1991, as seen by Televerket/Telia. For the time being, it is difficult to appreciate and measure the market outside Telia. Using a wide definition of telecommunications, the total Swedish market is estimated at some SEK 80 billion, SEK 35 billion being generated by Telia. See also fig. 45, p. 60.

* *The integration of telephone and fax has resulted in this figure being irrelevant – there are no longer any reliable figures related to "fax connections." Fax machines can be hooked up to any telephone outlet. Moreover, PCs are used as fax machines. Uncertainty is prevailing! See also fig. 46, p. 61.*

** *The figures include Telia subscribers only. In total, there are almost two million cable TV subscribers in Sweden.*

Source: Televerket/Telia AB

Telecom in Sweden
Mainlines in 1992



	1988	1989	1990	1991	1992
Secondary homes*	313	321	328	331	333
Companies	1,129	1,188	1,276	1,306	1,298
Residental subscribers	4,159	4,207	4,245	4,274	4,288
Total	5,601	5,716	5,849	5,911	5,919

* *A large proportion of Sweden's inhabitants are owners of secondary homes, in the countryside. This fact has led to separate connection charges for such homes, a majority of them being situated in isolated, rural areas.*

Fig. 39: By the end of 1992, the total number of telephone mainlines in Sweden was 5,919,000, distributed among secondary homes, companies, and residential users. The figure shows the growth rate of mainlines from 1988 and the distribution per type of user.

Source: Televerket Årsredovisning 1992 (Annual Report from Televerket 1992)

Telecom in Sweden – An International Comparison
Telephone Charges for Professional Users, January 1992

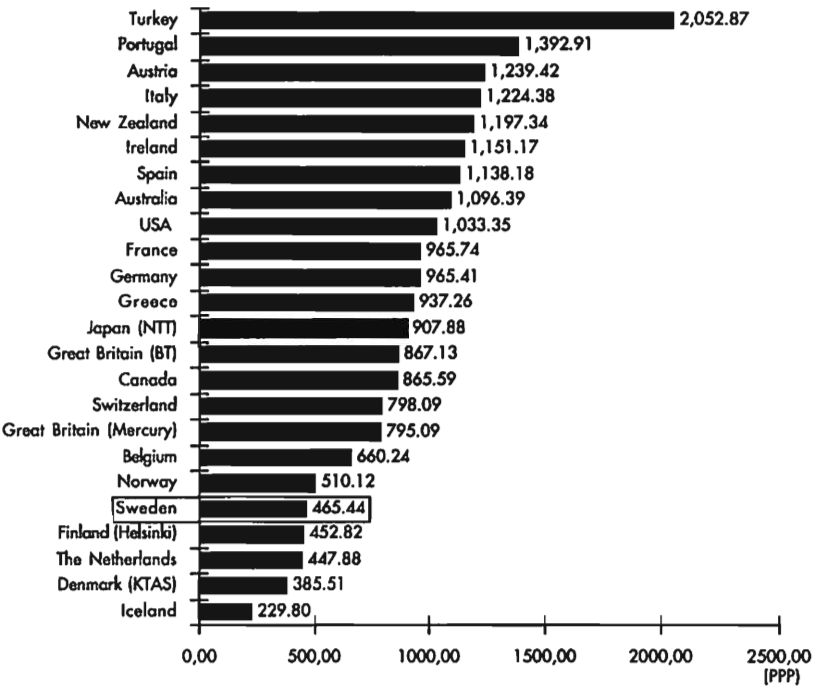


Fig. 40: The telephone charges of Swedish based corporations are modest in international comparisons. The chart shows corporate telecommunications spendings on January 1, 1992, expressed in the PPP of 1991, including taxes. PPP = Purchasing Power Parties, is a buying power measurement, based on the relative value of international currencies. The PPP is regularly calculated by the OECD and Eurostat. See also fig. 23, p. 39.

Sources: OECD/Televerket Årsredovisning 1992 (Annual Report from Televerket 1992)

Telecom in Sweden – An International Comparison
Telephone Charges for Residential Users, January 1992

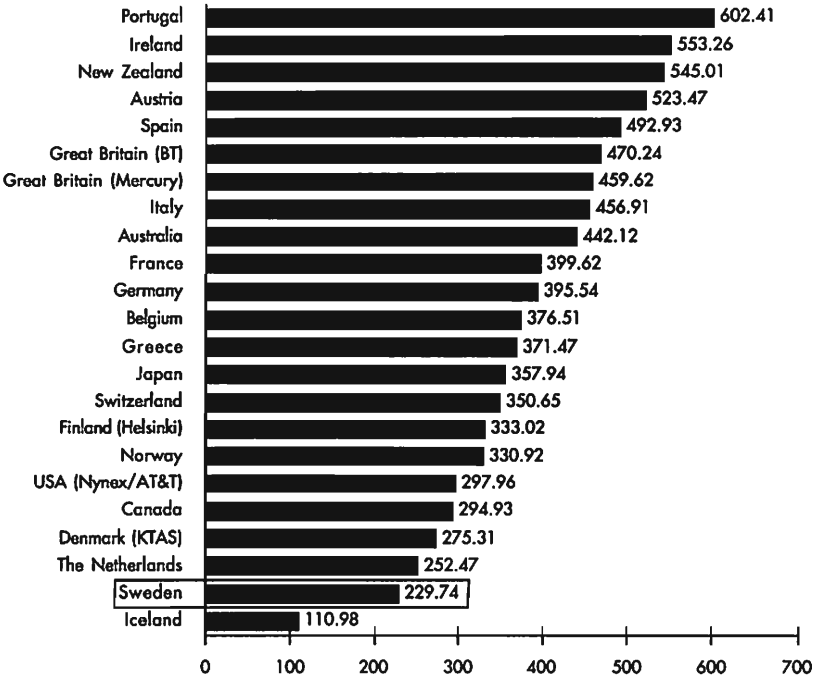


Fig. 41: From an international point-of-view, Sweden places well when it comes to offering residential telecom users low telecom charges. The chart shows the telecom costs for residential users on January 1, 1992, expressed in the PPP of 1991, inclusive taxes. PPP = Purchasing Power Parties, is a buying power measurement, based on the relative value of international currencies. The PPP is regularly calculated by the OECD and Eurostat. See also fig. 24, p. 40.

Sources: OECD/Televerket Årsredovisning 1992 (Annual Report from Televerket 1992)

Telecom in Sweden – An International Comparison
The Most Telephones in 1991

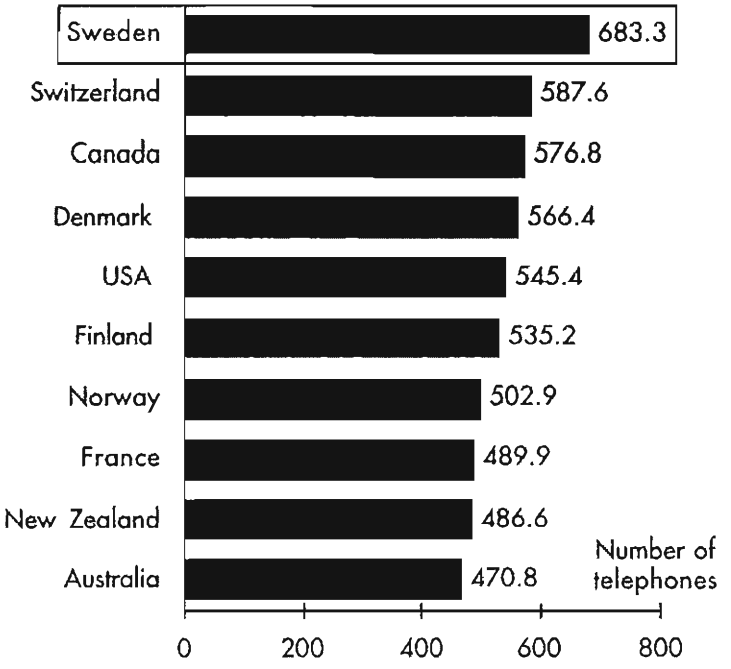


Fig. 42: In 1991, Sweden had the most telephone subscribers per 1,000 inhabitants in the world. The penetration rate for Sweden was 683.3 subscriptions per 1,000 inhabitants. The Americans had a penetration rate of 545.4 following Switzerland, Canada and Denmark.
Source: Svenska Dagbladet, July 30, 1993

Sweden's Transatlantic Telecom Connections

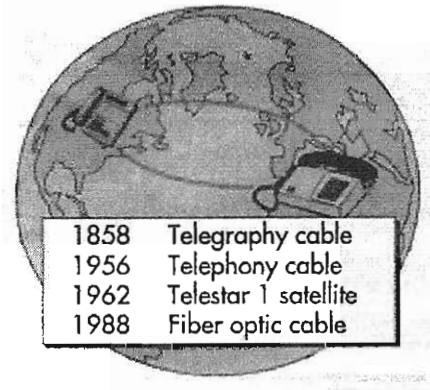


Fig. 43: Sweden's telecommunications connections to the USA have sometimes followed the bed of the Atlantic Ocean, sometimes been beamed across the atmosphere by satellite. The latest one, a fiber optic cable, follows the bed of the Atlantic. The figure shows the major connections and when they were installed.

Source: Ny Teknik/Teknisk Tidskrift, June 17, 1993

Telecom in Sweden
A Regulated Market from July 1, 1993

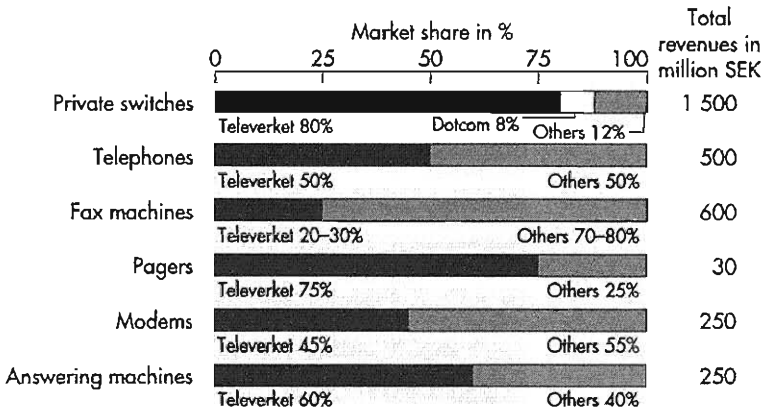


Fig. 44: As of July 1, 1993, Sweden took the final step from a liberal and unregulated telecom market – Televerket – to a regulated, competitive market. A number of operators are active in the Swedish market, but so far Televerket, as of July 1, 1993 called Telia AB, is a dominant supplier. The figure shows Telia's market shares in different segments of the Swedish market in June 1993. See also Appendix, p. 253.

Source: Dagens Nyheter, June 29, 1993

Telecom in Sweden
Telia Sells the Most Services

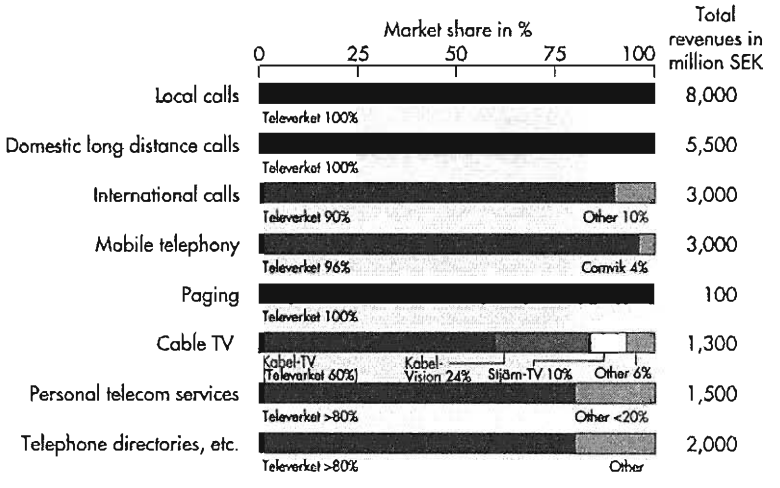


Fig. 45: Telia sells the largest amount of telecommunications services in Sweden. The operator also has the largest market share in all service segments in the country. The chart shows the market shares in percent for Televerket/ Telia in the different segments. This can be compared to the overview on page 53. Most likely, the figures go as far back as 1991, that is, before the Swedish market became competitive in the sense of having many different operators. No official research in the area is available, only "guesstimates" and evaluations made by individual experts. These figures represent such expert evaluations.
Sources: Gemini Consulting/Dagens Nyheter, June 29, 1993, Lena Larsson Meyer

Telecom in Sweden
Installed Fax Machines in 1992

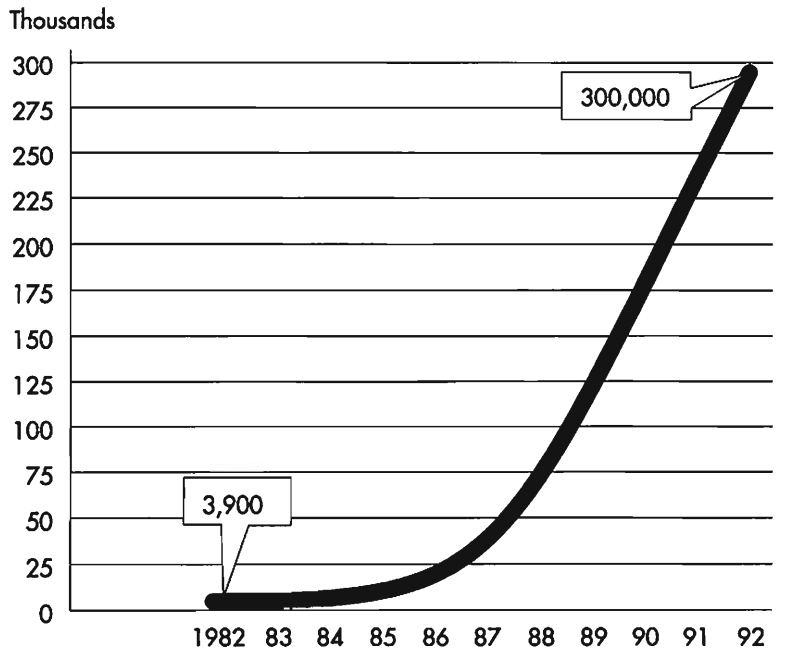


Fig. 46: In 1992, some 300,000 fax machines were installed in Sweden. The annual growth rate is thought to be some 60,000 new units. Japan, having the highest fax penetration in the world, has one fax machine for every 10 mainlines. Today, Sweden has one fax machine for every 20 mainlines. However, as PCs to an increasing extent are utilized as faxes, the real figures are likely to be considerably higher.
Source: Svenska Dagbladet, February 21, 1993

The ISDN Market in Sweden in 1992–97

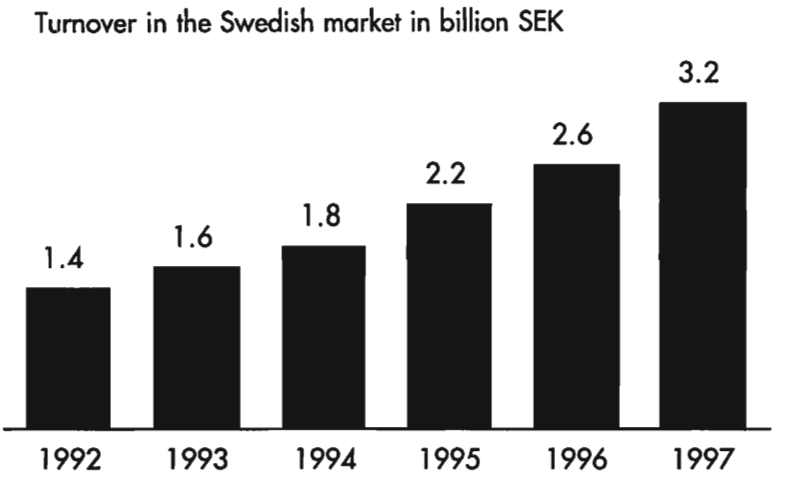


Fig. 47: For 1992, Frost & Sullivan estimate the Swedish ISDN market to be SEK 1.4 billion. In 1997, according to their forecasts, ISDN services totaling SEK 3.2 billion will be sold in Sweden. High transmission speed, high reliability, and multimedia support – voice, data, text, graphics, images, and video, are the properties thought to be most alluring to users. At the same time, the price of many services will decrease considerably and rapidly.
Sources: Frost & Sullivan/Computer Sweden, April 2, 1993

Telecom Costs in Sweden
Modem or ISDN for DomesticTransmission?

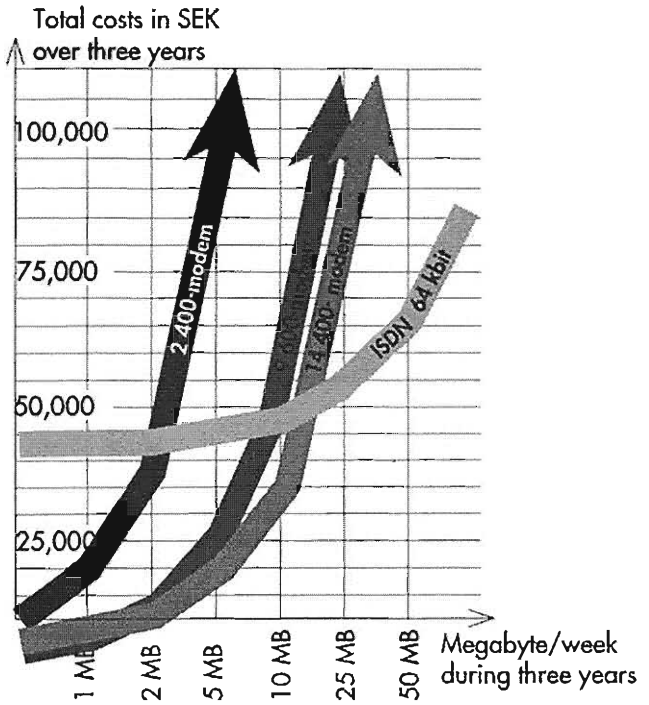


Fig. 48: The hardware costs are not neccessarily the most interesting part of the total cost picture when it comes to a choice between modem transmission and ISDN transmission services. In the long run, the overwhelming part of the costs could well become the telecommunications costs. Our figure demonstrates the total cost for transmission of a fixed amount of megabyte per week, from Stockholm to Gothenburg during a three year period. During our three year period, should there be a need to transmit, for example, 15 megabyte or more each week, ISDN turns out to be the most cost effective solution, in spite of the high installation costs of aproximately SEK 43,000.
Source: Computer Sweden, January 29, 1993, Thomas Zirn

Telecom Costs in Sweden
Cost Comparison: Modem vs ISDN

2,400 modem:
Approx. price: SEK 1,500

Amount of data:	Time required:	Local costs:	Long distance costs:
500 kB	42 min	SEK 4	SEK 59
1 MB	1 hrs 24 min	SEK 8	SEK 118
2 MB	2 hrs 48 min	SEK 16	SEK 235
5 MB	7 hrs	SEK 40	SEK 588
10 MB	14 hrs	SEK 81	SEK 1,176
25 MB	35 hrs	SEK 203	SEK 2,940
50 MB	70 hrs	SEK 410	SEK 5,880
100 MB	140 hrs	SEK 820	SEK 11,760

14,400 modem:
Approx. price: SEK 5,000

Amount of data:	Time required:	Local costs:	Long distance costs:
500 kB	7 min	SEK 0.60	SEK 10
1 MB	14 min	SEK 1.35	SEK 20
2 MB	28 min	SEK 2.70	SEK 39
5 MB	1 hrs 10 min	SEK 6.75	SEK 98
10 MB	2 hrs 20 min	SEK 13.50	SEK 196
25 MB	5 hrs 50 min	SEK 34	SEK 490
50 MB	11 hrs 40 min	SEK 68	SEK 980
100 MB	23 hrs 10 min	SEK 136	SEK 1,960

9,600 modem:
Approx. price: SEK 3,000

Amount of data:	Time required:	Local costs:	Long distance costs:
500 kB	10,5 min	SEK 1	SEK 15
1 MB	21 min	SEK 2	SEK 29
2 MB	42 min	SEK 4	SEK 59
5 MB	1 hrs 45 min	SEK 10	SEK 147
10 MB	3 hrs 30 min	SEK 20	SEK 294
25 MB	8 hrs 45 min	SEK 51	SEK 735
50 MB	17 hrs 35 min	SEK 102	SEK 1,470
100 MB	35 hrs	SEK 205	SEK 2,940

ISDN 64 kbit:
Approx. fixed price: SEK 43,000

Amount of data:	Time required:	Local costs:	Long distance costs:
500 kB	1 min	SEK 0.29	SEK 1.40
1 MB	2 min	SEK 0.29	SEK 2.80
2 MB	4 min	SEK 0.58	SEK 5.60
5 MB	10,5 min	SEK 1.20	SEK 15
10 MB	21 min	SEK 2	SEK 30
25 MB	52 min	SEK 5	SEK 73
50 MB	1 hrs 44 min	SEK 10	SEK 146
100 MB	3 hrs 28 min	SEK 20	SEK 292

Fig. 49: The tables compare the total costs for data transmission via three common speed modems, 2,400 bit/s; 9,600 bit/s; and 14,400 bit/s; to the costs of transmission via ISDN. The example is calculated on a fixed amount of data transmitted per week during a three year period. The time required for each amount of data is indicated. The fixed costs per alternative are indicated at the top, together with the type of transmission. The telecommunications costs, in SEK, have been calulated for local transmissions, in the same area code, as well as for long distance transmissions. It is important to remember that the actual performance of time needed for transmission can show important deviations, depending on the types of cables, amount of traffic, and compressing functions utilized.

Source: Computer Sweden, January 29, 1993, Thomas Zirn

Do You Know This About Telecom in Eastern Europe?

* There are very few telephone mainlines available to the inhabitants of the Eastern European countries. The OECD has estimated the average mainline penetration in the entire area to be 13.7 per 100 inhabitants. The Baltic states are leading, having a penetration rate of 22.2 mainlines per 100 inhabitants, while the Asian republics are far behind, having less than ten mainlines per 100 inhabitants. The largest short term problems in the area are, on the one hand, the inflexible organization of society, which may result in as many as ten different authorities being involved in decision making processes, and on the other, the total lack of common policies and tariffs decisions.
  Source: Communications Outlook 1993

* Telia International and Telecom Finland own 49 percent of the Estonian telecom operator, Esti Telefon. The challenge is to construct a modern and well functioning countrywide telecom infrastructure.
  Source: Dagens Nyheter, July 27, 1993

* In the beginning of 1993, the NMT 450 technology was implemented serving 1,000 subscribers in Moscow, and 3,000 subscribers in Bucarest.
  Source: Mobile Europe, November 1992

* In February 1992, a NMT 450 service was inaugurated in Vilnius, Lithuania. It has been expanded to the cities of Kaunas and Klaipedia. One of the partners is Telecom Denmark, that also has set up a satellite link to Lithuania.
  Source: Mobile Europe, August 1992

* Poland has some 3,420,000 mainlines serving a population of more than 38 million. In 1992, a mobile telephone facility, compatible to the NMT 450 technology, was opened.
  Source: Mobile Europe, August 1992

* The Republic of Tartarstan has decided to replace its old, low capacity telecom network, with a cordless digital system from American Hughes Network System, at a cost of US$ 48 million. For a start, it can service 50,000 subscribers. During 1993, the inhabitants of eight cities will be serviced by the new telecom network. By the autumn of 1992, about five percent of all homes in Tartarstan had telephones.
  Source: Mobile Europe, October 1992

* The Latvian mobile telephone operator introduced its new NMT 450 system for commercial usage at the end of 1992. The first phase covers the cities of Riga, Ventspils, Daugovpils, Rezekne, and Valmiera. The system was delivered by the Finnish company, Nokia. An extensive training program is part of the delivery. Telia is one of the partners.
  Sources: Mobile Europe, December 1992/Telia

* Telefonica Romania has ordered its NMT 450 system from Ericsson. During the first quarter of 1993, 3,000 subscribers in Bucarest started using mobile telephony.
  Source: Mobile Europe, December 1992

Telecom in Eastern Europe
Estimated Penetration in 1988 and 1991

	Mainlines 1988 (thousands)	Inhabitants 1988 (thousands)	Mainlines per 100 inhabitants 1988
Poland	2,953	37,800	7.8
Czech Republic and Slovakia	■ 2,226	15,624	■ 14.2
Hungary	■ 996	10,590	■ 9.4
Romania	■ 2,359	23,000	■ 10.3
Bulgaria	■ 2,180	9,000	■ 30.0
Eastern Germany	1,761	16,661	10.6
Eastern Europe total	11,047	112,645	9.8
Former Yugoslavia	3,267	23,641	13.8
Former Soviet Union	33,991	283,100	12.0
Western Europe (EU)	▲ 122,700	327,000	▲ 37.5
The OECD countries	341,303	825,000	41.4

■ = estimate for 1991
▲ = estimate for 1989

Fig. 50: Compared to Western Europe and the OECD countries, telecommunications in the countries of the former Eastern Block are underdeveloped, for the time being. Mainlines, services, service quality, i. e. some of the measurements used in the West, give generally much lower results when applied to the East. Moreover, the overall costs are likely to be considerably higher, although it may be difficult to make certain statements in the present currency situation. See also fig. 52, p. 69 and 53, p. 70.
Source: Mobile Europe, October 1992

Telecom in Eastern Europe
At Western Level by 2010

	Mainlines needed, in thousands, (a)	Annual growth rate needed, percent (a)	Costs in billion US$ (b)
Bulgaria	1,938	6.7	4
Czech Republic & Slovakia	4,123	9.4	8
Hungary	3,378	14.2	7
Poland	12,167	14.6	24
Romania	7,500	15.1	15
Total	29,108	–	58 (c)

(a) The figures are based on the 1988 penetration rate
(b) Based at an average cost of US$ 2,000 per mainline
(c) Rounded-off

Fig. 51: The telecom operators of the Eastern countries have one common objective: by 2010, to reach the same penetration rates for telecom services as that of the Western countries. The table shows the growth rate required, how many mainlines are needed, and the resulting investment per country, in order to reach the objective. See also fig. 52, p. 69 and 53, p. 70.
Source: Mobile Europe, October 1992

Telecom Network and Growth 1992 – 2005
The Commonwealth of Independent States

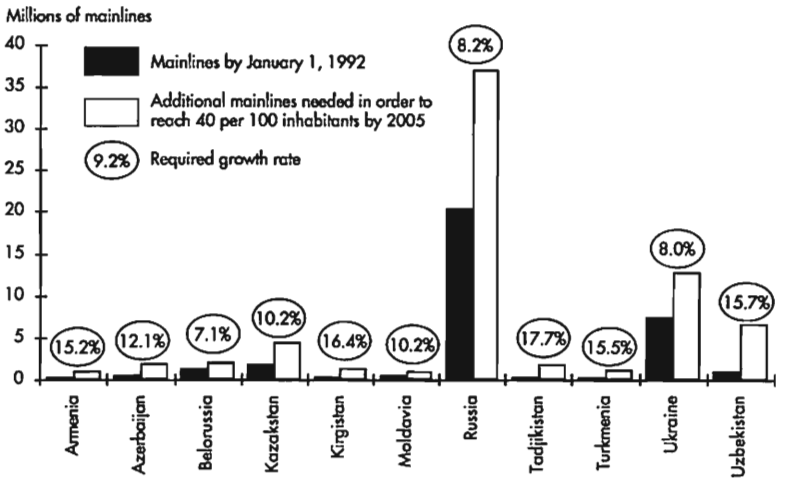


Fig. 52: At present each state in the Commonwealth of Independent States holds responsibility for its own telecommunications development. The diagram shows how many mainlines were available in each state in the Commonwealth on January 1, 1992. It also shows how many additional mainlines are needed in order to reach a penetration rate of 40 mainlines per 100 inhabitants by 2005, and what percentage growth rate this would entail.
Source: Communications Outlook 1993

Telecom Networks and Growth in Eastern Europe 1992–2000 – Bulgaria, Czech Republic & Slovakia, Hungary, Poland, Romania

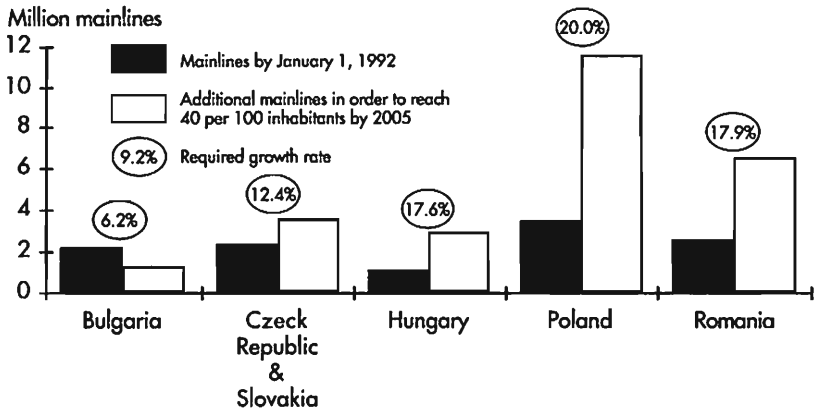


Fig. 53: The diagram describes the situation of the telecom networks in the Eastern countries of Bulgaria, the Czech Republic, Slovakia, Hungary, Poland, and Romania. Indicated are the number of existing mainlines per 100 inhabitants on January 1, 1992, as well as how many additional mainlines are needed to reach a penetration level of 40 mainlines per 100 inhabitants by 2005. Also shown are the required growth rates, in percent, per country, to reach the objective.

Source: Communications Outlook 1993

Do You Know This about Satellites, Cable TV, and Home Electronics?

* In 1989, according to French Arianespace there were a total of 83 satellites in civilian use, circling the earth. Seventy percent of all satellites launched – except for those launched by the former Soviet Union – are used for communication purposes. Sixteen percent are dedicated to earth observation and meterological applications, while the remaining 14 percent serve scientific purposes. By 2010, there will be in total, 150 – 200 civilian satellites in space.

* Home shopping via television is rapidly turning into the latest fad in USA. Today, products for more that US$ 2 billion annually are ordered by viewers, and the forecasts are that the service will show an annual growth rate of 20 percent over the next few years. Traditional TV advertising is replaced by "infomercials," longer informational programs telling about products in entertaining forms. Some large retailers plan to run their own TV channels. Everybody seems to be eagerly awaiting the digital TV system, that will offer sharper pictures and which is likely to be interactive. Which means, telephones will no longer be needed to place an order.
Source: International Business Week, July 26, 1993

* Video on Demand service, VOD for short, can be transmitted via ordinary copper lines directly to the home, thanks to a technology based on high frequency signalling, combined with a signal microprocessor. Trials including fiber cable to the homes are under way. During 1994, at least six American states will have VOD.
Source: International Business Week, November 16, 1992

* During the next few years, the European satellite companies are planning to launch satellites having the capacity to distribute more than 500 digital TV channel to some 150 million homes in Europe. Today, only 45 million of these homes have satellite TV via cable or satellite dishes. All that is needed in order to receive the 500 new channels, is a small, digital home satellite dish.
Source: Svenska Dagbladet, June 15, 1993

* Cable TV operators are offering their clients an ever increasing number of services, from telecommunications to specialized films. In spite of this, users in many countries seem to hesitate. For instance, in the UK, eight million homes can connect to cable systems, but only 500,000 have chosen to do so. By January 1993, 2.5 million British homes had installed their own home satellite dish.
Source: New Scientist, May 1, 1993

* On May 17, 1993, a new form of collaboration was announced in the US – Time Warner and US West agreed to develop a hydrid network. Time Warner, the second largest cable TV operator in the USA, having some seven million subscribers, and US West, will develop and offer broadband services and telephony. Other similar, intended collaborations have been announced, for instance one between TCI, the largest cable TV operator in the US, and AT&T.
  Source: Sveriges Tekniska Attachéer

* The annual world market for video games is now worth more than US$ 10 billion. It is forecast to grow rapidly over the next few years, games for grown-ups have also been introduced.
  Source: Time Magazine, September 27, 1993

* The European cable TV operators have some 32.5 million subscribers. In 1992, according to AID, the satellite industry organization in Europe, the cable tv operators generated revenues worth almost SEK 30 billion.
  Source: Svenska Dagbladet, June 17, 1993

Worldwide Television Sets and Video Players 1992

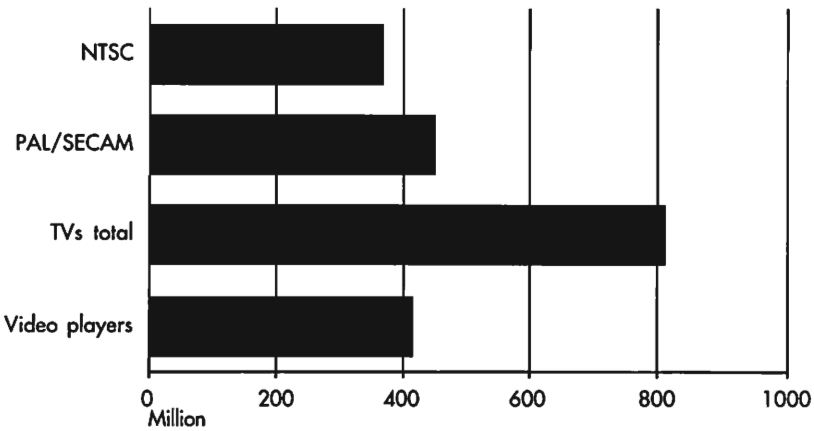


Fig. 54: Almost 400 million television sets worldwide are adopted to the American NTSC standard, while some 420 million are PAL/SECAM compatible. These two standards, at least in theory compatible, are the ones most European countries use. In total, there are more than 800 million TVs worldwide. The number of video players is estimated at 400 million worldwide.
Source: Televerket, "Tele" no. 1, 1992

Television Sets and Video Players in the OECD Countries in 1990

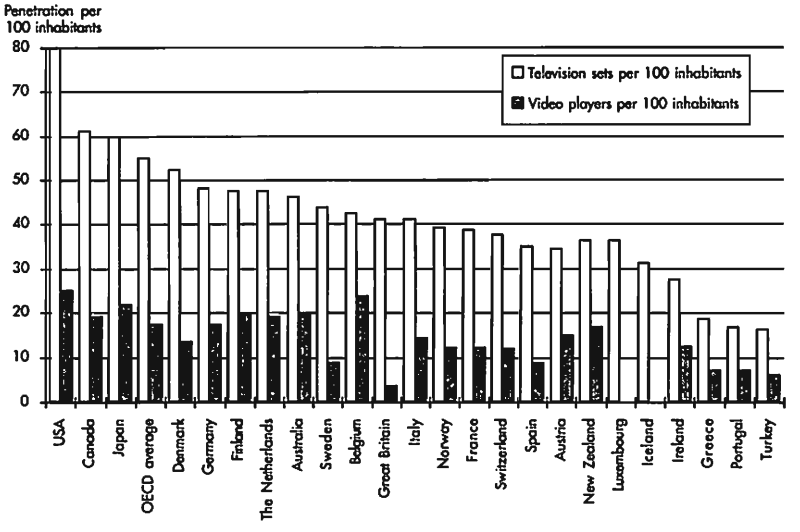


Fig. 55: USA, Canada, Japan, and Denmark have the highest penetration rates for television sets per 100 inhabitants. Belgium and Canada have the highest penetration rates for video players, according to OECD research. According to Swedish research carried out in 1993, this picture does not project the correct information about Sweden. Research carried out by PUB, the special research department related to the Swedish public broadcasting corporation, shows the following figures with the correct numbers of Swedes possessing television sets and video players for the years 1987, 1991, and 1993:

	1987	1991	1993
TV	53%*	76%*	95%
Video	34%	58%	69%

** Only television sets having remote controls*

7.9 million Swedes, belonging to 3.8 million households, are watching more than five million television sets. 400,000 persons, or five percent of the total population, do not possess a television set at all. 69 percent of the Swedish population have a video player. It is important to the context, that, in for instance USA and Canada, actual television sets are counted, while the Swedes have to have a license for each household having a television set.

Sources: Communications Outlook 1993/PUB "Hemelektronik 93"

Cable TV in the OECD Countries in 1990

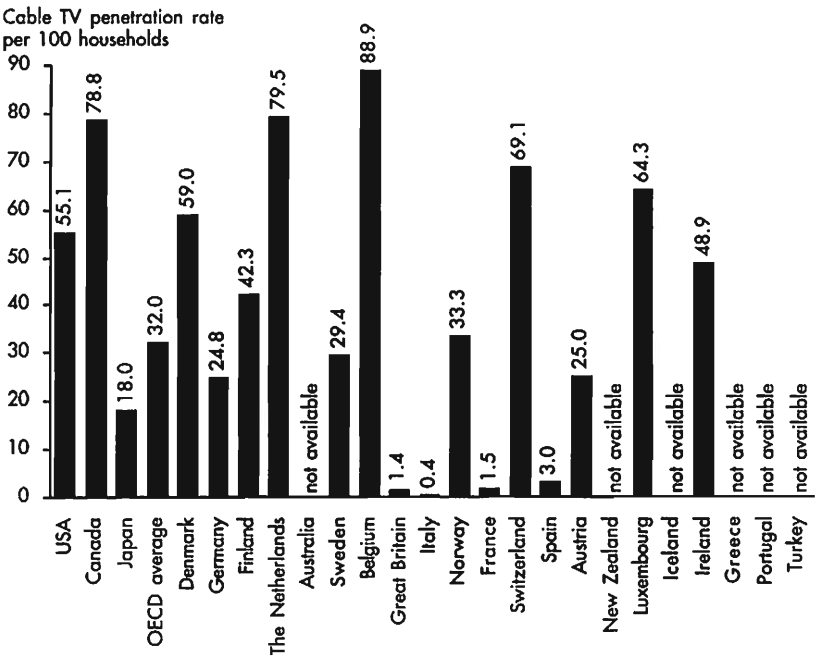
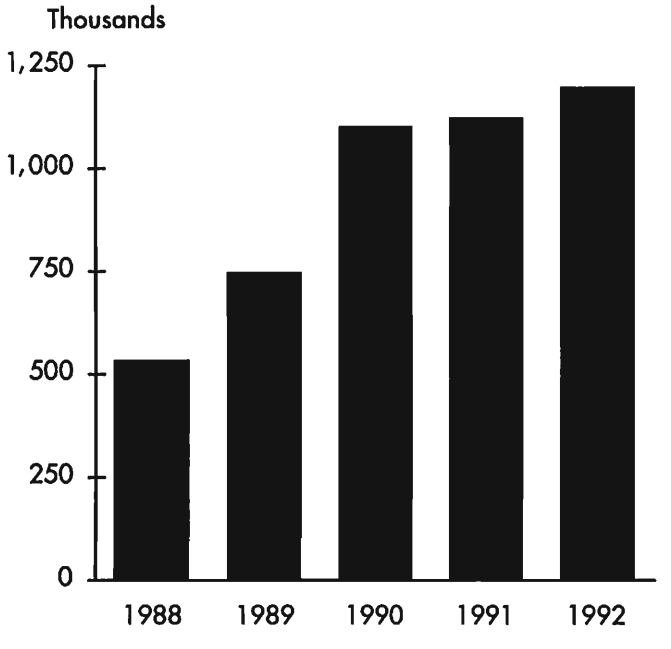


Fig. 56: In 1990, the cable TV penetration rate per 100 households among the OECD countries was the highest in Belgium, The Netherlands, Canada, and Switzerland. In the USA, cable TV is used for offering new services such as home shopping, and in the UK, cable TV operators offer cheap telephony. In Sweden, some two million inhabitants could connect to cable networks via different cable TV operators. Moreover, about 10 percent of the population had their own satellite dishes in 1993. Since the Swedish market is totally free – no concessions are needed – there is a tendency to underestimate its real size. It is difficult to correctly access to what extent the 3.8 million Swedish households are connected to cable TV.

Sources: Communications Outlook 1993/PUB "Hemelektronik 93"

Telia's Cable TV Subscribers in 1992



Number of subscriptions in thousands				
530	744	1,100	1,122	1,195

Fig. 57: The number of subscriptions to Telia's cable TV network has been growing during the period 1990–92. In 1988, there were 530,000 subscriptions in the country. In 1992, the figure had more than doubled, to 1,195,000. Telia has some 60 percent of the Swedish cable TV market. By the end of 1992, there were almost two million subscribers. See also fig. 45, p. 60.
Source: Televerket Årsredovisning 1992 (Televerket, Annual Report 1992)

Interactive Television in USA
Forecast for 1996

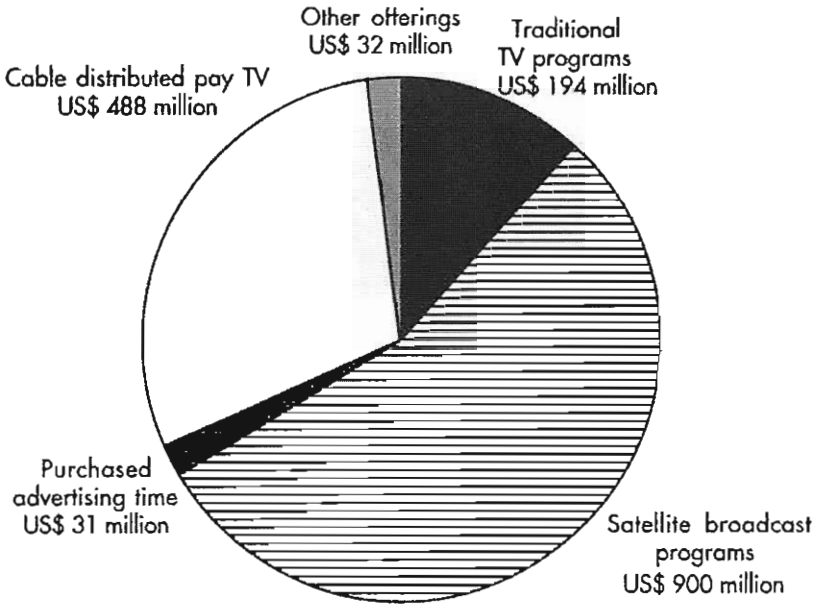


Fig. 58: Interactive television is an industry much in the focus of investment – and attention – in the USA. According to Frost & Sullivan, the total market value will reach some US$ 1.65 billion by 1996. The chart shows the distribution per market segment, calculated in dollar value, for 1991, in million of US$. The total for the year was US$ 1.546 million.
Sources: Frost & Sullivan/STATT, Sveriges Tekniska Attachéer

Consumer Electronics in USA in1993

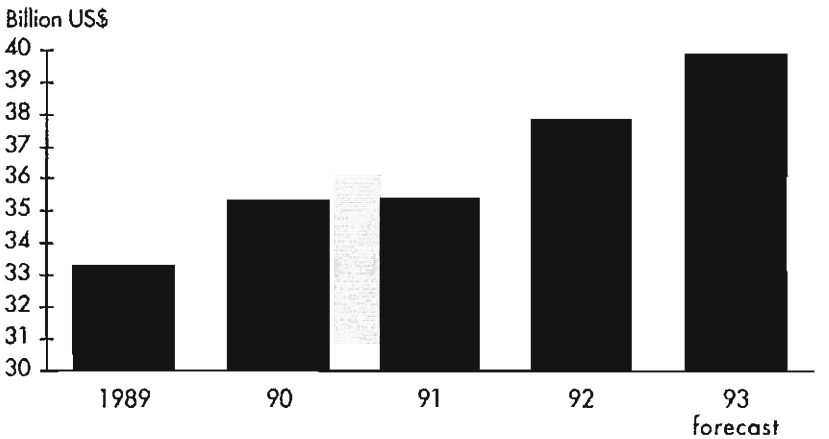


Fig. 59: In spite of less than brilliant economic conditions, it seems as if sales of consumer electronics are growing faster in the USA than predicted. One forecast indicates a total growth of 5.6 percent for 1993, compared to 3.4 percent in earlier forecasts. According to specialists, the main reasons for this growth are, that consumers are buying more color television sets and camcorders than predicted, and that prices have not dropped as drastically as once feared. The total sales value for 1993 is close to US$ 40 billion.
Sources: Electronic Industries Association/The Economist, June 19, 1993

Consumer Electronics of the Future
DSP Microprocessors in the World

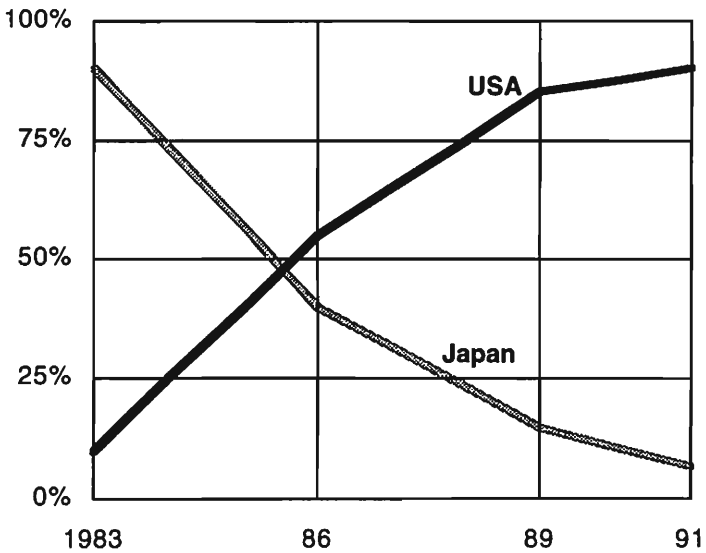


Fig. 60: DSP, Digital Signal Processing, will be at the heart of new technology for consumer electronics products in the next few years. Video telephones, HDTV, multimedia based PCs, very small, multifunction pocket telephones, and intelligent toys, are some examples of products on their way to the market. DSP makes the products cheap enough to be available to anyone who wants them. In 1990, the global home electronics market totalled US$ 100 billion. In 1991, home electronics products valuing US$ 32 billion were sold in the USA. The diagram shows the distribution of DSP products, in percent, in the USA and Japan for the period 1983–91.
Source: Fortune, April 20, 1992

Consumer Electronics of the Future
Global Sales of DSP Processors

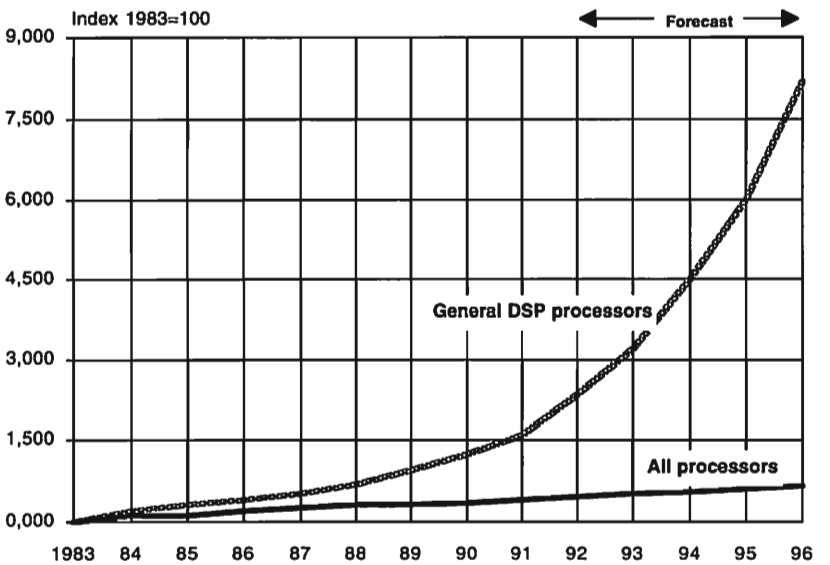


Fig. 61: The global sales of DSP (Digital Signal Processing) processors are growing three times as fast as general semiconductor sales. The diagram shows the development of the growth of DSP sales, compared to other processors, and gives a forecast up to 1996. The user areas are manifold – airlines use them for providing their passengers with electronic mail access, telephones, fax and PC links in their individual seats. The automotive industry is using them for more efficient muffling – every month new applications is introduced.

