"Gutenberg made everyone a reader
Xerox made everyone a publisher
the personal computer made everyone an author
the personal telephone makes everyone a participant".

Value addition in videotex networks

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Summary

This paper discusses knowledge flows in networks. The discussion is a contribution to the development of that part of information economics that concerns the emergence of electronic markets on videotex networks. This discussion stresses the importance of communication and analysis of conditions for exchange of information services in firms and organisations. It is discussed a quantitative model for analysis of the values users experience as relevant for different information services.

The discussion in this paper is meant as a background for application oriented discussions about education with interactive media.

In this text, information is treaded as a commodity, more or less as a piece of goods that can be handled on a market. Such exchange of information between different parties naturally presupposes that these parties refer this information to a common meaning. What one person refers to must be meaningful to the other, for the communication to be meaningful. When developing concepts and relations in the area of information economics it is essential to deal with quantities of information that are related to the same environment. Otherwise the information exchange would try to quantify apples and pears at the same time.

A certain network type is chosen for examplification. In order to be easily and practically available for further later tests and measurements, it is chosen videotex networks. Such a videotex network is technically defined to be structionally simple in certain respects. It is flexible, it can be dynamic, and can represent changing values. Thus, it forms a good base for analysis of effects in different types of more or less efficient communication. It is argued in the paper that, seen from a network perspective, electronic markets will most likely develop from videotex and upwards, rather than from ISDN-applications and downwards.

In the discussion it is mentioned the fast development concerning mobile telephony in industrialized countries in the 1990´s. When the telephone device becomes smaller and smaller, and is provided with a built-in modem, it is proposed to treat such a piece of equipment as a personal terminal. Each human being, with her personal terminal can then be looked on as an extended person, having access to certain databases. Further, extended persons can form extended groups. These concepts are discussed in the text.

It is discussed the nature of value addition in electronic networks. Different aspects of this elusive concept are analyzed, and it is suggested that its time dependance will be considered important. Experience from the 1988 TeleGuide home videotex trial in Västerås, Sweden, is then taken as an empirical example, to calculate comparisons of user evaluations for different information services. In this way, users´ views on value addition is shown in a comprehensive manner.

Charateristics of electronic markets with value added services are discussed. Here, dynamic activities concerning advertizing have interesting possibilities. Also, organizational effects of cooperation through the french concept of reroutage are shown. Forms of groupware as a form of coordinated behaviour on such markets is discussed. As a base for further analysis of these types of electronic markets, it is proposed to consider user modeling as a relevant tool.

Knowledge system background

In this paper we discuss effects of activities in electronic networks. These networks are used by users with interest to acquire knowledge. However, the users are naturally also able to give knowledge, to contribute.

The discussion concerns the field of information economics, where environments and market conditions for flows of information are analyzed. This discussion is not in this case meant to stress empirical results. Rather, it puts questions, and presents hypothesis discussions based on theoretical reasoning.

The knowledge that can be acquired in such an environment has principally two origins. Either it is made available through access to databases that are or can be connected to the network, or it has its origin from human participants in the network communication. Generalized, we might consider this knowledge to be "database" knowledge, wether or not the database is strictly artificial or of human nature.

Networks that are completely manual, human networks that combine users completely without the presence of computing resources, have as counterpart totally artificial and automated networks, without human participation. Between these two poles we find the mixed networks that are most common, and of concern in this discussion. One important reason behind our interest in these mixed networks is that they can be dynamic in an interesting way. Their characteristics change fast over time.

A topic of concern here thus is the exchange of human knowledge in mixed knowledge networks. This exchange can technically seen be carried through in different formats. Knowledge that is communicated in a network represents statements or facts about objects. Such statements can be given the form of documents. Documents express statements in different formats, for instance, format-free text comments, sound or graphics, fixed forms, forms that contain references to predefined statements.

All human knowledge has human origin, and is time-dependant. Some knowledge is related to old history, some knowledge builds perhaps on a fresh human comment that was created a moment ago. All knowledge degenerates with time. It looses value. It is essential to keep in mind this temporal dependence for all knowledge.

The discussion in this text is meant as a background for later application oriented discussions about education with interactive media. Development of such applications require knowledge about the underlying levels of "value addition". This concept is analyzed below.

In this text, we are going to refer to access to knowledge from user participation in networks that are "of videotex type". However, other types of networks are also concerned. Videotex is just one technological form of network representation, a form where user interactivity is essential. We are also going to discuss dynamic activities on the part of the user, activities that may follow network access.

Videotex as a network base

Naturally, there exists a number of network forms that can support cooperation between terminal equipped users. Structures can be centralized or decentralized, there can be combinations. Most systems do in practice combine the two. In this discussion, we are not going to argue for or against a certain network structure. We are going to deal with videotex networks in general.

It must be stressed that apparently other (non-videotex) formats for data communication in networks in many respects function quite as well for the type of information analysis that is discussed in this report. However, there are reasons for elaborating from the videotex base, reasons that will be commented below.

What characterizes a videotex network?

Videotex is not a sharply defined network form. Instead, and formally, it is simply a character set for data transmission, a type of standard. There are, however, different types of such videotex character sets, being accepted and used in different parts of the world:

- In the West European, or English, area, the Prestel standard dominates. Prestel was the first practically and widely used videotex standard.

- In the Central European, or French, area, the Télétel standard (built on Antiope) at present is used by close to 6 million users. By quantity, at least, this standard clearly dominates.

- In the North European, or German, area, the CEPT standard is expanding. Among other countries adopting to this standard we find Austria, Sweden, Switzerland, and others.

- In the American area, the NAPLPS (built on Canadian Telidon) standard is competing with ordinary TTY and IBM 3270 communication forms. NAPLPS is expanding, although slowly, also because of competition with local Télétel systems.

- In the Asian area, primarily its Japanese part, the Captain standard, although not widely accepted, is used by an increasing number of users. Prestel also is used in several Asian countries.

In the CEPT organization, specifying numbers have been given to these different standards, CEPT 1, CEPT 2, CEPT 3, etc. These different standard are principally incompatible with each other. Thus, there are communication problems between different national videotex systems. Communicating routines have, however, been developed, to overcome and solve many of these compatibility problems. At the end of 1990, there exist such communicating routines for communication between the English and the French, and between the French and the German standards, among others.

Within each of these standard areas it is possible to transmit text and simple graphics with ease. For more demanding graphic communications, other more graphically competent standards are being developed. Since they are demanding on terminal processing and memory capacity, capacities that are not around today, they are not used to any large extent at the present time.

However, there are international discussions going on aiming at the use of a general overall common videotex standard. Results are expected in the foreseeable future. Perhaps the Common Market will speed up the process.

Characteristics for videotex

Apart from these character coding methods, the concept of videotex communication is not sharply defined. There are, however, certain other characteristica that are common to many of the existing videotex systems worldwide. These characteristica are of a practical nature. No one authority, nationally or internationally, has stated what should and what should not be, about them. Still they are used in most systems.

These characteristica concern database structure, as well as administrative measures for the management of the network systems.

