"From vision to action" which was published in 1995 was the Danish Governments first IT policy statement and action plan. The action plan outlines which action is going to be taken in each of the areas of action.

"The Info-Society for all – the Danish Model" is the IT policy statement and action plan 1996, following up on the results of the first IT policy action plan. The focal point is to ensure an info-society which focuses on people and is controlled by the interests of the individual and the community, rather than by our fascination with technology.

This publication "IT in figures 1996 – 23 pictures of the info-society" follows up on the IT policy action plan 1995 and tries to answer questions like; how are we getting on in the areas referred to as action areas? and where does Denmark stand interna
tionally?

We have made no attempt to offer a final answer to the question of whether Denmark is No. 1, 2 or 17 in the world, but we compare selected areas. Actually, the most important thing is to maintain and to expand in areas of strength and to catch up on neg
lected areas where we are lagging behind.

"IT in figures 1996 – 23 pictures of the info-society" can also be read as part of the foundation on which rests the thinking presented in this year's IT policy statement and action plan, "The Info-Society for All – the Danish Model". In that regard e.g
. questions about accessibility and dissemination of IT and the use of IT in the homes are relevant.

The subtitle – 23 pictures …. – indicates at the same time the strengths and weaknesses of facts and figures. A picture freezes the moment and provides an opportunity to look more closely at things which are otherwise almost impossible to study. At th
e same time a picture is undeniable and, nevertheless, restricted to having just two dimensions and conveying a visual impression only. Sometimes it is possible to envisage what happens after the picture has been taken, but often it will be quite unpredictable.

It is the intention to produce a similar survey every year as a supplement to the IT policy action plan. We hope to develop "IT in figures" with new areas and hopefully with new and still more interesting evidence about the progress into the info-societ
y year 2000 – in Denmark as well as internationally.

Any comments or contributions to this publication will be much appreciated to the Danish Ministry of Research and Information Technology (se address page 2).

It is safe to say that Denmark has a very highly developed infotech infrastructure. IT equip-ment is widespread, both for private and professional use. Denmark has some of the cheap-est telecom services within the OECD and one of the highest levels of investments in IT. Traditionally, the interest in electronic communications for private use has not been high in Denmark, but this seems to have reversed. The share of Danish homes with a PC and a mo-dem is growing fast, and Denmark is experiencing an annual doubling of the number of Internet users, as is also being seen worldwide.

In the following a number of indicators have been selected to show the international position of Denmark, in an IT context. The choice of indicators does not mean that the areas included are the only ones of significance. Only that they illustrate development as viewed from various angles.

Moreover, it should be noted that, in comparison with other countries, it may be misleading to look at the result as an order of precedence with first, second and third places. All comparisons are made with selected countries, and other countries, had they been chosen, might have been placed some-where between them. However, the international comparisons say something about the spread of the individual indicators and how Denmark is doing as compared with other countries.

Equipment and use

Number of PCs

According to an international poll conducted by IDC in March 1995 32% of Danish homes had a PC (personal computer). In an international context the number of PCs in Denmark was at that time higher than in such countries as Germany, Great Britain, France and Japan. However, the USA was the clear leader with 37%. See Fig. 1.

Meanwhile, things are developing very rapidly in Denmark, and one year after the above poll 47% of Danish homes had a PC. This appears from a poll conducted by the Gallup Institute for the newspaper "Berlingske Tidende" in March 1996. See Picture 12 - Accessibility and dissemination of IT. An international comparison is impossible here.

Computers are even more widespread in Danish work places. Thus, in 1993 IDC registered the number of computers and other computerised work places installed to be 0.85 per salaried employee. IDC is not recording this number any longer, but it is estimate
d to be just over 1. This means one PC or other computerised work place per salaried employee.

The use of PCs

Generally, there are no great variations in the type of software installed in private PCs in the various countries. Most of them have word processing – in Denmark 96%. Spreadsheets and graphics software come next, while database programs are less common. By and large, this pattern is the same in all the above-mentioned countries. Of the countries men-tioned, games in PCs are most widespread in Denmark. 79% of the homes in Denmark with a PC have games installed. In comparison, the average of the European countries is 66%, USA 68%, and Japan 50%. For additional information about the Danish figures, refer to Picture 13 – Use of IT in homes.

In the USA and Japan the importance of being able to communicate electronically via e-mail, telefax and on-line services is rated markedly higher than in Europe, according to a poll conducted by IDC in March 1995. Especially in Denmark the importance of getting access to on-line services and electronic mail was given a low priority. However, there is reason to believe that the interest in buying a modem and getting access to the Internet has increased considerably during the past year.

IT turnover

Generally, Denmark is a leader among the European countries, together with Switzerland, Sweden, and Norway, as regards the overall IT investments of society. The total expenditure in connection with IT products may be taken as an expression of society's general focusing on IT and its investments in the technological infrastructure of communications.

If IT turnover is related to the number of inhabitants, the spread between the various European countries is relatively great. In Greece the turnover is USD 49 per inhabitant per year, while the turn-over is 20 times higher in Switzerland, viz. USD 996 per inhabitant. See Figure 2.

The IT turnover as a share of the gross domestic product illustrates how much IT accounts for in the economies of the various countries. Here the spread is not as wide, being 0.7% for Greece and 2.7% for Sweden. With 2.5% Denmark is just behind Sweden, Norway, and Switzerland.

Infrastructure

Telephony

Denmark is consistently among the 4 cheapest of the 24 countries embraced by the OECD statistics on prices of telecom services. As regards their use in

industry Denmark is third and, in private telephony, fourth. These rankings are calculated on the basis of fictive exchange rates reflecting the general price level in the various countries. In actual prices Denmark is lower, and the price of local calls is among the highest in the EU. See Picture 21 - Denmark has some of the cheapest telecom services in the world.

Mobile telephony

In March 1996 the number of mobile telephone subscribers in Denmark topped 1 million. Together with the other Nordic countries, Denmark is a leader as regards the number of mobile telephones.

Denmark and Finland have about 19 mobile tele-phones per 100 inhabitants. Norway and Sweden have 23 to 24 and the other Western countries have typically 4 to 5 mobile telephones per 100 habitants. Looking at prices of mobile telephones and the coverage of the mobile telephone network, the Danish mobile telephone network is among the best in Europe. See Picture 22 - The Danes become mobile.

Network communications

The Internet

From January 1995 till January 1996 the number of host computers (i.e computers connected directly to the Internet) grew by 100%, from 26,000 to 52,000. This doubling corresponds to the international trend. It places Denmark as No. 8 calculated on the basis of the number of host computers per 1,000 inhabitants in January 1996. This is the same placing as in 1995. See Picture 15 - The Internet growing rapidly.

Modems in homes

In Denmark just under 15% of the homes with PCs had a modem in March 1995. Equipping of home PCs with modems is an important step. It enables electronic communications from the home. There is a marked difference in the number of modems in Europe and the USA. In the USA almost half of the PCs in private homes are equipped with a modem, i.e. 17% of homes in the USA had a PC with a modem. In comparison only 5% of the homes in Denmark had a PC with modem at the same time. See Figure 4. However, the share of PCs with modems is growing rapidly in Denmark. Thus, in March 1996 12% of the homes had a PC a with modem (poll conducted by the Gallup Institute for the newspaper "Berlingske Tidende", March 1996). See also Picture 12 - Accessibility and dissemina-tion of IT.

Local authorities well on the way towards more advanced case processing

In January 1996 17 local authorities (6%) had introduced or were about to introduce case processing software and scanning of incoming mail.

More than half of the local authorities and two thirds of the counties expect to be in the process of introducing similar tools by the end of 1996. These figures bear witness to great interest in progressing towards more advanced case handling.

