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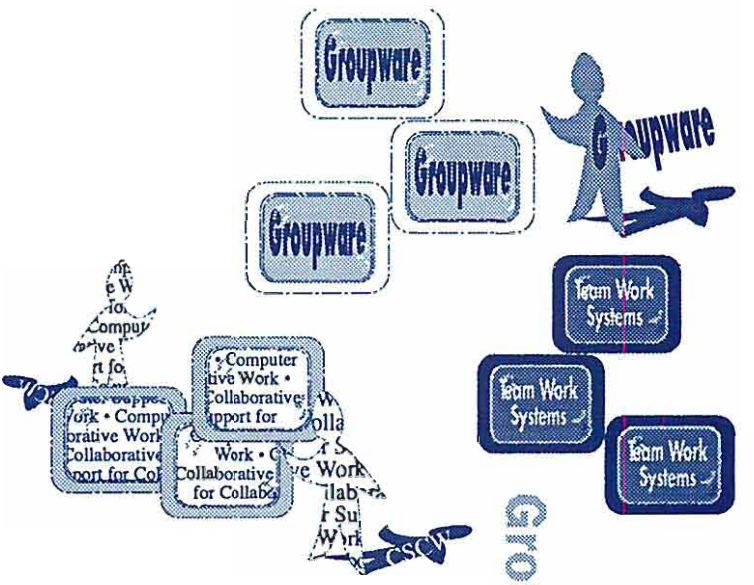

Group CSCW —A Promise Soon to be Realized?

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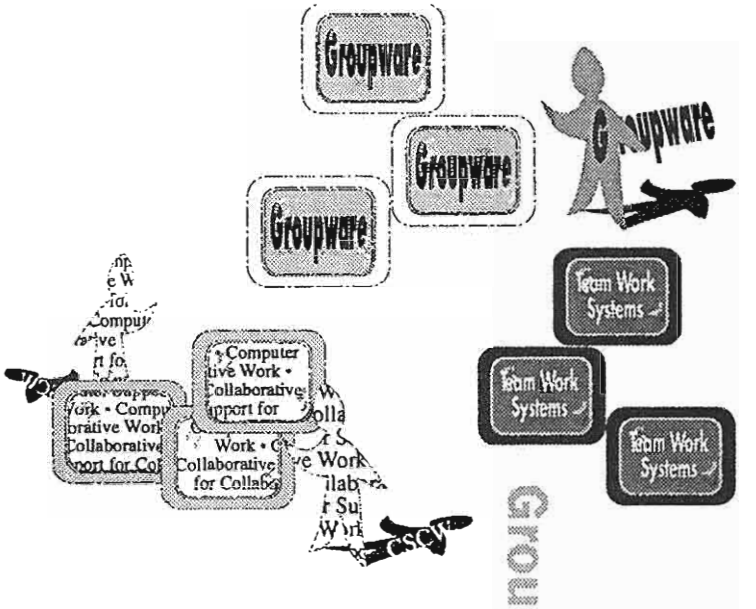

CSCW —A Promise Soon to be Realized?

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Preface

We are working in a world where work is being done, perhaps increasingly so, in teams and groups and committees.

White-collar workers of today are toiling for ever in meetings, conferences, seminars. Is this well-spent time? Could we reach better decisions with the aid of more suitable, potent, and convivial tools, inside and outside of the meeting rooms? Could we lean on more sources of information, and the opinions of a larger, invisible network of colleagues and experts, if we were able to conduct our meetings in a different fashion?

These are the questions that are being faced by the advocates of a class of new information technology: computer support used for the coordination of team work – groupware, or CSCW (or some other unlikely acronym) for short. These are the issues, and the technologies used to address these issues, on which this TELDOK Report attempts to shed some light. It is a fascinating subject!

The members of the TELDOK Editorial Board continously use an electronic mail system to throw out and digest ideas as well as to make actual decisions, much as we have ourselves done for the past ten or fifteen years. It seems a waste to spend the time between formal meetings without dealing with pertinent issues; and it seems a waste not to bring the desktop computer, on which so much effort and knowledge has been typed in, into the face-to-face gatherings where so much of what resides on its hard disk will be discussed.

"Computer Support for Collaborative Work" attempts to facilitate just that: for meetings to be more organized, with the support of computers, and for team work to be better coordinated with computer linkups between distant team members.

