Teldok
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Information Technology Requires Dramatic Organizational Changes at General Motors

A report from
TELDOK's Viking's Midsummer Seminar 1988
Speakers from the auto industry, society, and research
discuss burning issues in information technology

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Preface

Even in retrospect it looks somewhat venturesome to invite a selected set of top experts to join in the discussion of a loosely defined set of topics, ranging from international perspectives to the microcosm of the individual work place.

Yet, this is exactly what TELDOK did when arranging TELDOK's Viking's Midsummer Seminar in Marstrand 1988.

The participants, coming from the U.S., Sweden and a few other countries, represented an unusually wide spectrum of disciplines and professional experience, ranging from nuclear physics to psychology not to mention hard-won practical experience in design, production and communication. A number of the Swedish participants, as well as some from the U.S., had never met before, being active in quite different sectors of society but open to ideas from other areas and countries.

One of the main objectives of the seminar was that it would deal with communications that break new ground in various fields, the car industry, for example, where totally new production methods based on information technology are now being introduced.

The chosen focal point was the automotive industry (represented by General Motors and Volvo) where wide-ranging change is now taking place worldwide. As in other advanced industries, effective communication and the exchange of information is now given as much attention as the physical production of cars per se.

Seen from another perspective, the much-talked-about "office of the future" might well be dispersed and located at the the shopfloor, rather than confined within the conventional office module. Even more, the flows of information might well have to integrate vehicles, goods, and people "on the move" to speed up, and enhance, the interaction between the customers and the different steps of production and design.

Many future developments will obviously be driven by international competition as companies strive to utilize and market the most cost effective solutions, but it would be foolish to overlook basic developments where joint studies and joint action can save substantial amounts of money and time and can facilitate more extensive international trade and cooperation.

Therefore, lessons expensively gained within the car industry have obvious implications for other industries, as well as for the public sector. More efficient communication with (or without) technological support is beneficial to any human effort.

Obviously, this certainly was not a gathering of meticulously briefed and prepared experts addressing a given set of highly structured and focused problems with the requirement to arrive at "the one and only solution"!

Instead, in order to fully exploit the richness of the experience and competence gathered, the formal agenda was loosely defined and the formal introductions kept to the very minimum needed to trigger and encourage as much informal exchange of ideas as possible. Thus, it is simply impossible to cover all the inputs and outputs of this free interchange of ideas in any printed volume.

In brief, the final discussions focussed on "communications" as a means of more fully understanding the needs of "(physical) production" and vice versa. Unfortunately, the flavor of these discussions, and the participant's urge to understand and contribute, can't be covered in a single volume.

However, in order to give those not able to participate an opportunity to share the experience, we have tried to reproduce at least the initial contributions which triggered the discussions in this printed TELDOK Report. We do hope that this reproduction will give the impetus to further interchange in even wider circles.

Even if it is not possible to truly represent "The Spirit of Marstrand" in print, we are convinced that what is presented here will provide a high-quality platform for further developments.

The TELDOK Editorial Board wishes to extend its thanks to all contributors, making the seminar days in Marstrand a great event to join.

Bertil Thorngren
Chairman

Birgitta Frejhagen
Member

By the editor

What forces are behind the car industry's great venture in information technology? Electronic Data Interchange (EDI) is predicted a tremendously rapid growth. What is the reason for this? Why is facsimile spreading so fast, and what are the strong points of the various message-handling systems? Which are the trends affecting Value Added Network Services (VAN Services)? In every country there are powerful forces that are trying to influence the development of telecommunications. What are these forces and what exactly do they want?

The speakers at TELDOK's Viking's Midsummer Seminar gave their answers to these and many other questions.

In June 1988 TELDOK arranged the Viking's Midsummer Seminar in Marstrand to discuss some of the most exciting questions in the field of tele and data communication.

One of the objectives of the seminar was that it would deal with communications that break new ground in various fields.

The import of information technology for separate countries' entire ability to compete becomes obvious through the car manufacturers' speeches.

Representatives of Volvo Car Corporation and General Motors (GM) speak of the way they want to use the new information technology. Both of these companies are of great importance to their countries' economies. To the car manufacturers information technology is a necessary tool for achieving persistent profitability.

For General Motors the new technology is essential in the company's efforts to recapture markets that Japanese suppliers have won in the United States.

Volvo as well as GM are at the forefront when it comes to using new technology. Their ideas are of great interest to anyone wishing to follow the progress of techniques in blue-collar industry.

This TELDOK Report is divided into seven chapters, one chapter for each speaker.

The language spoken at the seminar was English, and we have decided to publish the documentation in English.

The speakers have worked their speeches over before publishing.

The first chapter discusses the progress of international telecommunications, especially where various national forces are trying to influence international progress.

This is followed by three chapters about information technology in the car industry.

The final three chapters deal with Electronic Data Interchange (EDI), Value Added Networks and message-handling.

Basically, all seven chapters can be read separatly. However, the three chapters about the car industry are naturally linked together as they deal with the same field.

Each chapter starts with a brief outline in which the speakers are also introduced with photographs.

This TELDOK Report does not include the experiences in the Härnösand municipality. The reason is that a specific TELDOK Report (number 38) was published in the summer of 1988 where the plans for Härnösand were presented in detail. A representative of the municipality of Härnösand talked at the seminar.

Göte Andersson

October 1988

Contents

1 National telecommunications tug-of-war

The progress towards the so-called information age is rapid. However, in every country there is a tug-of-war going as to how the future should look.

It is primarily international telecommunications that will be affected by a number of national considerations. The various countries' trade, industry, defence and foreign policies carry weight to varying degrees. Powerful pressure groups want to have a say in the matter.

For this reason the final choice is often a compromise between different constituencies. The more pluralistic the society — the more complicated the negotiations to arrive at an acceptable compromise.

This was the message from Professor Percy Tannenbaum in his opening speech at TELDOK's Viking's Midsummer Seminar in Marstrand.

Tannenbaum means that private transborder telecommunication networks may well be the best way to proceed the future. That is, in the long run a series of separate transborder networks may be more efficient than one multi-purpose network under centralized governmental regime. □

Percy H. Tannenbaum is a professor at the University of California, Berkeley. He works at the Graduate School of Public Policy and Survey Research Center.

Transnational aspects of telecommunications

By Percy H. Tannenbaum

The evolution of the modern telecommunications era proceeds at a rather rapid pace, and with it our entry into the so-called "information age". While many truly significant developments have taken place in recent past, it is important not to be too carried away by the apparent denotations and connotations contained in this term. Some distinctions and limitations are worth nothing as we approach the last decade of the 20th century and try to foretell what awaits in at least the short-term future.

For one thing, to date new technological developments have led to a situation that can be labeled "the entertainment age" as readily as "the information age". While I speak mainly of what we have witnessed in the USA, I believe a similar situation prevails in other western nations as well, if to a somewhat lesser degree. While there has been a definite increase in the amount and rate of transfer of information-like materials, there has been an ever larger growth in content meant to amuse, stimulate emotionally, possibly to distract, as well as to inform. This situation has persisted for a half-century or more in communication via the mass media, and has become even more so with the advent of new technologies when we look at general public usage.

Airwaves versus wired communication

An important distinction here is in the means of communication, particularly as between communication by the airwaves and by wire. The former, almost by definition, involves broadcast transmission and is hence suited to reaching large, relatively anonymous mass audiences. While such consumers do appreciate some input of hard-fact news and public affairs information, their strong shared preferences (the so-called "lowest common denominator") is for entertainment-type content. The newer broadcasting modalities, very much include satellite (direct or distributed through local ground cable) transmissions. While relatively expensive to produce, such fare has very wide appeal which yields sizable revenues through advertising, license fees, or direct government subsidies.

In contrast, wired communication is better suited for narrower, point-to-point, more private messages. It is for intimate person-to-person exchanges; even when extended to teleconferencing, it involves relatively few individuals, with a highly focused common concern, and pre-selected rather than by an open invitation as with the mass media. Perhaps this is why almost every attempt so far at videotex (even teletext, for that matter) have failed to attract a sufficient wide base of viewers. The latest American venture in this arena — an unlikely partnership between IBM and Sears, essentially a large retail network recently diversifying into financial and insurance services — has just been launched, but its success is also far from certain.

The way from data to knowledge

There are also legitimate questions to be raised with the very generalized, hence ambiguous way in which the term "information" is employed. It has become more a "buzz-word" than a meaningful, agreed upon concept. For our analytical purposes it is important to distinguish between different usages lest we get caught in the myriad of possible definitions. With the aid of new technological developments, we have become quite proficient in producing reports, archives, data banks, and lots of idle chatter. But that, as we all know from personal experience, is different from hard information — facts that make a significant difference, that tell us something we did not know before, or at least reduce the uncertainty about alternative decisions (i.e., in the "information theory" sense of the concept).

Converting data into information is no easy matter, and in that regard we still have a long way to go (although computer networks and appropriate software still in the making may help considerably before very long). And while we are at it, one should add that converting information into real knowledge is something else again. The process can be likened to going from a high degree of uncertainty (data) to a reduction of uncertainty (information) to relative certainty (knowledge), with the transition processes being highly dependent on the transmission capacity and fidelity.

Transborder exchanges

My assigned topic is with telecommunication across national borders. Internal communication systems are certainly not immune from domestic, social, political and economic considerations, but all these become more acutely relevant when we address the international scene.

Recent communication developments have certainly opened up the world. Individual countries may have different motives for restricting incoming and outgoing message exchanges, but these are becoming more difficult all the time. In broadcasting, targeted signals have been jammed (the only effective way to stop incoming programs), but these have all but disappeared in the Soviet Bloc and China, not only for reasons of political detente.

It is also getting more difficult to block transborder telephonic conversations. A country that installs a reasonably up-to-date long distance telephone system has to allow a substantial degree of access for its citizens for direct dialing and the like. Thus, I have had conversations to and from the Soviet Union without more trouble than to Sweden.

Politics, in all its manifestations, plays a role — must play a role — in domestic policy-making. That role is apt to be even larger for transnational communications, if for no other reason than decisions and mutual arrangements might have an impact on many other sensitive bilateral and multilateral agreements, actual or pending. Other government ministries and bureaucracies than that involved in the immediate telecommunications negotiation will want to have a say, like to be consulted and may lobby for a change in any proposal arrangement.

This is particularly true, of course, if the new agreement involves budgetary or other financial redistribution among agencies and programs.

The question of security

To begin with, international agreements by their very nature, immediately involve questions of common standards and other hardware and software compabilities. When they affect certain vested interests within a given country, there are apt to be disputes, making for even more delicate negotiations in the transnational case. By the same token, legal issues may be raised, both on the level of international law and the mutuality of bilateral legal traditions (eg., on the issue of privacy). When sensitive, possibly security-related, legalities are present they may present serious obstacles to any international accord.

The question of security is bound to arise when highly technical new techniques are involved. There are issues of patent protection, copyright understandings, technology transfer that are almost always lurking in the background to any such between-nation exchanges with many private vested interests feeling threatened. In most countries, there are ways and means by which such perceptions, real or imagined, can be manifested in the political apparatus; if sufficient misgivings are marshalled, the combined political clout may well be fatal to any pending agreement.

This suggests that various government agencies will get into the act, often at odds with one another. When sensitive military technology is of issue, national defence agencies have to be included. Their perspective may or — possibly more often — may not agree with that of foreign affairs ministries, which cannot be excluded from any crossborder negotiation.