Source: Fortune, April 20, 1992

Do You Know This about Mobile Communications?

* GSM has two interpretations – one French one, Group Speciale Mobile, and one English one, Global System for Mobile Communications. ADC means American Digital Cellular, and PDC, Pacific Digital Cellular. GSM, ADC, and PDC are the three existing global standards for today's digital, mobile communications. GSM refers to European standards, ADC to the North American ones, and PDC to Japanese standards.
  Source: Kontakten no. 3, 1993

* The Ericsson systems for mobile telephony have more than 60 percent of the global market. At present, Ericsson is the only company in the world possessing the technology to integrate all three digital, mobile standards existing today.
  Source: Kontakten no. 3, 1993

* By January 1993, the GSM subscribers of the world were found in the following markets, according to "guesstimates" by the industry:

France	**1,500**
Germany	**160,000**
The Nordic area	**6,000**
Portugal	**5,000**
Italy and UK	**3,000**
Total	**175,500**

  In total, there were 21,574,200 mobile telephone subscribers worldwide in January 1993.
  Source: Ericsson Reference List Cellular Systems, January 1993

* Televerket Radio, the mobile communications division of Televerket/Telia, added 88,000 new subscribers to the NMT systems during 1992. By the end of the year, there was a total of 660,000 users. (Since July 1, 1993, the company has changed its name to Telia Mobitel.)
  Source: Verksamhetsberättelse 1992, Televerket Radio/Annual Report 1992, Televerket Radio

* Simultaneously, as digital technology is making progress in the advanced markets, analog mobile technology is making progress in the Eastern countries.
  Source: Kontakten no. 3, 1993

* Telia International, and the Finnish and Norwegian public telecom companies, have joined forces with three Russian telecom operators in a consortium, in order to build a GSM network for mobile communications in the St Petersburg area. St Petersburg, with some 15 million inhabitants, is forecast to have some 70,000 to 200,000 GSM subscribers within 10 years.
  Source: Dagens Nyheter, July 27, 1993.

* By the end of 1992, Televerket had 125,900 users of their paging services. 20,000 were new Minicall users. One reason for the important growth of many new customers, specifically young ones, is the fact that Televerket suppressed the fixed charges of the service, and passed the charges on to the one who calls.
  Sources: Verksamhetsberättelse 1992, Televerket Radio/Annual Report 1992, Televerket Radio/Dagens Nyheter, July 30, 1993

Global Mobile Telephony
Penetration Level by January 1993

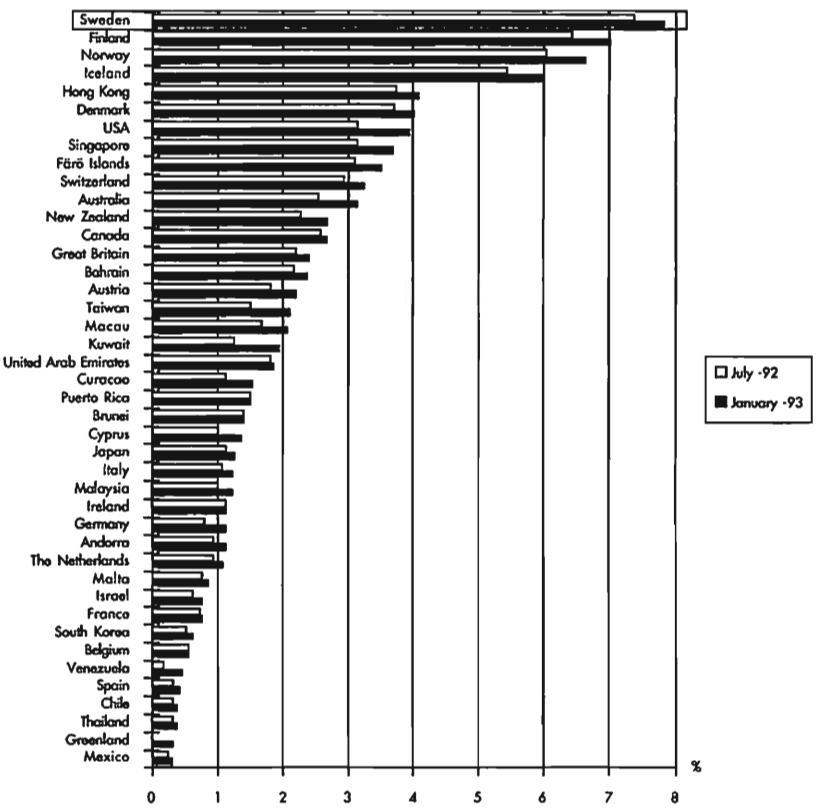


Fig. 62: This table shows the global penetration rates for mobile communications, calculated as a percentage of the total population of each country. The table also compares the status between July 1992 and January 1993, giving an indication of the rapid growth.
Source: Ericsson Reference List Cellular Systems January 1993

Mobile Telephony in some OECD Countries 1981–91
Penetration since Introduction Date

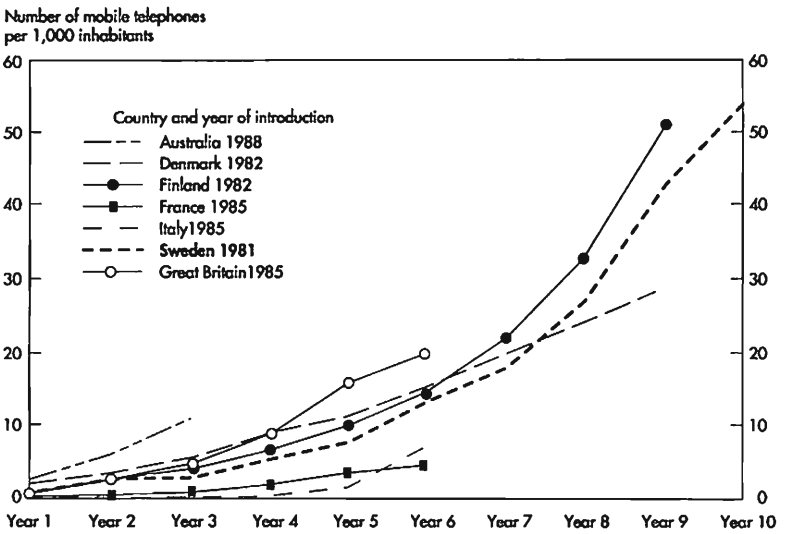
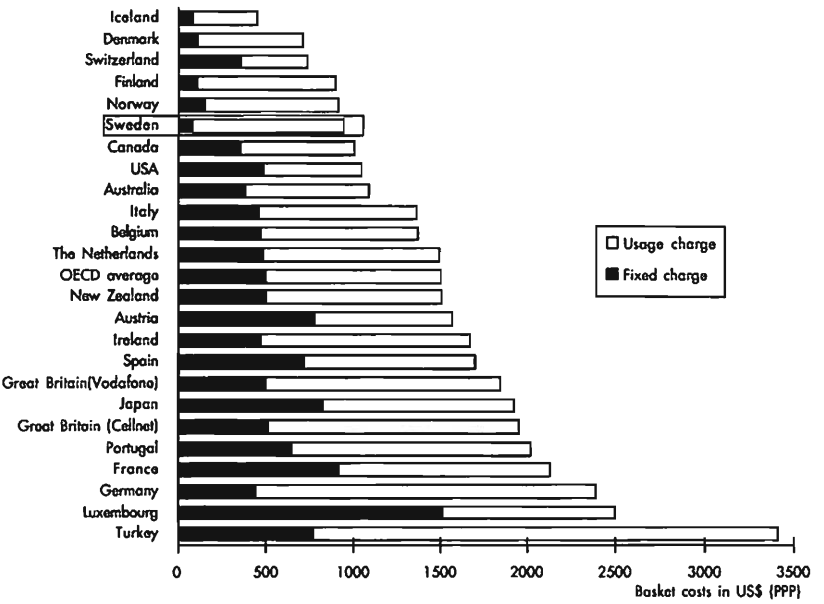


Fig. 63: In Sweden and Finland, mobile telephones have become more widely used than in most other countries. Our chart shows the growth rate of the total number of mobile telephone users, per 1,000 inhabitants, in some OECD countries for the period of 1981–91.
Source: Communications Outlook 1993

Costs for Mobile Telephony in the OECD Basket
January 1992



(PPP= Purchasing Power Parties is a measurement for the relative value of international currencies expressed in buying power.)

Fig. 64: A comparison of the costs for mobile telephony in the OECD countries in January 1992, expressed in US$ (PPP), excluding tax. The charges are divided into usage charges and fixed charges. According to this comparison, Swedish users enjoy the lowest costs. In Great Britain, there are two operators, one of them, Vodafone, is a partner to Swedish NordicTel.
Source: Communications Outlook 1993

Mobile Telephony in Western Europe 1985–96

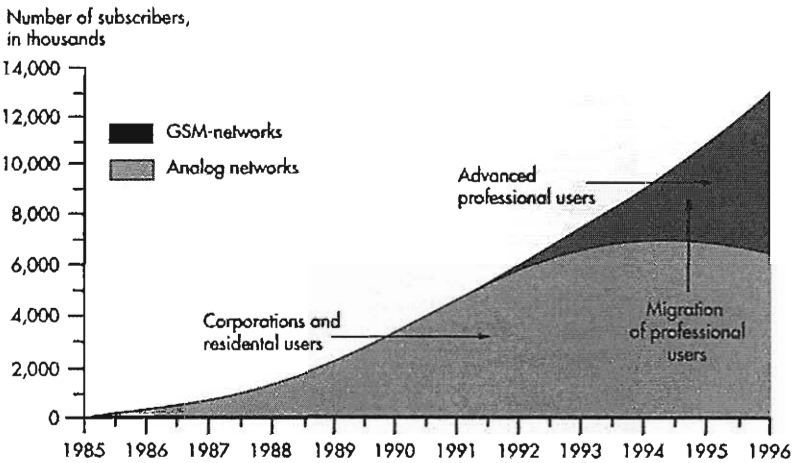


Fig. 65: The penetration level of mobile telephony in Western Europe grew from an average of 1.2 percent of the total number of inhabitants in 1991, to 3.4 percent in 1993. The number of users will grow from 4.5 million to 12.5 million during the same period. The research company BIS is also forecasting that advanced professional users will leave the analog networks in favor of the digital GSM ones, while new users will chose the analog technology. In this study, the Scandinavian countries are regarded as the general leaders in the development of mobile telephony. Germany, that went into mobile communications relatively late, was leading the penetration of GSM by January 1993. However, it is important to bear in mind that it is difficult to view Europe as one single unit – the differences between the countries are considerable. Scandinavia and the UK, for instance, have high percentages of users in total, while Germany and France so far have had low penetration rates, which explains why the growth rates seem so dramatic. Considering this, it is rather natural that GSM shows the fastest growth rates in these countries.

Sources: BIS/Mobile Europe November 1992

Mobile Communications in Europe
Subscribers to Analog and Digital Systems in December 1992

Country	Operator	No. GSM sub. end 1992	No. analog sub. end 1992	
Austria	PTT	–	170,000	
Belgium	Belgacom	–	60,000	(max.cap.)
Denmark	Tele Mobil	confidential	210,000	
	Dansk Mobiltelefon	confidential	n.a.	
Finland	Tele Radiolinja	1,000	352,000	
France	France Telecom	several hundred	330,000	
	SFR	–	111,500	
Germany	Telekom	n.a.	771 890	
	Mannesmann Mobilfunk	100,000	n.a.	
Great Britain	Cellnet	–	605,000	
	Vodafone	50	780,000	
Greece	Panafon	–	n.a.	
	STET Hellas	–	n.a.	
Ireland	Telecom Eireann	–	42,000	
Italy	SIP	–	780,000	
Luxembourg	PTT	–	1,200	
The Netherlands	PTT	–	175,000	
Norway	Tele-Mobil	100	283,000	
	Netcom	–	n.a.	
Portugal	TMN	–	27,966	(incl. GSM)
	Telecel	3,000	n.a.	
Spain	Telefónica	–	181,000	
Sweden	Tvt Radio	confidential	646,037	
	Comvik	confidential	20,000	
	NordicTel	confidential	n.a.	
Switzerland	PTT	230	215,500	
Turkey	PTT	–	58,000	

Fig. 66: Digital mobile technology is still an emerging technology, having relatively few users. Because of this, direct comparisons to the situation of the long established analog technology, and its high penetration rates, become slanted. The GSM networks, based on digital technology, are not likely to come close to the large number of users of the analog technology networks (such as NMT), until 1996 according to some experts. More services are rapidly being introduced by the operators, which are competing head-on for the users' favors, especially in the Scandinavian markets, which have the largest penetration rates in the world.
Source: Public Network, February 1993

European GSM Tariffs In May 1993

GSM operator	Connection charge	Monthly charge	User charge per minute	
Currency = ECU			High traffic	Low traffic
Belgacom	75.03	37.51	0.38	0.18
Sonofon	73.81	7.118	0.25	0.125
TeleDanmark	73.81	8.435	0.29	0.14
Telecom Finland	16.39	8.19	0.26	0.14
Radiolinja	5.37	n/a	0.27	0.13
France Télécom	53.18	54.69	0.76	0.38
SFR	53.18	47.85	0.73	0.38
Telekom DI	33.48	36.06	0.62	0.26
D2-Privat	35.03	35.03	0.64	0.25
SIP	106.8	27.04	0.35	0.11
P&T LuxGSM	32.44	32.44	0.29	0.29
TMN	68.49	47.40	0.53	0.23
Telecel	65.86	47.56	0.53	0.27
Televerket	33.67	13.09	0.38	0.26
Comvik	33.67	11.22	0.37	0.25
NordicTel	39.28	14.03	0.37	0.25
Swiss PTT	0.00	36.19	0.28	0.12
Vodafone	73.98	36.99	0.40	0.40

Fig. 67: This table is a attempt to compare the tariffs for connection to, and usage of, GSM networks in Europe. The charges have been calculated by converting the local currency charges into ECU. However, due to the unstable currency situation, this comparison must not be regarded as providing absolute figures – rather, it should be read as an indicator of the relative relations between the operators. One more factor making comparisons like this one almost impossible, is the highly variable taxation levels between the countries.
Source: Mobile Europe, May 1993

GSM Plans in Europe by the Summer of 1992

Country	Operator	Introduction	Coverage by end of 92	National coverage
Austria	PTT	End 92	–	End 94
Belgium	Belgacom	Sept. 91/ Nov. 92	80% of country	Start 93
Denmark	TeleDanmark Dansk MobilTelefon (Sonofon)	July 91/June 92	70% of population	End 94
Finland	Finska tvt.	March/Oct. 92	Helsinki + 6 cities	1996
	Radiolinja	July/Dec. 91	50 % of pop.	1996/97
France	France Télécom	Dec. 91/July92	"Lille - Nice"	1995
Germany	DBP Telekom	July 91/Aug. 92	80% of pop.	1993
	Mannesmann Mobilfunk	July 91/End 92	80% of pop.	1994
Great Britain	Cellnet	July 91/93	50% of pop.	End 93
	Vodafone	Dec. 91	90% of pop.	End 93
Greece	Two applications for license	–	Both 85% of pop.	Within 6 years
Ireland	Telecom Eireann	None/ May/June 93	–	1996/97
Italy	SIP	None/92	80% of pop.	1994
Luxembourg	Luxemburg P&T	End 92/ Start 93	100%	Start 93
The Nether-lands	PTT Telecom	Start 93/ End 93	–	End 95
Norway	Tele-Mobil	Oct. 91/ 92	65% of pop.	1995
	Netcom	March 93	–	Start 95
Portugal	TMN	June/Sept. 92	Selected areas	1993/94
	Telecel	July/Oct. 92	85% of pop.	1995
	Telfónica	Test start 93	–	1996
Sweden	Telia Radio	July 91/Nov. 92	Large cities	1995
	Comvik GSM	March /Sept. 92	65% of pop.	End 94
	NordicTel	March /Sept. 92	Large cities	End 94
Switzerland	PTT	Oct. 91/92	Airports Large cities	1997
Turkey	PTT	June 92	Large cities	1997

Fig. 68: On May 13, 1992, the GSM specification was finalized, making it possible for the European operators to test GSM in their home markets. How fast GSM will penetrate in the various markets, depends partly on which services are offered, and partly on how technology problems can be solved.
Source: Public Network Europe, July/August 1992

Mobile Networks in Asia and Oceania by Autumn 1992

Country	Number of mobile subscribers	Penetration rate per 1,000 inhabitants
Australia	450,000	26.15
Bangladesh	400	–
Brunei	4,071	15.07
Philippines	37,000	0.60
China	128,763	0.12
Hong Kong*	200,000	34.14
Indonesia	18,197	0.10
Japan	1,378,100	11.16
Korea	200,000	46.70
Macau	9,200	18.24
Malaysia	207,000	11.59
New Zealand	86,000	25.29
Pakistan	4,000	0.04
Singapore	100,000	37.17
Sri Lanka	2,500	0.10
Thailand*	215,502	3.77

* New operators were installing themselves in these countries.

Fig. 69: Japan has 40 percent of the mobile communications systems of the region. The European digital standard, GSM, is competing with the American and Japanese systems in the various markets. When this was translated GSM had been decided for Australia, Hong Kong, India, New Zealand, and Singapore. In many of the less industrialized countries, digital technology is being rapidly introduced.

Source: Public Network Europe, December 1992/January 1993

Mobile Telephony Development in Sweden
Mobile Telephones Sold 1981–92

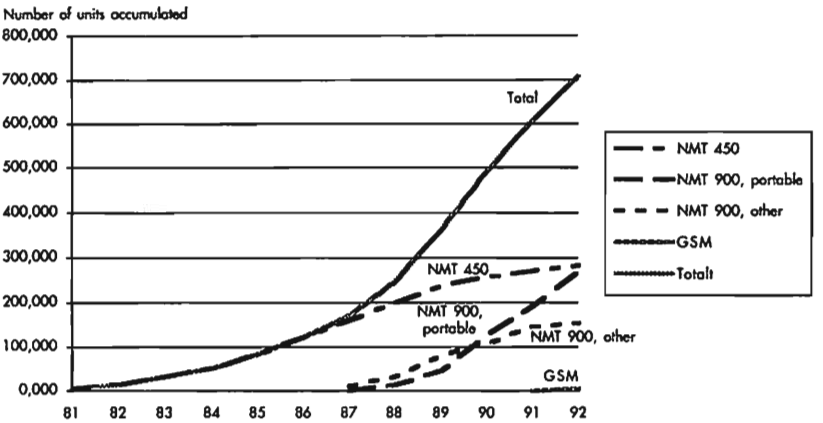


Fig. 70: The graph shows the accumulated number of mobile telephones sold in Sweden during the period 1981–92, divided per type of network. In June 1993, a new sales record was established, 18,000 telephones sold in one single month. For 1993, the industry as a whole expected to sell 150,000 mobile telephones. It is sales to private users that is growing most rapidly. Industry experts estimate that 35,000 GSM telephones were sold in Sweden in 1993.
Source: Mobiltelefon, informercial from MLT (The Swedish Mobile Telephony Industry Association) in Svenska Dagbladet, September 14, 1993

Mobile Telephony in Sweden
Number of NMT Users in October 1992

NMT-450	247,495
NMT-900	368,885
Total	616,380

Fig. 71: The number of NMT users has continued to grow during 1992, even if the growth was slower than predicted, compared to the earlier growth rate, which from August 1988 to April 1991 was 163 percent. In December 1992, Televerket Radio reported the total number of mobile telephony subscribers to be 660,000. (Editors note: In September 1993, the number of NMT users in Sweden was 710,000, and there were 90 mobile telephones per 1,000 inhabitants. In Stockholm, 20 percent of the population have mobile telephones – Stockholm has a higher penetration rate for mobile telephones than Manhattan!)
Sources: Teldoks Årsbok 92/Televerket Radio 92, Verksamhetsberättelse (Annual Report)/ Mobile Europe, October 1992

Do You Know This about Computers?

* Productivity increase resulting from the introduction of computers has been, so far, more hype from the computer suppliers and marketers in order to increase sales, than real fact. The only measurable productivity increases have shown a difference of between "before" and "after" of less than one percent, and this is for very large computer investments. Now, some 40 years after IBM sold their first mainframe, a number of users in the USA, as well as in Europe, can actually demonstrate that computerization dramatically contributes to increased productivity. This is not least true for the service industries, which for a long time have been the real slow movers. The ICA Retailers in Sweden is a good example of how constructive new thinking has resulted in increased productivity. MIT's Sloan School of Management has published a report, looking into the results of investment in information technology (IT) in 400 large American companies for the period 1987–91. According to this report, the return on IT investment is 54 percent for manufacturing industries, and 68 percent for all industrial sectors combined.
  Source: International Business Week, June 14, 1993

* US companies invested US$ 1,000 billion in information technology during the 1980s. In spite of these immense investments, corporate profits remained at the same levels as before the investments. The average employee productivity stagnated. IT has turned out to be neccessary in order to remain competitive, but it is not the only thing needed. In order to achieve real productivity gains, different organizations are needed, transparent, flexible ones, close to the customers, and intent on satisfying their needs. Such organizations are made possible thanks to IT.
  Source: International Business Week, June 14, 1993

* Computer software is the magic key to information technology, not in the least for productivity within the software industry itself. American experts have identified four software areas playing the leading roles for productivity increase: graphic interfaces, networking software, flexible databases, and graphics.
  Source: International Business Week, June 14, 1993

* By the end of 1992, the number of PC users worldwide was estimated at 120 million. Some 30 million of these are advanced users, who according to some industry experts, should be interested in investing in RISC-based hardware.
  Source: Computer Sweden, March 19, 1993

* About one million "notebooks", A4-sized computers, were sold in Europe during 1992. In Sweden, 48,770 "notebooks" were delivered, according to Dataquest analysts.

* "Palmtops" are following "laptops", "notebooks", and pocket computers. The American analysts Frost & Sullivan estimated that 219,000 "palmtops" with a value of SEK 1,5 billion would sell in the USA during 1993. In 1997, the same analysts forecast that the value of "palmtops" sales will be SEK 2.8 billion. These small computers are expected to replace calculators.
Source: Computer Sweden, May 14, 1993

* IDC and their colleagues and competitors at Hummingbird Communications have publicized figures covering the development of terminals and PCs running X-Windows. From 1991 to 1992, the number of terminals sold globally, increased by 62 percent, from 120,000 units to 193,000. The equivalent increase for PCs was 182 percent, from 67,000 units sold in 1991 to 189,000 units in 1992.
Sources: IDC/Hummingbird Communications/Computer Sweden, March 5, 1993

* Flash memories is the latest micro technology, having the advantage of loading, even when the electricity supply is broken. The electricity consumption is 250 milliwatt when someone is using the memory, five milliwatt for the waiting position. The access time is approximately 250 nanoseconds, compared to 20 milliseconds for traditional memories. Manufacturers of "palmtops" and portable computers are already implementing flash memories.
Source: New Scientist, November 21, 1992

* Technical problems caused only some 25 percent of the security problems the Swedish public authorities are experiencing. Failures of an organizational nature, lack of policies for security work, and weak programs for training and information, are seen to cause 75 percent of all security problems.
Source: Statskontoret, "Öppna system" no. 1:1992

USA Leads Global Computer Penetration

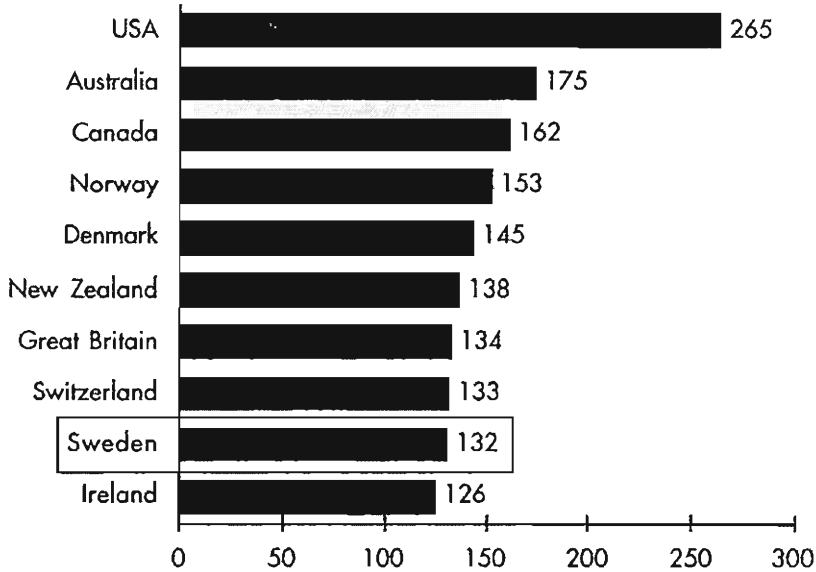


Fig. 72: The USA has the highest computer penetration rate in the world. Counting all kinds of computers, there are 265 computers per 1,000 inhabitants. In Europe, Norway and Denmark have the highest computer penetration rates, Norway with 153 computers per 1,000 inhabitants, and Denmark with 145 per 1,000 inhabitants. Sweden appears as number nine, showing 132 computers per 1,000 inhabitants. Before PCs became common, Sweden, together with Switzerland, had the highest computer penetration rates in the world.

Sources: The World Competitiveness Report 1993/Svenska Dagbladet, July 27, 1993

Computers in the World in 1991 Compared to 1985
Market Shares per Computer Segment

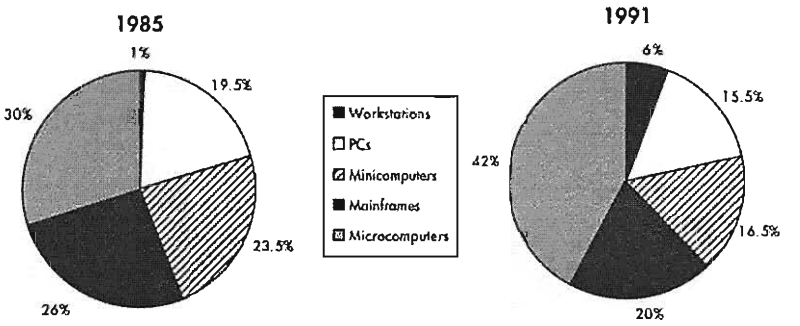


Fig. 73: By the end of 1991, the accumulated global value of installed computers was US$ 152.864 billion. In 1985, the equivalent figure was US$ 76.154 billion. During a period of six years, the value of installed hardware more than doubled. The following figures make an interesting comparison between the distribution, in percent, among various types of systems:

	1991	*1985*
Workstations	*6%*	*1%*
Microcomputers	*42%*	*30%*
Mainframes	*20%*	*26%*
Minicomputers	*16.5%*	*23.5%*
PCs	*15.5%*	*19.5%*

The small systems, including workstations, microprocessors and PCs, made up 67.7 percent of the total market value in 1991, compared to 46.5 percent in 1985. The predictions that small computers would take over at the cost of large systems turned out to be true.

Source: IDC/Le Monde, February 11, 1992

Worldwide Computer Sales 1980–2000

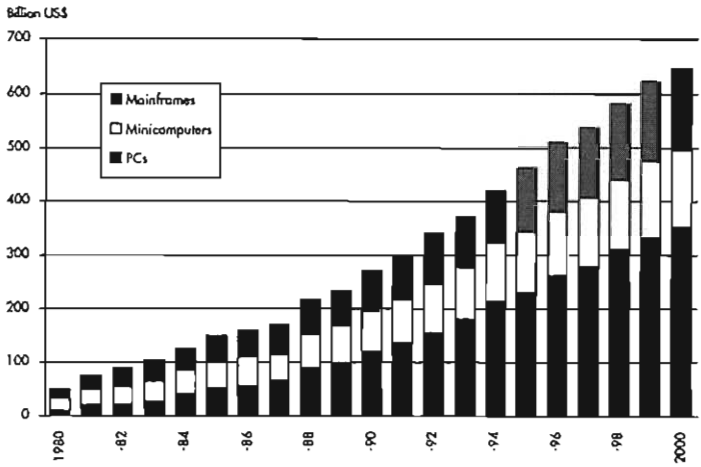


Fig. 74: The global computerization continues. By the year 2000, specialists predict that the total value of all computers sold will be US$ 630 billion. Our graph shows that PCs are growing fastest in relation to minicomputers and mainframes. These types of systems will also see growth in the future, but at a slower pace.

Source: Svenska Dagbladet, June 19, 1993, Martin Ek

MIPS Installed Globally 1986–96

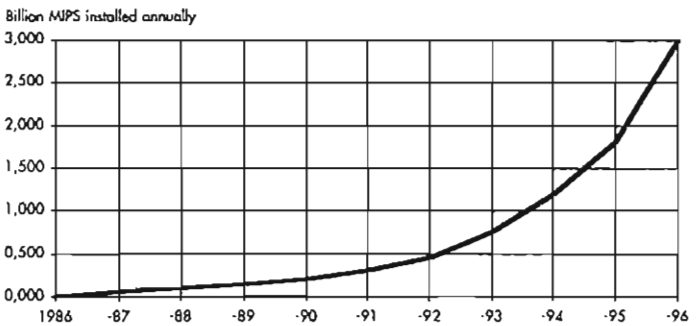


Fig. 75: The number of MIPS (million instructions per second) installed annually is growing rapidly. One reason is that more and more people become computer users. Another is that as technology grows more powerful, existing users buy larger and more powerful systems. Moreover, technological development also results in lower MIPS price every year.

Source: Svenska Dagbladet, June 19, 1993, Martin Ek

Global Data Communications
Revenue per Medium in 1990 and 1997

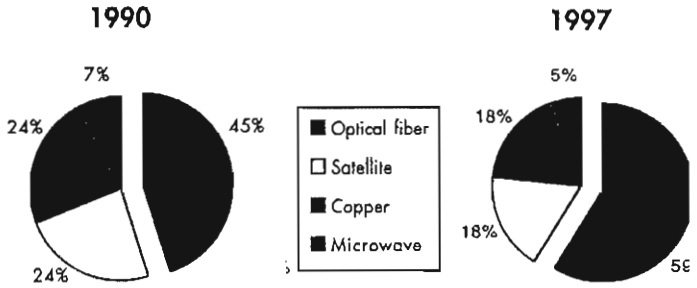


Fig. 76: To an increasing extent, the network constructors of this world tend to base their new products on optical fiber technology. In 1997, almost two-thirds of all communications is predicted to be transmitted via optical fiber. Satellites, copper, and microwaves will all be surpassed by optical fiber technology. The diagram shows in percent, the estimated global value for revenue distribution, per transmission medium, for 1990, compared to a forecast for 1997.
Sources: Market Intelligence Research/Data Communications/Computer Sweden, April 2, 1992

Global Cordless Networks in 1997

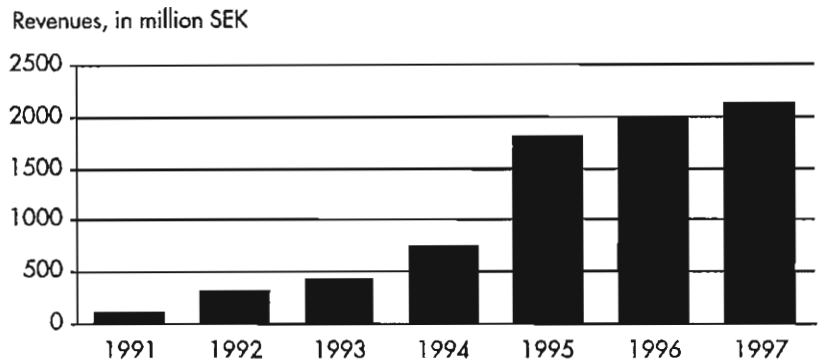


Fig. 77: Cordless networks will generate global revenues of more than SEK 2 billion by 1997, according to a forecast made by BIS Strategic Decisions. Today, the global revenues are some SEK 100 million. The increasing number of portable computers will contribute to the growth of the cordless networks.
Sources: BIS Strategic Decisions/Computer Sweden, February 19, 1993

"Notebooks" in the World 1990–95

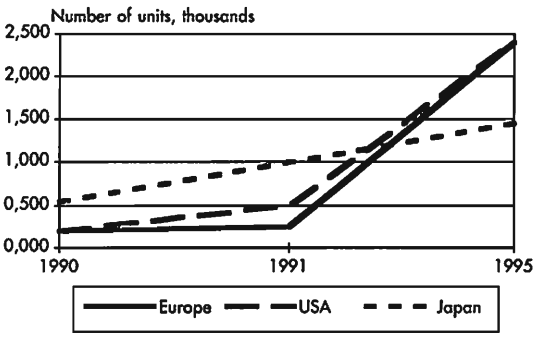


Fig. 78: "Notebook" users are estimated to grow rapidly until the end of 1995. The graph shows the number of "notebook" units that are predicted to be sold in Europe, USA, and Japan, for the period 1990–95. The largest growth is predicted for Europe. The Japanese manufacturers are working hard to make "notebooks" even smaller and lighter, and at the same time offer better functionality and higher prestanda.

Sources: Dataquest Japan/Computer Sweden, March 27, 1992

The Leading Computer Manufacturers in the USA Revenues per Region in 1991

	Revenues in million US$		Revenues in %			
Corporation	USA	Rest of world	USA	Europe	Asia	Rest of world
IBM	26,393	36,447	42	40	14	4
Digital	5,410	8,827	38	46	16	–
H-P	4,350	6,007	42	39	19	–
Unisys	4,080	3,920	51	30	19	–
Apple	3,897	2,598	60	29	11	–
AT&T	6,210	1,961	76	18	3	3
Compaq	1,341	1,930	41	50	7	2
Sun	1,693	1,762	49	30	21	–
Xerox	1,465	1,465	50	33	5	12
MicroSoft	1,116	1,162	49	30	13	8

Fig. 79: In 1991 as well, the leading American computer manufacturers generated the major part of their revenues in the American home market, with two exceptions – Digital and Compaq. In spite of this, the computer area shows a trade deficit estimated at US$ 5 billion for 1992. Total exports from the USA were almost US$ 26 billion, an increase of two percent over 1991. Imports grew by 15 percent to more than US$ 31 billion.

Sources: Datamation/US Industrial Outlook 1993

Global Facilities Management Growth
1990 and 1995

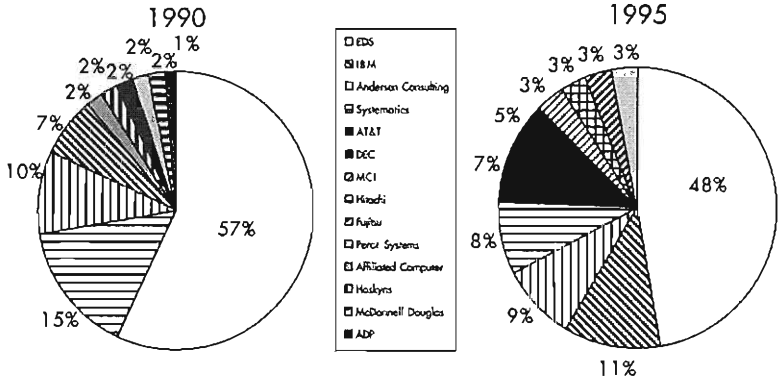


Fig. 80: These graphs show the global growth of facilities management, in percent, for the largest suppliers. "Facilities management," meaning suppliers that take over operating, maintenance, and support responsibility from the users, is forecast to grow from a global value of SEK 11 billion in 1990, to SEK 60 billion by 1995. The forecast was made by the analyst firm CTR, Computer Technology Research.

Sources: CTR, Computer Technology Research/Computer Sweden, April 16, 1993

IT* in the OECD Countries
Expenditure in 1989 and 1990

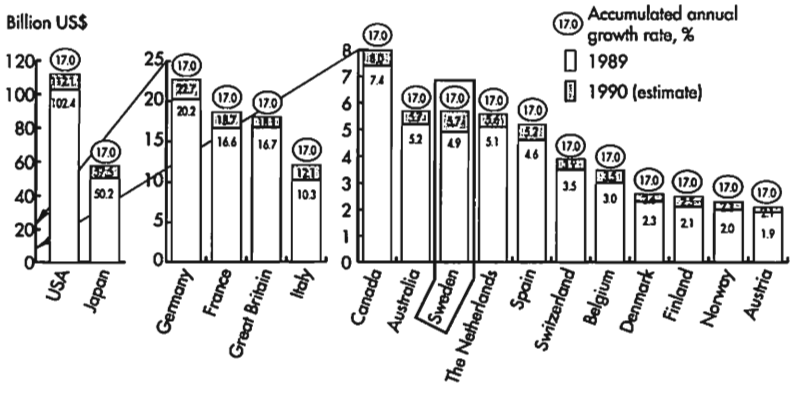


Fig. 81: In 1989, the accumulated global IT costs were US$ 272.6 billion. For 1990, the OECD estimated equivalent figure at US$ 305.1 billion. The global IT market is growing by 12.1 percent, that of the OECD countries by 11.6 percent. The graph shows, in US$ billion, how much some selected OECD countries spent in 1989 and in 1990, and the accumulated growth, per country, in percent. See also fig. 1, p. 11.
Source: Information Technology Outlook 1992, OECD

**** N.B: The OECD definition of IT = hardware, software, and services.***

IT* in the OECD Countries
IT Costs per Capita in 1989

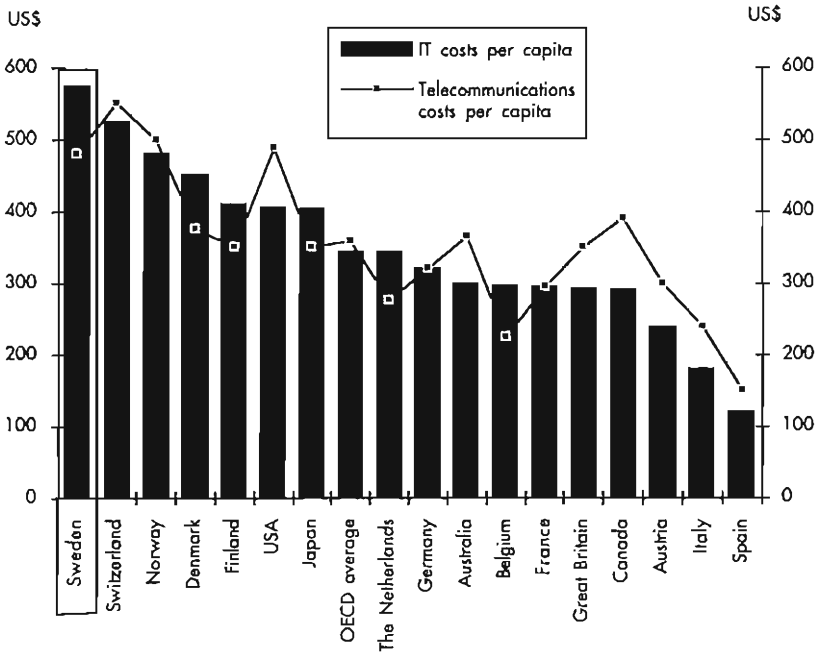


Fig. 82: Per capita costs for IT and telecommunications in selected OECD countries. Sweden reports the highest spending per capita in IT, but spends less than Switzerland and the USA in telecommunications. See also fig. 37, p. 52, and fig. 42, p. 57.

Source: Information Technology Outlook 1992, OECD

N.B: The OECD definition of IT = hardware, software, and services.

IT* in the OECD Countries
IT per Sector in 1989

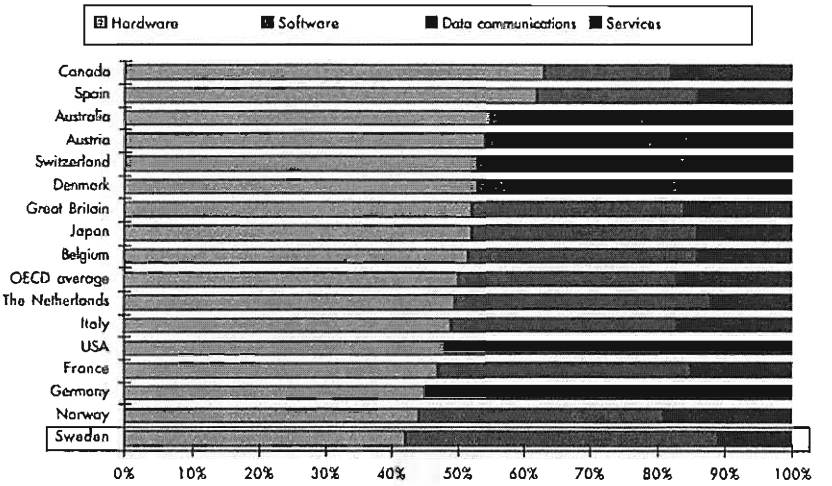


Fig. 83: Hardware costs are still dominating IT spending in most countries. In Sweden, software spending is on its way to taking over most of the allocated resources. According to the OECD, software, data communications, and services, are consuming almost 60 percent of the total Swedish costs.
Source: Information Technology Outlook 1992, OECD

** N.B: The OECD definition of IT = hardware, software, and services.*

IT* in the OECD Countries
Software Costs in 1989

	Costs for software in % of total IT expense	Costs for program packages in % of total software expense	Costs for services in % of total software expense
Sweden	46.9	24.2	75.8
The Netherlands	37.9	48.1	51.9
Finland	37.5	43.2	56.9
Norway	37.3	42.0	58.0
France	37.2	38.8	61.2
Belgium	34.9	50.4	49.6
Japan	34.6	19.2	80.8
Italy	33.4	46.1	53.9
OECD average	32.3	42.1	57.9
Great Britain	31.9	52.3	47.7
Switzerland	31.8	53.1	46.9
Austria	31.8	59.1	40.9
USA	31.5	49.0	51.0
Denmark	30.4	46.3	53.7
Germany	29.0	51.4	48.6
Spain	23.8	59.7	40.3
Australia	22.8	64.0	36.0
Canada	19.6	56.2	43.8

Fig. 84: For the period 1985–89, the average OECD expense for software increased by 18 percent annually. Sweden and Japan showed the largest annual growth, 42 percent and 35.6 percent respectively. The table shows, in percent, the software share of total IT costs; the program packages to the total software expense; and the percentage costs for services as compared to total software expense.