In arena sports and other entertainment, modern technology has already transformed arena audiences into zillions of couch potatoes, tuning in to the event even from the other side of the planet. Will new presentation and collaboration techniques do likewise to business meetings, making distant actors of the participants in tomorrow's meetings, calling in from their remote computers and personal telephones?

As you will learn from the following scores of pages, there is a great variety of CSCW applications out there, some already for sale, some still being tested and used in-house. CSCW applications are as diverse as the backgrounds of the participants in the study tour and seminar TELDOK arranged in April 1991 to examine groupware. You will notice that the diversity in background and outlook of seminar attendees, and the variety of applications they were exposed to, may have colored how they regard the status and the future of computer support for collaborative work, as shown in participants' "personal reflections" at the end of

the Report (Part 2) as well as in their detailed field notes from the various site visits (Part 1).

The Report was edited by Dr Peter Docherty, an Associate Professor with the Institute for Management of Innovation and Technology and a long-time student of collaborative use of computer tools. He and Randall Whitaker, now with the University of Umeå in northern Sweden, are laying the ground for a more thorough understanding of CSCW – definitions, uses, examples, problems – in their Introduction chapter. The serious reader is invited to start reading that with no further trepidation.

If at first it seems hard to comprehend what Computer Support for Collaborative Work means, or not means (and this Report should help in untangling that possible web!), it is harder still to figure out whether each ingredient of the alphabet soup of nouns and acronyms used to denote that phenomenon is employed to carry different meanings or not. In the near past, we have been saying *groupware* when referring to this class of techniques and tools; and groupware still seems to be the expression that most people can relate to.

You may have years still to study the Introduction before groupware takes off and CSCW or TeamWork Systems applications permeate every business meeting and every business team; but if you read the chapter now, and then the rest of the Report, you will be prepared when the groupware promise is realized.

Bertil Thorngren
Chairman
TELDOK Editorial Board

P G Holmlöv
Secretary
TELDOK Editorial Board

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Introduction

by Peter Docherty and Randall Whitaker [1]

CSCW: "A loved child has many names"[2]

In all spheres, the pressure of competition is forcing vendors to position their products by continually relating them to current changes in the needs and interests of their customers. One example of this from the information technology industry has been the exponential growth in network systems and software which have been given the general label "Groupware". The area is the subject of rapidly increased attention from users, policy makers and the research community. Surprisingly, little literature is to be found on the effect of groupware on team performance and/or organisational productivity.

Much has been written about groupware — a collection of electronic tools — under an increasing variety of names — CSGW (Computer-Supported Group Work), CSCW (Computer-Supported Cooperative Work), CAT (Computer Augmented Teamwork), flexible interactive technologies for multiperson tasks, Workgroup computing, GDSS (Group decision support systems), EMS (Electronic Meeting Systems), CWSS (Collaborative Work Support Systems) or TWS (Team Work Systems). The multiple meaning of groupware and the complex management dynamics that it involves remain, however a source of managerial challenge and business confusion.

The most widely-used label for research and development in this area is "computer-supported cooperative work" (CSCW), coined by Irene Greif and Paul Cashman in 1984 as a marketing tag for a vision of integrated office IT support. It can generally be said that CSCW pertains to the overall field of supporting task-oriented teams with information technology, while groupware refers to those products applied in providing such support.[3]

A review of some of the written material, reveals that most focus on the technical side of groupware. For some groupware is a technical

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1 This section is based heavily on two working papers: Docherty, P. and Shani, A.R. "Groupware and Team Performance: More than meets the Eye?", Stockholm, IMIT, 1992 and Whitaker, R. "A short introduction to CSCW", Umeå, Institution for Computer Science, 1991.

2 An old Swedish saying.

3 There is a significant body of research, development, and trade literature covering the areas of CSCW and groupware. Greif (1988); Olson (1989); and Johansen (1988) cover the origins, themes, and developments in this area. Bullen & Bennett (1990a; 1990b).

view of work; for some it is a work method; for some it is an approach to conduct and manage work; for some it is a management philosophy, and; yet for some it is a movement toward an improved work environment and working conditions. Since the phenomenon of groupware has been mostly studied from technical perspectives, few guiding conceptual maps have been published.

What Delineates Groupware?

Groupware applications to date focus on different aspects of cooperative work behaviour such as:

- Providing simultaneous access to one work process (e.g., group text editors).
- Managing communications among concerted actors (e.g., conferencing systems; group decision support systems).
- Organising resources and personnel involved in a work process (coordination systems).