Use by organisations of IT
- 4 stages of development

To illustrate the dynamic growth of the use of IT in organisations, a "development ladder" with four steps might be useful. Each step of the ladder is characterised by a certain level of utilisation of technology and the integration between the solving of tasks and the technology used. The four steps appear from Table 1.

In a telephone interview poll conducted in January 1996 by Rubicon for the Ministry of Research and Information Technology in collaboration with the National Association of Local Authorities, all the 275 local authorities and 14 counties were asked about their current use of advanced office automa-tion tools and their expectations of the introduction of new tools during 1996.

17 local-council spearheads on step 4 in January 1996

According to the poll 17 local authorities were on step 4 on the development ladder in January 1996. Thus, these local-council spearheads had either already introduced various forms of electronic case processing and scanning of incoming mail or were about to implement them. Besides, they were al-ready using the advanced office automation tools on the lower steps.

The figures also show that in January 1996 83% of the local authorities and counties were using either e-mail (step 2) or using case handling systems or electronic filing (step 3). Only one tenth of the local authorities and counties were not using advanced IT of any type (step 1). Fig. 1 shows graphically the spread of the local authorities and counties on the development ladder.

Local authorities and counties show great interest in the info-society

There is a great interest within the local authorities and counties in participating actively in the development of the info-society for the benefit of citizens and firms, which stand to gain from faster case processing, and for the benefit of the local authorities which may introduce much more flexible routines using technology features.

This is the conclusion to be drawn from the ex-pectations of the local authorities/counties in respect of their position on the development ladder by the end of 1996. It appears that every second local authority (141 local authorities) and two thirds o
f the counties (9 counties) expect to be implement-ing case handling (or groupware) and electronic filing of incoming mail by the end of 1996. Local authorities' expectations of reaching the top step of the ladder shortly point to a likely extension of
the ladder too. This might for instance be a fifth step: "The network organisation" characterised in that the organisation is using the network to a great extent in its communications with the outside world. Moreover, the employees of the organisation a
re given the option of working from remote work places in their own home. At any rate, much seems to indicate that public authorities are willing to utilise the potential of the info-society.

Central Government is heading for the info-society too

A similar poll conducted in mid-1995 among 65 governmental institutions (12 departments and 53 agencies/directorates) shows that at that time 2% of the governmental organisations were on development step 4, while 83% of the institutions were either on step 2 or step 3. Finally, the remaining 15% of the institutions are on step 1. See Figure 2. Like the local authority enquiry this poll revealed the same great interest of the governmental organisations in introducing advanced case processing tools.

IT is not implementing itself

The introduction of modern IT is more than merely computers, software and linking to networks. It is essential that also routines and the structure of the organisation are thoroughly considered in connec-tion with the organisational changes necessitated by the introduction of new technology.

It is therefore important that, for instance, routines and managerial structure are discussed within the organisation prior to the introduction of IT. The local authority enquiry shows that both local authorities and counties are aware of this. Three out of four local authorities (72%) and practically all the coun-ties are thus analysing the interaction between the introduction of IT and changes of routines. Half of the local authorities (49%) and 12 out of 14 counties are examining the interaction between the introduc-tion of IT and changes of the managerial structure.

It is a demanding process to introduce new technology, and much time may elapse from the introduc-tion of advanced IT in case processing until the technology is fully implemented in the organisation.

New options for communications with the authorities

In January 1996 only two out of five local authorities had electronic mailboxes. On the other hand, two thirds of all the local authorities of

the country expect to have established electronic mailboxes by the end of 1996. Every fifth local authority

has access to the Internet, but only few utilise the Internet to offer information to the individual.

Opportunities of e-mail in local authorities – internal and external

Via internal networks, 82% of the local authorities have the opportunity of e-mailing within the organisation. Towards the end of 1996 this number is expected to have risen to 94% of the local authorities. This appears from an interview poll conducted by Rubicon for the Ministry of Research and In-formation Technology in collaboration the National Association of Local Authorities in January 1996.

The local authority enquiry shows that only 41% of the local authorities have an electronic mailbox for external communications. In the Government's action plan for 1995 the governmental organisations were ordered to introduce electronic communica-tions
 with the outside world. At the same time the local authorities were requested to introduce e-mailboxes too. In January 1996 almost large all governmental organisations had e-mailboxes, and it is surprising that so few local authorities had installed e-
mailboxes.

That the local authorities are considering changing this can be seen from their expectations for the end of 1996. At that point in time 69% of the local au-thorities expect to have introduced the use of e-mail for external communications with, for instance, firms and citizens. However, the fact is that almost one third of the local authorities (31%) will not have established e-mailboxes by the end of 1996. See Figure 1.

Local authorities are hesitant about exploiting electronic communications externally

The local authorities were asked whether they had already taken or were about to take initiatives regarding electronic communications – externally – with citizens and firms. The results appear from Figures 2 and 3.

Here only 2 out of 5 local authorities (40%) reply that they have already introduced (6%) or have specific plans for introducing (34%) electronic communications with individuals before the end of 1996. Similarly, only every third local authority (34%) has introduced, or has concrete plans for introducing, electronic communications with private firms.

Thus, the great majority of the local authorities consider it advantageous to communicate internally between their administrations by means of e-mail. Apparently most of the local authorities have no immediate plans of offering citizens and firms the same possibilities of electronic communications which could take place independently of the open-ing hours of local-council services and – in the form of electronic self-service systems – might be beneficial to both

citizens/firms and the services themselv
es.

It should be pointed out that the county authorities are further ahead than the local authorities as regards the use of electronic communications. For example, all the counties expect to have e-mail-boxes by the end of 1996. The likely explanation is th
at the county is a larger organisation than the average local authority and therefore usually has greater IT resources.

Local authorities on the Internet

As regards the mode of electronic communications most frequently referred to today, viz. the Internet, it appears that 18% of the local authorities and 79% of the counties had a graphical Internet connection (the so-called "World Wide Web" - WWW) in Janu-ary 1996.

These figures may be compared with corresponding figures from Danish firms (an enquiry instituted during October-December 1995 for the Confederation of Danish Industry and the Ministry of Research and Information Technology by the Department of Economics of the Aarhus University) showing that only 7% of the 2,141 participating firms with more than 5 employees were connected to the Internet. However,
 as it might be presumed that the greater the organisation, the more likely it is to be on the Internet, it is impossible to compare firms with few employees on the average with local authorities which usually have far more employees.

The local authorities using the Internet are primar-ily using it to gather information over the network. Only every fifth local authority connected to the Internet says that it also offers information - for instance to the citizens - over the Internet. Con-sequently, the local authorities are forfeiting the chance of communicating with citizens and firms.

Voice response systems
- good experience in Told .Skat

Danish citizens have been receptive to the initiative of Told·Skat (customs and tax authorit-ies) enabling them to provide information for their

self-assessed tax return via the telephone. Thus, 25% of the citizens able to do so took advantage of telephone reporting. The public sector

has special opportunities for getting quick results with electronic communications.

Every fourth taxpayer used thetelephone for their self-assessed tax returns for 1994

In 1995 Told·Skat introduced a voice response system (self-service system using touch-tone telephone sets) as an alternative to forwarding an answering letter for the citizens who wanted to change the information in their tax returns. The offer applied to ordinary tax returns, not the more elaborate tax returns. Out of more than 1.2 million requests from citizens about changes of the tax return for 1994, well over 300,000 or about every fourth (25%) were made by means of the voice response system. See Figure 1.

