Teldok report 111e

IT—visions at work

Inger Stjernqvist

Teldok

TELDOK was initiated in 1980 by the Board of Telia, Sweden's largest telecommunications operator, to facilitate early and easy-to-read documentation on the use of telecommunications-based 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 activities are coordinated by an Editorial Board with wide representation from the IT corporate user community, academia, trade unions, government authorities, suppliers, and Telia AB.

The TELDOK Editorial Board welcomes new ideas concerning the study and documentation of working applications of new communications technology systems. The Editorial Board can best be reached by sending email to PG Holmlov, Telia, pg.x.holmlov@telia.se.

TELDOK has issued more than 160 publications, mostly in Swedish, that are distributed regularly and at no cost to 5,000 professionals in Sweden and abroad.

Recent TELDOK publications in *English* include…

TELDOK Report **116:** *The TELDOK Yearbook 1997.* December 1997.

TELDOK Report **111E:** *IT—Visions at work.* December 1997.

TELDOK Report **101E**: *20 seconds to work. Home-based telework.* October 1995.

TELDOK Report **94E**: *IT Myths.* November 1996.

TELDOK Report **90E**: *Telecottages, telework and telelearning.* June 1994.

Via TELDOK **28E:** *The building of a World Industry—The Impact of Entrepreneurship on Swedish Mobile Telephony.* February 1997.

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Foreword

"The most interesting aspect of technological development over the coming years will probably not be the development per se but rather how the use of IT develops." This sentence quoted from the introductory chapter of this report successfully encapsulates the idea behind *both* TELDOK's aim and publications *as well as* encompassing Telia's Demotel program described in this TELDOK report.

TELDOK describes the pioneering use of new information technology. Inger Stjernqvist's task was to independently document a selection of applications from the Demotel program. This was funded by Telia Promotor which administers the Demotel projects but TELDOK was always very interested in having such a survey done and keen to see the results. The report has proven to be of such quality that TELDOK is keen to publish it.

IT–Visions at work is a broadly-based report. It does not only cover a particular industry sector, type of company or a certain type of IT solution. It simply mirrors the breadth of the Demotel program. The program has few limitations apart from its aim to stimulate the use of IT rather than to develop the technology as well as to contribute to increased productivity, effectiveness and new business opportunities for the parties concerned. The projects within Demotel are primarily based on technology which is commercially available but where further or new types of applications need to be developed.

Telia (Sweden's major telecommunications carrier) develops IT solutions within Demotel together with clients and other interested parties. The clients contribute their problems and their needs as well as their own resources. Telia contributes with problem-solving expertise and project leadership. A Demotel project is often undertaken with several partners so that the client can obtain a total solution. The partners split the project funding but the client is responsible for investing whatever resources are necessary for its own operations.

An essential part of stimulating the use of technology is to spread knowledge and examples of its purpose and usage. Inger Stjernqvist, the author of this report, readily speaks about knowledge and imagination. She states that it is often not the technology which places barriers between vision and reality but rather ability and imagination. The source of her own imagination is an interesting question when she freely conducts an ideological discussion about a particular project.

Here, the aim is to create understanding of the opportunities which exist æ and to call forth new visions using reality as a firm foundation.

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The original Teldok report 111 was written in Swedish in 1996 and printed in January, 1997. This means, of course, that some of the web sites referred to in the report have been updated or completely altered since that time; change is the constant characteristic of the Internet.

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Goals and target groups

It is easy to express the opportunities for information technology in visionary terms. Or to put it more accurately, it is difficult to resist the temptation to do so. But the road from vision to reality can appear long. However, it could be shorter than realised as demonstrated by the Demotel program. Telia's aim is, through the Demotel program, to develop IT solutions by working with clients and other stakeholders. The projects should stimulate the use of technology rather than develop technology. They should lead to increased productivity and effectiveness and should provide new business opportunities for the parties involved.

There are currently more IT solutions than needs to be met by them be they expressed or even understood. One of the reasons is the prevailing gap in knowledge between IT experts and non-experts. The goal of this TELDOK report is therefore to try to bridge the knowledge gap by:

- bringing to life the Demotel projects and associated IT solutions and to clarify what needs and problems are the basis for the solutions
- describing IT solutions so that non-IT professionals understand the significance of them
- illustrating how the same type of solution can work for different needs and problems
- illustrating how needs and problems expressed in the words of a company's or organisation's own operation can be the basis for valid IT strategies.

The report is about IT, business growth and the interplay of people and technology. For obvious reasons, it is the communications aspects which are given the most prominence. Readers will comprise people who are knowledgeable about IT and those who are not. The main target, as represented in the project descriptions, are small business people as well as IT and business entrepreneurs who deal with smaller companies' problems, needs and business opportunities. Today IT is more relevant for small business than ever before.

Overview

The twenty or so Demotel projects which are the basis of this report anchor a number of IT visions in a reality which is characterised by widely different activities within very different companies, organisations and industry sectors. Some of the projects have been fully completed while others are being implemented. All of them are based on IT solutions which are commercially available. The whole spectrum of problems and needs, solutions and opportunities is discussed in the report regardless of each particular project's stage of development. The actual stage of the project is usually not mentioned as this type of information quickly becomes out of date.

In order to find a common link for the report, the project descriptions could have been grouped by industry sectors. But taking more than a superficial view, it is clear that the needs expressed are not specific to a particular sector. IT solutions are even less specific to a particular type of business. This is why the report is arranged as a collection of essays with discussion on issues based on themes which most companies and organisations may need to consider:

- Networked companies and organisations
- Telecommuting and mobility
- Service and client support
- Electronic commerce and interactive sales promotion
- Interactive, individualised mass media
- Professional development and education

The report begins with the chapter *From computer technology to information technology* which provides a short summary of IT developments during the second half of the twentieth century.

The report concludes with the chapter *The infrastructures of knowledge through the ages* which is an contrasting theme to the introduction. IT does not just have to be seen as a further development of computer technology but can just as well, or maybe even preferably, be seen as a further development of the networks and infrastructures which people have always used to develop and convey knowledge.

Explanations of the IT concepts raised in the report have, in most cases, been concentrated to the Appendix. This is in order not to weigh down the reader with technicalities in the text.

From computer technology to information technology

Background

Technological development is so rapid that the information technology (IT) area just about seems to have no history. But this, of course is not so. Present-day problems and needs, solutions and opportunities have their basis in the past. It is common for IT to be seen as a further development of computer technology. This is a viewpoint which to some degree is acceptable. In conjunction with the personal computer's powerful expansion during the 1980's and '90's together with developments in telecommunication and electronic communication, it is more common to speak about IT instead of computer technology.

IT today is characterised by the following important I's:

- **Integration** between computer technology and telecommunications technology making it possible to combine telephones and telephone exchanges with personal computers and computer systems in a way which leads to one and one adding up to a lot more than two.
- The **Internet** has just about become a generic concept for open communications where everyone can communicate with everyone else. The foundation for the Internet is TCP/IP (Transmission Control Protocol/Internet Protocol) which is a standard for open communication within and between different networks.
- **Interactivity** is the interplay between IT systems and users so that the use of systems becomes much easier and at the same time more filled with opportunities.

The technology of these three I's is constantly evolving. But the most interesting aspect of technological development over the coming years will probably not be the development per se but how the use of IT develops. Much will change.

Mainframe computers

Computers were initially developed because of the need for a device to perform complicated calculations within science and technology. These calculations, despite what people may believe, are not particularly complicated. They principally consist of a large number of simple and routine calculations. Gradually, the number of calculations became so extensive and time consuming that it was no longer humanly possible to manage with just the electro-mechanical calculators on offer. Electronics was the answer. With the assistance of electronic valves which were extremely fast and energy-saving compared with electro-mechanical components, it was possible to build the first computer. It had a capacity which was far less than the weakest of today's personal computers but despite this was nearly as craving in energy as a small town.

Computers developed rapidly. Computer technology was soon applied to other routine tasks of a transactional nature mainly in finance and administration. The same work which humans had previously done could now be undertaken a lot faster and on a larger scale. But for a long time the computers continued to be both large and expensive and required specialists to operate them. They were, therefore, placed centrally within large companies and organisations and were mainly used to rationalise staff and coordination functions. Therefore, more and larger organisational units could be managed and coordinated in, what was considered, a rational and effective manner.

Proprietary networks

Initially, networks had been proprietary and designed for the company's internal electronic communication when communications technology between computers was developed. It was mainly the large companies which could take advantage of network technology. The principal aim was to achieve a cost effective utilisation of joint resources such as central EDP systems, software, databases, printers, technical support etc. The use of the networks was first and foremost for data transmission and not for communications as it is today.

Personal computers and open networks

During the 1980's, personal computers became more common and over time more and more powerful and user-friendly. The move from centralised information processing to distributed and process-oriented information flow occurred when personal computers could be connected together, first locally and then gradually in wider and more open networks. As a consequence, it was possible to create decentralised, flexible and flat organisations. However, it is only in recent times that there has been a trend away from the restrictive view of IT being synonymous with rationalisation and efficiency measures towards a broader vision of its possibilities. IT contributes increasingly to renewal and change within all areas of activity and levels of society.

Small and large scale operations

Large scale operations benefited from computer technology but IT has made it possible to break away from this form so that small and large scale operations no longer have to be opposing forces. New communications opportunities make it easier for large corporations to be split into smaller units to achieve small scale advantages such as entrepreneurship and involvement. On the other hand, smaller companies can use communications opportunities to cooperate with each other. In this way, they can profit from the advantages of working on a larger scale or rather as part of the greater whole. The smaller companies can form networks, using today's open public communications systems, to focus on cooperative forms of creativity, flexibility and competence. Within the framework of virtual project organisations and consortia, companies can retain the independence of working on a small scale and still be part of the most global large scale operations. This is illustrated by several of the projects in this report.

User situation

IT means enormous developmental possibilities for smaller companies but there are also some problems which become obvious when a comparison is made of the user situation in large and small companies. IT users in the larger companies often have specialised duties such as word-processing, costing, design, logistics, marketing, human resources, finance and orders. They have usually been well-trained in the

use of software and systems. The integration between the different systems looks after itself. In other words, it is done by others. If the user has a problem, help is usually close at hand.

This is not typically the case in smaller companies. Help is not always readily available. Possible integration is on the whole limited to the purchase of packages of office suite software. Any further systems integration is very difficult as the system does not look after itself if several suppliers are involved. User specialisation is often not even a consideration when one office clerk is supposed to cope with the majority of tasks. In a worst case scenario, there may not even be an office clerk. And when is there ever any time for user training?

Knowledge, imagination and power

The above description indicates that IT development in smaller companies is often slower than admitted to by the technology and the individual. It is very much about knowledge and imagination but also about power structures. The larger companies have the power to make demands of their IT suppliers. Their problems and needs therefore have and continue to set the standards to a large degree.

To ensure that IT will be used to best advantage within all types of companies, there is a need for increased understanding between the IT suppliers and their customers and users in the smaller companies. The IT supplier has an educative as well as a technical role to play. There is also a need for increased mutual understanding between large and small companies. IT developments which benefit the smaller companies also benefit the larger ones. Why would they otherwise introduce more small scale operations within their organisations or increase efficiency and flexibility in cooperation with their suppliers and customers?

Myth or competitive edge?

Technological development over the past decade has just about been unbelievable. Few can even imagine where it will lead when current technology offers opportunities which are used to only a small degree. But technological development continues to be something of a myth as long as the corresponding ability to take advantage of it develops more slowly and while power structures take time to change.

Does this sound pessimistic? If that's the case, let's look at it another way. There are more personal computers and mobile phones in Sweden per capita than in any other country. Half of all the Internet traffic between USA and Europe is routed through Sweden. This should not solely be interpreted that Sweden comprises gadget crazy Internet surfers. These facts illustrate that Sweden, from an international perspective, is very advanced in its IT usage. The reasons are partly historical, thanks to Swedish corporations such as Telia, Ericsson and SAAB (which developed Sweden's first computer) which have always been at the cutting edge of technology and acted as strong driving forces in the Swedish market.

Sweden currently has one of the world's most advanced and deregulated IT markets. It is distinguished by strong competition between a growing number of national and international network operators. They are not in the Swedish market because it is large but because it is, despite its size, highly interesting. Sweden probably focuses more on IT both in the mass media and in the boardroom than any other country. This in turn forces the pace of IT usage and competence in the marketplace so that there is a positive feedback between thought and action.

As an advanced IT nation, Sweden has an international competitive edge which may not be used to full advantage. The icing on the cake is that an important generational change is on its way. At the same time as computer technology is approaching middle age and its contemporaries can cloak themselves in wisdom's years, there is an IT savvy younger generation which is establishing itself in the workforce. A generation which often has a different viewpoint on the values of life and work compared to those currently in power. From that perspective, it is not the actual technological development which is most interesting as we enter the 21st century, but how IT usage develops.

IT strategy

People often say "We must have an IT strategy". But what is an IT strategy? It is based on a company's business plan where it can define the future directions of the organisation. Formulating a strategy is based on attempting to answer a number of questions such as: What are the priorities for the organisation? Are these priorities carried out in the best way? What methods should the company use to become better or the best in its field? What are the views of staff, suppliers and customers? How should the various stakeholders view the company and its

products and services? How should cooperation take place internally and externally? What are the goals and hopes for the future? What are likely changes and how can these be interpreted? Which decisions about the future should be quickly resolved and which should be kept on the backburner?

When a company has a business plan, it is possible to obtain a good understanding of the use of IT to support the plan. In the broadest sense, it means how internal and external communications and various IT equipment can and will support the business plan. As much as possible, the IT strategy should be expressed in non-technical terms as it is primarily an issues and needs-oriented strategic description rather than one which focuses on solutions. It is only when decisions are made based on putting the IT strategy into practice that the technical solutions become of immediate interest. For example, consideration can then be given to the type of network, equipment, applications and software.

It is important to involve users in the IT strategy. They can become a strong link between the business plan and the IT strategy æ a link which gives impetus to IT funding commitments. But they may also be a weak link which decreases the investment's profitability. It is therefore important that factors such as user-friendliness, user support and user training are included in the IT strategy.

- User-friendliness means that systems and their applications should be designed so that there is an easy interaction between man and machine. Specialist users usually do not set as high demands on user-friendliness as non-specialist users but user-friendliness is generally seen as an important characteristic. It is, therefore, highlighted in several sections further on in the report.
- User support means that there is support for the users if they encounter problems despite the user-friendliness of the system. User support can be built into the applications, for example, as online user manuals or be provided through some form of help desk within or outside the company.
- User training is necessary to be able to benefit from the opportunities offered by an application or system. The training in many cases can be given online in the same way as the user support. Interactive, computer-supported user training is becoming more common as a substitute or complement to conventional training. Users can choose their own time for the training or even adapt it to their own requirements. Conventional training is often designed for the average student who often does not exist in reality.

Other important parts of the IT strategy are management and service aspects. It is not always wise to initially choose the cheapest IT solution considering the lifetime of the investment. Under any circumstances, one must be convinced that inadequate reliability or high operational and service costs do not reduce the profitability of the seemingly cheapest alternative.

Security against unauthorised encroachment is another strategic factor. The more open the communications solutions are, the more important it is to handle the confidentiality and security aspects in a professional manner. It requires special expertise to find appropriate solutions but it is easy to visualise potential if information systems and the information flow were accessible to uninvited external parties. Confidentiality and security are also closely connected with the legal aspects of IT.

Flexibility is another strategic factor. A continuously changing world demands flexible IT solutions which can grow and change. Otherwise, there is a risk that they will start to become stumbling blocks over time. Many old IT solutions suffer from this problem. Then, there were no standardised interfaces or the open systems architecture which exist today.

Networked companies and organisations

- Overview
- Kalmar LMV and Henjo Plåtteknik
- Timber on the Go
- Forest haulage contractors
- Forest alarm
- FR Online – Meeting place for Sweden's business people
- Networking for knowledge, creativity and communication

Overview

Networked companies and organisations can mean anything from IT-based collaboration within and between companies to the contribution of communications networks to modern organisational development. This chapter is about both these aspects and others as well.

- Starting with something very concrete, is the description of CAD/CAM collaboration between Kalmar LMV and Henjo Plåtteknik, one of LMV's subcontractors, in the manufacture of sheet metal parts for heavy-duty fork-lift trucks.
- There are all together three projects in this chapter about IT in the forest industry. These deal with how felling can become client-centred, how forest haulage can become more efficient and precise as well as how safety can be improved for those who work in the forest.
- What can Företagarnas Riksorganisation – FR (the Federation of Private Enterprises) do for its member companies through the FR Online network? FR's member companies are found within all industry sectors and represent all types of businesses. Small companies dominate numerically. There are many aspects to the significance of FR Online for the smaller companies both now and in the future.
- Towards the end of the chapter, there is more of a philosophical discussion. Virtual networks can be formed using IT so that the spirit of innovation and cooperation often found in cottage industries, known in Sweden as Gnosjöandan, does not have to be concentrated in a specific locality.

Kalmar LMV and Henjo Plåtteknik

Background

The company, Kalmar LMV situated in Ljungby, a small town in southern Sweden, manufactures heavy-duty, custom-made fork-lift trucks. The company has used CAD/CAM for many years and it has now taken the step to link together, through telecommunications, its design unit in Kalmar with one of its many subcontractors. Henjo Plåtteknik, which manufactures sheet metal parts for the fork-lift trucks, is a company in Ljungby with 38 employees. Kalmar LMV and Henjo Plåtteknik are the first companies in Sweden that have chosen to use ISDN in a CAD/CAM application.

From design to production in less than an hour

The drawings for the sheet metal parts are made at Kalmar LMV's central drawing office in Kalmar. From there, the electronically stored CAD drawings are sent to the CAD/CAM system at Henjo Plåtteknik over 150 kilometres away. The drawing can be used directly without having to be redrafted as was necessary in the past. Work is halved and there is one less possibility for error. Consequently, higher quality is attained.

Previously, the programming of the numerically controlled machines which cut out, punch and bend the metal created a bottle-neck. Now the production can immediately be prepared on the machines. The first metal part can be ready less than an hour after the drawing has been received. An order which is received in the morning can be totally ready for delivery in the afternoon of the same day.

Profitability in the short and long term

Together, Kalmar LMV and Henjo Plåtteknik have been able to halve the lead times with this new method of collaboration. This is a big advantage, especially with quite small batches for some metal parts, when the final products are so markedly customised as Kalmar LMV's fork-lift trucks. Before a design is completed, it can have been preceded by many discussions and alterations.

Today Henjo Plåtteknik can produce a prototype in a very short time and to a reasonable cost. Thus, new parts can be quickly assessed without the need for lengthy meetings and discussions about different types of design ideas. This working method can be further refined through three-dimensional presentations where the CAD drawing generates an electronic prototype which can be twisted and turned on the monitor before it is implemented.

The combined advantages of faster product evaluation, shorter lead times and higher quality as well as a markedly more effective drawing and editing process has resulted in cost savings of about 20%. All the investment and development costs were recovered after three months' usage of the new technique. That means a lot for long term profitability.

Why ISDN?

The reason for using ISDN is a need for high network capacity to transfer CAD drawings. Usually internal company networks or permanent telecommunications connections are used for CAD/CAM applications as there is often a need for regular or continuous communication. But there is only an irregular need to communicate between LMV's drawing office in Kalmar and Henjo Plåtteknik in Ljungby. ISDN offers exactly what is needed: High capacity on demand.

ISDN is a publicly switched network for digital transmission of image, sound, data or text based on users' needs. Transmission capacity is always accessible but there is only a charge for the capacity used. ISDN is nearly as cheap and easy to use as the ordinary telephone network. The communications costs are dependent on the number of

ISDN channels needed. Special equipment has to be purchased such as terminal adaptors at each end to which the CAD/CAM system is connected. The type of ISDN use is determined by the terminal adaptors as the network as such can be used for all types of digital information.

Who needs CAD/CAM collaboration via ISDN?

An increasing number of companies place orders with subcontractors and many will replicate the type of collaboration established by Kalmar LMV and Henjo Plåtteknik. A subcontractor investing in ISDN communications equipment can considerably improve collaboration with an important customer or attract new customers and maybe even try to find new markets. ISDN is available in many parts of the world and the network is well-developed in Western Europe.

Certain CAD/CAM applications are suitable for ISDN while others are not. It is necessary to consider total needs and ask a number of questions based on needs as follows:

- Is there a need to communicate in real time? If this is the case, faster transmission capacity than what ISDN can offer may be necessary.
- Is there a need for frequent or even continuous communications? In this case, it may be better economically to lease network capacity instead of using a public network.
- Are there extremely high demands on service reliability? In this case, dependable transmission capacity may have to be assured. ISDN offers very high reliability but a public network offers no guarantee of dependability.
- How permanent is the collaboration and how will it be developed? ISDN does not commit a company to any large investments. This is a simple and effective solution which offers the freedom to further develop or discontinue the collaboration.

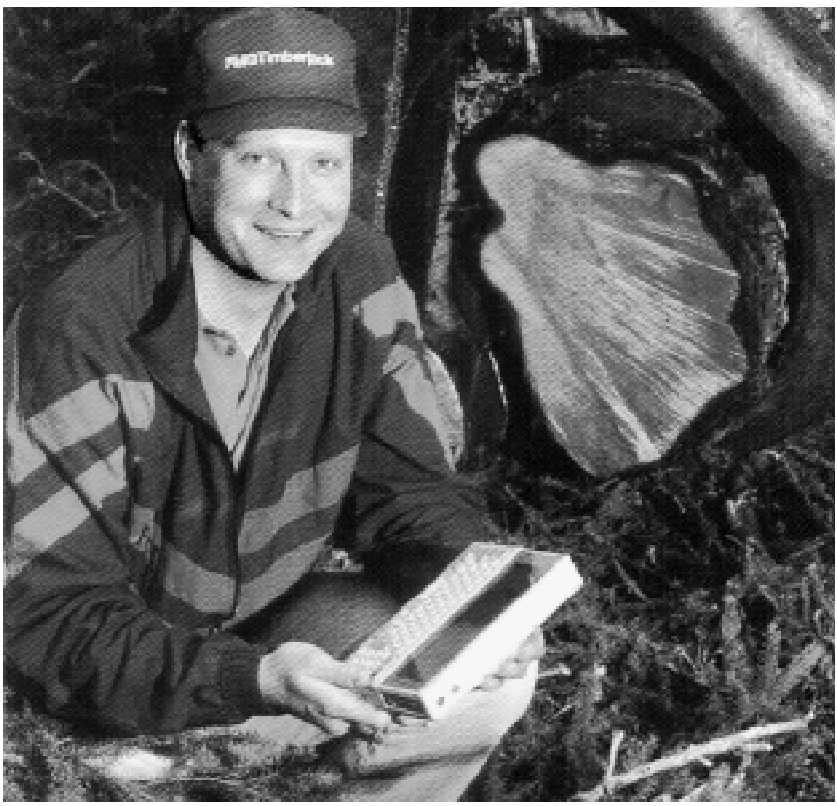
One characteristic of ISDN which has not previously been mentioned is that data can also be transferred “beside” the CAD/CAM application. An ISDN connection comprises two or more broadband channels and a data channel which, for example, can be used for EDI communication. EDI (Electronic Data Interchange) is the automatic exchange of standardised business documents between computers. The use of EDI is especially common in the car industry where, over a long period of time, considerable resources have been invested to create effective collaboration with subcontractors.

Timber on the Go

Background

Timber on the Go is a project which was carried out in cooperation with SkogForsk, Graningeverken and Telia. SkogForsk is a research and development organisation specifically for the forest industry. Graningeverken is a forestry and power company and its subsidiary, Graninge Skog & Trä has four sawmills supplied with timber both from its own forests and from other forest owners.

The aim of *Timber on the Go* is to demonstrate the benefits and opportunities of handling detailed information in a systematic way both in a mobile and fixed environment. Effective control and follow-up of the whole operation both in the forest and the sawmill is the desired result.



From harvest to delivery

The trees are felled, trimmed and sawn into sections in the forest and then the timber is moved and piled up for further transport to the sawmill. The timber is measured, sorted and processed at the sawmill.

Some timber deteriorates if it is left piled up too long in the forest on the road between the felling place and the sawmill. Some of the raw material is wasted during sawing because the dimensions required by customers do not make best use of the timber on hand. It is not possible to wait for other timber if the delivery time is to be met. Anyway, it is not known when timber with more appropriate dimensions are expected. Some of the processed timber is sold quickly. Other timber is stored and may be wasted if no customers request the exact quality and dimensions for a period of time.

This is a worst-case scenario. Logistics, production planning and adaptation to the market are hardly unknown concepts within one of Sweden's most important industries. However, this is not to say that all raw material is always used optimally, that there are no stock defects, and that the process from felling to delivery could not be more effective and the deliveries faster and more precise.