Firstly, videotex communication to-day is page oriented. This means that although the transmission of characters nearly always is assymmetric (transmission is done character by character, and not in blocks), from a user perspective the page to-day is the most natural form. A videotex page usually contains 24 rows with 40 characters per row. Presentation is done "pagewise" after the transmission of a page of characters. This means that scrolling seldom is used. The user sees page after page, distinctly.

So far, videotex networks in general are almost always unintelligent networks where large numbers of users use databases with tree-formatted data. The use of the tree format in videotex databases has a specific background. There is no generally accepted international rule, or "Videotex Green Paper", behind this. Instead, its background is historic.

In the early days of videotex, one of this concept´s genuine originators, Sam Feddida of General Post Office in Great Britain, saw and named today´s concept of videotex as "viewdata", a combination of "looking" and "reading" on equipment that was widely available. Users would be you and me, everyone. He figured that it would be hopelessly expensive to force new types of terminal equipment into the homes of everybody. The solution he came up with was that viewdata would provide access to information via a combination of the home TV and the ordinary telephone. Together, these two pieces of equipment would form a (kind of) home terminal for everybody. This was around 1970, and the concept of personal computer had not been spread.

Feddida´s concept stressed "home oriented applications". This meant applications that were of relevance to everyone, applications that needed no professional skill from the user. The main reason behind all this was simply that use of such a system would increase the use of the telephone, which would generate profit for the General Post Office. After all, this was the place where Feddida was employed.

The applications that were thought of in these early days stressed access to simple forms of data that were of an "everyday nature". It would concern fresh news, local as well as global, it would concern time tables for trains, buses etc, it would concern pleasure. The latter turned out to attract a certain amount of attraction, since at that time games were almost completely manual, and interactive games hardly existed.

As future applications, it was sketched on ordering of goods and services, with the aim further on at possibilities to pay for what could be ordered.

Apart from these later applications, who were thought to be somewhat futuristic, the system was characterized by its ability to handle simply structured information. It concerned the latest news and the local weather forecast, plus travel time tables etc.

Such types of information were considered to be suitably mapped by a simple data structure. Intuitively (source: personal communication with Sam Feddida), a tree structure was picked. A reason was that use of such a structure would be easy to handle for everyone.

Later on, when personal computers have taken over in quite a number of areas, the tree structure has been kept partly for the same reason, and partly for reason of compatibility and cost of change.

When discussing the relevance for tree structures in videotex, it is important to observe its relations to both users and to service providers.Trees are logically simple structures. It is practically easy for the user to choose one out of a certain number of alternatives (for spacial reasons usually less than 10). The user has to know her desire, however, which one of the alternatives that is most relevant for her. This condition has been considered to be simple over the years. Lately, however, it has become increasingly evident that the choice of alternatives can be a compex matter. Therefore, different alternative search methods have been implemented. These contain use of simple keywords, use of logically combined keywords etc. The use of keywords most often refers to data that are stored in tree structures inside the system.

Because of limited processing and graphical possibilities and limited direct access screen pointing facilities, searching based on for instance mouse oriented dynamic pointing at graphic picture elements (icons etc) have not yet been used to any large extent in videotex. Again, this type of communication is designed to be exceptionally simple and inexpensive. Graphics is included in to-day´s in practice videotex standards only to limited extent, and mouse technology requires processing power that during the 1980:s has been available only in PC´s, not in unintelligent (French) Minitel or (Swedish) TeleGuide terminals.

Videotex is the simplest practically available data communication network that may be suited for commercial and public applications. For economical reasons, users can hardly be expected to start using advanced and expensive, perhaps ISDN-oriented, applications directly. They will start from the simpler and less expensive forms. Electronic markets will develop from videotex. The logic of tree searching is a natural way into both broader and more direct mechanisms for information retrieval.

Videotex network nature

All network types have their special characteristica. Here, the concept of "intelligence" is worth discussing. What is usually meant by network intelligence? Here it may suffice to note that it comprises adding some type of power, which is close to value addition in the network. This is usually started in small networks. Large networks, i e with hundreds or thousands of users, are often examples of "unintelligent" networks, partly due to structural problems, partly due to economical restrictions. Intelligence or value addition always has a price, and widely spread large scale network intelligence is therefore so far rare.

Videotex networks seldom are constant in size over time, they have life times. This is partly due to dynamic interaction with users. During their lifetime, they often tend to grow up to the size of their economic and social limits (an application of "Peter´s Principle"). This can from a rationalistic viewpoint be looked on as a type of built-in network bureaucracy, driven by the demand for increased quality of service from users. Increased quality may mean that the node accesses from users must not decrease in quantity and transaction quality.

There are different reasons behind the growth of these networks. We might look upon, or compare, a network with an instance of a small or medium sized firm. The information network forms a representation of the firm, on a level aside or "above" the physical reality. The information flow pattern shows the firm´s activities to fulfil its goals. Since expansion is natural for many firms and organizations, however not all types, the related information networks also expand.

In this context, we shall note those types of intelligence that exist in relations between the nodes. This means that we shall refer to intelligence that not only has origin in the services that are being made available on the network, but also such types that stem from reactions from and between users.

Large research efforts are being put into the field of service intelligence at the present time. Methods are being put forward where increased quality is made available in searching for knowledge in predefined databases. Expert systems are being developed that highly increase efficiency in the search for well-defined knowledge in databases.

Such activities can be looked on as means to increase the "intelligence in the nodes" in a network. We can add aspects to this that contain the activities of the users themselves. The network can be looked apon as example of a more general system. Thus we may discuss the concept of group intelligence. This can be seen as a generalization of personal or node intelligence.

Types of network intelligence

Many aspects can be laid on the concept of network intelligence. A general view could start with quality as origin for analysis. Intelligence in networks can exist in different forms:

- in the nodes
- in the relations between the nodes
- among the users of the system
- in the network operating system

The main interest in this discussion stems from the situation of the user. Thus, intelligence can be looked on as service quality for the user. This quality contains ability for the user to :

- observe data that are available in the network
- relate these data to her (the user´s) environment
- deduce and reach conclusions from these data
- take action according to these conclusions

One of the fundamental actions that a user can take is to give a comment to the data. This comment can have the form of an added personal piece of text or graphics, something that has been created spontanously. It can also have the form of suggested references to other data that the user finds relevant.

The user naturally also has the possibility to delete data that she finds irrelevant. This can be done in her own database, but also, if she has the authority, in a higher, regional or global, database.

The important fact here is that systems consisting of users and databases seldom are stable in size. Actions from users can lead to decreasing or increasing sizes.

In most systems, human or artificial, different users have different access responsibility. In completely "logically circular" systems, all partners have equal types of access. These are few in practice. Many systems are to some extent hierachic, where there always is defined one part who acts as controller, or chairperson, with administrative responsibility.

Extended persons

Many systems are built on a mixture of human and artificial resources. The human parts are represented in knowledge, or experience, the artificial are often computer supported facilities.

It is quite possible to define a basic combination of human and artificial resources. We might consider a human being plus her access to "her" data bases as a whole.

This "extended person" then has access to a memory that is formed by both her own human memory and the data bases she has access to at a certain moment in time. It follows that an extended person is a time-dependant being.