The experience of Told·Skat may be compared with the experience of DSB Rederi (Danish Rail's ferries). At the beginning of 1992 the DSB Rederi introduced a voice response system for ferry bookings. Towards the end of 1995 almost one quarter of all bookings were made via the voice response system - in other words, the same share as that of Told·Skat in its first attempt.

In the coming years, both parties may be expected to use voice response more due to better knowledge and generally greater confidence in the population in using voice response systems.
Reporting of the self assessment via voice response has proved especially well suited due, for instance, to the following advantages:
It is possible to inform about the possibility of telephone reporting and to give guidance in the letter which always accompanies other information.

Drawbacks of voice response

It is often heard as an argument against, for in-stance, voice response that citizens are rarely in contact with public authorities, and that there will therefore be an obstacle against learning how to use the system. The objection is also frequently ma
de that citizens do not have sufficient confidence in this form of contact with public authorities.

The experience of Told·Skat cannot be said to support these arguments for a considerable part of the population. This does not mean in any way that the arguments are wrong or that "ordinary" reporting can be or should be phased out.

A considerable part of the population still has more confidence in personal service or in putting the information in writing on a piece of paper, instead of keying it into an instrument such as a telephone.
Voice response has also great limitations with re-spect to the complexity of the information that may be gathered. Thus only ordinary tax returns may be changed via the telephone, not the more elaborate ones. Other media are better suited for more complex communications, but the use of voice response is a first attempt in electronic communications with the citizens/customers.

However, the experience of Told·Skat shows very clearly that people are very interested in self-service via the telephone, and that very high response percentages may soon be attained.

The land registry offices are replacing books by computers

By the year 2000 all the land registers of the country will have been converted to an elec-tronic form. This will facilitate the retrieval of land register information by citizens. Experimentation with electronic land register entries has started. When all judicial districts have gone electronic as regards the land register, a rationalisation gain of 15-20% is expected.

All information in the land registers on Denmark's 2.1 million properties will have been converted to an electronic form by the end of the year 2000, provided everything goes according to plan regarding the land register project of the Law-court Office of the Ministry of Justice.
By the end of 1995, 28% of the 82 judicial districts of the country had an electronic land register, and in 1996 this number will be increased by 12 districts, meaning that a total of 43% will have been con-verted. The overall plan for the conversion appears from Figure 1.

The conversion to electronic land registers will improve information quality and offer more user-friendly search criteria.

In addition to registration of real property the land register project has also developed registers of pledge of motor vehicles (the motor car book), other voluntary pledges than those of motor cars and real property, together with registration of marri
age set-tlements and decrees divesting a person of the capacity to contract (the person's book). These registers will be kept centrally by the Court of Århus.

Following up of the land register project experiments is currently in progress to make all land registry work electronic. At the same time the Ministry of Justice has set up a committee to provide information on the law modifications that will be nece
ssitated for adopting electronic registration.

The computerisation of registration is expected to result in a rationalisation gain of 15-20%, i.e. when the whole system has been converted and implemented. This gain is especially effective as regards the activity level, i.e. the processing of about 2 million documents. The investment in the land register system is to kept within just over DKK 300m. The rationalisation effect alone does not justify an investment in this region, and therefore the investment is also seen in the light of the benefits gained by external users and thus the national economy generally.

Danish health network welcomed

It is now appropriate to speak of a cohesive Danish health network. 4 out of 5 pharmacies in the country are now connected to the Danish electronic health network. Within the past year the number of electronic transmis-sions of information has risen markedly. The benefit of the electronic health network is assessed to be a reduction of the sources of errors, quicker treatment of patients, higher levels of quality and service.

We can now seriously begin to speak of a cohesive Danish network in which the most frequent messages in the treatment of a patient are communicated elec-tronically between doctors, pharmacies, hospitals, and laboratories. The health network cannot only reduce the number of sources of errors, e.g. in con-nection with re-typing from paper, but will also mean higher speed and quality in the treatment of patients.

In March 1996 82% of the pharmacies, including branches, were connected to the health data network, MedCom, and could thus bill the National Health Insurance Service and receive prescriptions from the doctors. Similarly, 57% of the hospitals, and well over one third (36%) of the general practitioners of the country – or 42% of all GPs – were connected to MedCom. See Figure 1.

Within the past year we have seen quite consider-able growth rates in the number of link-ups, more than a doubling of the number of connected hos-pitals. See Table 1.

The number of electronic transmissions has in-creased rapidly during the past year, from just under a doubling of the number of prescriptions dispatched per month, to a trebling of the number of commentaries dispatched, cf. Table 1.

This means that about 19% of all prescriptions, about 39% of the clinical-chemical laboratory re-plies and 7% of all commentaries (excerpts of case records) were transmitted electronically in March 1996. The development of the total number of all electr
onic transmissions appears from Figure 2.

Even though the health network is accelerating in the greater perspective there are still great regional differences. Some counties are almost fully covered while others are hardly using electronic communications at all.

The objective by the end of 1996 is to have fully developed the health data network, allowing all hospitals, pharmacies and GPs who wish so to be connected and thus transmit and receive informa-tion electronically.

Private research and development within the IT/telecom sectors

The expenditure on research and development (R&D) within the most significant IT and telecom related industries has grown rapidly. There has been a doubling, from almost DKK 800m to more than DKK 1,500m. Across all industries a total amount of about DKK 2bn is spent annually on IT research and development. At the same time focus seems to be shifting from hardware-oriented R&D towards software. All things considered, a rapidly growing knowledge-intensive Danish IT industry is emerging which, however, seen in the international perspective, still constitutes a comparatively small part of the total R&D effort.

Over a 10-year period the R&D expenditure regis-tered in the selected IT/telecom related industries has doubled. See Figure 1. Thus, the R&D efforts within this sector are today comparable with the R&D efforts of the pharmaceutical industry. At the same time the focus is shifting from hardware-oriented IT, construed as the manufacturing of office machinery, DP-equipment, process control systems, etc., towards more software-oriented IT, construed as data processing activities. Thus, in 1993 data process
ing was the line of business that spent most on R&D, while in 1983 it was the line that spent the least. See Figure 2. This is an interesting development, inasmuch as IT in the form of "software" plays a growing role in many manufacturing sectors, as process control systems and products are made "intelligent".

In 1993, across lines of business, products and technologies, the operating costs of R&D within IT were recorded to be DKK 1,840m. Inclusive of funds invested, it is presumed to exceed DKK 2bn.

In actual fact more is spent, since a great amount, especially R&D costs, is not recorded in small and medium-sized firms, of which there are many in the lines of business involved. To this should be added substantial IT/telecom related R&D within a number of other sectors, e.g. research in semi-conductors, electronic storage and optical fibres classified as "Materials research" and, similarly, some software related R&D is included in the categories "Mechan-ical engineering" and "Electrical equipment", such as pumps, thermostats, and hearing aids.

An assessment carried out by the Ministry of Re-search and Information Technology shows that the share of Danish industry's total R&D related to IT is surprisingly small. See Table 1. Denmark's share was 11% as against an EU average of 28%.

This is due to some extent to the fact that Denmark mainly has small and medium-sized firms and lacks the large international R&D-intensive groups of companies. However, this does not alter the fact that efforts within the sector are far from matching the efforts in other industrial countries.

Public IT/telecom related research and development

In 1993 overall research spending within the public sector totalled DKK 6.5bn, which represented an increase of 8.3% at constant prices as

compared with 1991. Thus, in 1993, public R&D expenditure constituted 42% of the total R&D expenditure of the country.

Public R&D spending within IT is estimated to be just under DKK 300m and about DKK 100m within telecom. Consequently, IT and telecom play a smaller role in public R&D spending than in the private sector.