Harvesting based on delivery requirements

The optimal material and production flow is obtained if the customer's needs can steer the harvesting work. This is exactly what has been done in *Timber on the Go*. The felling machine operators have been equipped with a laptop computer called Husky Hunter and a Mobitex unit for mobile radio communication. Orders received, current price lists and other information which can be useful for the machine operator, are transferred by radio communication from the sawmill's EDP system to the laptop computer. The laptop has an interface for direct data interchange with the felling machine's computer measuring and marking the timber.

Data about required dimensions and lengths as well as current price lists are automatically transferred to this computer assisting the machine operator to control the felling machine and to enter data about the felled timber. Thus the machine operator has good support in the planning of the work and can fell exactly those types of trees, dimensions and lengths which are needed as well as marking the timber so that it can be identified against the received orders. After each shift, data is transferred from this computer to the laptop. The machine operator supplements the data with additional information which is then all sent to the sawmill's database.

In this way, the sawmill always knows which timber is coming in and when it is arriving. Transport, production and deliveries can be optimally planned. All raw material can be used with the minimum amount of waste. No raw material is left stockpiled unnecessarily either by the timber roads or at the sawmill. Neither does theprocessed products lie in wait for sales as it is the customers' requirements which right from the start control both the felling and processing. It is possible to achieve a cost-effective material and production flow and attain a high level of guaranteed delivery.

The machine operator gets closer to the customer

With this technique, the machine operator's reporting procedure is simplified, he gets closer to the customer and is actively involved in production planning. He can plan his work with regard to current prices and the customers' wishes about the type of tree, quality, dimensions and delivery times. Thus, he actively participates in the felling work so that it is adapted to the production at the sawmill and the promised delivery times.

A striking example of how the machine operator gets closer to the customer is the following story by the supervisor Anders Forsberg:

"After a discussion with Birger about how we should fell the new Japan logs, we decided to test it on a machine. Paul compiled a new price list on Tuesday which was directed towards the special length of 410 cm in several classes of diameters. He sent it to the test machine. The price list also contained instructions that the 410 cm logs should be colour-marked. On Wednesday, the measuring and marking was started according to the new price list. On Thursday, we had a visit from our marketing manager together with a Japanese customer. There was already a pile of red-marked Japan logs by the roadside at the same time as the articulated tractor came up with another load. The Japanese person probably was quite impressed and Sven on the felling machine was fired with enthusiasm. The Japanese person joined him on the machine for a while and finally Sven suggested that the Japanese customer could ring him directly on the felling machine if there were any other special requests!"

Short and long term profitability

Over one year, it was possible to save 3 million kronor (SEK) at one of Graningeverken's sawmills just by avoiding the deterioration in quality of pine trees. The savings were even greater when the lower

logistics costs, improved use of raw materials and reduced capital costs for stockpiling were taken into account. The costs for wood piles in the forest can, for example, be reduced by as much as SEK 10 per cubic metre.

Why was Mobitex chosen?

Mobitex, comparatively speaking, is an old system for mobile data communications. It has been around for just over ten years and is a proven tool in transport industries where there is a need for data communication between mobile units and stationery EDP systems. Mobitex networks can be found, apart from Sweden, in several European countries as well as in USA and Canada and to some extent in South-East Asia.

But why was Mobitex chosen when the alternate communications choice was the use of the well-established NMT (available in the Nordic countries) or GSM mobile phone networks? The answer is that mobile telephony could not be used because of the lack of coverage. It is true that the majority of Sweden is accessible by mobile phone but there are still gaps in coverage in the northern mountain areas and in less populated regions further south. And even when there is coverage, radio reception for NMT or GSM can be degraded in hilly terrain or deep in the forest as these networks use shorter wave lengths than Mobitex. Therefore, the choice was straightforward.

Another difference between Mobitex and mobile telephony is that Mobitex is based on packet switching technology and therefore is totally adapted for communication over packet switched networks such as Telia's Unidata Datapak and Eripax which are often used for communication between large EDP systems. Apart from this, Mobitex offers a number of functions which are suitable for transport industries such as the ability to transfer data and text messages and to send messages to individuals or groups. It is also possible to use speech connections between Mobitex units as well as to reach the public fixed and mobile phone network.

In addition, the alarm functions in Mobitex are a great advantage. A tree felling workplace is not risk-free and it is often located a long way from civilisation. This will be further discussed in the section on *Forest alarm*.

Husky Hunter

Not any laptop computer will do in the demanding environment of tree felling taking into account the weather, vibrations, jolts, sawdust, dust and pine needles. A sturdy and well-sealed computer is needed. Husky Hunter easily works in the hottest summer months, worst damp autumn weather and the harshest winter cold. It can cope with jolts and vibrations and keeps out moisture, liquids and solid particles.

Forest haulage contractors

Background

This project is directed at communications supporting the transport of timber from the felling locations to the sawmills and pulp mills where the raw materials are processed. As in *Timber on the Go*, SkogForsk is one of the driving forces behind the project together with a large number of stakeholders. Various suppliers of raw material, processing companies and transport companies are involved. They all have a common interest in ensuring that the transport capacity is utilised in the most cost-effective manner, that the capital costs tied up in stockpiles of timber are reduced, that deterioration in quality is prevented and that the raw materials from the forest arrive at their destination "just in time".

Mobitex – again

In the same way as in *Timber on the Go*, Mobitex is used to exchange information between the mobile units (in this case, the logging trucks) and the EDP systems of the haulage companies, sawmills or pulp mills. As previously stated, Mobitex is a communications system which is well established in the transport industry. It is used by all types of haulage contractors for transport planning, traffic control, driving orders, reporting etc. It is not possible to use NMT or GSM, as there is exactly the same problem of coverage with the timber trucks as in the example of *Timber on the Go*.

So this is how it works: The haulage contractor receives information from the sawmill about the raw material to be collected in the forest and when it should be delivered. This information is transferred directly from the sawmill's production planning system to the haulage contractor's transport planning system. Each transport is planned for optimal carrying capacity within the time restrictions for collection and delivery. The transport plans with information about the various trips are transmitted to the drivers' computers by Mobitex. The drivers report back after each task. Thus, both the haulage contractor and the sawmill can follow up the situation by always being aware of the position of each transport, what it contains and when it is due to arrive.

Openness and profitability

Several of the companies involved in the project have been competitors since time immemorial. At the same time, everyone realises that

the transports are a very important link for the effectiveness of the entire Swedish forest industry. And what the forest industry gains, is to the benefit of the individual companies as well as the forest industry's international competitiveness.

Therefore, traditional conflicts between the involved parties in the *Forest haulage contractors* project have been overcome. The project illustrates how increased competitiveness can be based on cooperation and open information channels. This is one of many examples of communication and communications systems contributing to increased openness which in turn results in increased profitability.

Forest alarm

Background

Forest alarm is a project carried out in cooperation with SkogForsk, Mälarskog and Telia. Working alone and in isolated locations can present risks in modern forestry work. However, the risks can be minimised with technical aids. An injured forest worker can raise the alarm for rescue and be found straight away through satellite navigation.

Mobitex – yet again

For precisely the same reasons as in the *Timber on the Go* and *Forest haulage contractors* projects, Mobitex is the basis for *Forest alarm*. The Mobitex unit, which was found in the tree felling machine and in the forest worker's truck, has now been supplemented with a little personal alarm system. This alarm is carried on the forest worker's person in a similar way to the emergency call systems used by aged and disabled people. When the personal alarm is activated, the signal is transmitted to the Mobitex unit which automatically calls SOS Alarmering, an emergency service centre.

The personal alarm has two buttons, one for testing the alarm and the other for the real alarm. The forest worker can assure himself that the alarm is working by checking the test alarm. He should always be able to rely on it. The test alarm goes to the emergency service centre but does not reach the operators. The real alarm goes directly to the operators who immediately send out a rescue team. A return signal from the emergency call centre via the Mobitex unit activates the horn on the felling machine or truck and is an indicator for the forest worker that the alarm has been received. There are different signals for the real alarm and the test alarm. This is partly for practical reasons and partly for safety reasons. If the forest worker in the confusion of an accident presses the test alarm instead of the real alarm, it is possible to correct the mistake.

Using satellites for positioning

It is not always enough that an injured forest worker is in relatively close proximity to the Mobitex unit in order to find him. The position which he has to manually feed in to the Mobitex unit may not have been properly updated especially if he has been out in the truck at several different workplaces in the forest. This was why the position provided by the Mobitex unit was not used in this project. Instead, the

Global Positioning System (GPS) which is a satellite navigation system was chosen.

GPS satellites constantly send out signals so that a GPS receiver can exactly estimate a person's position anywhere in the world. With a GPS receiver connected to a Mobitex unit in the vehicle, a position description is sent on to SOS Alarmering together with the alarm.

The positioning will be even more accurate if the forest worker carries the GPS receiver directly connected to the alarm on his body. Even if he is not far from the Mobitex unit, it may be difficult to locate him in rough terrain especially if he is not able to shout when rescue is close by. Therefore, the small GPS receiver may be built into the personal alarm as the next stage of the *Forest alarm* project.

Various applications of GPS

The system was originally designed by the US Defence for navigation and its usage has increased dramatically since the system was introduced to users worldwide.

This has resulted in a growing number of applications. GPS is now used for civilian air, sea and land navigation. The system is becoming more common amongst, for example, professional vehicle transportation. One example is car hire firms which use GPS to monitor a car's location. Another example is international trucking. A driver in a foreign city might lose his way but he can easily find his position with a GPS traffic control system. This type of control system also makes it simpler for the haulage contractor to locate its trucks and to keep its transport plans properly updated. GPS systems are attracting more interest as "just in time" transport becomes an important competitive device for the haulage contractors.

Various measurement work such as layout of roads, surveys of cables and finding the locations of ancient monuments are further examples of GPS applications. One of the latest applications is the Öresund project, where a bridge will be built to connect Sweden and Denmark. GPS is used to steer dredges and position the foundations and tunnels with enormous precision. Another topical application is position finding and surveys of the scene of a crime. In association with criminal investigations and as a preventative measure, the system has many uses. Cars and boats which are popular with thieves can be fitted with GPS equipment and be easily located if they are stolen. Such an investment can be profitable for both the owner and the insurance company.

A totally different example of the use of GPS is domiciliary care where technical aids are considered useful for locating wandering patients with dementia. Here, the emergency call system can even operate outside the home. Patients have the opportunity of moving around more freely without carers or relatives being forced to be zealous "prison warders". However, it is vital to balance what is technically possible with respect for the individual's integrity and safety.

FR Online – The meeting place for Sweden's business people

Background

Företagarnas Riksorganisation – FR (the Federation of Private Enterprises) is Sweden's largest business organisation. Its approximately 100,000 member companies represent a huge number of industry sectors, types of businesses and business approaches. About half of the member companies are directly associated with FR while the other half is affiliated through 36 branch associations.

The FR Online project was established so that FR can create a communication network within the Federation. Small companies comprise a predominant proportion of members and FR Online was principally designed to cater for their needs. Of course, FR Online can be used by medium and large member organisations but the small companies often have a more difficult and different situation regarding their IT usage.

The initiative for FR Online actually arose as a result of a letter sent to Telia from FR with a request for a more appropriate range of services and better support for small companies. What started more or less as "Now Telia better damned well do something..." resulted in constructive collaboration with the Demotel project FR Online.

FR's organisation

FR comprises a central organisation and a Board with representatives from many parts of Sweden.

The central organisation consists of a head office and 17 regional offices. It supports member companies with professional advice areas such as finance, law and business policy. It also represents the companies' collective interests and lobbies the media as well as politicians, authorities and other relevant parties. The aim is to create increased understanding and improvement in conditions for companies and business people. Another of FR's many important tasks is to disseminate information to member companies on new laws and regulations.

The Board represents 25 districts and 327 associations. On the local level, FR is more of a social club where lectures, breakfast meetings and pub evenings are arranged both for pleasure and to the benefit of business dealings. FR on the local level is quite a traditional organisation whose members are mainly men who, on average, are in the older age brackets. This is stated to illustrate the current situation and is not meant to annoy those business people who in many important respects are innovators and constitute the pillars of society.

New directions

FR Online is one part of FR's new directions strategy. Considering the high hopes of politicians that increased small business activity will lead to decreased unemployment, a strengthening of cooperation and liaison between small companies is necessary. The combined voice of companies needs to be more strongly heard in public debates. Their business opportunities and skills in various areas need to be developed. And new business people who do not have the same amount of experience as those who are well-established, need more effective initial support. An organisation such as FR can never rest on its laurels.

Needs analysis

FR Online is a Bulletin Board System (BBS) for information dissemination and exchange by computer. This can be compared to a communication medium offering enormous opportunities for creating a broad network of contacts. FR Online can operate on a person to person basis just like the phone and fax. But the communication also

operates on a group basis, for example, within a district or a certain industry sector or from central office to all of FR's members.

FR Online was set up to cater for the following needs:

- More effective information dissemination from central office to members.
- More effective distribution of the services offered by central office to its members.
- Service innovation and development so that members obtain even greater benefit from FR.
- Better opportunities for members to communicate with each other and exchange experiences and viewpoints.
- Better opportunities for companies to make use of each other's experiences, resources and expertise to enable them to establish joint business ventures.
- Increased opportunities for marketing in a geographically broader market.
- Increased opportunities for professional development within important areas.

The above overview of needs is probably more obvious to the central office than the individual member.

FR Online users

The users of FR Online are far from a homogenous group in all respects: age, sex, background, professional experience, level of qualifications, area of expertise, computer usage etc. A reasonable profile of users can be obtained through rough categorisation.

- The typical business person and FR member is a male. Whether highly educated or not, he is a highly-experienced businessman. These typical members, generally speaking, see little benefit in FR Online. But it is important to gain their support as they have the power on the Board. Many are probably reticent about using computers when fax can sometimes be seen as an annoying technical gadget and are adopting a wait-and see policy. Besides, FR Online may be seen as a threat to FR's social role as "networking by computer" may not be considered as enjoyable or beneficial as social get-togethers. One must quickly point out though that one good practice does not preclude another!

- While the typical new business person is still a Swedish male, more and more new business people are women, young people and immigrants. The central organisation needs to meet their comparatively higher needs for professional advice about business conditions if FR is to be an attractive organisation for new business people. This need can be met in a cost-effective manner through FR Online. At the same time, it gives new business people the opportunity of creating their own network of contacts which would otherwise take a long time to build up through personal contacts.

- To further categorise, another special group of small companies are the knowledge-based firms, many of which are new. People who set up these companies are highly educated and have a different perspective of IT than the typical FR member. If FR is going to entice the new knowledge-based companies, it is with "networking by computer" as much as with social get-togethers.

It is important for FR to attract the new knowledge-based companies as there then would be increased opportunities to buy and sell skills for the mutual benefit of all member businesses if they were connected to FR Online. Many small and medium enterprises (SMEs) need expertise within areas such as IT, business growth, product development, marketing, finance and languages but cannot employ university educated staff. There may also be resistance in purchasing services from some of the large consultancy firms whose experience and fees are often more attuned to large projects.

Current IT literacy of members

Approximately 60% of the roughly 50,000 companies which are directly affiliated to FR currently use computers. A relatively small proportion (30%) of the computer users have a modem. This basic statistic indicates that computer usage ranges from zero to an unspecified level and the typical situation is usage of a few standard software programs. The proportion of modem users indicates a relatively low IT literacy.

The longer a small business person waits to launch into IT, the more varied will be the possibilities. And the more important but more difficult will then be the first step. The biggest obstacle is the lack of time. It takes time to become acquainted with the selection of computers, software and communications options in order to decide what is re-

ally needed. It also takes time to learn how to use what has been purchased. The dilemma is that it takes time to save time.

IT development for small companies

The project FR Online is a clear indication of the importance which FR's central organisation places on encouraging IT development in smaller companies. The increased possibilities for communication over open networks brings with it many new opportunities. There is strong potential for rationalisation of resources and improved effectiveness but even more so for business growth and increased competitiveness.

Companies will gain greater benefit from IT development as a whole if they are better at using the new communications systems to link their administrative systems, production systems and logistics systems as well as build up EDI functions, electronic marketing and electronic commerce. It is easier for small companies to use IT than ever before but they often do not have the skills to put it into practice as they have limited expertise in IT-based business growth and systems integration. Someone must supply this.

FR working in cooperation with IT suppliers, which have experience in working with small companies, can offer this possibility. Combining forces, it is possible to increase companies' understanding of and interest in the opportunities of new developments. And the fragmented nature of SMEs can be brought together into a market which is attuned to business growth and systems integration. It can be said that an organisation like FR is necessary in order to gather together the smaller companies into a larger and more homogenous market. This is a market large enough to have its requirements met and at the same time is concentrated enough for IT suppliers to expend effort in offering integrated and business-supported overall solutions.

A larger and more homogenous market segment is required to develop IT solutions which do not just comprise personal computers with standard software but can also offer a rich diversity of IT-based business development and integrated systems solutions. An IT supplier may be unable to package and reuse the large amount of knowledge which has been built into the provision of new services. Thus, services become more consultancy-based and often too expensive for the smaller company. This is the main reason that IT-based business development and integrated systems have primarily been acquired by the larger firms which generally can bear the consultancy costs.

IT requirements for FR Online

FR Online is based on an IT solution for small business people with extremely varied backgrounds and on average with relatively low IT literacy. This solution must be simple, easily accessible, reliable and very user friendly. And it must also be inexpensive.

All systems and applications which are offered to smaller companies must be simple, easily accessible, reliable, user friendly and not too expensive to be beneficial. This is not because the users are different to their colleagues in the larger companies but because they are often less specialised. Besides, there are often tighter margins for time and money.

Consequently, IT solutions for smaller companies need to have good built-in features. The case is quite different with larger firms as their systems are more complex. They often commission the setting up of systems themselves, including integration, operation and maintenance as well as the provision of technical support and proper training for users. Those systems which are not commissioned by the companies themselves, are purchased from IT suppliers and third parties whose product range is usually better adapted to the needs of larger firms.

FR Online's IT solution

A stable, user-friendly and relatively inexpensive IT solution has been chosen for FR Online. It is called First Class and is a Bulletin Board System (BBS) with electronic bulletin boards and conferences for information exchange and information dissemination within closed user groups. Electronic mail can also be used both within and outside FR Online. First Class has become quite a common way for geographically dispersed companies and organisations to handle internal information.

From the user's point of view, access to a personal computer and modem for data communication over the phone network is required to use First Class. Special software, which is offered to FR's members in an FR Online package, also contains user instructions and other important information. An 020 number (toll-free number) is used to reach FR Online. Those members who do not have a computer, can use a phone or fax (fax on demand) to gain access to most of FR Online's services.

FR Online uses a central server and has chosen a flexible communications solution so that the use of a certain type of modem is not imposed on members centrally. The server has a modem pool with a choice of different types of modems and range of speeds.

Why not an intranet?

An intranet, which is Internet technology for closed user groups, would have provided a similar solution. It provides a huge number of possibilities especially with regard to communications and information searching outside FR Online. But at present an intranet solution may not be as easy to use and as inexpensive. This situation can quickly change. When the time comes, FR Online can switch to an intranet without any inconvenience to the users.

What does FR Online offer?

Users of FR Online first see a welcome page with the title "FR Online – The meeting place for Sweden's business people". The welcome page contains icons with simple and clear symbols which illustrate the different uses of FR Online:

- Help – Assistance in using FR Online for the new user.
- Mailbox – Personal electronic mailbox with folders for sent and received mail.
- Business people talk – Electronic conferences in different skill areas.
- FR in Sweden – Information exchange between clubs and districts.
- FR info – Information on FR's commercial policy work, news, media releases, press clippings on FR mentioned in newspapers as well as articles from Företagarnas Presstjänst, a media service for companies.
- FR's industry associations – Presentation of the associations.
- FR Debate – Dialogue between business people, employees and elected representatives.
- *Företagaren* newspaper – Articles and advertisements. Messages about news items or interesting topics to be discussed can be sent directly to the newspaper's editors.
- News – Latest news from FR.
- My interests – A meeting place where members can sort their favourite conferences into groups to make usage easier.
- Other systems – Information on and direct connections to other systems.
- FR membership – FR's calendar of events, useful names and addresses, membership benefits, talks and articles on commercial policy

as well as listings of FR's publications and other material that can be ordered by members.

- FR trading – Advertisements can be placed to buy or sell products, services or spare capacity. Or to seek collaboration with other companies or maybe just to introduce a company.
- Advice line – Good advice does not always have to be expensive. The advice line has a solicitor on duty and there are other possibilities of receiving answers from experts on questions of tax, finance, labour legislation etc. Questions can be asked directly or people may wish to follow the questions and answers which are introduced in the advice line's conferences.

There are plenty of opportunities for FR Online and it has the potential for further development. This is especially the case with FR trading and the advice line.

FR trading, an easy way to buy, sell and establish joint ventures with other companies, provides the small business person with a new dimension for marketing and business development. Members can take advantage of the large scale of FR's organisation to do more business or make bigger business deals. New and maybe surprising markets can be found for a company's products and services without the need for large investments in marketing and sales promotion material. Companies with customers in common can offer a more comprehensive service than is possible for individual companies.

The advice line, offering professional advice, provides the opportunity to get answers to questions from experts at FR's central organisation. There is also the possibility for various member companies to offer each other professional advice within their own areas of expertise. This can cover everything from marketing to tricky questions on choosing the best material. It depends entirely on which companies are connected to the advice line.

What can FR Online offer in the future?

It is easy to imagine all sorts of possibilities without being unrealistic. As small companies always find paperwork onerous, the paperwork can be eased with FR Online. For example, a toolbox provides various choices such as:

- packages with user-friendly and appropriate software for word-processing, layout, spreadsheet, planning, personnel administration, book-keeping, accounting, records management, client files

- easy to use templates for layout and phrases for business documents such as quotations and invoices as well as business correspondence, reports, memos etc
- functions for monitoring and carrying out of business activities
- support for EDI and electronic commerce
- annual agendas with current directions for legally regulated business activities for various types of companies
- and more (it probably should be added).

There is standard software on the market for most of this. Some of it is marketed as complete, user-friendly office suites. However, the individual business person has to find out what programs are available, choose the ones most suitable, buy them, learn how to handle the differences and similarities as well as keep them updated when new releases become available. All this takes time and costs money.

In addition, the cost is the same for the person who seldom uses the software as for the person who often uses it. It would be better for the individual business person to pay for use only and also to be spared the need to keep programs up to date. There is a trend in this direction. The prevalence of the network computer will probably continue to be discussed for quite a while but the fact is that software suppliers are increasingly starting to distribute their programs via the Internet and to lease them rather than sell them. Thus, the customers' capital commitments are reduced and they are more likely to use software which they otherwise would not have bought primarily because their level of usage was not enough to warrant the purchase.

This could occur if FR, in cooperation with one or several IT suppliers, put together a toolbox which could be offered to small companies through FR Online. This is an example of how the large scale of FR and its strong position can produce results which otherwise would have taken a long time to achieve. FR can both analyse the needs of small companies and present those needs to the IT suppliers. FR also has the resources to assemble the toolbox with a common user interface as part of FR Online so that the contents are as simple, accessible and user-friendly as possible. These possibilities should be seen as ideas and not as concrete plans.

Professional development

Another problem for small companies is professional development. The need for training is on par with the constant lack of time. FR

Online is an excellent medium for dissemination of knowledge in the form of brief details on a bulletin board and the distribution of more indepth information over the network. Similarly, it is possible to form study groups through the BBS conferences on such topics as European Union regulations, Quality Assurance and the use of electronic commerce. Needs and interest would determine the content of the study groups.

Professional development and distance training can be facilitated in many ways by interactive education, use of multimedia and the less common but very effective use of knowledge-based systems. These are often called expert systems but this name gives a misleading impression of its use. Interactive, knowledge-based systems can produce realistic training in problem solving in a way which is difficult to imitate. Thus, both knowledge and experience are gained.

Selling the idea of FR Online to users

FR Online can become an electronic marketplace for knowledge and ideas, goods and services. This marketplace strengthens members' opportunities to make themselves a force to be reckoned with both as individual entrepreneurs and as a group.

As mentioned earlier, the need for FR Online is generally more understood by FR's central organisation than the individual member. However, if the individual member does not join FR Online, the critical mass of users is not attained to assure that FR Online is going to be beneficial. As with all communications media, it is the number of users which decides the benefits and opportunities for development. Right from the start, FR Online offers attractive services and useful information to benefit many members which in turn provides further benefits and even more members.

As FR on a local level is very much a social body, the influx of users greatly depends on word of mouth. Good experiences of FR Online is very important in order to attract more members. The first stage of the project involves a pilot district so that both the range of services and the technology will work in a way which is adapted for members and to show that computer networking has a positive influence on social get-togethers. Usage is encouraged and supported in the pilot district. At the same time, the services are revised and added to in order to become more beneficial and user-friendly. When the experiences of the pilot district indicate that it is time to promote FR Online more widely, a large number of testimonials can help to broaden FR Online usage to all districts.