Source: Information Technology Outlook 1992, OECD

**** N.B: The OECD definition of IT = hardware, software, and services.***

IT* in the OECD Countries
Important Public IT R&D Projects

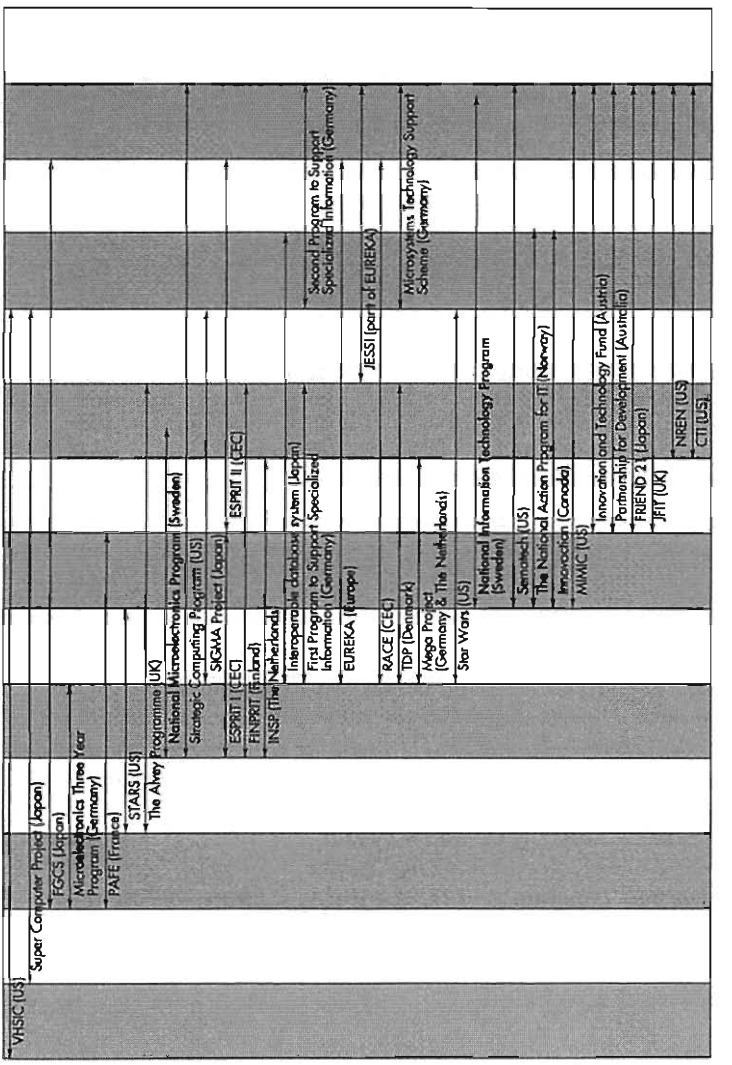


Fig. 85: Starting with 1980, the table indicates the most important public research and development programs in the IT area within the OECD.
Source: Information Technology Outlook 1992, OECD

**** N.B: The OECD definition of IT = hardware, software, and services.***

IT* in the OECD Countries
IT Equipment Trade 1985–89

	1985	1986	1987	1988	1989
Australia	-1,154.9	-1,258.2	-1,482.6	-1,833.2	-2,251.9
Austria	-110.9	-189.0	-204.8	-817.5	-887.4
Belgium/Luxenbourg	-486.3	-549.4	-574.9	-675.0	-846.9
Canada	-2,888.1	-3,023.2	-3,850.2	-2,329.4	-2,664.5
Denmark	-391.1	-503.0	-641.2	-656.3	-682.1
France	-1,009.0	-1,089.3	-1,344.0	-2,324.0	-2,385.4
Germany	-751.9	-799.0	-1,505.7	-2,585.4	-3,599.4
Greece	-54.4	-83.6	-108.1	-131.3	-190.9
Iceland	-23.5	-30.6	-41.4	-35.3	-21.5
Ireland	909.2	1,284.9	1,843.2	1,997.6	2,343.0
Italy	-397.6	-473.0	-1,177.6	-1,423.0	-491.3
Japan	4,460.0	7,754.6	10,616.5	13,609.1	13,455.2
The Netherlands	-714.6	-941.0	-1,227.5	-1,894.6	-1,439.3
New Zealand	-204.0	-237.1	-287.6	-354.5	-392.0
Norway	-394.2	-499.5	-583.1	-432.8	-501.2
Portugal	-41.3	-107.1	-204.6	-343.7	-317.6
Spain	-624.6	-762.1	-1,095.5	-1,590.4	-1,721.8
Sweden	-167.0	-190.0	-164.3	-850.9	-953.9
Switzerland	-123.4	-157.4	-258.9	-1,693.1	-1,732.6
Turkey	-68.5	-133.8	-203.4	-242.4	-229.2
Great Britain	-771.1	-1,219.9	-1,442.1	-1,594.5	-2,236.0
USA	5,620.9	4,883.4	5,079.8	6,028.7	-411.2
OECD average	361.2	1361.3	725.2	-790.9	-8,859.0

Fig. 86: The table shows, in US$ million, the trade balance for IT equipment – export value minus import value, in US$ million, for the OECD countries during the period 1985–89. Japan and Ireland are the only countries having positive trade balances. The accumulated IT equipment exports of the OECD countries was US$ 77.4 billion.
Source: Information Technology Outlook 1992, OECD

**** N.B: The OECD definition of IT = hardware, software, and services.***

Europe – IT Consumption Compared to IT Production

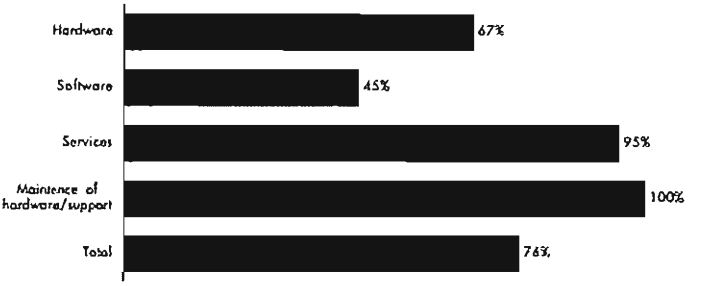
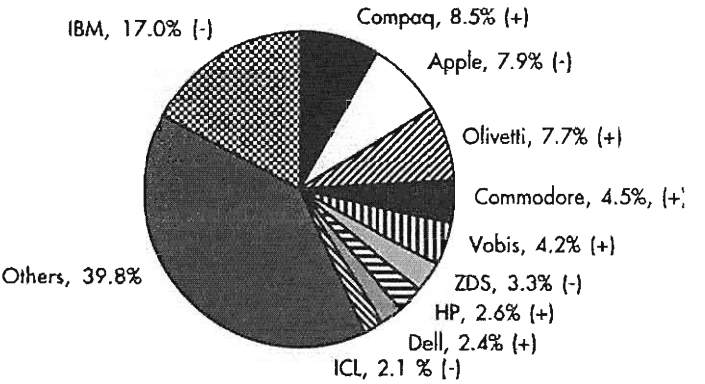


Fig. 87: Demand for computers and IT related products in Europe is greater than the computer and IT production of the region. In 1992, Europe represented 36 percent of the global market, but only 27 percent of the global production. 76 percent of the total orders generated in Europe could be filled by products manufactured in Europe. Not neccessarily by European companies, though.
Source: "The European IT Forum 1993", IDC

PC Manufacturers in Europe in 1992



Number of sold PCs in Europe during the fourth quarter, 1992, percentage per manufacturer

Fig. 88: During 1992, 9.4 million PCs were sold in Europe with a total value of US$ 8.9 billion. The number of sold units increased by 11.8 percent over the preceeding year. This important growth is believed to be the result of tough price competition between the manufacturers. The chart shows the distribution, in percent, among the largest manufacturers in Europe for the fourth quarter of 1992. In 1992, in Sweden, 302,000 PCs were sold, which is an increase by almost 33 percent in comparison to the 271,000 PCs sold in 1991. For global figures, see also fig. 94, p. 112.
Sources: Dataquest/IDC/Computer Sweden, March 5, 1993

UNIX-Based Relational Databases in Europe 1992

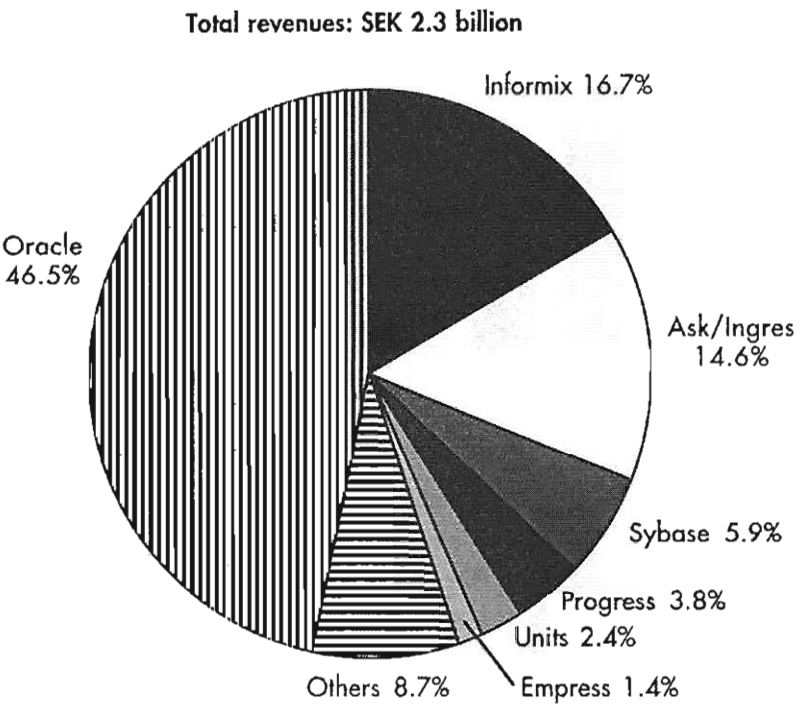


Fig. 89: In 1992, the European market for UNIX based relational databases grew by 42 percent from total revenues of SEK 1.6 billion in 1991, to SEK 2.3 billion in 1992. The graph shows the distribution per supplier, in percent.
Sources: IDC/Computer Sweden, June 4, 1993

Software and Consulting in Europe

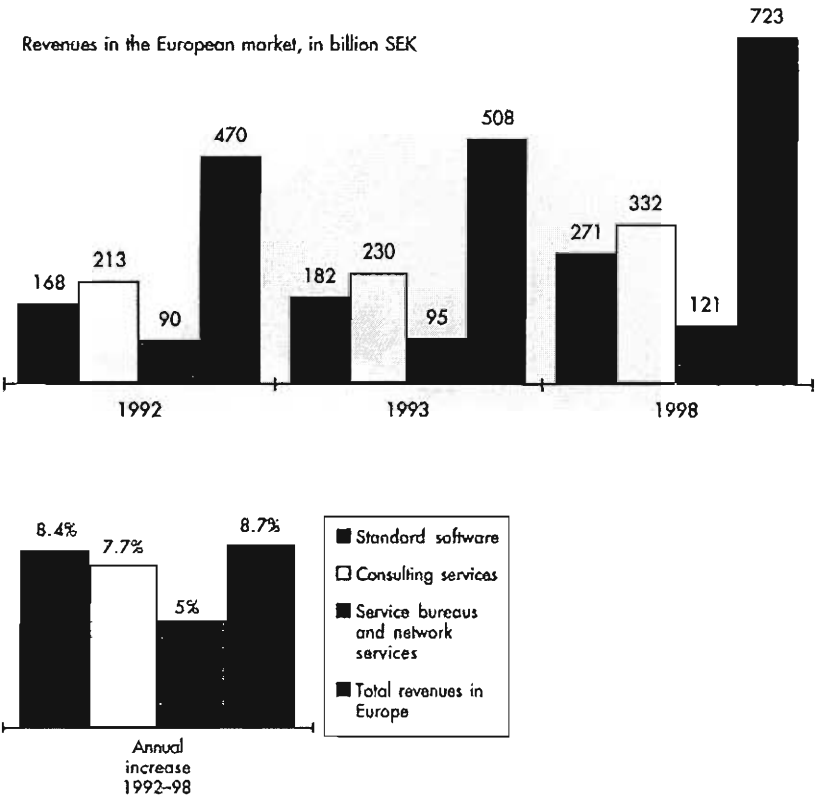


Fig. 90: In 1992, the European markets for software and consulting services increased by 8.1 percent, according to IDC analysts. In total, these two segments generated SEK 470 billion during that year. The consulting market was responsible for SEK 210.7 billion. The fastest growing segment in Europe is standard programs – in 1992 it showed a growth of 9.3 percent and revenues of SEK 170 billion. For 1998, the IDC analysts predict an average annual growth of 6.4 percent. Factual figures for 1992, forecasts for 1993 and 1998, and the predicted annual growth for the three segments – standard programs, consulting services, and service bureau and networking services – are shown above.

Sources: IDC/Computer Sweden, April 16, 1993

IT Services in Europe in 1992

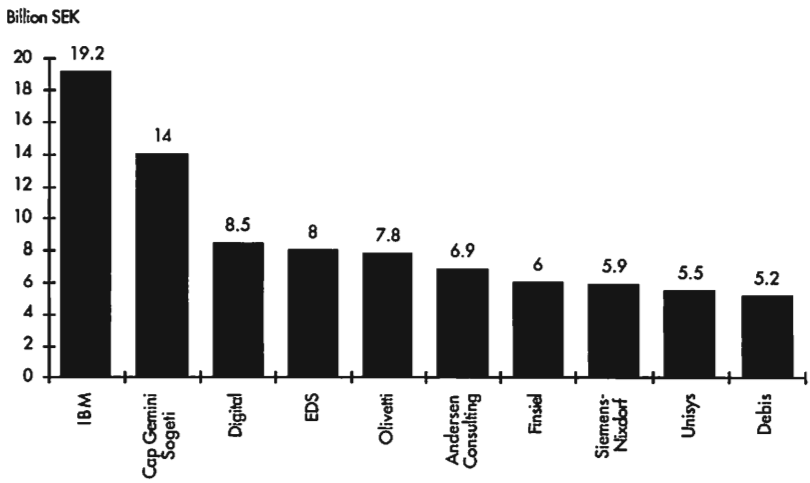


*Fig. 91: The graph shows the 10 largest service suppliers in Europe, measured by revenues, in billion SEK. The specialists of OVUM have analyzed the European computer services and consulting market. The 50 largest companies generate 44.2 percent of the total revenues, which for 1992 was US$ 332 billion. By some, this is regarded as 52 percent of the total European IT market, estimated to be US$ 635 billion, hardware **not** included. Three Swedish companies, SKD/DAFA, WM-Data, and Enator, rated as no. 32, 48 and 50 respectively, are among the fifty largest companies in Europe. See also fig. 1 and fig. 2, pp. 11 and 12.*

Sources: OVUM/Computer Sweden, May 7, 1993

Outsourcing in Europe in 1992

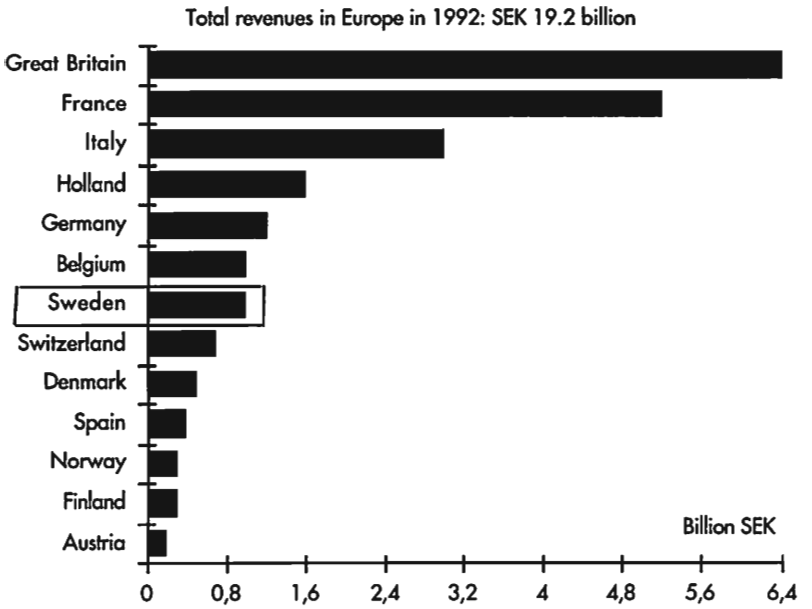


Fig. 92: The global market for outsourcing will increase from SEK 82 billion in 1990, to SEK 191 billion in 1995, according to IDC specialists. For 1992, analysts estimated the outsourcing revenues in Europe to be SEK 19.2 billion. The increase for 1993 is estimated to 12 percent, and the total European revenues at SEK 21.5 billion. Sweden has an annual revenue of SEK 800 million, and is the seventh largest outsourcing user in Europe. Above, the outsourcing revenues per country, are shown in billion SEK, for 1992.

Sources: IDC/Computer Sweden, May 28 1993

IT Growth in Eastern Europe

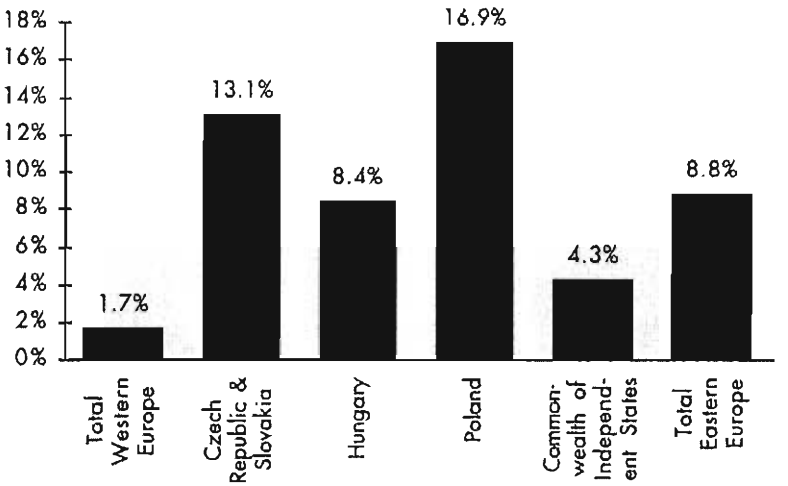
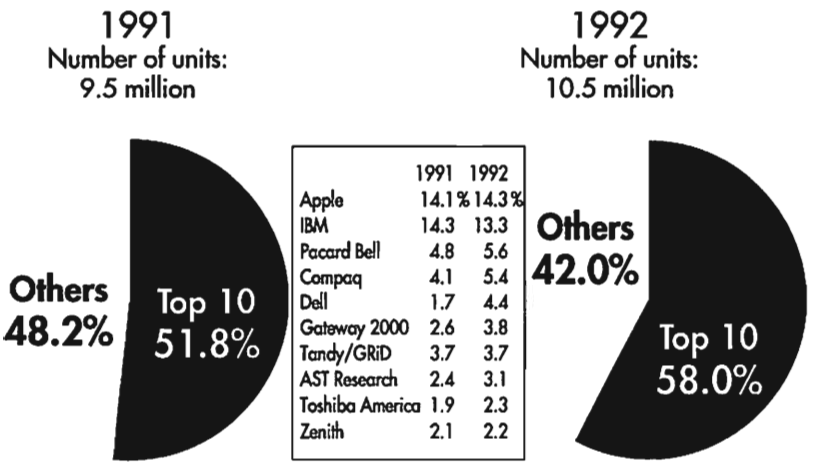


Fig. 93: Investments in hardware in the former Eastern Block countries are estimated to be considerably more important than those of Western Europe. For the period 1991–94, IDC analysts forecast that the total annual growth in hardware investment will be 1.7 percent for Western Europe, while the growth rates in selected Eastern countries will be from 4.3 percent to 16.9 percent for the same period.

Sources: IDC/European Information Technology Observatory 93

Top 10 PC Manufacturers in the World
Market Shares in 1991 and in 1992



	1991	1992
Apple	14.1%	14.3%
IBM	14.3	13.3
Packard Bell	4.8	5.6
Compaq	4.1	5.4
Dell	1.7	4.4
Gateway 2000	2.6	3.8
Tandy/GRiD	3.7	3.7
AST Research	2.4	3.1
Toshiba America	1.9	2.3
Zenith	2.1	2.2

Fig. 94: In 1991, the top 10 PC manufactures in the world shared 51.8 percent of the global market, measured in number of units delivered. In 1992, they had increased their share to 58 percent. In 1991, 9.5 million PCs were sold, while in 1992, 10.5 million were sold.

Sources: IDC/International Business Week, February 15, 1993

PCs in the Nordic Countries in 1992

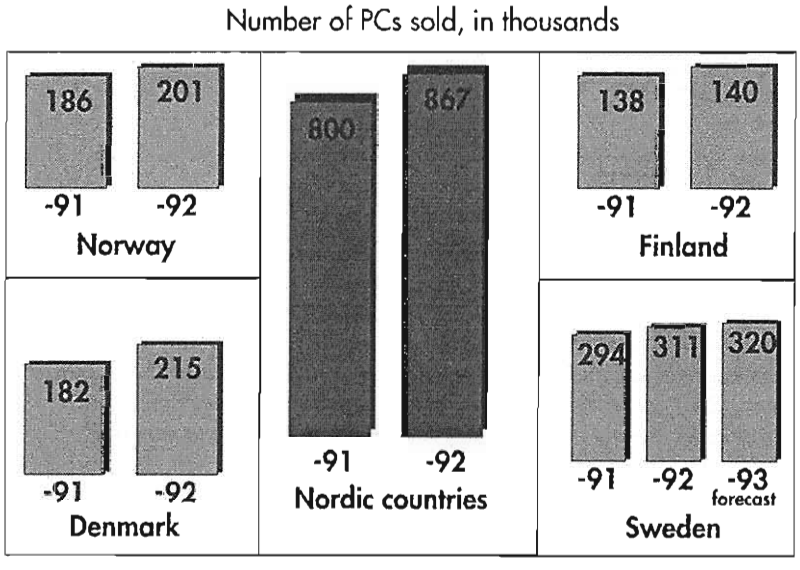


Fig. 95: In 1992, 876,000 PCs were sold in the Nordic countries. Sweden has absorbed the largest amount, approximately 320,000 units, while Denmark is growing the fastest. However, specialists estimate that the total growth for the Nordic countries in 1993 will be only half that of 1992.
Sources: IDC/Computer Sweden, February 19, 1993

The Swedish IT Market 1991–96

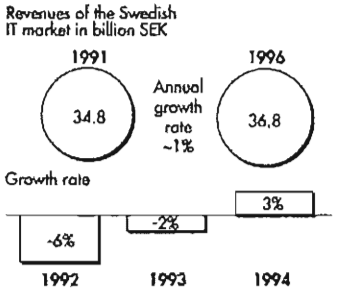


Fig. 96: The generally negative situation of the Swedish economy is also mirrored in IT sales. IDC analysts have calculated that in total, the Swedish IT market decreased by 6 percent during 1992, to SEK 32.7 billion. For 1993, the total decrease is predicted to some two percent, but during 1994, a turn-around is predicted, and the market will show a slight increase. The decrease is the result of decreasing hardware prices in particular, which therefore generate a decreasing part of the total revenues, in addition to generally decreasing prices.

Sources: IDC/Computer Sweden, April 2, 1993

The Swedish IT Market 1990 – 1994

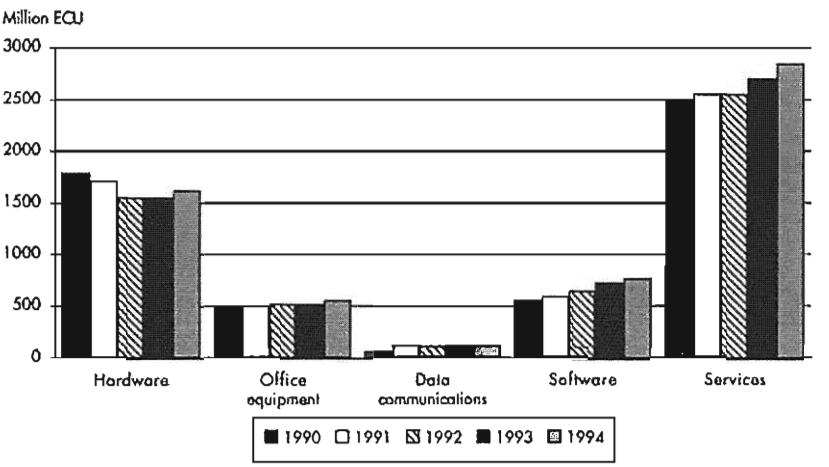
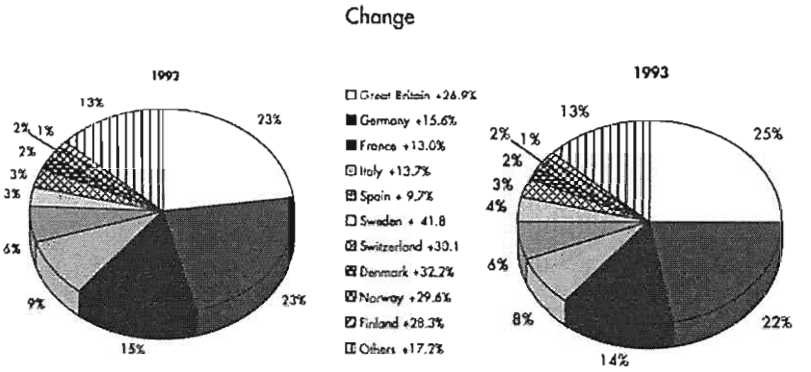


Fig. 97: The IT market in Sweden for the period of 1990–94, in million ECU, according to LKD, the IT suppliers, trade association in Sweden. (The reader should understand IT in this context to mean "computer technology," consisting of hardware, office equipment, data communications, software, and services.)

Source: LKD, Informatikföretagens organisation

PCs in Sweden in 1992
Highest Growth Rate in Europe

Number of delivered PCs in Europe



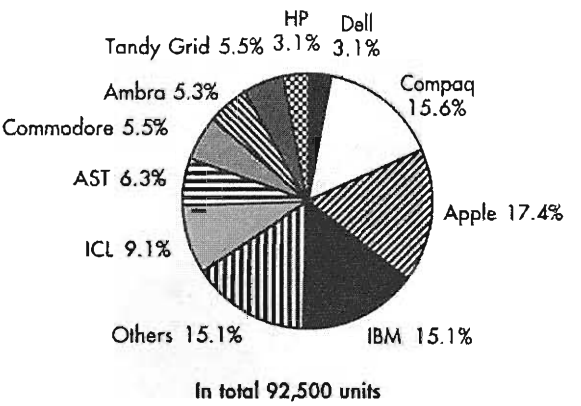
First quarter 1992:
In total: 2,095,565 units

Average
increase +19.4%

First quarter 1993:
In total: 2,502,110 units

Fig. 98: According to Dataquest, from the first quarter of 1992, to the same period of 1993, European PC sales grew most 41.8 percent in Sweden, in comparison to the sales of other countries. Denmark and Switzerland follow, with growth rates of 32.2 percent and 30.1 percent, respectively. Our two charts compare the shares of delivered PCs, in percent, country by country, the growth of the first quarter, 1993 included.
Sources: Dataquest/Computer Sweden, May 28, 1993

PCs in Sweden, Firrst Quarter, 1993
Distribution per Manufacturer



Increase in % from first quarter, 1992	
Apple	27
Compac	247
IBM	0
ICL	51
AST	547
Commodore	-2.8
Ambra	-
Tandy Grid	-2
HP	866
Dell	163
Others	28
Total	38

Fig. 99: The number of PCs sold in Sweden during the first quarter 1993, by manufacturer, as a percent of the total market. The table to the right gives the increase in percent, per manufacturer from the same period in 1992.
Sources: IDC/Computer Sweden, May 14, 1993

Portable Computers in Sweden in 1992
Distribution per Manufacturer

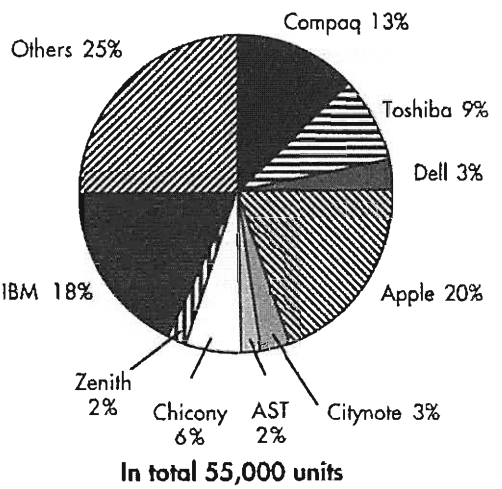
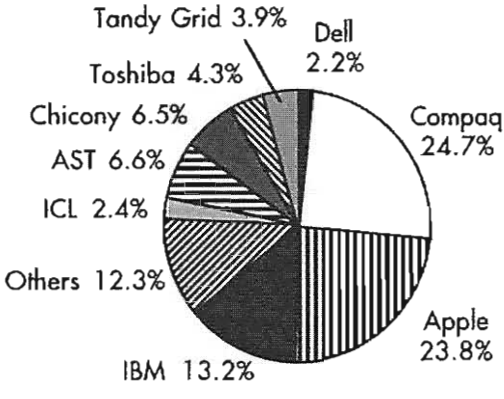


Fig. 100: 55,000 portable computers were sold in Sweden during 1992. The percent of market share, per manufacturer, is shown above.
Sources: CS/Rockwell Technology/Computer Sweden, March 19, 1993

Portable Computers in Sweden, First Quarter, 1993
Distribution per Manufacturer



In total 16,900 units

Increase in % from first quarter, 1992	
Compac	106
Apple	13
IBM	22
ICL	43
AST	516
Chicony	10
Toshiba	-47
Tandy Grid	-11
Dell	-7.3
Others	22
Total	29

Fig. 101: During the first quarter, 1993, 16,900 portable computers were sold in Sweden. The market share per manufacturer is shown above. The table to the right shows the increase in percent over first quarter, 1992.
Sources: IDC/Computer Sweden, May 14, 1993

Operating Systems in Sweden
Installed Base in 1992 and Forecast for 1997

Number of installed operating systems	1992	1997 (forecast)
MVS	100	100
DOS/VSE, VM	300	300
Others, mainframe based	400	300
VMS	5,000	4,000
AS400	3,000	2,000
Others, proprietary minicomputers	17,000	13,000
UNIX	32,000	143,000
DOS & Windows	546,000	660,000
Windows NT	0	140,000
OS2	8,000	85,000
Mac	63,000	110,000

Fig. 102: The OVUM analysts made a study of the installed base of operating systems in Sweden in 1992, and a forecast for 1997. The starting point was the first choice operating system used in 1992. The users were then asked what system they believe they will be using by 1997. The results show that the mainframe-based operating systems, as well as the proprietary ones for minicomputers, do not have growth potential. On the contrary, they will decrease. It seems as if there is a tendency for Swedish users to migrate to open systems faster than users in most other countries do.
Sources: OVUM/Computer Sweden, February 26, 1993

The Accumulated Swedish IT Market 1990–94
In million ECU

Sweden	1990	1991	1992	1993	1994	90-92*	92-94*
						%	%
Mainframes	303	247	227	212	215	-13.4	-2.7
Mini computers	183	185	169	170	173	-3.9	1.3
Small computers	182	163	154	162	165	-8.1	3.7
Work stations	78	95	97	121	153	11.4	25.3
PCs. professional usage	820	806	679	634	650	-9.0	-2.2
PCs. private usage	69	36	48	56	61	-16.7	12.7
PC printers	149	161	178	195	205	9.3	7.4
Computer hardware	1,784	1,694	1,552	1,550	1,622	-6.7	2.2
Typewriters	32	45	40	35	30	12.7	-13.9
Calculators	34	34	35	40	38	2.0	4.0
Copying machines	250	255	261	265	278	2.2	3.2
Other office equipment	161	170	171	173	176	3.3	1.4
Office equipment	475	503	507	513	522	3.3	1.4
LAN hardware	36	47	42	49	50	8.5	8.2
Other data com hardware	57	63	54	58	60	-2.3	4.7
Hardware for datacom.	93	111	97	106	109	2.0	6.2
Systems/tools	120	130	131	141	146	4.5	5.5
Application tools	186	202	207	219	230	5.5	5.4
Application solutions	293	316	334	360	375	6.7	6.0
Software	599	648	672	721	751	5.9	5.7
Consulting services	167	178	177	185	190	2.8	3.7
Contract programming	273	292	294	322	330	3.8	5.9
Distributed services	609	634	635	669	705	2.1	5.4
Training	118	125	114	117	122	-1.6	3.1
System and network operation	55	67	69	87	108	11.9	25.1
Professional services	1,222	1,296	1,289	1,381	1,454	2.7	6.2
Processing services	521	541	552	607	670	2.9	10.2
Networking services	52	56	49	67	77	-3.2	26.0
Hardware maintenance and support	698	706	699	704	710	0.1	0.8
Other services	1,271	1,304	1,299	1,377	1,457	1.1	5.9
All services	2,493	2,600	2,588	2,758	2,911	1.9	6.1
In total	**5,445**	**5,555**	**5,416**	**5,648**	**5,915**	**-0.3**	**4.5**

Fig. 103: IDC analysts have presented the values, calculated in million ECU, of the accumulated IT market per country per segment, for the period 1990–94. The table shows the values for Sweden. The tables are presented in the European Information Technology Observatory 93, by EITO.
Sources: IDC/European Information Technology Observatory 93

3. Usage Areas in Telecommunications and IT

Do You Know This About Usage Areas in Telecom and IT?

* A flight from Stockholm to New York results in an airline entering 27,000 bits of information per passenger!

* **Currency unrest** is seen to be the result of the "quiet revolution" sweeping the world's economy. New telecom and computer technology have tied the world's financial centers together. In a true sense, a boundless, global financial market has developed. In the financial area official statistics trail after reality as well, far after, states the International Monetary Fund, IMF. Here is a small sample of how enormous sums travel around the world with the help of technology:

  - In the six years from 1986-92, the turnover of the international currency trade has grown from US$ 325 billion to 1 trillion daily;

  - The trade of stocks rose from US$ 120 billion to 1.4 trillion a year from 1980-90;

  - The combined direct investments abroad from the USA, Japan, West Germany, France and Great Britain increased during the years 1986-90 from US$ 61 billion to 156 billion per year;

  - In autumn 1992, the global stock of foreign direct investments was estimated at US$ 1.7 trillion.

  Source: BIS/Economist/Svenska Dagbladet, February 20, 1993

* American Express handles a quarter of a million transactions daily.

* According to "The Economist" (September 12, 1992), **European air traffic** is steered by 54 control centers, which together, have 31 different computer systems, using 70 different program languages. This multiplicity leads to, on the average, a delay of 22 minutes per flight for 2,600 flights per day in Europe. One single airline, Lufthansa, loses 14,600 flight hours per year waiting for permission to take off, and an additional 13,700 flight hours per year in circling while waiting to land. In the USA, only half as many control centers are needed to handle the same amount of air traffic.

* We can read about **virtual companies** in American and British business magazines. These types of companies have been set up to solve problems, for example, to develop a new product, and can consist of employees from many different firms. The virtual employee works geographically where he/she normally does, and is tied together with his/her colleagues with the help of fast and cheap telecom and computer communications via virtual networks. It is not unusual for those that work together in virtual companies to have never met.
Source: International Management, June 1993.

* **MAN, Metropolitan Area Networks,** are estimated to have a global market of nearly US$ 2 billion in the near future. By the year 2002, ISDN will be responsible for more than half of the European telecom carriers' revenues.
Source: CIT Research, London

* Despite the many charge and credit cards, 81.1 percent of all Americans still pay for their groceries in cash, 7.6 percent pay by check, and the remaining 11.3 percent use some type of charge or credit card.
Source: Business Week, September 21, 1992

* The majority of Danish households have at least one **Dankort,** a charge and ATM card, common to all Danish banks, and savings & loans. In 1992, the card was used for 160 million transactions. Within seven years, the number of checks in the Danish payment system has decreased from 230 to 100 million. The amount of circulating currency has also decreased, so the Danish economy gets by with only 2.8 percent of the value of BNP in the form of "real" money in circulation. The corresponding figure for Sweden is 5.2 percent of BNP. Since the Dankort is so rational, and saves so much for the banks, there is no charge to the user.
Source: Dagens Nyheter, April 17, 1993, Lars Ramklint

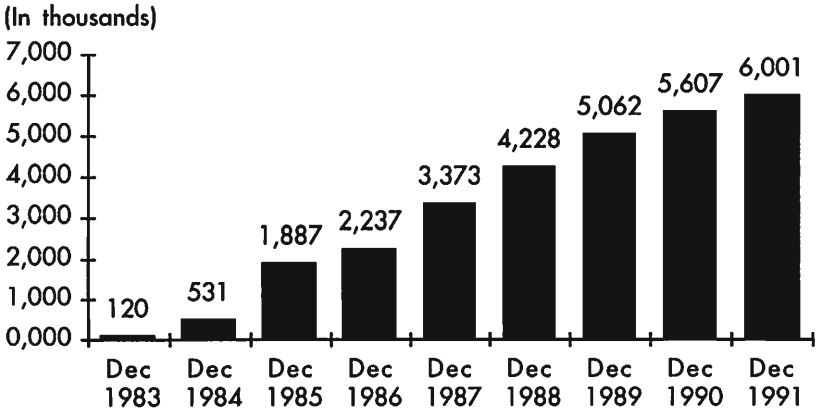
* The **telephone numbers 071 and 020** have become a great success during the last few years. 071 is a "calling-party pays" number – those who call the number, pay at the same time for the service that he/she is seeking by phone. Revenues are estimated to be approximately SEK 500 million for Sweden during 1993, according to certain sources. 020-numbers (corresponding to the US 800 numbers) are mainly used by companies that wish to reach their customers with information. An advertisment on TV can contain a 020-number where one can call for more information. Shortly afterwards, the requested information is faxed to the caller at home - paid for by the sender.
Source: Dagens Nyheter, July 17, 1993

* **Advertising** and information to customers, both present and future, will soon be completely different from that which we see in today's media. In the US, Japanese car salespeople are, more and more, reaching people via different types of databases for their informational campaigns. For example, information is based on multimedia and is interactive, so that the curious can get answers to their questions immediately. This is just the beginning of how telecom and IT can be used as sales tools.
Source: Business Week, July 12, 1993

* **TV shopping** is beginning to be in vogue in the US. With current revenues of US$ 2 billion, industry watchers estimate a 20 percent yearly increase in the future.

* A research project in Wales is trying to understand the **psychological effects of tele-commuting** in sparsely populated areas. An interesting result thus far, is that the managers are more affected that the actual worker. The bosses are the ones who have a problem with understanding their changed role, not the workers!
Source: New Scientist, June 5, 1993

* During 1992, the **French Minitel**, now Télétel, increased by 10 percent, reaching revenues equivalent to SEK 8 billion. There is a total of 6.2 million terminals in France, and over 20,000 different services available. Total Minitel traffic reached 110 million hours. The figure shows the total number of Minitel terminals installed during the period



1983-91. Minitel is accessible, at home or at work, to 29 percent of the French population.
Source: Sveriges Tekniska Attachéer, notice no. F-93-051

* Thanks to the help of **"tele-commuting"**, 6.6 million Americans now work at home. Approximately 80 percent work for companies with fewer than 100 employees. Two to three times a week, the tele-commuter goes into the office to meet colleagues, managers and others. The demands for a new type of management style are being discussed. IDG News states that 25 million Americans work outside the office. Of these, 26 percent are salespeople, 18 percent administrative personnel, 15 percent engineers, 23 percent technical service, 10 percent upper management and 8 percent miscellaneous. These should most likely be counted as tele-commuters, but in a different way.
Sources: IDG News/Computer Sweden, January 22, 1993/Svenska Dagbladet, May 30, 1993

* With the help of **Sverige Direkt,** a service from Telia, telephone calls from abroad can be placed directly on the telephone bill at home. If so wished, calls can even be paid for by the receiving party – an equivalent to collect call.
Source: Telia AB

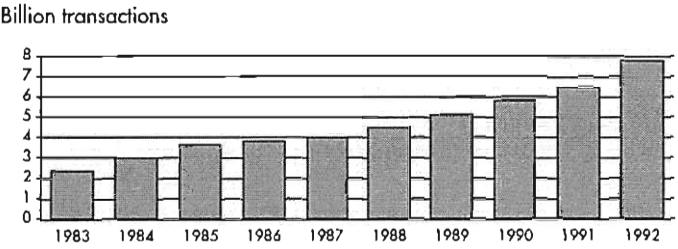
* **Giromat** is a self-service pay automat for postgiro deposits, supplied by the Swedish Post Office. With the help of your ATM card, you can now also pay your bills automatically. The Giromat will write out a receipt and reminder slip.
Source: Postgirot

* **Postgirot** in Sweden has one of the country's largest computer centers with optical reading and photo scanning as automatic routines. Every day PostGirot receives 75,000 envelopes, handles 1,700,000 payment transactions, 30,000 checks and 200,000 account withdrawals. Each day, SEK 24 billion are placed in the books in actual payments. All for the service of the 1.6 million postgiro account holders. Postgirot uses telecom and IT more and more to develop and offer their customers new services – GiroVision and GiroLink are two such services, which customers can use and access directly from their own PC.
Source: Postgirot 1992

* Towards the end of 1992, Swedes had purchased **cordless telephones** worth slightly more than SEK one billion.
Source: Telia, Tele no. 4, 1992

* **ANI** – Subscriber number transfer – means that the person called, in a character display on the telephone or telephone switchboard terminal, can see who is calling, and eventually save the information in his/her customer database. For the moment, the service is not available in Sweden.
Source: TELDOK Report 76: "Teletjänster"

* **ATM, Automated Teller Machines,** accounted for approximately 7.8 billion withdrawals in the USA in 1992. The diagram shows the development of the number of billion transactions from ATMs for the period 1983-92.



Source: American Bankers Association/Business Week, May 31, 1993

* **Audiotex** is a name for information and transaction services via the telecom network, where the services contain some form of computerized solution. Some examples of Audiotex services are:
  * weather reports
  * ordering of weather maps via fax
  * reporting in sick by punching in your personal code (SS number), and the date, on a touch-tone telephone
  * news, where one queries according to his/her special interests
  * stock market information, custom-made for your own stock portfolio
  * ordering and home delivery of goods
  * timetables for buses, trains and planes
  * ordering tickets.

  Source: TeleJournalen no. 2, 1992

* **Biometrical security systems** have shown to be both cheaper, and safer, than personal codes, magnetic cards, and other similar security systems against improper access into computers and other electronic machines. Fingerprint, cornea and hand scanners, speach recognition and handwriting scanners are the most common varieties today. It is rumored that they will soon be available even for PCs.

  Source: Computer Sweden, April 16, 1993

* **CD-discs for text storage** are used more and more often. The Swedish fiscal tax legislation and the National Tax Board's instructions for taxation are available on CD. In addition, CD-based information is available on 250,000 of Sweden's registered companies, and their most recent balance sheet statement, as well as the "Stor-tele" directory with the address, telephone and fax numbers to approximately 100,000 Swedish companies and organizations.

  Source: Revisorn informerar, no. 5, 1993

* **Computer viruses** are now appearing on CD-ROM discs, according to the Italian institute Istinform. Italy also holds a top position among the European countries as concerns computer viruses, both for the number of different viruses in circulation and their spreading. At the end of 1992, there were 444 known viruses in circulation, of these, at least 38 different types of viruses came from Italy.
Source: Sveriges Tekniska Attachéer, notice no: IT-93-040

* **Distinctive Calling** – the receiver hears who the call is for when the phone rings. One can also tell whether it is a fax or a normal call. For the time being, the service is not available in Sweden. See also ANI.
Source: TELDOK Report 76: "Teletjänster"

* **Electronic mail or E-mail**, is growing very fast according to the American magazine, Fortune. At the end of 1993, the world's 2,000 largest companies had a total of 15.9 million E-mail users. In the beginning of 1992, the number of users was 8.9 million. The number of sent messages is estimated to be 14.3 billion, compared to 2.3 billion in the beginning of 1992.
Source: Computer Sweden, March 27, 1992

* **ISDN – Integrated Services Digital Network** – services are primarily intended for companies. ISDN means that one can integrate voice, text, data and images, even video images, in one and the same digital transmission. ISDN was introduced in Sweden in 1992. Subscribers are connected either via their office switchboard, or with the help of a basic subscription, Basic Rate Access, which provides access to two 64-kbps-channels and a "data channel" with a capacity of 16 kbps.
Source: TELDOK Report 76: "Teletjänster"

* **Multimedia** has found interested users in museums around Sweden. A database connected to multimedia provides the visitor, for example at Stockholm's City Museum, access to more than a million photographs, artifacts and works of art, which are registered in the museum's database. Thanks to multimedia terminals, visitors and researchers can have easy access to information of special interest from the museum's huge database, with the help of film, text and sound. The next step – the virtual museum?
Source: Newsletter from SAS Institute, no. 2 1993/IEPRC

* **Video conference by PC** connected with the help of cheap ISDN for the average, normal user, is on the way. CCITT standards for picture compression make it possible for systems from different manufacturers to communicate. Up to now the use of the "normal" video conference has made inroads at among others, the lecture halls of Stockholm's Royal Institute of Technology, where half of the class can study by long distance, from Gotland for example.
Source: Computer Sweden, May 7, 1993

IT within Wholesale and Retail

by Ingrid Fürst

... from a European perspective

* In 1992, the commerce sector in Europe invested SEK 35 billion in IT.

* European telecom suppliers are investing in the digitalization of trunk and local networks, making faster, and better, transmission of information possible. *See also* fig. 20, p. 36.

* The great technological development is expected to take place in the distribution chain, that is to say, between retailers and wholesalers, as well as between wholesalers and suppliers. Information transfer is expected to take place mostly via telecom networks.

* The integration of different systems within the distribution chain is expected to lead to a more effective flow of information, and a reduction in the number of middlemen.

* A small number of the larger wholesalers and retailers within the EU have begun to expand their IT structures. To this group belong the largest grocery store chains within the EU and Sweden.

* EU commerce has invested relatively little in developing their IT structure. With a few exceptions, the European wholesalers and retailers do not want to be the first ones to utilize IT to its fullest. Only after other branches within industry, especially manufacturing, have begun to use new technological solutions, is commerce ready to follow their lead. The implementation of EDI is an example. (*see also* p. 144+) It is mostly the manufacturing industries that have been able to develop and use industry-specific standards.

* The overall goal for the enlargement of the IT structure, is for the majority of commerce within the EU to use the technological equipment for supervision and control of their operations. This is especially true within the areas of marketing and accounting.