From 1981 to 1993 the total R&D expenditure of the public and private sectors has risen steadily, from 1.1% to 1.8% of the GDP. From 1991 to 1993 the increase was 7.8% at constant prices.

Public research spending within IT/telecom is estim-ated by the Ministry of Research and Information Technology to amount to about DKK 400m annually, DKK 300m on IT and 100m on telecom. As within the private sector a great deal of IT-related R&D is not being registered as such. This is due to the fact that the available statistics are not well suited to elucidating the extent and development within the IT sector, since the international OECD classifica-tion of R&D statistics is not sufficiently detailed within this field, and an internationally accepted definition of IT is still missing.

Part of the research not included takes place in the more "soft" areas. As a case in point, research is carried out within the humanities into linguistics, psychology and the man/machine interfaces, within social sciences into the impact of IT on society and production, and within natural science into math-ematics, encryption, and data compression. This may be considered a division of labour according to which the public sector is focusing on the "soft" areas and basic research, while the commercial se
c-tor is focusing on the more application and development oriented "hard" IT.

If comparing the R&D expenditure on IT/telecom in the public and private sectors, it is seen that IT/telecom related R&D constitutes a comparatively smaller share of the public expenditure, and that the efforts within this field mainly are made by the private sector. With a public R&D expenditure of about DKK 400m, as against that of the private sector of approx. DKK 1.5 to 2bn, the public share is about a fifth as compared with the 42% of the total R&D expenditure. See Figure 1. However, it should be taken into consideration that the public sector has other research-related tasks than the private sector, and that therefore the weighting is different too.

IT in education

There has been a sharp increase in the number of computers in the primary and lower secondary school, but the investment rate must to be doubled to attain the target of the Government of 5-10 pupils per up-to-date computer. In January 1996, 28 pupils shared an up-to-date computer (486/Pentium and suchlike). Further youth education is faring somewhat better than the primary and lower secondary school as regards computers.

The need for increased computer investment in schools

The number of computers in schools has risen
sharply, but to meet the Government's target of 5-10 pupils per up-to-date computer, the investment rate must be almost doubled by the year 2000. That is the most significant conclusion to be drawn from the poll of the National Association of Local Au-thorities in January 1996.
The increased number of computers per pupil can be seen clearly, irrespective of whether all computers or only more recent computers are included. See Figure 1.

It appears from the poll that 28 pupils today share an up-to-date computer. In this context an up-to-date computer is defined as being of the type Pentium, 486, PowerPC or similar computer. Currently, results seem to indicate an average investment rate of 6-7,000 computers per year, which must therefore be doubled to meet the target of the Government. 13 pupils share each computer, if all computers are included.

There are still considerable differences between local authorities as regards the number of pupils per computer, although the spread has presumably decreased in recent years. Today just under 4% of the local authorities have less than 10 pupils per up-to-date computer, while 6% have more than 100 pupils per up-to-date computer. See Figure 2.

Half of all computers in schools are up-to-date computers

There is at least one powerful computer (Pentium or PowerPC) in just under one third of the schools (31%). This appears from a poll conducted by the National Association of Local Authorities in January 1996. Totally, these powerful computers constitute just under 6% of the total number of computers in primary and lower secondary schools.

At least one of the medium capacity computers (486 and Apple Macintosh 68040 down to the 475) is available in 92% of the schools. This type of computer accounts for 40% of the total number of computers.

More than every other computer (54%) in primary and lower secondary schools is of a less powerful type (typically 386, but also Piccolo/Piccoline and suchlike). These types of computer will only accommodate to a limited extent a CD-ROM drive, multimedia software or be connected to networks. The distribution appears from Figure 3.

86% of all primary and lower secondary schools have at least one computer accommodating a CD-ROM drive. Computers accommodating a CD-ROM drive constitute 15% of all computers in the schools, and on the average 88 pupils share each computer with a CD-ROM drive.
According to the poll by the National Association of Local Authorities, 29% of all schools have their computers connected in local networks. Computers in networks constitute 15% of all computers in primary and lower secondary schools. The poll does not
go into detail as regards type and age of the networks installed, but it is the experience of the Ministry of Education and Science that the networks involved are simple ones, which only allow several work places to share, e.g. printers.

Further youth education fares better as regards IT than primary and lower secondary school

Just under 6 pupils share each up-to-date computer (486 or better) in the commercial schools in the school year of 95/96. This appears from a poll conducted by the Association of Principals and Inspectors of the Commercial Schools (HFI) in the summer of 1995. Among other things, the commercial schools are in charge of further youth education lead-ing to commercial "HG" ("O" level equivalent) and commercial "HH" ("A" level equivalent) certificates.

Moreover, HFI's poll shows that almost every second PC (47%) in the commercial schools is able to read CD-ROMs, and more than every third PC (35%) can connect to the Internet.

From a similar poll conducted by the Ministry of Education and Science at the beginning of 1995 it appears nationwide that 21 of the secondary educa-tion pupils (upper secondary school, higher preparatory examination school, adult upper secondary course) share each computer, type not specified. Seen in the county perspective, this figure covers regional deviations from 12 to 31 pupils per com-puter.

Education in networks

Less than one third of primary and lower secondary schools have all or some of their computers connected in networks. 3 out of 5 schools have access to external communica-tions via their computers, typically via tele-phone modems.

Primary and lower secondary schools in networks

29% of all primary and lower secondary schools have all or some of their computers linked together in local networks. This appears from a poll con-ducted by the National Association of Local Author-ities in January 1996 among primary and lower secondary schools on the computers available to schools for educational purposes.

Of the schools with computer networks, 5% have all their computers connected in a network. Computers in networks amount to 15% of all computers in primary and lower secondary schools. Typically, the computers in the DP rooms of the schools, at the schools' libraries and in media workshops are connected in a network. The poll does not provide details on type or age of the networks installed, thus it is impossible to conclude anything precise about the options offered by the networks.

The poll by the National Association of Local Au-thorities shows that 60% of all schools have one or more options of external communication. In almost all cases it is a matter of external communication via telephone modems. Compared with a poll conducted by the Ministry of Education and Science in 1992, according to which 28% of all primary and lower secondary schools were able to communicate externally, there has been a marked increase in the number of schools with this option since then.

Educational establishments connecting SkoDa

The options of external communications are used primarily for retrieval of data in various databases. This is the case within the framework of the so-called "SkoDa initiative" (the database service of the schools) of the Ministry of Education and Scienc
e. Here the schools are offered national as well as international conferences for pupils and teachers, access to the text-based part of the Internet and a number of Danish databases: Poltxt (news database), Danlib (library database) KSDB (local authority statistics database), etc. SkoDa is an offer to primary and lower secondary schools, the further youth educa-tion, teachers' training colleges and folk high schools and there is a small annual feel for connection.

The number of subscriptions to SkoDa showed a total growth of 14% over the period from the autumn of 1995 (798 subscribers) until the spring of 1996 (911 subscribers), and the Ministry of Education and Science expects this growth to continue. Table 1 shows how many institutions of each type of education were connected to SkoDa in the spring of 1996
.

Primary school teachers maintain a positive stance on IT in their teaching

Two thirds of the teachers are of the opinion that the introduction of DP in primary and lower secondary schools will have some, or very beneficial influence on the quality of teaching. 6 out of 7 teachers believe that the introduction of DP will increase the pupils' interest in what they are to learn. Practically all teachers wish to introduce DP in their teaching. Generally, teachers in the Greater Copenhagen Area are more receptive towards DP than elsewhere in the country. 9 out of 10 teachers feel that they themselves need supplementary training.

