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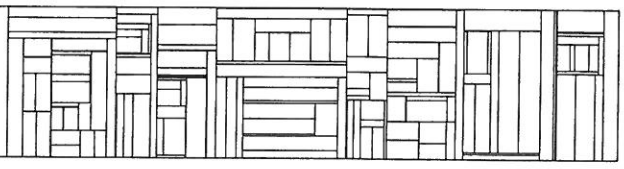

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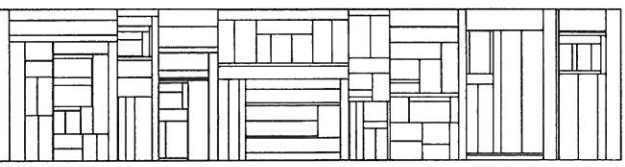

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Abstract

Computer supported cooperative work (CSCW) currently arouses plenty of interest. There is, anyhow, an evident tendency to regard CSCW-technologies (e.g. electronic mail, hyperdocument applications, calendar systems, and the like) as belonging to the office territory. This paper aims at illustrating some possibilities of utilizing CSCW-applications in an industrial setting (inventory management system). In other words, it is claimed that CSCW-technologies are relevant throughout the organizational sphere. Some light is also shed on the eventual consequences of the use of these technologies. I also discuss how to avoid the creation of unnecessary applicational complexity in the case of employing CSCW-technologies.

1. Introduction: conceptual background

An important function in an organization is collaboration. Expressed the other way around, it is hard to imagine an organization functioning without collaboration with other organizations, between its own departments, within working groups, between individuals, etc. This claim is based on a certain assumption: in order to reach the the goals -- whether those of the organization as a whole or those of smaller units -- collaboration has "survived" even though conflicts would have occurred. Hence I do not stand behind the naive assumption of having *harmony* as the driving force when mankind's everyday life is in question. What I think is obvious is that in *existing* (at least up to the present time) organizations a certain degree of collaboration has in one way or another been retained. This has probably happened by means of compromising, and thus the atmosphere of collaboration is not necessarily purely pleasant and joyful. Nevertheless, the organization's existence is ongoingly based on collaboration which probably will meet new and new challenges. So, I do not draw on a *conflict* perspective either. In other words, I have made an attempt to neutralize this study as far as the most "inflammable" power struggle discussions are in question. (A discussion about the choice between the harmony and conflict perspectives is presented in [25]. Conflict as an important organizational catalyst is assessed in [24].)

As difficult as it is to comprehend an organization without both inter- and intra-organizational collaboration, it is equally problematic to understand the very nature of collaboration itself without more detailed reflection. One possible perspective to collaboration is to interpret it as coordination of organizational tasks. There are, of course, several levels of such tasks, some of which cannot be regarded as human performances. This is the case in many industrial settings where *automation* has replaced the observable human acts of task coordination and thus collaboration. These cases, as relevant as they are, are not discussed in this paper. On the contrary, I focus on cases where task coordination can be understood for instance as an act of

- transferring the *responsibility or control of performance* from one organizational unit (i.e. person, working group, department, etc.) to another,
- giving or receiving an impulse (*triggering* action), or
- *joining* commensurable, material and/or information *objects* together.

Task coordination in turn fails without some kind of communication. Concrete messages like 'wait!', 'cancel!', 'skip!', 'do!', 'try!', 'attention!', and 'help!', articulated between two individuals in above mentioned types of coordination situations, illustrate coordination as such on one hand and the communicative character of coordination on the other hand. Focusing on communication is necessary since all communication is naturally not coordinative, and in many situations it does not make sense to include all possible communication. On the

contrary, it would be difficult to study the dimensions of collaboration by merely analyzing the coordination level. This is mainly due to the many-facetedness of collaboration: it as well *requires* as is a *consequence* of practicing communication and task coordination. Hence, collaboration can be studied in the framework of organizational communication.

Generally, communication takes place under different conditions, for instance:

- the topography of the communicating community may vary considerably,
- communication is mediated by several types of media, and
- the time dimension in a communication situation is not fixed.