In the 1990's, an increasing number of portable telephones are sold. They build on networks of cellular type, covering urban country areas, and successively even rural districts. It is expected that by the end of the present century, a large number of even smaller and lighter telephones are in use. Not far is the situation where every person has her own portable telephone available at most parts of the day.

Such a personal telephone quite normally will be complemented with a modem, making it a personal terminal.

With such a device it may become interesting to discuss the characteristics of the amounts of information that an extended person can have access to. Naturally this differs largely from one human being to another. There also are large differences between the number of data bases that a person may have access to. However, it may be intersting to ponder over the amounts of information that different groups of persons in practice, in everyday reality, can access.

It is said that a human being rarely can hold more than five thougts in mind at the same time. Perhaps there exist a "parallel" maximum amount of database accesses that a person can handle, when one considers the environment and time restrictions that always are there? Accessing to much data often is not meaningful. A reason for discussing questions of this sort is that access techniques to different databases differ largely to-day, and can be expected to do so for long times to come. Even though automated access routines will make access simpler in the future, there will probably always be some difference between different systems. A person who has practical access to a broader spectrum of databases, has advantages over a less well informed person.

It may soon enough perhaps become a question of social justice to provide practical means for everybody to reach at least a minimum of public and private databases through the personal terminal.

Algebraic manipulations can be made with simple models of extended persons, where formalized treatment of characteristics of database accesses can help comparing the efficiency in different parts of systems of extended persons.

Extended groups

Groups of extended persons form extended groups. An extended group consists, then, of two parts:

- the collected group of physical persons in the group
- the collective database access possibilities that belong to these persons

Comparisons about group efficiency can be made between extended groups, by comparing the characteristics of the respective database access possibilities. There can be made algebraic manipulations with characteristics of extended groups in much the same way as with extended persons.

When distributing information services to large groups of users in society, there is a need to be able to tune such services differently for different user groups. One must be ready to analyze personal information service needs with adequate precision. Studying a human person and her portable modem-computer as an entity may simplify such studies. This will be an enlargement of scope compared to the counting of modems that to-day characterizes the methods to evaluate the spread of telecommunication resources.

A formal view on value addition

There are many different representations and models for flows of information. On a macro oriented level, we here choose to formulate that information concerns change in knowledge. These two concepts are both dependant on time. A person gets informed when she gets to know something, a fact, that she already did not know.

If we denote the information content in a service by I(t) and the related knowledge function by K(t), then our relation takes the form:

$$I(t) = dK(t) / dt ;$$

Verbally, we read this as follows: Information equals increased (or decreased) knowledge over time. We can expand the interpretation: If the knowledge is constant, then the information content is zero (the person or system already "knows"). If we integrate, we see that knowledge equals accumulated information over time.

With this thinking, knowledge refers to factual data, measured or accessed manually from a human person or through a database system.

Prof Percy Tannenbaum formulates (at a PTT seminar at Marstrand, 1988) a related statement, that "information is reduction of uncertainty". This is not very far from our model, since reduction of uncertainty can be reformulated as increase of certainty, or increase of access to factual knowledge.

The concept of value addition for a service in a network is commonly used, but hardly sharply defined. Many would agree on, however, that it concerns quality that is added above certain basic information services. Quite often it is rather practically treated, as for instance in the large English "Vanguard project", where one makes a difference between three different types of value added communication:

- Person-to-person (mail, conferencing etc)
- Person-to-computer (information retrieval, videotex etc)
- Computer-to-computer (EDI etc)

Additional forms, like EFT (electronic funds transfer) and home banking are not included in the Brittish scheme. These are considered to be "above" the ones mentioned here, as having still greater (potential) added values.

It is important to note that value addition most oftenly refers to increased value for the users of a service. This distinction is not always made clear. Too often reference is blurred between both users and service providers.

For our purpose, if we relate it to time, we might state that in a given usage environment, the value V(t) of a piece of information I(t) is being reached through a value addition function VA(t). We provide a hypothesis here that this under certain conditions can be reached through simple multiplication. In later research we shall be back to discussion about these conditions. According to the hypothesis:

$V(t) = VA(t) * I(t)$;

or

$V(t) = VA(t) * dK(t) / dt$;

VA(t) takes positive values if a service induces increased value, but can naturally also be negative, if a certain functional activity leads to decreased user value.

Does value addition functions have natural maxima (or are they mostly linear etc)? Let us take a practical example. It is sometimes discussed (for instance at IVIA Forum 1990 in Toronto) whether some kind of "magic price point" exists for interactive teleshopping, a point which users/customers normally would not exceed in their ordering. In the United States, the amount of $ 200 has been mentioned for Prodigy. In France, FF 750 is mentioned by the leading mail order company La Redoute. These refer to largely different information service backgrounds, but may reflect common customer reaction types for certain types of value addition. It would be highly desirable to have access to formal representations for such services, as a base for concise analysis. This is a topic for continued research.

Let us now further analyze VA(t). We begin by defining a communication function C. This may be used to symbolize to make certain information available. It may have several components:

$C = \text{constant} * (c_1, c_2, \ldots, c_n)$;

Each component c_n can be looked on as an element of communication in a certain dimension. The dimensions may concern speed, security, cost etc.

In many applications there is a balance, often an alternative, between on one hand finding a piece of information through retrieving and carrying through a calculation Calc(I(t)), and on the other obtaining the piece of information as a result from a process of communication C(t). Thus C(t) is in principle proportional to Calc(I(t)).

In our model it is appropriate to treat specially the user availability. Let us extract an availability function A(t) from the concept I(t). What is left in I(t) then can be seen as a more pure information quantity :

$V(t) = A(t) * I(t) * C(t)$;

We recall that $I(t) = dK(t)/dt$;

with K(t) = the knowledge function, referring to those data that are stored in the database that are relevant for the actual application.

A security function, S(t), can be useful when there is a need to regulate the access to certain data. In its binary form:

$S(t) = 0$ or 1 ;

This regulates the physical access to the information.

So we see that the user value of the information in this model has several components (where value addition concerns the first three):

- security
- user availability
- communication function, to get access to the information
- change in knowledge

$V(t) = S(t) * A(t) * C(t) * dK(t)/dt$;

This model may be used for formal tests in empirical environments, where different parts can be analyzed separately. A part of it is used below. Such analysis is planned to be expanded in later research.

Value addition in practice

Generally, a value added network service, called VANS, often relies on communication or database services that add some kind of quality to the original service. This quality may consist of reference to data or services that are relevant to the original service.

A few examples:

- Plain old telephone services (often abbreviated POTS) might be complemented with services that concern number administration, bill handling, background music etc.

- Facsimile is a form of picture oriented document transmission which has "higher value" than the data transmission facilities it uses. The value addition is of administrative nature, and is computer controlled, especially when store-and-forward functions are included.

- Electronic messaging and computer conferencing contain a number of administrative aids to handle communication of free-text messages.

- EDI (Electronic Data Interchange) consists of transmission of "form bounded" data (invoices, buying orders etc) between computerized systems. Completion of actual data in the "form" is done more or less automatically in the sender´s system. The value addition is taking place in the sender system.