DP has a beneficial influence upon the quality of the teaching

Every fifth teacher (20%) thinks that the quality of teaching will improve greatly if DP is introduced, while 46% think IT will improve somewhat. The distribution appears from Figure 1.
Teachers in the Greater Copenhagen Area are especially receptive (80% think the quality will improve somewhat or greatly), while the teachers in rural areas are least receptive (58% think the quality will improve somewhat or greatly).

This appears from a poll conducted by the Foundation for Teaching Information and the Media Office of the Ministry of Education and Science in the autumn of 1994. Among other things, the poll meas-ured the teachers' attitude to the introduction of DP in primary and lower secondary schools. The analysis, which measures such things as the introduction of new technology in primary and lower secondary schools (DP, CD, CD-ROM, video and multimedia) presents a number of questions to the teachers, and is based on 308 questionnaires – cor-responding to 67% response – received from teachers in primary and lower secondary schools.

DP has beneficial influence on pupils' interest in learning

Every third teacher thinks that pupils will become much more interested in learning if DP is intro-duced, while 52% think that pupils will be some-what more interested.

It can also be seen here that teachers working in the Greater Copenhagen Area are most receptive to DP. 97% of the teachers working in the Greater Copenhagen Area think that the pupils will become some-what, or much, more interested in learning after the introduction of DP, while only 73% of the teachers in schools in minor provincial towns are of the same opinion.

All teachers will use DP in their teaching

Practically all teachers in the Greater Copenhagen Area will use DP in their teaching. 65% of the teachers arrive at the conclusion that they will use DP considerably, while 34% will use DP to some extent. The distribution of the replies appears from Figure 2.
Again, the teachers in the Greater Copenhagen Area are most keen to use DP in their teaching. Thus, three quarters (75%) of the teachers in the Greater Copenhagen Area are willing to use DP extensively in their teaching, while only every second (51%) teacher in minor provincial towns gives the same reply.

Teachers need supplementary training

While teachers like to use DP and have a receptive attitude to it, they are more doubtful about their own qualifications. Thus, only one third (36%) of the teachers are of the opinion that they are able to live up to their desire for integrating DP in their teaching, while 56% do not believe that they can. 8% of the teachers are in doubt.

There is a great need for supplementary training. 9 out of 10 teachers say they need this, although some of them are already able to integrate DP in their teaching.

The Royal Danish School of Educational Studies, which handles 85% of the total supplementary training within the school sector, has established that courses focusing on the use and integration of IT constitute 12% of the supplementary training activitie
s in 1995/1996. In addition, the county centres offer short-term courses, and local development projects are contributing to developing the competence of teachers too.

Accessibility and dissemination of IT

In March 1996 47% of the Danish homes had a computer. This represents a doubling over 18 months. The number of homes with a modem

and, thus, the possibility of electronic com-munications has more than doubled in one year only, which is in accordance wit

h the growing number of Internet users. The greatest PC coverage is found in the Greater Copen-hagen Area and in Funen, whereas Central

and South Jutland have relatively few PCs.

47% of all homes are computerised

In March 1996 47% of the Danish homes had a computer. As can be seen from Figure 1 this is more than a doubling in 18 months. According to IDC (1995) 49% of Danish homes have typewriters, which means that it will very soon be more common to have a PC th
an to have a typewriter.
Nationally, PCs are unevenly distributed across Denmark. Especially in inner Copenhagen many households have a computer. Apart from that the greatest density is found in the Greater Copenhagen Area, North Zealand/Bornholm, Funen and the islands and, partly in East Jutland, whereas fewer homes in South Jutland, Central and South Zealand, Mid Jutland, and North Jutland have a PC. See Figure 2. The regional differences might indicate that the distribution of PCs in Denmark is to some extent an urban pheno
menon since, regions with major cities (the Greater Copenhagen Area, Aarhus, Odense, and Aalborg) generally have a higher PC density than other regions.

Electronic communications
– the next step

The share of homes able to communicate electron-ically has more than doubled in one year. See Fig-ure 3. From March 95 till March 96 the share of homes with a modem has risen from 5% to 12%.

The fact that the computer is a normal tool in most homes could be considered the first step towards bringing households into the info-society. The other important step is that households start to use the computer for electronic communications from the home. With computers in 47% of homes and modems in 12%, Denmark is well on the way to taking this second major step. See Figure 4.

With an estimated part of the Danish population of between 1.5% and 4% actually using the Internet, the distribution is still very small. But seen in the light of the increasing quantity of information offered, growth is expected to continue. See Pictur
e 15 – The Internet growing fast.

For the Danes who do not have PCs or a private Internet connection the public libraries of the country offer increasingly good possibilities of getting in
touch with information technology. In the fourth quarter of 1995 1.2m Danes had access to the Internet at a library in their own municipality. See Picture 14.

Use of IT in the homes

Men use computers in their spare time more frequently than women. Salaried employees and students are the most diligent users of

computers, while pensioners and unskilled workers rarely use a computer. The home PC is primarily used for word processing and games.

Half of the PC households use the computer all the days in the week and one third is using it for work from their work place.

The typical home PC user is a man and a higher salaried employee

Men use computers in their spare time more often than women. This is the, perhaps not very surprising, conclusion to be drawn from polls about the use of home PCs. One of the polls carried out by the Copenhagen Institute for Futures Studies in February 1996 shows that the tendency is most apparent in the teenage years where more than every second male and only about every third female uses the computer. See Figure 1. In the age group from 70 years and up only one of 20 men and women use the computer in
their spare time. More than half (56%) of the higher salaried employees use the computer in their spare time, while students (44%) and lower salaried employees (38%) are also diligent users of computers in their spare time. See Figure 2. The unskilled workers (16%) and the pensioners (9%) are the groups using computers least in their spare time.

The home PC is used for word processing in connection with education and work, and for entertainment

Almost all (96%) private PCs have word processing software installed. This appears from a poll con-duc-ted by IDC in March 1995. In second place are games (79%). The popularity of other software appears from Figure 3.

57% of the Danes with a home computer say that they use it for computer games. This appears from a poll conducted by Sonar for the newspaper "Morgenavisen Jyllands-Posten" in October 1995 (cf. Figure 4). Otherwise, the computer is used for papers, term
work and suchlike by pupils and students (43%), accounts (38%) and professional work (35%).

In a poll conducted by the Gallup Institute for the newspaper "Berlingske Tidende" in March 1996, the specific question is asked whether computers are being used for work brought from the work place. 26% are doing so, but since 16% have replied that they do not use the computer themselves, this cor-responds to 31% of those who use the computer. From the same poll it appears that 51% use the computer for work jobs, 28% for entertainment and 20% for both equally. Regarding how often the home computer is used, 47% reply seven days a week (cf. Figure 5) and only every twentieth computer is used less than one day a week.

Libraries as users and presenters
of new information technology

At the end of 1995 23% of the population had access to the Internet via libraries in their own municipality. New media, such as CD-ROM and the Internet, are gaining a foothold in a considerable proportion of the libraries of the country, while more proven technologies, such as on-line retrieval, may already be considered an established part of the libraries' use of technology.

1.2m inhabitants - or about 23% of the Danish population - have access to the Internet via a public library in the municipality in which they live. They are primarily citizens in major local authorities with large libraries. This appears from a poll conducted by the Danish National Library Authority in the fourth quarter of 1995. See Figure 1.

Actually, just under every third public library had access to the Internet. However, only 10% made the Internet available to its users. The Danish National Library Authority expects most public libraries to have access to the Internet by the end of 1997.
The poll also shows that 71% of public libraries offer on-line retrieval from external databases
and the collections of other libraries. In the course of 1996 almost all the libraries of the country will be able to offer electronic searching in their own collection.