* Commerce within the EU is investing in building up better internal management systems, thereby increasing sales, and in coordinating operations better with suppliers and customers.

* The completed investments are mainly concerned with data collection, processing and analysis.

... from a national perspective

* In 1992, Swedish commercial firms invested nearly SEK 4 billion in IT.
* Swedish commerce is face to face with structural transformation and internationalization. The parties must reduce their costs, reduce the number of middlemen and strengthen their competitiveness.
* Data communication over the telecom network between retailers and wholesalers, is expected to expand greatly in the future, leading to greater effectiveness.
* Regionally and centrally, ICA-stores are expected to invest half a billion SEK in IT during the 1990s. The goal is to tie together all the operations – from manufacturers to final customers – thereby reducing the number of middlemen and bringing down inventory costs.

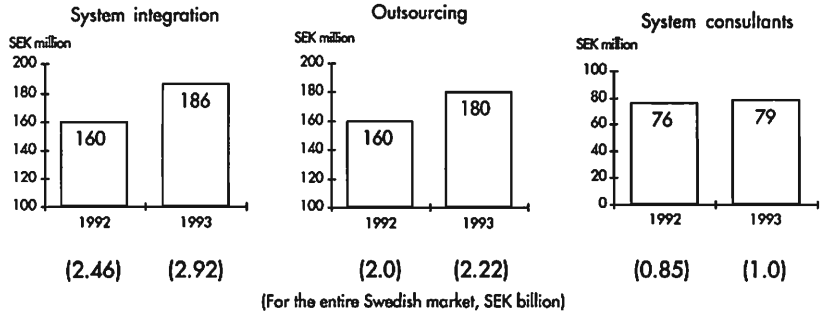


Fig. 104: System integration is increasing fastest within commerce, providing strong growth for system integration, outsourcing and system consultants.
Source: OVUM/Computer Sweden, April 1993

Usage areas within commerce

* **Wholesaling**
  - Swedish wholesalers mainly use computers for finance, administrative and purchase routines, as well as for inventory and invoicing.
  - Database management and expert systems have low priority.
  - Half of the companies invest in communication, which in this case means expanding local networks and electronic mail systems.
  - Just over 10 percent invest in promoting contacts with the market via international networks.

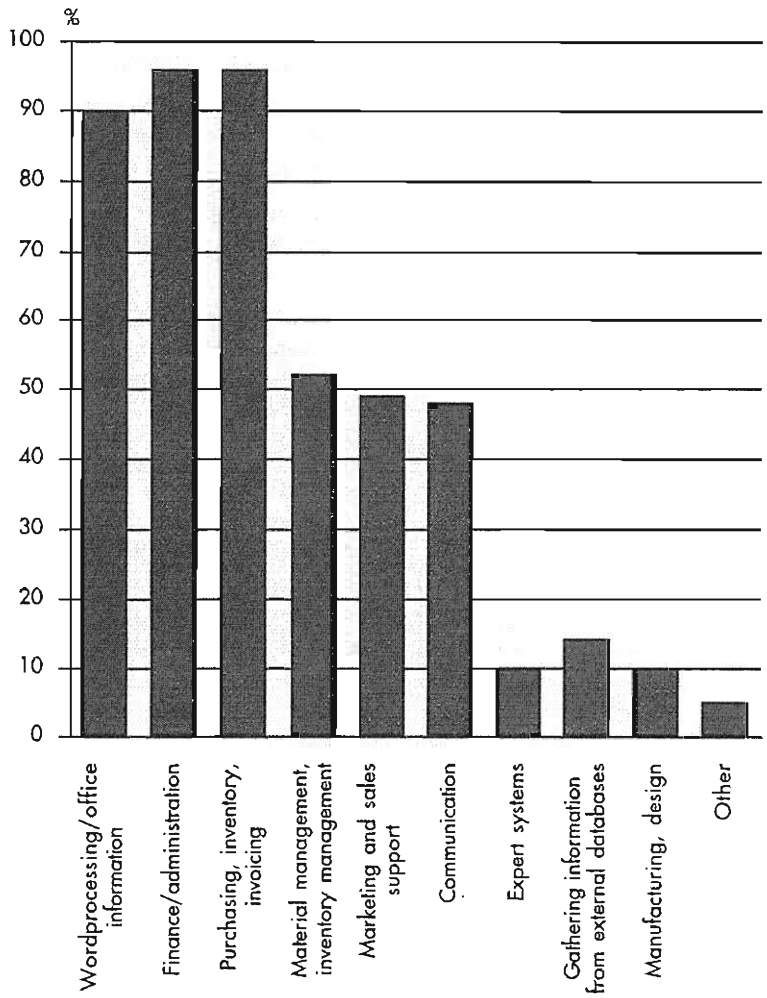


Fig. 105: Areas of usage for computers within Swedish wholesaling.
Source: Grossistförbundet Svensk Handel 1991

- Over 40 percent of all shopkeepers wish they had more information on communication.
- More than 30 percent inquire about information on marketing and sales support.
- Nearly 20 percent want to know more about expert systems.

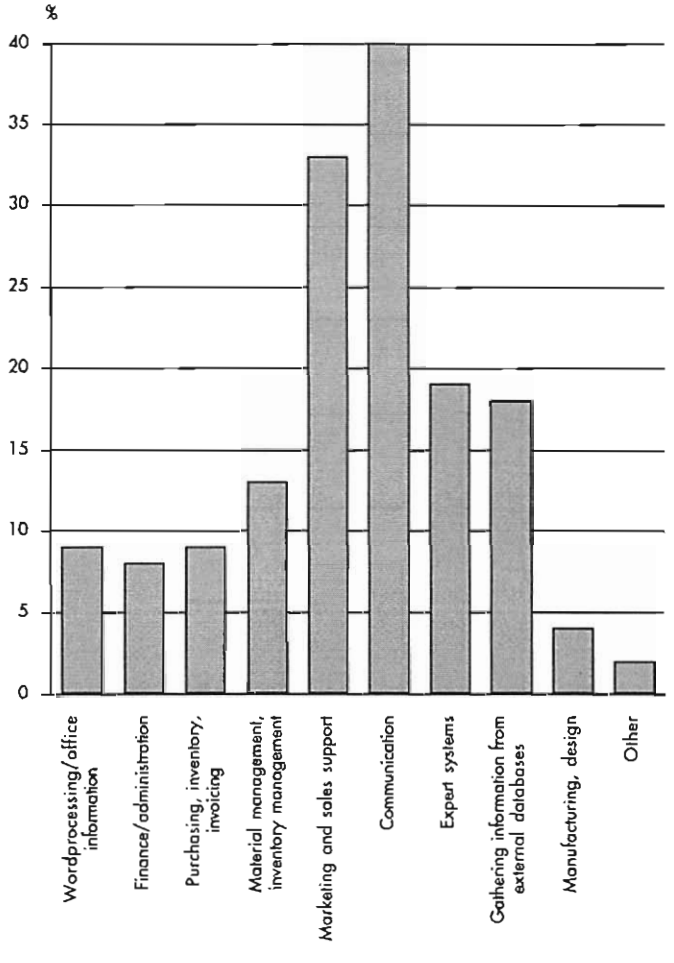


Fig. 106: Areas where wholesalers want more expertise.
Source: Grossistförbundet Svensk Handel 1991

Planned development

- Communication, general marketing and sales support, followed by inventory management and control, as well as purchasing, inventory and invoicing routines, are prioritized areas for wholesalers.

- Investing in communication creates expectations of the future integration of different systems, and thereby, a more effective flow of information.

- Expert systems and information management are low priority areas.

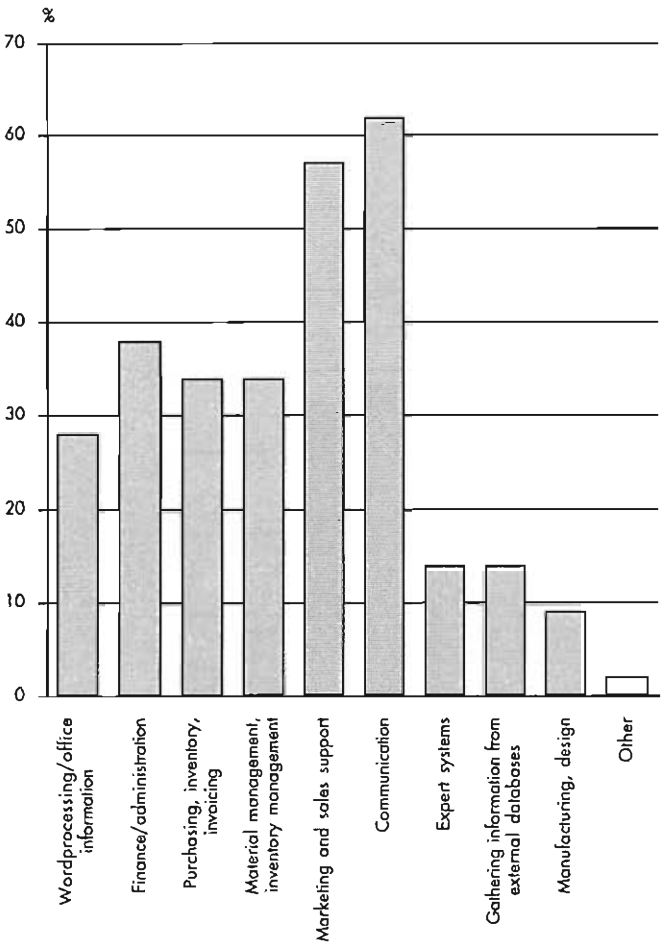


Fig. 107: Planned development of the IT structure in wholesaling.
Source: Grossistförbundet Svensk Handel 1991

* **Retailing**

- Over half of the companies use computers, but there are great variations within specialized trade.

- Retail firms can be divided into two poles. Farthest down are the small stores, which in the best case, have a PC for wordprocessing and accounting. At the opposite pole are the giants with supermarkets and many stores, spending billions on IT.

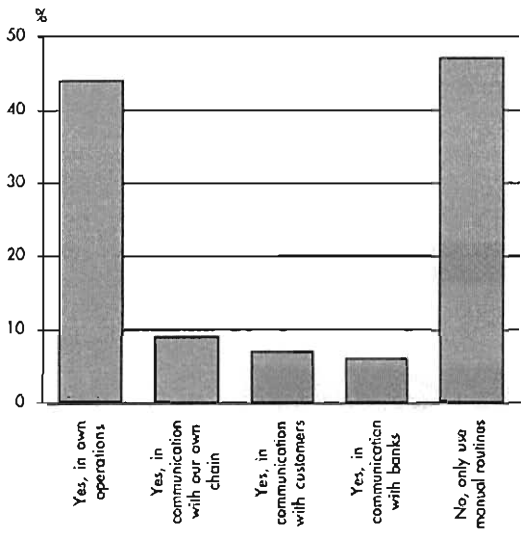


Fig. 108: Only half of the retail stores have computers.
Source:HUI

Usage Areas

- Technology is most widely used in the areas of finance/administration, invoicing as well as wordprocessing.

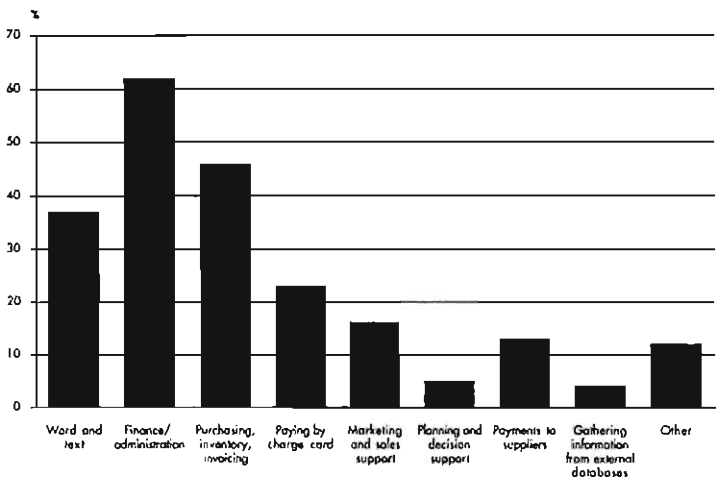


Fig. 109: Finance and administration are the most common areas of use within retailing.
Source: HUI

- Over half of the companies believe that computerization has resulted in more work being done, with no change in the number of employees, and that more necessary information has come forward.

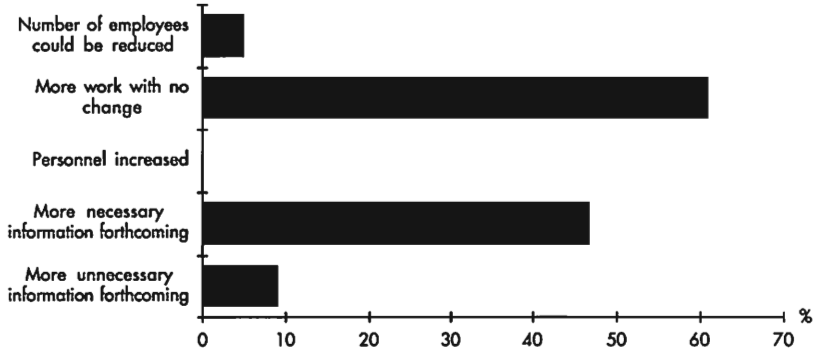


Fig. 110: Computers are of value, even within retailing.
Source: HUI

Grocery stores

- Numbering articles with bar codes (EAN) on groceries and other daily goods, makes it possible for grocery stores to utilize computer technology for cash registers, marking prices, sales analysis, inventory control, etc.

Computer cash registers spreading

- Registers that can read bar codes are present today in approximately 2,300 out of 8,000 grocery stores. The greatest frequence of these registers is in the larger stores.

- Within the Swedish cooperative chain of stores (KF), the installation of computerized cash registers is most developed. Within certain associations, for example Konsum Stockholm and Konsum Väst, the spread of computerized registers is 100 percent. In total, 900 of 1,400 cooperative grocery stores, or approximately 65 percent, have computerized registers today.

- Of 2,900 ICA stores, approximately 30 percent have computerized registers. However, their percentage of sales amounts to 65 percent.

- Of the remaining 3,800 grocery stores, approximately 500 are fitted with computerized registers.

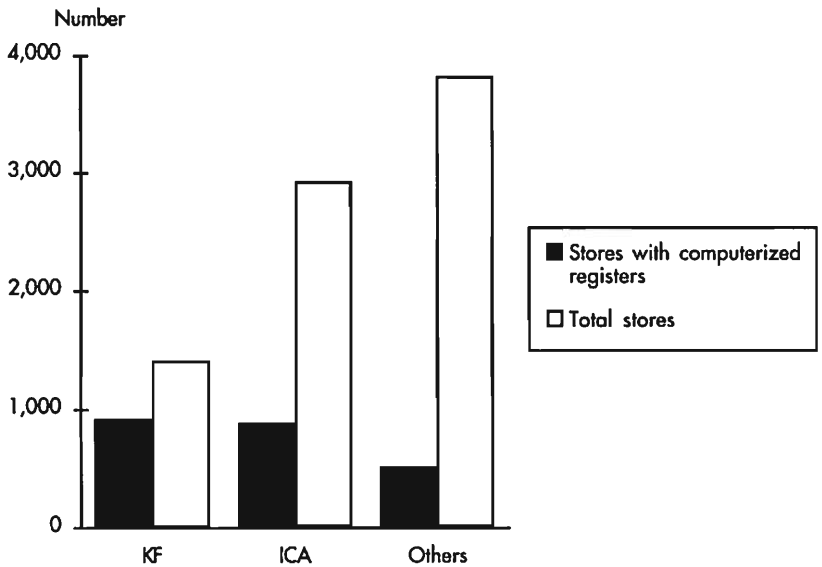


Fig. 111: Computerized registers within grocery stores
Source: HUI

- Marking prices
The largest profits from rationalization in going over to computerized registers results from the work involved in marking prices - in addition to the actual cashiers work – as well as the decrease in entry mistakes made at the register.

- Electronic shelf labelling
The labels are electronically connected to the store's price register, meaning that the prices in the cash register, and on the shelves, will be identical as they are updated at the same time.

- Automatized registers
Within KF and ICA, cash registers have been tested where the customer registers the goods themselves, while the cashier supervises and assists. An entirely automatized check-out, without any manual handling, is for the time being, still a utopia.

- Paying in the store

Traditionally, cash has been the dominant means of payment. In the last few years however, checks and charge cards have become all the more common. During 1990 however, only 1.5 percent of the total transactions, and five percent of the total value of purchases within KF, were made with charge cards. On the other hand, 75 percent of the purchase value at gas stations was paid by charge card.

Card usage at gas stations has been so high due to their ability to provide effective solutions for card handling. There are great possibilities for a large increase in card handling within retailing during the 1990s.

	1 Cash	2 Check	3 Traditional manual payment with paper bills	4 Paper payment with electronic control	5a Electronic payment with integrated control	5b Electronic payment with manual control	6 Electronic PIN-code
Cashiers work	0.82	2.23	3.17	3.36	1.76	2.64	1.03
Follow-up work	0.5	2.46	1.4	1.12	0.51	0.93	0
Total	1.32	4.69	4.57	4.48	2.27	3.57	1.03

Fig. 112: Costs for handling different payment methods within commerce, in SEK.
Source: HUI

- **Electronic card management**
  - The only card handling which is comparible to cash – and even somewhat cheaper – is electronic card handling with PIN-codes, i.e., personal codes.

  - The security aspect is important. Store robberies have increased greatly in the last few years. Large amounts of cash in the registers creates problems for the stores.

  - Electronic handling of charge cards is advantageous for the financial sector. By going over to charge cards, the banks avoid the costs for cash withdrawals over the counter, or expensive check handling. The transition from a paper-based to an electronic handling of charge cards means that the banks avoid data entry and registation. Data entry already takes place in the store.

The number of credit card terminals in Sweden, 1991

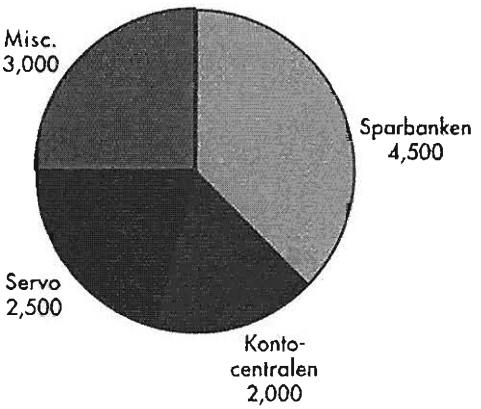


Fig. 113: The market for on-line services for charge cards.
Source: OVUM

- Marketing
Charge cards are a marketing tool. By using this channel, the stores can reach their frequent customers, which represent a large portion of the revenues.

- Borrowing
The company can use the card as a source of borrowing. Of the retail companies that have given out charge cards so far, only ICA, KF and OK have accepted deposits from households. Up to now, retailers have paid out a much higher interest than the banks have for equivalent accounts.

For those who want to know more:

Trade up to the year 2000, Trade's long term report, ISBN 91-38-50081-7 (Swedish)

Grossistförbundet Svensk Handel (1991), The use of information technology (Swedish)

Payment methods, Investigative report, HUI, 1991 (Swedish)

Computer Sweden (Swedish):
On-line services open new possibilities, March 19, 1993
Commerce needs to invest in computer communication, January 29, 1993
Focus on Commerce, April 2, 1993

IT in Tourism

by Ingrid Fürst

... from an international perspective

* Tourism employs more than 100 million people

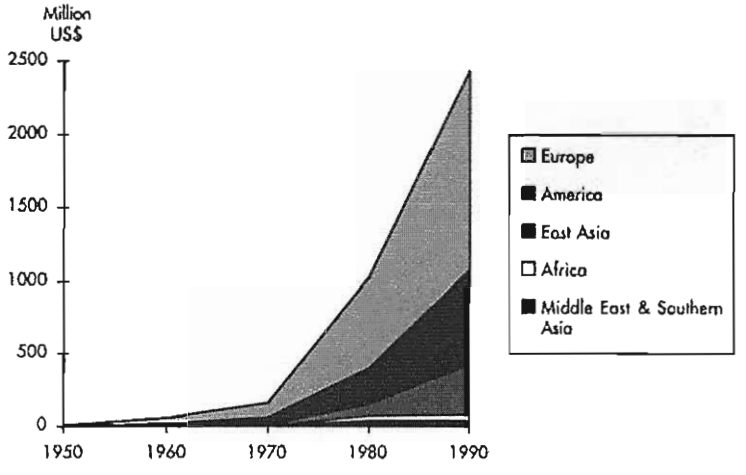


Fig. 114: The international travel and tourism industry is increasing.
Source: WTO, World Travel Organization

... from a national perspective

* Swedish tourism consists of approximately 21,000 companies and employs 200,000 full and part-time employees.

		Million SEK/year
Board	Restaurants	28 ,000
Room	Camping	700
	Hotels	6,000
	Cabins, youth hostels	800
Travel	Trains	2,600
	Buses	1,600
	Domestic flights	4,500
	International flights	7,500
	Domestic ferries	5,400
	Car rentals, taxi	2,000
Distribution	Travel agencies, tour organizers, tourist bureaus	2,000
Activities	Lifts, theme parks and misc.	900
		Total SEK 62,000

Fig. 115: The travel and tourism industry in Sweden delivers services for more than SEK 60 billion a year.
Source: SCB/SHR 1990

* The Swedish travel and tourism industry utilizes IT to a rather high degree, but detailed compilations of IT usage within the industry are lacking.

The public sector

* The Tourist and Travel Database, (TDB), is used as a basis for decision making in several projects, and complements The Swedish Central Bank's travel currency statistics.

* TOUREC – the financial tourism model – a computer supported prognosis and results rating tool, is used today by more than 120 municipalities in Sweden.

* A Product Bank, with information on Sweden's tourist attractions, is used by municipalities and tourist offices.

Consumers

* Sweden-on-line – under development – is an interactive system for consumers, who via self-service terminals, can get information on hotels, sights, transportation, etc., in Sweden.

* Self-serve systems for tickets to trains, airplanes, theater, etc.

Tour organizers and travel agencies

* The service providers, that is, tour organizers and travel agencies, use booking and distribution systems.

  - SMART (Scandinavian Multi Access Systems)
    In SMART, travel agencies can get information and book travel destinations both within Sweden and abroad. Planes, trains, buses, boats, limousines/rental cars, hotels and charter trips are found in the system. The travel agency's clients even have the possibility of communicating directly via Memonet and their own terminal connected to the travel agency.

The SMART system

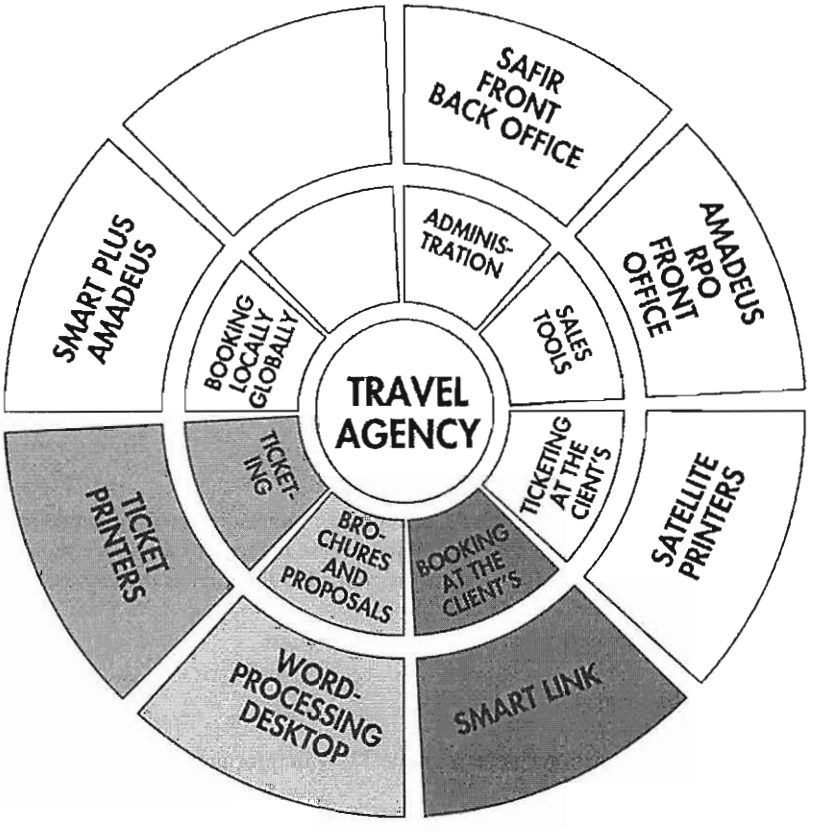


Fig. 116: 500 travel agencies have daily, updated information from 60 travel service providers via 3,550 terminals. SMART works with those products covering travel agencies' needs. The products can be integrated, and functions can be easily accessed, by all users of the travel agency.

* Information, reservations and ticketing in 60 local travel service providers reservations systems, including Amadeus Direct Access, an international booking system for airlines.

* Ticketing, for airline ticket allowances and automatic payment procedures, are examples of services that are computerized.

Hotels

* Computerization has brought a radical change in service quality for the hotel guest. New services will be introduced successively into hotels. As yet, there are no hotels which use all of the following services, but the majority of these services are in place in Swedish hotels.

* **When booking reservations**
  - Telephone systems with call waiting functions
  - Quicker booking with the support of client registers
  - Remote check-in/reservation terminals at airports (self-service)
  - Possibilities for companies to make reservations directly with the hotel's central reservation center via terminal
  - Possibilities for hotel personnel to reserve rooms at other hotels via terminals at the reception desk
  - Possibilities to make reservations via terminals at home

* **While checking in**
  - Check-in is faster with card scanners
  - Automatic check-in terminals, intended for motels that are unmanned at night, or larger hotels that would like to ease the load of their reception
  - Customers, own credit cards are programed to function as the key to the hotel room
  - Lock systems with greater security for the guest

* **During the stay**
  - Pay TV films
  - Internal information channels on the TV with information on the hotel's facilities
  - Payment for room service via the TV
  - Searching external databases, for example flight schedules, from the hotel room
  - Climate control/energy saving systems with movement detectors in the room, so that the air conditioning functions automatically when the guest is in the room
  - Safe in the hotel room
  - Minibar in the room which is connected to the hotel's main system for automatic charging.

* **Digital telephone system with:**
  - Voice mail for messages
  - The customer's name appears on the telephone's character display so that the employees can answer the client in the right language, and with the correct name
  - Possibilities to directly connect PCs in the room for external communication
  - Messages in different languages (even connection to different alarm systems)

* **When checking-out**
  - Check-out via the hotel room TV
  - Automatic updating of the frequent guest register (so that the guest gets advantages on their next visit)

* **More connections to the outside world**
  - To the bank for payments and other bank errands
  - To the hotel chain's central marketing information system and frequent customer list, and to suppliers for orders.

THE HOTEL COMPUTER ENVIRONMENT 1991

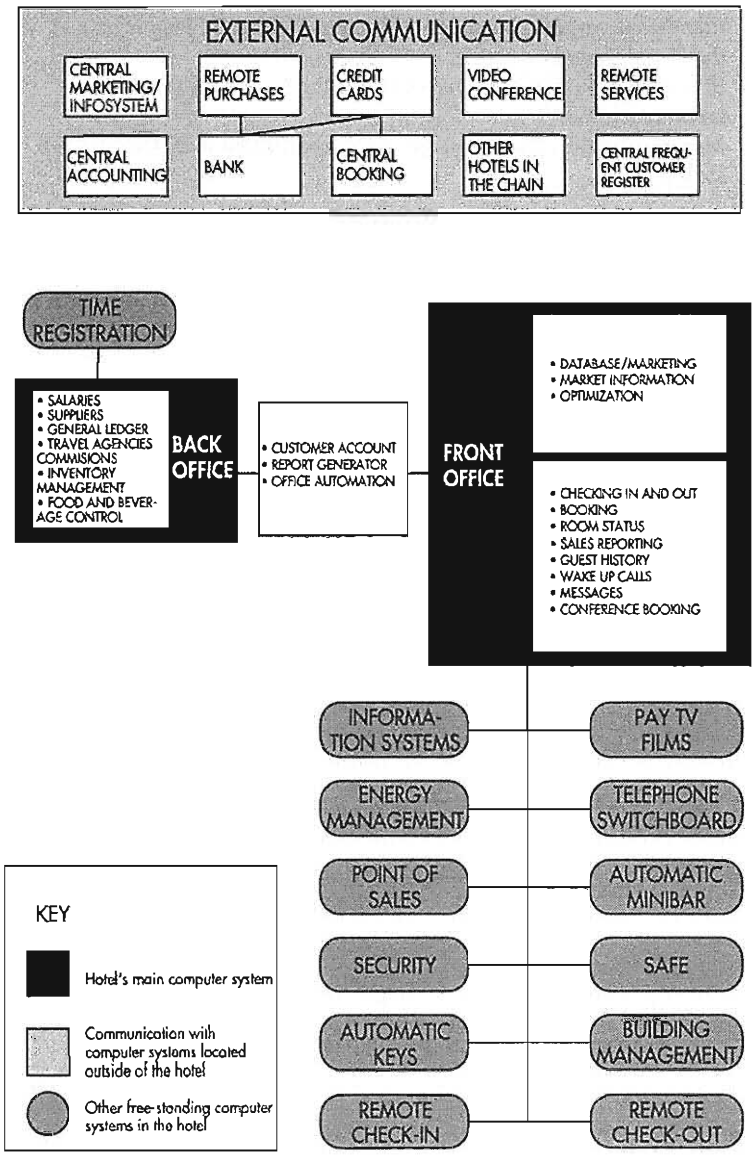


Fig. 117: A hotel's computer environment, a maximized model.
Source: Hospitality Management Consultants AB

An EU - Perspective

* IMPACT (Information Market Policy Actions)
  A common European information service market for improving competitive expectations for the European producers of, among other things, tourism services, by utilizing advanced information systems.
* ULYSSES INTERNATIONAL
  A multi-lingual system which will supply general tourist information (on roads, events, activities, sightseeing, lodging, etc.) and reservations services. Even transmission of pictures and diagrams as well as communication with other systems, such as Gallileo and Amadeus, will be possible.
* ATIS
  A consortium built of the largest motor associations in Holland, Germany and Great Britain in order to technologically and administratively, coordinate the collection and distribution of tourist information.
* EUROTOP
  The goal is to solve the growing need for information, between tour organizers and travel salespeople, by replacing existing printed travel catalogs with an electronic catalog, where the gradually changing offering of trips can be updated and made available. The electronic travel catalogs are distributed to the European travel salespeople through EUROTOP SERVICE, a new, advanced network (ISDN.) The database even provides information on place availability and reservations procedures.

For those who want to know more:

EU and tourism, Sveriges Turistråd 1992 (Swedish)

Hotel and Restaurant Facts, Sveriges Hotell och Restaurangförbund 1992 (Swedish)

SMART, Annual report as well as discussions with Charlotte Sandström, communications director

RRF, Svenska Resebranschens Riksförbund, Christina Wennmark

Sverige Fakta AB, Dan Humle

Next Stop Sweden, Åsa Gunnarsson

Restauratören, no. 1, 1993

Hospitality Management Consultants, Anders Grevby

Nordic Team, Hotel and Travel Systems, Anders Numan

Statistics Sweden (SCB), Gunlög Eidebrant-Nilsson, responsible for tourism

EDI – Electronic Business?

EDI, Electronic Data Interchange, is really an advanced application of data communications. It means that companies, authorities, and other organizations, can easily work together with the help of computers. However, EDI is much more than data communication – it represents a new way of entering into agreements and doing business, influencing the organization as well as the routines.

SwePro, Swedish Trade Procedures Council, defines EDI as:

"EDI consists of data, transferred electronically between computers, which are structured beforehand to agreed upon rules. With the help of these rules, the receiving computer is able to compute and understand the received data. It's all about the formalization of information which will be transferred."

The important part within the EDI system is that the receiving computer can translate the incoming messages. The transmitted information is structured in such a way that makes it possible for the data to be worked automatically into a system, transferred automatically and computed further in the receiving system, without any manual intervention.

The integrated logistic system

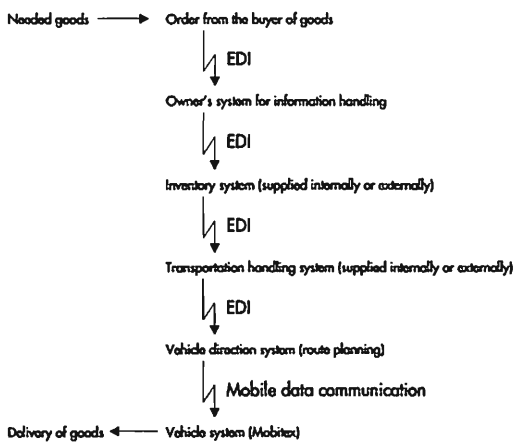


Fig. 118: The figure shows a simplified overview of an open EDI system and how it could work. The payment flow is not shown however, as it would make the figure far too complicated.
Source: TELDOK Report 75, 1992: "Lönsam logistik – med sikte på 2000-talet."

The current EDI system, for the most part, handles transferring orders of payment from companies to banks, orders of goods or services, invoices, decision making, insurance documents, delivery documents, customs documents, and technical data.

There is a special EDI standard which is used within the Swedish medical service, EANCOM/EDIT, which really is a basis for EDI for commercial messages. Medical services use it for purchasing, sales, delivery, transportation, receiving of goods, price changes, invoicing, etc., between medical centers and external suppliers of goods and services. The system is also used internally within medical services. HSS, the Swedish Health Care Standards Institution, has worked out a system in conjunction with EMEDI, European Medical EDI.

The EDI system of the future, the so called open EDI system, using more publicly accessible networks for communication, will make it possible for two unacquainted parties to do business entirely electronically. In order for it to really work, special legislation is required, not in the least when it comes to questions of responsibility and security. The demands for work on standardization are great as well. EDIFACT has devoted itself to these questions on an international level.

The users of EDI feel that they have achieved the following:

* *Lowered costs* as several links of data entry are eliminated
* *Improved data quality* as the data is reused without risk of incorrect data entry
* *Interest gains* through faster invoicing and payment, i.e. more effective cash flows
* *Freeing capital* within material handling through minimized inventory levels and quicker delivery, hopefully according to JIT, Just-In-Time principles.
* *Increased competitiveness* through improved communication and service levels between supplier and customer.

EDI is seen to be the single IT area which can look forward to the greatest growth, both within industry and the public sector. The development of EDI-based applications has been especially quick within the automotive and construction industries, in commerce and in transportation sectors. TDS, the Swedish customs computer system, is in all probablity, the largest EDI system in use anywhere in the world. *See also* fig. 122, p. 149.

Swedish companies interested in EDI, May 1991

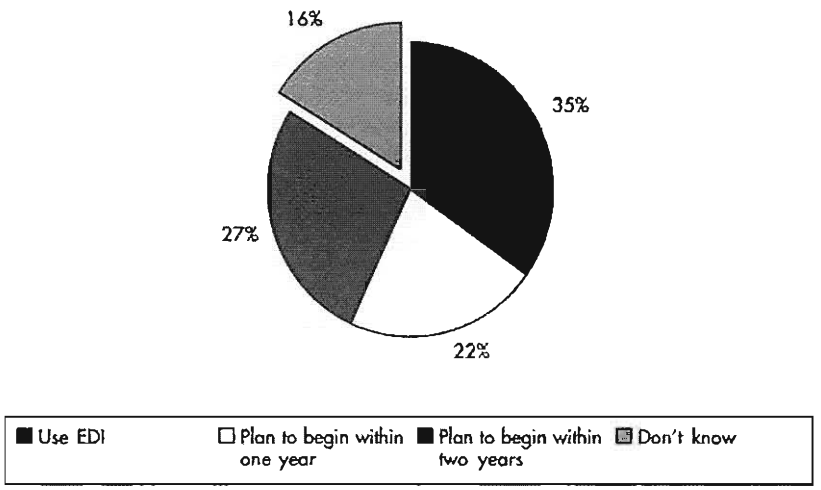


Fig. 119: The figure shows the percentage of companies in Sweden which were interested in EDI, use, or plan to use EDI, in May 1991. In the beginning of 1993 there are said to be 5,000 – 10,000 organizations using EDI in Sweden.
Source: SwePro/"The security of information systems in society during the 1990s", SAMS, February 3, 1993 (Swedish)

The prediction (OVUM 1990) is that there will be 39,000 EDI users in Europe by 1994. In this context, a user is defined as an organization which has more than 200 employees. What EDI can mean for the development of small businesses is difficult to even imagine.

Changed growth of EDI in Europe 1990–94

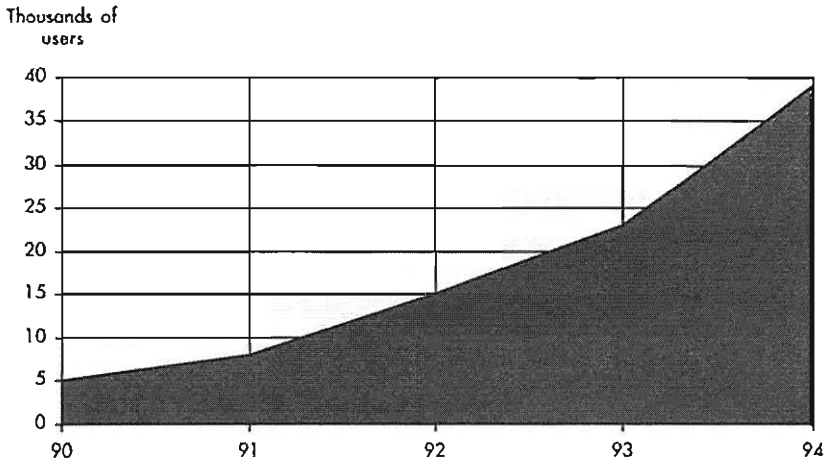


Fig. 120: EDI is expected to grow greatly in Europe up to the beginning of 1994. 39,000 users in 1994 compare to not quite 4,000 in 1990!
Source: SwePro/"The security of information systems in society during the 1990s", SAMS, February 3, 1993 (Swedish)

Many countries have pointed out EDI as a strategic area for the development of companies' international competitiveness. In Norway, Finland, the Netherlands, and France, as well as Sweden, there are national EDI authorities. On February 16, 1993, Sweden's EDI association, Edis, was founded.

Within the EU, there are several programs which focus on the development of European networks for data communication. EU is also running a number of programs, focusing on standardizing, developing and stimulating the use of EDI. TEDIS, Trade Electonic Data Interchange Systems, is one of the most all-encompassing EU programs. It is run by DG XIII and works towards open EDI systems and common standards. TEDIS coordinates work in EU and EFTA countries and provides technical support to UN/EDIFACT.

Detailed information on EDI is available in many different publications. Sources: SwePro/"The security of information systems in society during the 1990s", SAMS, February 3, 1993/HSS Report 4 1992: "Electronic commerce in Swedish health care" (Both in Swedish)

EDI Projects in Europe

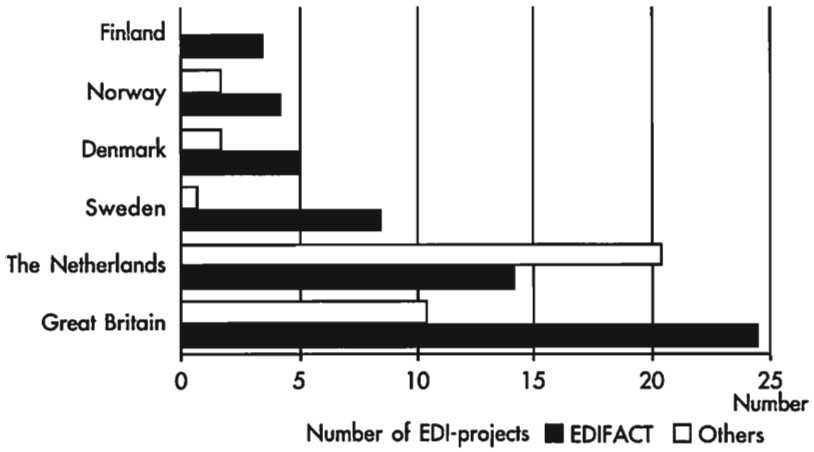


Fig. 121: A newly made inventory of on-going EDI projects shows, according to the research firm OVUM, the largest number of projects come under EDIFACT – except in Holland.
Source: OVUM/SwePro News no. 3, Summer 1993

The Status of the Customs Computer System, Summer 1993

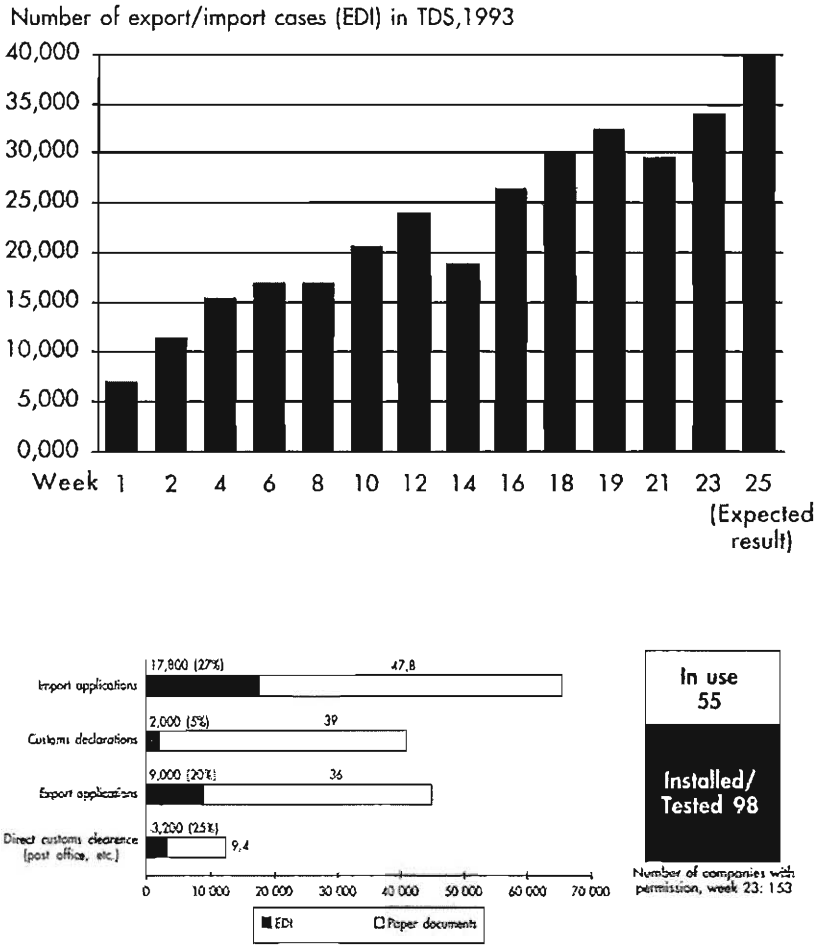


Fig. 122: The Swedish Board of Custom's computer system, TDS, is on the way to becoming one of the largest EDI systems in place in Europe. The Swedish Board of Custom's EDP-bureau expects the annual volume to eventually reach four million messages, from the current 40,000. The figure shows the development the system has undergone only during 1993.
Source: SwePro News, no. 3, Summer 1993, Björn Grahn

SWIFT – Bank's Transaction System EDI

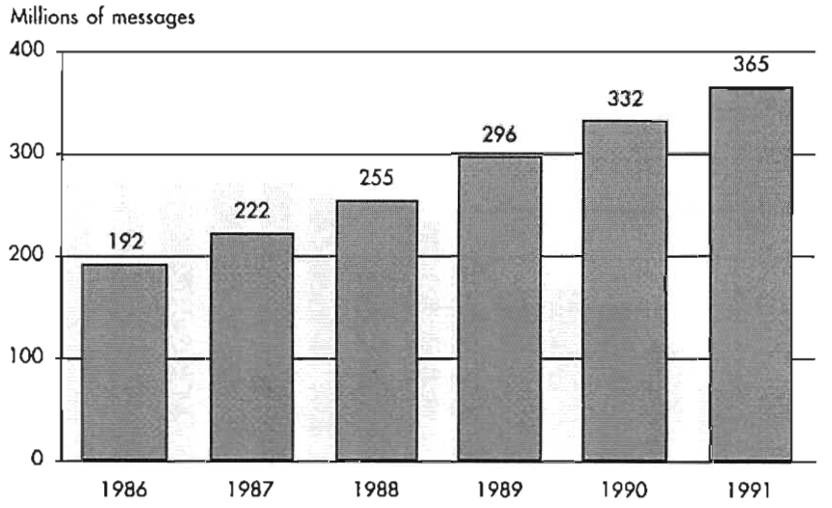


Fig. 123: SWIFT, Society for Worldwide Interbank Financial Telecommunications, adapts all of the transactions which are carried out to a standardized format. In 1991, 365 million different types of SWIFT messages were handled.

Source: S.W.I.F.T. Annual Report 1991

Do You Know This About EDP in the Swedish Public Administration 1993?

Taken from "EDP in the civil administration and defense 1993" by the Swedish Agency for Administrative Development (SAFAD)

* There is no longer a total increase in state EDP costs for civil administration and the defense. The earlier growth of 15–20 percent per year in current prices, seems to have remained completely still for the budget year 1991/92.

* The civil authorities, and parts of the Department of Defense authorities – the miliary portion excepted – purchased PCs for a value of SEK 476 million during 1991/92, software for SEK 165 million, printers for SEK 51 million and other computer equipment for SEK 1,006 million.

* The civil authorities' and defense's total EDP costs went up to SEK 3.462 billion. The civil authorities show costs of SEK 2.937 billion while defense's costs are SEK 525 million.