- Videotex is a technically defined type of communication of pages and certain types of graphics between terminals, for instance of type Minitel or TeleGuide, or PCs. Reference is made to database hosts where added services concern teleshopping, telebanking, travel ticket issuing, game playing etc.

Such, and others, types of value addition form types of intelligence. Adding possibilities to refer to services of this type thus adds value, and at the same time some type of intelligence.

We might state that adding network service value means increasing network intelligence.

It is relevant to address the qualitites here. Where are the borders between the different VANS? Exactly where does the value addition take place?

During the 1980s it has become noted that much of the real profit from activities on the telecommunications market concerns telephony and telephone-related services. It is around such services that there is a user demand today. However, certain new services are expanding. We may note the expansion for facsimile, mobile telephony, voice mail, and, lately , videotex. These services give examples of value addition that technically give fairly low addition of intelligence. However, in a user perspective, one has to refer to another perspective. Its background is the following.

A lot of financial effort is being put into VANS from producers of telecom and information services at the present moment. This is being motivated by the reasoning that the more intelligence one can add, the better are the chances for profit. An example: Graphics-oriented ISDN-services are for many of these institutions perhaps more tempting, and expansive, than slow-speed electronic mail. The reasoning behind this is unclear. One motive concerns desire for power over possibly coming network technologies, another appears to follow the thought that "the more added technical intelligence, the more market success". The success of this formula has yet to be shown.

The addition of intelligence in such a reasoning concerns technological intelligence, higher speed, better graphics, better sound etc. It is possible that user demand is more application oriented. A few examples:

- Market success with EDI needs knowledge of different application environments. This reflects that EDI is not a general solution to most computer-to-computer transmission needs, but rather a way to automate an information system application in a branch, with characteristics that differ from branch to branch.

- Electronic mail finds users regionally and locally rather than on distance. This is natural because of the fact that people mostly exchange opinions about matters that are well known to them, in some sence local matters. It is no coincidence that a large majority of telephone calls are local. The same reasoning can be applied on text calls, as well as mail.

- Many successful videotex services are of a local nature. They rely on local knowledge of business, travel, pleasure. The supplier of videotex services has to be locally knowledgeable.

- Even facsimile may add to this, when its use has expanded. Its further value addition may also occur branch oriented.

These examples appear to show that user oriented value is demanded, referring to objects or services that in some sence are close to users. If generalized, this reasoning would mean that an increasing number of successful intelligent telecommunication services are local, in spite of the fact that telecommunications technology in itself is distance independent. If true, this conclusion would be of great importance for many institutions on the telecom market, from service providers to telecom network operators. It would imply a need for especially close contacts with applications environments.

A conclusion here thus indicates that, practically seen, value addition more often concerns consumer values than it concerns service producer values.

Apart from characteristics of separate services on different value levels, it is possible to discuss value addition for networks as a whole, or as parts of larger networks. A local network may provide a specific value added service in all its nodes. For such a network we can state that the value addition is a property for the local network service package as a whole.

Size and critical mass

The distribution of services in networks is seldom purely linear, i e is spreading straightly parallel with the number of nodes. There are borders to be passed, and threshholds to be climbed. The concept of critical mass becomes interesting.

A critical mass is often seen as a minimal number of node functions, (services, users etc), in a network that is needed for a certain activity to take place. The concept of critical mass however should be related to a certain variable in a network. In commonday use, critical mass often simply refers to a certain number of nodes in a network. This number has to exceed a certain level for the service to be successful in some sence. Usually this "sense" concerns profit. Naturally, other possible such "senses" exist.

However, pure number of node relations is not always sufficient in order to make an estimation of the critical mass for a service. Consider for instance an electronic mail system. Quite often, mail nodes (in this case physical persons) contact each other more than once in a certain time period - the contact distribution function is not a constant function. In these cases, the critical mass can not be calculated purely on the linear basis of numbers of nodes. We also have to know frequencies for the activities of each node. Estimation of critical mass becomes more complex.

From a qualitative viewpoint, it might be stated that passing of the critical mass in a network occurs when an adequate number of development activities at a certain moment in time turn towards the same direction, the same goal. They decide to start to cooperate and pull in the same direction.

For the spreading of certain telecommunication services, like facsimile or videotex, analysis of critical mass - number of participants - have been considered interesting by many observers. For facsimile this can be seen as evident, because for such a technology to spread it is essential for a sender to know that she really is able to reach the receiver. For electronic mail the same reasoning can be applied.

For videotex the situation is not that simple. Videotex services usually contain much more than mail. However, one might state that for videotex services to spread in a country, it is of importance that "its" mail function is able to spread. Mail is neccessary but not sufficient for videotex.

Pure mail services in a videotex service package show less value addition than other interactive services in the same service package (for instance of type on-line ticketing or banking). The reason is that the latter usually connects or refers to more fresh and sophisticated database services than the former does.

Following this reasoning, we might formulate this qualitativly based hypothesis:

The critical mass for a service on a higher level of value addition is less than the comparable critical mass for a service with less value addition.

As mentioned above, critical mass often refers to border for profit. But, the concept of "videotex profit" naturally has to be defined: profit for whom? There are at least three principal participants on the videotex market: the customers, the service providers, and the network operators.

The customers use videotex if it is "profitable" in some sense for them, concerning money, time or other qualitative content. The service providers make a videotex profit if they can attract large enogh numbers of subscription customers. The network operators find videotex profitable if their network carries enough traffic. Since there unfortunately - so far - is available only little data to describe basic network profit for large telecommunication networks, statements about the overall profit mostly concern the situation for the service providers. If large numbers of service providers are making a profit, the service as a whole is seen as successful.

One of the problems with profitable videotex for network operators is the difficulty to define network profit. There are many different services on most telecom networks, not only videotex. These are available for a varied number of years. The network itself is upgraded regularily with new technical functions and higher transmission speed possibilities. How should all these financial uncertainties be handled? The estimation of critical mass for certain types of network profit certainly touches on questions about definitions.

Discussion about the critical mass for overall videotex profit have been going on for quite some time. For Télétel services in France, it has sometimes been mentioned the number of 1 000 000 Mintel terminals as a cruical number. This is comparing with a total population of more than 50 million french inhabitants. After 1987, when this million Minitels was reached, proponents for the french videotex system were markedly more optimistic about its coming commercial success. The border was passed.

However, other countries tend to aim at much lower numbers. For Sweden, with fewer inhabitants but high penetration of telephones, and also of modems, higher than in most other countries, a relatively lower critical mass is natural. In 1990, there are only 8.4 million inhabitants in Sweden as a whole. The critical mass for profitable videotex (profitable for a relevant number of service providors) in Sweden has been estimated to lie almost a factor ten below the french figure. The figure 200 000 has also been mentioned. The accuracy of such estimations remains to be shown.

It should be repeated, however, that the concept of critical mass is of interest also for other concerns than profit. It may concern social acceptance of mail or fax or even videotex as a whole, but with the interest focused on threshholds to be passed for a service to be accepted as commonly accepted and available. Telephony has surely passed this level, when does fax, when does non-french videotex? Judging from the history of telephony, it might be possible to find the point where this medium could be considered to be generally accepted. From this it might be possible to extrapolate into the fields of newer media, through taking into account the different value addition levels of the services.