Networking on the computer versus social interaction

Any fears that FR Online on a local level may constitute a threat to the social and personal relations amongst members should be allayed. FR Online is a communications medium and increased possibilities for communication very seldom lead to reduced social interaction. Train, boat, car and plane have not done this nor has the telephone. Instead it is an important basis for the maintenance of lively contact with colleagues and business associates. In the same way, and to a greater extent, FR Online provides the opportunity to create and maintain a broad, deep and varied network of contacts. It is possible to be present in many different ways regardless of time or geographical distances.

Networking for knowledge, creativity and communication

Åseda and Lycksele at the centre of the universe

Success factors for both individuals and companies rely on knowledge and the ability to create networks. The networked organisations now evolving are often based on visions of a different type of organisational and social structure within and outside the company and towards customers. The organisations may be less fixed and hierarchical; and virtual corporations and project-based consortia can be developed. These can function as long-term partnerships or temporary phenomena depending on circumstances.

"In the new society of knowledge, creativity and communication, it is not natural resources or the proximity of the market which are important factors. Companies locate themselves in regions which are well-equipped for knowledge, communication opportunities, culture and creativity. These regions also tend to build networks. The large, knowledge-based corporations build a range of production units of equal size on these networks. The pattern replicates itself and makes use of the whole network's capacity in relation to knowledge and communications opportunities." (Andersson & Strömquist, *K-samhällets framtid*, 1988)

When this was written, the regions discussed were seen as geographical centres such as university towns. The development of research parks such as Electrum in Kista (a suburb in Stockholm), Ideon in Lund and Chalmers Technical Park in Göteborg as well as Soft Center in Ronneby are some examples of this type of thinking. Not even the most well-initiated in 1988 could imagine the fast development that was about to take place in telecommunications. Mobile phones were status symbols for yuppies and the Internet was a totally unknown concept outside a small group of researchers. Those networks which existed for computer communications were proprietary. Open networks were still a futuristic vision.

Now it is easy to see that knowledge regions can be virtual and geographically totally independent centres for knowledge, creativity and communication. In this way, both the small and fairly isolated towns (in the traditional sense) of Åseda and Lycksele can be at the centre of the universe.

New ways to work in networks

Sproull & Kiesler describes in the book *Connections – New ways of working in the networked organisation* (1988) how collaboration through networks, both internally within companies and externally for customers, suppliers and other interested parties, can give rise to new social phenomena and ways of working:

“The real challenge will be to the human imagination to envision and invent new ways of working in these (networked organisational) structures.

Electronic linkages between organisations will substantially increase in the future. They will undoubtedly reduce processing time and costs for many routine transactions. Their more important effects, however, are likely to be found in how they change the focus of attention, social contact patterns, and interdependencies among organisations. We can not predict the particular form that these changes will take, but organisations that see more than efficiency benefits will be best positioned to capitalise on them.”

We are still at this stage. Time, space, geographical distance, organisational affiliation and the formal position in the hierarchy are less important in the networked environment. Many people can quickly shed some light on a problem and contribute with knowledge. It is possible to access a variety of knowledge without first having to be aware of exactly who knows what. It is difficult to visualise the significance of all this.

On the other hand, it is very easy to imagine. Cooperation and collaboration between companies which support each other, relieves pressure and complements each other. Does this sound familiar? Maybe all the talk about IT-based networks and virtual organisations is a fancy way of expressing what is generally the old cottage industry spirit of innovation and cooperation which in Sweden is called Gnosjöanda. This cottage industry spirit can now be further developed without geographical restrictions.

Telecommuting and mobility

- Overview
- Sydkraft – An office in the car
- The Alarm Centre in Karlstad
- On call at Malmö General Hospital
- Vetlanda ComCenter
- Telecommuting research

Overview

To be able to travel, not to have to travel or....? Telecommuting and mobility can take many forms, have many reasons and be used for many purposes. Mobility is to be able to work independently of a fixed location, for example, to be able to travel and still be accessible and contactable as if the person was at an ordinary workplace. The aim of telecommuting is usually to avoid travel. However, reality is not quite so straightforward which is evident from the Demotel projects described in this chapter.

- Sydkraft's service technicians have offices in their bags æ a mobile, complete, comfortable and foldaway office workplace with all communications facilities. They can be both reachable and unreachable with this type of office in the service car regardless of their location.

- The Alarm Centre in Karlstad monitors industrial sites all over the country and can summon emergency crews if necessary. The first installation under surveillance in this way is Telia's Hammarby site in Stockholm.

- Malmö General Hospital represents one of many projects in health care where video communications in combination with remote X-ray diagnosis is a good way to make radiologists' expertise more accessible. This means that health care can be more efficient and patients save time and benefit from improved security as well as the occasional avoidance of long and difficult travel.

- Working with telemarketing from home means that travel to work is avoided. In the case of Vetlanda ComCenter, it provides hope for the future and work opportunities for a number of women who otherwise would be unemployed.
- Research into telecommuting in a survey undertaken by the Sociological Institute at Lund supports the experiences of Vetlanda ComCenter. A forthcoming doctoral thesis illustrates both the problems and possibilities of telecommuting from home by women.

Sydkraft – An office in the car

The service technicians of Sydkraft, a large energy company are now equipped with a mobile office in a handy case, the size of a cabin bag. The case is specially designed by an industrial designer to offer a compact and effective office workplace in the car. This is an office which is easy to carry when the car is not used, if one has to work at another location or to avoid the “office” being stolen.

The case contains a laptop computer with built-in printer and a communications port connected to a digital GSM phone as well as a transformer and a power adaptor connected to the car’s cigarette lighter outlet. When the service technician uses the office in the car, the case is attached to the front passenger seat with a simple fastening device. The case, when open, functions as a work table with a space in the lid for office material, maps etc. The computer is mounted on a plate which can be opened and adjusted to a comfortable position in the driver’s seat.

Service technicians can obtain information about their jobs and report results back through the mobile office. They can communicate with and through the office’s LAN but can also use public phone services for sending and receiving faxes and electronic mail and connecting to external databases. These communications opportunities cover all the requirements of people who, to a large degree, use the car as a workplace and who need to be in contact with the office, customers or other parties. Communications is both national and international because GSM usage covers all areas served by the GSM network.

Sydkraft’s mobile office was tested initially on a small scale with very good results. In this case, it is Sydkraft’s service technicians who have the need for a comfortable, easily transported and communications-enabled office workplace in the car. Other companies may need it for their service technicians and travelling sales staff or maybe it would be useful for journalists who work out in the field. Many outside Sydkraft can benefit from the developmental work done in this project. This is why Sydkraft Telecom now sells the package with the mobile office under the product name MobiKom.

The Alarm Centre in Karlstad

The Alarm Centre in Karlstad offers remote visual alarm services. In this case, the concept of telecommuting refers to a service provided from a remote location. With the aid of interactive video communications, it is possible for industrial and commercial sites to be under visual surveillance regardless of their location in Sweden. Local security services or the police can be called in, as necessary. The Alarm Centre in Karlstad is a project with stakeholders including SOS Alarmering in Karlstad, TeleLarm and Tandberg, an important supplier of video and audio communications equipment.

Needs

The need for surveillance services increases but these services can often be quite expensive. The Alarm Centre in Karlstad shows how, with the support of modern technology, it is possible to make surveillance services more accessible with regard to cost. The visual alarm services offered are a combination of movement detection systems and visual surveillance. These types of services are best used to guard installations against unauthorised entry or in a visual manner gain an appreciation of damages caused by fire or other accidents. The first installation monitored in this way is Telia's Hammarby site, a large rock shelter which houses many advanced and important technical systems.

IT solution

This project is based on similar communications technology, in principle, to that used for videophones and videoconferencing. Video cameras have been placed at sites and places to be monitored. The video information is coded for transmission by ISDN to the Alarm Centre. The video transmission is not continuous, however, and connection to the Alarm Centre only occurs when something changes in the camera's field of vision. There is then an automatic and lightning fast connection. The cause can be investigated more closely at the Alarm Centre and suitable measures can be taken.

As the surveillance is activated only when something moves in the camera's field of vision, there is a combination of continuous visual surveillance and movement detection. In many cases, it is when something unusual happens that it is important to be able to monitor what happens and find the cause.

It is possible to combine the video transmission with control signals to

the surveillance camera because ISDN can be used for transmission of both image, sound and data. It is technically possible, from the Alarm Centre, to alter the camera angle and zoom in as well as activate other cameras other than the one that has sounded the alarm. It is even possible to manipulate floodlights and other technical aids and to use infrared cameras if the place under surveillance is not lit at night.

Naturally, video and sound are combined so that the Alarm Centre can see and hear what is happening and with a stern voice, shout out “Who is there?”. Likewise, incoming alarms can be automatically logged and recorded picture and sound sequences can be stored in the database which is part of the alarm system. Important information about the sites under surveillance can also be stored in the database. When the alarm goes off, these details are automatically shown on the computer screen at the Alarm Centre. This uses similar technology to calling line identification when incoming phone calls activate a client database as discussed in the chapter, *Service and client support*.

The details in the database can vary depending on the type of place under surveillance. It can comprise checklists of measures to be taken by the Alarm Centre as well as phone numbers for contact persons, the closest police station, which security firms should be called etc. It is possible to quickly locate where on the site the alarm originated if a digital map of the site is stored in the system. In this way, the Alarm Centre can prepare and guide the alerted emergency staff.

Profitability

Remote visual alarm services can be used both as an alternative to and as a complement to security guards on the spot. They can also be combined with other technical alarm and security systems. With this new and effective technology, the market potential for alarms and security is increased to include sites where surveillance costs were earlier considered too high in relation to the risks. The technology is flexible with many possible solutions which can be tailor-made with regard to both costs and risks.

Comparative costing, based on profitability, could be done on surveillance by security guards on the spot and the security services offered by the Alarm Centre in Karlstad. However, the extent to which remote visual alarm systems can replace manual surveillance on the spot varies from case to case. The most appropriate solution depends on the site’s characteristics, its location (especially if it is secluded) as well as the risks involved. A general comparison of costs versus risks is therefore difficult to make in this case.

On the other hand, it is possible to make a comparison between remote visual surveillance with communications technology based on leased permanent telecom lines. The advantage with ISDN, which similarly to the standard phone network is a switched network, is that the connection between the installation under surveillance and the alarm centre only needs to take place when the video information changes. When everything is calm and quiet, the situation is as it should be. Continuous video communication is not necessary with ISDN. It is not necessary to pay for any transmission capacity other than that which is used. This means that many sites which previously were considered too expensive to monitor visually now can be guarded in this way.

In certain cases, ISDN can have a functional disadvantage. If something moves very quickly in the camera's field of vision, the transmitted image can appear jerky. This disadvantage, if even noticeable, is often overcome as it does not influence the alarm function. Another factor which influences profitability is that costs are decreasing for most types of ISDN systems and equipment. This is due to the fact that ISDN is increasingly used worldwide. A factor which may not slow down, but also does not increase usage of the new surveillance system is that the investment and operating costs are not reflected in lower insurance premiums. The technology is so new, despite having been around for a few years, that it is still difficult for the insurance companies to evaluate reduced risks of damage.

On Call at Malmö General Hospital

Background

On Call at the X-ray department of the Malmö General Hospital is a further example on the use of picture communications together with telecommuting. For several years, Telia and the health care services in Malmö have closely collaborated in the development of the use of picture communications for diagnosis. This project is one of many examples aiming for increased effectiveness and security in health care.

Needs

Being on call means that the radiologist is available at home during evening and night-time hours and can be consulted by the doctors on duty for the interpretation of X-rays. The digital X-rays are sent via the telephone network home to the radiologist on call to quickly make an initial assessment. Picture communications between the radiology department's computer and a computer with a modem which the radiologist takes home, saves time for the radiologist who would otherwise have to travel to the hospital to look at the X-rays.

The quicker a correct diagnosis can be made, the safer it is for the patient. This method is usually not used for comprehensive X-ray diagnoses but rather when the doctor on duty needs to consult with the radiologist. A much higher picture quality than what is possible with the technique discussed here is usually necessary for a comprehensive X-ray diagnosis. Even if the radiologist must go to the hospital to make a complete diagnosis, the first consultation will provide a substantial time advantage so that the patient can quickly be given the correct treatment.

IT solution

Digital X-ray equipment for techniques such as computed tomography is increasingly used today. Thus, X-rays can be stored in databases and sent via the phone network with no loss in quality. What does restrict the picture quality in this case is the standard phone network's transmission capacity as well as the screen resolution of the laptop computer. The phone network's transmission capacity does not permit the transmission of high resolution images. In actual fact, it takes too long to transmit them. Under all circumstances, the screen resolution of the

laptop computer places a barrier on the picture quality which can be received. The picture quality, however, is enough for a preliminary consultation between the doctor on duty and the radiologist on call.

Security is very important in this context. The radiologist may often have to look at several images. When they have been transferred, both the radiologist and the doctor at the hospital must be sure that they are looking at the same image. This is why Telia has taken part in developing a system where one computer takes control of the other computer.

This system was originally developed for another project where complete X-ray diagnosis is carried out remotely. However, then a laptop is not used nor is communications through the standard phone network. Large screens with high resolution are used together with transmission capacity equivalent to ISDN. This technology is used for communications between smaller hospitals and specialists at major hospitals so that badly injured or gravely ill patients sometimes can be spared transportation to the major hospital for X-rays.

Are there any disadvantages?

One disadvantage of remote X-ray diagnosis is the difficulty in obtaining the same overview on a computer as when the X-rays are viewed directly. An experienced radiologist quickly flicks through one image after another and can take stock of hundreds of images as well as select the most relevant. A similar overview can not be achieved on a computer using current browsing techniques. The importance of browsing for an overview can be more fully understood by using a book as a comparison. A quick flick through provides a very good idea of what the book is about and how it is structured. This takes a great deal longer if the book has to be browsed through on a computer screen.

User-friendliness!

The use of advanced technology within all areas of health care has increased over a long period of time. The attitude of all categories of health care staff to this development is quite ambivalent. Obviously, they see the great benefits but it is hardly a lively interest in technology which has brought them to health care. The ambivalence can be illustrated by the following quote from Staffan Sjöberg, the senior physician at the radiology department of the Malmö General Hospital:

“I don’t have a great desire to work with computers. But we see the developments among manufacturers and soon we will not be able to buy conventional X-ray equipment. Then everything will be stored electronically. To be able to indicate our needs, we have to be at the forefront of developments and constantly teach ourselves the new technology.”

The priorities for the new technology is a high demand on security and user-friendliness. If these demands are not made of the suppliers, they are required of the staff who work within the health care system. Naturally, the technical systems within health care are designed with both user-friendliness and security in mind. Besides, security is regulated by standards, regulations and legislation. On the other hand, user-friendliness is not regulated in the same way.

Different suppliers have different views on what is user-friendly. Staff who use various technical systems in their work are therefore forced to cope with different philosophies on user-friendliness. They must often accept different designs for man-machine interface, different logic for working with the system as well as different structures and design of the accompanying user instructions. There are many forces at work to achieve uniform standards in all these areas but it takes time.

More and more technical systems in health care are being automated at the same pace as interaction between the user and the system is increasingly occurring through the computer screen. The advantage is that standardisation of the user interface is facilitated at the same time as user support and manuals are included as part of the system. A comparison can be made with the developments that have occurred in office information technology where wordprocessing and spreadsheet software look similar and can be manipulated in a similar way despite the fact that they have totally different uses.

More examples of remote collaboration

Video communications is developing quickly as a method of telecommuting, both at a long and short distance. It is not only X-rays which are of importance. It can also be used with images of injuries where a specialist can judge and advise on measures to be taken as well as deciding if it is necessary to transfer the injured person to specialist care. In this way, both medical centres and smaller hospitals can be given support at an early stage when complicated cases are admitted.

Video communications also means that a remote specialist can follow an operation and provide the operating team with advice. Keyhole surgery provides opportunities of working in this way as the consulting

specialist can see on the computer exactly the same course of events as the operating team. At the same time, the specialist has access to precisely the same data about the patient's condition and test results. Naturally, the presence of a specialist can never be substituted by remote advice but in urgent cases, collaboration at a distance may be the only possibility for obtaining access to the specialist.

Vetlanda ComCenter

Background

Vetlanda ComCenter is a new telemarketing company with employees telecommuting from home. Vetlanda is located in a sparsely populated area with high unemployment where women are especially affected. ComCenter was started as a joint venture by the government's employment service, Telia and the telemarketing firm, Accretia. The initiators of the project got the idea after attending a course on telemarketing. Contacts with the government's employment service indicated that there was a group of unemployed women who, through previous work or through vocational employment training, had some computer experience and were interested in telecommuting.

Working at ComCenter

Telemarketing is an assignment-based operation using the phone and computer as work tools. The aim is to interest the person being called in the ideas or products of the client. It can relate to public opinion polls and market research or the booking of sales meetings but also straight telephone sales. Telemarketing work places high demands on a service-minded and confidence-inspiring manner in order to establish contact by phone. At the same time, it is important to be professional and efficient in order to have time for as many phone calls as

possible. It is also necessary to be thorough as the work comprises documentation of the phone calls so that the client can quickly follow up and use the results.

The women at ComCenter have, in different ways, appropriate backgrounds for telemarketing such as health care or office work as their experience in being able to relate to people is important. The ComCenter project started with six month's training in marketing and sales for the women as well as special training necessary for communication by phone. Communication by voice and speech only without the support of body language is a talent in itself. There was also training in the use of the equipment. Handling the equipment without any problems is especially important in telecommuting and with solitary work on the whole. Work efficiency is reduced but it also can be very stressful for those who do not have colleagues close by to call upon if the equipment can not be handled properly.

Telemarketing equipment

ComCenter's home workplaces comprise a personal computer with a modem and a phone with a headset. The computer and the phone are integrated to achieve more effective handling of the large number of outgoing calls. A number is dialled automatically when a name is clicked on the phone list stored in the computer for each assignment. When the called number answers, the time is logged automatically. A form pops up on the computer screen simultaneously. The form functions as both a checklist for the phone call and as support for the documentation of the call.

An experienced person can complete the form at the same time as conducting the phone conversation. This can save time. However, the inexperienced person would not do this as it can clearly be heard in the voice if concentration is on something other than the conversation. Then, the aim of interesting and involving the called person is not achieved.

The telemarketing assignments comprise preparation and planning, carrying out the phone calls, documenting them and forwarding the documentation through computer communications to a shared server at ComCenter's office in Vetlanda. The transfer takes place a couple of times a day using particular support software developed by Telia. Further processing and analysis occurs in the office where the clients can obtain results in progress. Modern and cost-effective technology together with cost savings in office space means that ComCenter can keep a competitive edge on the prices of its services.

Experience of telecommuting at home

Most of ComCenter's staff are positive about telecommuting but there are, of course, general problems with telecommuting from home. Independence is experienced as an advantage but on the other hand, there is a risk that the work can be seen as isolating. Regular weekly meetings overcome the feeling of isolation but they are sometimes considered inadequate when trying to obtain enough information about the various assignments. Working alone entails the ability to make quick decisions by oneself and to give clear answers. The more informed a person is, the better service can be given to clients and the people being rung and the greater will be the job satisfaction.

According to a questionnaire completed by the women at ComCenter, the most positive aspects of telecommuting are:

- travel to work is avoided saving time and money
- children can come home straight from school
- one is close by if something happens to the children
- it is easy to visit the school or the child-minder
- one can work undisturbed.

Negative viewpoints are the lack of daily social contact at the workplace and that there is nobody close by to spur you on when the work is difficult.

Telecommuting research

Problems and opportunities

Both the positive and negative experiences of telecommuting from Vetlanda ComCenter are recognised in a broader survey undertaken at the Sociological Institute at Lund. Kerstin Hytter illustrates in her coming doctoral thesis, both the problems and opportunities with women's telecommuting from home. This survey includes women who, similarly to those at ComCenter, work with telemarketing. Another part of the survey deals with women who have their own businesses and are based at home.

One of the important issues of the thesis is whether telecommuting from home can provide an opportunity to combine gainful employment with care of the family or if this is a trap for women. Is there a risk of being left behind professionally? Does the work offer professional development comparable with a normal job? There is a variety of answers to these questions, partly depending on what the main reasons are for telecommuting from home and what type of telecommuting is involved.

This type of work has previously been, to a great degree, the province of people with flexible schedules but now more occupational categories are joining the telecommuting group. However, the work methods of a conventional workplace are not necessarily appropriate for telecommuting. There may be a need for increased flexibility and presence from management as well as a conscious sensitivity towards needs and problems which are not the same or as obvious at a conventional workplace. Another type of strategy might be needed for professional development. We may take it for granted but the daily contacts between colleagues is important both to develop our professional competence and to have it confirmed.

Setting limits

Another interesting issue is how time is divided between gainful employment and family care when telecommuting from home. It can be difficult to set limits in relation to family members or neighbours who think "since you are home anyway, could you..." and likewise in relation to the employer if especially large efforts are required. Setting limits is not so problematical when working at a normal workplace. It is impossible to be both at home and work at the same time, in other words, there is an "alibi" which obviates the need to set limits oneself.

This can be an added stress factor for those who telecommute and are based at home.

On the whole, there are many aspects to setting limits when telecommuting from home. This includes setting limits between what is and what is not gainful employment. If a complicated consulting problem is solved whilst ironing, is this gainful employment or not? The borderline between the professional role and private life becomes much more ill-defined with telecommuting. This indicates in turn that the definition of gainful employment has, to a large degree, been dependent on the place where the work is done, in other words, the workplace. Similarly, work hours have been dependent on the time spent at the workplace. With telecommuting, the definition of what is gainful employment can, or must, be changed and be more tied to the work's character and results.

Opportunities for technology and people

Telecommuting, regardless of whether it occurs in homes or as a result of a different way of siting a company, is not only reliant on technological possibilities but to a large degree also on human and organisational opportunities. The individual is often attracted to the freedom in time and place, not to have to come in on time to work, to avoid commuting as well as being able to live and work where one wants and to have the family close by. The employer is attracted by the increased staff motivation and the reduced costs for office space.

For these and many other not yet discovered reasons, there is a trend towards increased telecommuting which in turn leads to an increased need for research into its conditions, threats and opportunities.

Many wish to consider telecommuting, when it occurs in the home, as a return to the times before industrialisation when people had to start leaving their homes to work in factories. Telecommuting from home should in that case be compared with a return to the pre-industrial outworking system. This may well be wishful thinking for those who try to convince themselves that the new opportunities are not so novel and maybe therefore not so transformational.

Outworking which developed at the end of the Middle Ages meant that people worked for a wage from home and used their own equipment while raw material and directives for output were supplied by the employer who also was responsible for the results. Work duties were simple and standardised. It was mass production but on quite a small scale. The work was often done by women and children. The wage was based on piece-work. Up till the 1940's, outworking was relatively

common in the Swedish textile and clothing industry. Many pensioners remember that it gave small farmers and crofters the possibility of putting aside a little bit of extra money for the family income.

A comparison between outworking and today's telecommuting from home could possibly be made if telecommuting consisted of simple and routine tasks which were performed according to fixed patterns set by the employer. This is not the case. Telecommuting can be very demanding. There is no upper limit. The lower limit is set since there are hardly any occupations these days which are totally simple and routine.

Outworking was a pre-industrial work method. Telecommuting today is post-industrial. So let's forget thoughts like "there is nothing new under the sun" and consider what this new wave can mean.

Telecommuting often means cooperation using networks. In the book *Connections – New ways of working in the networked organization* (Sproul & Kiesler, 1992), the authors make the important point that information exchange, using communication through networks, is often done in writing. Nothing other than what is stated in a message influences the communication between sender and recipient. The message is judged accordingly if it is badly thought-out and badly expressed. If it is carefully prepared and clearly expressed, the message will have better impact.

Totally different factors, other than the message's contents, play a crucial role in direct communication between people. Factors such as voice, gestures, charisma, clothing, body movements, authority and formal status all influence how a message is interpreted. The person who seems a bit unsure will often be perceived as a little stupid while the person who acts with self-confidence and worldliness often is perceived as clever. How often has wisdom been ignored and forgotten? And how many acts of folly have become reality?

Sproull and Kiesler state that many different types of people can more easily contact each other in an organisation using networks for information exchange irrespective of whether the network's aim is for telecommuting or for different ways to organise the company. Older and younger men and women, senior and junior staff, everyone's ability, experience and creativity can be better utilised in this way than in a conventional organisation. Bert-Inge Hogsved in the book *Klyv företagen! [Split the companies!]* provides a similar reflection in view of the large company, Hogia using electronic mail since the end of the 1980's as the principal means of internal communication. Experiences

show that the level of creativity and wisdom has increased and that the basis for decision-making has improved at the same time as the decision-making processes have become faster.