In many countries, special offices and agencies and even ministries (Japan's MITI) have been established to coordinate various international trade undertakings and negotiations. In this arena — growing all the more important as nations become to be particularly sensitive to changes in international trade deficits, currency exchange levels, and the like — telecommunication is merely a special case of the more general problem. If trade precedents have been set previously, it is likely that new ones will have to be compatible with the existing ones, or at least be prepared to make a strong argument that this one represents a special enough instance deserving a variation.

"The industrial policy" a U.S. novelty

All this can get intricately involved in what is called "the industrial policy" of a country. This is a rather novel concept for us from the United States, where instead of events following pre-established industrial policy it is often the opposite sequence. The actual term aside, we nevertheless have similar concerns, as they come increasingly into play when suspicions of product protectionism in other countries are introduced or when domestic job protection looms especially large in general (eg., due to rising unemployment) or in specific sectors. Naturally, telecommunication arrangements are not immune from such pressures.

Threat leads to accommodation

Another factor included in the many forces shaping transborder agreements is the nature of the grand national economic structure. While most western countries have somewhat mixed economies, as between centralized, regulated and private, open-market elements, they do vary in the relative proportion of the components. There has been a general trend lately toward more market-oriented systems, but there are still strong political constituencies pushing in the opposite direction. When one or another such constituency (a trade union) feels threatened, the political system may be forced to accomodate them in one way or another.

Private companies often espouse full and open competition, but are also known to resort to government subsidy or ball-outs when the competition from their foreign counterparts becomes too severe for their liking. In general, they are better than political governments in terms of planning and undertaking longer-term new initiatives, the need for research and development investments, etc. But they have boards of directors to accommodate, market shares and profit margins to contend with, and stockholders to appease — all demanding short-term needs that can detract from incremental long-term planning and growth, with their share of market risks.

The end policy a compromise

What we are left with here is a large and diverse nexus of factors — sometimes but rarely mutually supporting, more often in opposition with one another — within which and from which some sort of policy for bilateral and multilateral arrangements has to emerge. To accommodate the various interests, the end policy is more often than not a compromise between alternatives — not a unique policy outcome, to be sure.

To dismiss these factors as merely "political" is missing the point. They are indeed political, because that is largely what politics is mainly about, especially in western democracies — an interplay of the preferences and desires of a variety of constituencies. The more pluralistic that society, the more diverse the array of interests — and the more complicated the negotiations to arrive at an accepted compromise.

But something must be working reasonably well, because despite many other obstacles, there is a highly efficient international telephone service covering most of the globe (at least where telephone saturation has reached respectable levels) and transborder data flow is more common and far-reaching than ever. Some of this state of affairs is due to the fact that private multinational companies have bypassed centralized monopolies to set-up their own domestic and transnational telecommunication systems. This is the subject of other reports at this seminar so I will refrain from entering that territory.

Suffice it to say that private transborder telecommunication networks — narrowly focused in some ways (eg., all with the concerns of a single corporation), but broad-based in others (eg., covering many organizational levels

within a company and considerably dispersed in terms of location, languages, etc.) — may well be the best way to proceed. That is, a series of separate transborder networks may be more efficient in the long run than one multi-purpose network under centralized governmental — and hence subject to political-economic stresses and strains — system. □

2 General Motors confronts Japan Inc. with high-tech

Saturn Corporation is General Motor's response to the expansion of the Japanese car industry in the United States.

Saturn Corporation will prove that the American car industry is capable of competing on its own home market with cars produced in the United States.

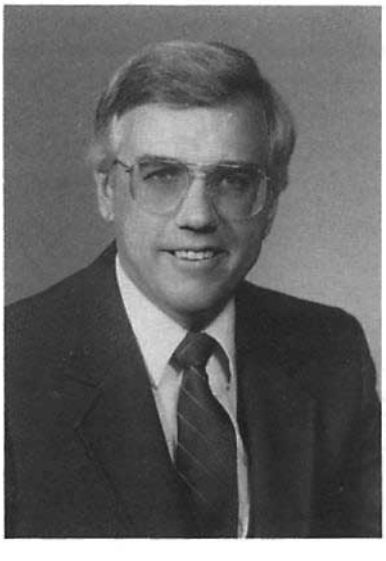
New technology and a new way of organizing the production will make this possible.

This was stated by James L Lewandowski, vice president of Saturn Corporation at TELDOK's Viking's Midsummer Seminar in Marstrand.

The introduction of new information technology in GM's production systems requires dramatic organizational changes.

Saturn is a whole new subsidiary company of GM. The company will be characterized by an entirely new working organization and a new type of technique. GM hopes that Saturn Corporation will become the most effective car company on the American car market.

This chapter starts with a short background on GMs venture on Saturn. After that will follow James L Lewandowski's presentation of Saturn. □



James L. Lewandowski is vice president of Human Resources, General Motors, Saturn Corporation.

"More efficient than the Japanese"

By Göte Andersson

The U.S. car industry will produce at least as good small cars and to the same low prices as the Japanese car manufacturers.

This is the goal of the American car company General Motors. A totally new, wholly-owned subsidiary company, Saturn Corporation, will prove that it is possible. GM wants to become at least as efficient as the Japanese suppliers. Japanese car manufacturers have been successful in the United States. They make less expensive and better cars. In 1983 GM:s production costs were $ 2 000 more per car compared with Toyota & Co. By that time GM had to make a choice: either cease their own U.S. small car production or try to compete. GM decided to become efficient and competitive.

By means of a new working organization and modern information technology GM hopes to reach its goal. Just like Volvo Car Corporation, Saturn wants the production to be controlled by the customers. The customers will order a tailor-made car that will be delivered quickly.

The entire car industry affected

The possible success of Saturn will probably affect the entire car industry. American critics say that the car industry will have to choose the same manufacturing methods or cease its activities if Saturn is to achieve its goals.

Surrounded by speculations in the entire business, the race has now started.

Within five years we will know if GM was able to succeed.

Saturn Corp's aim is to make 250 000 cars in 1991, 350 000 in 1993, and 500 000 cars in 1995.

According to Saturn the activities will be profitable with sales of approximately 350 000 cars per year.

Saturn has to make better cars than those previously made by GM. The quality and the reliability have to be better, and the costs have to be competitive.

GM is investing 3,5 billion dollars in Saturn. If GM proves to be successful, it would doubtless be a great victory for the whole American car industry. Then GM would become powerful on its traditional main market: massproduced cars.

As for the rest, the 1980's has been a decade full of setbacks for GM. There was a time when GM held more than 50 percent of the American car market. During the 1980's this share has dropped to 34 percent at its lowest.

Turnover losses

GM has lost one third of its turnover in the 1980's. In 1987 the turnover was $ 90 billion.

In spite of this, GM was the largest car company in the world that same year.

25 000 white collar and 100 000 blue collar workers have been dismissed since 1980.

A number of divisions have been sold. They include the loading divisions (tractors as well as caterpillars), the railway engine division, and the freezer division.

In the truck business GM has formed a joint venture where Volvo of Sweden is the main owner. In the car business GM cooperates with other car manufacturers, Japanese Suzuki among others, in several joint ventures.

GM is focusing on the car market. New companies have been bought in the high tech branch, which may make it easier to take advantage of the most advanced techniques in car production. The main companies that have been bought are the computer service company Electronic Data Systems (EDS) and Hughes Electronic, operating in the space business. □

General Motors plans to change the manufacturing process in America through its information systems

By James L. Lewandowski

I anxiously accepted the invitation to participate in this seminar as I am excited about my corporation's vision for an information flow system and the opportunity to share it with you.

Saturn, if you are not aware, is a wholly owned subsidiary of General Motors, chartered to produce a new line of automobiles, in a new manufacturing plant, in a new part of the U.S. to General Motors.

Our direction, incorporated in our mission statement, leads us to "market" vehicles, developed and manufactured in the United States, through the integration of people, technology and business systems.

We have begun our enterprise with new people, new systems, and new approaches to the business.

Began as a partnership

We also began our business as a partnership. Rarely would a business begin this way. Most of you would agree that partnership normally evolve within mature, well-established companies.

But partnerships form the fundamental building blocks of Saturn. Whether a partnership is a marriage, an agreement between doctors, lawyers, or any group, the commom requirement for any partnership is that information be freely exchanged. Such is the principle at Saturn.

We have established a partnership with the United Automobile Workers Union which improves the relationship between our workers and corporate leadership; with Electronic Data Systems Corporation (another subsidiary of General Motors), to design, develop and install our communications and data processing systems; with our suppliers, our dealers, our neighbors, both in Michigan and at our new plant site in Tennessee; and with the colleges and universities that will aid in training our workforce and educating our team members.

Today's global market is extremely competitive. Today's consumer has more to choose from and expects and demands high quality and service at a reasonable cost. Our goal is to effectively compete in this quickly changing global market at a time when worldwide capacity will exceed demand.

Changes through information systems

Moreover, we plan to change the manufacturing process in America, not so much through the introduction of new high technology processes, rather through our information systems and how we integrate those systems into the process of building an effective organization which produces world class automobiles.

At Saturn our philisophy includes an understanding that people at all levels of the organization want to participate in decisions which affect them.

We believe that every member of the Saturn team wants to participate in the decision making process. This is quite contrary to the traditional environment, where the assembly line worker had little or no decision making power.

We "borrowed" the idea from Volvo, which has demonstrated that workers at every level can be genuinely involved in every facet of the business.

Thus, we prefer to see the corporation in terms such as "sharing", "involving", and "empowering": sharing information, involving team members in decision making, and empowering teams to make decisions at the operating level.

So, what does this mean about how we communicate with one another? What implications does this have for our information systems? How do we ensure that this "vision of Saturn" becomes a reality?

Defining the company's needs

First, we quickly realized that for Saturn to succeed, we must clearly define the company's needs — our business functions, our supplier relationships, and our decision making processes. What are the needs of our workers, the Saturn team members? We must clearly understand this to effectively create a useful information system.

Next, we recognized the difference between the traditional pyramid-structured company's management style and Saturn's consensus decision making system.

In the pyramid company, the information system acts as a vacuum, sucking up production reports, cost figures, sales totals, etc., feeding the data to management for decision making.

On the other hand, in a consensus environment, the information system acts like a human heart, gathering data from all parts of the organization, centralizing it, and pumping it back out to the organization so decisions can be made at the operating level.

Next, Saturn closely examined the relationship we envisioned with our partners from the United Automobile Workers (UAW). This partnership has provided Saturn with a highly motivated, technically sound workforce and was seen as the key to Saturn's success.

But, we predicted a significant training challenge here.

A partner in the business

This workforce would come from the traditional management/labor system where the assembly line worker did not participate in decision making and therefore had little need for access to an information system. We recognized that the challenge would be to develop an entire workforce of highly skilled technicians into well informed business people, capable of making decisions on the plant floor. Truly, a partner in the business.

Thus, the bottom line was to design an information system that would provide the data to the Saturn team member where they worked on the plant floor. Getting the right information to the right person at the right time.

Once we decided what management system we would use and who the players were, we set out to define the information system needed to support our process.

As I mentioned previously, the nature of any information system is determined by the corporate environment. Saturn's unique corporate culture and management system dictated an equally unique information system — a single, integrated corporate data base, available to all users of the information. This concept allowed strategic and operational decisions to be based on the same reliable information. Putting it simply, the president, executive officers, other leadership of the corporation, and the assembly line technicians would have access to the same information for the same reasons, decision making.