CSCW is claimed to be applicable to a wide range of task settings. A wide variety of applications are cited in this context, ranging from electronic mail to conferencing systems to work coordination systems. The variety of exemplars is disturbing for the fact that it prevents straightforward categorization of software applications as groupware.

Groupware is difficult to delineate, but several general statements are helpful in this context:

- *Groupware is not synonymous with any class of IT hardware.* First, groupware is explicitly designed to support collective activity among workers (Dyson, 1989). More generally, we can say that groupware is not limited to any particular class of computing equipment.
- *Groupware is not synonymous with communications.* Pure communications systems should not in and of themselves be construed as groupware. Whitaker (1991) points out that this is no more illuminating than calling a telephone a "decision support system".

  Johansen (1989) includes many general purpose communication systems in his review of groupware, but he undertakes his discussion within the context of "technological support for work group collaboration" — a setting not limited to computers. Bannon and Schmidt (1989, p. 364) identify "sharing an information space" as a "core issue for CSCW", but their usage refers to conceptual matters rather than communication links. Similarly, De Michelis (1990) cites "information sharing" as the key support need in collaborative activity. However, pure communications systems (e.g. E-mail) support no specific task(s). Many people may interact without reference to any cooperative or collaborative focus (i.e., a common task).

- *Groupware is not easily defined with reference to activities.* The boundaries on what we mean by "groupware" certainly depend on our concept of what constitutes a work group or task-oriented team work. The idea of "cooperation" is extremely problematical. Bannon & Schmidt (1989) conclude "... the term 'cooperative work' is the general and neutral designation of multiple persons working together to produce a product or service ... The concept of cooperative work does not imply a particular degree of participation or self-determination on the part of the workers, nor a particularly democratic management style."

  It would appear that the issues surrounding the work style definition will not be soon settled. Intermittent shifts of emphasis between work style and the technology still pervade the CSCW literature. Broadly speaking, work life issues are more heavily emphasised in European (particularly Scandinavian) circles, while application issues are more heavily emphasised in the United States. The problems with establishing a clear focus (or rather, the fact that the phenomena can be viewed from a variety of perspectives) often instill confusion (and some cynicism) in those trying to figure out this field. One way to demonstrate the range of such perspectives is to present some of the ways in which key CSCW researchers have outlined the issues. Three are presented here: De Michelis, Johansen and Malone.

De Michelis: CSCW and Generic Functions in Groups

De Michelis (1990) focuses on the generic activities or behavioural functions in groups. He delineates three different categories of cooperation: Coordination, collaboration and codecision.

1 *Coordination* is that process by which group members organise and/or synchronize their actions within the framework of a task. This term has been used generically within the CSCW field to denote the process of organising and synchronizing activities, goals, and results. Coordination is commonly approached through specifying what is to be done; who is committed to doing it; and when it is expected to be accomplished. Specialized systems such as The Coordinator are configured atop a LAN to provide a communication environment in which structured messages are exchanged among users to generate and maintain the "network of commitments" thus generated.

  Coordination thus addresses issues which have been dealt with before: scheduling, calendar maintenance, planning, and operations tracking. In the case of the work done by Anatol Holt (now of Coordination Technologies — developer of the groupware product

Together), factors such as space and resource allocation are included. What are termed coordination systems in CSCW are descended from project management tools originally developed for project management (particularly software engineering). Their primary audience are those who need to manage operations — be they supervisory personnel, self-regulating workers, or both.

2 *Collaboration* consists of those activities through which multiple actors work together on a given task. The most common example of groupware tools which have been developed to date for supporting this type of activity is group text and document editors. Such tools allow multiple users to jointly access and edit documents, either in real time or asynchronously. Since tools for collaboration (as De Michelis defines it) are task-specific, their primary audience consists of workers engaged in enterprise tasks.

3 *Co-decision* is an extended form of collaboration in which the task is reaching a decision. The most common example of tools supporting co-decision are meeting room facilities and applications such as Capture Lab, the University of Arizona facilities, Ventana's Group-System products, and IBM's TeamFocus products — all reveiwed in this report. Due to the concentration on decision making and the relatively expense of the dedicated tools, the primary audience for such co-decision support has been management personnel and/or skilled professionals.