The rapidly increasing market acceptance for faximile services to-day (1991) indicates that user orientation and simplicity for a service, once a basic technology level is passed, is more important than increased technical perfection.

Levels of value addition

Analysis of the expansion for existing and new telecommunication services often concern levels or degrees of value addition, although not outspoken. For such types of analysis, it would be helpful if a generally accepted classification schema would exist for such levels. To date, such a classification does not exist.

The following is suggested as a base for further discussions about levels of value addition.

The value that is added to a service often concerns some type of added intelligence. This means added relations to in some sence new services. These services can contain added facility for communication, added reference to relevant data, or added computational facilities.

Thus, to an original information service we can:

1 Combine with other services of the same type
2 Connect "outside" existing database and/or communication services
3 Create new facilities spontaneously, like new comments, new algorithms etc.

These types of value addition form a scale, where the early ones can be seen as "lower" than the later ones. Unfortunately, there are no sharp borders that separate the different forms of value addition from each other. However, the different levels often represent different degrees of predefinition in time. One can see increasing value addition on a scale where what is added is less and less predefined. In such a model, the highest degree of value addition refers to what is created the latest in time. Addition of value often contains addition of some type of freshness, in form or contents. A comment that is created "on-line" and spontaneously in this sense represents a high degree of value addition.

This is naturally not the only way to look at value addition. It represents one out of many views on this elusive concept.

Dynamic comments as value addition

Having access to fresh user comments and references to predefined texts increase the value of the group activity. This is principally independant of group size. Giving a comment can be seen as giving a piece of value addition to an activity.

A comment that is judged in the user group as relevant induces a higher amount of value addition than a comment that is considered as less relevant. However, in most value systems there exists a lowest level here - all comments have at least a minimal value by themselves, independant of the opinions of participants in the group.

Value addition thus can be seen as increased reference to relevant data, whether or not these are spontanously created or they are just references to outside data.

The question of judging whether or not a comment is of relevance to a group naturally can be a delicate matter. Without referencing to group values one might, however, judge one type of relevance by the number of further references that the comment induces in a certain time. A piece of text that in short time forms the basis for a larger number of further references can be seen as more relevant than one that incudes a smaller amount of references. With a relevant definition of "reference", this reasoning is used in certain academic circles.

This is a rather static and quantitative view. Qualitites of content naturally also often have relevance, often higher than simple numbers of references. However, quality is a broad concept, and calculation of comment quantities - which is so much easier - may form a base for further analysis.

Also, there are naturally differences between networks that are friendly and "kind" to commenters, and those who appear to be of a more "chilly" user nature. We shall be back to this further on.

Interactivity in value addition

Time may be essential for many types of value addition. Interactivity is a facility that relies on time changes. Therefore, interactivity may be relevant for value addition. A service that is using a higher degree of interactivity can be said to apply higher added value than a service with a lower degree of interacitivity.

Certain types of classification of value added service types (VAS) has been suggested according to this reasoning, for instance:

Group 1: (Information-orinted VAS)
Database access
Electronic publishing

Group 2: (Communication-oriented VAS)
Electronic mail
Computer conferencing
Video conferencing

Group 3: (Transaction-oriented VAS)
On line reservations
Teleshopping
Telebanking
Electronic Funds Transfer at Point of Sale (EFTPOS)
Electronic Data Interchange (EDI)

Many other listings of this type are naturally possible, dependant on the type of analysis they are meant for.

A user view on value addition

In order to get an empirical view on the concept of value addition, we choose to analyze data from the first TeleGuide home videotex trial. This trial took place between april and november 1988 in the city of Västerås in Sweden. Västerås is a medium sized city, dominated by large industry concerns. It has an active press and a local university. It is situated 110 kilometers from Stockholm. The city celebrated its 1000th anniversary in 1988/89, an occasion that was considered well suited for new acitivities in the "media sphere", among others.

It was chosen a sample of aprox. 100 families, out of a general list of those who had indicated at least a fair amount of interest in the matter, at an early information meeting. The sample represented average user types. Half of the group were provided with french Minitel 1 terminals (Philips), and the other half were given Nokia/Salora PC:s. This was done without initial cost for the users. The families also were provided with a financial fee, to be used during the early trials with the system. It would not be costly for them to start their usage. After approx. two months, however, they would have to pay normal usage fees.

The services mirrored a fairly broad spectrum of videotex possibilities, with teleshopping and telebanking added to entertainment, news, catalogs etc. It must be stressed that the services that were provided at that time were not mature in all respects. Interactivity could be used only to a limited extent, and - seen from a systems viewpoint - user kindness in availibility etc. left some to be desired.

How would these non-videotex-experienced users react? How would they experience the kind of value addition that was presented through this videotex?

At the time of the trial, in springtime 1988 and in the fall of 1988, two intervjues based on the same questionnaire were presented to all users. Also, it was invited free-form comments to the questions presented. The comments were sorted in groups, referring to different types of observations and user comments.

Firstly, the structured interviews contained certain questions addressing the user´s opinions about "system kindness". The same questions were put at the start of the system usage, in May 1988, and at the end of the trial, in Nov 1988:

Activity	Very easy	Rather easy	Rather difficult	Very difficult	No reply
Find a service, May 88:	34	50	11	2	3
Find a service, Nov 88:	15	60	17	3	5
Search for something, May:	33	39	21	0	7
Search for something, Nov:	18	57	17	5	3
Follow from menues, May:	31	51	12	0	6
Follow from menues, Nov:	13	53	30	2	2

Table 1. Structured user responses at the Västerås TeleGuide trial, 1988 (Source: TeleGuide 88)

To these not very optimistic user reactions it can be added that no significant difference between usage of Minitel or Nokia PC was noted.

Secondly, the user satisfaction with the services was analyzed by dividing the additional comments that were given, into groups showing the users´ opinions of the system´s external, its internal characteristics, plus its administrative management characteristics:

A_1 External characteristics:

- The system should in advance be able to inform about its service content, plus the different costs of usage.
- The system should be able to give immediate informative systems messages error messages etc.
- It should be possible to access the system without specialist knowledge.
- The system should be availible at the wish of the user, whether this concerns availibility times of the day, practical availibility manners etc.
- The system should be secure
- The system should be able to communicate with other systems in a flexible way.
- The system should be able to vary its outer contact surface according to the needs of different individual needs
- Contact with the system is established at the user´s wish.

A_2 Internal characteristics:

- Help desk concerning system behaviour should be availible on all system levels, and at all times.
- The system should behave in a unified manner, under different environmental conditions.
- The system should contain flexible search routines.
- The system should incorporate mail as well as conferencing functions.
- Abbreviations for commands and groups of commands should be possible at the user´s wish.

- The system should be able to handle spontaneous comments.
- The system should be able to react and make suggestions in an intelligent manner when the user is unprecise in her behaviour.
- The system should support user creativity.
- The system should be able to cooperate with different presentation forms (multi-media)
- The system should be able to entertain to a certain extent, at the user´s wish.