Increasing the velocity

When the book on Saturn is written 15 years from now, we hope they will say that one of our fundamental accomplishments was to increase the velocity (and I'm using that in its correct engineering sense, to mean "speed and direction") of *relevant information* to everyone in the organization.

When I say "relevant information", I'm not just talking about the usual engineering and operations data needed on the plant floor. Yes, Saturn will be providing the technician or engineer access to the graphics of a part or tool design, access to the next that describes how the operation should be performed as well as will allow the team member to examine a spreadsheet on qualities and cost. In fact, Saturn, as far as we know, will be the first operating plant with screens on the factory floor that combine graphic, text, and spreadsheet capabilities.

But, more importantly, we envision providing each team member with access to their own "personal" information: Health benefits information, salary data, training and career growth systems, to name but a few.

Managing your own business

Eventually, we want each team member to be able to easily obtain information about the quality, defect rates, production rates, budgets, and costs of their team's product, and to plan their own training, vacations, and perhaps retirement plans. We hope to equip the team with what they need to truly manage their own business. To monitor how well the team is achieving their goals, what obstacles are in the way, and how they can overcome these obstacles. Better, more timely information simply increases our ability to do this well.

First we provide easy access to critical information. Then we stretch and expand our ability to analyze it and use it to benefit the business. Involve more people in decisions in each area of the business. For example, we know that having manufacturing and product engineers working together on the same

problem results in better decisions and better products. But we have gone beyond even that. We've now added an assembly technician and a service technician to the design team, significantly increasing the synergism.

We also know from experience that having finance and marketing people work together produces better results. Each person contributes ideas in their area of "expertise", and new fresh, and even sometimes naive ideas as well.

So how does information flow? Between computers, over communication lines, via microwave transmitters? No. The key here is that the information doesn't flow just between black boxes, or between mainframes and data lines, or between personal computers or local area networks. At Saturn information flows between people to make the best decisions to run the best business. Computers simply help us do it that much better.

A new type of worker

Does this require a "new type of business person"? A new type of worker? We believe it does.

At Saturn we stretch each individual to become, as Tom Peters, in his book "A Passion For Excellence", calls "Champions" — broad-focused people who actively reach out beyond their speciality, to grasp all the disciplines that underlie the success of their business.

Let me elaborate a little on that. It seems to me that many American industries have become too compartmentalized and centralized. The Finance Department is responsible for all of the financial planning, while the engineer, who actually spends the money, has little financial responsibility.

Not so at Saturn. The engineer and the skilled technician participate in the budgeting process equally and are called upon to make intelligent financial decisions. Because operating decisions are financial decisions.

As I described earlier, a healthy information system is like a healthy heart. When the organization is healthy, ideas and information flow freely, like blood through arteries and veins. But when the organ is unhealthy, it becomes like a blocked artery — causing problems throughout the entire body.

Clear communication — a healthy heart

For example, when customers complain about a problem with their car's engine, the complaint must be communicated from the customer to the individual who can fix the problem. I don't just mean the mechanic fixing the car, I mean the engineers and designers who can design a better product, avoiding repeat problems. Thus, clear communication within the organization is like a healthy heart, giving information and solutions to people who can fix the problem and ultimately improve the product with services that customers expect.

Our success thus far have been reassuring, but we all learn more, in most cases, from our errors than from our "victories". Saturn is not different in this regard.

If we have learned nothing else, we now fully understand the reasoning behind defining the requirements for any particular information system before

designing, developing and installing the system.

Let me illustrate. Early in the corporation's development, the concept of an education and training system was envisioned. Its far-reaching benefits included providing for individual training plans for each Saturn member and allowing team members to eventually enroll themselves in courses which would fulfill career objectives. Rather than solicit input from the eventual users of the system, the program was written, approved by its eventual owner, and installed at significant expense.

Now we are forced to develop equally expensive enhancements to that system so the information maintained in it can be accessed and used by the Saturn team member.

The lesson learned is about knowing the customer, in this case our own team members. And then to design the services to meet the customer's needs. In other words, customers define requirements — designers should not.

The world's best company

We are working hard at Saturn in this information flow arena which is rapidly expanding in the business world. Each of us here today is part of a larger community of professionals who share a vision of the world of tomorrow. Regardless of which country we call home, which language we speak, or which industry we serve, we share the common goal of wanting our organizations and our people to be the best possible. The best in the world.

It's comforting to me that despite our differences, we are facing similar challenges and sharing what we are learning. Fortunately, the issues of communication and decision-making are cross cultural. People in every country want to be involved in their organizations and be truly a part of making them successful. I'm confident that what we learn at Saturn in the coming years will be useful to organizations such as yours, and that we will have an opportunity to learn from you as well. That is what will help our businesses become truly international.

It's been an honor to have been asked to participate in this outstanding seminar with such a distinguished group of participants. I shall always remember this. Thank you for allowing me the opportunity to share the Saturn vision with you. □

3 Customer controlled manufacturing with information technology at Volvo

Volvo Car Corporation has customer controlled car manufacturing in prospect. To each customer car the right value adding service will be provided. The customer receives a unique product.

The time between customer order, delivery date, and customer payment is minimized.

The new business concept is a vision attainable in many of Volvo Car's markets, thanks to modern information technology. In the mid 1990's Volvo hopes to have taken considerable steps towards new business methods.

This was stated by Tammo Wellemets of Volvo Car Corporation at TELDOK's Viking's Midsummer Seminar in Marstrand.

The Volvo Group is Scandinavia's largest private corporation with a total turnover of 92,5 billion SEK (Swedish crowns) and 75 000 employees, of which Volvo Car Corporation accounts for 38,5 billion SEK of turnover and 26 000 employees.

Editor Göte Andersson will present Tammo Wellemet's view of the value of the new information technology for Volvo. □

Tammo Wellemets is vice president of Volvo Car Corporation, and is responsible for administration.

Volvo develops new business methods with information technology

Volvo Car Corporation has customer controlled car manufacturing in prospect. To each customer car the right value adding service will be provided. The customer receives a unique product.

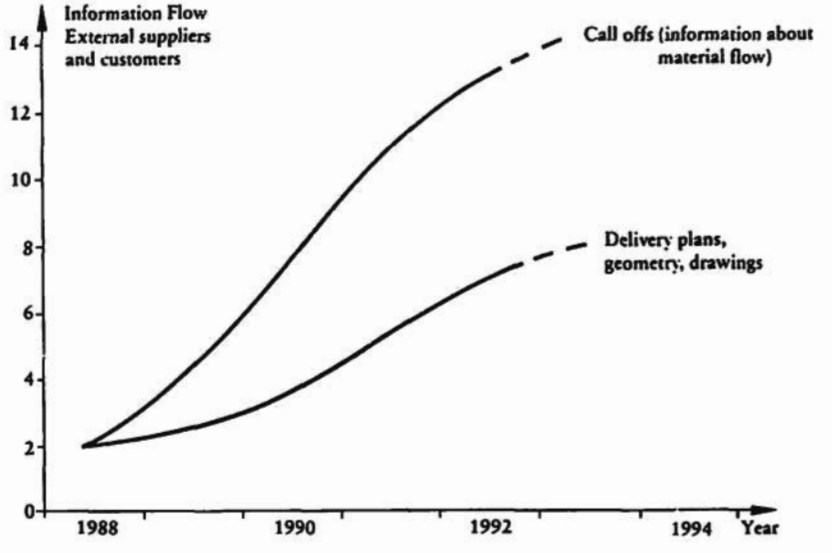
The time between customer order, delivery date, and customer payment is minimized.

This brings Volvo closer to their customers and the customer capital closer to Volvo. It eliminates, too, unnecessary sequential and wasteful activities as well as hundreds of millions SEK bound up in stocks and gives Volvo's customers more value for money.

This new business concept is a vision attainable in many of Volvo Car's markets, thanks to modern information technology. In the mid 1990's Volvo hopes to have taken considerable steps towards new business methods.

The major goal of Volvo Car Corporation (VCC) is persistent profitability. VCC wants to increase product quality, cut lead-times, reach the market faster, increase capital efficiency, increase cost efficiency and improve flexibility. In order to achieve this VCC must make a number of changes in its activities.

Picture 1 Data communication grows dramatically in Volvo Car Corporation



The data communication of Volvo Cars will grow dramatically in the next three to four years, according to the company's own prognoses. Electronic mail will grow 700 percent, drawings and delivery plans 400 percent. In the main part of communiction the West European car industry's communication standard ODETTE will be used.

Information technology is essential. The new technology embraces all of the techniques used to make cars. This flow of information is today as indispensable as the car components themselves when putting together a car. Information technology is also one of the few new means to be used when increasing competitiveness.

VCC plans a great increase of the total information volume transmitted by data and tele networks. VCC believes that data communication will grow enormously, internally as well as externally. See picture 1.

Volvo Car Corporation needs people who are not only acquainted with the car business but also capable of making the best use of these new techniques. It is necessary increase knowledge in this field.

VCC aquires know-how from, among others, its suppliers. In the field of information technology these are Televerket, IBM and Diqital Equipment. VCC together with the above mentioned companies are cooperating in the CAE Application Center-project in Gothenburg.

VCC is moving swiftly to incorporate the new information technology into its business processes. □

4 Efficiency, not technology, gives Japan the lead

It is not superior technology that gives the Japanese manufacturing companies their lead over other manufacturing companies around the world.

The Japanese have developed more efficent ways of organizing the labour force in important parts of the manufacturing process while using traditional technology.

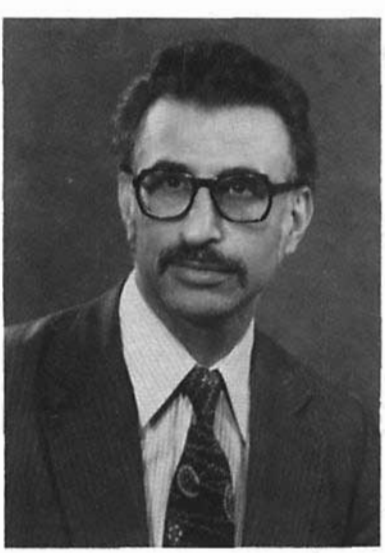
This was the message from Robert Cole at TELDOK's Viking's Midsummer Seminar in Marstrand.

Cole stressed that the image of a technology driven revolution involving a truly unrestrained flow of information is misleading.

During the last few years large manufacturing corporations have taken many initiatives to use information technology in order to become more competitive. Most well known are the initiatives to create the MAP and TOP Networks in the U.S.

The car manufacturing company General Motors is behind MAP (Manufacturing Automation Protocol). Technical Office Protocol (TOP) is Boeing's, the aircraft manufacturing company, office automation protocol.

MAP & TOP are designed to create standards to allow computers and other kinds of equipment to talk to one another, no matter who manufactures them. □



Robert Cole is a professor of Sociology & Business Administration at the University of Michigan. He is a long term student of Japanese organizations.

"Most companies are unprepared for a free flow of information"

By Robert Cole

On June 15 the New York Times published a report about the MAP and TOP Networks.

The author of the article argues that most industrial users are unprepared for the organizational changes that computer integrated operations involve.