Typically, the large libraries in major local authorities are the first to make new technology available to their users. Thus, a greater part of the population will have access to the offers of the libraries than indicated in Figure 2, which also applied to access to the Internet.
The research libraries have introduced new technology to an even higher degree that the public librar-ies, which may be explained by the fact that they are in greater need of international retrieval facilit-ies and the options offered by electronic communications, e.g. via the Internet, and on-line retrieval is very useful to them.

14% of public libraries expect to have their own home page by the end of 1996. See Figure 3. The fact that there is such a great interest in having their own home page, and thus being able to offer information and services, seems to indicate that the libraries expect to become active users of the Internet.

Internet growing rapidly - everywhere

The number of Internet users is doubling every year. Denmark is keeping up with this trend, but without advancing, and in January 1996

was placed as 8th in the world as regards computers per 1,000 inhabitants directly connected to the Internet. Conservatively, as of 1 April

1996 the number of actual users may be estim-ated at 75,000, but could be considerably higher. The present users are mainly well-educated

men under 40 years, but if the right offers appear on the Internet, this user profile will be

come less distinct in the coming years.

The number of Internet users is doubled every year

The current annual growth rate of the Internet is about 100%, i.e. a doubling of the number of users every year. This fact is supported by polling actual users, and when looking at the number of computers directly connected to the Internet.
It appears from "The American Internet User Survey", from November/December 1995, that half the users have joined during 1995. The survey is very extensive and is based on 27,000 screening interviews in which at total of 1,750 households with at least one Internet user were found.

The same growth rate - a doubling every year - can be seen when looking upon the number of computers connected directly to the Internet - often called nodes, host computers or hosts. See Figure 1. A host computer may for instance be an independent Internet node in the home or a network server in a company with many connected computers, which all have access to the Internet via the network server.

An annual doubling of the number of host computers has taken place over the past 6 years. However, this doubling is not a law of nature and this development will not necessarily continue unaffected by everything else. But at this point in time nothing seems to indicate that the trend is reducing its pace

– neither in Denmark nor in the USA, where the level is much higher than in the rest of the world.

Denmark ranks 8th internationally

Denmark is neither loosing nor gaining ground in the Internet field. From January 1995 till January 1996, the number of host computers in Denmark grew by 100%, from about 26,000 to 52,000 - i.e it exactly followed the international trend.

This leaves Denmark as No. 8, calculated according to the number of host computers per 1,000 inhabitants in January 1996. See Figure 2. That is the same placing as Denmark had in 1995.

It is a general feature that the Internet is most widespread in countries where English does not constitute a barrier. This means that, apart from Great Britain, the USA, Canada, Australia and New Zea-land, the Nordic countries and the Netherlands are keeping up well.

At least 75,000 Internet users in Denmark

While there is more or less agreement about the growth rate of the Internet, opinions differ widely as regards the number of actual Internet users - both internationally and in Denmark.

In this context "users" means persons that have been using the Internet for things other than send-ing and receiving e-mail within the past 3 months. It must be actual use and not just access to the Internet. This definition may seem somewhat narrow since precisely the use of e-mail is still one of the most important features of the Internet.

The Ministry of Research and Information Techno-logy estimates that as of 1 April 1996 there are be-tween 20 and 50 million Internet users according to the above definition, if the estimate is based upon the two most comprehensive surveys made in the USA: "The American Internet Survey" (mentioned above) and "Defining the Internet Opportunity" from O. Riley & Associates.

This corresponds to an estimated number of Internet users in Denmark of between 75,000 and 200,000.

The numbers are certainly higher if Internet users who use the Internet solely for e-mail are included.

With an estimated share of the Danish population of between only 1.5% and 4% who actually use the Internet, its penetration is still very small, but the trend in the USA seems to indicate that, if the services offered on the Internet are of sufficient interest to the users, vigorous growth could still continue, anyhow for some time.

The occurrence of PCs in Danish homes is so great that this basic prerequisite will not for the present constitute a barrier to the continued spreading of the Internet – and the number of modem connec-tions in private homes is currently growing rapidly (see Picture 12). With increasing popularity of the Internet, fast telephone connections, especially ISDN lines, will be of great importance.

Internet users are typically young, well-educated men

No major demographic surveys of Internet users have been conducted in Denmark. The nearest thing is the survey by the Egeberg advertising agency which in a spot test of 2,000 interviews found 49 users. The results from this survey support the results fr
om the USA that Internet users are charac-terised by the following:
· .... there are more men than women
· .... they are of above-average education
· .... there is a majority of persons of under 40 years of age.

However, it is a characteristic finding of the American surveys that the Internet is spreading to new sections of the population, i.e. still more young women,

less educated people, etc.

A prerequisite of a similar development in Denmark is that these new groups also find something they want on the Internet. Communications and the re-trieval of information do not suffice to make the Internet more attractive.

IT/telecom/electronics – an important ingredient in Danish business

The IT/telecom/electronics industry is, as per turnover, at par with such industries as "Agriculture, fishery and recovery of raw mater-ials" and "Building and construction". More than 20% of the turnover within the IT/telecom/electronics industry is exported.

The IT/telecom/electronics industry had a turnover of DKK 85bn in 1993, which is higher than for "Agriculture, fishery and recovery of raw materials" and at par with "Building and Construction". See Figure 1.

The turnover of the IT/telecom/electronics industry was made up as 54% IT, 25% telecom, and 21% electronic products. See Figure 2.
The IT/telecom/electronics industry is not statistically defined as a single industry, but consists of groups that transgress the normal definitions of lines of business.
22% (or DKK 18.7bn) of the Danish turnover of the IT/telecom and electronics industry was exported in 1993. IT and electronic products accounted for 85% of the export. See Table 1.
This is quite a considerable amount. In comparison the textile and clothing industry exports amounted to DKK 10.7bn, and those of the furniture industry to DKK 10.3bn.
Half (51%) of all Danish firms with more than 5 employees exchange data with other firms electronically. One third of the very small firms (5-10 employees) use electronic data exchange. The banks are the most important exchange partner for firms of all sizes.
Almost every third Danish firm uses EDI, but to a limited extent only. Generally, Danish firms do not consider its strategic potential sufficiently important to introduce or consider-   ably to increase the use of EDI in the firm. Demands made by external collaboration partners are the most important reason for introducing EDI.

Half of all firms use electronic data exchange

That electronic communication has become commonplace in Danish business, both in small firms and large companies, appears from a survey con-ducted by the Confederation of Danish Industry and the Ministry of Research and Information Technology in 1996. H
alf (51%) of all Danish firms with more than 5 employees exchange data with other firms or public authorities in some electronic form.

Large companies exchange data electronically to a greater extent than small firms, but small firms do not lag far behind. See Figure 1. More than one third of the firms with between 5 and 10 employees exchange data electronically.

The banks are by far the most important exchange partner, irrespective of line of business or size of firm. Thus, a total of 40% of all firms with more than 5 employees exchange data electronically with a bank. This means that only 1 out of 5 firms exchanging data electronically does not exchange data with its bank.

Even disregarding the exchange of data between firms and banks, much data interchange still takes place. 30% of all firms exchange data with others than banks. In this respect also small firms are well represented – more than 20% of the firms with between 5 and 10 employees exchange data with others than their bank.

Almost every third Danish firm uses EDI

In many ways EDI may be the key to closer collaboration between firms. This is most evident in the provisions trade where the transactions recorded by the cash register for certain groups of goods are channelled direct to the supplier.

This may lead to quite different terms of competi-tion. Thus, in the provisions trade, the close coupling between the retailer and the supplier has contributed to considerably reducing the storage space in individual shops.