A_3 Administrative characteristics:

- The system should be managed in such a way that the user gets correct systems information
- The user should be able to act anonymously
- The system should collect and be able to present user statistics.
- The system should not be a threat to the user´s personal integrity, for instance through collecting data about user behaviour without user permission.
- The system should provide protocol conversion to other system types.
- The system should provide efficient and flexible debit functions, where each user session is completed with information about session cost, accumulated user cost so far etc.
- It should be possible to use the system on different "levels of usage", concerning technololgy, contents and cost, for instance being able to handle requests of the type "Please find the following information or service at this maximum cost and/or in a certain maximum availible time".

Such a list of characteristics naturally by no means is complete, many other functions could be added. However, this was the list that was used during the TeleGuide data analysis. In total, concerning system kindness, it was collected 70 free-format comments at system start, in May 1988, plus 171 comments at the end of the trial, in Nov 1988.

These comments can be sorted according to the classification above:

$A_1(t)$ External systems characteristics at time t
$A_2(t)$ Internal systems characteristics at time t
$A_3(t)$ Administrative systems characteristics at time t

According to the contents of the comments, each comment was rated (given a value) on the scale 1 to 5, including borders. The lowest value (1) was used to indicate the lowest degree of satisfaction, while the highest value (5) showed the highest degree of satisfaction. According to this schema, the comments showed the following distribution (where t_1 is May, and t_2 is Nov 1988):

Characteristic	Number of comments	Mean (scale 1-5)	Standard deviation
$A_1(t_1)$	40	2.40	0.81
$A_1(t_2)$	87	1.82	0.69
$A_2(t_1)$	23	2.09	0.60
$A_2(t_2)$	62	2.00	0.77
$A_3(t_1)$	7	1.86	0.38
$A_3(t_2)$	24	1.58	0.58

Table 2. User reactions concerning TeleGuide 1988

Thus it is possible to collect the means of these opinions into the usage vector

$A(t) = (A_1(t), A_2(t), A_3(t))$;

where, to repeat, A_1 represents external systems charcteristics, A_2 represents internal systems characteristics, and A_3 represents administrative characteristics:

$A(t_1) = (2.40, 2.09, 1.86)$;
$A(t_2) = (1.82, 2.00, 1.58)$;

Here it has become possible to compare systems characteristics at the different points in time in a concise manner. The overall qualitative result from this early TeleGuide case is not very promising, and was in effect motive for substancial systems improvements in a number of respects before TeleGuide´s 1990 expansion.

Estimation of usage value

In order to be able to analyze not only overall systems behaviour, but the user value of different information services one by one, we have to continue empirically.

Earlier we have defined a formal way to estimate user value for a certain information service:

$V(t) = S(t) * A(t) * C(t) * dK(t)/dt$;

If we consider the security and communication functions as unity, as background for this special application, the formula is reduced to:

$V(t) = A(t) * dK(t)/dt$;

Using the TeleGuide Västerås trial data, we can then compare the user values of different services in the trial. We recall that

$A(t_2) = (1.82, 2.00, 1.58)$;

referring to evaluation of users´ experience from external, internal and administrative systems effects at Nov 1988, that was estimated above.

One of the services that was introduced to the users in Västerås concerned a catalogue of adresses and telephone numbers in Sweden as a whole. It is the direct counterpart to the french Annuaire Electronique, in Sweden called Nummervisionen. This service turned out to be successful among the users. If we want to estimate the users´ knowledge about this service, we can refer to the opinions given specially about this service on a direct question at the end of the trial, in Nov 1988. Then 42 % of the users said that they were well familiar with the service, they "had full knowledge about it". Considering that their knowledge of it had been close to zero at the beginning of the trial, we can formulate the following linear "knowledge vector" for Nummervisionen:

$K_{Nummervision}(t) = (0.42 * t, 0.42 * t, \text{constant})$;

This presupposes that the users´ knowledge concerned the external plus the internal characteristics of the service, and that their knowledge about its administrative characteristics were constant over this time period. Naturally, other forms than linear are quite possible, as a matter of fact a more increasing function may seem quite useful. For this case, however, we choose the linear form.

From this we get

$I_{Nummervision}(t_2) = dK_{Nummervision}(t_2) / dt = (0.42, 0.42, 0)$;

$$V_{Nummervision}(t_2) = A(t_2) * I(t_2) = (1.82, 2.00, 1.58) * (0.42, 0.42, 0) = \\ = 0.76 + 0.84 + 0 = 1.60 ;$$

We can make the same calculation for the other services that were introduced at the same time. If we compare this with the value estimation that were given by the users for each service, on a direct question after the test, we get the following:

Service	User value at interview	Calculated user value
Nummervisionen	4.05	1.60
Independent Finans	3.60	0.19
AB Trav och Galopp (horse racing)	3.50	0.34
Teletravel	3.45	0.99
Ellos (mail order)	3.32	1.18
TINA	3.17	0.15
Trygg Hansa (insurance)	3.00	0.19
Telebild (financial etc)	3.00	0.19
S-E-Banken (telebanking)	3.00	0.31
Åhléns (teleshopping)	2.98	0.99
Västeråsguiden (local news)	2.96	0.99
VLT (general news)	2.93	0.73
Samhall (public inf)	2.80	too few data
ICA (shopping)	2.76	0.99

Table 3. Directly indicated plus calculated user value estimations for different services at TeleGuide Västerås trial, 1988

It is not possible to directly relate the two estimations given above to each other. However, internal comparisons can give interesting results. The method also shows possibilities to follow the experienced development of different services over time periods.

Dynamic organizational effects

The french Télétel network contains a service called reroutage. This is a service for connecting between different separate original services. A typical example is that the service provider (SP1) for a certain service, say, a ticket ordering service, wants easy access to a payment routine, to organize payment for her service, a service that SP2 already offers in the network. SP1 may be a travelling specialist, SP2 may be a bank.

France Telecom has developed software in the Télétel network that makes it especially easy for SP1 to connect to SP2. This is the reroutage facility. Logically one can see this software function as a welldefined systems space where these two service providers meet to treat the ordering from a specific customer. This distribution of responsibility could perhaps mean that SP1 defines the customer, tells what is to be done, and SP2 verifies the security of the desired activity, and carries through what in this example might be a banking transaction, a payment transaction.

Functions resembling the french reroutage exist also in other videotex networks. In the Swedish public videotex network provided by Televerket, it is introduced in spring 1991.

Reroutage nearly always is complemented with message exchange facilities, where rapid message and conference contacts are being born.

An important characteristic of the reroutage facility is that is is extremely simple to use. It is probably the most easy way to connect two separate services to each other. This means that here is a dynamic facility that all service providers can use. As a tool for organizational adaption to changing market environments, this facility is worth special concern. It shows that intelligent communication services can be of special importance in situations where organizational change is needed.

Creation of a "computerized systems space" or contact field for formings of cooperation between firms, organizations etc. can be seen as making available a dynamic field for firm representatives to meet and reorganize when this is needed. This space makes possible not only to exchange information about market needs, but also to form rapidly constructed new organizational groupings.

It could perhaps be seen as a computerized golf course, where not only CEO´s, but representatives on all levels of firm influence can meet, and form a common future. Such a contact field is a place where you not only meet, but also immediately organize to take action. It is a truly dynamic field for contact.