"Truly unrestrained flows of information throughout all parts of an organization, which MAP & TOP standards are intended to encourage, would cut across traditional barriers of rank, function and geography."

Implication: Most Corporate Executive Officers (CEO's) are not prepared to accept this change.

They think that if I give away my information, then I would lose my monopoly to decide.

Most company organizations are not prepared to handle this. And they say: "Why give him information? He can't even use it."

Strong barriers

The traditional barriers in corporations are strong. Most individual users are not prepared for truly unrestrained flows of information.

There are social and cultural barriers. Socially of prevailing practicies; culturally in terms of dominant values and norms.

The prevailing practicies are working to defeat the unrestricted flow, including existing power relationships, sunk costs, strong bounderies, departmental practicing of orders, old leadership styles, labour management adversial histories, etc.

Cultural barriers include the values mentioned that create these existing practicies and support them. One exemple is a lack of belief in the ability of certain groups of business leaders.

The image of a technology driven revolution involving a "truly unrestrained flow of information" is misleading in a number of ways.

That image would be more appropriate in cases where end users are demanding the use of information — but this is not the case in most manufacturing firms. End users are demanding highest quality and low cost products, but that leaves a lot of choice for managers to figure out how to meet that demand.

Unrestrained flow — a nightmare

And, unrestrained flow of information is a goal of limited value. Unrestrained flow of information would be a nightmare, an overload issue.

Japanese firms have impressed me with their selectivity in gathering and sorting the information. Large manufacturing firms are collecting a tremendous amount of data, but they are only using a small part of it.

Much of the information is never used in operational manufacturing systems, the Japanese have simple information systems.

What drives the evolving information system in Japanese firms is not large new technology, but an emphasis on solving user problems. And users here are not only final users but internal users or internal customers. The objective is to transform final user needs into organizational practicies.

One can say that they have found ways to have final users drive the departments. And when you focus your information system on solving user problems, it means you will evoke a decentralized information system, as noted in page 109 in TELDOK Report 11 E.

JIT — technically simple

The Japanese have developed the Just In Time (JIT) delivery system and one condition for that is a good information system. But this system is not very technically advanced.

The monthly reports in the production units are produced on computers. But for the daily information on the production a wooden board is used.

The companies say: "We take it for granted that our employees are using their heads."

The Japanese have been very slow to automate information over the daily production in the factories. They mean that automation at this point is threatening the motivation and would reduce the quality.

In one important area, that is, in the pre-production process (PPP), they have chosen a different method compared to European and U.S. car companies. This difference is crucial to the competitiveness, according to the car manufacturers.

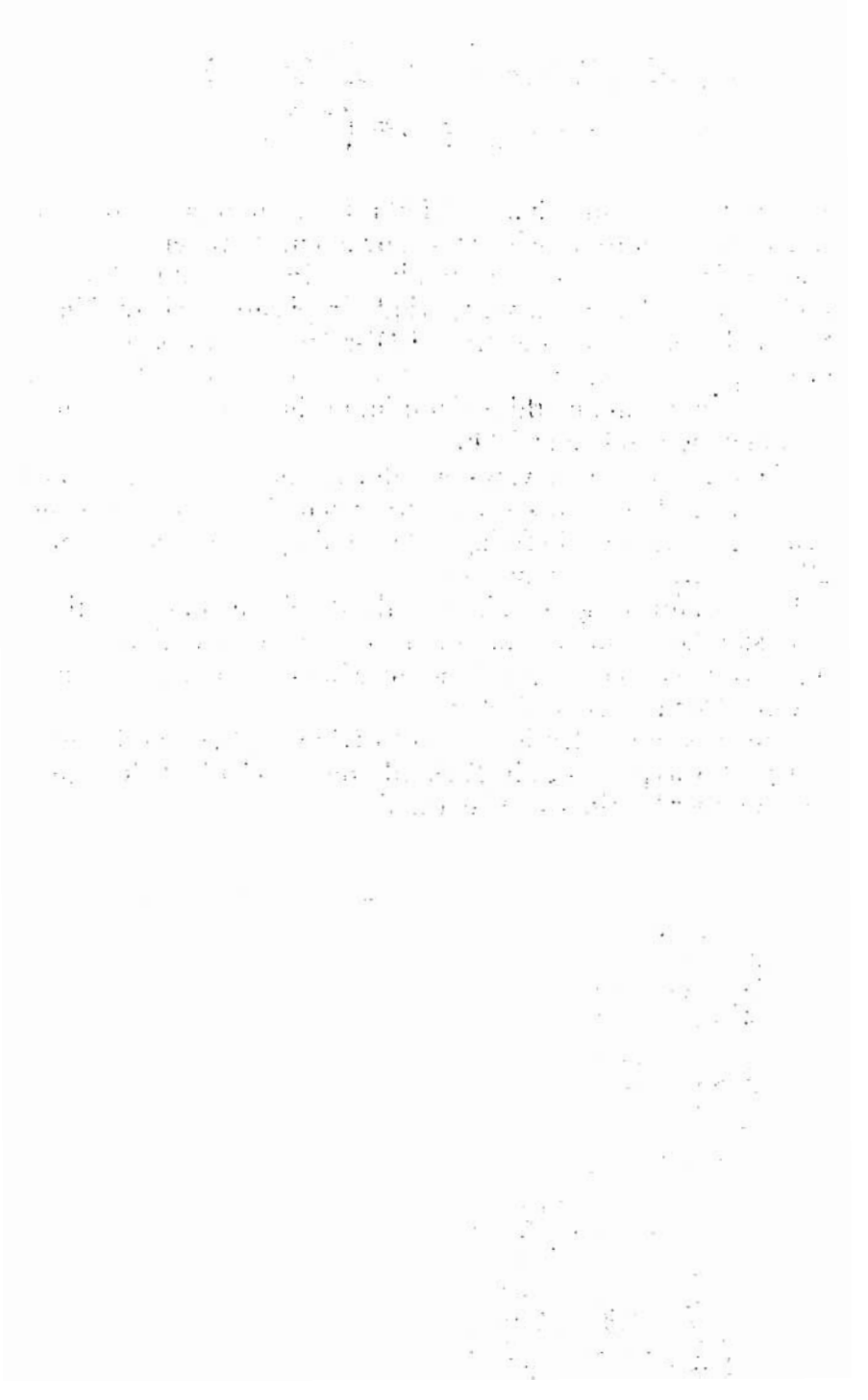
In the U.S. and Europe the companies have a sequential process when developing a new car model. One unit does its job and leaves it to the next group, and so on. It normally takes six to seven years to develop a new car modell.

The Japanese have chosen a quite different method and it has an enormous effect. Today they manage to develop a new model in three to four years.

Honda is in the lead and they can move from design to production in two years.

In Japan the groups in PPP work in parallel. And a powerful flow of information is going on between the groups informally and regularly. All the competence within the groups is mobilized.

Further more, the Japanese take better care of the competence among the low educated. In the U.S. and Europe this competence is not taken care of. Individual workers are not prepared to let others take advantage of their knowledge. □



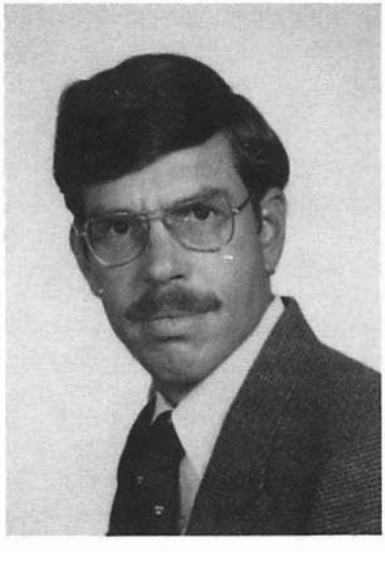
5 Rapid growth of Electronic Data Interchange (EDI)

Electronic Data Interchange (EDI) is the computer-to-computer transmission of routine business documents between companies and their customers and suppliers. First introduced in the mid-1970s, EDI has entered a period of rapid growth in the United States. Revenues derived from EDI-related services have been growing recently at more than 50 percent per year. By the mid 1990s, as much as one-third of routine business transactions in the U.S. may be handled by EDI.

EDI promises cost savings by reducing the processing of paper forms for orders, invoices, etc. Other benefits from EDI include faster response time in filling orders and opportunities for more efficient inventory management.

Reasons for the growth include the development of a national EDI standard and the adoption of EDI by several very large organizations, including the "Big Three" automobile manufacturers and the Department of Defence.

A history of the development of EDI in the U.S. and its future prospects was presented by Richard Adler at TELDOK's Viking's Midsummer Seminar in Marstrand. □



Richard Adler is Director of the Teleservices Program at the Institute for the Future, Menlo Park, California.

Standardization — the key to EDIs expansion

By Richard Adler

EDI has generally developed in the United States on an industry-by-industry basis where members of an industry get together to develop EDI standards for that industry. Each industry typically agrees on a series of "transaction sets" that specify standardized formats for the electronic exchange of documents such as invoices, purchase orders, shipping notices, and so on.

The concept of EDI originated in the late 1960s when members of the U.S. transportation industry founded the Transportation Data Coordinating Committee (TDCC) to develop EDI standards for motor, rail, air, and ocean freight carriers. The TDCC issued its first set of standards for these industries in 1975, and since then has become a major factor in promoting EDI use in the United States. (To reflect its broader mandate, the TDCC recently changed its name to the Electronic Data Interchange Association, or EDIA.)

Because EDI use requires a broad cooperative effort among members of an industry, it typically does not provide any individual company with a competitive advantage. Rather, it is intended to increase the operating efficiency of all industry participants. (While implementing EDI requires cooperation from participants, the efforts to move EDI is often spurred by the need of domestic companies to respond to foreign competition. This is the case both in the U.S. automobile and apparel industries, which have suffered from intense foreign competition, and where active efforts are under way to expand the use of EDI.)

EDI benefits

Specific benefits claimed for EDI include:

- Reduced data entry costs. When business documents are transmitted in a standardized machine-readable form, it is no longer necessary for each trading partner to re-enter the information into its own computer system. Substantial cost savings can be realized by the elimination of redundant data entry.
- Reduced clerical errors. One of the most significant benefits of EDI is the reduction of clerical errors as a result of the elimination of re-keying of data. The reduction of errors often represents the largest category of cost savings realized from adopting EDI.
- Faster response time. Because EDI documents can be transmitted instantaneously, it eliminates the time lag involved when transactions are based on the exchange of paper documents. The U.S. apparel industry is using EDI to develop a "Quick Response" systems to enable U.S. manufacturers to deliver new garments to retailers more rapidly than foreign competitors.

• Inventory control improvements. Because EDI makes information of orders instantly available in machine-readable form, it permits companies to exercise better control of their inventories. For example, Super-Valu, a large grocery distributor, achieved a savings of $ 100 000 per year in reduced paper processing costs from EDI, but it also realized an annual savings of $ 2 million from the more efficient inventory management made possible by EDI.

Large companies benefit the most

Although EDI may result in significant savings, there are also costs associated with converting from paper-based systems to the use of EDI. These costs can be substantial, particularly for companies that are not highly automated. Larger companies that deal with large numbers of customers and suppliers tend to benefit the most from EDI, as compared to smaller companies with low transaction volumes. In some cases, smaller companies have adopted EDI only when faced with an ultimatum from large customers to begin communicating via EDI or lose their business.