* Six authorities account for 65 percent of the civil authorities total EDP costs, namely; The National Tax Board, The National (Swedish) Social Insurance Board, The National Swedish Police Board, The National Labor Market Administration, Statistics Sweden, and the Swedish National Road Administration.

* The civil authorities have 69,572 offices with computer support, i.e., offices with PCs, work stations or computer terminals. The number of offices within the defense was 9,977. In total, there are 79,549 state offices with computer support.

* A study has shown that the SAFAD has saved SEK 100 million by functioning as a coordinator for state purchases of EDP equipment.

* The SAFAD has studied the new expectations for EDP and IT in public administration brought about by European integration. In 1992, the EU invested a total of SEK 40 billion on IT related solutions. That corresponds to five percent of EU's entire budget.

* The compiled postage costs for the Swedish civil authorities is close to SEK one billion per year. This shows the extent of the paper flow, and the desirability of getting an electronic system up and running. Today there are three levels: electronic mail, which is the transmission of text between people; document transfer, the exchange of information between computers; and EDI, the exchange of structured information for understanding between different applications. EDI is the area which has come the farthest in the necessary standardization work.

The State's EDP Costs 1987–92

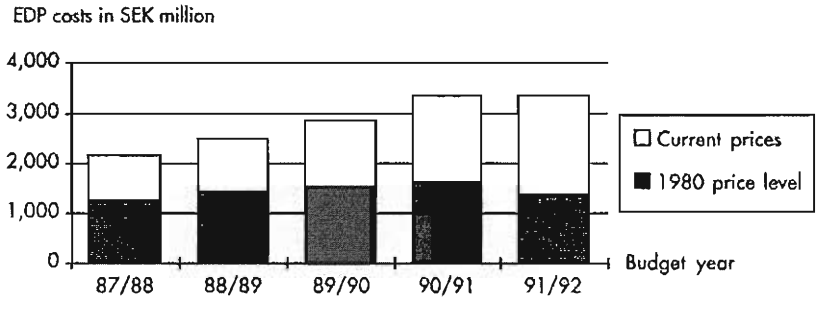


Fig. 124: Total EDP costs for civil authorities and defense during the period 1987–92, in current prices, as well as at 1980 price levels, expressed in SEK million. In 1992 it increased to SEK 3.462 billion.
Source: EDP in civil administration and defense 1993, SAFAD (Swedish)

The State's Computer Supported Offices 1988–92

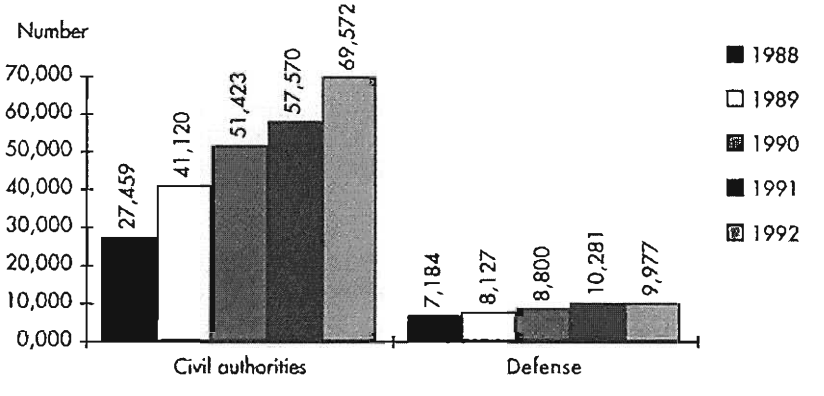


Fig. 125: The figure shows the number of computer supported offices in state civil and military authorities during the period 1988–92.
Source: EDP in civil administration and defense 1993, SAFAD (Swedish)

The State's Personal Computers 1988–92

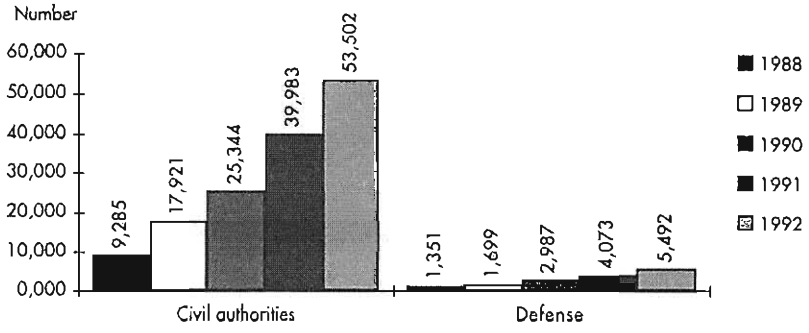


Fig. 126: Personal computers came to be an important work tool for the employees of state civil and military authorities during the period 1988–92.
Source: EDP in civil administration and defense 1993, SAFAD (Swedish)

The State's Computer Terminals 1988-92

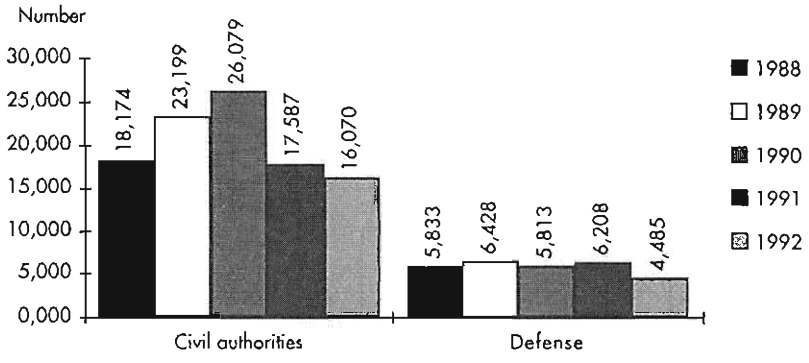


Fig. 127: The number of computer terminals in state and military authorities has decreased during the last few years. The figure shows the development for 1988–92.
Source: EDP in civil administration and defense 1993, SAFAD (Swedish)

Personal Computers in the State

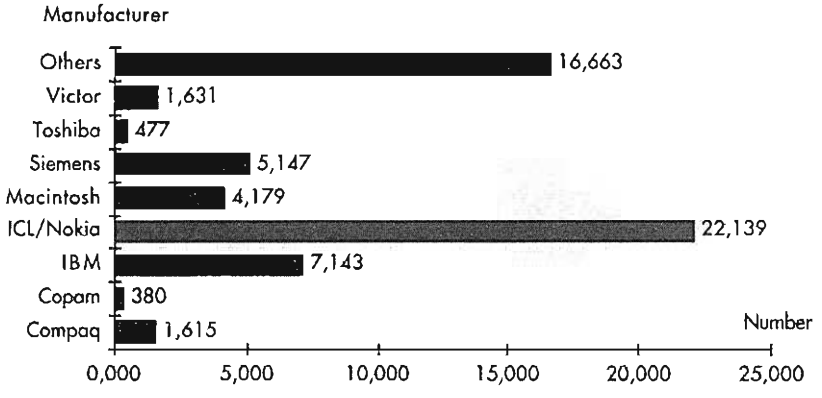


Fig. 128: The number of personal computers in civil authorities and the defense 1992, distributed by manufacturer.
Source: EDP in civil administration and defense 1993, SAFAD (Swedish)

The State's EDP Costs 1987-92
Personal Computers and Other Equipment

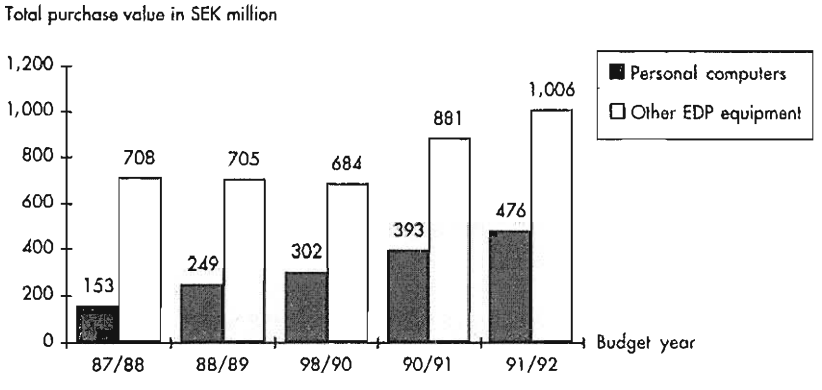


Fig. 129: In SEK million, the purchase value of personal computers and other EDP equipment procured by state authorities from 1987–92. The purchase value of other EDP equipment does not include military authorities expenses.
Source: EDP in civil administration and defense 1993, SAFAD (Swedish)

Miscellaneous EDP Equipment in theState
Market Shares 1992

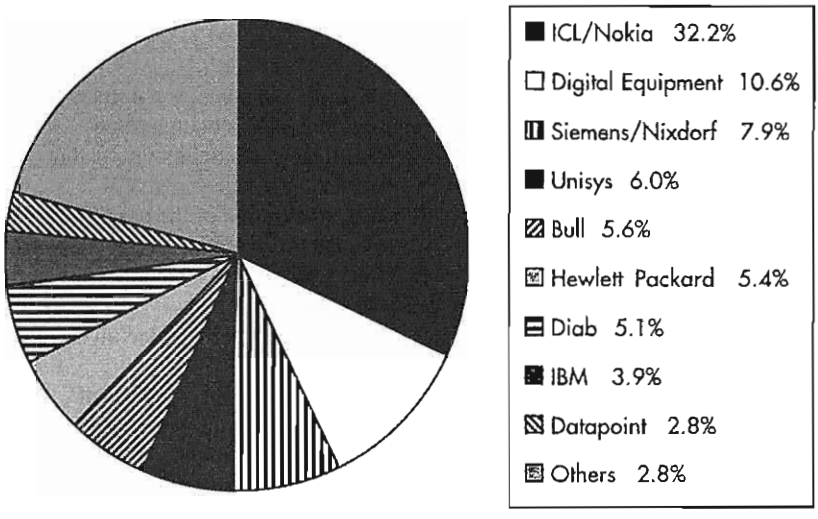


Fig. 130: The figure shows the market shares, in percent of purchase value, for suppliers of computer equipment, exclusive PCs, procured by civil authorities and parts of the defense.

Source: EDP in civil administration and defense 1993, SAFAD (Swedish)

4. The New Telecom Structures

Interconnection the Key Question

Introduction by Gull-May Holst

In the wake of new telecom structures and liberalization, comes a number of problems with economical, legal, international and technical undertones. One such question, mostly of an economic, legal and international nature, is that of interconnection costs. This debate is by no means new, but as yet, still unsolved. That is why we try to provide a brief illustration of the circumstances in this complex question. To help us, we have Peter Lynèl, one of the telecom experts from Price Waterhouse Corporate Finance. We also have interesting contributions later on in the chapter about the liberalization in Sweden as seen from the point of view of the country's leading telecom carriers.

Why is interconnection so important? The answer is obvious – it is in all telecom users, interest to be able to reach everyone, regardless of which network carrier they have chosen. Interconnection is also important for free competition, as it takes a long time, and requires enormous resources, for a new carrier in a market to build up their own, all encompassing, network. It is obviously practical to use already existing infrastructures. The question then becomes how much the new carrier and their customers should pay in order to be able to use the existing network. Should the price be the same for a network carrier as for an end user?

Those who want interconnection, normally competitive network carriers, feel that they should have a discount, as compared to the normal price of the end user. Their reason is that carriers have larger traffic volumes, and that carriers take over some functions from those who originally invested in building the network. Such functions include marketing and invoicing to the end users – and therefore also risks of credit losses. In other words, the carriers are looking for a "wholesale price" which is lower than that paid by the end user. Such an "interconnection discount" corresponds to the margin which a retailer of another's network services needs to cover their own costs.

Up till now, it has not been possible to find a simple, uniform formula for applying an interconnection discount. Each country has chosen their own model, which becomes clearer in the following articles.

One reason for the great variety of national models is that telecom charges all over the world are distorted in relationship to the real costs. The room for discounts on longdistance calls is great, as users often pay much more than the actual cost of the call. On the other hand, there is no room whatsoever for

discounting local calls as the user is already paying less than the actual cost. This is why some countries, for example the USA, have initiated an extra charge for companies that want interconnection with the local network, a so called access charge, (in Great Britain called an access deficit charge) which contributes to cover the costs of the local network. Covering costs is necessary simply to maintain, renovate and modernize the local network. Another component in the extra charge is the social and political reasons for equalization – everyone should be able to afford a telephone. For this to be possible, some sort of subsidy must take place. The question is: who will pay for it and how?

For the time being, the interconnection charges paid by carriers in different countries normally include two different types of prices:

1. One for the actual transmission of the call – paying for the length of time one actually uses the network of another carrier;
2. An additional cost to contribute to the deficit in the local network.

This deceptively simple principle has found various applications in different countries, based on diverse philosophies. This has, to a high degree, complicated the possibility for lucid, international, comparisons. In the examples which follow, grossly simplified, we find that in Australia, "pay first, get cheap interconnection" is applied, while Great Britain applies the principle of "cheap interconnection first, then pay for the deficit."

Despite great national differences, a striving towards cost-based solutions is taking place. There is no other way out in a competitive market. How will Sweden divide the costs in the transition to a telecommunications market with many carriers? That is the key question. Finally, *see also* the Appendix, p. 253.

Interconnection Costs - A Comparison

By Peter Lynèl, Price Waterhouse Corporate Finance

In Sweden, the requirements for interconnection are formulated in the telecom law. In the proposition for a telecom law and a changed business form for Televerket (Swedish PTT)*, appears the following:

"As a general starting point for the economic requirements, it could be stated that they should probably be decided based on reasonable, businesslike principles. It can, in my opinion, be seen as reasonable that those who supply networks for interconnection, demand reasonable profits based on granting access. The income from this access, that is to say, the price of the interconnection, should cover the actual costs, write-offs, and interest on capital, as well as the maintenance and R&D costs which can be attributed to the actual interconnection. Such a position lies well in line with the concept of cost-oriented."

This quotation reflects the Swedish government's views on the basis for future agreements between Telia and competing carriers concerning interconnection prices.

Introduction

There is a terminology used today which does not always reflect reality, especially as concerns interconnection. In Sweden the term "charge" is often used, which gives the impression of a tax, rather than a payment, for a performed service. Following, the term "price" is used, that is, the price which the customer pays for a delivered service.

If the costs of the local network are not covered by the income from traffic and fixed charges, there will be a deficit. A loss can come about as the result of flat rates, when the costs vary for supplying telephony in different parts of the country. In addition, deficits can result from poorly balanced prices with restrictions on raising prices, or, when due to a national commitment, the carrier is obligated to supply telephones to everyone with the same level of service, but does not receive the full cost of the supplied services.

A portion of the costs are to maintain, repair and upgrade the network. In order to supply services in the future, the price must finance those costs associated with supplying the service, otherwise, the network carrier cannot reinvest and satisfy the customer demands.

Every country requires that the network carrier supplies access to the network, whether or not an individual or business requests interconnection. In principle,

** Telia AB since July 1, 1993.*

the customer receives the same service – a line connected between two points. If a competing carrier wants to buy this same service, they often demand a lower price, partially with respect to the fact that certain functions, such as marketing, invoicing, etc., are handled by themselves, and partly as a discount for greater traffic volume.

Following is a short description of the situation in Australia, Great Britain and the USA, and their starting points for setting the price of interconnection. These countries have different viewpoints, and have chosen different methods for interconnection prices, depending on how long interconnection has been going on, (20 years in the USA, 10 years in Great Britain and just a few years in Australia), the degree of openness in the market, etc.

Australia

Australia has chosen to organize their network based telecom market into a duopoly up to 1997, with the market overseen by AUSTEL, the regulatory telecom authority. The two carriers are state-owned Telstra and the private Optus. Through low interconnection prices, but specified requirements for investments in the development of the network, AUSTEL would like to quickly create conditions for open competition and multiplicity in the network supply.

As concerns interconnection, Australia is divided into regions where the interconnection prices are regulated, however, competition prevails in the traffic between the different regions. Therefore, the requirements and price setting for that traffic is the subject of direct negotiation between Telstra and Optus, that is to say, setting the market price. As competition reaches certain levels within other traffic segments, the regulation of interconnection will cease.

Interconnection prices are separated into two categories, one related to usage and one to interconnection. For the usage dependent category, Australia has designed its own model, where the starting point is those costs that can be assigned as directly attributable incremental costs for usage and capital costs. In general this means variable costs, transmission, switching, etc., as well as the costs for new investments caused by interconnection. However, they have chosen another starting point for estimating the value of the interconnection to the local network. The main portion of the costs for the local network is assigned to the original investment costs and additional costs do not normally occur as a result of interconnection. If the same starting point was used as above, the costs would have been zero. However, the starting point has been that **the local network is commercially important**, even for the competitive carrier. The interconnection price is based on the non-capital directly attributable cost of operating and maintaining the local network and are charged per minute.

The price of interconnection varies with time, and depends upon in which of the three types of regions the interconnection occurs. In addition, the price is divided into four elements: customer access network charge, local exchange switching, junction network carriage, and trunk exchange switching. All are charged per minute. There is also a cost for each attempted call, as even attempted calls require capacity.

As the Australian interconnection prices have a cost for attempted calls, a comparison with Sweden is difficult. To produce a better comparison, I have started with Swedish consumer statistics. It is estimated that only 61 percent of all attempted calls in Sweden lead to a completed call. On the average, 1,200 calls are placed, for a total of 4,750 minutes per inhabitant/per year (Swedish average according to Telia.) Below are the interconnection prices in Australia sorted into this consumption pattern. It should be noted that this comparison assumes that all switches and lines in a region are utilized.

	Peak (Day)	Off-peak	Of which access
Central business district (CBD)	0.16	0.05	0.01
Metropolitan	0.15	0.06	0.02
Country	0.21	0.09	0.05

Fig. 131: Local interconnection prices in Australia separated into type of region, in SEK/min.

In pace with Optus' building out their own network, these interconnection prices will decrease. In Sydney for example, Optus has connection points to most of the local switches.

Except for the direct costs assigned to interconnection, the new carrier Optus has paid AUD 800 million for their licence. As a part of the agreement, Optus took over the ownership rights to the satellite carrier AUSSAT. In addition, Optus has committed itself, according to a fixed time plan to: expand their network so that they will have reached 45 percent of the population for longdistance and international traffic by 1992; supply telephone booths from February 1993; offer longdistance traffic to the entire country by 1997, etc. In total, these investments are expected to be in the order of AUD 4 billion by 1997. This means that it has cost Optus in the order of AUD 5 billion, (the majority imposed in the license agreement) corresponding to approximately SEK 26 billion, in order to enter the market.

In comparing the requirements of interconnection and usage charges of various models, between Australia and other countries, we must consider the large investment committment that Optus has made, and the license cost. To show the level of these costs, we can allocate them over the market of approximately 158 million call hours, which was the basis for entrance to the market. In

addition, the goal was to reach a market share of 25 percent by 1997. If we divide the cost into market share and traffic volume for the period up to 1997, it results in a supplimental cost of SEK 2.92 per minute, where SEK 0.54 per minute is the license cost. In this case, we have not taken into account any changes in volume during the period.

USA

In the USA, as in other countries, longdistance and international traffic subsidizes low subscription and local traffic costs. The development has been going on for nearly 20 years, since 1974, when MCI requested interconnection, to today, when the telecommunications market and network have been made competitive all the way down to the local level. As the USA is a federation, the market is regulated both on a federal and on a state level. In the USA, unlike Great Britain and Australia, the market is organized into local and longdistance companies. A local company may not connect a longdistance call.

The US telecommunications market is divided geographically into regions, so called Local Access Transport Areas (LATAs), within which a local company still has a monopoly. Longdistance traffic is viewed as all traffic outside of, and between, different LATAs. A local company can operate in many regions, for example, Bell South operates in 38 LATAs. A LATA can vary in size as well. A call between New York City and New Jersey is a longdistance call, despite a relatively short physical distance, while in Nevada, the entire state is a region. Locally, the market is regulated on the individual state level, but a local company can operate in several states. Longdistance companies pay the local companies for interconnection at both ends, that is to say, to the local company where the call orginated, and to the local company where the receiving party is located. Price levels vary between the different local companies, but an average is shown below. The local monopoly has been broken up and possibilities now exist for competitive companies to transmit traffic on a local level through their own equipment installed in the local companies' premises.

	Day & night
End user common line charge	0.08
Local switching rate	0.06
Local transport rate	0.04
Total	0.18

Fig. 132: Average USA local interconnection prices, 1992, in SEK/min.

The starting point for allocating and classifying costs, and thereby the local interconnection prices, is to separate them by traffic sensitive costs and non-traffic sensitive costs.

The non-traffic sensitive costs occur for the local network, whether or not they are utilized, such as fixed costs for equipment, the network, maintenance, and switches. It is paid as one price for access by both the longdistance carrier and the end user. The enduser pays a common line charge in their subscription, and the longdistance carrier pays a variable price per minute.

The traffic sensitive costs include switching, interconnection points, equipment, etc., which are a function of the networks design, and are directly attributable to the volume of calls and usage. They are paid by the longdistance carriers and consist of a switching element and a distance dependent transmission element, both paid on a per minute basis.

The transport element is distance-related and concerns the conveyance between the longdistance companies, interconnection point and the local switch. For Bell Atlantic, this can vary between SEK 0.06 – 0.10. As this distance can vary greatly, the above represents an average for the US. It is this component that makes it interesting for the longdistance company to have their interconnection point as close to the end user as possible, or to use a so called "by pass."

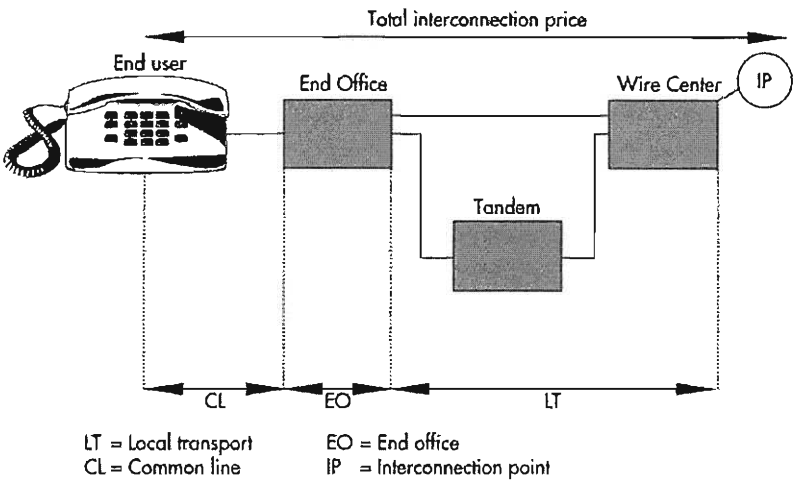


Fig 133: Local network structure in the USA

In addition, there is the price for the transmission through the long-distance network, that is, all interregional traffic. These prices are distance-dependent, are paid per minute, and can amount to SEK 1.75 – 2.62 for the type of service such as MTS by AT&T. By committing to a certain volume, during a set period, a buyer can obtain discounts up to 36 percent. There are many possibilities in the US. By packaging or dividing up the traffic and prices, for

example offering a higher fixed price and a lower variable price, the buyers' price can vary considerably.

Great Britain

The market in Great Britain is organized into a de facto duopoly between the previously state-owned carrier British Telecom (BT) and Mercury. In 1985, Great Britain's regulatory authority, Oftel, set the groundwork for an agreement concerning prices and requirements for interconnection between BT and Mercury. The starting point for the interconnection prices was a division of BT's total costs. At the same time, Oftel admitted that there was a loss related to the local network, resulting from the need for rebalancing, and the demands for uniform tariffs. The yearly price increases for interconnection were set initially at the consumer index of -3 percent.

In 1992, Oftel conducted an overview of the interconnection requirments and prices. This set the ground for discussions as to whether a viewpoint starting with a marginal cost price setting should replace the earlier division of BT's total costs, i.e. fully allocated cost prices. Oftel determined that a price which was lower than the fully allocated cost would be unfair in the long run.

To compensate BT for the access deficit in the local network, Oftel decided that BT should be paid a compensation by the various actors in the telecom market. This awakened strong reactions in BT's competitors, as to why Oftel used the possibility of preventing BT from obtaining compensation by issuing a mainer to Mercury. Oftel has this possibility up to 1997. In order to avoid the requirement paying an access deficit charge to BT, the competing carrier can not have more than 10 percent of the market share, or BT's market share can not go under 85 percent. How this market share is to be calculated has not yet been defined. * (see footnote)

Since a 1985 agreement, no contract on interconnection prices between BT and Mercury has been made public. However, in August 1993, an agreement was made between the cable TV company Nynex CableComms Sussex LTD and BT on interconnection conditions and prices. A definitive agreement could not be reached as concerns local prices, but rather has been turned over to Oftel for confirmation. ** (see footnote)

In 1991 a so called illustrative price list, was made public as to the size of the compensation that the cable TV company, according to BT, should pay for the deficit in the local network.

** On December 15, 1993, Oftel made clear that the room for exclusion from contribution to the deficit was "utilized" as BT's market share had gone down to nearly 85 percent. Room for exceptions had already been utilized by Mercury, which was able to avoid paying a charge on the 25 percent of the international traffic they had already achieved. (Ed. note)*

*** BT has announced that the interconnection agreement between BT and MCL concerns only these two companies. Other carriers must submit to the more expensive interconnection agreement between BT and Nynex being applied. (Ed. note)*

	Peak	Standard	Cheap	Access deficit charge
Local	0.19	0.19	0.19	0.04
Long national > 56 km	0.46	0.38	0.24	0.10
Short national < 56 km	0.50	0.41	0.26	0.10

Fig. 134: Interconnection prices according to the Nynex/BT agreement of August 1993, as well as the compensation for the access deficit in the local network according to BT 1991 in SEK/min.

On December 2, 1993, a new agreement was presented between BT and Mercury. It contains the following call prices:

	Cheap	Standard	Peak
Local switching area	0.08	0.15	0.19
Regional switching area	0.10	0.18	0.23
Short national calls	0.12	0.21	0.27
Long national calls	0.15	0.26	0.34

Fig. 135: Interconnection prices according to the 1993 BT/Mercury agreement in SEK/min.

There are two local segments. Which one Mercury uses depends on how far down in the network they have their connection point. If the connection point is near the local switch, only that segment is used. If however, it is located on a higher level, the second segment is used.

A condition for being able to utilize a connection point at a lower lever is that Mercury has built lines up to this level, or that Mercury rents a line from BT. This cost must be weighed against the lower call price which Mercury provides through a connection point at the lower level. The level chosen depends upon the most profitable alternative.

There is a physical barrier when it comes to longdistance transmission. A short national call is up to 56.4 km, while at greater distances, it is a long national call.

Oftel also determined that BT has a right to compensation for the local network deficit. This compensation is to be divided into local, national and international calls. For the last category there are 13 different levels.

	Cheap	Standard	Peak
Local calls	0.03	0.07	0.09
National calls	0.12	0.19	0.24
International calls			
Charge band 1	0.21	0.26	0.26
Charge Band 13	7.24	7.27	7.27

Fig. 136: Compensation for the deficit in the local network, in SEK/min.

The agreement states that Oftel again forces BT to refrain from compensation for the deficit.

In a comparison between the Nynex and the Mercury agreements, we must take into consideration that Nynex is a company with a local network, while Mercury is a company focused on longdistance. New to the agreement is that the cost for attempted calls is also included as a portion of the price for the time called.

Summary

The Swedish telecom law is based on the fact that the carrier that offers the network for interconnection, shall have the right to reasonable and fair compensation, and that the starting point for the compensation shall be cost-oriented. The carrier which secures telephony in the entire country can, in principle, obtain compensation for this from the other carriers who buy interconnection services.

As seen above, the starting point for setting the price of interconnection and access is different for the three countries, Australia, USA and Great Britain, which complicates a comparison. Given different purposes and assumptions, but above all, how far they have reached in the development of a deregulated and competitive market, different models have been chosen for price setting of interconnection and access.

		Local	Short national	Long national
Australia	CBD	0.01		
	Metropolitan	0.02		
	Country	0.05		
	License	0.54		
	Investments	2.38		
USA		0.08		
Great Britain		0.04	0.10	0.10

Fig. 137: Compilation of access prices for Australia, USA and Great Britian, in SEK/min.

			Morning	Afternoon	Evening	Off-peak
Australia	Local	CBD	0.15		0.04	
		Metropolitan	0.13		0.04	
		Country	0.16		0.04	
Great Britain		Local	0.15	0.15	0.15	
		National > 56 km	0.36	0.28	0.14	
		National < 56 km	0.40	0.32	0.16	
USA		Local	0.10			
		> 578 km	1.17		0.71	0.61
		> 3,590 km	1.67		1.12	0.86

Fig. 138: Compilation of interconnection prices for Australia, USA, and Great Britain, in SEK/min.

The assumptions in each country vary as to what constitutes distance, and thereby charges, time spans, costs for call attempts, etc. The above summary can be seen as a norm, where deviations can occur both above and below, depending on the traffic situation, contracts entered into, etc., in each special case. The development and the tendencies which have been shown can be of guidance as to how the development can go in Sweden.

The question of interconnection prices, their level, structure, etc., will be an object for discussion for a long time to come, but hopefully, the calculations and starting points will be easier than in these countries.

Given limited space for presenting a very complicated subject, this presentation has of necessity been short. It is meant to provide an overview, rather than a complete picture of the situation. More information, for those who wish, can be found in the publications in the bibliography.

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Liberalization – The US Experience

by Staffan Reinefjord, Managing Director, AT&T Nordics AB

AT&T welcomes this opportunity to share specific insights and expertise gained from experience in the US market, where AT&T within a decade has undergone a transformation from a monopoly provider of telecommunications services in the 1970s to, at present, a firm that faces fierce and effective competition in all of its markets.

In some significant respects, the evolution of a competitive telecom market in Sweden is likely to differ from the experience in the United States. However, in view of increasing global competition, Swedish customer needs will not differ fundamentally from those in the US. The telecom market will continue to be driven by customers who seek to procure cost-effective, efficient, timely and innovative telecom services.

Customer Benefits

The significant expansion of competition in domestic and international long distance services in the US following the January 1, 1984 divestiture of the Bell System has resulted in significant customer benefits. Customers now have choices of services, service providers, pricing plans, billing and other features, as established carriers and new entrants have responded to customer demand for innovative, efficient, cost-based services. Since 1984, for example, the number of new service offerings that AT&T introduced each year has increased dramatically, from 35 new offerings in 1985, to 188 new services introduced in 1990. As competitors have kept pace with customer demand, the network capacity of established and new providers has increased, and at the same time, the unit costs of technology have declined (*fig. 139*). As a result, since 1984, customers have enjoyed significant savings in their telecommunications expenses as market forces have driven prices downward, costs and carriers compete for customer's business .

	Fiber cable miles	Increase since 1985(%)	Voice-grade circuits*	DS-3 miles**
AT&T	32,398	471	271,172	13.1M
Sprint	22,586	326	192,965	6.5M
MCI	17,600	482	226,647	5.9M
NTN	13,035	131	210,670	4.1M
CTI	914	139	145,854	0.2M
Norlight	844	N/A	112,940	0.1M
Valley Net	570	N/A	112,896	< 0.1M
Diginet	90	N/A	302,101	< 0.1M
Total	88,037	309***		30.1M

* Equivalent Voice-grade circuits per route mile (on average for each carrier)
** Total equivalent DS-3 miles
*** Average increase (five companies)

Fig. 139: Interchange carriers' fiber networks, 1990
Source: AT&T

Reduced Prices

From January 1984 to January 1991, AT&T's prices for direct dial interstate calls were reduced by more than 40 percent, and international calling prices declined by 30 percent (*fig. 140*). During the period December 1983 through June 1990, the overall level of telecommunications expense to customers, increased by only 18 percent, although the Consumer Price Index in the US rose by 28 percent. Increases in local service prices were moderate between 1984 and 1990, despite an initial rise after the AT&T divestiture of its local operating companies (*fig. 141*).

Telephone penetration and subscriber usage have also increased since 1984. In November 1983, FCC (The Federal Communications Commission) reports indicated that 91.4 percent of all American households had a phone available. By November 1990, the telephone penetration rate grew to 94.7 percent. Similarly, local and long distance usage rose. As new competitors entered the market, the total services market expanded, with the number of interstate switched access minutes by carriers having increased by more that 100 percent between 1984 and 1990, from 37.5 billion minutes to 78.7 billion minutes – an annnual average growth rate of approximately 13 percent. According to FCC reports, long distance revenues (both intrastate and interstate) approached US$ 51 billion in 1991 as compared with US$ 38.8 billion in 1984, despite decreasing prices.

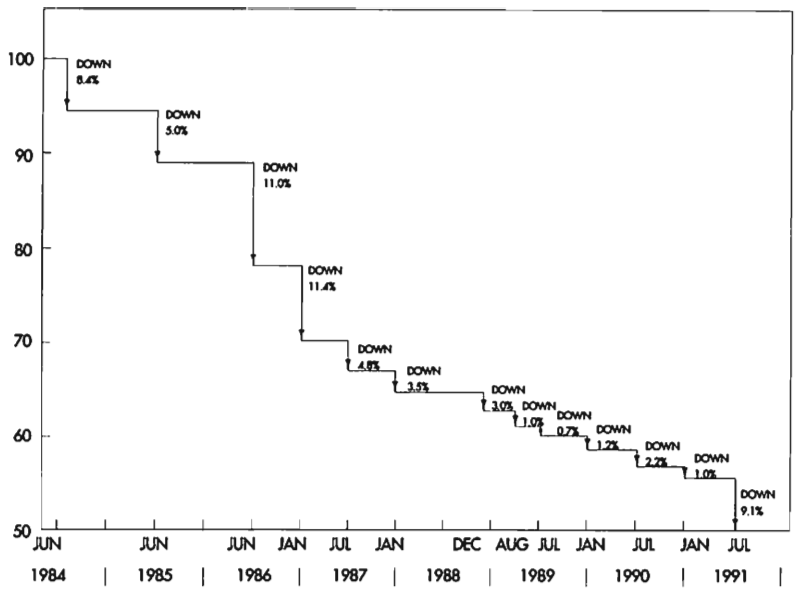

Fig. 140: Percentage price changes for telephone calls in the US after the January 1984 divestiture of the Bell System.
Source: AT&T

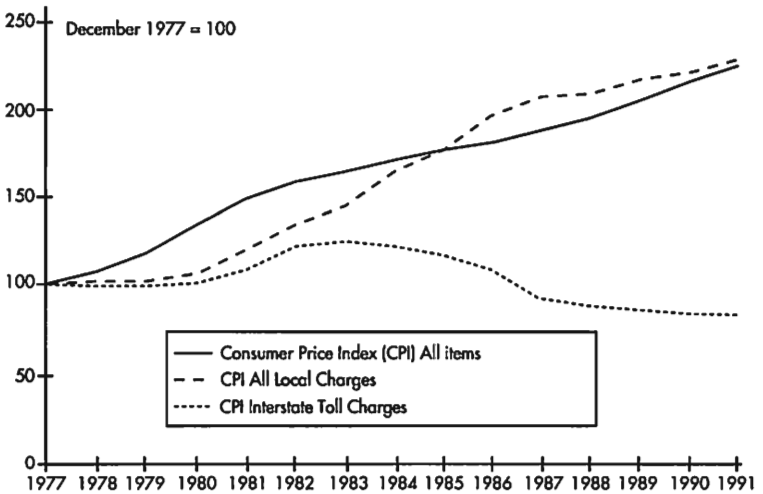

Fig. 141: Price changes for local and long distance calls in the US from 1977–91 related to the Consumer Price Index (December 1977 = 100), for all products.
Source: AT&T's Economic Analysis Section 1/92

The number of new carriers grew rapidly in the first five years after the January 1, 1984 divestiture with the introduction of interconnection arrangements that allowed customers to access all carriers on an equal basis (i.e. "equal access"). During this time, AT&T experienced an annual traffic growth rate of 7.5 percent. At the same time, the revenues of AT&T's competitors more than quadrupled. The market share of AT&T's competitors, based on interstate switched minutes of use, grew from 15.8 percent prior to the implementation of equal access to 36.7 percent in 1990. As competitors grew, employment increased, with new carriers employing approximately 36,000 persons in 1987 and over 47,000 by 1990.

Thus, the US experience with full long distance competition, has resulted in unquestionable benefits to customers and carriers alike, through a stimulated and expanding market.

Transition Period

The detailed implementation of a fully competitive long distance environment in the US involved a transition period during which specific steps were taken to meet customer and carrier needs. A timetable was established for providing interconnection arrangements and equal access capabilities. In this way, the local operators had a level of certainty to consider how these requirements could be included in network modernization and construction plans, while new entrants were provided a level of certainty to enable them to assess market entry.

The experience in the US suggests that specific obligations to provide interconnection services (both switched and leased lines) to new entrants at reasonable rates and on a timely basis, will assist in the development of full and fair competition. The general rule was to provide equal interconnection arrangements on a non-discriminatory basis to all long distance service providers.

To provide price predictability and equal, non-discriminatory, availability of interconnection, all interconnection arrangements are best offered pursuant to terms and conditions (or "tariffs") publicly filed with regulators. Merely leaving interconnection terms and conditions to commercial agreements in a multi-carrier environment does not seem satisfactory. Even the opportunity for new entrants to appeal to regulators following unsuccessful negotiation with the TO (telecom operator), would not provide the necessary level of certainty required by a potential entrant. Although the involvement of the regulator could lead to an eventual contractual agreement on interconnection terms, it would not afford the potential entrant an adequate planning base from which to make an entry decision. Nor would it provide sufficient assurance to new and existing entrants that interconnection, vital to their business, could be obtained in a timely fashion, and with the terms and conditions that would make operations viable.

Policies for Interconnection

The experience in the United States suggests that national regulatory authorities would need to administer at least the following policies with respect to interconnection:

- Equal and non-discriminatory access, not only among new entrants, but also between an established TO and new entrants;

- Presubscription selection of long distance carrier by customers;

- Cost-based pricing of interconnection charges and timely interconnection services provisioning;

- Published interconnection charges (or "tariffs"), with unbundled interconnection components;

- Accounting and audit rules to avoid cross-subsidy of competitive services by reserved services.

Global competition among users and, in turn, their demands for more cost-effective, innovative telecommunications solutions, will inexorably drive the telecommunications industry to worldwide competitive reform. AT&T hopes that insights available from the US experience in this regard will be useful in accomplishing the transition.

BT – A Global Operator

by Bo Rehn, Managing Director, BT Nordic

Since privatisation in 1984, BT (formerly British Telecom) has evolved from a state-owned monopoly acting mainly in the domestic market, into a customer-oriented company working in a competitive market with global ambitions. Consequently, BT today serves as a model for many other European telecommunications companies.

BT now has more than 100 offices in some 30 countries and a turnover of more than SEK 145 billion annually (£ 13.24 billion). In addition to the UK, BT is present in eight European countries.

The company started its Nordic operations at the end of 1989, and currently employs a staff of 50. Nordic activities comprise sales, marketing and providing customer service as well as managing local correspondent relationships.

Today, BT is the fourth largest telecommunications carrier in the world, and Europe's largest independent communications company.

BT's International Services

BT's business is to design, build, operate and manage networks and applications across the world. BT operates one of the world's largest managed data networks, GNS (Global Network Services), providing complete end-to-end managed services in 21 countries including the Nordic region, and over 100 countries using local access networks.

Pioneering European Privatisation

BT was privatised by the Thatcher administration in 1984. The aim was to introduce private sector discipline and market forces into this vital industry.

The initial restructuring of the UK telecommunications sector had begun already in 1981. The liberalization of the telecommunications market was seen by the Government as going hand-in-hand with privatization. The Government-appointed industry regulator, OFTEL, was set up to promote a program of increased competition, and to provide customer protection in those market sectors where BT remained a de facto monopoly.

A further 27.8 percent of the government's balance of initial share issue was sold in December 1991. The government also announced its intention of selling some or all, of its remaining shareholding in July 1993.

BT's overall prices are currently kept at 6.25 percent below the annual Retail Price Index figure (RPI) by OFTEL. This increased to 7.5 percent after August 1 1993. Since 1987, BT's average call charges have fallen by around 24 percent, relative to inflation.

Developments in the UK Telecommunications Market

The period between 1985 and 1990 witnessed a progressive liberalization of services. During this period, two analog cellular networks were licensed. Value added and basic data services were liberalized in 1987, permitting inter alia competition to BT's and Mercury's packet switching services using leased lines provided by the duopolists.

By 1989 there were six specialized satellite operators providing point to multipoint services. The same year, three operators were licensed to provide microcellular GSM based services (PCN).

In 1989, the UK government also liberalized national, simple resale services which enabled anyone to provide voice bypass services using leased lines rented from BT or Mercury.

In September 1991, the Government's new policy on the telecommunications market was announced. The conclusion was that the UK domestic market should be completely open to competition, with licenses available to any carrier possessing sufficient resources to provide services.

Competitive Environment in the UK

To summarize, the home market of BT is now a highly competitive one:

- The market for customer premises equipment is completely liberalized
- Value added and data services are liberalized
- Voice resale services are liberalized at the national level
- Cable TV operators are beginning to form an alternative to local telephony
- A large proportion of BT's customers are able to access the Mercury long distance and international services, if desired
- In line with the new Government telecommunications policy, new operators are being licensed – e.g. British Waterways and British Rail – soon about to enter the market
- Further competition is expected from PCN (Personal Communications Network) operators
- Government policy is to speed up international telecommunications competition, subject to reciprocity in overseas markets

The BT License

The BT license of 1984 included more than 50 stringent conditions that would control BT's market dominance, and ensure that BT did not abuse its position in a way that would run contrary to the public interest. Among the conditions were:

- An obligation to serve all customers without discrimination or preference, and to provide basic telephony services, and any other services, where the demand is reasonable (with the exception of cellular and cable TV services, which are in effect reserved for other carriers). BT also faces other social obligations such as running emergency services and phone booths.

- An obligation to assist its competitors in certain ways (pricing announcement rules, interconnection and non-discrimination rules). The most important of these conditions are probably the interconnection rules compelling BT to open up the public networks so that competitors may reach all customers.

BT's Internationalization

Privatization gave BT the opportunity to invest both at home and abroad. The legislation of 1984 also allowed for network competition in the UK, making it the first, and still the only, country in Europe that has actually introduced competition in the basic telecommunications area of public voice services. Competition at home, and growing markets abroad, combined with the freedom to make decisions involving substantial financing without government constraints, encouraged BT to expand internationally.

The mid-80s were a more optimistic period of the world economy than the present one, and it was apparent that BT's main existing and potential customers were themselves "going global." This meant that their needs for telecommunications were no longer confined by national or even regional borders, and those needs could only be properly met by companies that had an actual presence which matched their clients, around the world.

At the end of the 1980s, BT also adopted a decision not to become a provider of telecommunicatons equipment, nor become a manufacturer, instead, BT would focus on areas of telecommunications where it believed it had most to offer – the operation of telecommunications networks.

Consequently, BT's international business development since 1990 has been targeted almost exclusively at large corporations, particularly companies with operations on a global or regional scale.

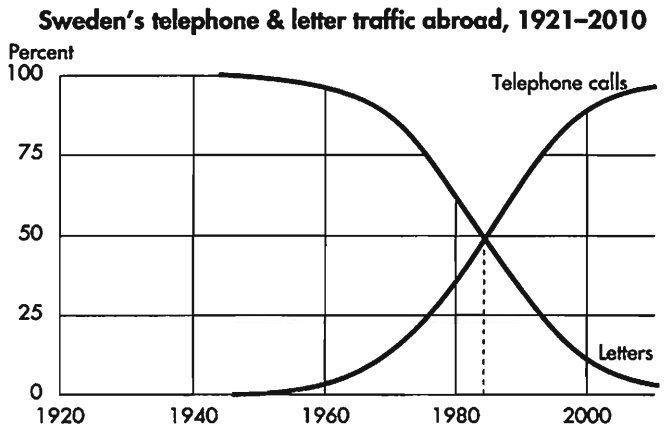

Fig 142: In the beginning of the century, Swedes communicated by letter, nearly 100 percent of all long distance communication was sent by mail. At the end of the century, the majority of all long distance communication takes place with the help of telecom technology. In the first decade of the 21st century, letters will be as scare as phone calls were some 100 years earlier. In the mid-1980s, telecom took over letters previously dominant role.
Source: Andersson, Åke E and Strömquist, Ulf: "K-samhällets framtid" 1988

The Telecommunications Market in Sweden and the Nordic Region

The Swedish and Nordic markets for telecommunications and network services are characterized by a high degree of maturity. The globalization of Swedish industry, with its large percentage of multinational corporations, creates demand for communications services of high quality.

Another feature of the Nordic telecommunications market is the relatively large proportion of intra-regional traffic, a consequence of the substantial volume of trade taking place among the Nordic countries (19.6 percent of total Nordic trade stays within the Nordic area). 54.62 percent of all Nordic international telecommunications traffic stays within the region. Compared to the five largest EU nations, the Nordic region has 15.68 percent more of its total outgoing traffic staying within the region.

The Nordic and Swedish industries undergo a constant transition, away from branches that rely on raw materials, on to high-tech research intensive industries. This entails increased demands on the infrastructure. In the past, the location of companies depended heavily on proximity to either markets or raw materials, or to some ideal point in between. Today, given the development of

trade, transport and telecommunications, a completely different set of parameters control the choice of location.