With reroutage, videotex network services show important possibilities for research concerning rapidly changing markets.

Effects of dynamics on network security

One noteworthy effect following the emergence of such dynamics in user oriented networks concerns security, protections against unauthorized access. Security in a network is built on predictability. A balance between static structure and security is natural. For a network to be secure, it has to be stable. Security is defined for a network with a fixed size and well defined outer invironment.

Giving users the possibility to add contents and functions to a system makes the system security situation more complex. One no longer has to deal only with predefined security situations. Some such situations may show security effects that are predictable only to a certain extent, others are not predictable at all.

In order to make a dynamic network secure, one has to define a balance between stability and dynamics, containing an upper border of dynamic noise that is allowed. If this border is exceeded, the network security degenerates.

Such borders can be of both syntactic and semantic nature. Example of crossing over a syntactical border would be that creation of a comment or making a reference to a certain procedure would override physical security relations in the network. The created comment or procedure relation would simply be superposed over the ordinary security routines or measures, making them unaccessable and/or obsolete.

Crossing over a semantic security border would mirror crossing over a syntactical border, but on a "semantic level". A created comment would contain data that upon interpretation, i e referencing to other relevant data in the network, would make transitions over existing security measures. An example could be that someone makes a comment of such textual content that another network participant finds herself motivated to immidiately force herself into an unallowed network area.

Towards value added electronic markets

With the concept of an electronic market it is often meant a market that is dominated by services that are being offered with computerized support. Many of these are "automated" to a large extent. Such markets contain a substancial offering of services that are of on-line database character. Many of the services offered then are of interactive type. Also distribution of the services and goods are computer supported. There is, however, no need for completely total on-line computerization on an electronic market. Markets can be more or less electronic.

The marketplace for such activities is dependent on the existance of telecommunication network facilities, where the customers have access to certain more or less interactive ordering of goods and services.

In this report we concentrate on information services that use the videotex format. It is a fact, though, that no electronic market demands solely and exactly the format videotex. Other formats are quite as useful.

Markets of this type exist or are on the border of being developed in many countries. Some, but definetely not all, have reached profitability.

On a non-monopolistic and well-functioning market, there is at least a minimal amount of competition. This means that there exists more than one producer in each field of interest, otherwize a monopolistic situation would exist.

On an electronic market service providers form a more dynamic community than on manual markets. Changes may occur more frequently, since many of the activities on the electronic markets are more easily adaptable to change. Adaption to changed market environments can be made faster than on non-electronic markets. Fusions can be organized rapidly, cooperation deals can be carried through without delay. An important consequence is that establishing new organizations becomes more uncomplicated. Low administrative barriers exist for establishment of new knowledge based firms in these systems.

The automatization of a number of such market activities means that the market competition more concerns degree and form of automatization than manual skill. The competing advantages on an increasingly automated market are dependant on skill to build and support dynamic interactive systems. Access to knowledge about such possibilities become important.

It is possible that because of its dynamics, margins are smaller on electronic markets than on others. On the other hand, easy access may make commercial adaption faster in automated systems. Therefore, chances for profit may well be promising.

The development from industrial to increasingly information-oriented markets stress the strategic importance of information flows in business. An increasing amount of commercial activities concern exchange of information about goods and services. The mere handling of the goods contain a smaller part. Information services can be added and changed more easily than goods services. They are more dynamic.

Since new services mean new business opportunities, it is evident that access to better information channels becomes more and more cruical to business. Also, division of information access has become fundamental to division of labour.

Access to information services means getting value addition. A market where a number of firms and organizations are occupied with business concerning different types of value addition, may be called a value added market. Such a market is truly dependant on the quality of its infrastructure, the telecommunication networks. A badly functioning network structure means low efficiency for the business with the value added services that are being offered on this market. The network organization is important for value addition.

A market that contains a number of especially easily available and fresh services can be seen as having higher added value that a market with slow and old services. A market that is reliant on a telecom network that is slow and difficult to access shows indications for low value addition. Moving a service from a highspeed network to a lowspeed network means decreasing its value. Adding a feature like smart-card-access to a service surely increases its value.

Also the legal restrictions for a market concern its value. A strongly regulated market may hinder certain new applications. An example: In the New York area, the telephone yellow pages services in 1990 were availible on a strongly regulated and slow market. As a concequence, New York yellow pages were transferred to the french Télétel network, and were there offered as a service across the Atlantic to American customers. This was said to be done with some commercial success, in spite of the geographical distance between customer and service provider. What matters was the customer access tariffs and the ease of access to fresh data. Having access to knowledge about such legal characteristics of different markets surely can be of competive importance. On electronic markets the speed of change and service adaption is potentially high. Staying informed becomes even more important and time-critical for successful service providers.

Dynamic advertising

One function that can take into use the high degree of dynamics that videotex networks contain, concerns advertising. Advertisments in videotex systems occur in many forms. Quite often, they appear as parts of menue pages in the beginning of an interactive session. Other times, advertisments occupy a whole page, or numbers of separate pages.

One facility has up til now been used only to a limited extent. This is the use of the interactive possibilities in videotex for advertising. Consider the following example (which actually appeared in an American database in the mid 1980´s):

> "The red Chevrolet that you see sketched on the following page, is three years old, has been driven 20 000 miles, and is is excellent shape. Its price is $ 6 000 to-day at noon, and this price decreases with one dollar every minute, until somebody buys it. Please respond on the related response page, and please - act fast!"

The person behind this advertisment pointed at an interesting marketing facility in interactive videotex. These possibilities are noteworthy. They show the chances to let customers interact with service providers, and to really influence business opportunities. The electronic market becomes vivid.

An ordinary auction (public sale) naturally is a good possibility here. Customers can leave bids on-line, and the best bid in a certain time period wins.

However, there are much wider forms possible. The advertisment above uses a price function that decreases linearly over time. Naturally, other price functions may be used. These can have any form, they can be non-linearly dependant on time, and they can be dependant on other outside parameters, like competitor behaviour on the market, customer behaviour etc. This means that the selection of price policies on these markets is an especially interesting and qualified activity.

It is important to remember that the practical implementation of even complicated such price policies is extremely simple with videotex and videotex-like systems. It is mainly a question of creating a price algorithm in the external computer system that is connected to the telecom network.

Special price offers could easily be directed towards certain customer groups, like for instance "special price offers to teenaged youngsters in southern Stockholm area between 8 and 10 pm on Sundays" etc.

If customers agree, checks could be made with login identification data, to check that each customer really is entitled to receive a special offer. The connection to personal integrity problems is apparent. This is an area that needs special care in electronic markets.

It should also be noted that although price policies could easily be chosen that are favourable to certain groups of customers, it is quite as easy to select and implement pricing policies that in short time maximize the profit for certain service providers. Price cooperation between producers in a certain market branch might also be made very efficient. Producer cartels could be formed that efficiently guard the price development of certain markets. But consumers could also get together, and perhaps lay bids groupwise. The contact between demand and supply on such electronic markets is extremely sensitive.

This means that having control over price setting and price cooperation possibilities in these kinds of systems is an extremely delicate matter. It gives specific competitive advantages.