Service and client support

- Overview
- What is a call centre?
- Online Telefonpassning (Online Telephone Answering) in Kalmar
- Using speech synthesis for SMHI's (Swedish Meteorological and Hydrological Institute) special weather forecasts
- Synthesia – a small, specialised firm in a global market

Overview

The meaning of service and client support was, for a long time, related to products whose use required that the supplier provided service and support if the client had any problems. During the last decade, the meaning has shifted towards something more positive meaning freedom from problems for the client and an added value to products leading to an advantageous competitive edge for the companies concerned. Furthermore, the added value is increasingly present throughout the product's life-time. Thus, the client is treated positively from the first contact through to the time when the product has fulfilled its purpose.

Service and client support does not, however, always have to be linked with a product and its value but can represent values in themselves, in other words, services. The "production" of service and client support involves intensive contact and often information-based work. This can, to a large degree, be made more efficient and client-focused through different IT solutions. There are valuable opportunities for developing totally new concepts of service.

- To provide a background of existing opportunities, the chapter starts with a description of the fairly new concept of call centres and what this means.
- Next is a project which illustrates a normal requirement and a simple IT solution. This is for business people to receive and handle phone calls in a personal manner without always having to do it themselves. Online Telefonpassning (Online Telephone Answering) in Kalmar takes care of this.
- Because the weather is a constant source of joy and annoyance, there are many people who wish to control it according to their

own wishes. SMHI (the Swedish Meteorological and Hydrological Institute) has not quite accomplished client-centred weather as part of its service delivery but it is using IT to offer client-centred special forecasts.

- The chapter concludes with a visionary reality. Synthesia is a small Swedish high technology company which competes with global giants using its unique skills and a special IT-based concept for service and client support.

What is a call centre?

The call centre is a generic term for systems which efficiently support the handling of incoming or outgoing phone calls. Previously, it was not necessary to use the word call centre when one really meant the company switchboard. However, the call centre has more to offer than what was possible with a company switchboard. Technically, the fast development of digital telephony has resulted in:

- telephone equipment and computers working together
- a push button phone, whether fixed or mobile, being used as a small computer terminal
- advanced switching functions which are now available over the telephone network
- more integrated telecommunications and computer communications.

Some of the important functions or subsystems which can be combined in various ways to create a call centre are:

- calling line identification
- free calls, pay calls and business calls
- PLUS services
- Centrex
- call diversion system
- messaging system
- Interactive Voice Response (IVR) system
- speech synthesis
- fax on demand
- computer-supported telephony

Calling line identification. Before the phone rings, the telephone "knows" from which telephone number the call has originated. This has always been the case. Technically speaking, it has always been possible to identify the calling number. However, until recently, it was illegal, in Sweden, to supply this information to the person being called. Now, non-confidential numbers (both standard and ISDN numbers) can be shown on a small display. The same information can also go directly into a computer system and activate a client database. In this way, information about the calling client can automatically be pre-

sented on the computer screen. The person who answers is then prepared to take the call and handle it in an efficient and service-minded way.

Free calls, pay calls and business numbers. Service organisations can be easily accessible to their clients by providing a free call number (in Sweden, a 020 number) so that those who ring only pay one unit for the call regardless of where they are and how long the call lasts.

The organisation which instead wishes to charge those who call, for example, for information services, can, in Sweden, make use of a pay call (071 number) which provides information and transfers payments. Telia transfers the payment from the caller's phone bill to the recipient of the call.

020 and 071 numbers work similarly to long-distance numbers with the major difference being that one and the same number can be used in several locations throughout the country. Incoming calls can be transferred between the different places where they are answered without the caller noticing any change. This means that several locations can be used for one and the same call centre and resources can be rationalised to handle the varied intensity in the number of calls.

A special business number which is easy for clients to remember can also improve client contact. It is even possible to use a "faked" area code for an organisation which wishes to appear to be close to the client but needs to have the call centre located in another town.

PLUS services. In Sweden, PLUS services are available to everyone on the telephone network. The services offered basically correspond to the basic functions in a company switchboard such as call forwarding, call transfer, automatic redial, abbreviated dialling etc. PLUS services provide these particular exchange functions through the use of the buttons on the standard phone.

Centrex. Centrex is a telecommunications service which offers all the functions normally available on a company switchboard. The difference is that Centrex is totally within Telia's network. This means that a company switchboard can be set up without the need for any capital investment. A flexible solution is obtained without any upper or lower limits on the number of extensions. There are also no geographical limitations. Centrex means that firms and organisations which are geographically dispersed can combine their units into one call centre.

Interception on no answer system. These computer systems are used with company switchboards, including Centrex, to increase the effectiveness of the operator's job when the person being sought is not

available to answer the phone. Information about absence and return is keyed into the relevant phone. A spoken message can also be left with the operator who types it into the computer. When that particular extension number is rung, the stored information is automatically displayed to the operator from the computer system's screen.

Messaging system. Messaging systems are used in company switchboards, including Centrex, often in combination with the interception on no answer system, to increase the effectiveness of the receipt and relaying of messages. A messaging system can be either voice or text-based. It can be connected to pagers, Minicall (a Swedish paging system), electronic mail etc. If the caller leaves a message, the person with that extension is alerted usually with a special buzzing tone which is heard as soon as the phone receiver is lifted.

Voice mail. A messaging system can comprise or be complemented by voice mail which basically means that each extension is equipped with the equivalent of an automatic answering machine.

Interactive voice response (IVR) system. This system can be described as an interactive automatic answering machine which leaves instructions or information to the person who is calling. The caller uses the keys on the phone to lead the IVR system to particular services or information. It can involve placing orders, conducting banking transactions, or to gain access to information services.

Speech synthesis. A speech synthesiser automatically converts written text to speech and is used in conjunction with frequently updated information services provided by an IVR system. Speech synthesis has a wide range of applications. Telia has therefore conducted advanced research in this area for quite some time.

Fax on demand. This is often used in combination with IVR systems for information which is presented in graphic and text formats. The caller orders the information through the IVR system and it is automatically sent to the caller's fax number. A common application is real estate where a person interested in an advertisement can receive further details about the property together with drawings and photographs.

Computer Telephony Integration (CTI). On a small scale, CTI can mean connecting a phone to a personal computer to activate a client database using calling line identification or to generate automatic dialling. It can also mean the integration of a large EDP system with an advanced company switchboard to provide a large number of call centre functions. Examples of use are the handling of extensive incoming orders and the control of the consequent transactions.

The call centre for incoming calls

A call centre can rarely predict who will call and when they will call. Through surveys and testing, it is possible to gain a good statistical appreciation of the number of calls coming in at different times of the day. From that knowledge, resources can be allocated and varied by, for example, the number of people taking calls and the number of operating stations. The work, however, is primarily influenced by the client as it is impossible to exactly know what queries will be coming in.

The aim of a call centre dealing with incoming calls is that incoming queries be handled as efficiently as possible while providing a good personal service. Any information about an incoming query which can be extracted beforehand, for example, from a client database, means savings in time and improved efficiency.

The person who takes a call can, using calling line identification, automatically have the client information on their screen so that they may immediately have a good idea about the nature of the incoming query. The caller's request can be dealt with in a friendly and appropriate manner without any indication of stress behind the efficient service. In some cases, there is no need to offer personal service. The service can then be automated so that, through an Interactive Voice Response system in combination with a personal client code, transactions can be completed by using the client's phone keypad. Sometimes, the caller can choose between fast, totally automatic service and a somewhat slower but more personal service.

The call centre for outgoing calls

The ability for detailed planning is typical for the outgoing calls component of a call centre. The priority is that call centre functions work together for the effective planning and handling of queries. This often means that, together with telemarketing or sales, the client database and support for client documentation have to be connected to the phone so that dialling is automatic when a client's name is clicked on at the same time as information about the client and support documentation on the conversation appears on the screen. Sometimes, it is also necessary for the time of the call to be logged automatically.

Online Telefonpassning (Online Telephone Answering) in Kalmar

Online Telefonpassning (Online Telephone Answering) in Kalmar is a call centre firm which offers a service needed by many businesses, especially smaller ones. This is a service where somebody always answers the phone courteously, gives clear information to the caller, takes and relays messages and if necessary, takes care of the caller's request.

An answering machine can certainly answer the phone courteously, give a short message and take a short message "after the beep". But it is quite impersonal and it is not enough for the company which wishes to give personal service but cannot always have someone available to answer the phone. Many smaller companies within crafts, retail or consulting recognise this situation.

Millions can be invested in a call centre but this is not always necessary. Online Telefonpassning have not done this but uses technology which is available on the phone network such as PLUS services and calling line identification. A computer system with integrated telephony is also used. This is the most simple form of call centre yet it is full of opportunities.

It works like this:

- The Online client transfers calls to Online when he or she cannot answer the phone. All incoming calls are then forwarded to Online.
- The client database is activated through calling line identification before the phone rings at Online. Thus, the incoming call can be identified as having been forwarded from a particular client.
- Simultaneously, stored client information appears on the screen such as the company name to answer the call with, the persons who work there and what type of information and messages should be given to the caller.
- All this happens before the phone at Online has even rung. The caller notices nothing and does not have to wait longer than usual. Online answers with its client's company name, ascertains who is being sought, provides information and takes any messages.
- The incoming calls are documented by Online. When the client cancels call forwarding, he or she obtains details of who has rung, as well as queries and messages. These details can be given personally by phone or through a voice mailbox or sent as electronic mail according to the client's wishes.

Online can not only take care of all forms of phone answering but also tasks relating to the incoming calls. Orders and bookings can be taken on behalf of the client as well as information provided on prices and delivery. In short, Online is a multifaceted service firm. The techniques used are very simple but the technology is still quite advanced. This is not obvious to either Online or its clients as the technology is based mainly in the telephone network.

Using speech synthesis for SMHI's (Swedish Meteorological and Hydrological Institute) special forecasts

Background

Will it be beautiful weather for the birthday celebrations? Will the weekend be rainy? Will the roads to Älmhult be slippery? SMHI (the Swedish Meteorological and Hydrological Institute) provides a large number of special forecasts for various target groups apart from its weather forecasts for radio, TV and newspapers. The following are some examples.

- Rural weather forecasts for farmers who need to know what the weather will be like for harvesting.
- Boating weather forecasts for holidaymakers who need detailed information about the weather.
- Tourist weather forecasts for outdoor cafe owners who need to know if there will be many or just a few tourists the following day or for IKEA which gets an unusually large number of holiday visitors on cloudy days.

Special weather forecasts are often more localised than the standard forecasts. They can also be far more short-range, for example, what the weather will be like at a certain place for the next hour. Interest in special forecasts is increasing and SMHI uses several different media such as fax on demand, the Internet and telephone information numbers to make forecasts easily available to its target groups.

Needs

SMHI has to often update the special forecasts to keep them current. The updating in itself is not difficult as all weather information is generated in the same large information system and is stored in these databases. The difficult part is that some type of interpretation of the data must always be done so that the information which comes from the databases can be made available in an appropriate manner to the various target groups and be distributed to them in a suitable way.

The interpretation of forecast data to image and text for distribution by fax or the Internet is quite simple. It can be done automatically as

SMHI stores digital images from satellites and radar weather stations directly in its databases. Standard text is then used to present the forecast data.

It is more difficult when weather information is to be given by phone. Forecasts by phone require more manual work. They are read into a tape-recorder and are made available by an Interactive Voice Response system. However, it would be much simpler to avoid the recordings if the text instead could be recorded automatically each time a forecast is updated.

The technique which SMHI has been trying out to improve the efficiency of updating the forecasts distributed by phone has been to use pre-recorded standard texts and phrases which can easily be edited together for a current forecast. The drawback is that the intonation does not sound natural which means that the forecast can be difficult to understand. Also, the repertoire of standard texts and phrases can sometimes be insufficient to meet requirements.

SMHI would prefer to use speech synthesis where speech can be automatically generated from text. Speech synthesis provides:

- a large choice in the formulation of message contents
- good sentence phrasing
- the opportunity to emphasise certain information through slower speech, higher volume, spelling or repetition
- simple and swift updating of the information.

Special weather forecasts for low altitude flights

Speech synthesis is now being trialled in weather forecasts for low altitude flights. Before take-off, the pilots always receive a current forecast via telephone. Because of air safety, there are very high demands on audibility of the forecast. Good comprehensibility and clear phrasing are the most important aspects and this can be achieved with speech synthesis. One drawback is that the character of the computerised voice can sound unpleasant. Therefore, this project uses Telia's new diphone speech synthesiser which is more pleasant to listen to than older systems.

The text messages to be transformed via speech synthesis are generated by SMHI's VAX computer in Norrköping. General forecasts are given for the three areas of Malmö, Stockholm and Sundsvall as well as localised and detailed forecasts for airports within these areas. The VAX computer is connected with Infovox 3000, the IVR system

which is equipped with a built-in speech synthesiser. The speech file can be played using the system's standard functions which are used to create a dialogue adapted to the end-user. Normally, the keypad on the user's phone is used to generate the dialogue. Mobile or fixed phones work equally well.

The dictionary normally used as a basis for speech synthesis is primarily designed for conversion of text to speech for the type of messages used in messaging systems. The sort of words used for flight weather forecasts are seldom encountered here. Therefore, a number of special words and phrases have been added to the speech synthesiser. The same type of adaptation can, of course, be made for all types of special forecasts

Several types of special forecasts

The advantage for SMHI in automating its forecasts for low altitude flights is that forecasts of this type have to be updated often and are used frequently. It is therefore important for SMHI to make these forecasts more effective without compromising air safety in any way. A technical solution which is reliable enough for air traffic fulfills very high requirements. SMHI can further develop new special forecast services by phone based on this solution which all live up to the high standards of reliability and client service.

Synthesia – a small, specialised firm in a global market

Background

Synthesia is a specialised ultra high technology firm where everything revolves around IT. Software products are developed for the design and manufacture of advanced microelectronics. Despite Synthesia being a small and quite new company with just twenty staff, it competes successfully in a global market. This is how Synthesia's Managing Director, Per Nilsson describes the situation:

"Our clients are often large corporations such as Ericsson, SAAB, Siemens and Alcatel. They are accustomed to good support and large

staff resources from the traditional companies which supply software products for electronics construction. Synthesia is a small firm with concentrated expertise. We have to compete with higher quality and better service despite being small. The key to success is to make use of new technology."

The way in which Synthesia strives to use new technology for client contact and communication between clients is uniquely insightful and consistent. Its focus is on user-friendliness and interactivity. However, the technology used to achieve this is not remarkable in itself and more companies could do likewise.

Synthesia's story

At the Internet Home of Synthesia is the following passage:

"Synthesia is a Swedish knowledge based company. We are a spin-off from the Swedish Institute of Microelectronics. We develop, market and sell EDA tools for high level design. Synthesia offers high level EDA solutions including both products and services. The Synthesia products form a complete set of tools for high level design based on VHDL. The services are general in terms of tools and techniques. Some areas where we have special competence are:

- High Level Synthesis
- VHDL Simulation in mixed environments
- HW/SW Coverification
- VHDL Modelling."

What this means is not entirely self-explanatory and probably cannot be described in a short and easily understood way. However, there is an interesting story behind the sentence "We are a spin-off from the Swedish Institute of Microelectronics."

Synthesia's story begins in the 1980's in conjunction with the much-discussed embargo on the Swedish export to the Soviet Union of advanced electronics which contained microelectronic components from the USA. This was not military electronics but products and systems for civilian use.

The embargo was an unpleasant surprise for everyone except those most closely involved. The situation exposed an extremely serious threat for many of the large Swedish exporters of high technology like Ericsson, SAAB and the then ASEA. The result was a fast and single-minded national concentration on building up knowledge and developing tools for the domestic design and manufacture of advanced microelectronics.

The Swedish Institute of Microelectronics was commissioned to produce the needed software products. These became commercially successful and the decision was finally made to privatise this part of the Institute's activities. Synthesia was established as a privately owned company.

Synthesia's products

Synthesia's products comprise software or tools for the design and manufacture of microelectronic circuits. The scale of design is unbelievably small. It is unthinkable to use drawings to describe the design as these would be much too coarse. The modelling must be described in totally different terms.

Synthesia works with behaviour synthesis which means that clients can describe, using the software products, how they wish the finished design to behave. The software products are based on a programming language called VHDL (Very high speed integrated circuit Hardware Description Language). This language is based on a set of standards in the same way that human speech is based on grammatical standards to ensure that words have meaningful connections.

The software products which Synthesia develops can be called linguistic description tools for design and manufacture where the path from design to manufacture means that the described design model is always replicated in the material consisting of the microelectronic circuits. The corresponding tools for more large scale technology would be CAD/CAM/CIM software (Computer Aided Design, Computer Aided Manufacturing, Computer Integrated Manufacturing).

Competition with giants

Synthesia has grown to be a company with a leading position in a global market in competition with international giants. This market demands the presence of very high expert service for the client. Even so, the growth rate in terms of employees is not especially large. As the production is principally knowledge-based, a disrespectful description is that thought transfer has solved the growth issue. Synthesia develops and distributes specialised knowledge to like-minded specialists. The client service which supports Synthesia's software products require a high level of intellectual rather than physical presence.

User friendliness and client service

Synthesia is among the world leaders with regard to functionality and quality. Its software products are becoming key tools for clients' development and manufacture of new products. This creates extremely high demands on client service. Synthesia staff need thorough knowledge of how the tools are to be used as well as support for problem-solving if the application does not work the way it was intended. This can be due to a fault in the tool itself or that it is used in the wrong or an unexpected way.

The consequences of faults can be very costly. Service in the form of fast and effective troubleshooting is needed day and night, all the year round and all over the world. How can the client be convinced to rely on quite a small firm in Kista, Sweden to fulfill these demands of a constant presence? It is easy to imagine the hesitation of a large client in USA or Japan but they have to simply test Synthesia's client service to convince themselves that Kista is not so far away. Of course, clients would not even be tempted if it wasn't for Synthesia's world leading position in significant parts of its product range.

A factor which further strengthens Synthesia's unique position is the manner in which it keeps clients from encountering problems. Synthesia's tools are designed in a very user friendly way with graphical user interfaces. They are interactive which means that the user always has total insight into and control of the work process. This interactivity is unique to Synthesia's tools. Conventional tools are designed so that the user first feeds in the data and then does not know what happens until completion of the design.

Interactivity means that Synthesia's tools are simple to use despite being very advanced. This simplicity saves a considerable amount of time even if the clients have enough skills to use the most difficult tools. At the same time, the possibility that a user may make a mistake is considerably reduced.

Another important factor which underscores the user friendliness is that the tools have built-in user support. Complete information is available to the client online in the form of the whole user's manual with simple search paths and indexes. In this way, the client has direct access to help if a problem is encountered. If the client still cannot solve the problem, Synthesia offers a service on three levels where the lowest level comprises more detailed guides for self-help and two other levels with an increasing amount of active assistance from Synthesia.

Synthesia's clients

It is appropriate to describe Synthesia's clients at this stage before explaining the three service levels as the clients are the basis for the functionality of the service concept.

The clients and users of Synthesia's tools are an extremely homogenous target group comprising professional electronics designers from the world's leading high technology companies. All are engineers with the same type of knowledge base regardless of which part of the world they are from. They have advance problem-solving skills and

prefer to solve problems themselves. Highly qualified technicians are hardly likely to admit they are having problems solving a technical problem and they are even less likely to admit to having made a mistake as a user. This is an excellent target group for guides to self-help in technical matters; it is homogenous and comprises skilled and independent people.

It is also a first-rate target group for Synthesia to work with if the client despite his best efforts cannot solve the problem. The client who makes contact with Synthesia always meets a kindred spirit. There is an accord and a similar technical background which means that it is easy to develop a mutual intellectual presence for the common problem. This is a presence which bridges the longest distances and the most diverse cultures.

The significance and importance of this similarity between partners, which is the foundation of Synthesia's service concept, can easily be depicted by the opposite situation. We, who use IT in everyday life in different ways often have access to user support by phone. When there is a problem, we call and a description of the problem might be as follows: "When those little arrows pop up, everything freezes but after a while, everything works again." We get asked a number of specific questions which we may not always understand but we still try to answer. After a while, a suggestion for a suitable action is given such as tidying up the hard disk. But not everyone dares to tidy the hard disk - what if something important is removed by mistake. Such things can happen.

This is a support situation where the user is relatively inexpert in the technology being used while the support person is an expert who sometimes may be unaware of the lack of knowledge on the part of the user. This is not the case with Synthesia. Two equals meet to solve the client problem which they can attack from a common conceptual background.

Service concept on three levels

Synthesia's service concept is based on relational databases which can be accessed on the Internet. The client signs a contract for a particular service level and receives the respective "key" to use the databases as necessary.

At the first level, the self-help level, the client can be automatically connected to Synthesia's databases where all the product information, program corrections, new releases, frequently asked questions and solutions to already identified problems is found. The client communi-

cates interactively with the databases through Web browsers such as Netscape.

At the second service level, the client can receive phone assistance if the self-help level is insufficient. The information which the client has on his computer screen is then automatically copied by Synthesia. The service engineer, who has access to comprehensive client documentation such as tools and applications used, any client adaptations made and what kind of problems the client has had previously, can together with the client discuss appropriate measures to take as well as see on the screen what happens when this is done.

Both the phone call and what happens on the client's screen is synchronised and recorded. If the problem still cannot be solved, Synthesia, on the third level of service, investigates the problem at its headquarters and uses the recorded documentation for analysis of other possible actions. When the problem is solved, the client is immediately contacted and told what has to be done.

Identified problems and solutions are regularly used to update Synthesia's databases so that clients with similar problems can solve them independently. A wealth of experience is built up constantly. It is heavily used by clients but it is also an important source of experience for Synthesia's continuing product development.

IT solutions

As mentioned in the introduction, it is not the IT solutions themselves but rather the insightful and methodical manner of using IT which is unique at Synthesia. The technology used is not especially advanced nor difficult to obtain commercially:

- relational databases with regularly updated product information, user support and problem-solving information
- graphical user interfaces
- information which is available using easy and logical search methods and interactive, standardised search tools through Netscape
- distribution of software products and client support via the Internet
- telephone
- software for interactive cooperation at a distance as well as synchronous recording of what happens on the screen and what is being said on the phone.

The last point is especially interesting. It is easy to believe that a logical solution would be computer integrated video telephony of the type where the person being spoken to can be seen in a little box on the screen at the same time as both parties are working together interactively with what is on the screen. Why didn't Synthesia choose this type of solution? There are two answers to this question:

- The cooperation is interactive but the manipulation of what is on the screen is not interactive. It would not even be possible to do this. It is the client who makes the decisions and takes measures which are discussed together. It is, not the least from a legal viewpoint, very important that Synthesia can only see what happens on the client's screen and that it is absolutely not possible to manipulate the client's computer as the computer may be connected to a design or manufacturing process which is very valuable.

- Video communication is not necessary as neither party needs to see each other or show anything to each other apart from the client's screen. Furthermore, video telephony is not generally available for all clients. In short, Synthesia's service does not require any more advanced technology than client access to the Internet which all the clients have in this homogenous group apart from some isolated exceptions.

Client Service 2000

The three service levels which are outlined above form the basis of Client Service 2000 which is the vision for a complete Synthesia client support system. The system's support functions are developed and evaluated continuously. Client Service 2000 includes:

- product information
- product demonstrations
- client adaptations
- distribution
- installation
- training
- advice and service
- updating.

Client Service 2000 is directed to those who already are clients or at least potential clients. Those prospective clients can receive a temporary key to acquaint themselves with and test Synthesia's products as a service concept.

Interactive sales promotion

Electronic commerce and interactive sales promotion is the title of the next chapter. The story about Synthesia could nearly have fitted there especially as products are demonstrated and distributed through the Internet. It still makes sense to place Synthesia under the heading *Service and client support*. Synthesia has, through far-sighted client service and cultivating its own market, laid a stable foundation for expanding new business.

Currently, the only factor that can restrict Synthesia's expansion is sales. A great deal of the sales work such as product information and demonstrations, is done on the Internet but it must be remembered that business is done between people. Business on this level of complexity means first awakening interest and creating a basic trust before moving on to knowledge-based sales, problem-solving and client adaptations.

Synthesia currently works with agents and distributors in several places in the world for sales of the relatively more simple Windows-based products. However, there is at present no external sales network for the most advanced products. Synthesia is developing a partnership so that the sales of these products will not be a barrier to further expansion. The partner company has a global sales organisation which is directed to similar clients and has a related range which is complemented by Synthesia's products.

This new partnership requires Synthesia to train and support an external global sales organisation with technical and commercial sales promotion. This cannot occur in a conventional manner as it would require large staff resources. It must be realised over the Internet in a similar way to Client Service 2000. Nothing else has even been discussed. Technology is used where it is most suitable and personal sales resources are directed at building relationships.