Relative to other countries, Sweden has a very high proportion of research intensive companies. Pharmaceuticals, autos, electronics, aviation and aerospace are a few industries that have grown in importance. A growth in research intensive companies is followed by higher demands on telecommunications. The expansion of tele-communications networks has transformed Sweden, and the entire Nordic region, into a particularly interesting market with a high growth rate. This may be illustrated using a number of factors:

* A higher finishing value of the industrial output leads to more capital being tied up. Inventory reduction and a higher rate of throughput become important aspects of the rationalization process.

* Customization has turned into an important competitive factor, while at the same time, requiring shorter lead times.

* Consequently, systems for material administration have been rendered more effective. Just-in-time, reduced inventories, higher turnover rate, and a higher degree of customer orientation on the part of industry – all rest on efficient and secure information transfer.

At the same time, increased internationalization calls for the expansion of networks.

Early on, the Nordic industry began the transition from simple to more advanced technologies. Modern manufacturing methods, coupled with production and products characterized by a high degree of know-how, along with the focus on international markets, combine to make the Nordic industry a very demanding customer in the telecommunications field.

The Ericsson group has grown to become one of the world's leading suppliers of telecommunications equipment, including switching and mobile telephony, etc. BT is one of Ericsson's largest customers worldwide.

The Swedish market is one of the most demanding in the world. Customers as well as suppliers are at the forefront in requiring technical solutions.

The Swedish telecom market has grown heavily in the latter years. The traditional strong dominance by Televerket in most market segments is subject to increasing competition - from domestic suppliers such as Tele2, Comvik and Nordic Tel, as well as international suppliers like BT, AT&T, France Télécom and GEIS.

As of July 1, 1993, the Swedish telecom market is governed by a new law, based on the report from the Telecom Act Commission. Televerket's dual task of serving as public authority as well as market player has ended. The powers of authority are executed by the newly formed National Post and Telecom Agency.

Telecommunications Regulation

In setting up rules for a liberalized telecom market, regulators may be tempted to use interconnection charges as a mechanism to ensure the funding of universal services.

In the short run this would be an imperfect solution in BT's opinion. Besides creating a complex market situation, true competition would never be achieved. To reach an agreement on the funding of the stipulated social obligations would obviously entail disputes and time-consuming regulatory intervention. The system would also impose heavy demands on the impartiality of the regulator. Consequently, it should be a temporary solution pending full tariff rebalancing.

In general, telecom operator tariffs do not reflect the actual costs – a consequence of the history of providing universal service in a monopoly environment. The incumbent operator may use its dominant position to introduce discount schemes that favor large customers, thus rendering the market entry of new operators more difficult.

The pricing distortion means that true competition is encouraged only in some sectors of the market. Clearly, competing on equal terms with services that are subsidized by the incumbent telecom operator becomes impossible.

As long as the incumbent operator remains effectively the monopoly supplier of local access, it is reasonable to demand that charges should be cost-based. As competition develops in the local access market as well, participants should be free to apply pricing based on normal commercial principles.

As for interconnection, BT believes that competitors in infrastructure must be obliged to carry each other's traffic on fair terms. When competition is first introduced, the problem is to set the rate at which the incumbent operator will complete calls carried by the new network operators, and provide local access to their networks.

It is BT's view that regulation should deal exclusively with the setting up of fair market arrangements for the participants.

Getting Established in a Monopolistic Market

by Flemming Örneholm, president, AB NordicTel

Sweden has the highest percentage of mobile telephones per capita in the world. Today there are approximately 700,000 subscribers, and invoices of total services have reached the order of SEK 5 billion per year. By the year 2000, there will be more than two million mobile telephone subscribers in Sweden, with total invoices estimated to then be more than SEK 10 billion. One third of these two million subscribers are expected to make use of AB NordicTel's GSM network, going by the brand name, Europolitan.

Permission – but first Denied

In the spring of 1990, NordicTel requested permission from the Swedish National Post and Telecom Agency to utilize a portion of the spectrum in order to operate a GSM network. Previously, the Agency had promised band frequency to Televerket Radio and Comvik's GSM operations. NordicTel's application was rejected by explaining that there was not room for three operators in the available spectrum.

In December 1990, the government overturned the Agency's decision, as it felt that there was room for an additional operator. NordicTel was over a year behind schedule when this decision came, and therefore expanding the network was given the highest priority. On March 4, 1991, AB NordicTel was registered as a carrier of GSM operations, and Sweden had its third mobile telephone operator.

Organisation

AB NordicTel is owned by NordicTel Holdings. Behind NordicTel Holdings are three Swedish companies, Volvo, Trelleborg and the Nobel-companies via Spectra-Physics, as well as the British Vodafone, one of the world's largest mobile telephone operators. In June 1993, an agreement was reached between the American telecom carrier, PacTel, and the three Swedish owners, which resulted in PacTel acquiring 51 percent of NordicTel Holdings.

Volvo, Trelleborg and Spectra-Physics thereby own eight percent each, while Vodafone keeps their 25 percent. The acquisition requires that certain conditions be filled, and the final transfer took place during the second half of 1993.

AB NordicTel has their headquarters in Karlskrona where the departments for Operations, Customer Service, Marketing and Sales, as well as Finance are located. There are regional offices in Stockholm, Gothenburg and Malmö.

In July 1993, 10 months after Europolitan opened for commercial operations, the network covered an area in Sweden with 5.5 million inhabitants. The current growth of network expansion is approximately 250,000 persons per month.

Competition on Equal Terms?

It is self evident that a new company must press it's costs very hard in order to be able to compete with companies the size of Telia. As a small organization, AB NordicTel lacks the advantages of economies of scale. The small organization can not use the NMT-network to establish their GSM network, in the way Televerket did when they introduced an advantageous GSM-offer to existing NMT customers. The offer was stopped however, when the contents of the new legislation on competition were known – in that the law went into effect on July 1, 1993, the possibilities for combination offers were greatly limited.

The legalisation on competition places additional demands on those companies with a dominant position, which is described as "a company with a strong economic position making it possible for this same company to interfere with effective competition in a relevant market." In general, such a dominant position is based on several different factors, an especially important one being market share.

The Swedish National Audit Bureau has taken the initiative to investigate the competition conditions, partly between NMT and GSM, and partly between the different GSM operators in Sweden.

Europolitan's Competitive Edge: Quality

To succeed in a market such as mobile telephony, where the competition is so intense, places great demands on an organization such as Europolitan's with approximately 150 employees.

The organization is neither large nor well established, in the sense that it has been around for a long time. Europolitan must therefore offer their customers the best service possible. One element in this undertaking is that every customer, via Customer Service, shall be able to have their questions answered 24 hours a day, 365 days a year.

Most likely, the geographical coverage and price structure for mobile telephone services will be fairly homogenous for the operators in the long run. That is why customer service, a wide-spread distribution network, and the greatest flexibility possible, are critical factors which will decide who will be successful, and to what degree. A key criterion for Europolitan's survival is for existing and future customers, retail sales people, suppliers and everyone else

who comes in contact with the company NordicTel/Europolitan, to experience them as a quality leader in every detail. Quality is the cornerstone of the operations.

Another goal is to quickly establish agreements with foreign colleagues in order to offer Europolitan users the greatest possible accessibility when they are travelling as well.

Finally, it is the services, and to a certain degree the price of them, which attracts users. The Europolitan network is built directly for pocket telephones of class 4, for use everywhere, both in metropolitan and rural areas. The users are provided with the "Twin card," which means that both the SIM-card and the credit card have the same telephone number. The customer can pick their telephone number, given that it is available. The voice box service, EuroVoice, calls the customer as soon as he/she has a message.

Europolitan's tariffs with a Price Guarantee, are adapted to the users, consumption pattern and how much they call. The customer can change tariff levels if they wish. Eventually, the difference between tariff levels will be credited to the customer's benefit. With the help of a price guarantee, the customer knows that he/she will never pay too much. The customer pays for every connected second and thereby, only for the time that the call takes.

Certain of Europolitan's services are directed towards a specific customer group. EuroSplit sorts out mobile telephone calls on the bill, for example by a certain client or project – the customer decides. A Money Back Guarantee gives customers the right to, within three months, discontinue their subscription and get their subscriber fee as well as the monthly fee back. Air time used per call must however be paid by the customer.

Resources

To manage Europolitan's commitments requires resources, both financial and technical. On a daily basis, the owners support with economic and technical know-how and expertise. Especially valuable is Europolitan's access to the technical expertise of Vodafone, one of the world's most successful mobile telephone operators. These resources increased dramatically when the agreement with PacTel was finalized. This partnership is yet another critical factor for Europolitan's competitiveness, ability to adapt quickly and the quick introduction of new services according to the needs of the customer. The result is dynamics and flexibility.

The corporate culture, as concerns values, attitudes, and ethics is also a determining resource. It is normal for corporate culture to grow over the course of time. As NordicTel went from zero to 150 employees in a single calendar

year, there has not been time to wait for a corporate culture to form itself. It was a matter of quickly agreeing on what prevailed and, with a strong hand, determining the identity and culture. The organization chart is taken from sports. On the game field are the departments for Technology and Operations, Marketing and Sales, Customer Service, and Finance. Management and Personnel act as cheerleaders and supporters. One of the foremost goals is to hire and keep employees with high competence and motivation.

Thanks to this young corporate culture, NordicTel has an organization free from hierarchies. Responsibility is spread throughout organization, work is done on a project and process-oriented basis. The employees work according to 10 corporate standards as to how decisions should be made, and how everyone should act in their internal and external contacts.

The corporate standards bring about, among other things, that Europolitan shall be the personal alternative as concerns mobile telephone services, and that unconventional roads must be harmonized with trustworthiness. The leading ideals are humility, honesty and flexibility. This also means having respect for the technical systems, which are the main working tools, without letting the technology take over. Respecting expenses is a necessity for NordicTel's survival, as well as living by and with changes.

Liberalization in the EU as Compared to Sweden

by Olof Nordling, Director of EU Affairs, Telia International

All of the EU countries come formally from a situation with statutory monopolies for all telecommunication services and equipment. Through the Green Paper of 1987, EU set the political foundation for a complete liberalization of the telecom terminal market, and a partial liberalization in the telecom services market. Through several legislative acts, the EU has to a large degree, accomplished the policies on the formal plane, even if carrying out the directives, in practice, lags behind in several EU countries. Some of the more important directives in this context concern:

1. Full liberalization of the terminal market (in the widest sense, including all Customer Premises Equipment)
2. Mutual recognition of the conformity of telecom terminals, (i.e. a terminal which is approved in one EU country should also be able to be used in other Member States)
3. Liberalization of all telecom services except the "basic" services (including of course, telephony)
4. ONP, Open Network Provision, with rules for how monopoly protected services could be utilized for supplying liberalized services.

Some comments are called for:

- 1 and 2 are both called "the terminal directive," and risk for confusion exists!

- 1 and 3 were adopted directly by the Commission and were brought by discontented Member States before the EU Court of Justice, which however approved the Commission's actions in both cases.

- 3 and 4 are often mixed up in Sweden. They are certainly connected, however formal liberalization in itself is covered in 3, which is called the "service directive", while ONP is directed towards practical measures, harmonizing the rules for network usage, etc.

- ONP has developed according to plan from a general directive, "the ONP framework directive," with general rules, to several detailed directives for specific services. Important examples are ONP for leased lines (adopted directive) and ONP for telephony (proposed directive), which at the same time illustrate the points named above. "ONP for leased lines" provides rules for leased circuits so that these can be used to offer liberalized services. This is why the service of leasing lines can, in and of itself, remain in monopoly protection. ONP provides tools to make the formal liberalization possible in practice, in an environment where monopoly rights remain.

We have just covered a part of the EU's telecom policy. Many of EU's additional measures concern harmonization in order to realize a single inner market in the to date, motley telecom area as well.

Actual Development

EU's telecom policy continues to develop, and as anticipated in the "service directive," during 1992 the Commission undertook an overview of the telecom sector's situation in order to review the remaining monopoly rights. The Commission's study, called "Services Review", which was hotly debated, seeks to motivate the needs of further liberalization, firstly of telephony over Eu's inner country borders. A policy decision in the form of a resolution, was taken at the Council meeting in June 1993. After such a decision, additional time is needed to work out and adopt the directives and other legal acts, as well as time for implementation in the Member States. Effects can therefore be expected only after a few years. 1997 could be seen as a likely year.

In the version of "Services Review", dated March 22, 1993 the Commission went further than most expected and presented a program for the successive liberalization of all the remaining areas. Following are some of the important elements:

1. The ability to use alternative physical infrastructures for corporate networks, as well as closed user groups from January 1, 1994. The usage of cable TV networks for already liberalized telecom services.

2. The directive for the liberalization of services via satellite and mutual recognition of licenses for such services, should be adopted before January 1, 1994.

3. The Green Paper for mobile services should be ready by January 1, 1994 at the latest, and for the physical infrastructure at the latest by January 1, 1996.

4. By January 1, 1997, an analysis should be completed concerning, among others, the areas with undeveloped networks in EU's border areas. Transition rules should be set by January 1, 1998.

5. Full liberalization of telephony by January 1, 1998. The Green Paper on infrastructure will be utilized thereafter for the liberalization of physical networks.

In the plans are also the reworking of ONP, financial measures, increased commercial and political independence for telecom network operators, etc. An ambitious piece of documentation which now must be approved internally

within the Commission before it goes to the Council. Much can change, especially on the detailed level. Watching the EU's telecom politics is like "shooting at a moving target."

Liberalization in Sweden

If we now compare Sweden's path to liberalization, we can observe that Sweden has never had a formal monopoly for telecom services, nor for the establishment of the physical network. The now completely abolished monopoly for equipment connected to Telia's network was not some sort of legally binding monopoly, rather it was due to the fact that the definition of the network included the terminal equipment. When Swedes talks about "monopoly" in the telecom area, in general, this concept was meant. The starting point consequently, was a completely different one from that ofthe EU's Member States.

"In practice" the liberalization could be carried out quickly in Sweden, without any complicated legislative changes. Sweden's few rules, in the form of a laconic telecom ordinance and occasional governmental decrees, hardly set obstacles in the way of a liberalization, rather quite the opposite. Especially since the government decided on full liberalization of third party traffic. The problem has, if anything, shown to be the inverse, that an environment with several carriers demands a somewhat more formally expanded set of rules. This in turn results in proposals for a new telecom law, as well as the establishment of the Swedish National Post and Telecom Agency, as an independent regulatory telecom authority with expanded duties compared to its predecessor, STN.

The Consequences from the Swedish Perspective

As concerns the liberalization in itself, Sweden has little to learn from the EU, rather the inverse, Sweden lies far ahead of the EU in this area. That Sweden liberalized "in order to fulfill requirements from EU," as some claim, is a fundamental misunderstanding. It may be so in other industries, however, not within the telecom sector, which in Sweden was liberalized in practice, through local market forces.

Therefore Sweden in general, and Swedish operators in particular, have an offensive interest in the EU reaching an equal level of liberalization as soon as possible in order to have the same access to the markets in the EU's Member States, which the EU and other countries' carriers already take advantage of today in Sweden. From this perspective, the new version of "Services Review" provides much hope.

The circumstances are somewhat different with EU's measures to reach harmonization in the telecom area. By definition, no one can "be ahead" as it concerns being like everyone else. There are reasons to pay attention from the

Swedish side, because the set of rules which are growing forth are both more comprehensive and more detailed than what we are used to in Sweden. Furthermore, to date the EU has come from a situation where essential services and assets were monopoly protected. Here the detailed ONP rules are worth careful analysis. The overview of ONP rules, anticipated in light of a situation of full competition, is especially welcome from the Swedish perspective, and experiences from Sweden can contribute constructively to this work.

In order to provide a small sample of other harmonization measures with direct consequences for Sweden, we can name those rules which the EU is developing for common numbering in Europe. To date, they have decided on 112 as the SOS number (corresponding to the Swedish SOS number 90 000 and the American 911) and 00 as the international access code. This effects Sweden Direct and ironically, there is contradiction between the rule that the international access prefix shall be 00 and the newly established Swedish rule where we assuredly have 00, but followed by a number for the choice of operator for international calls. The classic 009 will go through Televerket, 007 via Tele2. This situation has not been anticipated in EU's legislative acts, and will at least lead to some interesting discussions between the EU and Sweden.

Negative and Positive Deviations

At a EU Council meeting on June 16, 1993, a resolution was adopted which basically made the telecom policies development within the EU discussed above, permanent. A few countries will however be able to delay their liberalization of telephony by a few years after 1998 as they have "insufficiently developed infrastructures" or "small networks."

So much for the negative deviations. It should at the same time be underlined that there is nothing which prevents that one "deviates positively" or liberates earlier than the EU requires, which is the case in Great Britain. However, even in that country, the liberalization is undertaken from a starting point where "everything that is not expressly permitted, is forbidden." This has led to a complicated license system for those that wish to offer telecom services, providing the British authorities the possibility to make political or commercial issues and take other considerations as factors in the attribution of licenses to foreign companies. This implies that the risk for protectionism still remains.

For those who perchance are awarded a telephony license, the costly truth of operations then becomes apparent in the form of the interconnection charges which are offered. The British local call fees are six to seven times higher than the Swedish ones. In addition, from foreign competitive carriers an extra "access deficit charge" is demanded of approximately one SEK per minute, over and above the normal cost of the call. All together, the charges are three times higher than the established interconnection rate in Sweden, SEK 0.65 per minute, everything included.

This as an example that even when a fully formal liberalization has been accomplished, one can steer the practical conditions for international competition in many different ways. As compared to Great Britain, Sweden offers a competitive climate with equal conditions for foreign and national companies.

Menu or à la Carte?

To sum up, the EU's model for liberalization follows a richly detailed, step by step approach, while the Swedish model serves everything at once, with broad guidelines on a more general level. To make a restaurant analogy: "Would you like the daily special (EU) or à la carte (Sweden)?"

Although if certain of the EU's Member States were serving, it would most likely sound like: "This is not my table!"

Comparison of Telecom Market Conditions in the EU and Sweden 1993

	EU (except UK)	Sweden
Free market for terminals	Under liberalization	Free market
Value added services	Free/under liberalization	Free
Third party traffic for data communications	Free 1996	Free
Establishment of data networks	Free 1996	Free
Mobile telephony	Monopoly/duopoly	3 operators
Satellite communications (2-way VSAT)	Monopoly/free	Free
Third party telephony traffic	Forbidden/restrictions	Free
Telephony services	Legislatively set monopoly	Free
Cable TV	Geographical monopoly	Free
Building of (physical) network	Monopoly	Free
Independent regulation	Under realization	Accomplished

Fig. 143: Sweden's adaptation to EU brings with it the fact that the earlier, to a large degree, completely free Swedish telecom market, gets a more comprehensive set of rules. Within the EU, Great Britain still has the freest market, however, the authorities exert more requirements in licensing than Sweden does. The figure above shows that Sweden has let in more operators on the mobile telephone side than any other European country. One bit of news is also that Sweden, with the establishment of The Swedish National Post and Telecom Agency, now has an independently regulated telecom market. (See Appendix, p. 253.)

Source: Telia AB, Corporate Strategy

The OECD Liberalization Index
The OECD

	PSTN competition			Data communications and leased lines		Mobile communication			Degree of liberalization
	Local call	Long distance	Int'l call	X.25	Leased lines	Analog	Digital	Paging	Index
Australia	D	D	D	D	D	M	C	C	9
Austria	M	M	M	M	M	M	M	M	0
Belgium	M	M	M	1993	M	M	M	M	0,5
Canada	M	C	M	C	C	RD	D	C	10
Denmark	M	M	M	1993	M	M	D	M	1
Finland	1993	1993	M	C	C	D	D	D	8
France	M	M	M	1993	M	D	D	D	3,5
Germany	M	M	M	1993	M	M	D	1993	2
Great Britain	C	C	D	C	C	D	C	C	14
Greece	M	M	M	1997	M	M	1993	M	1
Iceland	M	M	M	M	M	M	M	M	0
Ireland	M	M	M	1993	M	M	M	M	0,5
Italy	M	M	M	1993	M	M	1993	M	1
Japan	C	C	C	C	C	RD	C	C	15
Luxembourg	M	M	M	1993	M	M	M	M	0,5
The Netherlands	M	M	M	1993	M	M	1993	1993	1,5
New Zealand	C	C	C	C	C	C	C	C	16
Norway	M	M	M	1993	M	M	D	1993	2
~~Portugal~~	~~B~~	~~D~~	~~M~~	~~1997~~	~~B~~	~~M~~	~~D~~	~~M~~	~~3~~
~~Spain~~	~~M~~	~~M~~	~~M~~	~~1997~~	~~M~~	~~M~~	~~M~~	~~C~~	~~2,5~~
Sweden	C	C	C	C	C	C	C	C	16
Switzerland	M	M	M	M	M	M	M	C	2
Turkey	M	M	M	M	M	M	M	M	0
USA	PC	C	C	C	C	RD	C	C	14,5

Fig. 144: OECD's liberalization index from "Communications Outlook 1993." According to this, New Zealand and Sweden are the OECD's most open markets with the highest index, 16.

Key:

C = Competitive
PC = Partly competitive
D = Duopoly
RD = Regional duopoly
B = Competition allowed in borderline license cases
199X = Year when competition is expected to be introduced
M = Monopoly
N = No services
16 = Most liberalized
0 = Least liberalized

OECD warns that the index only represents a subjective comparison, and so should not be taken as a definitive or quantitatively absolute statement. (See Appendix, p. 253.)

Source: OECD Outlook 1993

Do You Know about These Changes in the Telecom Market?

* ETNO stands for **European Public Telecommunications Network Operations Association.** In May 1992, ETNO was founded as a telecom operators' industry association and consists of 26 network operators from 21 countries. ETNO will, most of all, establish and bring forward the operators' common viewpoints on the EU's telecom policy initiatives. The association has gone through the EU Commissions proposals as concerns data and integrity protection in the digital network, ONP for telephony services, and the policy for Europe's telecom equipment industry.
  Source: Digitalen no. 28, July 1992

* On July 1, 1992, Sweden got a new authority, **The Swedish National Post and Telecom Agency.** The agency's main duty is to manage the telecom regulations which, for the first time, are introduced into Sweden as a result of the ESS negotiations and EU harmonization. This new regulation of the telecom market is steered likewise by Sweden's new telecom law of July 1, 1993. According to this law, a company which wants to operate telecom traffic in Sweden must apply for, and receive, an operator's license.
  Source: "Management of Technology", IMIT, no. 1, March 1993

* On February 17, 1993 the **Nordic Telecom Operators Branch Association** of NORDTEL was founded as a sub-department to ETNO. It consists of, among others, Telia, Tele2, Tele Danmark, Telecom in Finland, the Norwegian Televerket, and the Islandic PTT. The Assocation's purpose is to "aid in developing publicly accessible telecom networks and telecom services that are of use to customers in the Nordic countries." Anyone who is operating in the telecom area in the Nordic countries can be a member. The association has it'soffice in Copenhagen.
  Source: Press information from Telia

* On July 1, 1993, after 140 years as a state-owned agency, Televerket was reorganized into a corporation, **Telia AB.** The new telecommunications company will compete in the market by the same rules as everyone else. For the moment, the Swedish state still owns 100 percent of Telia AB. The company has eight regional offices to take care of their customers in Sweden, as well as one subsidiary which focuses on the very largest users (Telia Megacom.) The Telia concern includes the parent company Telia AB, as well as the specialized subsidiaries Telia Mobitel, Telia Megacom, Telia International, Telia Data, Telia Research, Telefinans, Fastighets AB Telaris, and Telia Holdings AB.
  Source: Telia AB

* **The Stattel Delegation,** whose duties are to make telecommunications in the Swedish state administration more effective, has signed an agreement with a foreign operator offering data communication. This is unique in Europe. "Sweden is somewhat of an experimental field for the liberalization of telecommunications," states the magazine, "Ny Teknik."
Source: Ny Teknik/Teknisk Tidskrift 1993:21

* The number of **strategic alliances** in the world's various industries increased greatly during the period 1980–89. According to a study, there were 1,660 such alliances agreed upon the period in the IT area. They are distributed according to the following:

Computers	198
Industrial automatization	278
Micro electronics	383
Software	344
Telecommunications	366
Other	91
Total	1,660

Source: Hagedoorn and Schakenraad, Maastricht Economic Research Institute in Innovation and Technology/The Economist, March 27, 1993

* The EU presses on with **harmonization and liberalization** in Europe. The Commission's most recent time plan looks like this:
  - 1994: Owners of private networks can to a limited extent, use these for the transmission of telephone calls
  - 1996: International telecom traffic will be allowed for everyone who uses leased lines from the monopoly operators
  - 1998: All voice-based traffic, international as well as domestic, interurban and local, will be free over leased lines.

Source: Business Week, April 5, 1993

* On July 15, 1993 the French government annouced that they will be **selling out a minority portion** of France Télécom. On July 23 of the same year, the Dutch government, KPN, invited new operators to compete with Koninklijke PTT Netherlands. On July 26, Deutsche Bundespost Telekom stated that the German government should set down a plan for selling out stock in DB Telekom as soon as possible.
Source: The Economist, July 31, 1993

* In April 1994, the Japanese market for mobile telephony will be deregulated. The Ministry for Post and Telecommunications have chosen a total deregulation of the terminal market.
Source: Sveriges Tekniska Attachéer, notice no.: J-93-022

* The FCC has made some decisions for the demonopolization of the local portion of the American telephony market as well. Local telephone services have revenues of about US$ 90 billion annually, which is why we can count on competition.
  Source: The Wall Street Journal, September 18, 1992/Sveriges Tekniska Attachéer, notice no.: U1-92-202

5. IT2000 – Industrial Policy through New Methods and Goals

by Göran Axelsson

"IT2000" is the name of a review by the Swedish government of its support to research and development projects within telecommunications and information technology, IT.

The review was initiated by the Department of Industry and supported by the Government. The results of this review of the Government's programs and other initiatives in the areas of telecommunications and IT, were presented by experts and decision makers representing industry, trade, and public administration in the autumn of 1991.

In 1992, an interdepartmental work group was formed, and given the specific objective of following up the original plans, and of preparing the 1993 bill by the Government to the Parliament for government supported research and development programs.

During the spring of 1993, the Government and the Parliament made a number of strategic decisions, all of them influencing the government's support to research and development in telecommunications and IT. In spite of the fact that the Government was forced to cut costs rather dramatically, telecommunications and IT were still considered as growth areas, having strategic importance for the future.

Earlier IT Programs

The first Swedish industrial policy-based investments in the IT area, were all directed towards the computer industry. The Swedish company Datasaab produced medium sized computers in direct competition with the IBM series 1400 and 360. At this period in time, the country had considerable potential to produce general computers. The production was concentrated to work stations, and specialized systems for traffic control and the like.

During the late 70s and the early 80s, Swedish society gave priority to societal questions. The general approach was strongly influenced by the French researchers Nora and Minc, and their studies in France during the late 70s, and by the so called Siemens report on office work, which forecast depopulized offices by 1985. The general opinion was, that an overall cut-back by some 30 – 40 percent of the number of white collar employees would be possible thanks to the micro electronic revolution. Other "hot" topics for general debate and political decisions during this period, were the fact that society in general

became more vulnerable as computers were more widely implemented, and that there was a lot of uncertainty about what positions towards the electronic industry and the computer manufacturers should be held. Should the politicians promote "buy Swedish" or not?

There was a lot of uneasiness among the political parties as well as among the whitre collar employees, trade unions, TCO and SACO. Because of this, the Government felt forced to clearify what role the state should play in this development. As one consequence, during the period 1975–85, a number of government investigations on possible societal and industrial policies for computing and telecommunication, among others, were presented. As a result, the Government realized that there was a need to implement a program for research and development in the IT area.

In 1983, Parliament decided to implement a comprehensive IT program. The first part included microelectronics, later it was to be extended to system development and development of user related problems. Parliament asked the Government to prepare a proposal for such a program. The microelectronics program started in 1984.

In early 1987, the Government introduced a proposal for a total IT program. Its industrial part was financed in equal parts by the Government and industry. A special delegation, having it's own administration, the IT Delegation, was commissioned to manage and control the industrial IT program. The main objective of the two programs, the microelectronic one, and the industrial one, was to develop and gather knowledge.

The third part of the general program, the one concerned with development of the possibilities for users to utilize IT, only had rough outlines, and the Government had to promise Parliament to get back with a concrete proposal as soon as possible.

During the years that followed, some negative comments to the priorities of the IT program were heard. Small and medium sized companies complained that only large enterprises were supported. The trade unions and other special interest groups complained that the "softer" components, the human interest ones, were neglected.

However, during the final stage of the program, a comprehensive dissemination of information and knowledge has taken place. The program for microelectronics as well as the one for IT, received a very positive evaluation in the end.

IT2000

In March 1991, the then Ministry of Industry initiated the IT2000 program with the specific objective of evaluating the need for continued government support. Three groups of specialists were established and asked to present their proposals by no later than September of that same year. The objectives of this exercise were to undertake an indepth study of the possible future prospects of Swedish IT industry, and to express a proposal for an industrial policy for the 90s, elucidated from many different aspects.

The study had to consider three main questions:

1. How is it possible to create a competitive furthering environment for large enterprises and organisations, which depend on IT?

2. What is needed to increase the number of independent and growth oriented, small IT companies?

3. How can IT be used to increase productivity, effectivity, and efficiency in industry, trade, and public administration?

There was a certain hope that Sweden would be able to position itself better, even to strengthen its position in the IT field, should it be possible to find good answers to these questions.

IT2000 would not increase the costs for the Government, but it would use existing resources better. The Government wanted support from all important parties in the IT area before it committed itself to participating in any programs, especially as regards applications.

A separate group was formed for each of the three main questions. The ministries and public authorities involved, as well as important actors representing industry, trade, and research, participated in each of the groups. In turn, they were supported by a coordinating group in the Ministry of Industry. In total, the Minister of Industry appointed 45 persons to the four groups. They were:

The Large Users' Group consisting of representatives from the defense industry; large Swedish IT dependent manufacturers; the IT support organizations; universities and polytechnical institutes.

The IT Dependent Growth Companies' Group made up of representatives of software developers; small, innovative companies; and companies involved in technology dissemination.

The IT Users' Group was made up of specialists from the service industries; manufacturing corporations, dependent on IT; small companies; various centers for IT dissemination; IT support organizations; public authorities; etc.

The chairperson of each group, several specialists, and decision makers from the ministries, made up **the Coordinating Group.**

The Results

One overall result of the joint efforts of the groups is, that almost all ministries are involved in at least one project, resulting from the industrial policy program for all forms of ITs.

The most important conclusions from the groups are shortlisted below:

The Large Users' Group focused on the IT dependent industry. Thanks to IT components and IT systems, the products, systems, and services from these companies offer their users a considerable added value. This also goes for the traditional IT industry.

Among its demands, the Group expressed, that the Government should create the best possible opportunities for the IT industry in Sweden. This industry needs opportunities for growth, equivalent at least to those being offered by other countries. Likewise, the possibilities for forming new companies within this industrial sector must equal those of the leading IT countries in the world. Moreover, the Group expressed the opinion that existing support to the IT dependent corporations is insufficient. The access to competence, as well as the size of publicly supported research and development programs, are not satisfactory to the large corporations.

In the 1990s, the situation is likely to become even more difficult for the IT dependent Swedish corporations, which should result in considerable support from the Government as well as from the rest of industry. On the wish list is an increase by 100 percent in the number of academically educated engineers by the year 2000. The universities must build competence centers and coordinate their activities with the corporations to a much larger extent. The governmental and local authorities should utilize public technology procurement to a greater extent than at present. Finally, the Group asked for more money from the Government, should it be politically desirable to lift Sweden to the same level as the leading European countries.

The IT Dependent Growth Companies' Group stated that the best help a small, IT dependent growth company can get, is for one or more large corporations to order and buy very qualified products or advanced systems. In particular, when the small company is in a start-up phase and unknown but highly competent.

The Government should support such small fast growing companies, especially as Sweden needs a large number of them.

The Group pointed out that large corporations, in comparison to the small companies, have a considerable advantage when it comes to searching for and the handling of market information and know-how about customers, sales, business opportunities, etc. Thus, the Group stressed, there is a need to disseminate selected information to small companies, and to create opportunities for collaboration between them. It is particularly important for small companies to maintain and develop competence, and to create strategic alliances. Stimulation of the market, and improved customer contacts, are other examples of activities, not forgetting the key words – competence and quality.

But also more general and "heavy" issues for growth companies were brought out by this Group. More liberal taxation rules, and labour market regulations, are important in order to improve the competitive comptetence and the conditions for growth, which is all in line with the Government's decision to support general issues rather than industry sector related problems.

In particular, the Group stated that there is a need for a national IT commission for the IT industry, whose objective should be to support small IT companies regarding large public technology procurement programs. It is feared that without such support, only large corporations will profit from the public procurement programs.

The spin-off effects of advanced development programs like "man on the moon" were pointed out. As local Swedish examples, two technology development programs were indicated as models – "the security program for the Baltic" and "the project for a exhaust-free, fixed track taxi system for Gothenburg".

Interviews undertaken by the Group indicated that small growth companies in Stockholm need an improved infrastructure, via for instance EDI, improved access to public procurement, and relevant information. Companies based in other parts of Sweden are looking for more up-to-date information about EU, and easier access to new markets.

The IT Users' Group presented a vision: "Swedish industry and public administration should lead international IT utilization in areas of strategic importance to Sweden. Swedish IT users should improve their role as pioneers in effective IT utilization."

The Group presented their proposals in five different strategic areas:
- access to a national, high quality network for tele and data communications;
- know-how of management questions related to IT
- possibilities to develop organizations that are independent of antiquated IT solutions
- knowledge about, and competence in, the introduction of IT systems
- opportunities for small companies to successfully introduce IT.

The Group stressed the fact that in order to successfully introduce advanced IT systems, there are a number of non-technology related prerequisites that have to be fulfilled, such as organizational issues, business related issues, skills, and competence.

They proposed to the Government that the resources should be reallocated according to the following:
- from one-of-a-kind activities in many different areas to well focused activities
- from a defensive usage of the public resources to an offensive one
- from a narrow IT perspective to a broad one
- from a technology orientated Government support to market and user orientated activities
- from national to European activities.

Specifically, the need for activities in the following areas were stressed:
- training and competence development
- the public administration as the leading IT user
- an infrastructure based on telecommunications networks, adapted to the needs of small and medium sized companies – a majority are still using yesterday's methods in conducting their business!

The Users' Group pointed out that it is not sufficient for IT issues to be discussed by the Ministry of Industry alone. It is vital that all ministries involved are active in the field. Thus, they suggested the formation of a common group, responsible for implementation in the ministries.

A Summary of the Proposals

The proposals from the three groups can be summed up in three different kinds of activities, as follows:

1. **Competence** – education, R&D, competence centers, dissemination of technology, collaboration between industry and government. Four ministries are involved: education, labor, industry, and foreign trade.

2. **The public sector** – technology procurement, rules and regulations, competence centers for local governments. Five ministries are involved: defence, communications, finance, industry, and internal affairs.

3. **Infrastructure** – deregulation, harmonization, standardization. Four ministries are involved: foreign affairs, communications, industry, and internal affairs.

The Inter-Ministerial Group for Implementation

The Government has formed an inter-ministerial work group with explicit responsibility for the implementation of the proposals in IT2000. The objective is to coordinate the preparations of the more detailed proposals, and to indicate priorities. The group consists of experts from seven ministries, which is an indication of the fact that IT-related issues are given a much wider spread of attention than earlier.

The group has initiated a number of studies, for instance "Infrastructural Investments in the Information Society"; "The Needs for Education and Training within the Information Technology Area"; "Collaboration on Common IT Issues for Civilian and Military Utilization"; "SIREN – An Alternative to National Collaboration in the IT Area"; "Efficient IT – Opportunities for a New Development Program within the Application Areas of IT. A Preliminary study"; "Information Technology on the Roads – An Analysis of Traffic Policy Consequences".

The Decisions of the Government and the Parliament

The first results were made public in February 1993, when the Government presented its proposals to the Parliament in the bill 1992/93:170, entitled "Research for Knowledge and Future".

The Government has expressed the following objectives for R&D in the IT area:
- to create internationally competitive opportunities for IT dependent industry in Sweden;
- to construct knowledge-based foundation for Swedish IT manufacturing in important industry areas;
- to encourage Swedish industry and public administration to become international leaders in the utilization of information technology in areas of strategic importance to the country;
- to increase the involvement of small and medium sized IT companies in national and international research programs.

As one major action the Government proposes, that R&D results are disseminated via demonstration projects. The second major action is to increase the knowledge base in the areas of computer technology, communications, and microelectronics.

New resources are allocated to research projects by reallocations and important effectivness. The total amount is SEK 170 million for each of the budget years 1993/94–1995/96, which is an increase by more than 90 percent in comparison to 1992/93. In addition, comprehensive general activities are carried out in order to encourage the creation of small companies and risk capital. These are all, in one way or another, related to the IT area.

The Parliament accepted the proposition and the new programs started on July 1, 1993.

The Computer Industry in Sweden 1950–91

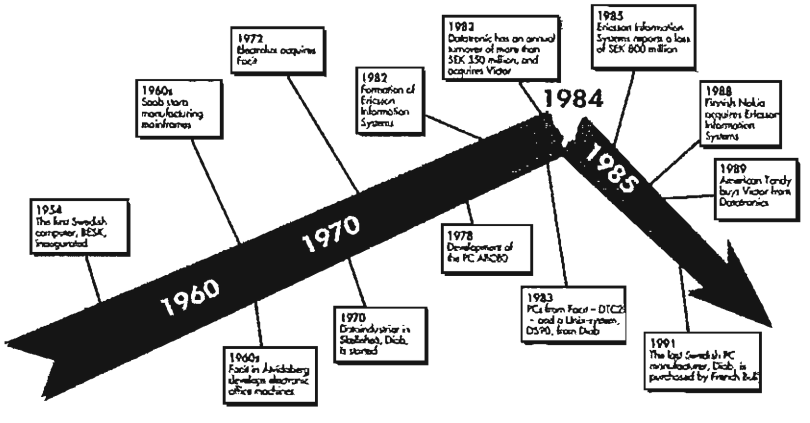

Fig. 145: The Swedish computer industry, its rise, downfall, and final doom.
Source: Computer Sweden, January 8, 1993, J Sundwall

6. Future Applications

Do You Know This About Future Applications?

* HDTV, high definition television, is on its way, in spite of recent twists and turns in policy decisions regarding digital or analog technology. As expected by many, the digital standard won, which means that the system developed by the Americans is most likely to become the standard. Experimental tests have started in Sweden. 1995 is planned as the start-up year for the new technology, when Swedish Television, STV, will start a systematic training in its use for their employees. By the year 2000, STV plans to broadcast in HDTV 4 – 5 hours daily, and during 2001 – 2007 the PAL system picture format 4:3 will be abandoned for the 16:9 HDTV format.
  Source: Telia, Tele no. 1 1992

* Interesting times are ahead in the IT area, at least according to the analysts of the American Gartner Group. Just consider this:
  - companies and organisations of all kinds will more and more frequently collaborate in small ad hoc groups in order to solve problems quickly. These groups, by some called "firmets", are made up of people from different departments and companies and will be disolved once the task is solved;
  - no single supplier will have more that 50 percent of the market for operating systems;
  - no single supplier will have more than 25 percent of the hardware market;
  - OS/2 is given slightly less than a 50 percent chance to succeed.

  Sources: The Gartner Group/Öppna system no. 1:1992

* On March 25, 1993, the FCC gave the American cable TV producer, Time Warner, permission to develop the first FSN, "Full Service Network" in the world in Orlando, Florida. The idea is to create a model of the much talked about "Communications Super Highway", offering users different services such as interactive video services, i.e., games and video on demand (VOD), telecom services such as long distance access, Personal Communications Services, PCS, i.e., wireless communications, and mobile communications. Companies are offered access to high speed networks and video conferences. The trial, for a trial it is, will include 4,000 households.
  Source: Sveriges Tekniska Attachéer

* Interactive dailies and similar publications are becoming established in the USA. In the year 2000 the equivalent market in Europe will be worth ECU 12 billion. The consumers choose the content of their daily or publication themself, by pointing to a flat screen. The publishers look upon themselves as being in the "content business", which is believed to have an interesting future thanks to CD-I technology, CDs for interactive CD-ROM readers. The International Electronic Publishing Research Centre, IERPC, presents the following figures for the CD-I market:

Number of CD-Is in million	**1995**	**2000 and beyond**
USA	1.25	30
Japan	1	20
Europe	1	20
CD discs in million	**1995**	**2000 and beyond**
USA	6.25	150
Japan	4	100
Europe	4	100

Source: IERPC

* Multimedia in Japan and the US is regarded as a medium for entertainment. In France, the technology is regarded foremost as a conveyor of education and culture.
Source: IERPC

* The unintelligent databases of today will become the intelligent ones of tomorrow, with integrated multimedia based systems. "The post-litterate generation" will receive their information via their PCs, all tied together in high speed networks, which can transmit pictures and videos from, for example, TV news emissions of the last month, text from the dailies and magazines of the past year, combined with data from databases and voice messages from electronic mail systems. The passive systems we know will become active, according to IERPC and others.
Source: IERPC

* Electronic dictionaries have become a great success in France – "La Larousse Electronique" has beaten all sales records. In Japan, electronic books on music are highly popular, and in the US, electronic vocabularies are successful. In the future we can look forward to intelligent guides based on expert systems – "do it yourself" assisted by the leading experts of this world!
Source: IERPC

* What will the TV news services of the future be like? Stories reported by one single journalist, who does the research, the interviews and also serves as the cameraman and the technician? The question is not so much of what is feasible from a technology point of view – New York 1 News is already providing their viewers with 24 hour news, thanks to reporters working in this way. Rather, the question of quality will become the focal point – what kind of reporting will be provided when real "big news" occurs? Is it possible for one single reporter to cover all aspects? But, on the other hand, today's TV teams have already decreased from six persons to two, due to technological developments...
Source: The Economist, September 12, 1992

* Before the turn of the century, the market for 3DO players, terminals for games based on 32 bit processors, will total 50 million units worldwide, according to IERPC.
Source: IERPC

* Data compression is the one technology without which the information compact equipment of the future is not possible. Electronic dictionaries, vocabularies and databases are some examples of data compression applications.
Source: IERPC

* NTT, Nippon Telegraph and Telephone, the second largest telecommunications operator in the world, is sponsoring research programs on how the brain's neurons communicate. The objective is to find possible models for future computers, based on how the brain operates. Other Japanese companies, such as NEC, are involved in similar projects.
Source: Science, vol. 260, May 21, 1993

* NII, the National Information Infrastructure, is the name of a much hyped program in the USA, aimed at implementing a computer high speed network, covering the entire nation by 1996. The network will transmit data at speeds of one billion bits/second. Researchers, university professors and students, libraries, hospitals, schools, companies and authorities involved in research programs, will be able to utilize this "data super highway" in order to exchange information across the country.
Source: Science, vol. 260, May 21, 1993

* WaveLAN is the name of the first cordless system for data transmission. It is a set of microwave radio links for transmission of data between standard computers.
Source: Science, vol. 260, May 21, 1993

* Who will be the leader in the advanced operating systems of the future? There are many options. The table below includes the five most successful ones so far:

	NT	OS/2	UNIX	SOLARIS	NEXTSTEP
Supplier	MICROSOFT	IBM	NOVELL's UNIX SYSTEM LABS	SUN MICRO-SYSTEMS	NeXT
Installed copies	80,000 test copies	2 million	24 million	800,000	50, 000
Microprocessor	486/Penthium DEC's ALpha MIPS	486/Penthium	486/Penthium Workstations IBM's RS/6000	486/Penthium Sparc	486/Penthium Motorola 68000
Number of applications	1,000	1,200	18,000	7,500	620

* The SUN versions are not included.

Sources: DataQuest Inc./Business Week, May 31, 1993

* Within twelve months, the inhabitants of Manhattan, New York City, will just have to tell their telephone whom they want to call, instead of pushing a number or a code. In the US this service is called "voice dialing." Each user will store a voice-based library in their normal telephone, and the telephone will then choose the appropriate number upon request.
Source: Sveriges Tekniska Attachéer, note no.: U3-93-024

* Of the 569 new firms spun off from the Swedish universities since 1970, 32 percent are involved in data and telecommunications, electronics and computers. The distribution is three percent for data and telecommunications, 16 percent for computers and 13 percent for electronics.
Source: Ny teknik/Teknisk tidskrift 1993:11

* Automated translating systems, which can easily be connected to any telephone, now take care of simultaneous translations between speakers of different languages. The next step may well be electronic headgear, which directly translates whatever the wearer says to the language of the conversational partner.
Source: Svenska Dagbladet, June 13, 1993

* The for so many decades discussed video telephone is by no means dead. The only thing it lacks is a common international standard for picture transmission which can solve today's user problem. Anyone using their picture phone from AT&T, calling a friend having a similar gadget from BT, will not receive a picture! For reliable picture transmission, one user can only call another user having equipment from the same supplier.
Source: New Scientist, April 17, 1993

* Some market experts believe that the Japanese buy new, electronic equipment for some US$ 17 billion a year. Among those gadgets no up-to-date Japanese can live without are:
  - The Global Positioning System, which, led by satellite signals, calculates the latitude and longitude of the user. Boating amateurs are seen as the natural target group, but also international business people lost...
  - The virtual ski instructor needs no snow, no hills, and no skis. Just jump into your boots in your living room, put on your virtual helmet, grap your poles and go!
  - The portable PC with a built-in modem for communication, all for underwater usage is here!

  Please note, that new products are introduced every single week. Thus it may well happen that these products are obsolete by the time you read this. However, whatever the products, the French weekly "L'Express" is certainly correct in stating that "Homo Digitalus est arrivé!" – digital man is here!