31% of all firms with more than 5 employees are EDI users. However, the majority use EDI together with just one or two trade partners, and most of them just within one business area. There is there-fore still far to go before EDI becomes sufficiently widespread to constitute an electronic infrastructure that enables flexible and close collaboration.

Perhaps the most important obstacle to achieving a much broader EDI base is that the firms consider practical and financial problems to be of paramount importance, and only to a limited degree do they consider strategic possibilities as crucial to the decision. See Figure 2.

The dissemination of EDI is much dependent upon one or a few central players capable of doing all the hard work. Thus, 58% of the firms using EDI today have started doing so by request from someone outside. See Figure 3.

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The dissemination of EDI is much dependent upon one or a few central players capable of doing all the hard work. Thus, 58% of the firms using EDI today have started doing so by request from someone outside. See Figure 3.

IT strategy and targets of use of IT in Danish firms

Almost every fifth Danish firm with more than 20 employees has analysed the interplay be-tween management, organisation and the use of technology. This is an important prerequisite of harvesting the gains of IT investments. Every fourth Danish firm with
 more than 20 employ-ees has an IT strategy, and here the security aspect is the element most frequently included.

Interplay between IT and company routines in focus

Within the past 2 years almost every fifth Danish firm with more than 20 employees has analysed the interplay between management, organisation and the use of technology. This appears from a poll conducted among 2,000 firms by Rubicon for the Ministry of Research and Information Technology. Not surprisingly it appears that the larger the firm, the larger the share of firms making such analyses. Almost every second company with more than 1,000 employees has made an analysis.

The interplay between management, organisation and the use of technology is extremely important. This appears from an analysis made by the Welfare Commission (Velfærdskommissionen). The analysis showed that in the cases where considerable investments in IT were followed by organisational changes and/or changes in management, the increase in productivity was much higher than in companies where no organisational and/or management changes were implemented.

The analyses of the interplay between management, organisation and the use of technology primarily resulted in changes to routines (90%) and the use of technology (72%), and in less than one third of the cases, in managerial changes. See Figure 2.

Every fourth firm has an
IT strategy

It is not the general rule to have a written, formally approved DP strategy. Only 25% of firms with more than 20 employees have that today. Security rules are the subject most frequently specified in written strategies (83%) followed by rules and standards for purchasing (74%). But also such important factors as the interplay between IT and routines/business strategy are often included (49% and 39% respectively). See Figure 3.

E-mail and the Internet mushrooming in Danish firms

Every fourth Danish firm with more than 20 employees is today using e-mail, and every sixth has a graphical Internet connection. Danish firms wish to participate actively in the Internet. Every third firm connected to the Internet has its own home page,
 and a further third is planning to get one in 1996. Appar-ently the size of the firm is of no decisive im-portance when considering whether or not to have a home page.

Every fourth firm is using
external e-mail

E-mail is gaining a foothold in Danish firms. Almost every fourth (23%) firm with more than 20 employees is using external e-mail today, according to a poll among 2,000 firms conducted by Rubicon for the Ministry of Research and Information Technology. See Figure 1.
If the plans of the firms are implemented, 40% will have introduced e-mail in the coming year. Seen in this perspective it seems astonishing that one third (33%) of the firms do not think they need e-mail. Developments among those using or planning to introduce e-mail seem to indicate that over a short span of years e-mail may attain the same import-ance, for instance, as the Telefax.

Every sixth firm on the Internet

As at 1 April 1996 every sixth Danish firm (17%) with more than 20 employees had a graphical Internet connection (World Wide Web). If the plans of the firms are implemented, every fourth firm (27%) will have graphical Internet access by the end of 1996. It appears that the larger the firm, the more widespread the Internet. See Figure 2.

Many firms have their own home page

Apparently the firms connect to the Internet to participate actively. Of the firms with Internet access almost every third has its own home page, and a further third is planning to get one. It is interesting that apparently the size of the firm is of no particular significance for whether a firm has its own home page once the firm is connected to the Internet. See Figure 1.

92% of the firms with their own home page consider one of its purposes to be marketing. See Figure 4.

Telecommuting work places and the mobile office

It is estimated that in 1995 there were some-where between 5,000 and 10,000 "electronic telecommuting work places" in Denmark. In comparison telecommuting is much more widespread in such countries as Great Britain, France, and the USA. Every fourth firm with more than 20 employees offers the possibility that employees may work from their home by utilising IT. The number of "telecommuters" is estimated to grow by 15-20% annually.

Today somewhere between 5,000 and 10,000 Danes are estimated to work at home as "telecommuters" by utilising IT. Thus, in a survey in 1995 the Occupational Health Institute has estimated that about 8,000 persons were telecommuters.

Electronic homework or "telecommuting" refers to a situation where work is done away from the work place (often in the home) and is subsequently transmitted electronically to the work place or some other recipient.

Another type of teleworking is "flex-work". This concept covers work performed wherever the person is located - in the office, at home, via mobile telephone en route to the office, at a portable PC on a train, in a video conference from a hotel, etc. This tendency of working anywhere - anytime - is doubtlessly growing rapidly, but it is almost impossible to measure.

It is difficult to give a precise definition of telecommuting. The penetration of the PC into Danish homes means that many persons have the technical facilities for working from their home, while others are self-employed who work at home. These factors make it difficult to guess accurately the frequency of computer-based telecommuting both in Denmark and abroad.

Nevertheless, Table 1 lists a number of international figures for the estimated number of telecommuters and the estimated number of firms practising telework. The number of persons making use of telecommuting is estimated to increase by 15-20% annually (80% of these are knowledge and information providers), and at the same time the number of working-at-home days tends to increase over time, with an approximate doubling from 1 to 2 telecommuting days a week over 2 years.

As can be seen from the above Denmark is, in the international context, one of the countries where telecommuting is least used - most probably due to the small geographical distances. But telecommut-ing offers other benefits apart from reducing transportation. The possibility of planning their own work results in increased flexibility for the staff, and telecommuting may result in savings in the firms due to reduced costs for offices, increased productivity, etc. This is why there is an increased interest in telecommuting in this country. However, it is reasonable to presume that here telecommuting will remain a supplement to work at the work place - not an alternative.

25% of Danish firms with more than 20 employees make telecommuting available to selected staff via link-up to the computer system of the firm, and 10% of the firms not making telecommuting available today, plan doing so by the end of 1996. These figures, which stem from a survey conducted by Rubicon for the Ministry of Research and Information Technology, seem to indicate great - and growing - interest in telecommuting in firms.

This trend is supported by a survey conducted by TELDET in 1994 showing that on average 35% of European firms express an interest in telecommut-ing

while 47% of the staff polled express an interest in the possibility of telecommuting.

Furthermore, a survey conducted by the Gallup Institute for the newspaper "Berlingske Tidende" in March 1996 shows that 40% of those with a computer at home are using it for work from the work place, and that up to half of them use it for some form of work, but not necessarily for work brought home from the work place.

Teleservice centres

In addition to providing staff and firms with in-creased flexibility, telecommuting also provides an option for work for socially marginalised groups. A case in point is disabled persons and people living far from towns or on islands. One example is loc
al "teleservice centres" providing the possibility of furthering the development of local areas. These telecom based work centres which are often located in local areas near to places where people are living, are practical for people who cannot or do not wish to work at home, and they may be a low-cost way of assuring access to expensive resources (high-speed printers, video conference equipment, etc.) which would not be profitable if installed in indi-vidual homes. 12% of the telecom work centres are located in towns with more than 10,000 inhabitants while 26% are located within 10 km distance from such a town. More than 60% are located more than 20 km outside a town with more than 10,000 inhab-itants and 15% are located more than 100 km away from urban districts. In Sweden and Canada there are examples of telecentres located 350 km away from the nearest town.