The arrangement which already exists for Client Service 2000 is an ideal basis to build upon. Synthesia has already made sure that it can complement and adapt to the new sales organisation. For example, a number of the partner's sales force have taken part in product demonstrations and found them "fairly self-instructing". Synthesia has shown many times the effort it has made to ensure its software products and its client support are user-friendly.

If this had not been done but rather a level of user-unfriendliness had been assumed which the clients in this case could cope with and accept but which would have been much more difficult for the external sales staff, Synthesia would have had a large and costly exercise ahead. Even if the sales staff in the partner company are specialists with experience in selling advanced software products to discriminating clients, it would have been a long and costly exercise to develop effective sales promotion and to establish cooperation with the partner company.

Life is full of surprises

Just recently parts of Synthesia have been sold to one of the giants it had been competing with. One of Synthesia's product areas with the accompanying service concept is left together with the planned cooperation of the global sales organisation. This markedly changes Synthesia's future business but it does not alter the fact that the key to Synthesia's success is to utilise IT in the way described above. A method where the client's needs are the starting point for the supplier's thoughts and actions.

Electronic commerce and interactive sales promotion

- Overview
- From St. Sigfrid's Fair to electronic market
- Husqvarna's Vision 2000
- Swedish Automotive Suppliers
- BYGGDOK's information services

Overview

The electronic marketplace is everywhere but nowhere, close and far away. Many comparisons can be made to clarify the possibilities. Why not start with the age old marketplace? The sales person could show the products, talk about them, answer questions, counter objections and bargain during a lively discussion with the customer. Or, as it is called today, through interactive communication or interactive sales promotion.

Market communication which is normally associated with marketing, i.e. advertisements in the mass media, has the disadvantage of not being interactive. It only works one way. It also has the limitation of not being able to inform exhaustively or to answer further questions. Marketing through conventional mass media does not support dialogue and the interplay between seller and customer. In contrast, the electronic marketplace can be used both as a virtual showroom and as a medium for an extensive dialogue between supplier and customer.

- St. Sigfrid's Fair in Växjö is used as a starting point for an historical reflection of how the age old marketplace's closeness has changed to impersonal mass marketing and how there is a desire now to revert to a dialogue with the customer as an individual regardless of distance.
- Effective support for an entire sales organisation æ Husqvarna's Vision 2000 describes how new technology is used to provide retailers and their customers with a better service. The vision has been successfully tested with some of the retailers.

- Swedish Automotive Suppliers (SAS) is establishing a joint electronic marketplace on the Internet where member firms can introduce themselves and their products as well as invite customers to make contact and ask questions. This type of marketplace can give a clear picture of the diversity, skills and competitiveness of the companies represented by SAS. Member companies of this organisation are suppliers to the automotive industry both in Sweden and internationally.
- BYGGDOK is an information centre for the Swedish construction and environmental sector with services directed mainly at professionals. The organisation is based on the idea that knowledge is reusable. The Internet and electronic mail can be used to combine individualised client service with the opportunity for clients to choose from a full and varied selection of information.

From St. Sigfrid's Fair to electronic market

The age old marketplace

At the crossroads by the lake there is the age old marketplace where people have always been able to meet to exchange information, goods and services. The old trade routes meet in the middle of central Småland, just below the hills. There are many highways on land, as there once were on the sea. In former times this was border country, where the Danes pillaged and burned, though this did not prevent there also being an unofficial cattle trade with the Danish warlords. The people of the Värend district were experts in breeding oxen, since horses were not strong enough to work the hard and stony ground.

Nowadays "elk products" are sold here to German tourists, with remarkable success. The nearby cathedral has not been burned down for many years. Many more than a thousand years have passed since the marketplace first came into being. Over the years developments in communications have made people less dependent on close geographical proximity between the point of production and the point of sale (the consumer market). Industrial mass production in the course of time made "the market" into an abstract, remote and impersonal concept. The individual consumer was moved from centre stage.

Near and far

Those telecommunications which have been developed in recent years lessen still further our dependence upon geographical distance. The electronic marketplace is everywhere and nowhere, near and far, out of reach of clenched fists, head-butting, the stench of manure and hard drinkers on market days – but within reach of sight, hearing, imagination, thought, ideas and knowledge.

The appearance of the electronic marketplace varies. Sometimes shopping arcades, city squares, boutiques, shop windows and sales catalogues serve as models – perhaps even the time-honoured marketplace as well. One thing however is certain: that the concept of "market" is recovering a personal dimension, as the customer is again becoming an individual. Another and better way might be to say that the customers are becoming vast numbers of individuals rather than an impersonal mass, roughly divided into segments, by demographic characteristics or geographical residence.

Suppliers and customers can come together in the electronic marketplace, irrespective of where they happen to be physically. Suppliers can present their products on every level, from the most general to the most highly detailed. There is room for everything - environmental images, detailed images, video recordings, spoken information, textual information, advertisements, brochures, production sheets, sales folders, technical specifications, drawings, descriptions, price-lists, questions and answers to customers' questions. In the fairly near future it will also be possible to pay one's bills electronically.

Interactive and multimedia-oriented

The electronic marketplace is interactive and multimedia-oriented. That means that those involved in the marketing process must abandon much of their conventional thinking about sales and market communication, and at the same time think far more than before about basic aspects of communication:

- How does one persuade the customer to accept what is offered by way of products, services and information?
- How does the customer define his or her needs?
- How does the customer make his or her choice?
- How does one guide the customer through the range of products in an instructive and interesting way?
- How does one enter into dialogue with the customer?
- How does one take the wishes of the individual customer into consideration?
- How does one facilitate the continuation and completion of the transaction?
- How does delivery and payment take place?
- Is it necessary to keep (parts of) the electronic marketplace staffed, to enable supplier and customer to communicate person to person, in real time?

There are many questions that are worth asking, now rather than later. At the same time there are many new ways of bringing products and services to life. For instance, technically complex products can by interactive means be "taken apart" by the customer, and turned this way and that with the help of animation and three-dimensional presentation. Services which are hard to describe can be illustrated, showing how they perform in an actual setting, and the results they give. That

which is difficult or impossible to illustrate with real-life images can be demonstrated by way of “virtual reality”.

Husqvarna's Vision 2000

Background

Husqvarna is part of the global whitegoods firm Electrolux. Sales in Sweden are managed by Husqvarna Svenska Försäljnings AB (Husqvarna Swedish Sales Ltd.), which is divided into 24 districts, supporting a large number of electrical suppliers and stores specialising in kitchen and bathroom equipment. In Vision 2000, Husqvarna describes the ways in which it will apply new technology to provide its retailers and their customers with a better service. Preliminary practical assessments have been carried out by some of these people.

The range of whitegoods on offer is constantly increasing, and both its technical quality and appearance is improving. In addition, the products are highly variable. The customer will naturally want to see what is available before deciding what to buy. At the same time the products are expensive for the retailer to keep in stock for purposes of demonstration. They tie up capital and take up a lot of space. No one can physically present the complete range of products – especially keeping in mind that one retailer can have a number of different brand-name suppliers.

Bearing this particular point in mind, the advantages of Husqvarna's offering an electronic marketplace in which to exhibit its products becomes obvious. To support retailers by providing their customers with a demonstration of the full range of their products gives them a considerable competitive advantage, without actually having to involve any heavy and expensive equipment at all.

Support for retailers

The 24 district managers belonging to Husqvarna Swedish Sales Ltd. spend the greater part of their time visiting retailers and supplying them with information about the range of products available. This includes, as well as straightforward product information, sales campaign information and launches of new appliances. Much of this information is general, but at the same time there are questions and problems which are unique to each retailer. If the district managers can supply the general information concisely and effectively, the time saved can be devoted to the support of the individual retailer. This is greatly facilitated by the use of video-conferences, ISDN links and interactive multimedia communications.

The electronic product catalogue

A constantly updated product catalogue, distributed electronically, is the current and fundamental complement to the brochures and information sheets the retailer's customers can take home and study. Unlike a printed catalogue, there is no need to limit the range of information to what can be provided in a limited space. Four-colour pictures, descriptions, specifications, installation instructions, wiring layouts, function details and price lists – everything can be kept together as it relates to the entire range of products, since the electronic catalogue is based on a product database. It is a great advantage to the retailer to always have all necessary information collected and properly updated.

A sales studio for product information

General information about sales campaigns and launches can be distributed collectively to retailers by means of multiple video conferences, well before the campaign/launch takes place. In this way all are able to share the information more or less simultaneously, which would otherwise be impossible. It takes at least a month, and sometimes longer, for a district manager to visit and brief every retailer: some receive the information too far in advance, while others get it only at the last minute.

Husqvarna has tested this approach in cooperation with five retailers. A central sales studio was equipped with everything needed for a sales conference – a video camera with decoder for ISDN transmission, a document camera for the presentation of still pictures, a computer for multimedia presentations, etc. Product training and sales campaign information can be provided, both "live" and by way of pre-recorded or photographed demonstrations. The retailers can have questions an-

swered, and discuss matters among themselves, as though they were all present (they can hear but not see one another). Retailers unable to attend the conference can obtain a recording.

Is a sales conference of this kind not going to be impersonal? No, not really. The retailers consider that personal visits from district managers primarily play an important social role, but that as sources of information they are sometimes inefficient and inadequate. When the retailer has to deal in person with customers, he has to break off his meeting with the manager. His concentration suffers and important information may be missed. Now each visit can be shorter and more concentrated on the special problems and needs of the individual retailer.

Electronic viewing room

The difficulty that retailers experience in being able to stock no more than a limited range of products for customer viewing is largely overcome by having an electronic viewing room. By this means the retailer can complement his own display of stock, showing the customer a bigger range of possibilities and ideas. The entire range can be demonstrated, both in detail and in various furnishing milieus. This overall impression is important for the customer. Actually to be able to examine everything on offer, as well as providing more and better ideas, gives the security of not having missed important items of pre-sales information. Everyone knows the uneasy feeling that commonly follows every decision to purchase. Did I do the right thing? Might there have been a better alternative, perhaps better value for money? Will there be an entirely new model on the market next month?

Is there then any further need for a “real” showroom? Indeed there is. If the customer is to gain a realistic impression of the product’s quality and function, there needs to be demonstration models. It will, on the other hand, be possible to exhibit a smaller number of products in the showroom.

Interactive, computer-supported advice

Customers are frequently in need of advice, since there is so much that has to be right such as functionality, measurements and appearance. They want wise, insightful advice, and perhaps also exposure to new ideas. This requires that the retailer has good and up-to-date knowledge of the product, coupled in some cases with abilities in the area of interior design.

If the customer has a plan of his or her kitchen, this can quickly and easily be put onto the retailer's computer and be used as the basis for alternative designs. A design can be transformed, equally quickly and easily, into a three-dimensional computer model, which can be further redesigned and on which a variety of colour combinations can be tried, until a satisfactory result is reached. Orders to Husqvarna Swedish Sales Ltd can be placed directly, if the customer wishes. This computerised assistance is enhanced by the availability of Husqvarna's product specialists to give personal advice.

Long-distance training of retailers

One of the five retailers put it like this: "The more you know about your product, the better you are able to sell it." The electronic product catalogue, the electronic sales conference, the electronic showroom and the interactive assistance are all, in various ways, channels for the training of retailers. They can use whatever time they need to familiarise themselves with the whole range of new products, without the anxious feeling that they need to make the most of the district manager's personal visits. Once all the general and basic information has been dealt with, the district manager can give the whole of his attention to the retailers' individual needs.

Swedish Automotive Suppliers

Svenska Fordonskomponentgruppen, SKFG (Swedish Automotive Suppliers, SAS) is a common interest organisation bringing together approximately 100 member companies, directly or indirectly involved in supplying the automotive industry in Sweden and abroad. These firms together employ almost 20,000 persons and have a total production value of over SEK 10 billion.

The automotive industry has long been at the forefront in establishing effective cooperation with its subcontractors. Increased customer demands for the meeting of individual needs and requests in their turn place extra requirements on subcontractors in respect to exact timing, level of quality, product development etc. Today a large proportion of vehicle production is customer-directed. Every private car or truck is, right from the beginning, a unique individual with a fixed delivery date.

What chiefly joins the members of SAS together is the very high demands made by their customers. SAS therefore works nationally and internationally at many levels, to:

- represent its members in matters of common concern, to be their mouthpiece for the authorities and in the mass media, and to act as a consultative body in Sweden and the EU;
- create good relationships with vehicle manufacturers and help in the marketing of the subcontractors' products;
- work to increase the level of interest in the subcontractors and raise their status, by providing information and improving competence through theme days, courses, seminars and regular meetings for members.

SAS has a wide network of international contacts, through which it works to facilitate its members' export initiatives. Through its membership in Clepa, SAS is also able to influence the developments of the component industry in the European Union and to work towards the allocation of both EU and Swedish government funding for research and development.

A common electronic marketplace

One element in the work of SAS is the setting up of an electronic marketplace on the Internet, in which its member companies, through a shared home page, can introduce themselves and their products and invite their customers to make contact and ask questions. In principle the members of SAS can present their information in as much detail as they need to. They can exhibit complete catalogues containing product information, pictures, drawings, three-dimensional models, technical specifications, price lists, etc.

Only a small number of member firms have so far made use of these opportunities, but the number is sure to increase and it needs to if the result is to be a living electronic marketplace for vehicle components. A small number of pages, coupled together under a common Internet address, cannot be called a marketplace. Such a marketplace will not become a reality until a larger number of different, and complementary, producers join together to exhibit the strengths of their respective products. A comparison might be made with an arcade, in which a large number of shops producing different but complementary goods, attract customers. The increased flow of customers is to everyone's advantage.

SAS is at the stage of needing to promote its marketplace and its possibilities internally to its own members. They need to be motivated to give the time and the resources that are necessary to contribute to an interesting and attractive marketplace. They also need help to establish optimal conditions for creating a marketplace that is visited by both national and international automotive manufacturers in search of suppliers.

EDI and electronic trading

There is no marketplace without trade. Electronic money in an electronic market is not yet a reality, but is not always necessary in order to bring about electronic trading "business to business". That firms engage in electronic trade with one another has long been a reality. The

basis for this is EDI (Electronic Data Interchange) which is an automatic exchange of standardised business documents between computers.

Using EDI and by developing a common set of trading procedures, firms can create a fast, efficient and logistical support for the flow of information. In addition an information flow is achieved that is not distorted by unnecessary sources of error. When papers – quotations, orders, invoices and transport documents – are exchanged, error is possible at every stage: papers from one system are sent, received and registered by another, and so on. There can be many stages between quotation and delivery. In a business with a large number of subcontractors, the total number of these stages can be considerable.

The automotive industry is a case in point, characterised as it is by a long tradition of cooperation with many subcontractors. For this reason the industry has long been a powerful and important factor in the development of EDI. Actually the creation of ODETTE as a de facto standard has been one of the main driving forces. It may be then that SAS's electronic marketplace can be complemented through the use of ordering procedures and EDI functions.

CALS for lifetime information management

Today's automotive industry is characterised by increased technical complexity, increased consumer adaptation and increased competition, all of which means a greater need for information flows which minimise the time spent at each stage of the process. There is a similar need in the computerised exchange of business documents, such as the exchange of technical documents like designs, specifications and descriptions. Here another concept is encountered, that of CALS (Continuous Acquisition and Life Cycle Support).

CALS is a strategy to ensure the value of information. Its purpose is to minimise the time at each information stage and increase the cost-effectiveness of the flow of material and information which accompanies a system or a product throughout its lifetime – which sometimes can extend over several decades. In this context, a lifetime is the period from the birth of a new idea for a product to the point at which the product is scrapped and its material recycled. It is becoming increasingly important to make the most of that lifetime. New models have to be manufactured and marketed more quickly. Then they have to be serviced at efficient workshops, which in their turn need the support of service and maintenance documentation, and training material for their staff. In the end the cars have to be scrapped and recycled in

an environmentally acceptable way, which requires further documentation; everything must be traceable.

All this combines to ensure that motor manufacturers and their suppliers increasingly base their management of technical information upon CALS. One prerequisite is that the information be made independent of software and technical platforms, both today's and those which will occur in future.

An important basis of this independence is SGML (Standard Generalized Markup Language) which is a CALS-related standard for the structuring of information. SGML is closely related to HTML (Hyper Text Markup Language) which is used on the Internet. More precisely, HTML is a subset of SGML. With the support of SGML, it is possible to handle information structures independently of document layouts, computer platforms and software. In this way a flood of technical information from different sources/subcontractors can be brought together into a whole, corresponding to the vehicle manufacturer's overall needs.

BYGGDOK's information services

Background

BYGGDOK is an information centre for the Swedish construction and environment sector, providing information services directed primarily at professional users. Its activities are based on the idea that knowledge can be recycled. BYGGDOK is not a particularly large organisation, having no more than 20 or so staff. Its work on the other hand is very extensive. Nowadays Internet and electronic mail are used in order to combine individual customer service with the possibilities for customers to search and select on their own from the wide range of information which BYGGDOK makes available on the Internet and various Internet-linked databases.

Services and Products

BYGGDOK's Internet home page (http://www. byggdok.se) is organised under the following main headings:

- Search databases
- News Watch
- The Construction Market
- Journal abstracts
- Information Brokers
- Library

Below is a slightly abbreviated extract from "How BYGGDOK works" as an information broker.

Information searches. We search for and assemble information at your request and in accordance with your specifications. This may be in the area of problem-solving, the supply of factual data or background information to assist decision-making. The answer is adapted to your individual needs. Our information specialists are fully qualified in the construction and built environment sectors. As well as BYGGDOK's own databases and extensive library, we have access to the whole international range of databases and electronic information, and have a well-established network of contacts.

News Watch. We provide you with regular summaries of news and new literature in your own specialist field.

Databases. You can connect to the BYGGDOK system and conduct your own searches in our database from your own computer. These databases are accessible on the Internet, and contain references to a quarter of a million documents in the construction and built environment area (in the broad sense) and reports on current research projects.

BUILDING & ENVIRONMENT is the consolidation of the four databases produced by BYGGDOK:

- BODIL – construction literature
- VANYTT – literature on environmental management technology
- BYGGFO – building research in progress
- REGLER – current laws and regulations in the building and built environment areas
- SGILINE – geotechnical literature produced by SGI, the Swedish Geotechnical Institute.

Journals. Our listing of journal articles give you an overview of recent knowledge such as new or amended regulations, instructions and standards.

Document Service. We acquire all the literature you need, through purchase, borrowing or copying. All documents surveyed and included in BYGGDOK's databases are quickly accessible through our library.

Consultative Services – knowledge on request. We assist firms and organisations to make their own supply of information more efficient. We are information specialists with expertise in the construction and built environment area. We take a vast variety of enquiries in the areas of technology, marketing and business information. We seek and assemble information on request, and according to your directions.

In simple terms: we deliver knowledge to order.

- You gain increased knowledge and obtain a better basis for making those decisions which increase the competitiveness of your firm.
- You save time which can be spent on other questions while our experts, with the help of databases, networks and other sources of information, produce the decision-making material and facts you need.
- You receive unexpected and profitable inspiration from areas that might otherwise have been overlooked.

Sector-specific information services

BYGGDOK's method of using electronic media to furnish information in the construction and built environment field is a typical example of the way in which an organisation operating within a single industry can offer an interactive marketplace for large quantities of information to many different target groups. Self-service can be combined with the individual service the customer wants in every particular case. Those who are used to gathering their own information can do so, while those who are not are given the help they need.

Virtual exhibitions

The next possible step is to assemble virtual exhibitions, or perhaps even electronic building fairs, alongside the real ones. The Internet, thanks to its rapidly increasing capacity to transmit visual information, is becoming a more attractive and versatile medium, which combines the realism of the traditional marketplace with the variety and innovative products on offer at the huge contemporary trade show. Using in-

teractive technology, the visitor can choose between acquiring detailed information in a narrow specialist field, or a wide overview of a number of fields.

Interactive, individualised mass media

- Overview
- Newspaper distribution in areas of low and high population density
- What are the requirements?
- Which solutions are possible?
- A distribution problem or an opportunity for development?
- Interactive, individualised newspapers
- The advertisers' target groups identify themselves
- Interactive TV
- The interactive multimedia revolution

Overview

No one yet knows what will happen when mass media become interactive and individualised. There is a vast range of threats and opportunities – primarily opportunities, which will in all likelihood lead to an enormously far-reaching restructuring of all branches of the media. Production, distribution and utilisation will undergo radical changes, as will the media's role in the transmission of news, entertainment, knowledge, culture and advertising.

To start at the beginning: many newspapers are presently involved in electronic distribution. The northern Swedish newspaper *Västerbottenskuriren* (The West Bothnia Courier) can be used as an example. There, the staff asked themselves which solutions were possible and suitable. The immediate and obvious answer was the Internet. However, it is hard to say anything about the Internet which has enduring validity. A good deal of what is said one day is out of date the next day and the range of possibilities is constantly increasing. The number of connections, in Sweden and worldwide, is growing at an incredible rate, as is the capacity of the Net. This growth rate would turn the most confirmed high-flyer green with envy!

Two main questions to be dealt with in this chapter are:

- Is this a distribution problem that can be solved by the Internet, or are the newspapers acquiring new business opportunities?

How does it alter the role of the local newspapers if it is possible in principle to provide every subscriber with an individual newspaper? What will be the consequences for the paper's advertisers?

There are far more questions than answers.

- When even the questions are far from obvious, the answers are even less so. What might happen when the telephone network can function as an interactive multimedia carrier; when normal telephony can be combined with the Internet, interactive TV and interactive radio?

Newspaper distribution in areas of low and high population density

Västerbottenskuriren (The West Bothnia Courier), the largest daily newspaper in the north of Sweden, has many subscribers in sparsely populated areas, and distribution costs are high. In some districts, distribution has to be done by the country postal service. But there is no postal delivery on a Saturday and getting your Saturday paper on a dark Monday morning is a doubtful second best.

The question then is whether there may be a good way of distributing the paper electronically in country areas. If this were so, it would solve a problem affecting every daily newspaper, that the cost of delivery tends to claim a large part of the income earned through subscriptions – and sometimes more than that. This problem is experienced in the cities as well as the country areas, but is more acutely felt in the country.

The obvious answer is that the problem can be solved by the developments on the Internet. The Internet, however, does not provide a short-term solution for the distribution problem, but in the first instance offers both a short-term and a long-term opportunity to develop the business activities of the newspapers, both as carriers of advertising and on the editorial side. Only in the longer term will it be possible to convert wholly to electronic newspaper distribution. But this is not going to take place by way of a computer on the breakfast table; rather with the help of a convenient little colour-printer in the hall. Or why not in the "media room", similar to the TV and living rooms which became so popular in the sixties? A coin-operated printer in the nearest store might be another possibility. No one knows for certain.

What are the requirements?

The *West Bothnia Courier* lists the following important requirements:

- Not having to invest in expensive new technology, and not having to employ extra staff to produce the electronically distributed edition of the newspaper. This in turn presupposes that production is already computerised, and that the printed original is largely produced in electronic form;
- Not having to produce a special newspaper for electronic distribution as well as the printed version. This follows on from the previous point, since additional staff would be needed for such a production;
- That all the material – text, artwork and advertisements – in the printed paper should also be found in the electronic edition. If it were not, readability would suffer and advertising income would be reduced. Thus it is the whole of the newspaper, and not just parts of it, that is to be distributed electronically.
- That all subscribers should receive the newspaper at home, and that it should not need to be fetched from somewhere else. This requirement, is in a manner of speaking, sacred, since the morning paper is part of the morning routine, and no one wants to undertake a daily expedition in dressing gown and pyjamas.
- One further, absolute requirement is that no unauthorised person should be able to alter or interfere with the contents of the electronically distributed newspaper.

These requirements express not only a distribution problem, but also problems of production, presentation and security (i.e. a number of separate but interdependent problems). They do not in any way reflect the newspaper's possibilities of developing its business activity.

Which solutions are possible?

The problem of distribution

The solution for the problem of distribution to the customer presupposes the use of an infrastructure which is already accessible and through which practically all private individuals can be reached. In this area we have three obvious possibilities: the telephone network, normal radio/TV or cable/satellite TV.

Currently, a TV-based solution has to be based on text-TV which ought to work, in principle. It does so already up to a point as more newspapers are using TV as a complementary medium. However, this is not for the entire newspaper's contents and the use of text-TV would compel a person to read the paper on a TV screen with the help of a fairly clumsy browsing function. TV is quite unsuitable for texts and still images, being created for moving pictures and sound. If this solution was chosen for the distribution problem, it would result in a newspaper unsuitable for reading, and which would also be in competition with newspaper reading through the normal means of supply. Any newspaper choosing this course of action would risk, in a manner of speaking, shooting itself in the foot.

If, on the other hand, the telephone network is chosen as an infrastructure, there are three possible distribution solutions by fax, e-mail and the Internet.