  Sources: Time Magazine, December 14, 1992/L'Express, November 20, 1992

* Virtual Reality is – reality! By virtual reality we mean advanced computer supported simulation programs. Virtual Reality – VR – is predicted to turn over more than £1 billion before the turn of the century, according to the Financial Times. Entertainment, computer aided design and production, simulation and education, are seen as the largest market segments at this time.

  Source: Financial Times, October 12, 1993

* Video transmission via ordinary telecom copper lines combined with ADSL, Asymetric Digital Subscriber Lines, offers every household access to video-on-demand and other services of similar character. The ADSL technology works as a powerful modem, "scaring" good old POTS lines into high power functionality.

  Source: Telia

The IT Industry in 2001

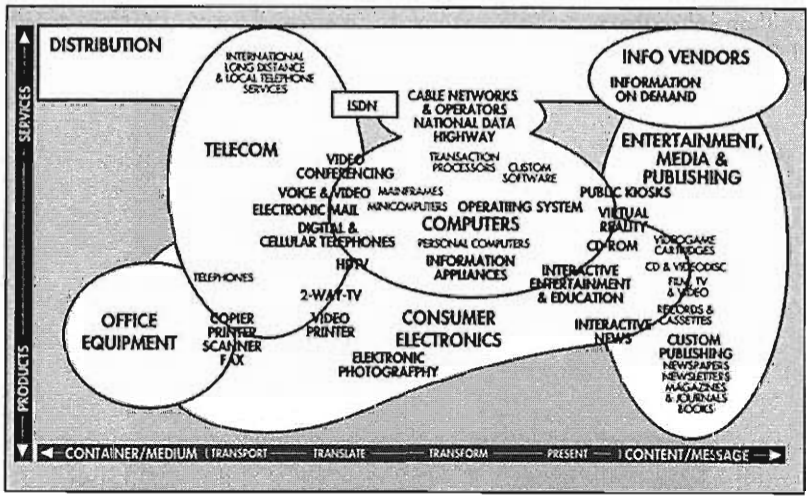

Fig. 146: The telecommunications and IT industries are constantly creating new visions about the future. Thus, Apple Computers imagines that the users want products that can fulfill the demands according to this scheme by 2001. The number of technological opportunities for new products and services demonstrate an overwhelming growth, among others due to the fact that there are no longer borders among today's different technologies and industries.
Sources: Apple/The Economist, February 27, 1993

The World's Telephones in the year 2000
Wired – Wireless – Mobile

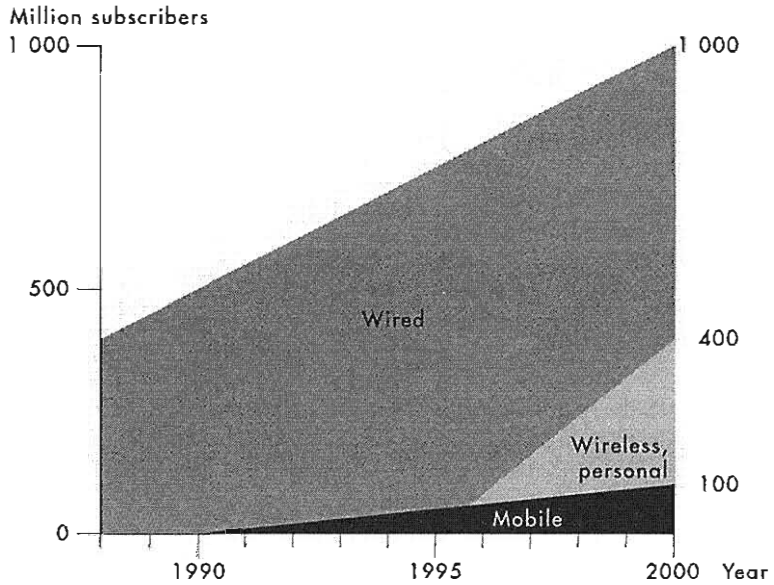

Fig. 147: Worldwide, by the year 2000, there will be one billion subscribers for ordinary wired telephones, 400 million subscribers of cordless personal telephones, DECT, and 100 million subscribers of mobile telephones.
Scource: Allgon AB, Annual Report 1992

New Media CD-ROM Players in the USA

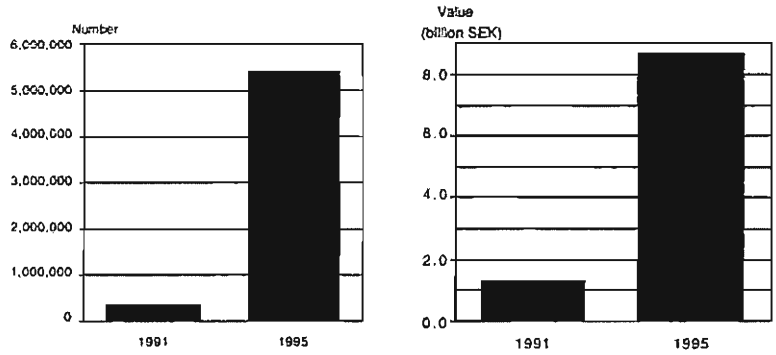

Fig. 148: CD-ROM technology is breaking through in the US. In 1991, 350,000 CD-ROM players were sold in the country with a value of SEK 1.3 billion. In 1996, that same market will sell 5.4 million players valueing SEK 5.4 billion. The average price will fall during the period, from approximately SEK 3,900 for a separate player in 1991, to SEK 1,700 in 1996.
Source: Frost & Sullivan/Computer Sweden March 27, 1992

New Media CD-ROM Databases in the US

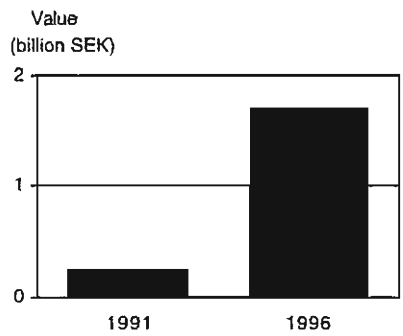

Fig. 149: As CD-ROM players become more accessible in terms of price, and find more uses for the average user, for example, photo album, dictionary, telephone catalog, etc., the CD-ROM based databases will find more users. In 1991, CD-ROM database services valueing SEK 245 million were sold. The analysts Frost & Sullivan predict that the value of these services in the US market will grow sevenfold until 1996, to a total value of SEK 1.7 billion. At the same time, the average price will drop from SEK 1,000 to SEK 450 during the same period.
Sources: Frost & Sullivan/Computer Sweden, March 27, 1992

The Market for Cordless Access in the USA 1989–95

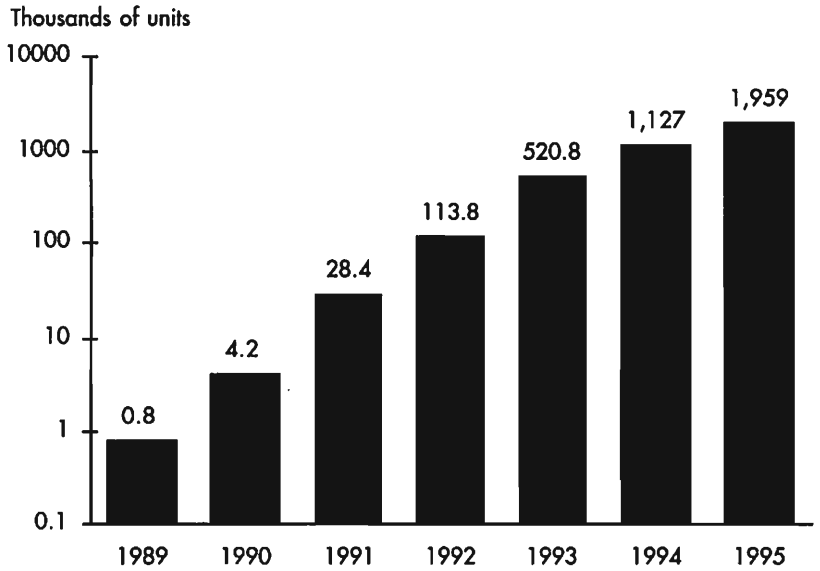

Fig. 150: The market for cordless access is not yet a fast moving one, in spite of PCN technology offering great opportunities, not in the least for the service industry. One reason for the sluggishness is the lack of standards. One basic demand is open systems. The diagram shows the predicted number of installed cordless local networks in the USA for the period 1989–95.
Sources: IDG News/Computer Sweden, January 22, 1993

This Year's Innovation: The Personal Digital Assistant (PDA)

by Bengt-Arne Vedin

Mainframes, minicomputers, personal computers, portable computers, lap-tops – there is no doubt that development is headed towards information technology assistance on an increasingly smaller scale: pen-computers, handheld computers for inventory, teleterminals which use radio to register that a rental car has been returned, or keep track of fast-delivery letters and packages. Next step, many believe, will be personal digital assistance: wallet sized computers which can connect to other computers, directly or via the telephone network. Prototypes already exist in the form of advanced pocket calculators and electronic calendars.

At the time this was written, the advanced offspring of these predecessors existed only on the drawing board. The announced personal digital assistants of Apple and others were, as so often in the information technology world, delayed. The first products on the scene will certainly be limited in their functions, in relation to all the promises and dreams of future systems. So what can we expect, and when?

Small portable products require altogether more input via symbols or through pen-writing and speech than keyboards, which tend to be too small and uncomfortable to use. There are – as always – several different contemplated standards or operating systems for pen-writing on computers (Go, PenDOS, Windows for Pen Computing.) The problem for them all is identifying the handwriting, precisely as the problem for voice commands is speech recognition. Another problem is that, ideally, the portable pocket computers should offer communication possibilities, they should be mobile (computer) telephones. This works well for voice communications but data transmission requires a totally different freedom of interference.

The idea is to make many functions available in the same portable computer and terminal: fax, electronic mail, voice messaging service, computing capabilities and comprehensive reference lists of, for instance, hotels and restaurants. During 1993, EO (jointly owned by AT&T, Matsushita, and others – NEC and Toshiba have decided to use the same system) introduced a mobile, pen-based product, AT&T especially emphasized its mobility.

The AT&T product arrived just a hair before the much talked-about PDA Newton from Apple. General Magic, started by ex-Apple wizzards, and backed by half a dozen electronic giants – Apple, AT&T, Matsushita, Motorola,

Philips and Sony, is combining all these qualities in the development of Telescript, a system which makes it possible to communicate freely between different platforms and networks. Psion already launched a more traditional keyboard based version; Amstrad's response is writing-based.

So, when using Telescript it is sufficient to indicate a name on one's personal telephone list in order for that person to be called up, or in order for the right electronic mailbox in the correct electronic conference system to receive the message. One of several built-in functions is a system checking that the receiver actually has received, i.e. called up and read, the message. On the other hand, the user should be able to ask the "assistant" to select and prioritize the received mail by sender, for instance. And he/she should have the opportunity to choose to receive a messsage immediately via expensive cordless communication, or to receive information only about the fact that a message is waiting, to be picked up later whenever an ordinary telephone is available.

Tests carried out have indicated another set of shortcomings in addition to cellular tele-transmission, such as batteries of limited capacity, and hardware not quite compatible, or not functioning properly. However, new systems, smaller and more functional, are on their way. The question is whether EO and Magic may start a standards war, even worse than the one expected when Microsoft launches their own system software for personal communication in early 1994(?)

The Apple Newton contains a number of gimmicks. When opening a "folder", there is an accompanying sound as if a desk drawer is being pulled open. When looking through the telephone list there are sounds as if a telephone directory is being leafed through. When putting something in the trash can, sounds of crumpling a piece of paper illustrate the action. Newton is not equipped with a cellular telephone but has a communications link via infrared light for "close contact" with a base computer or with other Newton units within close proximity.

The question is whether these "digital assistants" are to be regarded as developed substitutes for pocket calendars, be they electronic or paper-based, or as improved cellular telephones, or as something totally new. From a base close to zero, Technology Partners predict sales of US$ 7.4 billion by 1997. Many companies, including IBM, Compaq, Tandy, Sony, Casio, and Motorola, are sufficiently uncertain about these market predictions. Thus, they have products under development, but are putting off market introductions until they know how the Apple Newton is received. Sharp is manufacturing the Newton for Apple, and they are planning for their own version. Ericsson, collaborating with General Electric on cellular telephone systems in the US, has developed

an add-on system allowing the popular handheld computer from Hewlett Packard to communicate by, for instance, receiving and sending electronic mail. Maybe such add-on systems for existing lap-tops offer another attractive solution?

Many of today's users of hand held computers are engineers and economists, having a need to carry out complex calculations quickly, perhaps using standard formulas of a statistical or technical nature, or maybe using special formulas of their own design. Another category of users are brokers, trading with stock, currencies, options, and raw materials – they find "historical" data, though not neccessarily very old, and background information interesting – as well as different kinds of current quotations. Communications possibilities offer distinct advantages to all of them. Other types of information of interest could be general news, weather forecasts, traffic news, sports and general information search, given that the chosen starting point is videotex or videotex-like systems. The question is how large the market will be, for instance the need for convenience versus speed, and, of course, price sensitivity.

Even though the development to a large degree depends on needs, demand will be sensitive to price. Facing the introduction of new devices in the middle of 1993, estimates were made for a total market of 100,000 to 250,000, which is a wide span indeed. This is related to pioneering products, always highly priced, estimated to cost from SEK 15,000 to SEK 30,000, i. e. toys for the price insensitive. As usual, a true mass market is there only when prices have come down to less than SEK 5,000.

Except for these "guesstimates", what should we believe is the future market development for these products? A lot depends to what extent they will be regarded as totally new devices, or if they are seen as substitutes for already existing, or as innovations trying to take over the already existing and also adding substantial new developments to the old applications. As already discussed, our indications are that substitution of some kind of, for instance, pocket diaries, and maybe of cellular telephones are the best guesses, but complementary functions also offer good bets.

If the market is totally untapped and moreover independent of some kind of existing infrastructure, for instance base stations for cellular telephony, or developing standards, the development will follow a S-curve, deserved to be called classic:

$$S = S_{\infty}(1-e^{-bt})(1+e^{a-bt})$$

At the time "infinite" the result will be "S_{∞}", at the time t=0, it becomes 0, as expected.

Should we be faced with a substitution, where the market S_g does not grow at all, as for instance in the case of leaded gasoline being replaced by unleaded, or one kind of weed-killer being replaced by an environmental friendly one, the development curve looks a little different:

$$S = S_g e^{kt}/(1+e^{kt})$$

It is also possible to express this as the frequency of "the new" relative to "the old" being $e^{kt}/(1+e^{kt})$, a number approaching 1 at $t=\infty$, but 1/2 instead at $t=0$, i.e., the point in time at which there is an even match between the old and the new. The frequencies of the old and the new are the mirror images of each other. Thanks to the mathematical simplicity of the formula, the substitution curve f/(1-f) becomes a straight line in a logarithmic diagram.

Finally, when there is competition between old and new, and the new is enlarging the overall market substantially, sometimes without any effect on the market share of the existing one, sometimes affecting the existing market later on, the equation becomes rather more complex, since we now have to decide the size of the advantage of the newcomer.

The first equation above contains a number of constants denominated S_∞, a and b. The first one refers to the "saturated market", while a and b can be derived from the growth curve of the new product, that is to say the growth rate of the product. Let us assume that we know the development of such a product, the named constants. But before market saturation occurs, a new challenger appears on the market, a new technology. Its development as it gradually drives the old technology from the market, wholly or partially, or finds new niches, can be determined by calculating its "competitive advantage," given by yet another constant A, which appears as soon as the competitor has reached some level of its own market curve, so that it is possible to fit a formula to it. The formula for this and for the later continued development, is given in the following differential equation:

$$S_{d(t+1)} = \mu S_{dt}/(1+\partial S_{dt}+\partial A S_{At})$$

By differential equation is simply meant that index t is equivalent to the value of S at the point in time t, index (t+1) the value at a point in time one time unit later. The letter d indicates the first established product, the one that is being attacked, and A indicates the challenger. In this case it is possible to derive the constants μ and ∂ from the behaviour of the market *before* the challenger A appears, which is determined by how things proceed after A has appeared. (One example from real life is telegraphy versus telephony, measured by the number of messages compared to the number of telephone calls: A turns to have the value .018, and telegraphy had its peak in 1940.) Should we suppose

that S_d is on its way to saturation following the normal, unthreatened curve to $S_{d\infty}$, the challenge having the attacker's advantage of Q from S_A at the point in time T means a development after T according to:

$$S_d=S_{d\infty}\{(1-e^{-bt})(1+e^{a-bt})-(1-e^{-Qb(t-T)})(1+e^{a-Qb(t-T)})\}$$

According to some researchers there are nine factors which influence success, giving an advantage, deciding if there is an advantage factor, and how large it is. The most powerful factor is so dominant that it is quite possible to forget the others. It is, not unexpectedly so, a superior product bringing new and unique advantages to the user. Among the other factors are good selling power/marketing organisation, higher quality and good adjustment between technical demands and technical capabilities within the company.

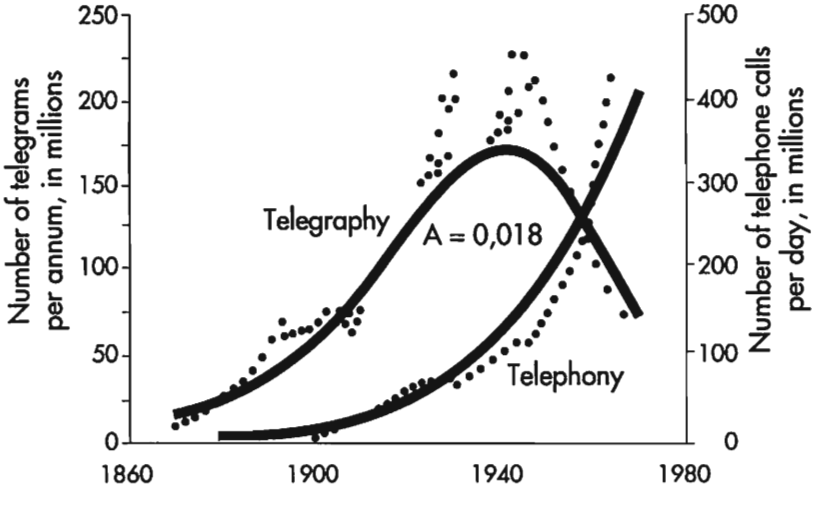

Figure 151: Telegraphy versus telephony, measured by number of messages compared to the number of telephone calls, serves as an example of how new technology becomes dominant.
Source: New Scientist, February 6, 1993

7. Telecommunications and IT Companies

Some Telecom Operators and Suppliers, Results in 1992

Company	Number of employees	Revenues	Year founded
Operators:			
AT&T* (USA)	312,700	$64.9 billion	1885
BT (UK)	170,700	£13.242 billion	1981
Cable & Wireless (UK)	38,835	£3.2 billion	1929
Deutsche Bundespost Telekom (Germany)	255,219	DM 53.9 billion	1990
France Télécom (France)	155,300	FF 122.6 billion	1988
KDD (Japan)	6,000	¥ 244.3 billion	1953
MCI (USA)	30,964	$10.5 billion	1968
AB Nordic Tel (Sweden)	150	-	1991
NTT (Japan)	272,903 (1990)	¥ 6 398.4 billion	1985
Sprint (USA)	43,400	$9.2 billion	1899
Telefónica de España (Spain)	74,437	ESP 1,154 billion	1924
Telia AB. f d Televerket (Sweden)	41,771	SEK 34.419 billion	1853
Tele2 (Sweden)	100	-	1985
Leverantörer:			
Alcatel NV (The Netherlands & France)	125,700	ECU 16 billion	1986
Bosch* (Germany)	169,804	DM 34.4 billion	1886
Ericsson* (Sweden)	66,232	SEK 47 billion	1876
GEC Plessey Telecommunications, GPT (Great Britain)	156,000	£9.4 billion	-
Italtel (Italy)	16,517	ITL 2,973 billion	1980
Motorola* (USA)	107,000	$13.3 billion	1928
NEC* (Japan)	117,994	¥ 3,514 billion	1899
Northern Telecom (Canada)	57,955	$8.4 billion	1882
Philips* (The Netherlands)	252,200	NLG 58.5 billion	1891
Siemens* (Germany)	413,000	DM 78.5 billion	1847

Fig. 152: Some operators and suppliers of telecommunications equipment, compared by the number of employees and the latest available revenues, expressed in local currency. ATTN: The above figures pertain to the latest complete business year, which is not always recorded in calendar years. (Also conducts other operations)*
Sources: Datapro: Reports on International Networks and Services/Datapro: Vendor Profiles/ corporate annual reports

Telecommunications Traffic 1992

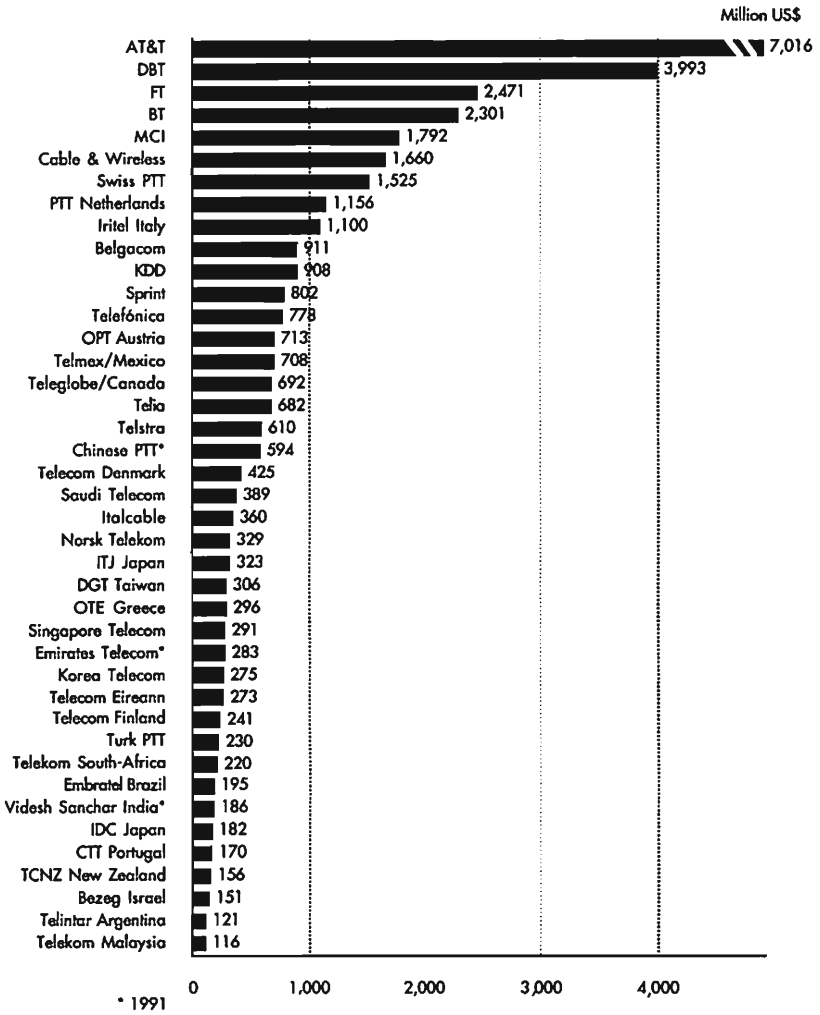

Fig. 153: The diagram shows the international telecom traffic in million US$ 1992 per supplier. Worth noting is that none of the Regional Bell Operating Companies (RBOC) are included, despite the fact that they are relatively large.
Source: International Institute of Communications

Telecom in the World
The Leading Manufacturers 1990/91

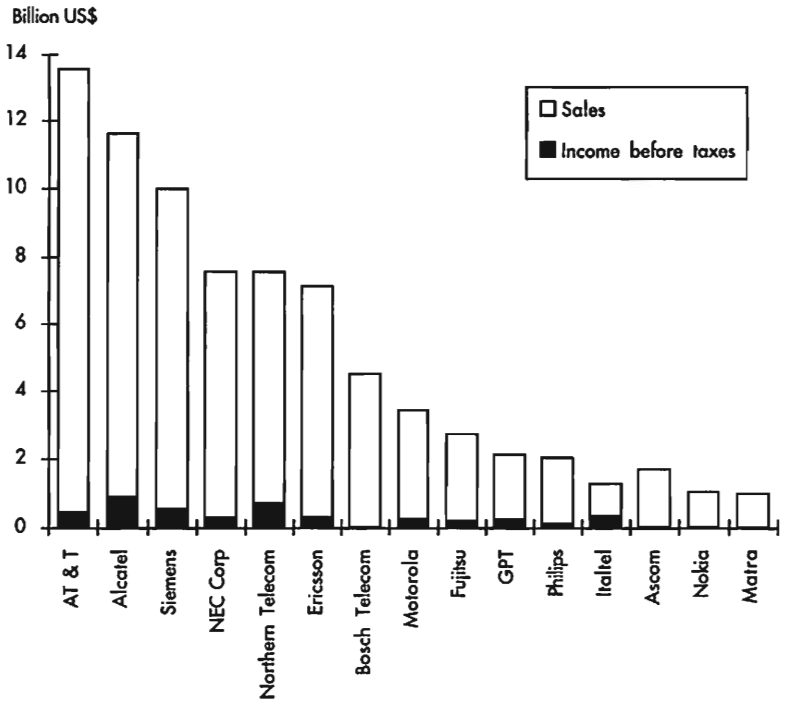

Fig. 154: The figure shows the world's leading manufacturers of telecommunications equipment, ranked by sales, expressed in billion US$, as well as the companies' income before taxes 1990/91.
Source: Communications Outlook 1993, OECD

Telecommunications in the World
The World's 15 Leading Operators 1990/91

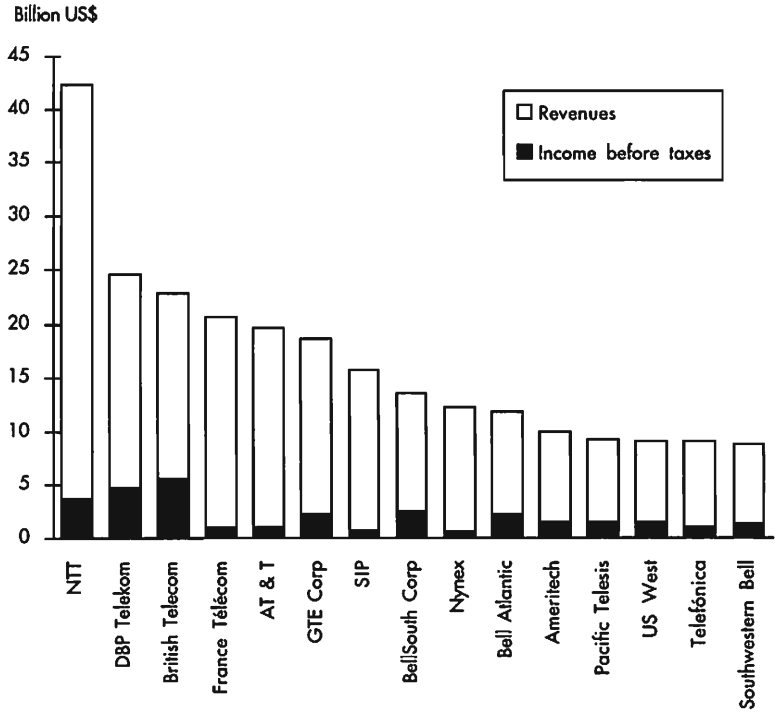

Fig. 155: The world's fifteen largest telecom operators ranked by revenues for 1990/91, expressed in billion US$. The companies' income before taxes is also indicated. That Telia is not included has, of course, to do with the company's relatively small size in international terms.
Source: Communcations Outlook 1993, OECD

Some Leading Operators in Numbers for 1991

Company	Number of employees	% state ownership	Revenues billion US$
AT&T	317,100	0	63.1
NTT	264,908	67	48.1
DBP Telekom	250,000	100	28.4
British Telecom	226,900	22	23.3
France Télécom	156,100	100	20.4
Telefónica de España	75,499	32	9.7
Sprint	43,200	0	8.8
MCI	27,857	0	8.4
Swiss PTT	19,396	100	7.3
Televerket Sweden Telia AB after July 1, 1993	42,800	100	5.7

Fig. 156: The Yankee Group did this ranking of the world's telecom operators with 1991 data as a starting point. Among these, NTT and AT&T are ranked as the world's second, respectively ninth company, for all categories with respect to total market value.

Sources: The Yankee Group, Newsweek, April 5, 1992/International Business Week, July 13, 1992

Mobile Communications in the World
Market Shares per Supplier, January 1993

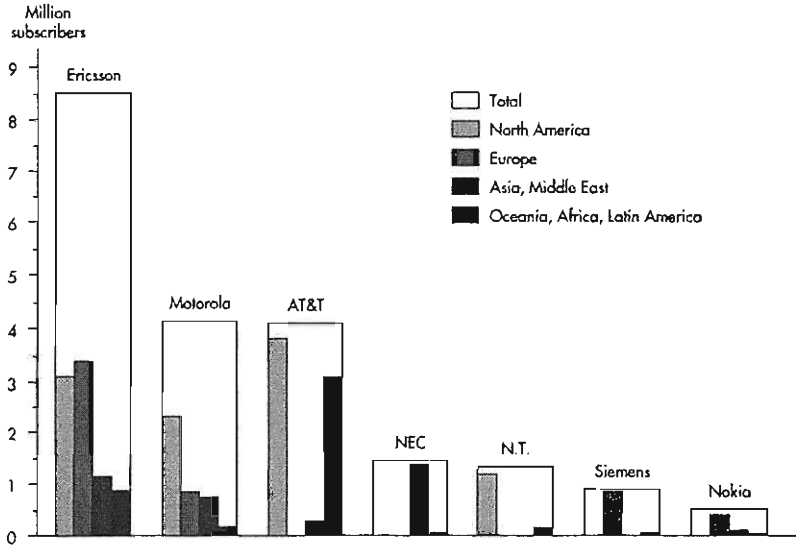

Fig. 157: The figure separates the global market for mobile communications per supplier in January 1993. At that time, there were 21,574,200 subscribers.
Source: Ericsson Reference List Cellular Systems January 1993

Competitive Situation in the USA, 1991
Revenues and profits in billion US$

Company	Revenues	Profits
International traffic:		
AT&T	38.8	1.4
MCI	8.5	0.551
US Sprint	8.8	0.367
Local services:		
Ameritech	10.8	1.2
Bell Atlantic	12.3	1.3
Bell South	14.4	1.5
NYNEX	13.2	0.601
Pacific Telesis	9.8	1.0
Southwestern Bell	9.3	1.1
US West	10.6	0.553

Fig. 158: The figure shows the complementary relationship between the largest operators in the USA, partly as concerns international traffic, partly locally, expressed in revenues and profits in billion US$. There is completely free competition as concerns international traffic. The local traffic is still limited by the FCC's rules, but these will be eased little by little. For example, it has recently been possible for cable TV companies to offer telecom services as well.
Source: Public Network Europe, October 1992

Competitive Situation in Japan, 1991
Revenues and Profits in Billion Yen

The percentage expresses the yearly change, increase or decrease.

Local traffic/domestic services:	**1989**	**%**	**1990**	**%**	**1991**	**%**
NTT's revenues	5,847	+2.5	6,034	+3.2	6,056	+1.6
NCC Combined revenues	199	+148	304	+52	406	+33
NCC's share of total domestic revenues	3%		5%		6.5%	
NTT's profits	484.7	+13.8%	414.3	-14.5%	352.8	-14.8
NCC Combined profits	29.2		31.3		30.6	
International traffic:	**1989**	**%**	**1990**	**%**	**1991**	**%**
KDD's revenues	256.3	-0.1	240.7	-6	244.5	-1.6
NCC Combined revenues	3.75	–	19.0	+500	51.5	+271
NCC's share of total international revenues	1%		7%		21%	
KDD's profits	29.4	–	25.9	-11.9	26.0	+0.2

Fig. 159: In Japan, NTT has long dominated domestic traffic, and KDD, international traffic. However, since 1985, new competitors have gained foothold, the so called New Common Carriers, NCC, which consists of three domestic operators, DDI, Japan Telecom, and Teleway Japan, as well as two international carriers, IDC and IT. The Minister for Posts and Telecommunications is considering an entirely free market, or alternatively, a liberalized one. Due to declining tariffs, the Japanese market grew 13 percent from 1989 to 1991.
Source: Public Network Europe, July/August 1992

Operators

Due to floating exchange rates, all revenue figures are in local currencies. See page 8 for rates of the US$, ECU and Yen.

Ameritech - American Information Technologies

Country of origin: USA

Primary operation:

* Telecommuncations services in the states of Illinois, Indiana, Michigan, Ohio and Wisconsin - covering 17 percent of the US population.

International operations:

* Ameritech International was founded in 1990 in order to exploit business opportunities outside of the US;
* The company concentrates on international markets that are undergoing liberalization and privatization of operators;
* Areas of interest are Western Europe, Eastern Europe, Oceania, and Latin America. Ameritech International and Bell Atlantic are part owners of "Telecom Corporation of New Zealand".

In Europe:

* Active in Europe since 1991;
* Ameritech has strategic alliances with six European telecommunications companies for common marketing of products and services: France Télécom, ItalCable, SpA, PTT Telecom BV, Telefónica and KTAS (Denmark);
* The first commitment in Europe was in Poland where they, together with France Télécom and the Polish telecom administration, constructed an analog mobile telephone network;
* Ameritech International, together with Singapore Telecom, own 49.9 percent of Norway's second GSM operator, NetCom GSM;
* Ameritech and ItalCable have an agreement to develop mobile telephones and services.

The company in numbers:

* 1992 revenues: US$ 11.15 billion;
* Number of employees: 71,300.

AT&T

Country of origin: USA

Areas of operation:

* In the beginning of the 1990s AT&T focused their operations on three main areas:
  - Public, global networks with user equipment and network systems
  - Data networks and open systems
  - Strategic international alliances and intelligent networks.

The market:

* Over half of the revenues, in 1992 approximately US$ 39 billion, was generated from telecommunications services via their own public switches and networks for domestic and international longdistance traffic;
* Nine percent of the telecom services business is generated by international operations;
* The major challenge is to maintain the North American market, and at the same time, increase the international market share. AT&T's goal is that international operations shall generate half the revenues before the year 2000;
* AT&T has had a subsidiary in Sweden since 1988;
* Another partial goal is that by 1995, over half of the traffic over AT&T's network should be from data communication;
* With revenues of US$ 7.5 billion, AT&T Network Systems is the USA's leading supplier of network equipment.

The company in numbers:

* 1992 revenues: US$ 64.9 billion, of which approximately US$ 39.5 billion is generated by telecom services;
* Number of employees: 312,700, with 50,000 employed outside of the US;
* Up until 1984, when deregulation went into effect, AT&T was the largest company in the US;
* AT&T's international operations are steered by the FCC, Federal Communications Commission, the US regulatory authority;
* Bell Laboratories are well-known for their research and development;
* Since the end of the 1980s, AT&T has, above all, focused on ISDN;
* AT&T has invested US$ 15 billion in R&D during the last five years.

Bell Atlantic

Country of origin: USA

Primary operation:

* Bell Atlantic has 18 million telecommunications customers in New Jersey, Pennsylvania, Delaware, Maryland, Virginia and Washington D.C.

International operations:

* Bell Atlantic looks for international business opportunities. They go in where regulatory possibilities are provided, and where they feel there is political and economic stability;
* The company owns just under 30 percent of "Telecom Corporation of New Zealand", where Ameritech is also part owner.

In Europe:

* In Western Europe, Bell Atlantic has concentrated on mobile telephone systems and public packaged networks;
* In the Czech Republic and Slovakia, Bell Atlantic is part of a consortium with among others, US West. Currently, they are modernizing the countries' telecom networks. In 1991, an analog mobile telephone network and a public data communications network were installed.

The company in numbers:

* 1992 revenues: US$ 12.6 billion;
* Number of employees: 71,400.

Bell South

Country of origin: USA

Primary operation:

* Bell South provides telecommunications services in the southern states of Alabama, Florida, Georgia, Kentucky, Lousiana, Mississippi, North Carolina, South Carolina and Tennessee. Bell South is the RBOC which has the most access lines, 18.9 million.

International:

* Bell South wants to become a world leader in wireless communications;
* Currently, the company is involved in the operation of mobile networks in five Latin American countries: Argentina, Chile, Mexico, Uruguay, and Venezuela;
* The largest of Bell South's international interests is in Australia, where the company is part of the Optus consortium, with 24.5 percent. The Optus consortium, the second operator in Austrialia, is currently constructing a digital mobile network;
* Bell South has interests in Ram Mobile Data which will be constructing and operating mobile data networks in both the USA and Europe.

In Europe:

* European headquarters are based in Brussels;
* In France, Bell South is a part owner in COFIRA, which has been operating the second GSM network since July 1992. Bell South also has a minority share in the leading cable TV company, ComDev, with nearly 275,000 subscribers. In addition, Bell South owns 12.5 percent of France Télécom's new mobile data system;
* Bell South has shares in consortia competing in the GSM markets in France, Denmark and Germany;
* The company persues, in various collaborations, mobile data networks in Holland, Great Britain and France.

The company in numbers:

* 1992 revenues: US$ 15.2 billion;
* Number of Employees: 97,112.

BT

Country of origin: Great Britain

Areas of operation:

* The main business areas are domestic and international telephone services;
* Three business areas:
  - British Telecom U.K.
  - British Telecom International (BTI)
  - Communications Systems Division (CSD);
* British Telecom U.K. is the largest division and is responsible for local and international networks and services to households and companies;
* BTI is responsible for international networks and services, maritime and airborne communication, as well as off-shore operations;
* BTI has established agreements with a number of foreign operators, and operates their own subsidiaries in various countries, e.g., in Sweden;
* CSD is responsible for sales, distribution and integration of user equipment, systems, and services, such as electronic mail, VAN services, mobile communication, PBX manufacturing and the yellow pages.

The market:

* In 1993, domestic telecom traffic generated £ 5.5 billion, without any growth;
* Public networks (PSTN) are responsible for more than half of BT's revenues, and represent 82 percent of the assets;
* The new open market of the EU provides many new opportunities, while at the same time, BT will have stronger competition in the domestic market;
* BT supplies 23 million people with telephony, the majority being local calls. Competitor Mercury focuses on the more profitable longdistance calls, as well as the corporate sector;
* In November 1992, AT&T and BT entered into an agreement whereby AT&T would purchase BT's 18 percent share in McCaw Cellular Communications, Inc.

The company in numbers:

* 1993 revenues: £ 13,242 million;
* Number of employees 1993: 170,000;
* BT was privatized in December 1984 and the state now owns 23 percent. BT has more stockholders than any other company in the world.

Cable & Wireless (C&W)

Country of origin: Great Britain

Areas of operation:

* Installation and management of domestic systems and international cable networks;
* Concentrates on mobile communications and niche markets through purchases or joint ventures;
* Hong Kong is a core business and is responsible for 43 percent of revenues and 65 percent of the trading profit. Hongkong Telecom's international telecom traffic rose by 15 percent, while traffic between Hong Kong and South China increased by 35 percent;
* C&W operates 15 mobile communications companies in the world, with agreements for six additional companies to start during 1994;
* A 25 year license, starting in 1984, gave Mercury Communications Ltd., C&W's public network operator in Great Britain, the same status as BT. Today, C&W operates 4,800 kms of fiber optic cable and an additional 2,000 kms of digital microwave links;
* In September 1991, a new corporate structure was introduced in which markets were separated into OECD and non-OECD countries.

The market:

* "The Global Digital Highway," a digital network based on fiber optic cable, connecting the world's economic and financial centers, is a core activitiy in the company's strategy;
* Asia and Oceania are the most important markets, the Caribbean and the Middle East also have high priority;
* Many subsidiaries and well-developed cooperative agreements are part of their strategy as well. These exist in Hong Kong, USA, Japan, Bahrain, the Philippines, Vanuatu, West Indies, Sweden (Tele2), Eastern Europe and China;
* US operations occur via an alliance with US Sprint.

The company in numbers:

* Revenues, March 31, 1992: £ 3.176 billion;
* Profit before tax, March 31, 1992: £ 714 million;
* Number of employees 1992: 38,835;
* Founded in 1929 as a private company, it was nationalized in 1946. In 1981 the company was privatized once again;
* Owns 40 percent of Tele2 in Sweden;
* C&W have operations in over 50 countries, with concentration in the former British Empire and the core business in Hong Kong.

Comviq GSM

Country of origin: Sweden

Areas of operation:
* Mobile telephony, mainly GSM based;
* Value added and additional services, for example, directory service, secretarial services, informational services, and limited time calling.

The market:
* Focuses first and foremost on large companies;
* Comvik has signed roaming agreements with Denmark, Finland and Germany.

The company in short:
* Established in 1989;
* Owned by Kinnevik.

Deutsche Bundespost Telekom

Country of origin: Germany

Areas of operation:

* Three main service areas:
  - telephony
  - mobile telephony
  - data and other non-voice communication;
* Telekom supplies all types of services above and beyond telephony – fax, teletex, interactive videotex, cable TV, personal paging services, land mobile radio, video conferences, electronic mail, etc.;
* They manufacture more than 200 different types of telephones and pay telephones.

The market:

* Telekom is Europe's largest telcom operator/supplier. Some numbers from 1991:
  - 33,400,000 telecom accesses
  - 800,000 connections to leased lines
  - 9,800,000 cable accesses
  - 285,000 ISDN accesses
  - 946,000 fax accesses
  - 113,000 telex accesses;
* One of the top priorities is the modernization of the six new federal states with investments of DM 55 billion over a seven year period. The goal is that by 1994, the new federal states will have access to the same service as the old federal states;
* In 1991, 550,000 new subscriptions were installed in the new federal states, mainly for industry and administration;
* Telekom has their own subsidiaries in the key markets of Brussels, New York, Paris, London and Tokyo;
* Kopernikus, Telekom's satellite system, is used for telephony, TV, and the transmission of large amounts of data;
* Together with France Télécom, Telekom has built Eunetcom for international telecom and data communications services.

The company in numbers:

* 1992 revenues: DM 53.9 billion;
* Number of employees 1992: 255,519;
* Privatization and liberalization are still hot political topics in Germany, and within the EU. A certain amount of liberalization is under progress, for example, in the mobile telephony area;
* There are 3,000 employees working with R&D at Telecommunication Engineering Center (FTZ);
* Deutsche Bundespost was separated into three business areas on January 1, 1990: Postdienst, Postbank and Telekom.

France Télécom

Country of origin: France

Areas of operation:
* Functions as a domestic and international telecom supplier, but purchases equipment from various manufacturers;
* The first public telecom operator to launch ISDN services;
* Télétel, France Télécom's videotex service for private users, has over six million Minitel terminals in France. Minitel provides access to approximately 20,000 different databases and services;
* Expanding on Minitel's success, the system is being connected to foreign videotex systems.

The market:
* For the most part, all of France's trunk network is digital;
* International services are responsible for over 10 percent of revenues;
* France Télécom has established agreements with, among others, Deutsche Bundespost Telekom, GSI and MCI Communications Corp.;
* France Télécom is building out their services through joint-venture agreements with other European and international network suppliers;
* The EU's demand for liberalization exerts continued pressure on the French political decision makers as concerns the liberalization of France Télécom. Certain principal decisions on the sale of a portion of the state's shares have been taken.

The company in numbers:
* 1992 revenues: Ff 122 billion;
* Number of employees 1992: 153,300;
* France Télécom become public in January 1991;
* A name change, and a change in strategy to a commercially oriented company in 1988;
* Ff 1.8 billion were spent on R&D at the Centre National d'Etudes des Télécommunications (CNET).

KDD, Kokusai Denshin Denwa Co., Ltd.

Country of origin: Japan

Areas of operation:

* KDD is an international telecom operator, with Japan as a base, which offers:
  - International telephone services;
  - ISDN services to 13 countries, including G4-fax, video conferencing, transmission of data and images;
  - Leased lines;
  - International TV transmission via satellite;
  - Owns and operates a global network consisting of satellites and undersea cables of various types.

The market:

* Strong focus on developing advanced telecom services which can be paid for with many major credit cards;
* The KDD group has 33 subsidiaries with operations in Europe, USA, Africa, Asia, Australia and Latin America;
* China and the USA have strong growth, and KDD has a number of cooperative agreements as well as R&D projects in progress in these countries;
* KDD is cooperating with Unisource, owned by Telia together with the Dutch and Swiss PTT's.

The company in numbers:

* Revenues, March 31, 1992: ¥ 244.5 billion;
* Number of employees, March 31, 1992: 6,004;
* KDD was founded in 1953, but has its roots in the international telecom traffic going back to 1871.

MCI Communications Corporation

Country of origin: USA

Areas of operation:

* Two main divisions:
  - MCI Telecommunications with seven self-standing divisions, each responsible for one of the RBOC's domestic longdistance traffic;
  - MCI International, Inc., is responsible for MCI's electronic mail, telex, and international services;
* The purchase of Overseas Telecommunications, Inc. (OTI) in September 1990 gave access to 24 communications satellites and the development of satellite communications;
* Offers a large assortment of telecom services such as domestic and international longdistance calls, telephones with telephone cards, special "non-peak" charges, special services for large users of longdistance traffic, 071 (calling-party pays) numbers for domestic and international calls, electronic mail, fax, telex, etc.

The market:

* As the second largest longdistance operator in the US, MCI has 16 percent of the US market;
* MCI International has 80 offices around the world, including one in Sweden;
* MCI's network was digitalized in 1991, and has a length of 78,800 kms;
* A transatlantic fiber cable, TAT-X, in agreement with BT, is expected to be finished during 1993;
* MCI handles approximately 20 percent of the US international traffic.