After several years of steady growth, the use of EDI in the United Stated has entered a period of rapid growth. Over the past two years, EDI expenditures have been growing at a compound rate of more than 80 percent per year. (See table 1.) As of 1987, total expenditures for EDI network services, processing services, software and professional services, amounted to approximately $ 80 million. It has been estimated that as of 1986, EDI-based transactions from companies to their customers amounted to seven percent of all transactions, while EDI accounted for 3.5 percent of transactions from companies to their suppliers.

Table 1 U.S. EDI Market

Year	Revenues (millions of dollars)
1985	24
1986	46
1987 (estimate)	80
1988 (projection)	130

Still industry-specific

There are several factors responsible for the growth of EDI. They include:

• Implentation of standards. By its nature, EDI depends on the development and acceptance of standards among trading partners. Developing standards is always a time-consuming process, and it has taken nearly two decades for EDI standards to be widely implemented.

For the most part, EDI standards are still industry-specific. The emergence of the generic ANSI X12 standard, which is intended to be used across industries, instead of a single industry, is a recent development and has not yet been widely adopted (approximately 75 to 80 percent of EDI transactions are still non-X12). Acceptance of X12 received an important boost in December 1987, when the

Department of Defence (DoD) announced its decision to support use of X12-based EDI for communicating with its suppliers. The DoD, by itself, is a very large customer. In addition, other U.S. government agencies frequently follow its lead in adopting new standards. Both Ford and General Motors have also announced their intentions to move from an automobile industry-specific standard to X12.

- Availability of third-party EDI networks and EDI software. As long as implementing EDI meant two companies having to develop customized links between them, usage remained confined to very large trading partners. The entrance of third party VANs and the availability of relatively inexpensive EDI translation software has significantly lowered the cost of moving to EDI. Today, all of the major VANs offer EDI services. And PC-based EDI software is available from multiple vendors at costs of less than $ 2 000.

The American VAN service providers (VANs) are normally companies offering different types of specialized datacommunication services, from pure data transmission to electronic mail and EDI.

EDI software translates data and documents

The software manages EDI communications and translates data and documents from the required by a company for internal use to the form required for EDI transmission. Computer manufacturers also have recognized the importance of the EDI market. In late 1987, for example, Digital Equipment Corporation joined IBM and Control Data Corporation in offering products targeted specifically at the EDI market.

- Success stories. As recently as two years ago, EDI remained a relatively esoteric subject. Today, however, EDI is becoming much more well-known. It is estimated that EDI is currently being used by some 3 000 U.S. firms. EDI success stories appear regularly in many industry trade journals and are beginning to appear in the general business press as well. For example, a recent issue of Business Week carried a story about EDI that reported that Wal-Mart Stores increased its sales of men's pants by 31 percent after using EDI to cut delivery times for restocking its inventory. The same article also stated that in a five-month test of EDI, J.C Penney found that sales of men's suits increased 59 percent, while inventories were reduced 20 percent, thanks to the use of EDI to replenish its stock of popular styles. (Business Week, August 3, 1987).
- The commitment of large manufacturers to EDI. In general, the most effective driver of EDI adoption is the decision of the major firms in an industry to the use of EDI with their suppliers. This process can be seen most clearly in the automobile industry, where the "Big Three" auto makers (General Motors, Ford and Chrysler) have gotten together to form the Automobile Industry Action Group (AIAG) to develop and promote the use of EDI. GM has announced its intention to slash more than $ 1 000 from the cost of producing each car, and adopting EDI is part of its plan to reach that goal. GM is already communicating with 25 percent of its 20 000 principal suppliers via EDI, and the company intends to automate its exchanges with all of its suppliers as soon as possible.

Great variation

Despite these positive developments, the penetration of EDI still varies greatly from industry to industry. In a few industry sectors — such as the transportation industry, pharmaceutical industry, grocery industry and the automobile industry — the use of EDI is becoming commonplace. In the pharmaceutical industry, for example, orders for approximately 85 percent of the dollar volume of drugs purchased by distributors from manufacturers is now transmitted by EDI.

The use of EDI for ordering is so common that at least one major pharmaceutical manufacturer (Burroughs Wellcome) announced that it would no longer accept telephone orders, but would accept only those orders submitted by mail or EDI. In the grocery industry, which only began to use EDI in 1983, more than 25 percent of transactions between manufacturers and wholesalers are now handled by EDI.

In some sectors — such as the apparel industry and the health care industry — efforts to develop and implement EDI are still in early stages. In these industries, standards have been developed, pilot projects have been carried out, and some of the more progressive industry leaders are using EDI, but the majority of industry participants have not yet converted to electronic transactions. In other sectors, there is still almost no EDI activity.

Unnecessary to link up in real time

Initially, EDI transmission took place through direct hook-ups from one company's computer to another. Increasingly, however, trading partners are making use of VANs to provide EDI communications. VANs provide store-and-forward capabilities that make it unnecessary for partners to link up in real time. In addition, they provide other services such as the automatic translation of EDI messages from one format to another. Some networks even provide conversion of electronic EDI messages to paper forms and vice versa to permit companies not yet automated to send and receive EDI transactions.

As of today, essentially all of the major U.S. VANs have entered the EDI market. Some recent developments among the VANs include:

April 1986 General Electric Information Services (GEIS) enters the EDI market with EDI*Express.

June 1986 McDonnell Douglas Tymnet introduces Order-X-Change, a service that permits PC users to access current production information and place orders with suppliers. The service includes the capability for transmitting freeform messages as well as standardized EDI transactions.

Dec 1986 Western Union enters the EDI market; GEIS announces a joint venture with MSA to develop an interface between GEIS' EDI*Express and MSA's EDI Expert software.

July 1987 Telenet enters the EDI market through an agreement to provide EDI services from the Ordernet Division of Sterling Software, the leading EDI service supplier.

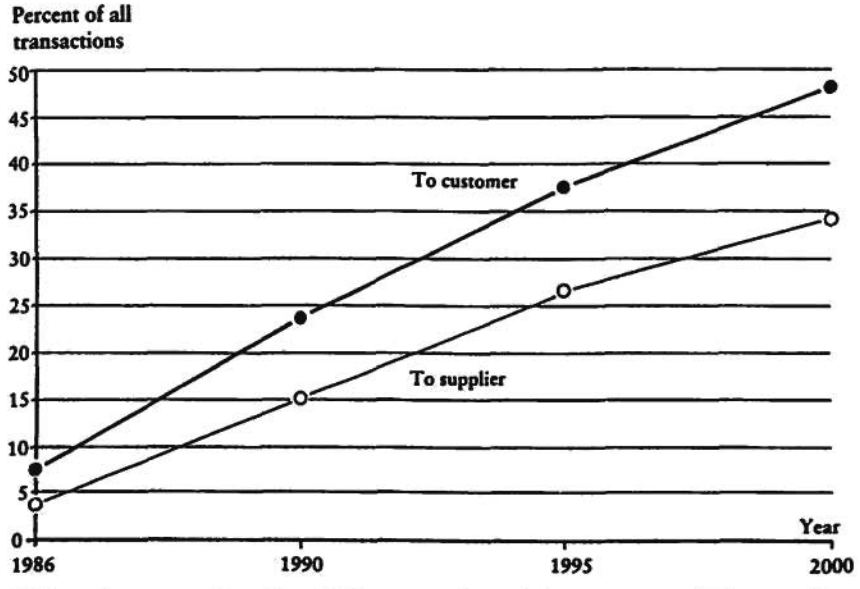
"The networks differentiate themselves"

Some network providers argue that the provision of EDI services is rapidly becoming a commodity, with little significant variation in the offerings of different VANs. Others argue that the networks differentiate themselves on basis of the value-added services they provide. These services include format translation, data management reports, transaction logs, status reports, transmission of EDI messages to multiple trading partners and the aggregation of EDI-based transaction information into databases of industry sales.

Although there is widespread agreement that the EDI market will continue to expand rapidly, estimates of the future size of the market vary widely. For example, Michael Mansouri, Telenet's director of EDI, has predicted that the EDI processing service market will reach $ 400 million by 1991, while Input, a market research firm specializing in EDI, predicts that the 1991 market will reach $ 1.2 billion (Information Week, July 27, 1987).

In December, 1987, Edward Lucente, vice president of IBM Information Services, predicted that by 1995, one third of all business documents will be exchanged by EDI. This prediction coincides fairly well with the results of a study by Professor B.J. LaLonde of Ohio State University. Based on a survey of 100 executives involved in distribution, he projected that EDI use for transactions from companies to their customers will increase from 7.2 percent of all transactions in 1986 to 37.3 percent by 1995, while for transactions from companies to suppliers, EDI use will increase from 3.5 percent of transactions to 26.5 percent (see figure 1).

Figure 1 Growth of EDI Use



EDI use for transactions from U.S. companies to their customers will increase from 7.2 percent of all transactions 1986 to 37.3 percent by 1995, according to predictions by Professor B.J. LaLonde of Ohio University.

Several other developments

Along with growth in the use of EDI are a number of other developments that promise to increase its impact on business. These include:

- Integration of EDI and X.400. The linkage of EDI messages formats with the international X.400 electronic mail standard will be particularly important to smaller companies in reducing their overhead for using EDI. It will also provide a major boost to interworking of private and public networks and of public networks to each other, so that it will be possible to send EDI messages to virtually any company in the United States — or internationally. Also, it eventually will be possible to send messages that include EDI, text and binary files in a single X.400 envelope.
- Convergence of X12 and the EDIFACT standards. As the X12 standard continues to be developed in the United States, the international EDIFACT standard is also under development by a United Nations sponsored commission, and it is emerging as the dominant EDI standard in Europe. Industry observers expect to see a gradual convergence between the two standards, which are relatively close in structure, so that they will be essentially compatible within five to ten years.
- Greater integration of electronic funds transfer (EFT) with EDI. Providing for electronic payment of invoices will be the final step in achieving entirely electronic transactions between companies. Although banks have developed sophisticated systems for moving funds between themselves, they have not been actively involved in working with groups promoting EDI. However, a group of twelve leading U.S. banks recently commissioned a joint study; it concluded that banks need to develop the ability to interface with EDI activities if they want to retain large customers that are moving to all-electronic environments. The study found that banks that have begun providing support for EDI are already linked electronically to five percent of their corporate customers. These institutions expect to be connected electronically to *50* to *80* percent of their customers within three years.

GM shows the way

It is the large manufacturing companies that are showing the way in this case as well. For example, General Motors has established a program linking eight banks to eight GM divisions for electronic payments to suppliers. As of late 1987, some 1 600 GM suppliers had agreed to receive electronic payments, and GM intends to add the rest of its suppliers in the future.

- Extension of EDI to retail level. Most EDI to date has been for transactions between manufacturers and wholesale distributors. Increasingly, however, EDI is beginning to be implemented between distributors and retailers. As noted above, several apparel manufacturers have been experimenting with providing retailers with the capability of rapidly restocking popular items via EDI. The National Retail Merchants Association has sponsored a pilot project using EDI linking two department stores with five apparel manufacturers. The grocery

industry has developed a set of standards that will replace paper records with electronic transactions for the direct delivery of products from manufacturers to supermarkets. An industry study committee is exploiting the use of smart cards in conjunction with EDI to record deliveries made at stores.