In an organization, collaboration takes numerous forms, and the modes of communication that make the required coordination possible are equally many. For example Damodaran reports an (office) survey where the following communication purposes were identified [7]: giving information/advice, getting information/advice, decision making/problem solving, negotiating/bargaining, arranging a meeting/contact, and responding to a prompt. Communication for these purposes can easily be observed in most organizations, at all organizational levels, and within and between different functional areas of organizations. For instance (strategic) decision making is typically considered a management function. However, the operational tasks in a manufacturing organization may be complex and include (situational) decision making. Moreover, bargaining between organizations take place in a market situation. Within an organization bargaining concerning, e.g., the division of resources is often regular. So, communication facilitates various work situations. On the other hand, similar work situations may occasionally require different types of communication. An example of this is a situation where the management of the material flow is based on (more or less) articulated agreements and established practises. This is adequate for coordination under normal conditions. However, in an exceptional or erroneous situation, negotiating and bargaining concerning rearrangements or recovery procedures become actual. Consequently, most definite borderlines drawn between types of communities and types of communication, coordination, and thus collaboration, are in my opinion somewhat artificial, although frequently attempted in literature.

In order to illustrate the amalgam nature of organizational collaboration I have specified some classes of communities in and between which communication, coordination, and collaboration *occur and can be interpreted* in different ways. As the classification criteria I have used the topography of the community and some communicational, coordination-related, and cooperative aspects of work:

- Between two individuals: communication based on *agreements* about sharing information -- sharing an *interest* or a goal.
- Between several individuals in a group: coordinating the work process of an *autonomous working group* with a common goal or shared interest.
- Between two groups or departments by two individuals: transferring the

responsibility *from a functional unit to the next one* -- a shared product of some kind is involved.

- Within a group or department between two individuals: *impulse switching* within a phase oriented task chain where human specialization can be observed.
- Within a group or department between several individuals: coordinating the phases of a work process where the performance of *a particular phase is multiplied.*
- Between an individual and a group or department: communication based on agreements about *sharing operational information.*
- Between an individual and an individual in a group or department: communication between the managerial level and the supervisory level (vertical control) or between *specialists* and non-specialists.
- Between two groups or departments in a functional sense: collaboration of organizational *units.*
- Within a group or department in a functional sense: collaboration between co-workers where the focus is on *product*, but not on individual performance.

In the classification I have drawn on the industry case which will be presented in Section 3. 'The functional sense' expresses the possibility of a situation in which it is unpractical to focus on communication between individuals, since the community operates as a solid functional unit, and individuals interchange very elementary messages. In other words, the individual is part of a group, which has common goals, the fulfilment of which is not possible for single individuals, and where a particular individual does not make a difference. In general, more and more forms could naturally be pointed out or developed. For example such parameters as local vs. global organizations, formal vs. informal organizations, and person-to-person vs. computer-mediated communication would naturally add color to the classification.

This classification serves two purposes. Firstly, it was illustrated that communication, coordination, and collaboration levels and patterns in an organization are many. Research in the area should thus be adequately open-minded, too. This point of view has relevance especially in connection to CSCW-technologies. Secondly, the further studies are explicitly based on the above mentioned understanding of organizational communication, coordination and collaboration. The classification is used as an instrument for analysis concerning the application of CSCW-technologies in work organizations.

In the following section I take a closer look at different CSCW-technologies and especially at their current uses. Later, in Section 3, I will sketch some possible uses of these technologies in a manufacturing organization.

2. Technologies for computer supported cooperative work

The technologies that usually are regarded as supporting cooperative work actually form a certain category of computer applications. These are applications which are designed for several users but not necessarily for an unlimited amount of them. The applicational area is not a conventional one either. Sørgaard [26] has given a characterization of computer supported cooperative work and has defined the following factors as relevant: people work together due to the nature of the task, they share goals and do not compete, the work is done in an informal and flat organization, and the work is relatively autonomous. A similar se of criteria is presented in [12]. Such criteria cannot be used as an exclusive definition of CSCW. However, they provide us with a good *intuitive* picture of what type of organization of work is being focused on. The set of relevant applications may probably best be characterized by mentioning examples of the types of applications that usually are considered in the CSCW-context. These are, e.g., electronic mail, bulletin boards, computer conferencing, calendar systems, hypertext, notecard systems, etc. (An overview of existing types of CSCW-applications is presented, e.g., in [1].) The following types of CSCW-technologies will be discussed in this paper (using the terminology in a broad sense):

- electronic mail[1] (see, e.g., [9, 19]),
- hyperdocuments[2] (see, e.g., [4, 11, 27]), and
- calendar systems[3] (see, e.g., [13]).