Characteristics for information flows

There are certain characteristics that are connected to information flows, an contrary to other types of flows in networks. Some of these that are consistent with the views we have discussed above, are the following:

- Information may be used as a commodity only in well defined environments.

- The cost of producing original knowledge is independent of the form of its use. A large number of users can often use the same knowledge without increased cost.

- Costs for understanding and assimilating information is often underestimated.

- Market possibilities for information services are often observed already within existing firms, before they are given the chance to be marketed externally. Expansion starts from inside.

- Slack and unbalance in information access goes together with business opportunities. Existance of information noise and assymmetries is essential for business. A market where access to information is equal and balanced for all parties, has low chances for profit.

- Information flows resemble capital flows, but selling information means selling copies of an original rather than selling the original itself.

In the field of information economics, there is a need for theory that take statements like these into account.

Groupware and organizational change

The concept of groupware usually concerns methods to organize human cooperation with in some sense increased efficiency. The methods then are applied to human beings. However, these thoughts can be applied also for organizations, or parts of organizations. An example: Reroutage can be seen as making availble a public space,

in order to make it possible for service providers, or firms, to meet and form new partnerships. This means that we are dealing with a sort of "bulletin board for organizations". Bulletin boards are just one form of groupware. Many other forms exist that can be used to increase the dynamic possibilities for firms on an electronic market.

In such forms, dynamic forming of new partnerships can be made availabale also between service providers and users, using groupware. This means that new market combinations can be constructed dynamically. The border between producer and consumer will be blurred on such dynamic markets. This was discussed in ref "Gruppsystemering", (Ohlin, Jan 1977).

In his pioneering work on groupware ("Groupware - Computer support for business teams", 1987) Bob Johansen uses a partitioning of the concept according to the following:

- Face-to-face meeting facilitation services
- Group decision support systems
- Computer-based extensions of telephony for use by work groups
- Presentation support software
- Project management software
- Calendar management for groups
- Group-authoring software
- Computer-supported face-to-face meetings
- PC screen-sharing software
- Computer-conferencing systems
- Text-filtering software
- Computer-supported audio or video teleconferences
- Conversational structuring
- Group memory management
- Computer-supported spontaneous interaction
- Comprehensive work team support
- Non-human participants in team meetings

For several of these, the groups concerned comprise numbers of human beings of limited sizes. There sometimes are technological size limits. Examples are computer conferencing systems, PC screen-sharing software, calendar management systems etc. In such cases things start to become difficult when the number of participants increases.

However, a participating person can represent either herself, or a group, or a larger organization, or a firm. Increasing communication efficiency for two persons then might increase combining the interests of the two organizations that these persons represent.

Apparent examples concern communication within groups with common interests, for instance labour unions. Here, combining the desires of different part-groups surely can increase the efficiency for the whole union. Often problems of communication within such organizations concern information barriers that perhaps need not exist if

information flows were more easily accessible. Computer supported group communication may well show efficient means to support contact between member groups and their representatives, thus increasing group efficiency.

Increased possibilities concern the forming of dynamic combinations for firms that compete on a market. Match making agents may appear, who specialize in fast observing of business oppportunities on electronic markets. Such agents may suggest forming of fast combinations between firms, or parts of firms, that used to compete, on the grounds of dynamically changed business environments. Here are new forms of specialization on electronic markets.

An easily defined playground for such market activities are open bulletin boards. Firms that use such boards for informing about their activities, coming market programs etc, may be advised by independant "match makers" to get together on certain projects just because of new environmental prerequisites. Naturally, a firm may have its own specialists for such observing of new possibilities. But there is reason to believe that the speed of environmental change on electronic markets may be high, higher than many in-firm observers may have time or knowledge to follow.

There are naturally also other forms of groupware that may be applied. Forms that are more intelligent than "linear" bulletin boards. The dynamic forming of consortia between more than two participating firms may suggest "two-dimensional" groupings, combinations where one participating firm is present in several changes of different timing at one time.

Blurred market roles offer new possibilities

On an electronic market the borders between producer and consumer possibly can become dynamically blurred, and new administrative demands occur. Systems for organization of producer actitivities have to be available in new and dynamic manners. Administrative functions need to be applied for new combinations of producer-consumers. A need for speciallly designed match-making software appears. There are market possibilities for groupware specialists.

An example: One consumer, let us call her A, starts to observe her market environment and collect data about the consumtion behaviour of her consumer mates on this market. This turnes out to be a valuable activity for those producers who market the products that A and her friends consume. A match-maker observes what is happening, and starts to spread the word. A becomes hot stuff, and starts to sell her data, in adequate collaboration with the match-maker. She packages her data in different forms for different customer groups. The consumer has become a producer.

The point in this seemingly quite normal activity is that on electronic markets this can be done fast, so much faster than before. The diffusion of a consumer into becoming a producer can be very quick, and the way back may be quite as quick. No one needs to stay on the play-ground any longer than she really wants. Organizational slackness may be reduced to a minimum.

On computer-conferencing networks it becomes easy to observe and organize groups with common interests. Other types of groupware show resembling possibilities. Establishing such activities as business opportunities can be done without large effort. The threshhold for starting to make business is extremely low, and it may well be just as easy to get out.

On an electronic market the use of groupware for Just-In-Time activities really gets meaningful. Groupware systems of different types are essential on electronic markets.

User modeling

A type of value addition that refers to specific systems behaviour concerns systems adaption. It is rare that large groups of users use a system in the same way. Often different users have their own ways to interact with the system. As an example, compare with the way we read a morning newspaper. Different readers show different reading patterns, starting with a glimpse on certain parts of page 1, skipping different materials, going back etc.

Another example is examplified by some automobile models, like for instance the Toyota Lexus. Here, each user (in this case the driver) can predefine a "type of usage" that makes her feel comfortable. This can concern the exact placing of the chair, the rear mirror, the steering wheel, adjusting the heat, tuning the radio etc. The data about this are stored in a car memory, and each time the specific user appoaches the car and activates her starting key, her number of predefined adjustments are activated. The car is adapted to her personal desires.

The same can be applied for interactive database systems. The user A wants to use the system differently than the user B. But there may be a number of A:s. They form a group with common behaviour pattern, a type of behaviour whose characteristics can be predefined after initial data collection and programming. Profiles can be defined.

Such user profiles can be built on the basis of known behaviour patterns, and/or be updated when the user so wants. A change in the user´s behaviour can automatically or manually lead to changed profile for the user. If the new behaviour pattern is known to the system, the user is transferred to another user group. In other cases, new user pattern profiles can be constructed.

From observations concerning the behaviour of several user groups, predictions can be calculated about supposed needs for new situations and new dialogues. Deductions can be made based on known and/or supposed user knowledge changes. This can be valuable when entering into new markets. Apparently here is a field of concern for future research.

Following the discussions in this text, there are needs for expansion of the reasoning about information flows that we here have touched on. The need for further research concerns several aspects of this reasoning. Of special concern we can note:

- Analysis of the nature of value added information flows in networks, including study of its functional behavior, and its implementation forms.

- Analysis of different aspects of the concept critical mass in networks with information services.

- Analysis of the conditions for organizational change in electronic markets, when market activities are characterized by higher dynamics than for other markets.

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