● Emergence of new EDI-based business forms. Over the past decade, EDI efforts have been aimed primarely at translating traditional business forms — purchase orders, invoices, bills of lading and so on — from paper into electronic form. However, with the emergence of cumputerized, electronic communications, it is becoming possible to create new forms that take full advantage of the technology.

"Evaluated receipt" replaces paper invoice

According to Ben Milbrandt, vice chairman of the ANSI X12 committee, "not only has modern technology led to the creation of an electronic invoice, it has called into question the very need for an invoice in the first place. From the supplier's point of view, the paper invoice is obsolete, as all the information typically carried on the invoice is accessible in his computer. From the purchaser's point of view, his receiving records, combined with his purchase order (or contract) file give all the information required to generate a payment." A new type of form, called the "evaluated receipt" has been proposed to replace the paper invoice as the basis for paying for goods delivered. Developments such as this suggest that the number of separate transactions may be reduced, as well as speeded up, by the introduction of EDI.

● Linkage of EDI to just-in-time (JIT) inventory management strategies. Perhaps the biggest payoff from EDI will be the use of electronic communication to support the introduction of JIT inventory techniques that can bring about major cost savings in production processes. Such savings can be many times greater than the savings realized from the elimination of paper forms. Navistar International, a manufacturer of farm and construction machinery, claims to have saved $ 167 million from inventory reductions during the first 18 months of using EDI with suppliers. Before the company began using EDI, it typically kept a 33-day supply of engines on hand; currently it works with a four hour supply of engines.

Using EDI to send CAD drawings

● The extension of EDI to link planning and design functions. The potential usage of EDI goes well beyond the exchange of routine orders and payments. A number of companies are moving towards the use of electronic systems for the electronic exchange of computer aided design (CAD), documents and other graphics. Such exchange will enable suppliers to work closely with customers to speed up the entire design cycle. The Big Three auto makers, each of which has been using a different CAD standard, are working through the AIAG to agree on a common standard for use in EDI. GEIS has just introduced Design*Express,

a service designed to facilitate the exchange of CAD documents over its network. It recently has completed tests of the service with companies in the aerospace and apparel industries.

In our research in IFTF, we see these developments leading to the evolution of new business structures. One near-term manifestation of these trends is the creation of the "extended corporation" — a term describing a company that does not merely maintain trading relationships with customers and suppliers, but one that integrates its planning and operations with key partners through a series of strategic alliances supported and coordinated by electronic links. The U.S. auto manufacturers are attempting, out of need, to transform themselves into such extended corporations as quickly as possible. Many of the high-tech computer companies in Silicon Valley are using their own technology to coordinate planning and development with makers of components and complementary products.

The emergence of "virtual companies"

Another manifestation of this evolution is the emergence of "virtual companies" — groups of smaller companies that link up electronically and appear to their customers like one large firm. Customers are able to order products via EDI, and delivery is handled by individual firms. One example of such an arrangement is a group of smaller regional distributors of medical supplies who have begun to cooperate in this way to meet the needs of large national hospital chains.

Beyond this point, we see the emergence of a new "electronic marketplace" — a computer-based electronic environment in which all sorts of goods are bought and sold. This marketplace will almost surely be international, even worldwide in scope, and will eventually encompass consumers at home through electronic shopping networks. How this marketplace evolves is the focus of ongoing research at the Institute for the Future. □

6 Big corporations construct their own value added networks

Corporate users are moving from public value added networks to their own private networks. The vendors of value added network (VAN) services in the U.S. have had to reevaluate their service offerings as traditional sources of revenue have declined.

As a result, vendors of public VAN services are beginning to offer a greater array of services at higher speeds. Some are emphasizing international service as a means of future growth.

Barbara Lucas, a consultant with Vectors in Boston, U.S., called attention to this at TELDOK's Viking's Midsummer Seminar in Marstrand.

The American VAN service providers are normally companies offering different types of specialized datacommunication services, from pure data transmission to electronic mail and EDI.

Ms. Lucas called attention to a growing dissatisfaction among U.S. corporations with international packet communications. This is due in large measure to the difficulties these companies have in negotiating separately with each country. Vendors that can appear to provide a single point of service for regions in Western Europe or Asia will have an advantage in attracting customers for their networks. □

Ms. Lucas is a partner with Vectors, a research and consulting firm in Lexington, Massachusetts. Her work focuses on the identification of market opportunities and assessment of products and services in the telecommunications and computer industry.

Traditional VAN services decline while private networks are growing

By Barbara Lucas

The potential growth and size of the European market for value added networks and services has been the subject of much speculation as European post and telecommunications administrations prepare for increased competition in this sector. Today, I'd like to discuss several facets of value added networks in the United States, in an effort to stimulate discussion about how European networks might evolve in the next several years.

My presentation is based on work recently completed at Vectors as well as work of other consultants in the U.S. The content of my talk will fall roughly into three parts. First, I will mention some trends that seem to be affecting U.S. value added networks. Second, I will discuss how some U.S. VAN vendors are responding to these trends. Finally, I will talk about how corporate users perceive value added nets along several dimensions, including price, performance and international service.

Time sharing declining

Let's talk about some trends facing vendors of VAN services in the U.S. Table 2 shows an analysis done in 1987 by one consulting group on the current and expected revenues of packet switching services by applications. You can see that in 1987, time sharing represented approximately 30 percent of revenues. Providing access to data bases was 27 percent, and private or semi-private systems were another 28 percent.

(Time sharing is a traditional service for computer service bureaus, where the users share computer capacity. Editor's remark.)

Table 2 U.S. packet-switching service revenue by application (million dollars)

	1987	1989	1991
Time sharing	$ 197	$ 205	$ 200
Data Base Access	150	300	455
Semi-Private (Hybrid)	180	297	400
Electronic Mail	57	96	158
Point of Sale	9	30	90
EDI	7	30	94
Local	—	10	30
International	50	110	185
Total	$ 650	$ 1 078	$ 1 612

The predominance of time sharing applications is expected to peak in 1989, although I would say that this peak has probably already occured and we are beginning to see a downtrend in time sharing applications. Not only is the share of time sharing as a percentage of revenues beginning to decline, but the annual rate of growth is also declining.

For some companies, like Electronic Data Service (EDS) and Automatic Data Processing (ADP) that provide back office services to financial and automative or other vertical industries, a substantial part of their business is still time sharing. But these companies are also expanding their VAN services so that their customers may purchase only network time. Customers are no longer required to use time sharing services in order to use the network.

Growth of private networks

A second trend in the United States that we expect to continue is a rapid growth of private networks. Private networks in the U.S. are expected to grow from about 8.3 billion dollars in 1987 to about 12.2 billion dollars in 1995. The voice component of private networks is expected to remain constant at about 5.5 billion dollars for the foreseeable future. Data and integrated voice and data services will experience more rapid growth. Specifically, we expect a high rate of growth, around 23 to 25 percent each year in integrated data services.

In spite of troublesome network management and network back-up issues, U.S. companies appear to prefer private networks where it is economically feasible to establish them. Network management for private systems, at least in the start-up phase, can be difficult and expensive. An emergency back-up system for private networks can also be a problem — a problem companies sometimes resolve by purchasing public network services to back-up their networks in the event of a malfunction. The desire for private networks is due in part to concerns about network control and keeping costs down. It is also related to the types of network services used by these companies.

Vendors of VAN services in the U.S. have followed two different strategies. One group, which includes AT&T, the original Bell operating companies, and Telenet, has concentrated on providing basic data transmission and protocol conversion to U.S. corporations. A second group, which includes companies such as EDS, ADP and General Electric Information Services (GEIS), has focused more on providing services to vertical markets such as finance, banking or insurance. One company, Tymnet, has combined both strategies.

New sources of revenue growth

As the traditional areas of growth for VAN services have declined and private networks have grown, VAN vendors have looked for other sources of revenue growth and are offering new services. On the domestic side, value added network providers such as GEIS and EDS are counting on newer services such as EDI, point of sale, and electronic mail services to produce a greater proportion of their future revenues. Others, such as Tymnet and Telenet, are beginning to offer voice/data integrated services and higher transmission speeds.

(Point of sale means that a buyer pays in cash electronically, for example through the telephone network. That is, a cashless way of paying. Editor's remark.)

Some vendors, like Computer Sciences Corporation (CSC), are basing future growth on the development of international services and are making arrangements with overseas partners to provide expanded international services. CSC has made a market commitment to provide "one stop shopping" for international communications and expects its international business to grow from five percent to 25 percent of their total revenues.

In the past years, Vectors has interviewed over fifty U.S. companies on various aspects of their use of value added networks. These interviews suggest that companies' primary use of VAN services are for protocol conversion and data transmission to remote sites, for asynchronous dial-up, and for international communication.

Companies frequently use value added networks as a means of extending their private network. For example, a company based in Chicago that has substantional communications with San Francisco, New York and Dallas will use their private network for these communications. But they may use a network vendor for communicating with sales people on the road, or for communicating with a regional office in Arizona, or other remote sites.

At the point that communications between two sites become high enough, the corporation will switch over to a leased line. This appears to happen continually, so that sites served by network vendors are changing. Vendors may serve the same customer, but the sites and the service are continually changing.

Table 3 How satisfied are the customers?
Value Added Network Services
Supplier Characteristics
(Average Ratings)

Price	3.7
Reputation	4.4
Locations	4.4
Protocols	4.5
Technical Performance	4.2
International Service	3.7
Customer Relations	4.0
Marketing & Sales	4.0
Installation	3.9
Service & Maintenance	4.2
Average Vendor Rating	4.2

Ratings could range from a low of zero to a high of five. Five means that the customer is completely satisfied with the vendor's performance.

Table 3 provides some ratings from recent interviews with corporations about their perceptions of sight of the VAN vendors. Users were asked to rate the vendors on characteristics such as price, reputation, and technical performance. Ratings could range from a low of zero to a high of five. A rating of five means that the customer is "completely satisfied" with the vendor's performance.

VAN users show satisfaction

The overall ratings suggest that corporate users of value added networks are very satisfied with the services they are receiving. Network vendors are providing most of the services these corporations need. Corporate users have made a commitment to the vendor, have made capital expenditures based on that commitment, and, for the most part, are extremely reluctant to break the relationship. When users do express dissatisfaction with VAN vendors, their concerns tend to fall into four categories. These are: speed, price, SNA support, and international communications.

In the U.S. the accepted speed for public accessibly value added networks has moved from 1 200 to 2 400 baud. But large corporate users are planning for higher speeds. For domestic service they want 9 600 baud and above, and for international services they would like 14.4K or 19.6K or even higher. Only Tymnet appears to be responding quickly to the desire for higher speed transmission by offering 9 600 baud at a growing number of domestic locations.

Companies establish their own networks

As prices for equipment continue to fall, companies are becoming more confident that they can provide service more cheaply themselves than relying on a public network. The growth and acceptance of standards for various services such as EDI are also making companies more confident that they can establish their own networks.

As I mentioned earlier, the companies we interviewed behave in a rational economic manner. They tend to use public value added networks for remote locations until the volume of communication makes it economically feasible to establish a private node.

Concern with price is also reflected in companies' preferences for kilocharacter versus kilopacket charges based on the type of communications they use. Companies using echo response methods prefer kilocharacter charges, for example. Finally, companies appear to be willing to make some speed and location tradeoffs in using VAN vendors if the service costs are low.