According to the classification of communication and collaboration which was presented in the previous section, the current uses of CSCW-technologies fall mainly into the two first categories (i.e. between two individuals, and between several individuals in a group). The main idea seems often to be supporting the work of a couple of co-authors of a book, facilitating the coordination process of an academical research project, or composing structured electronic mail systems. At its broadest, CSCW-research focuses on so-called office environments. It is

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[1]Electronic mail refers to network-based computer messaging systems by which users can address textual messages to each other.

[2]Conclin [4] has characterized *hypertext* as"...extending the traditional notion of "flat" text files by allowing more coplex organizations of the material. Mechanisms are being devised which allow direct machine-supported references from one textual chunk to another; new interfaces provide the user with the ability to interact directly with these chunks and to establish new relationships etween them. ... Windows on the screen are associated with objects in a database, and links are provided between these objects, both graphically (as labelled tokens) and in the database (as pointers)."

[3] Greif and Sarin [13] describe for instance MPCAL which is a "*multiperson* calendar system for meeting scheduling and resource management. ... There are several types of calendars representing the schedules of a person, of a common resource (such as a conference room), or of open events such as seminars."

also apparent that the development *and use* of most CSCW-applications has taken place in an academic laboratory. This is often the case with software development, but usually the products find their way out of the lab, too. As far as I understand, this is not happening with the CSCW-technologies. All in all, electronic mail, hyperdocuments, and calendar systems are applications whose contemporary sphere of relevance seems relatively narrow in at least two senses: either the community of active users is small (as well according to the amount of the users as the professions that are represented), or the task domain is "well defined", or thoroughly both (*Fig. 1*).

	Electronic mail	Hyperdocuments	Calendar systems
Strictly defined task domain	X (intention with certain messages)	X	X
Loosely defined task domain	X (all messages sent and received)		
Small group of co-operating users	X (shared task context)	X	X
Large group of co-operating users	X (all connected users)		

Fig. 1. A characterization of the three classes of CSCW-applications with regard to (a) the task domain which is usually supported and (b) the scope of the cooperating groups. Hyperdocuments and calendar systems are nowadays used almost only by small groups (like research projects and co-authors) for a strictly defined domain of tasks (like coordinating meetings and authoring a text correspondingly). Electronic mail gives more alternatives which at the first glance seem natural. However, in order to perceive the criteria (CSCW) in a meaningful way the focus needs to be sharpened. The group of cooperating users is probably not the group of all users who are connected to the network. The *actual group* communicates with something particular in mind (and in common). The size of a sensible task domain is also defined by this 'particular topic'. Thus also electronic mail has similar features as other CSCW-applications.

It is claimed in this paper that there are two phenomena which, as consequences of the above mentioned, need to be taken into account. Firstly, the types of work and organizations which could benefit from the CSCW-technologies are more numerous than what the current research focuses on. Secondly, the users of the CSCW-applications create/become part of unforeseen phenomena in term of the scope of organizational communication. Thus, strategies for avoiding too complex information infrastructures need to be developed.

3. Computer support for cooperation in an inventory

To illustrate my point of view with the application area of the CSCW-technologies I move directly to the other end of the scale of communicational patterns (i.e. communication between two groups or departments in a functional sense, and within a group or department in a functional sense). The CSCW-technologies could namely have a fertile soil to grow in environments, where the emphasis is on several groups and often also on material processes. I suppose it is not seldom that people working in industry could make use of other kinds of "support" for coordination than strict rules, management supervision, and most conventional edp-applications on the one hand, and for instance complementary arrangements in form of informal organization on the other hand. Also different communication media than schemas in six copies might prove worth investments. Several types of computer supported information systems for material process management could certainly be redesigned and realized in an alternative way by using for instance a hyperdocument application. The more autonomy that is given to the shop floor, the more useful a calendar system might be for supporting collective work activities. Electronic mail is an obvious media for communication at any organizational level. These examples are only suggestive and they will be concretized in connection to a case example (below). In Section 5 I will discuss some possible consequences of the application of CSCW-technologies.