- Mass distribution by fax is one solution – except that at present, newspaper pages do not correspond to the normal fax size.
- With e-mail the newspaper is sent as an attachment to an addressed message (otherwise the layout of the newspaper cannot be retained).
- Those who choose the Internet gain access to an entirely new means of distribution and wholly new business opportunities, since this solution provides interactive communication with the readership. We shall return to this subject shortly.
- Another possible solution would be conventional file transmission. This, however, is a distribution method that, for a number of reasons, is best suited to transmission between a newspaper's editorial offices and the printers. To adapt it to mass distribution for a readership, would necessitate the use of ISDN connected to local self-service printers.

Distribution by e-mail or Internet can, like fax, work on the basis of an ordinary telephone subscription. The receiver must complement his or her telephone subscription with an e-mail or Internet subscription, and have a computer with a modem and compatible software. Most people are probably not satisfied to read their paper only on the computer screen, but want it printed out, either wholly or in part, in which case a printer is also necessary. Here we have the same problem as with the fax: the newspaper page format is not the same size as that of the printer, nor that of the computer screen.

Otherwise there are obvious advantages in distributing the paper by way of the telephone network: everyone has a telephone. A disadvantage is that to transmit a daily paper in its entirety takes a great deal of network capacity (or a long transmission time). One alternative is to use ISDN, which allows very rapid transmission. However, not many individuals are ISDN subscribers, and ISDN does not extend to sparsely populated country areas.

Another alternative that can lessen transmission time is for the newspaper to send out a summary of the contents, leaving each reader to choose its most interesting sections for closer reading. This however prompts the question of how many would consider it worthwhile to download all the advertising and publicity material the paper contains. How might this affect the paper's value to advertisers, and what would happen to its important advertising income?

The problem of production and the problem of presentation

If a publisher wishes to produce one and the same version of a newspaper both in print and for electronic distribution, the paper must be produced electronically and also be given a format suitable for electronic distribution. The electronic edition must also be presented in such a way as to keep the page layout when it is printed out. Using fax retains the page layout automatically. To keep the page layout in e-mail or Internet distribution, requires that the pages be formatted in, for example, Adobe Acrobat, a program offering a general mode of presentation, "paper on screen", which can be printed out by the receiver.

The Security Problem

Security is important, since a newspaper's contents must not be altered or distorted during electronic distribution. Whether this is considered from the point of view of freedom of the press or to emphasise the importance of a daily paper's credibility, it is obvious that unauthorised interference could have serious consequences.

A distribution problem or an opportunity for development?

Not everyone, by any means, has a computer and a printer at home. The distribution problems facing *The West Bothnia Courier* and similar daily papers may therefore be somewhat of a Catch-22 situation. But owning this equipment is quickly becoming more common for a variety of reasons and therefore it is probably only a matter of time before daily papers have a format suitable for electronic distribution.

The advantages of this lie not only in lower delivery costs, but in reduced pressure on the environment, due to lower transport requirements and probably also less of a demand for newsprint (though this remains conjectural, remembering the vision of "the paperless office" and the piles of paper that can be seen today).

Another quite different advantage is time. The contents of an electronic newspaper is no longer bound by press deadlines which means that news can be updated more frequently. At the same time other contents become less like fresh but highly perishable goods. That news is news only for as long as it is hot off the press does not prevent a great deal of what we read in the papers having lasting value – background analyses, arts reviews, article series, thematic supplements, announcements, and so on. But we do not as a rule keep newspapers. Electronic papers do not need to be kept because the information can be retrieved at any time, provided that it is kept available in relational databases with interactive and easy search paths.

What looks at first like a distribution problem therefore proves to be an opportunity for daily newspapers to develop their business. Access to the information that pours in to an editorial office from all over the world, coupled with the ability to analyse and present it, can expand the newspaper's role as a versatile and up-to-date supplier of information to an even wider public. If customers are capable, on their own initiative and in an interactive way, of selecting what most interests them, there is no need for the paper's products being restricted to what is reasonable to put together in a printed newspaper.

Interactive, individualised newspapers

It seems self-evident to use the Internet as a suitable solution to the problem of electronic newspaper publication. This is because this technology, unlike fax and e-mail, is interactive, and can link up with previously published material or source-material, which is of great benefit both to the newspaper and to its readership. The newspaper is capable of developing its business on the basis of its editorial content far more than is currently the case. But the advertising market also gains a fresh potential for development.

Today, as more and more newspapers are developing electronic supplements and information services on the Internet, we see the beginning of a move toward individualised mass media. In a few years, when we take out a subscription to our electronically distributed local newspaper, the subscription might very well include a personal selection from other papers, a survey of press cuttings in areas of special interest, a survey of certain kinds of advertisements, a connection with a variety of information services, and so on.

The electronic daily paper can become our information forum, our book club agent, our ticket kiosk, our encyclopaedia, our textbook and much more – in short, our tailor-made mass media, in which advertisements are not only advertisements, but also provide access to the advertisers' products by way of electronic marketplaces. When electronic money becomes a reality, all that is left is also to deliver the desired goods by way of the Internet.

If the witticism may be excused – despite all the discussion of the irradiation of fresh food, somewhere there must be a limit to the electronic nature of a sirloin steak. Be that as it may, the possibilities of electronic newspapers are practically unlimited. One might perhaps say that the electronic daily paper can serve, on our behalf, as a skilled and rapid Internet surfer, diverting our tiny personal trickle from becoming an ever-growing flood of information.

The advertisers' target groups identify themselves

In the short term, interactivity and individuality can seem a threat to a newspaper's advertisers, and therefore to one of the pillars of its finances. If interactivity means that we can eliminate the announcements and the advertising that do not interest us, this means on the face of it that the readership of each item is greatly reduced. It would appear to follow that the newspaper is made less attractive as an advertising medium. However, not all advertisers need to feel this way; they only need to rethink slightly.

The great difference, compared to the present day, is that in interactive mass media (newspapers and others), potential customers can acquire information on their own initiative, as and when they need it. Target groups identify themselves in relation to their current needs, and look more actively for items that match their plans. In this way advertisers reach a more interested – though narrower – public than those today who merely leaf absent-mindedly through the advertising pages. Advertisers can also distribute more detailed information, since they can be given more space over a longer period, at a comparatively lower cost. This in its turn means that the target groups can come closer to a decision to purchase at the advertising stage. This is by far the greatest potential advantage to the supplier who uses interactive market communication.

Advertisers who adjust to their customers' needs and plans will therefore be able to reach a more interested readership, with more detailed information, than is currently the case. There will, on the other hand, certainly be difficulties ahead for advertisers who want to persuade us to change our plans: to turn our attention away from advertisements for furniture fabrics, and persuade us to buy a holiday trip instead, even though originally we planned to re-cover the living-room furniture. It will be a creative challenge – far more so than at present – to get us to change our plans. Let us hope that it sometimes succeeds.

The risk otherwise is that we shall be left standing there with our hands full of hard-wearing textile samples, when what we are really longing to do is to walk barefoot on a warm, sunny beach, with a cool drink waiting under the parasol.

The problem with interactivity is going to be most acute for those advertisers who really fail to interest us: the ones who bombard us with their boring messages, caring for nothing except to hammer home their trademark. It may be slightly wicked, but one is tempted to say, “So what, perhaps they deserve it.”

Interactive TV

In the long run TV and radio will also be developed in the direction of interactivity, through the use of switched broadband technology. It is switching – the technology on which the normal telephone network is based – which enables us to call anywhere we wish and have two-way conversations with the other party. Combining this with the capacity of broadband transmission means that we are no longer limited to ordinary voice communication, but that we can also transmit digital video information and digital hi-fi sound.

Unlike the telephone network, radio and TV networks are equipped only for one-way communication; the broadcasting media are not interactive, that is to say that they transmit simultaneously to everyone who can and wants to receive it, and not to any particular receiver. Before the turn of the century, however, there will be technically and commercially viable ways of establishing interactive TV and radio. This can take place through the integration of the telephone network with cable/satellite TV networks, or by way of direct broadband transmission on the telephone network, using the existing copper wiring. This latter alternative is entirely feasible for subscribers within close range of an AXE exchange. Both methods of combining switching technology with broadband transmission are already being tested.

The interactive multimedia revolution

“On the Net”

In the near future, by about 2000, it will become possible to create what we might call an all-in-one multimedia teleservice, bringing together the telephone, interactive TV, interactive radio and the Internet, a service capable in principle of reaching every household. It may be that as media users we shall no longer be conscious of the difference between what today we call separate media. Everything will in one way or another be “on the Net”, on an expanding Internet, irrespective of whether we calculate it in terms of numbers of connections, transmission capacity, utilisation areas or geographical expansion.

The result will be a total reconstruction of the media market. Nothing will remain as it was. Can anyone imagine what it will be like?

“This is the biggest revolution...” according to the media expert Evert Medbo, adding a little reflectively that people have always experienced the present, between yesterday and tomorrow, as chaotic and unstable. It is therefore all too easy to be historically short-sighted when the pace of development is so rapid: to imagine that ours is the most revolutionary time of all. But the revolution which is happening in every branch of the media by the Internet is a reality. The following sections of this chapter summarise a conversation with Evert Medbo about the consequences of this revolution.

Advertising and market communication

The trend towards the financing of more and more of the media through advertising is unlikely to decline. However, the whole basis of what is counted as quality advertising will change. Up to now, quality has been largely a matter of visibility: one might say that advertising forces itself on us with its messages, whether we like it or not. In the interactive media, advertising has to be attractive; it has to be valuable in terms of either information, entertainment, or both. Also it has to have the capacity to start a dialogue.

To many in the advertising industry, who sustain the belief that the Internet is merely one among many media and therefore only a complement to the others, this development is going to come as a shock. The advertising industry has a long tradition of one-way communication in the conventional media. But it will not be enough to simply put the kind of information designed for the conventional media on the Internet, and believe that that will be enough, since it is now “on the Net”.

How will advertising work in the interactive media? It may help us to find the answer if we distinguish between “high” and “low” involvement. Interactivity can be enormously valuable in advertising for products and services in which customers are actively involved in the purchase, both when the customer seeks out information of his own accord, and bearing in mind the purchase process is supported through interactivity. In some cases it is possible to cover the whole of the sales cycle, from the arousal of interest to the closing of the deal. Clearer price information and wider geographical range can be particularly important. Frontiers are disappearing in this regard too. Why buy an expensive car in one’s own country when it can be bought more cheaply abroad, with a pleasant holiday trip as a bonus? Why buy a more expensive camera in one’s own suburb, when it is cheaper a little farther away – and perhaps even less expensive if ordered directly from Japan?

Advertising for products and services lacking the capacity to arouse inquisitive involvement has to find new paths in the interactive media. One may for instance create something of pure entertainment value, or offer interesting information that need not be linked directly with the product or services on offer. Of course, the trademark might also “pop up“ here and there in the virtual landscape of the Internet. Product placement in entertainment programmes, films, soap operas and the like is a well-used alternative. “Didn’t you notice,” asks Evert, “that there is always a bottle of ‘Yes’ between them every time they argue in the kitchen?” – the reference here being to the Australian TV series *Neighbours*. “Didn’t you see that there was only one brand of beer in the country store?” This time the observation has to do with the Swedish film *Änglagård* (“House of Angels”), and is made by a man who never fails to take note of product placement.

Local newspapers and local programmes for a global audience

The local newspaper’s role as a medium of local news and advertising is not going to lessen, but will be supplemented. These days there is increased collaboration between TV and newspaper proprietors, at the national level and much farther afield, and there will be a similar relationship on the local level as well.

Local newspapers and local programmes may also reach a more global public. Imagine if the emigrants from Sweden to America, the subject of novels by Vilhelm Moberg, had been on the Internet and had been able to read *Smålandsposten* or watch the Småland news. Perhaps then Kristina would not have been so homesick in faraway Minnesota.

As the pace of globalisation increases, local newspapers and programmes will come to be increasingly important for those who still have strong ties to a distant homeland. This phenomenon is already a fact for newspapers in Israel, which today reach a vast Jewish readership in the USA. One does not however need to go so far afield as between continents and countries: the same applies to those who live in another part of their own country while still having strong ties to their home town.

Broadcasting

Broadcasting – the distribution of information in "real time" to all people within range – will also play a different role in future. We can already see today how TV satellites enable us to watch what is happening on the other side of the world, whether it is a dreadful war or an exciting sporting event. In future, broadcasting will be concerned only with the spread of "real time" information such as news and important events of general interest.

To broadcast an entertainment programme or a film on a Saturday evening will be pointless when the public has access on the Internet to films and entertainment programmes from all over the world, both new ones and repeats of old favourites. It will not, on the other hand, be equally pointless to produce "narrow" programmes, since these will no longer need to be shunted off into impossible time-slots. Narrow programmes will appeal far more to a wider public when they can be viewed at a time that is most convenient. As the media guru Nicholas Negroponte says in his book *Living Digitally* (1995), "The best broadcasting time is my time."

Gate-openers and gatekeepers

Mention was made in the chapter, *Electronic commerce and interactive sales promotion* of shopping arcades and squares as examples of models for electronic marketplaces on the Internet. Evert Medbo does not believe that such phenomena will be of more than temporary significance. Nor does he believe in the idea we mentioned earlier, of an electronic local newspaper becoming in the long run our substitute Internet surfer. Such Internet gate-openers as these, though perhaps important initially, will in time assume the role of gatekeepers, and inhibit freedom. They will become obsolete when Internet search tools become more efficient and easier to use, and people become more accustomed to the Internet.

As things are today, it is easy for the inexperienced Internet inquirer to get lost. However, in spite of everything it takes no more than about ten minutes for the person having a modicum of computer experience to learn enough to obtain information on the Internet – about the same length of time as it takes to learn by heart a couple of short hymn verses. If you know what kind of information you are looking for, it takes only a couple of hours to find and extract a fairly large and varied body of up-to-date and relevant information – about the length of time it takes to go to a library and find a single book on the subject.

Books and libraries online

The cost of writing a book is fairly modest, compared with what it costs to print and market it. Production, distribution and sales are so expensive that the publishers' output of books is very limited. They cannot afford to take the risks involved in an uncertain investment. Nor are booksellers able to maintain a wide range, since they have to keep their turnover at a high level in order to make a reasonable profit. Public libraries are also battling with the problem of increased costs.

Is the book threatened with extinction? Or might it experience a renaissance if books no longer need to be distributed as goods? It is already possible to distribute books on the Internet and copy them on to separate pages at home, in the school or at work. The next step is thin, light and soft "screens" from which a book can be read. Perhaps the book will have its renaissance in the form of a little, portable and reader-friendly screen – which will do no greater damage than an ordinary book if you happen to drop it while falling asleep reading in bed. When technology permits direct contact with the reader, book distribution will be drastically reduced. The supply of books can increase, their range can increase, their use can increase, while at the same time the costs will be comparatively minimal.

Today we are already able to gain access to and use many of the larger libraries' search systems on the Internet. We are increasingly able to access encyclopaedias and works of reference, and more and more books are to be found on the Internet. "Gutenberg" is the name of a web-site which supplies world literature on works which copyright has expired. The corresponding Swedish site is called "Runeberg". Certain kinds of literature with a very small edition but a wide geographical spread, are already distributed on the Internet – academic theses are a good example. It is also convenient for textbooks, which at present comprise an expensive element in teaching, to be distributed on the Internet. This is becoming increasingly common. This also brings with it the advantages of multimedia and flexible teaching.

Investigators

Being able to look for and find information is one thing. But to generate a basis for knowledge by sifting the material, assessing its reliability, assembling and presenting it – none of this happens automatically merely because the information is becoming more and more accessible. The skills which are still required are those of the journalist, the editor, the specialist or the teacher; in short, those of the investigator. The investigator's role is becoming more important, whether it is a matter of providing the general public with a concise and reliable picture of a political event, or of encouraging secondary school students in the more information-seeking style of teaching that the Internet makes possible.

Professional development and education

- Overview
- Quality Assurance training for small business
- Linné on Line
- Ottenby's birds on the Internet
- Computer-aided development of primary health care
- Knowledge-based systems
- The learning organisation

Overview

Computer supported and interactive education, multimedia, video-conferencing, Internet, intranet and other networks together form a well-developed infrastructure for learning and the quest for knowledge. Education no longer means learning for life (which is a splendid thing), but it can also, and increasingly, mean learning *in* life; the recurrent development of competence, based close to home as well as on distance education.

Education in schools is in the process of taking on a meaning which is far from the idea of fragmented "sausage machine" learning, for instance, when inquisitive students can be seen eagerly surfing the Internet. In a similar way, distance education has been given a character which is far from the assiduous industry of the lonely study chamber, where the hope of a better life was the powerful motivator for starting the next section of the correspondence course. And "doing a course" in working life is less often synonymous with travelling to some conference centre to contemplate closely-written overhead transparencies.

Can this simply be regarded that the new technological opportunities will make all the difference? Obviously not. Committed teachers have never practised the "sausage machine" approach to education; where there is knowledge and the power of insight, there are no dry facts. Neither can the motivation of the student in a solitary study ever be replaced by technological possibilities. Experienced and expert lecturers never flash illegible overhead transparencies in front of audiences paying high fees, do they? On the contrary, they run a multimedia

show which astounds those present. Or perhaps they adopt the style of Ingmar Persson at Telia Megacom: get closer to the audience and talk about communications as a subject of extreme interest, ask questions, answer questions, tell stories and attract a response.

In short, technology can never replace educational expertise and motivation. With the aid of the new technology, however, more people can be reached by skilled educators, have their motivation and curiosity aroused and enter the search for knowledge independently. And that has to be a Good Thing.

- The requirements and the positioning of small business concerning education and professional development have been discussed previously, in connection with FR Online in the chapter *Networked companies and organisations*. In the following chapter there is a short section dealing with training in Quality Assurance for small companies not linked to FR Online.
- Linné on Line is an example of the way in which universities and colleges are using the Internet to an increasing degree, in order to create interest in academic education and research. Their targets, as in this instance, are senior students in the final years of high school, who possess dynamic knowledge in a whole range of subjects.
- Would the global communications network, the Internet, make life easier for migratory birds? Hardly as a means of transport – here is one example of the limitations of technology. The Ottenby Bird Observatory has a home page which receives an increasing number of visitors, not least from abroad, who wish to learn about the assiduous long-distance aviators of the North. This is an interest which may in the end facilitate the continuation and well-being of these species.
- Computer-aided development of primary health care, “Pum@”, is a project within the health care system of the city of Norrtälje. One of the project subsections of Pum@ deals with the supervision and further training of doctors during their general medicine internships. Norrtälje has the most up-to-date hospital in Sweden and is now the first hospital in the country to use the Internet to support its interns.
- At the end of this section, talking about “the learning organisation” would seem like kicking in an open door – at least in theory. Who wants a non-learning organisation? Yet, in practice there are not so very many learning organisations despite the fact that they often consist of learning individuals.

Quality Assurance training for small business

Can the Internet be used to provide training in high-quality technology and support for the development of quality control systems? The question is relevant for many small enterprises which realise that Quality Assurance is an important means of competition in an ever greater international market.

The question originated within the Stiftelsen Småföretagsutveckling i Linköping, SMIL (Linköping Foundation for Small Business Development) which comprises approximately one hundred small enterprises. Most of these work with high technology at, or near to the Mjärdevi Technology Park. This Foundation has an active commitment to the SIS-STG "Project in Quality Control Management". By this means, it also has immediate access to those drafts of Standards documents circulated for comment, which have been developed internationally. The Linköping Foundation also has the opportunity to influence the future wording of these Standards.

Against this background, it is self-evident that our question at the head of this section is a rhetorical one. Of course the Internet can be used to further Quality Assurance within Swedish small enterprises. The problem is chiefly to find someone who can both make the idea a reality and finance it. In this instance, Demotel is one part of its solution. But there also has to be a sufficiently large clientele for the Quality Assurance training and quality-related services offered. And an infrastructure has to exist which reaches all the potential target groups. As yet the number of small enterprises connected to the Internet is low. But they may well increase – and perhaps quite rapidly (see the section *FR Online* in the chapter *Networked companies and organisations.*

Linné on Line

Seek on the Internet and ye shall find...

Searching for information on the Internet can very easily reveal totally different pearls of wisdom from those being sought. One example is the following byproduct of a search for the home page of Linné on Line (which hasn't yet been published). Another totally different page popped up instead. This is a charming little story about seeking and finding gold in more ways than one.

Linné on the divining rod (*Folkvett* 2/94, p. 14) Carl von Linné's (known in the English-speaking world as Linnaeus) *Skånska Resa* (1749) contains an hilarious passage about an experiment with a divining rod during his travels in Skåne (Scania). The following quote is from Carl-Otto von Sydow's revised edition (1975).

"The divining rod is a curious piece of trickery with which people believe that they can find hidden metals. My secretary often used to carry an evenly forked hazel twig with him to amuse the company present. This happened again here when one person hid his silver tobacco box and another his watch somewhere in the bushes to then be found quite successfully by the secretary. I had never believed in the divining rod, didn't want to hear so much positive discussion about it and thought that my companions and secretary had been in league to hoax the rest of the group. So I decided to walk to a large field north of the barn, where I cut away a small piece of turf, buried my purse, then carefully covered it with the same piece of turf so that no one could see any sign of the hiding place. The spot was marked by a big Ranunculus Fl. 467 (buttercup) growing close by, there being no other tall plants in the whole field. When this was done, I went back to the group, told them that I had hidden my purse in the field and suggested that if my secretary could find the ducats using his divining rod, I would believe in its powers because I was sure that no living soul except me knew where the coins were hidden. My secretary was pleased to have the opportunity of making me take a more sympathetic view of the divining rod which I had always ridiculed. The group was also curious to see the divining rod put to its ultimate test. My hosts and I then witnessed my secretary searching thoroughly for a whole hour in vain. Since the goods could not be found, the rod became an object of scorn. Later, when I returned to the field to retrieve my purse, I discovered that our diviners' peripatetic pacing had trampled all the grass so that there was not the slightest trace of a buttercup and I had to search for my ducats in the same directionless manner as the rod.

I did not want to gamble my 100 ducats on a rod so we all started a ridiculous and annoying search but without success. Finally, when I had admitted defeat, the baron and my secretary asked me to point out the place where I thought I had placed the purse. I did this but the silly rod would not point and drew us in a completely different direction, so finally my secretary and the rest of us were tired of it and I was especially miserable. Then, my secretary, who was standing in a totally different part of the field, stated that if the purse was not there, he had no idea where it could be. I did not bother to look over there as I did not think that was where I had hidden the purse, but Baron Oxenstierna got down on his hands and knees to search and scratched around with one finger. He pulled up the piece of turf under which lay the ducats. So this time the divining rod had worked and retrieved the ducats which I thought I had lost. If I see any more similar examples, I might have to believe what I do not wish to believe because the rod is totally different from the magnet and the attraction between two pieces of iron. That a hazel twig with no such characteristics should point me to richer metals does not lead me to believe in the divining rod, but I am no longer prepared to gamble many ducats putting it to the test."

Order restored – the background

The above story describes a simple method – very reluctantly acknowledged by a world-renowned scientist to be possible – of searching for and finding metal objects underground. This method might perhaps be used in order to find telephone cables to prevent them being dug up by mistake when carrying out drainage work, road construction and foundation work. The hazel twig might perhaps even work with fibre-optic cables?

After this little diversion concerning the divining-rod, it is time to restore order and return to the project Linné on Line and its background. Linné on Line is a part of Telia Internet @ School, where Telia, in collaboration with universities and colleges, offers education programmes directed toward senior students in the final years of high school. The aim is to arouse the interest of teachers and students in the active search for knowledge and learning which is made possible by computer-supported education, multimedia teaching and communication via the Internet. A further objective on the part of the academic institutions is to stimulate the students' interest in academic study, by introducing various aspects of tertiary-level teaching and research in a lively and attractive way.

Linné on Line is carried out in collaboration with the University of Uppsala – naturally enough, since Uppsala was Linnaeus' scholarly domicile. By taking him and his work as the point of departure, the university is able to demonstrate its broad field of scholarship and at the same time provide a vivid historical perspective for present-day research. Linné on Line also demonstrates how computer-aided education works, when interactive teaching is used at its best. It can capture the imagination, make the facts come alive, create links and associations, deepen or widen the student's knowledge – just as the individual student wishes. Here we are as far from the idea of the fragmented "sausage machine" approach as we can possibly get.

Linnaeus with multimedia on the Internet

The combination of Linnaeus, multimedia and the Internet is not totally inappropriate! Linnaeus' colleagues travelled to many of the world's continents (not even the Internet has penetrated all the places they visited in those days). His scientific work was multimedia-oriented in many respects – at a time when the herbarium, carefully crafted drawings and comprehensive descriptions were the only available means for scholarly documentation of the extremely detailed, colourful and graphic objects of his research.