Another concern expressed by users dominated by IBM equipment about publicly available value added networks is their lack of support for SNA based systems. Tymnet is perceived as being ahead in providing support, but some users are still dissatisfied. The IBM Information Network is not seen by many as a major actor in VAN services in the U.S. A newer entrant in network services, the SNA-based Sears Network, may provide some competition for other SNA based networks.

Finally, U.S. companies view international data communication as a cumbersome and difficult process. These companies feel "thrown to the wolves" by many vendors because they must negotiate with each country they operate in separately.

Dissatisfied with international service

Although users tend to stay with the value added networks they begin with and indicate a general unwillingness to switch among vendors for domestic service in the U.S., a number of users indicated that they would switch vendors for international service. These users would switch if they could locate vendors that would provide services to international regions, such as Western Europe or Asia, that did not require the user to negotiate separately with each PTT.

Our organizers asked us to provide some provocative conclusions. My semi-provocative conclusions are as follows:

Companies looking for customers in the U.S. should look at private network users like regional banks and corporations as well as vendors of publicly available networks.

Vendors of international network services that can provide a single point of service to regions as opposed to individual countries will be attractive to potential U.S. customers.

Customer satisfaction with domestic suppliers of value added networks in the U.S. and the move towards private networks will make it difficult for foreign companies to break into the domestic U.S. market. □

7 Competing message handling systems

Messages can be delivered in many ways, and it is important to think through how they work from the user's perspective.

This was the message from William A. Lucas, MD of International Videotex Network, as he compared message handling via mail, facsimile, telex, electronic mail and videotex mail at TELDOK's Viking's Midsummer Seminar.

Ease of use is decisive when many users choose among electronic alternatives for sending textual messages. The simplicity of facsimile is one reason why it is expanding very quickly. This technology has many advantages, the cost of facsimile machines is going down rapidly, and this media is capturing a growing market share in competition with electronic mail.

Telex is awkward to use, but if you want to send a message to Bolivia or Yemen, it is still the only real alternative. The strength of telex is that it can be reached all over the world, but its cost and the strengths of other messaging systems are leading to a steady decline in its market share.

Electronic mail is not easy to use or inexpensive if the user does not already have and regularly use a personal computer. For those with PCs, e-mail has many advantages, particularly when messages are composed off-line to control costs. For those without PCs, videotex mail using low cost terminals is the message system of the future, especially as home billing for videotex services eliminates the need for prior subscription to services and awkward sign-on procedures. □

Dr William A. Lucas is helping a subsidiary of the Deutsche Bundespost establish the International Videotex Network, which will provide the U.S. market with on-line access to Bildschirmtext and other European services.

Ease of use decides the user's choice

By William A. Lucas

Encouraged by the previous speakers, I must tell you about the bear. Two hikers in a remote part of Alaska were coming down into a valley when they saw a very large Kodiak bear. Even at a distance, they could tell the bear was very tall, and that it was angry about something. When the bear saw them, he started charging up the hill after them. They immediately turned and started running. When they looked back, the bear was gaining on them. They tried to run faster, but the bear was getting closer.

One of the hikers started hopping along on one foot, unlacing his boot, and then he took the boot off, dropping it as he ran. Then he took off the other boot. Next he reached into his pack, got out his tennis shoes, and started putting them on.

His friend said: "That's not going to help. Those bears run 30 miles an hour; he's going to catch us!" The first hiker replied: "I don't have to outrun the bear. I only have to outrun you."

Learning is half of the success

In our small companies, as we start activities in electronic messaging, none of us really understand the business yet. We are trying to keep up with our customers, who keep learning new ways to use the technology. And after we have done something for a year, we realize a lot that is wrong and go back to change things. Half of our success comes from learning as we go and changing our service based on that new knowledge more quickly than our competitors can. That is staying ahead of the bear.

It is very important to think clearly about our businesses, and today I'm going to take you through an exercise that I use to anchor the way I think about messaging. My central point is that you must use in your thinking the right model for the business that you are in. I have seen several failures in the past because people use the wrong model or analogy. In cable television, for example, people in education programs kept thinking that they were in broadcast television. As a result they came up with programs with production costs that were so high that the services had to fail because they were not consistent with the budget realities of educational institutions.

The same need to select the correct model is true in our field. I believe that in electronic messaging we continue to think about using computers over communications networks, time-sharing, as our mental model for electronic mail. There is a different mental model, and that is the post: giving it to the mailman. If we are to break out and offer a general service to the public, we will have to use the post as a model.

I am going to take you through a simple analysis that I have gone through in my company to try to make an effective electronic mail system. I would say I am prejudiced because of my focus on trying to come up with ways that I can make videotex, frame-oriented messaging systems very attractive and strong.

While I originally did the analysis some time ago, I want to say thank you to my hosts who invited me here, because I have benefitted from being forced to go through it again more carefully and formally to prepare for this presentation.

I could have spent a lot of money to do this analysis, hiring a consultant or whatever. But a lot of what I am going to say comes from my own experience, how I feel about these technologies and how I react to them. In some cases, there is a body of research that would support my conclusions; in some cases there is not. You may have different opinions and I look forward to arguing with you later on.

Ease of use

Let us start with what I call ease of use. Looking at table 4, consider the post. At the age of ten, we know how to lick a stamp, put it on an envelope, and give it to the postman. We do not have to teach that. So we can give it three plusses as very easy to learn and use.

Table 4 Ease of Use

	Post	Fax	Telex	E-Mail	Vtx-Mail
User type					
Ease of Learning	+++	++	0	−−	−
Convenience	++	+++	+++	+	+
PC/Convenience	+	++	−	+++	+

Post and fax get most of the plusses from ease of learning and convenience.

Facsimile. You have all done it, so what is the process? You touch two buttons and dial the telephone number. You stick the paper in, and even if it takes you a couple of tries to get the paper straight, pretty quickly we have sent a message. We keep forgetting the power of the facsimile machine that comes from its ease of use, something I will come back to.

Telex. It's awkward. You will have to learn to type once you learn how to use the machine. And **electronic mail:** Access a network, sign-on with an account number, passwords... You've got to be kidding! What we ask the individual user to do is very difficult. Even after you have learned the system, it is not convenient even for the experienced. I differentiate between the convenience factor for people who are routinely using personal computers on their desks, and others. For the average person, the inconvenience of needing to sign on never goes away.

I was associated with a company called Source Telecomputing in the United States which had grown at one point to 60 000 on-line subscribers. It is a successful company, making money today from electronic mail. We had at that

time 3 000 calls a month from people who could not sign-on. 3 000 calls a month! They had generally lost their password, or they could not enter their account number correctly. This problem of current electronic mail systems does not go away.

A different world

I think that one of the fundamental problems we have in the electronic messaging business is that we are ourselves mostly users of personal computers. For us, after we have created a document with our word processing package, we hit a few keys and our modern software signs us on. Oh, that's convenient. But let's go to someone who does not use a personal computer on a daily basis, and the world looks very different. And forgetting this difference is a primary source of thinking incorrectly about electronic mail.

Another area we can compare messaging systems is the content that you can put into it such as affect, emotion. See table 5. The value of psychological studies is that they remind us how important putting emotional content into communications can be. As a practical matter it is more difficult to put emotional content into one-way messaging. But some people do it effectively in the written word in type images. When you can write in the margins, you can put in personal handwriting. When you sign your name different ways in a letter, you provide emotional content. You can indicate informality; you can signal emphasis, anger, or whatever you wish. The post and fax let you send emotion even though they are one-way. But telex? You just type "I'm mad". That's about all you can do in telex, and it just doesn't have the same force.

Table 5 Content Characteristics

	Post	Fax	Telex	E-Mail	Vtx-Mail
Affective Content	+(1)	+(1)	0	0	0
Textual Information	+++(2)	+++(2)	+	++	++
Graphical Information	+++	+++	0	0	+

(1) Handwriting and informal notes

(2) Tables

Again post and fax get most of the plusses.

Hard to lie without video

Even when you have broadband media able to send video, it can be hard to convey emotion effectively. Narrowband is much more limited. There was some interesting work done about twelve years ago in Britain by a group called Communications Studies and Planning. One of the things that they discovered is that it is hard to lie without video. In less dramatic words, what they were saying is: The more robust the medium, the more emotional content you can convey to persuade or distract. Conversely, as you move from post and fax to the most limited form of messaging, telex, it is harder to use emotion. Most salesmen would agree that it is very hard to sell anything over telex or electronic mail.

Textual information. Even though all the messaging media can carry plain text, there are significant differences. Sure, you can write all the same words in telex, but who is going to pay for a 5 000 word telex? The amount of textual information goes down with telex simply because of cost and its structure: it is very tiresome to type long messages. Electronic mail and videotex mail can be much longer, but typing can again be a barrier for those who don't routinely compose messages on their personal computers.

Even greater differences occur with sending tables of information. If the tables are original material you are typing in, fine. But have you ever tried to type an airline schedule into an electronic message? Forget it! Although tables are textual in nature, they are best sent through old fashioned media using a postage stamp, or a facsimile machine, two very powerful media. And when you move to graphical information, the differences are even greater. Forget logos, figures or diagrams of products with most forms of electronic mail. When we get carried away with enthusiasm for e-mail, we should remember we are competing against very effective one-way messaging systems out there today.

How can we narrow that gap? In a graphics-oriented environment, I can put a logo on my videotex mail. I can also provide other tools, like foreign language character sets. Videotex can even provide Chinese characters, and the Bundespost Bildschirmtext service is offering Chinese characters in the CEPT Profile 1 standard. There are some advantages here of videotex mail over electronic mail, and in my business, that is what I am looking for. After all, the point of this exercise is to understand the strengths and weaknesses of different forms of messaging, and I am looking to strengthen the plusses and get rid of the minuses for my service.

"Nobody picks up e-mail"

Delivery Characteristics. Let's start with speed of delivery. Ah, finally the postman fails. One of the realities is that if you give the average human being another two days to worry about a problem, he will. So even though he used to be able to do a task and still have time to put a message in the mail in time for it to arrive by a deadline, now he steals the extra two days. And that great human failing is a fundamental motor driving electronic delivery. See table 6.

Table 6 Delivery Characteristics

	Post	Fax	Telex	E-Mail	Vtx-Mail
Speed	−	+++	+++	+	+
Sender Confidence	++	+++	+++	+	+
Multipoint	+	−	−	+++	+++
Network Robustness	+	+	+++	0	0

When comparing speed and sender confidence fax and telex get most of the plusses.

Telex and facsimile get there fast. But let me tell you why e-mail only gets one plus under speed of delivery. Electronic mail gets there right away, but nobody picks it up. How do you get the receiver to know he has received it the minute you send a message? You have to pick up the telephone and call them. So this electronic media we get all excited about has some inherent flaws.

This limitation on electronic messaging is related to another delivery characteristic that I am calling "sender confidence". Do you know your message got there? Again forms of electronic mail fall short of the post, fax, and telex with its answerback capability.

Broadcast, or multiple-person messaging, is a delivery capability that is done well by electronic mail, and facsimile certainly falls down here. Have you ever sent the same ten page fax to twelve different people? Not an exciting experience. If your secretary has to spend a whole afternoon sending fax messages, you will hear about it later. Broadcast delivery for electronic mail and videotex mail are wonderfully simple, and there are a lot of circumstances where it is effective. Picking a group management example, sales force management and reporting is a place where electronic messaging with its multiple-address capability can really shine.