In order to transfer the "speculations" with respect to the possibilities of CSCW-applications into a real environment, I use a case organization in food industry. The case is the inventory department of the firm. In short, what happens is: Food products are *manufactured and packed*. Some products need to stand in quarantine and wait for an 'ok' from the laboratory. Large amounts of products are long-term stored in the *bulk inventory*, while the short-term storing for small amounts and the *distribution* of goods take place in the *buffer inventory*. The workers of these organizational units cooperate tightly in order to manage the fluctuating material flow. Production statistics, quarantine management, product positioning in the bulk inventory, the fifo-order of stored goods, storage book-keeping, and waybilling are all edp-supported functions. The workers have continuous access to terminals and printers. The support that the system provides is, however, aimed at facilitating bureaucratic information processing. It is also rather static, and many exceptional, erroneous, and new situations require intervention in terms of manual procedures and temporary strategies. (More detailed descriptions of the case organization are given e.g. in [8, 14, 20].) Here the type of organization is obviously positioned at the opposite end of the scale than usually is the case with CSCW-technologies and their use environments (cf. Section 2). The dimensions of everyday work situations indicate also that planning, decision making, and knowledge work tasks are as clearly present as

the normal operational duties. So, both the local group organization and the variation of tasks call for special support. These observations are well in line with for example Kusterer's writing about the complexity of the above mentioned kind of work [17].

I claim that the same CSCW-applications that have been discussed earlier fit perfectly into this kind of organization. Here the emphasis of use would be on the *horizontal* organizational relations, and the uses in the inventory department could for example be following (*Fig.2*):

Electronic mail could be used in the management of the frequently occurring exceptional, erroneous and new situations. Particularly the management of big amounts of export products requires special treatment in terms of temporary space arrangements and coordination of transport between the departments. Many of these situations suffered from inadequate support to *informal* organization -- especially with respect to the frequent communication between the packing unit and the bulk inventory. As the information processing which is connected to the management of the material flow *export shipments* takes place at the terminals (both in the packing unit and the inventory department), using electronic mail would be a commensurable way of communication. Commensurability refers to the medium: because the bureaucratic information processing is edp-supported, communication concerning corresponding information (processing) should not require the change of medium. An example of this is the short-term management of export shipments: The goods packed for an export shipment are labelled in an unusual way, i.e. they neither get a position in the bulk inventory nor a pallet label indicating the physical shelf address in the bulk inventory. Instead, they are *registered* as non-stored pallets, marked with a 'pass'-tag and (often) placed outside the physical inventory. This kind of an exceptional arrangement requires coordinative communication between the departments and working groups. Informing the colleagues about the status and position of the export pallets could happen by using the same media as when registering the production. The information which is to be distributed is easily available (in correct form), it will certainly be received by somebody concerned, and it can be filed for future use. Neither phone calls nor notes possess all these qualities.

In these departments there are several operational (groups of) tasks which are influenced by the fluctuating nature of the material flow. Export shipments were mentioned above as one example. Seasonal variations cause considerable unpredictable fluctuation, too. Under these circumstances, the impact on the work process can best be regulated by the stakeholders themselves. A *calendar system* could be helpful when (re)arranging the physical conditions of the workplace or adjusting some "collective parameters" of the information system (which has a central role in connection with the material flow). I refer especially to the pallet positioning algorithm in the bulk inventory. The algorithm influences the

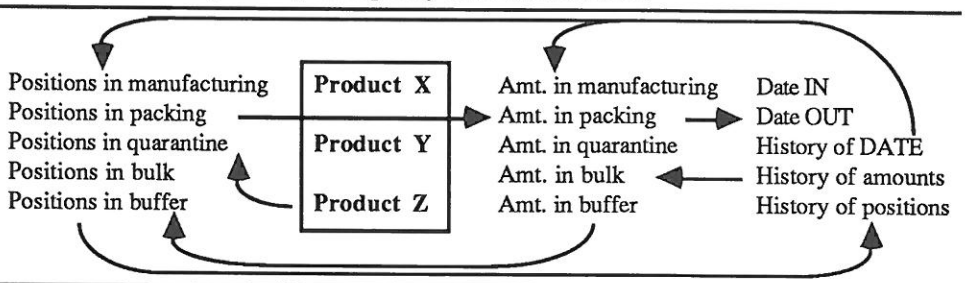
	Types of functions or tasks that could be supported by CSCW-technologies in a manufacturing organization's inventory department in food industry
Electronic mail	PACKING UNIT TO THE INVENTORY DEPARTMENT: "These products are repacked, not new. Please, take this into account when placing the soon arriving pallets in the inventory. They must naturally out first!" INVENTORY DEPARTMENT TO THE MANUFACTURING DEPARTMENT: "We have occupied a reserve space downstairs for a special shipment. It only takes a couple of days. Please, do not remove the pallets!"
Calendar system	MEETING ANNOUNCEMENT. Main topic fixed. Time open. Meeting groups open. TOPIC: Better functioning and more flexible material flow management between the manufacturing department, packing unit, and quarantine, bulk and buffer inventories. (Modifications to the edp-system? New division of labor and responsibility? Self steering groups? Night shifts? Reorganization of space usage?...) PARTICIPANTS: All workers of the above mentioned departments and units. In groups? TIME: Before holiday season, and hopefully between 7.3.-25.3.88.
Hyper-document	