Today there is a tantalising possibility of combining the original documentation with photographic images and illustrations showing what flowers and plants look like in their respective environments. The logical, yet complex connections in Linnaeus' comprehensive classification can be brought to life through illustrations and interactive teaching. Proposals for excursions and descriptions of them, laboratory experiments and study visits can provide further stimulation. In a similar way, links can be made to related subject areas or areas such as ecology, geography, geology and climatology for those who wish to seek further information about various plant habitats and changes which may have taken place throughout the many years separating Linnaeus' era from our own time.

Ottenby's birds on the Internet

Background

The Ottenby Bird Observatory on the island of Öland was founded in 1946 and is thus one of the oldest bird sanctuaries in Europe. Its founders could hardly have imagined that the remote institute would one day be accessible to the whole world; and that it would be possible to show and describe the many bird species which break their journey at Ottenby in the course of their spring and autumn migrations.

Large numbers of migratory birds pass over Ottenby. Out of approximately 475 bird species observed in Sweden, as many as 375 have been seen at Ottenby. The popularity of this area is due to its varied landscape, with grazed and wet coastal meadows, shallow and protected bays with sand banks, old and tall oak forest and more recent mixed forest of young birches and other deciduous trees. This variety of biogeography, in combination with Ottenby's location in south-eastern Sweden, provides a habitat for a great number of bird species. Many of these are endangered or rare in Sweden: for example the dunlin, the ruff, the avocet, the black-tailed godwit, the gadwall, the corncrake and the golden oriole.

The Ottenby pages on the Internet

The Ottenby pages on the Internet contain facts on a smaller number of birds:

- Chaffinch, *Fringilla coelebs*
- Blackbird, *Turdus merula*
- Corncrake, *Crex crex*
- Southern dunlin, *Calidris alpina*
- Willow warbler, *Phylloscopus trochilus*
- Nightingale, *Luscinia luscinia*
- Robin, *Erithacus rubecula*
- Sparrowhawk, *Accipiter nisus*
- Starling, *Sturnus vulgaris*
- Crane, *Grus grus*

The aim is to present at least fifty or so birds. The design of the information is the responsibility of the Department of Media Production at the University College in Kalmar. The immediate plans are for "clickable" world maps of migration routes and destinations. Further down the line it will also be possible to listen to bird calls such as that of the dunlin's "kyrrv". In the future it will also be possible to show videos of the birds.

Thanks to the Ottenby pages on the Internet, teaching at school about birds can be made lively and exciting. Remember the dusty and tattered, stuffed bullfinch in primary school? Sad, wasn't it? Or the dog-eared bird-posters after years of use in school. It is true that many school groups visit Ottenby annually to see the birds in real life. But the approximately 500 groups per annum are still only a drop in the ocean, compared to all those who can visit the bird observatory on the Internet.

An increased interest in birds

Amateur ornithologists from distant countries such as Canada and the USA have found their way to Ottenby via the Internet. A group of Swiss people discovered Ottenby at Telia's stand during the large Telecom Exhibition in Geneva a year or two ago. These participants were so fascinated that they later visited the bird observatory in real life.

Jan Pettersson (e-mail address: jan.pettersson@public.kalmar.se) who is responsible for the Ottenby pages on the Internet says: "There are similar projects on the Internet, but they are more directed towards research. We want to reach a wider audience, increase contact through various media, and increase interest in birds, both nationally and internationally."

The Dunlin presented on the Internet

The picture of the dunlin represents an adult bird in summer plumage. The immature bird lacks the black belly of an adult and has a more buff-coloured tinge to all its feathers. During winter the dunlin is grey on its breast, head and back, while the rest of its body is white. There are 15 to 20 breeding pairs at Ottenby. The highest recorded age is 25 years.

Voice. The male stages a flying display over his territory, while he lets out a stuttering "ryryryry" which fades towards the end. The mating call, which is also heard during migration, is a nasal, rolling "kyrrv".

Habitat and food. The dunlin is divided into two species, southern and northern. The southern species breeds on the coastal meadows around the Baltic Sea and on the west coast of Sweden. The northern species breeds on the Siberian tundra, while an intermediate form is found on the heathlands and moors of the northern Swedish mountain country. During the breeding season the dunlins mainly feed on mosquitoes and crane flies. When the breeding season is finished, dunlins are found on banks of seaweed, where they feed on flies and their larvae. Sandy beaches also attract flocks of dunlins, digging for polychaetes and molluscs.

Migration. The median date for the capture of adult dunlins belonging to the northern species is 30th July and August 25 for immature birds. Dunlins of all ages belonging to the southern species migrate approximately one month earlier than their northern cousins. Their winter habitats are the shores of Great Britain, the west coast of France and the Mediterranean. Occasionally dunlins are found winter-

ing in the southern areas of Sweden. In total, there are approximately 1.3 million dunlins wintering in Europe.

The dunlin at Ottenby. The majority of the dunlins using Ottenby as a stopover site during the summer come from Russia. Individual birds are extremely punctual every year and their migration is speedy. For instance, they only take four to five days to fly from Ottenby to the Atlantic coast of France. The southern species returns in March-April, while the northern dunlins do not arrive before late May.

Computer-aided development of primary health care

Background

Computer-aided development of primary health care, Pum@, is a project within the health care system of the city of Norrtälje. One of the part projects of Pum@ deals with the supervision and further training of doctors during their general medicine internships. Norrtälje has the most up-to-date hospital in Sweden, and is now the first hospital in the country to use the Internet to support its interns.

During the 21 months of internship, the doctors-in-training find themselves in a gulf between the theoretical knowledge of their basic medical education and that knowledge which they increasingly gain through the practical hospital work. This is when the interns learn how to work in the field and can test their knowledge for themselves. They are given opportunities to reflect, in a systematic way, on their experiences, under the guidance of senior colleagues. They can thus build a fundamental appreciation of what is "scientific knowledge and tried and tested experience" and what their future work will really be about. This appreciation will affect the continued development of their competence well into the future. That is why the internship period is such a very important phase in medical education. It is also a nomadic phase: the internship covers many different clinics, and so the intern works for only a short time at each one.

The Intern's Manual

The Intern's Manual (IM) is an important teaching tool. A document in a loose-leaf binder, it contains the organisational background for fundamental medical work, and the common medical routines and rules which govern practical work. As a rule, every clinic is responsible for its part of the IM binder. In common with most of the information distributed within the health care system, the IM binder is in paper form. This limits the information to one-way communication and demands frequent updates. To ensure the updating of, for instance, a memorandum on vitally important treatment recommendations is an administratively complicated task. In addition, it often entails costly follow-up work.

This is why the IM folder is updated rather infrequently, at present. Changes are made in different ways and by different methods. So there is a danger that important information is included too late in the IM

folder, something that it should be possible to avoid, using today's technology. If information could be collected and accessible to the interns via personal computers (preferably portable), it would be so much easier and less costly to keep the IM folder updated. Despite its information being paper-based, it is most often produced by electronic means. And computers and communications networks are certainly available within the health care system. Thus the foundations are already laid for electronic publishing. Conversion of this information into a presentable format which works both on-screen and on paper is not a great problem, either. The same techniques as those on the Internet can be used to present and link information by using HTML (Hyper Text Mark-up Language).

Test Pilots

"Now, in principle you have learned the theory which you need to begin working as doctors. Now you are going to learn to use that knowledge in practice. The object of what I am now going to show you is to make that process easier."

It was Anders Lindberg, who began testing his part of the Pum@ Project in February 1996, who addressed his two "test pilots" with these words. The result of many days' and evenings' work and great expectations was now to leave the desktop and face the real world. Two interns, Drs Ewa Carlsson and Connie Lagerberg, were the first in Sweden to be supported by the Internet during the whole of their internship. Or rather the intranet, since the electronic IM binder is not available on any Internet server for general access.

The two test pilots approached their task with mixed feelings. On the one hand they wished to guard against becoming systems developers. On the other, they were happy with the support they received. Far from all newcomer interns are told "Phone me if there are any problems — I'm available 24 hours a day, seven days a week". Anders Lindberg himself had gone through his internship at Norrtälje Hospital, using the conventional IM binder. He gave a telling example of the difference between the old and the new style of manual: "In the old IM binder there was a passage of eight lines on anaesthesia. In Pum@ we have entered ten new memoranda and we will also enter bits of video film to show how certain procedures are carried out, for instance intubation."

The next step... and the next

What is happening in Norrtälje may seem to be an expensive way of producing an IM binder. But it may also become the beginning of a totally new approach to organising large amounts of information available within health care. Once the IM folder is published electronically, there is a working method which can be applied to other important information as well which at present is limited to paper copy. The next step is therefore to publish all information related to a continual transfer of knowledge, that is to say, information which it is important to update regularly.

When this step is taken, the question may be asked – why limit this approach simply to health care in Norrtälje? Since the personnel in the Swedish health and hospital care system can be regarded in a certain sense as a fairly homogeneous group of computer users, this thought is entirely reasonable. At least there are no differences between various health care areas which argue against it. An argument for the new approach is that there is great financial advantage in structuring and rationalising the dissemination of information in this way, because in the health care sector the requirements have to be stringent, where updates and follow-ups are concerned. Standards can never be lowered, but they can be better fulfilled and in a much more cost-effective manner.

Parts of the project

Computerising the IM binder may thus be seen as a first basic step towards a medical computer-based system of support for medical knowledge, decision-making and communication. On the way, there is a number of part projects, each having its own objective.

- Subproject 1 (1995-96) – information corresponding to the needs at the internship level (general medicine)
- Subproject 2 (1996-97) – information corresponding to the needs at specialist level (specialised service within general medicine)
- Subproject 3 (1997-98) – information corresponding to the needs of qualified specialist physicians in various areas of medicine.

Anticipated effects

The anticipated effects are as follows:

- Accessibility and updating of medical knowledge is guaranteed.
- Internal and external communication of new medical knowledge is developed.

- The opportunity of knowledge transfer increases, and in the process also the quality of care
- The use of computers and networks in health care becomes more effective (the basic investments in this infrastructure have largely been made already, and will become more profitable, the more computers and networks are used).

Publishing via the Internet

Remembering that the long-term objective is the development of a medical knowledge base which is held in common by all health care areas, it seems reasonable to use the Internet as the infrastructure. Interactive communications also means that effective links can be created between different information units, so that each individual is able to choose the depth of information which is needed for each situation. Also, it will be used for exchanging thoughts and ideas via electronic conferences and using electronic mail to seek, receive or to give advice.

Further possibilities for the use of interactive technology is the development of knowledge-based systems (or expert systems) to aid decision-making in diagnostics and choice of treatment. This is an idea (not entirely uncontroversial) which has been tested in totally different contexts, unconnected with either Pum@ or Demotel.

Knowledge-based systems

There are many areas of practical application of knowledge-based systems. Some that have already been tested are medicine, law, geology, chemistry, metallurgy, construction, computer configuration, technical service and education. Up till now these applications have often aimed at providing experts with the support of other experts at an even higher level. But in the maturation process of knowledge-based systems technology, it is moving towards applications suited to a wider target clientele. Knowledge-based systems for computer-aided training in decision-making is one such example.

In this context it has to be emphasised that knowledge-based systems cannot create knowledge where there is none, or security if none exists. What is possible, is for example, with the help of knowledge-based systems to construct and analyse new models which may more closely approximate the complexity and uncertainty of the real world. In this way, a clearer picture can be gained of the degree of uncertainty. The use of this type of knowledge-based system for decision-making within medical diagnostics has been discussed by Dominic Clark and Paul Krause (*Representing Uncertain Knowledge: An Artificial Intelligence Approach*, 1993).

As is so often the case when knowledge-based systems (or expert systems as they are often called) are used, there is some doubt whether the decision-making is going to become a mechanical process – that users might prefer to "obey" the computer's advice than think for themselves. But this is a view which is founded on prejudice rather than on insight. An expert system that it is "transparent" to the user, is no authoritarian adviser. It works in a mode of competency development, as a combination of check-list (so that important factors are not forgotten or disregarded) and asking questions (so that nothing is taken for granted).

The advice generated in a transparent system always takes its point of departure from that information which has been exchanged between the user and the system. Often there will be several alternatives, so that users are responsible for making the final decision, based on their theoretical and experiential knowledge. It goes without saying that there has to be "scientific knowledge and tried and tested experience" behind an expert system. It cannot be used in areas where the body of knowledge is too diffuse or where decision-making primarily has to be built on factors such as intuition or sentiment.

The learning organisation

The image of the organisation and the reality

The objects of the Pum@ project can be interpreted as a desire to provide support for the role of the health care system as a continually learning organisation. Medical science and the experience of various methods of care is developing continuously and very rapidly. However, the learning organisation can also be a completely ordinary business enterprise, whose production is not seen to be particularly subject to change. It is always important for each business enterprise to be aware of, to interpret and to learn from changes in the world around it, and to visualise how these changes may affect it. Otherwise, sooner or later, it will meet the same fate as the Facit company, when their electro-mechanical calculators were swept off the market by the advent of electronic minicalculators.

"This is what our company looks like", says the Managing Director and puts a transparency full of squares and straight lines on the overhead projector. It is quite possible that it is the limited means of describing a complex world on a flat piece of paper that *in itself* might be one reason why many firms look the way they do today. The schematic picture has been allowed to shape reality, when the pen and the ruler have been the instruments of description; the map has formed the territory. The learning organisation is not likely to be able to be described in this schematic way. It is better and more easily illustrated by an interactive multimedia presentation – but only if the multimedia effects are not included as decoration, but in order to bring alive the fundamental and unique inner character of the company.

Subadditive, additive, superadditive and hyperadditive organisations

Although straight lines limit our possibilities when it comes to describing a complex world, these are greatly enhanced by everyday mathematics. The "additive" is something we take for granted in daily life, that one and one add up precisely to two. The whole is always equal to the sum of the parts. This is true in the arithmetic we learned at school. But mathematics can be deceptive. There is another kind of arithmetic in which one and one add up to less than two (the "subadditive"), or to more than two (the "superadditive", sometimes called "synergy").

“Hyperadditivity” may not be a generally accepted mathematical term, but this does not prevent it existing. In which case, it can be understood as meaning that the whole can be *a great deal more* than the sum of its parts. This is attainable if information technology is combined with organisational development to create learning organisations. To clarify how this can take place, it may be helpful to review the way in which the industrial organisation has developed.

The old, mechanistic view of the enterprise as a machine was formulated in business economics terms in Taylor’s *Scientific Management.* To a great extent this perspective was based on the need to have unskilled workers collaborate efficiently in a complex production process. But history goes back even further. The leaders of the old industrial enterprises often came from a military background – in their day the foremost training ground for leadership. The leadership style in which soldiers were led to total obedience in war, also became the style of leading an enterprise. We have inherited many concepts in business economics and management from this era: ”strategy”, ”tactics”, “operation”, “division”, ”department”, “unit” etc., and a great number of definitions of rank within organisations.

That the military campaign became the ideal for the industrial age is not so very strange. In both cases it was necessary that many individuals should work in a totally unified manner and act mechanically. Within industry, the machines set the pace. Humans were cogs in the machinery, neither more nor less. Oh yes – less, for they were cheaper than the machines to wear out and replace. The interchangeability of the individual was at least as important in industry as on the battlefield.

The old industrial enterprises were, despite this miserable state of affairs, superadditive, since many people together could produce a great deal more together than the sum of what the equivalent number of people could produce separately. The superadditive factors, though, were the organisation and the machines, not the people. Now that the human being has become a resource which is often more important than the machinery, companies tend to become subadditive, if they retain their old patterns. A large part of the administrative and controlling organisation forms a subadditive factor, when it is applied to competent and independent individuals.

One method of counteracting the tendencies towards subadditivity was developed through Management by Objectives (MBO). But that was not at all the way it was expressed. MBO came into being in order to channel human endeavour; to ensure that all strengths should be added together to achieve a result in the right direction. Great importance

was attached to quantitatively measurable goals and strategic direction, clearly indicated by the fingers of the whole hand.

Management by Walking Around was born out of the insight that committed leaders can motivate people to do a great deal more together than each one can do separately. Here we find superadditivity at work. But there remains a fixation upon leadership. And thus this type of management is only partly on the way to the learning organisation, where thinking and feeling individuals work together, and where leadership is not only exercised by skilled leaders, but is also shaped by autonomy and self-organisation. This is where several superadditive factors can work together: clear goals, strategic clarity, motivation, active learning, exchange of knowledge, excitement, enjoyment of work, responsibility and flexibility. The result may be hyperadditivity.

The brain as metaphor of the learning enterprise

One factor which reinforces hyperadditivity is the facility of communication within the organisation. In open, interactive networks, where there is a mutual exchange of information, it is possible to create knowledge flows; the brain, not the machine, becomes the model of organisational development.

One of the strengths in having the brain as a model for the organisation is that (according to Gareth Morgan, *Images of Organization*, 1986): "...it provides a valuable means of thinking about how computing and other microprocessing technology can be used to facilitate new styles of organization. In many organizations the full implications of this technology are not always realized, because new information-processing systems are often imposed to reinforce bureaucratic principles."

The brain is not only capable of learning, it is also able to learn how to learn, that is to say, to develop understanding; something that few organisations seem able to manage. Why? one asks.

"While some organizations have been successful in institutionalising systems that review and challenge basic norms, policies and operating procedures in relation to changes occurring in their environment – e.g. by encouraging ongoing debate and innovation – many fail to do so. This failure is especially true of bureaucratic organizations, since their fundamenting organization principles often operate in a way that actually *obstructs* the learning process."

Morgan describes three factors which counteract learning organisations:

- Bureaucratic organisations fragment their thinking by taking their point of departure from their organisational units; they do not encourage their staff to think independently in an overall perspective, free of the constraints of the company's organisation.
- Bureaucratic organisations are also marked by a clear allocation of responsibility, where those who carry responsibility are often punished if something goes wrong. In order to avoid placing themselves at a disadvantage, they are often forced to limit, hide, or minimise the problems.
- The third factor is that the gap between what people say and what they do can be considerable. Rationalisation after the event or recourse to rhetoric are methods often employed in order to give the impression of knowing what one is doing and being in control of the situation.

In summary, the bureaucratic organisation runs the risk of becoming narrow-minded and self-deceiving. What remedy does Morgan propose?

- Encourage and value openness and power of reflection, and accept that error and uncertainty are part of life in a changing world. In this philosophy it is permitted to write off mistakes against increased experience, and negative events are allowed to become a source of insight – they are not seen as automatic reasons to look for scapegoats.
- Encourage an open approach to problems and a way of analysing them which starts out from several different perspectives. The company as a whole has one perspective, their various sections may have others. The clients provide further perspectives, as do suppliers and partners. *The question of the real basis of the company's business must be kept alive as a question in constant need of answering.*
- Never allow the structure of the organisation to be the point of departure for thought and action. Seldom does a problem have relevance to only one department. This is where constructive conflicts between different units within the organisation may throw light over the problem in its entirety.

Morgan ends on the note that teaching is best understood as a process where the limits of thinking and acting are constantly called into question and that "Learning and self-organizing generally call for a

reframing of attitudes, emphasizing the importance of activeness over passiveness, autonomy over dependence, flexibility over rigidity, collaboration over competition, openness over closedness and democratic inquiry over authoritarian belief."

The creative, intuitive network organisation

Oticon (which is totally unconnected with any Demotel project) is a medium-sized Danish company which manufactures hearing-aids. In the early 1990s Oticon turned crisis into success within a short period of time. Some quotations from its CEO, Lars Kolind, may tell us why.

- "We can all copy one another's microchips, but not one another's organisations."
- "Here it is not only management which does the thinking. If everyone has the same information as the management, everyone will make sensible decisions."
- "Think the unthinkable." (Lars Kolind's motto.)

An important means of realising "the unthinkable" within Oticon has been a flow of information in an open organisation, where the individual is encouraged to move, physically and intellectually, between various activities and projects. Here the individual's "home base" within the organisation has the character of a social base and developmental centre, rather than merely being something that ties the individual to a limited activity.

A further example is provided by Hogia, a company which has also turned crisis into success by combining IT and organisational development in a creative way. In his book *Klyv företagen! [Split the companies!]*, Bert-Inge Hogsved (Hogia's founder and CEO, also a member of the IT Board within FR, the Federation of Private Enterprises) describes how his company grew very quickly, from being a small and successful entrepreneurial company to becoming a medium-sized and "slightly sticky" organisation, where the number of signs of entrepreneurship diminished, at the same rate as the need for coordination increased.

In making the choice between an organisation marked by entrepreneurship and ability to make rapid and intuitive decisions, and an organisation characterised by coordination and planning, Bert-Inge Hogsved decided to go for the former. Hogia was split into six different, quite independent companies. These, in turn, have grown and been split. Today the Hogia Group comprises 20 or so companies, all of which have stubbornly kept their small-scale and entrepreneurial character. In this way

the Hogia Group are also able to mirror the small-scale character of their clients, since the group turns largely towards smaller and medium-sized companies.

The strategy behind the successful splitting of the company rests on communication and the exchange of information, which is largely carried out by electronic mail within the Hogia Group. However, it is not coordination and joint planning which is the main objective, but dissemination of knowledge and ideas. Without the need for any joint staff or coordination functions, cooperation between the sister companies arises when they themselves realise that both they and their clients benefit from coordinated action. This is how the creative, intuitive network organisation can be developed, both within a company and in collaboration between different companies.

Communicare necesse est

Often the use of IT and the development of efficient information flows are still regarded as some kind of "lubricating agent" for the machine-like structure of the industrial organisation. With a better lubricant it is possible to bring together and coordinate more units and achieve greater synergy effects from the organisation. It can be slimmed down and made "flatter". The object of the exercise is both to reduce losses through friction and to reshape work processes towards greater efficiency, that is, less consuming in energy.

What happens if IT and efficient information flows are used as a means of dividing an organisation as happened within Hogia? At the technological, human and organisational levels, Hogia has succeeded in realising a communication-based strategy, which emphasises the importance of each individual for the whole, and the dominance of multiplicity over singularity. This strategy provides the Hogia Group with good and flexible opportunities for growth, as well as great freedom to place branch companies and colleagues where they are going to make the greatest contribution. The necessary relationships can be maintained but the networks are hardly to be seen as a tight rein.

What is this, if not fission energy? A physicist can easily imagine the difference between the enormous amounts of binding energy which can be released during a fission process, and those comparatively limited amounts of energy which may be saved by reduced friction and less energy-consuming procedures.

A fission process may result in large amounts of energy, but the manner of producing that energy is combined with certain risks – one may lose control. To save energy, on the other hand, would seem com-

pletely risk-free, at least in theory. However, it may lead in practice to starvation. Many companies succeed in staying both slim and effective, but there are examples of anorexic organisations. That is when an organisation has been created which is so slimmed-down that it never has any extra reserves of energy to turn to when they are needed. In such an organisation people suffer burn-out; they focus anxiously on their own limited goals and objectives. Courage and openness disappear. Curiosity vanishes. New thinking and reevaluation is concluded with a deep sigh – when one remembers the effort which has to be expended in order to put thought into practice. Without openness, curiosity and new thinking there will be no learning – and no learning organisation.

The infrastructures of knowledge through the ages

Learning from living

There is much talk today about learning and the information society. Every society has however, in the broadest sense, been an information society; they have differed from one another only in their ways of storing and communicating knowledge, that is to say, through the infrastructures of knowledge (Lorenz Lyttkens, *Mellan lust och nytta [Between enjoyment and usefulness],* 1993).

In the kind of society in which knowledge was transmitted by way of oral tradition, the infrastructure of knowledge consisted of the human memory and the spoken word. The transmission and development of information took place slowly. The collective memory of a society was passed on to coming generations by way of verses, rhymes, riddles and rituals, the purpose of which was to assist the memory. Much of its historical knowledge was formalised through myths, rituals and symbols, which lived on long after their original meanings had been forgotten.

By the time writing was developed, society had already reached a high level of organisation, specialisation and stratification. Agriculture, crafts, commerce, law and religion all increasingly required a complement to the spoken word. Knowledge of written language was long restricted to a tiny elite minority in society. It was employed primarily as a practical instrument for the permanent preservation and long-distance exchange of specialised information. Many of the oldest written documents preserved from that period consist of inventories.

It took longer before written language was used as a medium of the development of knowledge, and for literary purposes. Since the production of written works was extremely complicated and time-consuming, the use of these was still very limited. Not before the introduction of the art of printing could the written word be spread more widely, and a more institutionalised and comprehensive educational system be developed.

Later, in the mid-nineteenth century, a unique educational reform took place in Sweden, which prescribed literacy for all. At that time there was nothing like it in any other country. This reform was important in

laying the foundation of the rapid development which Sweden subsequently underwent, from being an impoverished agricultural society to being one of the richest industrial and technological nations in the world. This may be well worth contemplating by those who stress the need for knowledge and development of skills as an important factor in competitiveness, while at the same time talking, without the slightest tremor in their voices, about the need for educational cutbacks.