Junk mail — a coming problem

That's the good news. As I go along I am going to make some predictions, and one of them is bad news. Prediction one also involves the broadcast strength of electronic mail: A major problem facing this industry in five years will be junk mail. Wait until you get public network, multi-point mail, where hundreds of thousands of consumers can send each other multi-addressed mail. And how do you stop it, deciding who can and can't send multiple copies? Major policy problems will emerge that we will have to deal with over the next few years.

Network robustness is another very important delivery characteristic. The network is fine if you are in Western Europe or North America, but try to conduct international business in Bolivia or Yemen without telex. The telephone networks are just not sufficiently reliable. The strength of telex is the great anchor

that is going to keep telex with us for a long time in the international messaging business.

Question: What is convenient with fax?

Answer: The message just comes out the machine! There's the message on a desk, usually with a human being sitting there. I can't account for the efficiency of your organization if that person doesn't deliver it, however, which is an exposure.

No system will challenge the post office

Critical mass. The mailman is back in the lead, because you can send mail to anyone. See table 7. We still have fragmented the electronic messaging users across telex, the array of e-mail systems, and fax. Right now videotex is last in terms of critical mass, but it's coming along and should soon become, I believe, as important as e-mail. Videotex mail is usually frame oriented, a page at a time, instead of line by line display of ASCII characters. It has been proven very successful in France, with two million users or so. The Bundespost has over a hundred thousand users. There is a small system just starting here in Sweden which is typical of most of the world. In the United States, we really don't have videotex mail yet. Even with millions of users and with the growth of X.400 interconnection of e-mail, not one messaging system will ever begin to challenge the post office in scale, however.

The number in any one electronic messaging community ceases to be important if we start saying: "How many of them can I interconnect?" going across systems. My point today is that I am not only interested in using X.400 to interconnect this and that e-mail system. I want even more to go to a higher level, and interconnect different types of messaging media, because I want to reach a user no matter what, whether he uses e-mail, telex, or that easy-to-use electronic messaging system called facsimile. I want to reach the universe of messaging systems.

Table 7 Critical Mass

	Post	Fax	Telex	E-Mail	Vtx-Mail
Number	+++	+	+	+	–
Connectivity	–	–/+	+	+	+

Anyone can be reached by post.

Going from e-mail to fax

The reason for the minus and the plus on interconnectivity, see table 7, is that I think we are already beginning to go from e-mail to fax. Those translation services are on their way, and that is the plus. The problem is going the other

way, from the facsimile machine to the PC or terminal. There are boards for PCs which receive fax, but the benefits are really limited to those with expensive laser printers. If my subject today were convergence, I would say that Apple's Macintosh facsimile server on a Macintosh network, allowing a Mac to send and receive both text and graphics from fax machines and other Macs, is the beginning of real convergence of personal computing, e-mail and fax. But for the market as a whole, that is a long way away. The major effort today is on getting different e-mail systems to talk to each other.

Voice mail? I think voice mail is a very effective medium, because you don't need a terminal, and it will be very successful. But the problem with it is that an awful lot of information has to be textual — you need a written message in one form or another. Voice mail eventually will create its own interconnection opportunity.

Fax prices going down

Cost is another major area to compare messaging systems, including both equipment and transmission costs. See table 8. I believe that the most dramatic thing happening in North America (I cannot speak for Sweden) is the declining price of facsimile machines. I can go to a wholesale office equipment store in the United States and get a Group 3 fax machine in quantity for 700 U.S. dollars if I only need minimum capability. So one of the major negatives about fax machines is disappearing. The prices are still high in Europe, but they will come down here as well.

Table 8 Cost

	Post	Fax	Telex	E-Mail	Vtx-Mail
Equipment	0	going down	–(1)	–	
Sending	+	––	–––	–	–
Receiving	0	0	0	–	–

(1) Marginal Cost

The equipment cost is low for post, going down quickly with fax and is normally a marginal cost with e-mail.

Telex is an expensive machine. E-mail does not require expensive equipment if you think of it as a marginal cost. If you had to buy a personal computer system just for electronic mail, it would of course be costly. But most count only the expense of a modem and software as the marginal cost. For those without PCs, videotex terminals are coming down to the 300 U.S. dollar range. CEPT 2 (Minitel) and CEPT 3 (Prestel) are already at that level, and even the CEPT Profile (Bildschirmtext) standard will be under 400 dollars fairly soon.

The cost of sending mail through the post is very cheap. Facsimile, requiring payment of direct dial telephone charges, is not, and cost is a major problem for fax messaging. Telex is terribly expensive. In the U.S., England, and much of Europe, high prices are one of the reasons why telex is steadily declining.

Motivated sender — unmotivated receiver

The price to the recipient of electronic mail brings us back to our mental models. What is our analogy for electronic mail? Are we in computers, or are we a form of post? That should help answer the question: Who is motivated in a mail transaction? The sender wants to send mail. The receiver is not particularly motivated and usually didn't ask for the mail. The way electronic mail often works today the sender is saying to the receiver: "You want this mail", and before you know who sent it or what is in it, you will have to pay to connect to the system to access it. It makes no sense for us to follow the current form of the technology and force the receiver to share the cost of the transaction. And yet, when we ask people to sign on and pay connect time to receive electronic mail, that is exactly what we are doing. It is a case of our mental model of computing distorting our business.

Having run quickly through these comparative strengths and weaknesses, I can reach some conclusions, mostly from the perspective of electronic mail. Call them conclusions and predictions about the future of electronic messaging.

First, all forms of messaging have their strengths and none of them are going away. Even telex, the dead man of communications, will take a decade to wither away, because it plays an important international role and it has an established base of users. Fax traffic is growing, and user networks are forming and expanding. Not declining! Electronic mail is doing well, and videotex systems are coming.

I believe that there is not going to be a convergence of these various electronic messaging systems, if by convergence we mean they will combine into a single system. Convergence is not going to happen in the next ten years. There is instead going to be an interconnection of messaging media. And they will "converge" in the sense that they are going to become functionally equivalent. What do I mean by that?

The systems will become more similar

The people in our industry are learning about all the negatives. AT&T and MCI in the United States said: "Hey, it's stupid to charge for electronic mail the way we do computing." Now they are not charging the receiver of electronic mail, returning to the post model of messaging. I can find a half dozen other examples in my figures where solutions for the negatives are being developed. The salesmen are coming back and complaining to the engineers, and the engineers are trying to modify the messaging systems. All of us want to stay in business. So we must continue to understand our media, and make it more competitive with other messaging media. As we soften the minuses, build on the plusses, messaging systems will become more and more similar in function.

Fax, e-mail, and videotex mail will all get stronger, but it will take time. The companies offering those services are all going to get it wrong, making mistakes as we break new ground. They are going to get it right with time, because there are a lot of smart guys out there who are going to make all kinds of improvements. And if you look inside the good companies, you will find an engineer working on most of the minuses in this presentation.

I will make five more predictions.

Fax will appear on long-haul packet networks. A major disadvantage with facsimile machines is the cost of long distance calling. There is no reason to pay direct dial charges when you are moving data traffic. There will be dial-in fax nodes on the local access ports of the established value-added networks that receive a local fax call, move the fax data over the packet network backbone, and dial out locally to the fax machine at the destination city.

The first service that has done this, called USA Fax, is going to fail. The reason is that they think that they can start a stand-alone service of that kind, providing local fax nodes and long-haul data lines. What will happen is that the value-added networks are going to watch their success and then say: "Gee, what a neat idea!" And then the networks will establish their own nodes, take advantage of the economies of scale of their data networks, and sell it to their established customer base that they already offer messaging. And USA Fax will go right down the tube. It *is* a neat idea, and fax data networks will become routine.

Prediction two: E-mail will be transactional. Forget connect time to receive mail. We will have to find ways to get enough revenue from the sender and average it out to cover the receiving costs. If the receiver goes on-line, and he adds to our costs by hanging on the network a long time, our engineers are going to have to disconnect him. We are going to have to move to transactional charging for the sender, and no charging for the receiver, or we will never break open the large mass audience. The trend in this direction has already started.

The computing PTT-model

Prediction three: Automatic number identification and the local telephone loops are going to be the most important keys to the opening of the consumer marketplace in videotex. Why? Because I don't have to sign on and enter an account or password. A customer can dial a telephone number, get a menu, and go to work sending a message, beacuse I can bill his home telephone account without creating all kinds of complicated sign-ons. "Well, why did all those idiots have sign-ons in the first place?" Because computing was our mental model, and because in the early days of on-line services, we had a painful experience with computer hackers and bad debts that consumed between three and five percent of revenue. With that kind of financial exposure, you have operations people pulling their hair out trying to make the system tighter, in conflict with the marketing people who recognized that they had to make the system more open. But with access to the calling telephone number and telephone company billing as you have here with the telco, these problems become much more manageable.

In the United States, allowing the local telephone companies into the business and using automatic number identification and easy home-billing will launch a massive U.S. market in two years.

Prediction four: Videotex is going to come on strongly, particularly in international business messaging, because it has strengths that plain ASCII character electronic media lacks. Videotex with dynamically redefinable character sets will be able to provide a variety of foreign languages on a single terminal, which will help videotex marketing in international messaging markets even more than it will be used in practice. We will eventually be able to customer signature stamps one way or another, and logos will be routine. Customers will be able to create graphic images and figures that will add to the content of their messages. They will have to differentiate themselves from standard ASCII electronic mail, and this is one way they are going to do it.

Increased off-line composition

Prediction five: Off-line composition of mail will increase. The cost of providing users the opportunity to compose electronic mail on-line is very high, and particularly hard to recover in national systems. Electronic mail systems are all pushing towards services built around personal computers with an off-line composition capability. They are giving away software that keeps people off the network while messages are created, and then makes sign-on and sending mail quick and easy. The services are then able to charge by the transaction, going back to a classical post office model, and hiding the computing costs of connect time, computer resource units, and all that. Videotex mail will have to move in the same direction.

One of the most exciting products I have seen for the messaging field coming out of France is a printer with enough memory that it can be an off-line composition unit for simple terminals. We will see a lot of clever solutions to off-line message creation appear.

One last thing is a call for attention. The area that is probably the most neglected in this field, that we will have to see more rapid development on, is directories. As a messaging system user, I don't need a telex directory and an electronic mail directory. As systems interconnect, I need a directory of all the people in a community that tells me whether they have a fax machine, or whether they have e-mail or videotex mail capability, and what system I need to use to send them a message. Somebody is going to make a lot of money selling access to that directory, particularly international businessmen. But for the industry to prosper, we must have much better directory capabilities. That is my challenge to you. □

TELDOK was initiated by the Board of Televerket (Swedish Telecommunications Administration) to facilitate ***early and easy-to-read documentation on the use of telecommunicating information systems.***

TELDOK's aims include: to...

- Document, as early as possible, working applications of new telecommunicating information systems at work
- Publish, distribute, and—where needed—translate to Swedish and compare to the Swedish situation, information on the use of new telecommunications systems in the workplace
- Arrange study trips and seminars directly related to the preparation and dissemination of information pertaining to practical applications of telecommunicating information systems at work

Activities are managed by an Editorial Board with wide representation from the user community, research, trade unions, government authorities, suppliers, and Televerket. The TELDOK Editorial Board welcomes new ideas concerning the study and documentation of practical applications of new telecommunicating information systems. The Editorial Board can be reached...

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