Fig. 2. Examples of the possible uses of some CSCW-applications in an inventory management system. Electronic mail could be used to coordinate the fluctuating material flow in the interface area between two departments. Calendar system could be used to arrange working group meetings for organizing the work processes. Hyperdocument systems could be used to implement an inventory system itself. It is often the case that moving dynamically between different types and different levels of detail of data is a desired feature.

(the rate of change of position) of the products, and thus acts as a coordination factor between the packing unit and the bulk inventory. So, two organizational units have to cooperate at the same time as the fluctuating material flow and for example the nightshifts make it difficult to perform arrangements autonomously even if self-steering would otherwise be an established praxis. Supporting meeting arrangements by the use of a calendar system might facilitate *organizing* the work.

A *hyperdocument* type of application would obviously prove ideal in the management of the inventory itself. Several kinds of "views vs. levels of detail" are constantly needed, and realizing these by means of rapid pointers (like buttons) back and forth makes more sense than the use of conventional database applications with traditional user interfaces. Contemporary hyperdocument (or hypertext) applications are, as the name indicates, aimed at document processing. However, utilizing the idea in a broader sense is possible. The applicational

domain needs not be *text* -- it may as well be an *abstraction* of, e.g., an inventory.

The actual working practices in the case organization indicated that the above mentioned types of applications would support work in a meaningful way. Electronic mail was "simulated" in the real inventory management system by providing the users with free-format text fields in connection with certain file "records". These fields could for instance contain messages about unusual procedures that had taken place when treating product pallets. In the packing unit, manual records of e.g. packed products and corresponding amounts and dates were kept. These note books and cards were to ensure the possibility of comparisons and summaries when straightening out occasional messes. A "hyperdocument kind" of (manual) system was clearly observable.

4. Risking complexity

In the future we can expect to be confronted with situations in which a user trying to cope with her/his "normal" information tasks gets confused by the complexity of local and global task coordination. These tasks do often have edp-support (or at least they are performed in connection with the use of edp). In the future the tasks probably include the use of the CSCW-family's applications, too, and the issue becomes critical when the sophisticated versions of these applications enter the market. A broader use of the CSCW-technologies as such on the one hand and the numerous use options of the applications on the other hand define actually an enormous information infrastructure. The use of electronic mail systems alone may create unclear situations, and it is thus used here as an example to illustrate this assertion.

For example, a common electronic mail function is the 'carbon copier' (cf. ~c in Unix-mail, [19]). It is easy to send identical mail to several persons at the same time. Sometimes there is no way of knowing who else in addition to "me" who has received a copy of the message: some mail systems even include special 'blind copy' functions (cf. ~b in Unix-mail, [19]), which can be used for hiding other receiver(s) of a copy and the receivers of a copy may decide to forward the mail to still other colleagues. Sending mail to a group is also possible. When electronic mail groups are being established everybody concerned usually knows about her/his being a member of a group. The complexity increases when a person becomes a member of several (possibly partly overlapping) groups, or when new members are added to groups without explicitly informing the "original" group. Sometimes one is allowed to know the composition of a group, but this is not always the case. If copy functions and groups are combined, and restrictions are employed, quite hairy networks of communication can be composed. In other words, electronic mail networks are *explicitly allowing* cooperation, but *implicitly*

used to *define* groups of users communicating with each other. In addition, although Eveland and Bikson [9] report that electronic mail is mostly utilized by those persons who *already know* each other and thus communicate frequently, Feldman [10] suggests that also *new connections* -- so-called weak ties -- are established.