The company in numbers:

* 1992 revenues: US$ 10.5 billion;
* Number of employees 1991: 27,857;
* Founded in 1968. In 1969, it was the first company to receive permission from the FCC, the US regulatory authority, to compete with AT&T in the longdistance market;
* In August 1990, MCI purchased MCI Telecom USA, the fourth largest longdistance operator.

AB NordicTel

Country of origin: Sweden

Areas of operation:
* Mobile telephone operator with GSM base operating under the name Europolitan;
* Associated services such as voice mail, specified invoicing, etc.

The market:
* Has agreements on interconnection and international roaming with the Finish Radiolinja and the Danish SONOFON, covering 10 million subscribers;
* Interconnection agreement with the Italian SIP, providing access to the Italian GSM network;
* Interconnection agreement with France Télécom providing subscribers access to the French GSM network, Itineris;
* In total, Europolitan subscribers have access to 170 million potential users.

The company in numbers:
* Registered as an operating company for GSM users on March 4, 1991, thereby becoming the third Swedish operator;
* In 1992–93, invested some SEK 500 million in constructing Europolitan's GSM network;
* Owned by NordicTel Holdings, which in turn is owned by British Vodafone (25 percent), American PacTel (51 percent), and in equal parts (8 percent each) by the original owners, Volvo, Trelleborg and the Nobel company, Spectra-Physics;
* Number of employees, August 1993: 150;
* Headquarters in Karlskrona.

NTT - Nippon Telegraph and Telephone

Country of origin: Japan

Areas of operation:

* The main area of operations is telecommunications services, which in 1992 accounted for 92.7 percent of revenues. This includes: telephone services, leased lines, digital data exchange, data communication and associated services, pocket paging services, telegraphy and other services - ISDN, fax, videotex, video conferences, etc;
* Eleven regional divisions are responsible for telephony services within Japan;
* In 1985, NTT International Operations, NTTI, was founded to assist existing users outside of Japan's borders.

The market:

* Japan is NTT's market;
* NTT is the world's second largest telecom operator. Some numbers from 1992:

- 55.8 million telephone subscribers
- 846,000 mobile telephone subscribers
- 387.1 million telephone cards sold
- 973,000 leased circuit lines
- 3,859,000 pocket pager subscribers
- 482,000 fax network subscribers
- 90 percent of Japan's population has access to ISDN.

The company in numbers:

* 1992 revenues: ¥ 6,398.4 billion;
* Number of employees 1990: 272,903;
* Privitized at the end of 1984, NTT is currently 74.5 percent owned by the Japanese state, while 90 percent of the common stock is owned by private persons. Non-Japanese nationals are now able to hold NTT stock;
* Japan's telecom authority, Minister of Posts and Telecommunications (MPT), keeps NTT's activities in check, and prohibits international telephony operations;
* R&D costs in 1992 were ¥ 286.9 billion.

Nynex

Country of origin: USA

Primary operation:

* Nynex has approximately 12 million subscribers in the North Western USA – New York and the states of New England.

International:

* Nynex is an international company with activities in more than 60 countries;
* Nynex's international strategy is to build alliances with companies in other countries as those markets are opened for competition;
* Nynex Network Systems owns 15 percent of TelecomAsia in Thailand. TelecomAsia will build and operate a network with two million main lines over a 25 year period;
* Nynex is involved in three projects in Indonesia, involving building out the existing telecom network;
* Though different subsidiaries to Nynex World Service Group, the company has sold more than 700 bank systems in over 70 countries.

In Europe:

* Nynex is the largest cable TV owner in Great Britain, with 19 local distributors and 2.7 million households. The company is considering offering customers telephony in all the distribution areas. Currently there are 20,000 telephone lines to the users;
* Nynex is one of the members of the Hermes consortium, which will build a data network for 11 railroad companies in Europe. When the project is completed, it will be the first public, pan-European, broadband network, consisting of fiber optic cables placed along the railroad tracks;
* On Gibraltar, Nynex Communications is developing and building Gibraltar's public telephone network;
* Nynex has offices in Brussels, London and on Gibraltar.

The company in numbers:

* 1992 revenues: US$ 13.15 billion;
* Number of employees: 81,900.

Pacific Telesis

Country of origin: USA

Primary operation:

* Pacific Telesis, normally called PacTel, covers the states of California and Nevada and serves 11 million telecom users.

International:

* Pacific Telesis International runs PacTel's international operations. Pacific Telesis International's main business areas are wireless communication, international carrier services and information services. The company has become a significant actor within mobile telephony through alliances in markets with great growth and strong economies. Important markets are Europe and Asia/Oceania;
* In Japan, Pacific Telesis owns shares in a number of consortia which have licenses to build digital mobile telephony networks. The company owns 10 percent in International Digital Communications (IDC), which has a license to supply the market with international carrier services;
* In Thailand, Pacific Telesis owns 49 percent in PerCom which has a license to supply Thailand's 55 million inhabitants with public personal pagers.

In Europe:

* In Portugal, Germany and Sweden (NordicTel), Pacific Telesis International is part owner of GSM operators, i.e. digital mobile telephony;
* In Spain, Pacific Telesis International is in a consortium, SistelcomTelemansaje, for a personal paging system covering the entire domestic market;
* In Great Britain, Pacific Telesis International owns two Cable TV networks, covering 121,000 households;
* Pacific Telesis has offices in London and Frankfurt.

The company in numbers:

* 1992 revenues: US$ 9.94 billion;
* Number of employees: 61,346.

South Western Bell (USA)

Country of origin: USA

Primary operation:

* South Western Bell's territory covers Arkansas, Kansas, Missouri, Oklahoma and Texas, with a total of 9.7 million subscribers.

International:

* South Western Bell's international strategy consists of taking advantage of opportunities that exist in the privitization of state-owned monopolies, as well as in building up new mobile telephone and cable TV systems;
* In Mexico, South Western Bell owns 10 percent in Téléphones de México (Telmex) in which even France Télécom has a share;
* In Israel, South Western Bell has 50 percent of the cable TV company Golden Hannels Ltd., which will reach 279,000 households in 1994.

In Europe:

* In Great Britain, South Western Bell is involved in several cable TV distribution networks, covering 1.1 million households. In the areas in which South Western Bell has interests, approximately 16,000 telephone subscribers are currently served;
* South Western Bell has an office in London.

The company in numbers:

* 1992 revenues: US$ 10.02 billion;
* Number of employees: 59,500.

Sprint

Country of origin: USA

Areas of operation:
* Longdistance traffic;
* Local traffic – seven business areas are responsible for operations on a regional level. Sprint has offices in 17 states;
* Catalog distribution.

The market:
* The USA is the major market. Sprint is the third largest longdistance traffic operator;
* Built up the first entirely digital network for transmission of voice, data and images in the USA;
* Operates the world's largest public data network;
* Via their subsidiary, North Supply, sells equipment for data, voice and video communication to distributors and retailers;
* Has a cooperative agreement with Tele2 in Sweden.

The company in numbers:
* 1992 revenues: US$ 9.2 billion;
* Number of employees: 43,400;
* On February 26, 1992, United Telecommunications, Inc. changed its name to Sprint. United Telecommunications was founded in 1899 in Kansas City.

Telefónica de España

Country of origin: Spain

Areas of operation:

* Currently, Telefónica has an agreement with the Spanish state guaranteeing the company close to exclusive rights to operate networks for, and function as a supplier of, basic telephony services. However, the country's membership in EU places demands upon liberalization, which is why liberalization is slowly on its way, starting with the more advanced telecom services. The following business operations build the base:
  - Manufacturing of telecommunications equipment and components
  - Constructon and installation
  - Information technology with software development
  - Telephony services
  - International activities
  - R&D;
* The international operations focus on joint-venture agreements with AT&T, Fujitsu, Ericsson, EDS, and European Silicon Structures, to name a few;
* In 1970, Telefónica received permission to supply a series of new services: leased lines, private networks, telex, teletex, fax, videotex and EDI;
* Mobile communication includes personal paging, mobile telephony, land mobile radio as well as marine communication.

The market:

* The Spanish telecom network is the fifth largest in Europe with over 13.5 million installed lines in June 1992;
* Domestic telecom services are responsible for 78.7 percent of service revenues;
* In preparation for the 1992 World Exhibition in Sevilla, and the Olympic Games in Barcelona, ESP 130 billion was invested to modernize the telecom network;
* At the end of 1991, 33.6 percent of the country's local switches were digital.

The company in numbers:

* 1992 revenues: ESP 1,154 billion;
* Number of employees 1991: 74,437;
* Telefónica was founded in 1924 by ITT. In 1945 the government purchased a portion of the stock and gave Telefónica monopoly status for domestic and international telephony services;
* At the end of 1991, the Kingdom of Spain owned 33.69 percent of the stock in Telefónica, and was thereby the largest single owner. No one else owns more than five percent.

Telia AB
(Televerket until July 1, 1993)

Country of origin: Sweden

Areas of operation:

* The main area of operations is communication, without restrictions, in all its forms in the Swedish market. This includes, network services with fixed and mobile telephony, data communication, customized private networks, leased lines, personal paging, cable TV, VAN's and VSAT;
* Office switchboards, terminals, service, personal telecom services, catalog services, customer financing, and consulting services are also a part of operations.

The market:

* The mobile telephony networks NMT and GSM have given Sweden more mobile telephones per capita than any other country in the world, with over 700,000 subscribers;
* In June 1992, Televerket, together with PTT Telecom Netherlands, founded a joint-venture company called Unisource, which currently offers data communications to customers in Europe;
* In December 1992, an agreement was signed, together with Finnish operators, involving the development of the Estonian telecom network. Together, the Finnish and Swedish operators own 49 percent of The Estonian Telephone Company;
* In January 1993, together with the Swiss PTT Telecom, Unisource signed an agreement of intention that would expand Unisource to a joint-venture among the Dutch, Swiss and Swedish telecom operators. The goal - being able to compete in the European and the international markets;
* The digitalization of the Swedish telecom network has accelerated, and is expected to be completed by the year 2000, 15 years before schedule;
* In 1992, Sweden received its first regulatory authority in the National Post and Telecom Agency, and the previously free Swedish market became regulated.

The company in numbers:

* 1992 revenues: SEK 35 billion;
* Number of employees 1992: 41,771;
* On July 1, 1993, Televerket changed its name to Telia AB;
* During 1992, Televerket was obligated to pay a one-time sum of SEK 5 billion to the state treasury, as well as buy-out a state loan of SEK 2.2 billion;
* R&D costs reached approximately SEK 1.2 billion, or 3.5 percent of revenues.

Tele2

Country of origin: Sweden

Areas of operation:
* Supplier of international and domestic telecommunications with Sweden as a base;
* Services/products directed towards:
  - corporations
  - trade and industry
  - households;
* Mobile communication based on GSM via Comviq;
* Cooperative agreement with the Swedish National Rail Administration for a 2300 kms long fiber network;
* Cooperative agreement with SNUS (Swedish Network User Society) for the use of SWIPnet, a network offering external data transmission, file transmission, message handling, as well as data communication between UNIX computers and local networks;
* An agreement with Sprint International makes Tele2 a retailer with exclusive rights to SprintNet in Scandinavia.

The market:
* Within 10 years from start-up, expects to have revenues of over a billion SEK;
* The market is divided into three operations:
  - connected transmission of sound and data
  - leased networks for use in different areas, mostly for data communication
  - leased private networks for companies;
* The goal is to, within three to seven years, take approximately 10 percent of the total market, equivalent to SEK 330 - 350 million;
* Introduced to the Swedish market during the spring of 1991.

The company in numbers:
* Expects to have reach break-even in 1996;
* Number of Employees 1991: 70;
* Owned by Comviq (60 percent) and Cable & Wireless (40 percent);
* Registered in September 1990 as Tele2, with Comviq Skyport as a base, which was founded in December 1985.

See also Cable & Wireless and Sprint, pages 227 and 238.

US West

Country of origin: USA

Areas of operation:
* US West covers 14 states and thereby the largest land mass of the seven Regional Bell Operating Companies;
* US West and Time Warner have joined to utilize each respective companies' strength in the cable TV area.

International:
* US West considers itself to be strong and competitive within four areas: infrastructure for telecommunications networks, cable TV, telecommunication, and private networks (including cellular networks, personal paging systems and Personal Communcations Network, PCN)
* In Japan, together with DDI Corporation and Nissan Motor Company, US West is part of an alliance which is licensed to run a digital mobile telephone network in Tokyo and Nagoya.

In Europe:
* In France, US West has nine percent of Lyonnaise Communications, reaching two million households with its cable TV. Together with France Télécom, US West offers information services including electronic catalogs, and there are plans for these to be offered internationally;
* In Great Britain, US West owns half of Mercury One-to-One (C&W owns the other half.) Mercury One-to-One constructs and runs the world's first commercial PCN (Personal Communications Network) which, when fully developed, will reach 58 million people;
* US West is also developing cable TV together with Telecommunications Inc., under the name of TeleWest. TeleWest is Great Britain's largest cable TV operator, covering some 2.9 million households. TeleWest offers telephony in certain of their areas;
* Office in London.

The company in numbers:
* 1992 revenues: US$ 10.3 billion;
* Number of employees: 63,700.

Suppliers

Alcatel NV

Country of origin: France

Areas of operation:
* The main business area (40 percent) is networks with digital switches;
* Manufacturing cables makes up 26 percent of operations - the company is the world's largest supplier of telecom and power transmission cables. Fiber cables are also a growth area;
* In 1991, the company manufactured seven million telephones and is thereby the world's next largest telephone manufacturer. They also lead in videotex teminals;
* In July 1991, Alcatel purchased Rockwell International's Network Transmission System Division. This made Alcatel, after AT&T, the second largest supplier in the US.

The market:
* 79.8 percent of sales take place in Europe;
* France is the single largest market, with 24.4 percent of revenues;
* Central and Eastern Europe are new markets for Alcatel - different agreements have been entered into in Russia, Poland, The Czech Republic and Romania;
* Following the solid position in Mexico, strong growth is expected in Argentina, Brasil and Uruguay;
* Alcatel purchased Telettra, previously owned by Fiat, thereby strengthening their position in Italy.

The company in numbers:
* 1992 revenues: ECU 16 billion;
* Number of employees 1992: 125,782;
* Alcatel was founded with the merger of French CGE and American ITT in 1986. The company is 100 percent owned by the French Alcatel Alsthom;
* Headquarters are in Amsterdam;
* In 1991, Alcatel invested ECU 1.8 billion in R&D.

Bosch

Country of origin: Germany

Areas of operation:

* Bosch Telecom has three divisions, each one dominated by at least one previously independent company:
  - For public communication: ANT Nachrichtentechnik GmbH
  - For private communication: Telenorma GmbH and J S Télécom
  - For mobile communcation: Blaupunkt-Werke GmbH;
* Telenorma is also divided into three divisions:
  - Systems for private communication, i.e. switches, terminals, videotex systems and private networks
  - Systems for professional use, diverse caliber information systems, office systems and data systems, fax and telex machines
  - Security systems, alarms, TN security services and exhibition systems.

The market:

* Germany is the Bosch-group's home market. Telenorma GmbH is Germany's second largest telecommunications company after Siemens. It is the third largest in Europe after Alcatel and Siemens;
* Nearly 90 percent of the company's sales are generated in their home market;
* Bosch has, through purchases of telecommunications companies such as Telenorma Telefonbau, Normalzeit Lehner & Co., ANT Nachrichtentechnik GmbH, Blaupunkt-Werke GmbH and Jeumont Schneider Télécommunication (J S Télécom SA) firmly established themself in the German telecom market.

The company in numbers:

* 1992 revenues: DM 34.4 billion;
* Number of employees 1992: 169,804;
* Founded in 1886;
* Well-known for their electronic automotive systems;
* DM 5.3 billion is generated by their telecom products;
* In 1989, Bosch invested DM 1.8 billlion in R&D.

Ericsson

Country of origin: Sweden

Areas of operation:

* The company has six main business areas. Following, are figures for percent of total sales in each business area in 1992:
  - Public Telecommunications, 35 percent;
  - Radio Communications, 32 percent;
  - Business Communications, 13 percent;
  - Cable and Networks, 14 percent;
  - Defense Systems, 4 percent;
  - Components, 2 percent.

The market:

* With 60 percent of revenues, Europe is the largest geographical market, with Sweden responsible for 13 percent;
* The USA and Canada generate about the same revenues as Latin America, with 12 and 11 percent of sales respectively;
* AXE systems are found in 101 countries, both for fixed and mobile networks;
* Ericsson's mobile telephone systems have over six million users in 48 countries, equivalent to 40 percent of the world market;
* A number of former Eastern Block countries have signed agreements with Ericsson to supply mobile telephone networks - Slovenia, Romania, Hungary and Poland, to name a few.

The company in numbers:

* 1992 sales: SEK 47 billion;
* Number of employees 1992: 66,232;
* Fully or partly owned subsidiaries in 64 countries;
* In 1992, investments in R&D went up to SEK 7.377 billion, or the equivalent of 16 percent of net sales.

GEC Plessey Telecommunications (GPT)

Country of origin: Great Britain

Areas of operation:
* The main business area is the manufacture of public and private switches, PABX's, package switches and transmission equipment;
* Manufactures private switching system ISDX and i-SLX;
* More than 40 telecom operators use GPT's pay telephones for coins, credit and charge cards;
* Four major business areas:
  - Telecommunication systems (switches)
  - Transmission
  - Business systems
  - International services.

The market:
* About 70 percent of sales are generated in Great Britain;
* The greatest challenges are found in the EU's service market, for example mobile telephony and VAN's;
* In the USA, the company's strength lies in small and mid-sized switches (fewer than 25,000 lines) for rural areas;
* Subsidiaries exist in the USA (Stromberg-Carlson), Australia, Canada, Kenya and New Zealand.

The company in numbers:
* 1992 revenues: Over £ 9.4 billion;
* Number of employees 1992: 156,000.

Italtel

Country of origin: Italy

Areas of operation:

* Six main business areas:
  - Societá Italiana Telcommunicazioni (SIT) - network services
  - Telematica - telecom and computer communications services
  - Sistemi - systems
  - Tecnoelettronica - electronics
  - Tecnomeccanica - mechanics
  - Telesis;
* SIT develops, manufactures and markets switches, transmission systems, radio networks and power systems. These product areas are responsible for more than 80 percent of the total revenues;
* Public switches are the single largest product area, generating over 55 percent of total sales;
* Telematica's activities include manufacturing private digital switches, telephones, videotex and teletex terminals, modems, WAN's and faxes.

The market:

* Italtel has 40 percent of the Italian telecommunications equipment market, and 51 percent of the public switches market;
* The Italian state operator, SIP, has started a renewal program under the name "Piano Europa", setting requirements for, among others, modern switches from Italtel;
* Italtel has operations in over 40 countries.

The company in numbers:

* 1992 revenues: ITL 2,973 billion;
* Number of employees 1992: 16,517;
* Italtel has worked together with AT&T since 1989, providing Italtel access to Bell Laboratories. The agreement has resulted in a marketing company for AT&T and Italtel's products.

Motorola

Country of origin: USA

Areas of operation:
* The company operates in four technical areas:
- communication
- components
- computers
- control equipment;
* Operations are divided into three main sectors, and four self-standing groups:
  - Land Mobile Products Sector with two-way radios and electronic communications systems;
  - Semiconductor Products Sector with semiconductors, integrated circuits, and microprocessors as well as microcomputers;
  - General Systems Sector includes mobile telephony, land mobile radio, microcomputer boards, and information processing equipment;
  - Paging and Telepoint Systems Group;
  - Information Systems Group;
  - Government Electronics Group;
  - Automotive and Industrial Electronics Group;
* The world's largest supplier of mobile telephone systems.

The market:
* In 1991, 52 percent of net sales were generated in North America;
* Business in Europe accounted for 21 percent with nine percent each from Japan, the Asia-Pacific area and the rest of the world;
* Semiconductors are responsible for 31 percent of revenues, as are communications products;
* A priority is the development of products for the transportation sector.

The company in numbers:
* 1992 revenues: US$ 13.3 billion;
* Number of employees 1992: 107,000;
* Operations in 34 countries;
* Approximately eight percent of net sales is invested in R&D, distributed among eight centers for advanced research;
* The Nordic countries, with 700 employees, are responsible for about eight percent of European sales;
* Cordless communication will be the dominant operation, with nearly 70 percent of sales in 1995, according to *International Business Week*.

NEC

Country of origin: Japan

Areas of operation:

* Four main business areas:
  - Communications systems and equipment are responsible for 26 percent of the total sales, with products such as electronic and digital telephones, videotelephones, fax, CATV-systems, teleconference systems and fiber optic communications systems;
  - Computers and industrial electronic systems are the largest business area, with 43 percent of sales from products such as super, mini and personal computers, as well as software;
  - Electronic equipment includes integrated circuits, microprocessors and transistors, and is responsible for 22 percent of total sales;
  - Home electronics includes TV's, video equipment, CD players, and kitchen appliances, with seven percent of NEC's sales;
* Four groups are responsible for marketing, divided into sectors.

The market:

* Domestic sales account for 75 percent, international sales, 25 percent;
* NTT purchased a third of their digital switches, digital transmission systems and fiber optical hardware from NEC;
* Sales increased 220 percent during the 1980s;
* The company is strong in the American computer market and has targeted the USA for the future;
* Internationalization of research activities via NEC Research Institute in New Jersey, USA;
* NEC has 15 subsidiaries and offices in Europe, including Sweden;
* NEC markets and manufactures in Europe in four sectors:
  - Semiconductors: DRAM, ASIC
  - Home electronics: video equipment
  - Microwave and satellite communications systems
  - Communications equipment: fax, mobile radio.

The company in numbers:

* 1992 revenues: ¥ 3,514 billion;
* Number of employees 1992: 117,994;
* NEC has 78 factories, 51 subsidiaries/branches and 375 offices in the world;
* NEC invests approximately 16 percent of annual sales in R&D.

Northern Telecom

Country of origin: Canada

Areas of operation:

* Manufactures switches, transmission systems, fiber optical cables, subscriber switching systems, packaged switching systems and telephones;
* The world's largest manufacturer of digital systems;
* Main business divisions:
  - Northern Telecom Inc. (NTI) is responsible for the American market;
  - Northern Telecom World Trade Corporation (NTWT) is the umbrella organization for international operations;
  - Northern Telecom Canada Limited (NTC) is responsible for the Canadian market;
  - Northern Telecom Electronics Limited (NTE) manufactures printed circuit boards, components, and specially ordered semiconductor circuits;
  - Bell-Northern Research Ltd. (BNR) is the R&D division.

The market:

* Northern Telecom has an installed base of over 50 million lines in more than 60 countries;
* The US market represents about 60 percent of revenues, Canada 38 percent and other countries approximately four percent;
* The largest supplier of digital PBX switches in Europe;
* Central office switching systems account for 54 percent of sales;
* The international market for future growth includes Australia, France, Japan, New Zealand, Germany, Great Britain and Eastern Europe;
* Manufactures PABX-switches, System A345 and System M345 for Telia.

The company in numbers:

* 1992 revenues: US$ 8.4 billion;
* Number of employees 1992: 57,955;
* Founded in 1882 as the equipment supplier to Bell Canada;
* Bell Canada Enterprises Inc., a holding company for Bell Canada, owns 52.5 percent of Northern Telecom;
* In 1988, Northern Telecom invested 13.1 percent of total revenues in R&D;
* At the end of 1992, Northern Telecom had invested a billion dollars on the development of standards for synchronous optical networks (SONET).

Philips

Country of origin: The Netherlands

Areas of operation:

* Since 1987, Philips has been going through an extensive restructuring, which has led to the sale or divestment of a number of previous businesses. The process is still not completely finished. (Sept. 1993).

* The following business areas were reported in 1991's annual report:
  - Consumer products;
  - Lighting;
  - Professional products and systems;
  - Components and semiconductors;
  - Miscellaneous;
  - During 1991, the first system for interactive CD, CD-I, was introduced in the US. CD-I is expected by many industry watchers to be the next big home electronics product;
  - Despite EU's many requirements as concerns a European standard for HDTV, Philips has one of the leading rolls in Europe in the area;
  - In the telecom area, the company focuses on transmission systems and terminals for "the average user."

The market:

* Philips has a dominant position in the Dutch market;
* The company has a strong position, approximately 40 percent, in the European consumer electronics market;
* Philips has subsidiaries in over 60 countries, including 17 in Europe.

The company in numbers:

* 1992 revenues: NLG 58.5 billion;
* Number of employees: 252,200;
* Approximately 18 percent of revenues, or NLG 10.5 billion, is generated by the telecom area, employing approximately 14,500 people;
* In 1991, NLG 3.87 billion, or 6.8 percent of revenues, was invested in R&D;

Siemens AB

Country of origin: Germany

Areas of operation:

* Thirteen product groups including semiconductors, passive components and electronic tubing, transportation systems, public communications networks and private communications systems;
* Siemens Nixdorf Information Systems, SNI, is Europe's largest computer manufacturer;
* The most well known telecom products are EWSD switches with installations in some 40 countries, Hicom PABX, EWSP packet switches and Transdata 960 communications computer systems.

The market:

* International sales account for approximately 55 percent of the total revenues, Germany for about 45 percent;
* Siemens Stromberg-Carlson accounts for five percent of the American public switching market;
* Through corporate acquisitions, Siemens has become the third largest supplier of public networks in North America, after AT&T and Northern Telecom;
* Well-established in Eastern Europe for a long time, Siemens is provided with a strong base for growth.

The company in numbers:

* 1992 revenues: DM 78.5 billion;
* Number of employees 1992: 413,000;
* The telecom area generated DM 18.5 billion;
* Siemens owns 78 percent of the former Nixdorf Computers AG, now called Siemens Nixdorf Informations Systems (SNI);
* In 1990, the company spent approximately DM 7 billion on R&D;
* 90 percent of R&D resources go to product oriented projects;
* In 1989, Siemens purchased 40 percent of GEC Plessey Telecommunications (GPT). GPT's American subsidiary, Stromberg Carlson, and Siemens American company, became Siemens Stromberg-Carlson, with Siemens owning 70 percent of the stock.

8. Appendix

The following information is an extract from **"Study of the International Competitiveness of the UK Telecommunications Infrastructure"** prepared for The British Department of Trade and Industry (DTI) by Robert Harrison, PA Consulting Group, in February 1994. The study is based on data collected from July to December 1993, i.e., about the same period our yearbook was in its final stages. The DTI study compares telecom in selected countries to the UK situation from a British point of view. These countries are: France, Germany, Japan, The Netherlands, Sweden, and the USA. It is important to bear this limitation in mind when comparing the following facts to those in the previous chapters. We also ask the reader to bear in mind that the Swedish general standpoint for telecommunications is, that everything is permitted, unless it is explicitly regulated, as compared to the standpoint taken in several other countries, that everything that is not explicitly permitted is forbidden.

Several subjects are covered by the report. We have chosen to highlight two issues of great importance to future development — liberalization and infrastructure. This information is not included in the Swedish version of "TELDOKs Årsbok 1994".

1. Liberalization

Degree of Liberalization 1993

Country	Fixed n/w	Cable TV	Mobile	Leased Lines
France	M	LM	D	R
Germany	M	M	C	R
Japan	C	LM	C	R
Netherlands	M	LM	M	R
Sweden	C	C	C	U
USA	LM/C	LM	LD	U
UK	C	LM	C	U

Key: M: Monopoly D: Duopoly C: Competition
L: Local R: Restricted U: Unrestricted

Fig. A1: The diagram shows the degree of liberalization in the selected countries, in four areas: telephony via fixed networks, cable TV, mobile communications, and leased lines.
Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

Fixed Network Competition 1993

	Local loop	Main Network	Future plans
France	No	No	Possibly by 1998
Germany	No	No	Possibly by 1998
Japan	Very limited	Yes – Type I Carriers	
Netherlands	No	No	Possibly by 1998
Sweden	Permitted	Yes – Tele 2	
USA	Limited – CAPs serve business only	Yes – IXEs	Full local competition in local loop expected within 5 years
UK	Yes – cable TV operators, metropolitan nets and radio operators	Yes – multiple operators	

Fig. A 2: This diagram describes the competition in the fixed networks per country as well as the plans for future competition. Sweden has multiple fixed network and infrastructure operators. Thus, infrastructure can be leased from Telia as well as from the National Railway Board. and the National Electricity Board, or the local energy suppliers and the CATV operators.
Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

Cellular Voice Networks Competition 1993

	Current Status	Future Plans
France	Duopoly	3rd licence to be issued in 1994
Germany	Competition	
Japan	Competition	More competition in PDC
Netherlands	Monopoly	2nd licence to be issued in 1994
Sweden	Competition	
USA	Local Duopoly	Multiple PCS licences to be issued in 1994
UK	Competition	

Fig. A 3: Competition in cellular voice networks, current status and future plans.
Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

Digital Mobile Radio Services Competition 1993

Country	Service	Service start date	Operator
France	GSM	1992 1993	France Telecom SFR
	DCS 1800	TBA	France Telecom SFR TBA
Germany	GSM	1992 1992	Deutsche Telekom Mannesmann Mobilfunk
	DCS 1800	1994	E-Plus
Japan	PDC 1800	1993	NTT
Netherlands	GSM	1994	PTT Telecom 2nd operator licence procedure TBA end 93
Sweden	GSM	1992 1992 1992	Comvik Telia Nordictel
	DCS 1800	TBA	app'n by Telia
USA	DAMPS (TDMA or CDMA)	1993	Local wireline carrier and competitor
UK	GSM	1994 1992	Cellnet Vodafone
	DCS 1800	1993 1994	Mercury One-2-One Hutchison

Fig. A 4: Competition in digital mobile radio services, GSM and DCS 1800. DCS1800 is a variation of GSM, covering a bandwidth of 1800MHz instead of the 900MHz, normal to GSM. In Sweden, Telia and others are asking for frequencies in the 1800MHz band.
Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

Competition in Cable TV 1993

Country	Competition in CATV	CATV permitted to offer telephony	TO permitted to offer CATV	Future Plans
France	Local Monopoly	No Can carry data	Yes, on a local basis	Use of CATV networks for telepoint voice
Germany	National Monopoly	No	Yes	
Japan		In theory, but none do so	No	
Netherlands	Local Monopoly	No Can carry data	Through subsidiary	
Sweden	Allowed but none exists	Yes	Yes	
USA	Local Monopoly	No Can provide leased circuits	No	Competition both ways within 5 years
UK	Local Monopoly	Yes	Yes, through local CATV licences	TO not permitted to offer CATV nationally until 1998 at the earliest

Fig. A 5: The competitive situation of cable TV, the current situation and future plans. In early 1994, Japan announced that it will make it possible for CATV operators to carry telephony. (TO = Telecom Operator) In Sweden, competition is almost house by house – it is up to the house owner to decide from whom to buy CATV services. Competition has been around since the very start of cable TV. For an up-to-date description of the Swedish cable-TV-situation, see also fig. 45, fig. 56, and fig. 57.

Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

Mobile Data and Paging Networks Competition 1993

Country	Current status	Future Plans
France	Competition – both services	
Germany	Monopoly – both services	Licences to be issued
Japan	Competition – both services	
Netherlands	Paging Monopoly Mobile data classed as VAS, competition permitted	Competition planned for paging
Sweden	Monopoly (competition permitted)	
USA	Competition – both services	
UK	Competition – both services	

Fig. A 6: The current status and future plans for competition in the field of mobile data and paging networks. Please note, that the "monopoly" situation in Sweden is a de facto monopoly due to the fact that no competitors have entered the market. One reason for this may be that the mobile data service, Mobitex, originates from the R&D labs of Telia.
Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

Value Added Services Competition 1993

Country	VAS	Resale
France	Not voice services	No
Germany	Not voice services	No
Japan	Yes	Yes – but restricted in practice for voice
Netherlands	Not voice services	No
Sweden	Yes	Yes
USA	Yes	Yes
UK	Yes	Yes

Fig. A 7: Value Added Services (VAS) offered over the fixed and mobile networks are permitted in all the compared countries, although regulation may be applied to certain services in some countries, such as the UK, but not in Sweden. This also applies to the resale of VAS services, which is submitted to certain restrictions. However, there are no restrictions on resale of VAS in Sweden.
Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

2. Broadband Infrastructure and Services

Interchange Network — Installed Fiber 1993

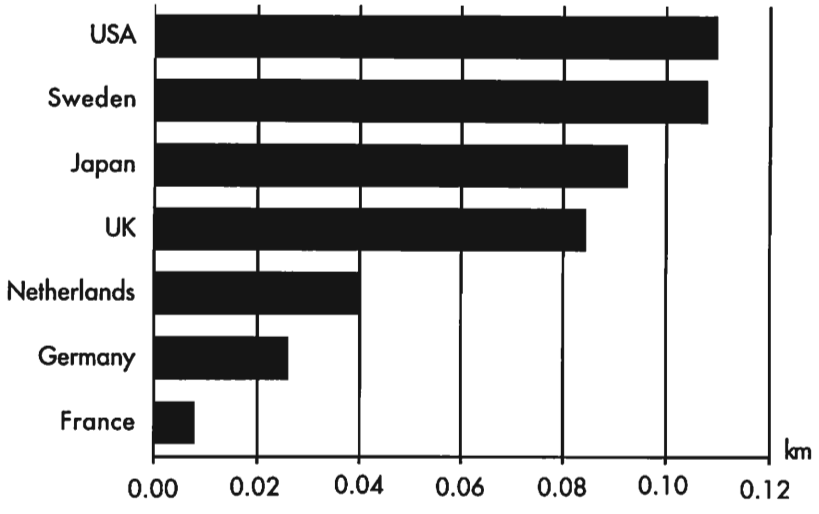

Fig. A 8: Installed fiber per subscriber in the interexchange network, expressed in kilometers per subscriber. Broadband networks serving businesses and residential users are regarded as the key issue to future growth in wealth and knowledge by the industrialized nations. For the time being, the number of applications requiring broadband is limited. Most of them can be satisfied by the existing narrowband ISDN services, offering 64/128kbit/s. However, some current applications need more bandwidth, for instance CAD/CAM, LAN interconnect, high quality videoconferencing, distance learning, medical imaging, and any interactive services. Thus, installation of optical fibers, offering a theoretical bandwidth of some 25 Terabit/s (25 x 10^{12}bit/s), is judged as one important factor in building national infrastructures. The figure regarding Sweden seems to show the fiber installed by Telia only, not the 2.5 Gbit/s optical network of the National Railway Board, for instance.

Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

ISDN Penetration 1993

Country	Basic rate	Primary rate
France	355,000 channels*	
Germany	138,831	11,304
Japan	170,000	30,000+
Netherlands	400	20
Sweden	800	30
USA	not available	
UK	16,500	11,000

* split not available

Fig. A 9: The chart shows the penetration of ISDN per country in number of mainlines installed, divided between those paying basic rates, and those paying primary rates. As a switched service, ISDN is dependent upon the growth of communities of users with common equipment. Market penetration will grow slowly initially until a critical mass is achieved. The TOs operating in the Swedish market have chosen to let the customer decide what serves him best, ISDN, LAN-LAN interconnect, or highspeed leased lines. See also fig. A 8. For specific Swedish facts, see also fig. 47, fig. 48, and fig.49.
Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

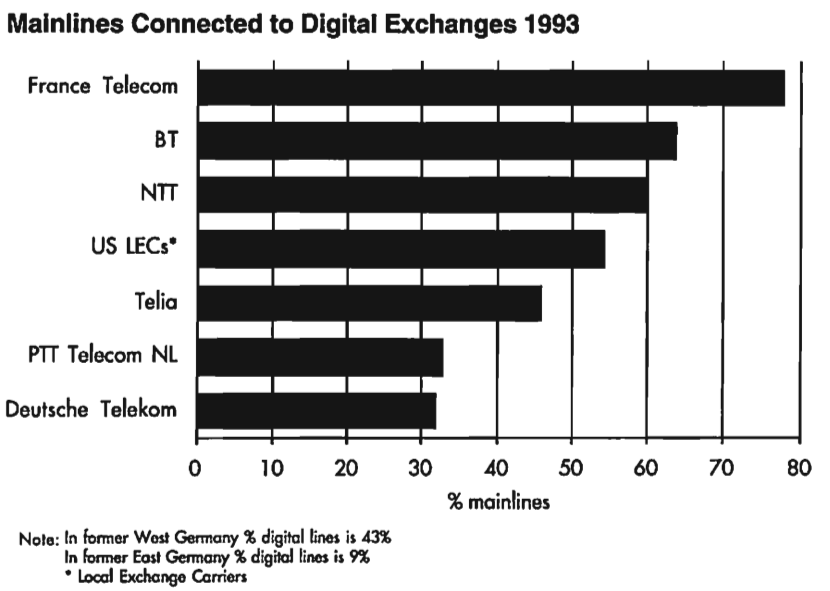

Fig. A 10: Digitalization is another key component in the infrastructure of the future, offering users high quality, and high reliability. The diagram shows the percentage of mainlines connected to digital exchanges. According to figures from December 30, 1993, the percentage of mainlines connected to digital exchanges was 66 percent for Sweden. By 1997, digitalization in Sweden will have reached 97 percent, once old routes have been replaced.
Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

Digitalization and ISDN 1993

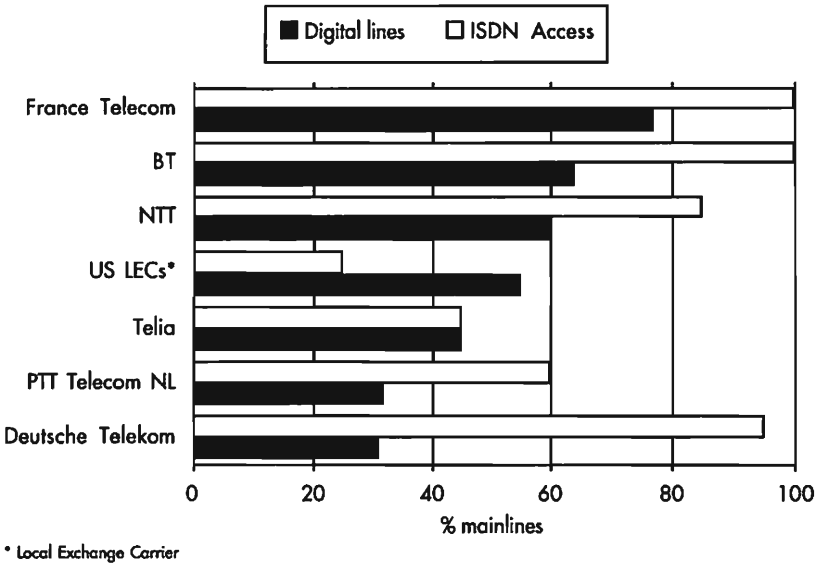

Fig. A 11: This diagram is a description of the percentage of mainlines, offering access to ISDN, compared to the percentage of digital lines offering the same service.
Source: "Study of the International Competitiveness of the UK Telecommunications Infrastructure"

9. Current Literature

A list of current literature about telecommunications, information technology, and other areas related to these, in several languages, follows below. It appeared for the first time in "TELDOKs Årsbok 1994". The list is in no way complete – those who are looking for indepth knowledge would be wise in carrying out their own research and inquiries. In some cases, it has been beyond our powers to find complete bibliographical information. In spite of this, we hope the list will serve as a guide for those looking for more information.

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10. This is TELDOK

TELDOK is a non-profit organization, aiming at documenting new telecommunications technology usage as early as possible. It was initiated in 1980 by the Board of Directors of the Swedish Telecom, (since July 1, 1994, Telia AB) in order to facilitate early and easily accessible documentation on the usage of telecommunication-based information systems. The objective of TELDOK is to document new information systems applications at the earliest possible stage. In order to do so, TELDOK arranges study trips and seminars on themes, directly related to the applications of new telecom technology.

So far, TELDOK has published more than a hundred publications, most of them in the Swedish language. Now and again, a report appears in English. They appear in the TELDOK publication list under their number, followed by "E", for instance 86E, which is the number of the English version of this very publication, The TELDOK Yearbook 1994. All publications, whether in Swedish or in English, are distributed free of charge. At present, there are some 3,000 regular subscribers to the TELDOK publications in Sweden. They are mainly telecom and IT professionals, researchers, decision makers, politicians, and analysts.

Should you want to know more about TELDOK, or should you want to know what publications are available, please, contact the TELDOK Editorial Board, which can be reached by fax: + 46 8 713 3588. Or have a look at the following lists.

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TELDOK Publications Available in English:

TELDOK Report 71

CSCW — A Promise Soon to be Realized?
Editor: Dr. Peter Docherty

CSCW stands for Computer Supported Collaborative Work, computer supported team work. New such support systems, basically software, but also communications links, are developed rapidly and incessantly. Often, they are called "groupware", sometimes also "workflow". Lotus Notes is the broadest product so far. The phenomen is placed in its context in this report, followed by a number of comments by participants in a study trip to the USA, where a number of companies, university departments, and others, are using groupware and sharing experiences, analyses, and comparisons. Experts give their overviews and forecasts.

Via TELDOK 17

Telecommunications Use and Users – Economic & Behavioral Aspects
by Dr. PG Holmlöv (editor)

Report from a conference in Nov. 1988. Researchers and users discussed deregulation and liberalization, regional development and networks for corporation. Based on a mathematical model, it is demonstrated that success for telecom services can be calculated, which is put into a behavioral context. Fax and EDI in Sweden, telecom services in Norway, and banking service in the USA serve as case studies. As does a future, virtual shop.

Via TELDOK 21

Information Technology, Social Fabric
by Dr. Bengt-Arne Vedin

This is a collection of essays, some of them scenarios, all starting with the idea that information technology can shape and reshape social fields and networks. This happens partly through contacts via the telecommunications network, partly, and more specifically, via more distributed supports, for instance groupware. The prerequisite is, however, that individuals know how to communicate efficiently, which is a matter of cultural, linguistic, and personal factors.

TELDOK Publications Available in Swedish:

Teldok Rapport 68
Ny informationsteknik — nya strukturer
by Gull-May Holst and Bengt-Arne Vedin

Teldok Rapport 69
Nätverksbildningar för att stödja mindre företag, speciellt inom EG
by Heraldo Sales Cavalcante and Ulf Sävström

Teldok Rapport 70
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by Gull-May Holst, Jill Melançon, et al.

Teldok Rapport 72
Telematik och handikapp i arbetslivet
by Jan-Ingvar Lindström et al.

Teldok Rapport 73
I en röd liten stuga nervid sjön vill jag jobba
by Mats Utbult

Teldok Rapport 74
Mobil telekommunikation inom skogsbruket
Editor: Frank Arnoldsson

Teldok Rapport 75
Lönsam logistik — med sikte på 2000-talet
by Magnus Swahn and Philip Söderberg

Teldok Rapport 76
Teletjänster
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Fler fyllda frakter med elektronisk asfalt
by Mats Utbult

Teldok Rapport 80
Esprit, Eureka och Race — tre pan-europeiska IT-satsningar
by Eric Lundberg

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by Tommy Lundtofte

Teldok Rapport 82
Danmark...
Framgångrika medborgarkontor och hög "IT-temperatur" i enskilda företag och regioner
by Olov Östberg (ed.)

Teldok Rapport 83
Mänskliga möten med mindre möda
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"Bootstrapping" – en strategi för att förbättra förmågan till bättre förmåga
by *B G Wennersten*

Teldok Rapport 85
Vård och råd på tråd
by *Mats Utbult*

Teldok Info 10
Multimedia — i ett användarperspektiv
by Thorḍ Fjällström

Teldok Info 11
Röst- och talsvarssystem i informationsteknologins tjänst
by Björn Runngren

Teldok Info 12
Nya affärsmöjligheter med faksimil överföring
by Hans Lindahl

Teldok Info 13
Tala i bild
by Henrik Wahlforss (ed.)

Via Teldok 19
Telesystemet i förvandling
by Lennart Sturesson & Ingela Björck

Via Teldok 20
Effektivisering av godstransporter — praktikfall Bergslagen
by Urban Hermansson & Lars E Johansson

Via Teldok 22
Electronic publishing – elektronisk förlagsverksamhet
by Bengt-Arne Vedin

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11 Cross Reference List

Special signs

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TELDOK was initiated in 1980 by the Board of Telia AB, then Swedish Telecom, to *facilitate early and easy-to-read documentation on the use of telecommunicationg information systems.*

TELDOK aims at documenting, as early as possible, working applications of new information systems and arranging study trips and seminars directly related to this task.

TELDOK's aims include to...

- Document, as early as possible, applications of new telecommunicating information systems at work
- Publish, distribute, and—where needed—translate to Swedish, while comparing to the Swedish situation, information on the use of new telecommunications systems at work
- Arrange study trips and seminars directly related to the preparation and dissemination of information pertaining to practical applications of telecommunicating information systems at work

TELDOK activities are coordinated by an Editorial Board with wide representation from the communications technology corporate user community, research, organizations with an interest in IT use, government authorities, suppliers, and Telia AB, Sweden's largest telecommunications operator.

TELDOK has issued over one hundred publications, mostly in Swedish, distributed at no cost to over 3,000 preofessionals in Sweden and the Nordic countries.

Recent TELDOK publications partly or completely in English include:

TELDOK Report

86E The TELDOK Yearbook 1994. May 1994
71 CSCW (Groupware)—A Promise Soon to be Realized? March 1992
68E New information technology—new structures. September 1991

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21 Information technology, social fabric. May 1993

These and other TELDOK publications may be ordered free of charge from DirektSvar in Stockholm, Sweden—call +46-8-23 00 00 or FAX to +46-8-10 13 27.

The TELDOK editorial Board welcomes new ideas for projects to study and document practical applications of new telecommunicating information systerms.

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