In today's media-dominated society, the written word is meeting growing competition from the cinema, radio, TV, video and multimedia. The memory capacity of the media society is increasing almost without limit. A more and more internationalised market is being created for information and knowledge in step with increased communication possibilities in every area. The learning process is still institutionalised, but the quest for knowledge can increasingly be pursued outside the institutional framework. Might the back-packing and Internet-surfing seeker after knowledge perhaps be finding the school bench too small and the institution too restrictive? The motto "learning for living" is more and more being exchanged for "learning *from* living" a point of view that is beginning to influence the professional development strategies of the most far-sighted firms.

Logistical revolutions

The development of information and communications technology can, according to a model borrowed from the book *K-samhällets framtid* (Andersson and Strömqvist, 1988) be placed in a historical perspective: a perspective describing how communications networks have always interacted with, and been a basic condition of, developments in culture, trade and industry.

One of the book's main theses is that all economic development builds upon a non-material infrastructure of knowledge and a material infrastructure of physical transport and communications networks (logistical networks). A gradual improvement of the logistical networks leads sooner or later to "logistical revolutions": such comprehensive changes in the conditions governing production, distribution and consumption that the overall structure of a society's economy is totally altered. There are many indications that we are on the way to such a revolution.

Against the thesis of logistical revolutions may be placed the view that all economic development is a process of evolution, in which a mass of factors combine, and single factors seldom play a decisive role.

One cannot however overlook the fact that it is the kind of infrastructure that is based on some form of network which always brings about a “ketchup effect”: like ketchup in a bottle, a critical mass has to be reached before a breakthrough can take place. We may look a little more closely at these logistical revolutions.

The expansion of shipping and increased trade in the mediaeval and renaissance periods interacted with a powerfully growing cultural exchange among the nations, near and far. Ideas and knowledge were energetically exchanged; far-reaching progress was being made simultaneously in science, art and technology. One of the most significant areas of progress was in printing. The ability to produce books on a larger scale led in time to the creation of an entirely new infrastructure for education and the development of knowledge.

Not only maritime trade, but land-based trade, began to attract attention during this same period. The road systems of Europe and the Near East, which had been in a state of decay for many centuries following the fall of the Roman Empire, began slowly to be improved. But the Far East proved still more attractive. The search for new maritime routes there led to the surprising discovery of an entirely new continent, the unimagined wealth of which brought about an entirely new economic order in Europe. People learned the meaning of such factors as capital accumulation and inflation – although the concepts as such were still unknown.

The treasures brought back from the American continent led to some European countries practically overflowing with gold. The price of food, like the prices of the basic necessities of life, rose alarmingly. But it was not the small landholders, tenant farmers and artisans who reaped the benefits of these price rises, but rather the merchants, large-scale landowners and aristocracy, who could amass wealth as never before, and this wealth was subsequently converted into industrial capital by their descendants. The mass of small landholders, tenant farmers and artisans on the other hand suffered the torments of hell, and soon were left without homes or property. Those who were not made into cannon-fodder in frequent wars had children who merely served as labourers in the satanic mills of growing industrialisation.

To make the growing flood of information and payments more easily manageable between the continents and across national frontiers, reliable networks of business connections needed to be built up. Commercial houses, banks and post offices were developed. One of the first steps in that direction was the pan-European messenger firm founded in the sixteenth century by the von Thurn und Taxis dynasty. Supported by the Church, members of the family enjoyed freedom of

movement in a Europe in which it was anything but peaceful and safe to travel around. The von Thurn und Taxis dynasty was able to transmit valuables and information unhindered and without regard to frontiers. This became a brilliant business initiative. (Today when we call for a Taxi, we probably do not know that we are using what may be the world's first generic trademark.)

The expansion of the railways in the second half of the nineteenth century meant that goods could be transported by land on a larger scale than ever before. Another network was built up parallel to the railways: where the railways went, telegraph lines followed. In time telegraph cables were put in place along the routes of the transatlantic steamships. It became possible to coordinate in an effective way the vast flood of goods and information, and at the same time easier and cheaper to travel. Geographical proximity between the source of raw material, the production unit and the market began to decline in importance. Mass production for a mass market which was so characteristic of industrialism became possible.

Investments in infrastructures and industrial complexes demanded more and more capital, and this in turn called for a new financial system. Joint stock companies were created as a form of ownership and financing, and stock exchanges to distribute ownership and share the risk factor. Today unimaginable sums of money are transferred among the world's stock markets every second. There is no country, no firm, no individual who can still regard finances as a matter of private concern. This is a barely comprehensible aspect of the most recent logistical revolution in which the high-capacity telecommunications network is being developed into a global infrastructure for the exchange of information and knowledge. The combination of this network and the post-war expansion of education and transport forms the basis of what we term the knowledge-based (or information) society.

Reflections on the new era

Up till now we have barely caught a glimpse of what the information society may bring. But there are many signs of an increased anti-materialism which is perhaps not only conditioned by the belt-tightening of the 'nineties. The orgy of the 'eighties – did that mean a farewell to the materialism of the industrial society? Did this mark the beginning of a more humanities-directed period? Is there perhaps an underlying factor in this time of ours, in cultural life, science and scholarship, business life and other areas of existence? Is there an undercurrent to

what appears to be happening, similar to events during the latter part of the nineteenth century?

In the years at the end of last century, decayed buildings and musty ideologies were torn down “in order to have air and light”. The paintings by the Impressionists were filled with shimmering light; van Gogh was seen in the fields at Arles, intoxicated by sunlight and turpentine. The physicists Michelson and Morley measured the motion of the ether with the aid of the speed of light. The result was not what they imagined, but it was interpreted in a revolutionary way through Einstein’s theory of relativity. Behind these occurrences, as a sign of the times, there was apparently an interest in the nature of light – perhaps a desire to see things in a new way?

Through the nature of light a further dimension or a new direction was brought to life, when Einstein’s explanation of the photo-electric effect became the starting-point for the development of quantum mechanics. Its discoveries became the foundation for transistor technology, and then the rapid growth of electronics. We got computers. And digital clocks and watches. Time has begun to pass more quickly. Not because clocks are digital, but because of the technology which they represent. IT provides vast opportunities for work in a time-conscious and knowledge-based way, with guiding concepts such as Just in Time, Total Quality Management and Business Process Re-engineering. Dynamic competition in the wide variety of economic life, with shorter development cycles, adaptive and client-directed manufacturing, new services and new quality and delivery systems – all this presupposes the existence of IT.

The tempo is growing ever faster. Perhaps soon we will not even have time to think? Just imagine if we only had time to keep ourselves informed, and hardly able to do even that? Awful thought. But it may happen in the opposite way: It may give us more time for reflection because we will be spared a great deal of routine reflection. IT will also provide increasing opportunities for developing knowledge, because we are able to share interactively in other people’s expressions and thoughts, irrespective of time and place.

But, to remain for a little while with digital watches, what has happened to them? Many of them have been given back their traditional faces and hands. What might the reason be? Is it unimportant that the time is 23.58.29? Most often it certainly is – except when it is New Year’s Eve and the champagne cork sticks hard in the bottle. But it is not the indication of time as such, but the interface and its symbolism which may warrant some thought. The progress of the hands around the clock-face gives us more than information about the exact point in

time. They provide a clear picture of where we are during the day and night, and we visualise time in terms of the cyclical concept which humanity has known since its earliest beginnings. The linear conception of time is a late invention based on the modern-day need of synchronicity.

What the new (though old) watch hints at, concerning those user interfaces which relate to more advanced IT systems than digital watches, is that they need metaphors and symbolism, whose meaning we are able to grasp with both feeling and intellect. Otherwise we run the risk of having an information jungle which only a very few people can penetrate without losing their way. The virtual, global information landscape that is the Internet, is today difficult to access for those who have not been trained in its use. "There's only a load of rubbish on the Internet anyway," say those who find that the grapes are sour. No doubt they are sometimes right. But if one does not want to end up surfing in a sea of meaningless information, one needs to make a landfall on the shores of that land of riches which is getting more and more accessible.

The Internet is an incredibly important part of today's new infrastructure for communication and knowledge. The Internet is not "one" medium, but consists of a mass of media which is constantly increasing. They are used in different ways and for different purposes: entertainment, education, marketing, selling, provision of services, exchange of thoughts, experiences, search for knowledge, and so on. Today there are virtual web servers, virtual shopping arcades, conferences, electronic newspapers and other publications, and large numbers of interlinked or separate home pages and databases. More and more "accretions" will put in an appearance, forming an ever clearer pattern as time goes on. Perhaps it could be said that different media will emerge ever more clearly. Many of these new media will shine with a clear light and for a long time, while others will change quickly. Or perhaps die out, soon, if nobody shows an interest. This prompts the question: "Who is a 'nobody' on the Internet?" Perhaps nobody at all.

Appendix

020 numbers, Telia Free Calls, operate in principle like an area code. It means that whoever has an 020 number pays for all incoming calls, thereby offering customers and interested parties free telephone contact regardless of where in Sweden they're ringing from. Other means of contact can be fax or data communications by modem. One and the same 020 number can be connected to several different answering locations. At times when the number of calls is less than at peak times, the answering locations can be concentrated down to a few or just one. An 020 number also works for fax and data communication by modem.

071 numbers, Telia Pay Calls, work like Free Calls, the difference being that the service is used by companies or organisations which have a reason to be paid for incoming calls, namely they are selling information, knowledge or consultative services by telephone, fax or computer. Payment is made to the service provider by Telia via the caller's telephone account.

077 numbers, Business Numbers, also operate like an area code where the caller pays a certain call charge. The business that uses an 077 number will be accessible on one and the same number even if it has answering locations in different places. The business will be able to move the answering locations or reduce their number, taking into account variations in the number of incoming calls. In short, it imitates the functionality of an 020 number, but without the need for the business to pay for incoming calls.

Automatic Call Distribution (ACD) is a system that is used in (large) company switchboards that automatically takes care of the distribution of incoming calls to different answering groups (e.g. organisational units). An ACD system can also include a statistical function which in real time shows traffic to different answering groups.

BBS (Bulletin Board System) is a server-based application that operates like a notice board or bulletin board and can be accessed from other computers. The bulletin board may contain information, information services, databases, electronic mail as well as various conferences (presentations, debates, exchanges of opinion etc.) that the users can participate in. BBS is often used by businesses and organisations for internal and external information. It is possible to define the parts which will only be available for internal use and which can also be accessed by external interested parties such as customers or suppliers.

First Class is the most common system. In Sweden there are about 500 First Class systems. Only a small number of them have been set up in such a way as to be accessed via the Internet.

Broadband communications uses a transmission speed of over 2 Mbit/s and has capacity for simultaneous transmission of information from different sources such as sound, data and video. The fields of application for broadband communications can be, for example, LAN-to-LAN communications, the Internet, intranet and telemedicine. Other examples are telecommuting, distance education and multimedia.

CAD/CAM (Computer Aided Design/Computer Aided Manufacturing). Here output data from the design process gives input data for the numerically controlled manufacturing process.

CALS (Continuous Acquisition and Logistic Support) is a strategy which makes it possible to keep track of the flow of material and information throughout the entire lifetime of a system (or product) from design and production to scrapping and subsequent recycling. With CALS, information of many different sorts and from many different sources can be collated and handled in a clear and uniform manner. Often information is gathered in a common relational database which may contain technical specifications, equipment specifications, drawings, pictures, video sequences, test documents, quality documents etc. It can also contain documentation for operations, maintenance and training, lists of spare parts, sales promotion material, instructions etc. See also SGML.

Call centre is a generic term for various combinations of products/services that make it easier to handle large numbers of calls in a cost-effective way. A call centre offers businesses and organisations increased possibilities for using the telephone as a sales and service channel. The components of a call centre can be, for example:

- company switchboards with accompanying support functions (or services such as PLUS services or Centrex)
- Automatic Call Distribution (ACD)
- Computer Telephony Integration (CTI)
- Interactive Voice Response (IVR) systems
- fax on demand.

Centrex is a network service that offers all the basic functions that are normally found in a company switchboard. The difference is that the functions are performed in Telia's network and not in a physical

switchboard on the customer's premises. The service is offered on a subscription basis and therefore only requires a low initial investment. Two or more self-contained Centrex groups with different addresses can be connected together into one Centrex network to link up businesses with geographically scattered activities into one common network.

Circuit switching is the technology that is used in the ordinary telephone network and in connection with ISDN. Circuit switching means that the traffic is switched via exchanges that connect the communications as their own lines through the network. To gain access to ISDN, it is necessary to be connected to a digital AXE exchange equipped for ISDN.

Data communications is a generic term for communications between computers regardless of the type of communications or network that is used.

EDI (Electronic Data Interchange) means transmitting commercial documents electronically. EDI only deals with standardised documents such as orders, delivery dockets, invoices and various types of transport documents – all with a typical standardised content and using routines that follow the same conventional patterns in all businesses. EDI means that you don't need to depend on the postal service, paper handling or repeated recording in order to get commercial documents transmitted and entered in the right place in the recipient's EDP systems. Some of the advantages of EDI are more efficient business routines, increased promptness and a reduced number of errors.

EDIFACT is the international standard for EDI documents.

Electronic mail or e-mail is a way of sending mail between computers. The mail may consist of messages and attachments. The messages may only be text without any graphics, whereas the attachments can consist of text, images, data etc. (e.g. graphically styled pages with text, captions and pictures). The messages always go to the addressee in the form in which they are sent. They follow a certain standard (often SMTP or X.400) which means that in principle they are completely independent of differences in network protocols and computer environments. Attachments are not independent to the same degree. They certainly always reach the recipient, but they require a certain amount of compatibility in computer environments at both the sender's as well as the recipient's end. For a recipient to be able to receive illustrated and graphically designed pages, the same programs must be present at both the sender's and recipient's end. In the case given as an example there has to be the same layout program, illustration or picture processing program and corresponding sets of fonts.

Fax on demand is a fully automatic fax service which is commonly used to illustrate information where "a picture is worth more than 1000 words". The customer or user calls a certain phone number (not uncommonly an 020 number) and then keys in a special code on the telephone's keypad to obtain the required information. The fax number where the information is to be sent is also keyed in the same way. Fax on demand is often used by real estate agents who, in their advertisements, give the fax retrieval code for each property. Fax on demand can also be used in combination with Interactive Voice Response where the call recipient guides the caller so that he or she can make the right selection from amongst the alternatives that are offered.

First Class see **BBS**.

GPS (Global Positioning System) is a global satellite navigation system. It was originally developed as a military navigation system by and for the US Defence, but is now available to users all over the word, both military and civilian. Guided by the GPS satellites' signals, a GPS unit can determine its position wherever it may be, and then send a position message on to control centres, alarm centres etc. throughout the world. A GPS unit contains a signal receiver, computing unit and a transmitter. It is small and light, and not particularly expensive, which means that GPS is developing more and more fields of application.

GSM (*Groupe Special Mobile)* is a European digital mobile telecommunications network which covers a great part of Sweden, almost the whole of Europe and large parts of the rest of the world (thanks to a growing number of agreements between different telecommunications carriers). GSM can be used for telephony, fax, data communication, electronic mail and text messages. *Groupe Special Mobile* was originally the name of the working party that developed the GSM standard. The standard was named after the working party and the network was named in turn after the standard. In Sweden, as elsewhere, there are a number of GSM carriers which have somewhat different strategies when it comes to coverage, depending on which groups they are targeting.

Home page, the first page brought up on the computer screen after inputting a WWW address (or URL) while connected to the Internet. The home page welcomes the "visitor" and informs him or her about the possibilities for searching for further information. A company's home page normally contains the business's name, logo or symbol and sometimes a picture that illustrates the company's activities as well as a number of "buttons" that lead to information about the company's

organisation, business concept, products and services, personnel, production resources, news, special arrangements etc. In the current situation (which can change quickly) it is a good idea to be somewhat sparing in the use of highly advanced photographic images, animation and video sequences because they take a longer time to download than text and simple pictures.

HTML (Hyper Text Markup Language) is a descriptive language that is used to code information for WWW documents. HTML is a subset of SGML and contains directives for handling fonts, pictures and links. HTML corresponds approximately to an SGML-DTD (also see **SGML**).

Integration between telecommunications technology and computer technology is becoming more and more common. It is therefore becoming increasingly difficult (and less meaningful) to differentiate the one area of technology from the other. CTI (Computer Telephony Integration) is an example of such integration. In its simplest form, computer integrated telephony means connecting a telephone up to a personal computer to make the handling of incoming and outgoing calls more effective.

Interactive Voice Response (IVR) is a way of automating the answering of incoming calls. The caller will be greeted by a recorded voice which gives instructions on how to proceed with the call (if you want … press 2, then end with a *). Even speech synthesis can be used e.g. in the case of frequently updated information that is being offered.

The **Internet** is a collection of networks that are connected to each other in accordance with the protocol standard TCP/IP (Transmission Control Protocol/Internet Protocol). The users of any one network can contact any other network. The Internet started with ARPANET in the USA, but now comprises 1000 or so networks throughout the world. There are other worldwide networks that are not based on TCP/IP and are therefore not part of the Internet. Despite this, it is possible to communicate between these networks and the Internet via electronic mail because the technology for electronic mail is based on communication of the “store and forward” type. This technology means that mail-handling computers act as “translators” between the network protocols that are involved. See also electronic mail and WWW.

An **intranet** uses the same technology as the Internet/WWW, but it is used by a specific selection of users (closed user groups) who verify that they are authorised users by using their own passwords. Those belonging to an intranet may be members of a particular organisation, employees of a particular group of companies or customers of a cer-

tain business. Intranets are becoming an increasingly more common alternative to BBS.

ISDN (Integrated Services Digital Network) is a further development of the ordinary telephone network into a digital multi-service network for the transmission of sound, fax, data, images and video. Like the telephone network, ISDN is a circuit-switched network. The new technology offers a range of new possibilities whilst at the same time maintaining the low cost level, the high accessibility and the ease of handling that characterise telephony. ISDN can be used for a number of different applications such as remote surveillance, video conferencing, CAD/CAM, transmission of printed originals etc. The connections and interfaces are uniform regardless of the application and the transmission capacity can simply be expanded to keep pace with growing needs.

There is a choice, in Sweden, of two types of ISDN connection: Telia ISDN Duo or Telia ISDN Multi. The basic difference is the number of B channels, i.e. the logical channels that are used for the traffic itself. ISDN Duo gives two B channels of 64 kbit/s each, while ISDN Multi offers at least 8 and a maximum of 30 B channels. Both types of connection have a D channel (data channel) which, amongst other things, can be used for signalling and controlling the ISDN connection. The cost of calls is easy to calculate because it follows the ordinary telephone rate multiplied by the number of B channels. The greater the number of B channels needed and the greater the volume of traffic, the more it pays to consider leased-line capacity as an alternative to ISDN.

Mobitex is a national, digital mobile radio network for the transmission of data, fax, text, speech, alarms etc. The Mobitex network is based on packet-switching technology, i.e. the same technology that is often used within large companies for communication between peripheral units and central computer systems/databases. Mobitex is used for communications where many mobile units need to communicate with a central system. One difference between Mobitex and mobile telephony is the coverage in areas that are uninhabited or that are difficult to access. But there are more differences, both technical and economic, which are due to the fact that Mobitex is a purely "professional" communications system which is not primarily intended to be used for public communications.

A **Modem** (modulator/demodulator) is a digital-analogue converter used to enable data communications via fixed and mobile telephone networks. A modem now most often consists of a card that is fitted into the computer if it is not already there when the computer is purchased.

NMT 450 is an analogue mobile telephone network which by and large covers all the populated areas of Sweden. It gives the best coverage of all mobile-telephone networks in Sweden. NMT 450 is mainly used for telephones mounted in vehicles. NMT stands for Nordic Mobile Telephone Network.

NMT 900 is an analogue mobile telephone network that is suited to pocket phones and provides a very good coverage in Sweden and the rest of Scandinavia. It can also be used in the Netherlands and Switzerland.

Network is used, if the term is not defined exactly, as a generic term for:

- LAN (Local Area Network) local networks that are usually restricted to a business's premises or a house.
- WAN (Wide Area Network) networks that extend over a certain geographical area, e.g. a city district, a region or a country.
- GAN (Global Area Network) global networks which in principle have no geographical restriction.

Network organisation, a non-hierarchical organisation that is constructed like a network (in contrast to a linear or matrix organisation for example) and which is connected via communications networks.

ODETTE, a de facto standard for EDI which has been developed by and used within the car industry.

Picture communications is the transmission of still or moving pictures. To transmit low-resolution pictures, communication is by modem, i.e. data communications via the ordinary telephone network. ISDN is often used for high-resolution stills or moving pictures/video.

PLUS services are telecommunications services which increase telephone accessibility and provide a wealth of possibilities for the telephone subscriber. Most PLUS services can be used without extra costs and can simply be keyed in on the subscriber's own telephone (general PLUS services). Other PLUS services must be ordered (other PLUS services). The technical prerequisite is that you must be connected to an AXE exchange and have a directly connected tone-dialling telephone with keys for * and #. Some of the PLUS services can also be used from telephones connected to switchboards, depending on the type of switchboard and how it has been configured.

General PLUS services:

- Call forwarding
- Call forwarding on no answer
- Automatic re-dial
- Call waiting
- Wake-up and reminder calls (cost is SEK 3 per booking)
- Enquiry calls (i.e. making a call to a 3rd party), switching between callers, 3-way conference calls

Other PLUS services:

- Direct calling (e.g. when you lift the receiver, you're automatically connected to a set number)
- Abbreviated dialling
- Call control (i.e. restricting the type of calls made from a phone)
- Call forwarding on busy
- Call transfer
- Call transfer on busy

Relational database, a database where the stored information objects are linked "one to many" or "many to many" so that they can be searched and updated from different starting points.

A **Server** is a computer that is open to communication with other computers (clients) and which offers services through them. The services can include software, computing capacity, templates, back-up service etc.

SGML (Standard Generalised Markup Language) is a standard for how a descriptive language can be constructed in order to preserve information. It is preserved by making documents that are produced on different platforms (in different computer environments and with the help of different programs) uniform in both structure and content, regardless of which platforms the documents originate from. The documents can thus be stored and exchanged between different computer environments, both present ones and those of the future. SGML is geared towards structures and links, not the appearance of the document. The information structure is defined by a DTD (Document Type Definition) that can be likened to a set of rules for the structure.

Speech synthesis is the automatic "translation" of written text to speech. Expressed simply, with speech synthesis a computer is programmed to be able to "read aloud" from a written text. Often the text is clearly pronounced and fully comprehensible, even though both the computer voice and the intonation may sometimes sound a little strange.

Telecommunications is a generic term for communications that are based on IT, such as ordinary telephony, ISDN, broadcasting, terrestrial TV broadcasting, cable TV, mobile radio, mobile telephony etc., as well as various types of communications between computers, including not least of all electronic mail and the Internet. Previously, more than now, you needed to distinguish between telecommunications and data communications, but since telecommunications and computer technology are becoming more and more integrated (a simple example of this is how an ordinary touchphone can be used as a handy little data terminal), there is no longer the same need to keep the terms apart. Telecommunications covers all of it.

Video-conferencing and video telephony is communications by speech and moving pictures in real time. Video-conferencing is a general term for two-way or multi-party communications, regardless of the type of network that is being used for transmission. Several different types of equipment can be used for video-conferencing and video telephony.

- Studio systems are characterised by specially equipped rooms with cameras and microphones as well as lighting and acoustics that are specially adapted for group video conferences.
- Roll-about-systems are completely portable systems for group video conferences. The idea is to be able to move the equipment to a workroom or meeting room and have a video conference. The system is designed to be able to be moved around and is therefore somewhat more flexible than a studio system.
- Videophones are for "ordinary" phone calls where both parties can see each other.
- Desktop systems involve personal computers being supplemented with a video camera, video card and sound card (with ISDN interface) and special software. Apart from picture and sound, there is also data communications and people can work together interactively on a common document, diagram or something else that will be dealt with on the computer screen.

Video-conferencing in Sweden normally uses ISDN and has at least two B channels of 64 k/bits each. Two B channels give a satisfactory picture and often good sound. For large group systems, consideration should be given to more channels. Normally six channels are used. For applications with very high-level requirements, e.g. in medical services, 30 channels are used, which gives a quality that almost corresponds to an ordinary TV transmission.

A **virtual Web server** is a service for those who do not have access to their own Web server, but who still want to present information via the Web. Space is leased on an Internet-connected server to which information is transferred. The provider of the virtual Web server often offers a comprehensive service including designing and coding the Web pages as well as updating them when needed.

WWW (World Wide Web) is a subset of the Internet and the one which is most commonly referred to when talking about the Internet in everyday speech. The information that is available on the Web is structured as hypertext documents using HTML coding so that there can be links from one document or a database to quite different documents/databases which may be stored on completely different servers or in completely different locations throughout the world.