Another interesting example of the dimensions of electronic mail is the eventual use of stored information. At a point of time a user stores or updates information located in a database. This information may then, after residing in the database *for some time*, be used by a totally different group of users working for quite other functional purposes of the organization, for example for reporting. The messages that people send may contain for instance reports, which have been incorporated by the mail system's 'insert file' function (cf. ~r in Unix-mail, [19]). The complexity of the situation is not observable at the sending end only. The *received* information may, firstly, have an important *immediate* function in the task flow of the receiving user. Secondly, she/he may *store* it for further use, whatever this might be. These persons, maybe *distant in time and space*, certainly take part in communication. The database has now the role of a communication channel, although the computer mediated communication is more *indirect* since the mediator sort of disappears.

Hence a network of organizational connections is established *by* the use of the information system, and the network covers *both horizontal and vertical relations.* But whether we focus on "traditional" information systems in general, or special applications for computer-mediated communication in particular, it is rather cumbersome to distinguish the communication, coordination, and cooperation *partners* from the mass and from each other. I.e., *who* is at the other end and *how*? The following scenario of an inventory system, where both the electronic mail system and the database have a mediating role, is realistic: 1. A manager gets a report concerning problems in raw material purchases and product velocities. 2. She/he decides to choose an alternative strategy. 3. She/he (among other things updates) some fields in the corporate database. 4. Then she/he uses the electronic mail network for broadcasting information about the changes that have taken place. 5. The inventory department's users change the parameters of their inventory application accordingly, and inform the packing department's workers about these changes. 6. It may be necessary to perform a stock taking before the system is run according to the new parameters. The new material flow events in the inventory are recorded in the database, and can, when time comes, influence some decisions again. 7. The inventory's usage of physical space is from now different than earlier.

It is often the case that only *direct* communication is regarded as "existing". The computer is not considered a means to communicate, but rather a machine being talked to. In the case of a database the computer system's role as a mediator of

organizational communication is partly invisible since (a) the user interface does not usually indicate that there are other users at the other end of the chain of events, and (b) the users probably take it for granted that they are exchanging information with the database which apparently contains attributes of entities instead of objects with a context and meaning. This is an important topic in connection to the use of CSCW-applications which usually are regarded as facilities for supporting direct communication.

As can be concluded from the discussion concerning user communities and computer-mediated communication, it is difficult to distinguish between different types, purposes, or instances of communication, coordination, and collaboration. In such complex situations it is in everybody's interest to support system perceivability. In the next section I discuss some relevant possibilities for comprehensive user support.

5. Ways of maintaining perceivability

As new kinds of communication and hence cooperation networks constantly enter the organizational scene supporting the user so that the context, dimensions and possibilities of the use situation are perceivable to her/him, is of great importance. There are lots of systems and applications where the problem of throwing people into confusion is not so obvious, although the applicational domain may be very large. For instance document processing, project scheduling, and electronic mail systems spread their roots in the whole organization, but do probably not cause immediate system imperceivability. In the future we can, however, expect to be confronted with situations in which a user trying to cope with her/his "normal" information tasks gets confused by the complexity of local and global task coordination. Computer supported cooperative work was separately discussed earlier. It was pointed out that for example the use of electronic mail may create complex communication topographies. In order to maintain the perceivability of an information system, especially when its complexity may be expected to increase, special attention to user support has to be paid. (Sophisticated support systems as secondary systems are of course not an excuse for not aiming at as good primary systems as possible!)

It is claimed that perceiving the highly social character of organizational information processing is poorly supported by traditional help systems. In a complex use situation an *adequate* support system contains a notion of *context*. In the following I refer to some views of contextual user support which might be utilized when realizing a comprehensive support system (whatever the mode of physical implementation might be).

Lutze [18] presents an approach to a contextual help system in a task context.

He distinguishes between the following help services: situational services (explaining the current situation of the task), actional services (supporting, e.g., the understanding of presuppositions, effects and consequences), comparative services (e.g., contrasting actual achievements and original intentions), categorical services (performance classification), locative services (emphasizing the summarization and abstraction of the most relevant parameters of a task situation), and illocutive services (extracting, elaborating and completing the user's goals with respect to his original intentions. The 'context' must here be interpreted as referring to information processes.