If one looks carefully at De Michelis' classifications, the boundaries among them immediately blur. Clearly, this framework cannot be maintained as a general analytical tool, although it has merit as an illustrative device (as used by De Michelis). More important than the absolute accuracy of his categorization scheme, however, is De Michelis' shift of definitional emphasis from a general notion of "cooperative work" to more specific, functionally delineable classes of activities. While one might dispute his contention that coordination, collaboration, and co-decision are fundamental categories, they clearly provide more tangible means for addressing the types of activities addressed by CSCW than general attempts to define "cooperative work".

Johansen: CSCW and Task Context

Robert Johansen has provided a taxonomy of groupware applications based on task context: their distribution in time and space (Figure 1). This categorization scheme has proven particularly useful both as a means of classifying groupware products and as an illustrative device for demonstrating the types of work environments addressable with such products.

	Same Time	Different Times
Same Place	*Face-to-Face Meetings* Copyboards PC projectors Meeting rooms	*Administration/ Data Management* Shared files Shift work
Different Places	*Remote Meetings* Conference calls Data sharing Video/Tele-conferencing	*Reliance on Coordination* Electronic mail Forms management Voice mail Structured messaging

Figure 1 CSCW applications based on distribution in time and space (Whitaker, 1991, adapted from Johansen, 1989).

One advantage of Johansen's approach is that newcomers to the notion of CSCW can easily grasp the time/space permutations and his mapping of product classes onto them. Another advantage is that by making time and space the key dimensions for his matrix, he has managed to avoid the thorny issues of what one means by collaborative work and the non-informative nature of a simple listing of products. His use of time and space parameters has in effect shifted attention from products to the context in which they are used.

Both De Michelis and Johansen have helped to clarify just what it is we are addressing with CSCW and groupware. Johansen accomplished his clarification by adding the referential dimensions of time and space. De Michelis makes similar progress by adding discriminatory criteria of specific work goals. The goal of coordination concerns the *plans* for accomplishing a given task; the goal of collaboration concerns the *actions* by which that task is accomplished; and the goal of co-decision concerns *policies* with regard to some task or topic. De Michelis' primary contribution is therefore the addition of these goal-directed criteria.

Malone: Organisational Interfaces

One user-oriented way of approaching groupware is Malone's (1985) discussion of organisational interfaces — extensions of single user

interfaces to the realm of group use. Malone defines such organisational interfaces as "the parts of a computer system that connect human users to each other and to the capabilities provided by computers". (1985, p. 66) Since in his view any computing system being used by a group should be developed with attention to the organisational interface, Malone's discussion subsumes all manner of groupware. In any case, Malone emphasizes the need to develop design theories to inform the process of better matching information technology to the character and needs of organisations. To devise such theories, Malone suggests four perspectives from which one may operate:

- *Information processing perspective* focusing on the nature of information utilized in organisations and the manners in which such information changes and flows.
- *Motivational perspective* concentrating on those factors which impinge on worker motivation and/or satisfaction. These are divided into factors extrinsic to task performance (e.g., wages and benefits) and those intrinsic to tasks (e.g., autonomy, meaningfulness, cooperation, etc.).
- *Economic perspective* emphasizing the allocation and distribution of resources in the organisational setting.
- *Political perspective* defined by Malone in terms of conflicts among organisational members. Avoidance and/or resolution of conflict situations may involve attention to issues not addressed in any of the other three perspectives. Malone offers the specific examples of coalition formation and confidentiality.

Malone's classification for organisational perspectives has a direct bearing on the conflicts in discussions of computer support cooperative work. Those who describe the CSCW phenomenon in terms of systems (i.e., groupware) are doing so in terms of Malone's information processing and/or economic perspectives — the two viewpoints based on artifacts and/or resources. In contrast, those who emphasize work style, human or social factors are operating within Malone's motivational and/or political perspectives, based on the individuals within the organisation.

Whitaker concludes from his review of the perspectives represented by De Michelis, Johansen and Malone that one should focus on the group itself — neither some feature or quality of its activities nor some specific character of the tool(s) it employs. This emphasis on the group (or workplace social system) is not offered as an exclusive alternative to either time/space parameters or goal specifications; indeed, all three of these aspects mutually influence each other.