Denmark has some of the world's cheapest telecom services

Danish telecom prices are among the lowest in the world, measured against the general price level in the countries. In the OECD rating

Denmark is consistently among the 4 best coun-tries out of the 24 included in the statistics. In actual prices, howeve

r, Denmark is further down the list, and local calls are among the highest in Europe. From 1984 to 1994 the price of telecom services

dropped by 17% in constant prices.

Danish telecom services are among the cheapest

Denmark's placing in the OECD rating which starts with the cheapest countries is:
No. 3 for business telephoning and No. 4 for household telephoning. See Figures 1 and 2.

The tariff comparisons of the OECD are based on a basket method. For instance, in the case of tele-phoning by firms the price is based on a basket of conversations distributed over different times of the day in a proportion that is considered to resembl
e "normal telephoning", ie. many relatively short calls over both long and short distances.
The OECD has converted the tariffs to a common currency by means of fictive rates of exchange (purchase power parity) reflecting the general price levels in the individual countries. The aim of the OECD in so doing is to rate the operators according to their ability to produce telecom services which are cheap as compared with the price of other amenities in the country in question.

If the tariffs of the individual countries were converted according to current rates of exchange, Denmark would have a lower rating. This appears from a tariff comparison conducted by the EU Commis-sion in March 1996. It shows that the cost of locals calls in Denmark is among the highest in the EU. There may be several good reasons for this. One of the reasons is that Denmark has implemented a so-called "re-balancing" of the tariffs so that local calls are not subsidised via high costs of international calls or regional/nationwide calls. The Commission recommends that, in connection with the compar-ison of tariffs conducted, the member states implement the required re-balancing and concede that this would entail higher costs of local calls. Denmark's placing in comparison with the other EU countries appears from Figures 3 and 4.

The structure of tariffs varies much from country to country. In many European countries local calls are relatively cheap while regional and nationwide calls are relatively expensive. In Denmark the situation has traditionally been the reverse. As a case in point, the costs of inter-urban calls in Denmark are much

lower than half of the corresponding prices in Germany, France and Spain which, admittedly, have longer distances.

The cost of local calls is of special importance in connection, e.g. with data transmission, Internet access, self-service, and information retrieval from public networks, as such calls will typically be of long duration and at the cost of local calls. The level and price structure of local telephoning will thus be important to the dissemination of the ser-vices, especially for private users.

Telecom prices have dropped by 17% over the past 10 years. This is the conclusion to be drawn from the so-called telecom price index, which is a Danish basket containing inland calls, subscription and installation charges. Nominally, the telecom price index has risen from index 100 in 1984 to index 109 in 1994, but if corrected for inflation the index drops to 83. This corresponds to a price reduction of 17%. The trend appears from Figure 5.

Mobile telephony cheap in Denmark

As regards mobile telephones Denmark ranks third in the OECD comparison. See Table 1.

The survey is based on prices which have since dropped considerably. However, it is difficult to adjust this ranking. The prices on which it is based are DKK 900 for connection and DKK 2.80/min. The basic price is today DKK 2.35/min. during the day-time and half of that in the evening. New price sys-tems have been developed such as leisure time schemes with minute prices of DKK 0.70/min. out-side normal working hours, and special discounts are used more for business subscribers. In addition to this the connection fee is generally lower due to campaign discounts.

The world's lowest list prices for
broadband connections

The Ministry of Research and Information Technology considers that Denmark has what may be described as the world's lowest nationwide unit prices in the broadband field. As regards the prices of leased lines Denmark held, according to OECD, in 1994 seco
nd place for 9.6 Kbit/s, second place for 64 Kbit/s and third place for 1.5/2.0 Mbit/s. See Figure 6.

Since 1994 there have been sharp price drops in this field. For broadband connections, i.e. above 2 Mbit/s, prices were reduced by 65% in the summer of 1995. Moreover, this has a rub-off effect on the prices of 2 Mbit/s connections, which have dropped b
y 10%.

Liberalisation of the telecom market

The price trend on competitive telecom markets has been more favourable for the consumers than on non-liberalised markets. This appears from surveys conducted by the OECD in which the price trend in countries with and without competition on the telecom market has been compared. This trend is illus-trated in Figure 7. In addition, the survey shows that the effect has been most clear for private users and more modest for commercial users.

The Ministry of Research and Information Techno-logy expects the planned liberalisation to mean quick establishment and offering of new telecom infrastructures by alternative providers and lower prices as a result of increased competition. The lower pri
ces are expected to become effective in densely populated areas and for commercial subscribers first.

The Danes become mobile

The Danes are about to become mobile. The number of mobile telephones has quadrupled in only three years, from 1992 to 1995. It is estimated that at the end of 1995 the number of subscribers was 850,000 and that the number would top one million during March 1996. This means that every fifth Dane has a mobile telephone.

With 1 million subscribers as of March 1996 Denmark, together with the other Nordic countries, is right at the top as regards the density of mobile telephones. Norway and Sweden have 23-24 mobile telephones per 100 inhabitants, Denmark and Finland have 19 while the other Western countries

typically have 4 to 5 mobile telephones per 100 inhabitants.

Growth in Denmark has been very rapid, especially since 1992, inasmuch as the number of mobile telephones has more than quadrupled in 3 years only. See Figure 1.

Two important factors contributing to the rapid growth in the number of subscribers are that mobile telephones have become very cheap, and that the competition between the two mobile operators has led to fast expansion of the network and dropping prices. This has meant a steep rise in the influx of private subscribers, in particular.

The objective of the telecom operators is 80 mobile telephones per 100 inhabitants as the tariffs for mobile telephones gradually approach the normal telephone tariffs.

High quality telecom services

For both the conventional telephone network and leased lines, the quality targets set are continuously being revised upwards. As regards mobile telephony, both the geographic and the demographic percentages of coverage, rejected and dropped-out calls, as well as the number of telecom services, are among the best in the world.

The conventional telephone network in the process of being digitalised

Today more than half of all numbers in operation are connected to digital exchanges. See Figure 1. From 1987 to 1994 the percentage of digital numbers in-creased from 11% to 53%, and this growth continues.
 Digital numbers are a prerequisite for using the new telecom services, such as redirection and information about who is calling prior to answering the call. Since 1992 the number of ISDN subscribers has more than doubled every year. The ISDN is a digital elaboration of the conventional telephone network allowing both normal voice telephony and data transmission. Speed and security of data transmis-sion are much higher than in analogue transmission, and therefore it represents an important upgrading of the telephone infrastructure. The vigorous growth of ISDN subscribers applies both to ISDN2, with a capacity of 128 Kbit/s, and ISDN30, with a capacity of 2 Mbit/s. See Figures 2 and 3.

The quality of the telecom network is high – and is still improving. The statement by the National Telecom Agency of not completed test calls shows a steady drop from 3% in the mid-80s to 1.1% in 1994.

Quality targets for leased lines surpassed

All quality targets for leased lines have been surpassed. As a quality target for leased lines, the number of new connections established within 30 and 45 days respectively and the proportion of faults that are remedied within 16 working hours, are registered.

High quality of mobile telephony

The GSM coverage in Denmark is among the best in Europe, if the quality parameters of mobile tele-phony are compared with price development as shown in Picture 21.
Quality is measured in the form of geographic and demographic percentage of coverage, rejected and dropped-out calls and the number of telecom ser-vices. The National Telecom Agency estimated in June 1995 that the two mobile operators, having only very few delays, were satisfying all of the set requirements. In several areas, such as the percent-age of coverage, the operators have progressed much further than the requirements originally laid down and have reached the targets one to two years ahead of the deadline.