Coutaz presents a concept of context, too [5]. Now the environment is object oriented dialogue design where the design is based on the three-fold structure of abstraction, presentation and control. The control part of the structure keeps track of the linkages between the abstract (or formal) descriptions of objects on one hand and the the object as they are presented to the users. The context part maintains contextual information which is composed of the following categories: history, help, explanation, customization, and multi-threaded dialogue. A concept of context is thus introduced in accordance to information objects. The context does not, anyhow, yield the conception of work tasks.

Reichman provides also some valuable notions about context support [22]. She asserts that context support entails two things: knowing when things should be interpreted together and knowing when things should be interpreted separately. In addition, it is necessary to provide visual reflection of interconnection. Although these ideas are presented in a window management context, they can be generalized.

All these approaches contain relatively powerful ideas of context. Nevertheless, organizational aspects like collaboration relations of information processing appear not to be fully reflected. I suggest similar functions as Lutze, Coutaz, and Reichman, although in an environment where the context is to cover *both work and information processes*. The underlying idea is to promote support function designs which are separately operational within the domains of these processes and which also support exploring the interface between them. In connection with the notion of (work) context, such a compound is necessary: information processes are an inherent part of work processes. The information process perspective is well represented in the approaches of Lutze, Coutaz, and Reichman. In the following I thus point at the work process aspect and the interface of the two processes.

As was asserted earlier, communication may be regarded as the "glue" in an organization. Communication may also be interpreted as a set of *information relations*. *People relations* (task coordination and organizational cooperation) may thus be reconstructed by using the information relations. This idea is based on the assumptions made about the conceptual construct of organizational collaboration

(see Section 1). Simplified to some degree, for instance the following kind of construct should be possible to visualize: [organizational unit]$_i$ - [person in job]$_i$ - [job task]$_i$ - [task-connected information]$_i$ - [task-connected information]$_j$ - [job task]$_j$ - [person in job]$_j$ - [organizational unit]$_j$. The results of inquiries might then be presented in terms of information, task, and people relations. In an inventory this could take the form of the following chain: [In the packing unit] - [a worker] - [registers the packed production] - [and produces an identification label for the pallet] - [The identification information is necessary] - [for giving the pallet a shelf position address] - [when storing the products] - [by an inventory worker] - [in the bulk inventory]. This is *one possible* chain. In addition to this, there are several other feasible chains. It would also be possible, using the same consstruct as above, to illustrate for instance the (coarse) task flow of a job, a detailed description of an information object and its relations to other obects, a composition of a working group in terms of jobs and their definitions, etc.

Using an above mentioned type of construct which may be reached by incorporating information process and work process oriented support perspectives would, for instance, make it possible for the users to study with whom they actually collaborate when they perform some, at the first glance simple, information processing tasks. The fact that e.g. questions 'where did this piece of information come from', or 'who will be influenced by this operation' become feasible to answer, has also concrete consequences. In a situation where the exactly correct course of action is not known, it is practical to be able to ask what happens (and to whom) if this-and-this is done. Firstly, as these questions can be posed to the support system, the spreading of risky transactions can be reduced, and thus alternative solutions developed. Secondly, exceptional operations with which people normally would hesitate may be allowed if the support system tells that no seriously harmful ones are to be carried out.

The value of a context sensitive support system may also be evaluated in the light of support that is given to different types of tasks. Croft and Lefkowitz provide an (office) task taxonomy [6] which is practicable here, too. According to their taxonomy a context sensitive support system would facilitate assistance with complex tasks, handling unusual actions, context switching, status inquiry and explanation, and handling multiuser tasks. The other types of functions -- automation of routine tasks, adaptability, and task invocation -- are not directly supported.

According to the "theoretical" starting point which was presented in Section 1 it is possible quite "fluently" to shift the focus from an individual to a group. In connection to contextual support, another assumption is made simultaneously: a context sensitive support system can give support to different kinds of organizations. Even though the global organization could be classified as being a hierarchical or a matrix organization, the formation of various local organizations

is more than probable. A group (see [2]) which functions autonomously with certain "inputs" and "outputs" can have a very antibureaucratic internal organization of work. Same goes for groups which are groups in the sense of electronic mail connections. A support system can aid getting an overall view, which of course is based on the known rules of information and work processes (i.e. "information bureaucracy"), but which from another point of view is apt to *make the global organization less bureaucratic in an interpretative sense as possibilities for understanding increase.*

6. Discussion

Support to horizontal activities is admittedly of controversial nature. Not much literature has to be studied, and it can be found out that (in addition to all intermediate forms of opinions) two opposite ways of thinking are prevalent. Robey [23] writes: "Most literature dealing with computers and organizations has been concerned with vertical authority and control issues. There has been relatively less concern about horizontal differentiation, or the lateral complexity of organizations. Since many administrative problems arise over the control and coordination of different subunits, the relationship of the computer to this aspect of structure is of considerable interest." Conrath [3], on the other hand, has the following approach: "While "better" communication, in the sense that it may be more "open", may be the consequence of the use of electronic mail, this may not be viewed as an improvement by the management. Managers may now have much greater difficulty maintaining the same degree of control that they exercised before." Olson and Lucas [21] have articulated the nucleus of the whole ongoing process in its "simplicity": "...employee attitudes, management processes, interpersonal relations, interdepartmental relations, and organizational structure will be altered by automated office systems through intervening changes in the locational and temporal definition of work, shifts in the mode and timing of communication, and changes in the work product itself."

My point of view is that sophisticated edp-applications, here especially CSCW-technologies, should be accessible to all members of an organization, and *if* the particular persons desire to apply the technologies, the prerequisites for and patterns of the use should be tailored to fit the local environment. The prerequisites are for instance educational aspects: the (future) users need to be able to reasonably evaluate the available applications and the possible ways of use. The patterns of the (future) use are also to be assessed for example with regard to the definition of the user groups and their exclusiveness. Desperate fears of loosing control, or stereotypical ideas of users who would not be able to utilize this kind of tools in the first place, are old-fashioned. On the contrary, effective and

efficient functioning of organizations, and more than anything else, making jobs more interesting and offering tools for complex tasks (which exist also at the lowest levels of most organizations!) should be self-evident directions of development.

There is naturally the other side of the coin, too. It is easy to exaggerate with the use of new technology. Technological enthusiasm does not become any more acceptable when CSCW-applications are introduced in the way I suggested above. Anyhow, I comprehend the above kinds of uses more democratizing than overpowering. This is due to the types of tasks that become supported. The amount, timing, and structure of information served to the users need to be considered, too. Hiltz and Turoff [15] have written warning words about information overflow exactly in the case of computer-mediated communication, but they point also out that good results and experiences are to be awaited if small task-oriented groups and communities of interests are supported. This is the case in the example I presented above. In an inventory environment -- and other industrial settings -- where people are (not even supposed to be) working primarily with information processing this issue is very important. The nature of the CSCW-applications is in my opinion such that the users can to a high degree retain control of the extent and purpose of the use without, e.g., too many rules concerning for instance the format or length of messages set from outside (see [15]). For example the users of electronic mail might choose not to participate in different news groups, but to use the application for explicit work-related purposes. The structured nature of the use situations is certainly less than with conventional applications, and support can be given to activities which may be classified as belonging to the area of informal organization (where the autonomous arrangements are kind of "default values"). This kind of tasks should get commensurable edp-support.

As a conclusion, there is a need for more research work in the area of CSCW. New kinds of user groups may enter the scene and the applications and the surrounding information systems have to be tailored to fit into the praxis. Also the large groups of users that exist and will be created need attention of special kind. The organizational context in which the use takes place has to be focused on. This assertion is in line with Howard's text about a special type of skill in connection with 'collective work' [16]. He emphasizes the importance of "the capacity on the part of members of a work organization to systematically reflect upon their own organizational practice and to engage in the on-going modification of work procedures and tasks." The contextual support that was in Section 5 proposed to be generally used represents supporting the formation and maintenance of such skills in a context of CSCW-applications which, in turn, require these skills in order to yield full advantage. The idea of support functions, which help users at many levels of the organization, and which reveal many levels of the

organizational universe of discourse to the user, originate also from this author's empirical observations of users at work [8]. I experience the use situation's quality as essential for the individual and the whole organization. In addition to comprehending one's own use environment, it is important for the users to perceive the organizational context of their work, e.g. the connections of their tasks to the tasks of other workers. This is not simply a question of understanding or not understanding, or computer supported cooperative work or not. It is a question of work motivation and thus the quality of edp-supported work in general.

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