This positive suggestion does not alleviate all our troubles. Many applications which are now experiencing a new summer under the sun of groupware belong to the general category of office automation

applications that support general administrative functions. Others are utilized by several individuals to perform an isolated activity in a work or project cycle. It would appear that much of the utilization of Electronic Meeting Rooms is of this character. Temporary groups execution of individual work elements should be separated from basic support for permanent teams. The development in work organisation that is receiving much attention at the present time is just this movement towards permanent teams in business operations, even if many also maintain that project work is also on the increase. The team relation to technology is emphasized in sociotechnical systems theory, which forms an important point of departure for the researchers at Georgia and Michigan Universities — two of the universities visited by the TELDOK group.

Sociotechnical Systems and CSCW

At the most basic level the *sociotechnical systems (STS)* perspective considers every organisation to be made up of a social subsystem (the people) using tools, techniques and knowledge (the technical subsystem) to produce a product or a service valued by the environmental subsystem. The degree to which the technical subsystem and the social subsystems are designed with respect to each other and the environmental subsystem determines how successful and competitive the organisation will be. Thus, while every organisation is perceived as a sociotechnical system, not every organisation is designed using sociotechnical systems design principles, methods, processes and philosophy. The economic results of organisations designed according to sociotechnical system design principles are significantly better than comparable organisations of conventional design.

From STS point of view, the primary work systems in an organisation are teams. Team activities are viewed as complex activities which are required to complete the process of transforming an intake into an output. Team performance is perceived as an outcome of the causal relationships between The Team Business Environment subsystem (or the "team context" that is composed of the nature of the industry, the nature of the organisation, the level of technological complexity and sophistication, organisation structure and, key organisational processes), The Team Technological subsystem (such as the nature of the computer-based support) and The Team Task subsystem (such as the nature of tasks, routine vs. nonroutine tasks, the nature of task interrelationships, the nature of task design).

Team task subsystem is viewed as a system of activities plus the human and physical resources required to perform the activities. As such team task subsystem can be examined in terms of:

1 "differential task environments" — teams within an organisation face environments that are different from those of others,
2 "differential levels of uncertainty" — teams face two types or levels of uncertainty: Boundary transaction uncertainty (uncertainty over what, where, or when inputs and outputs cross team's boundary) and Conversion uncertainty (uncertainty over how to alter the form, shape, location, or meaning of raw materials) and,
3 "technically-required cooperation" — cooperation, which is required when, for a given technology or production time, any or all the group's products can not be produced by a single individual because of limits in individual capacities to perform the necessary conversion or boundary transaction activities.

Many "team dynamics elements" might influence the effectiveness of work teams such as level of team cohesion, team norms concerning performance, stage of team development, technically proficient team members, reward system promotion of cooperative behaviour, training, the provision of support and resources that are required to accomplish the team tasks, degree of team's task stability, degree of interdependency between team members to accomplish the team tasks.

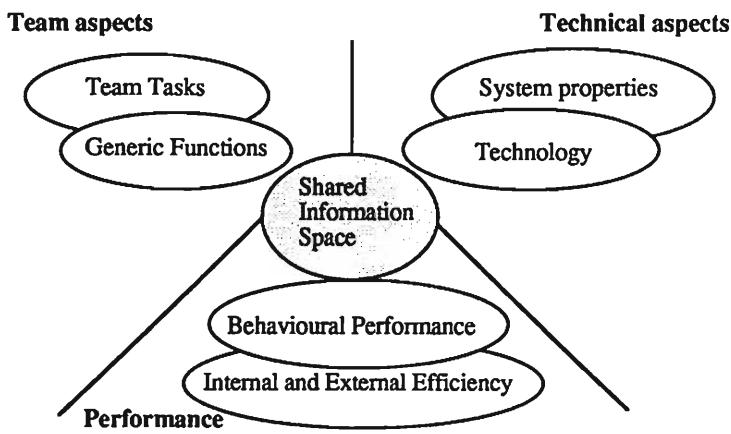

Figure 2 Sociotechnical factors affecting performance.

Figure 2 illustrates team performance as an outcome that is influenced by how well the critical factors are balanced (or fit) with one another. The team task design elements — is concerned with the nature of tasks, (i.e., routine vs. nonroutine tasks), the nature of task interrelationships, the nature of task environment and, the nature of task design. This is dependent the business activity/environment for the team.

The second level in the figure is the generic behaviours in the teams, such as communication and decision making. It is these generic behaviours or activities that are the object of technological support — especially in the context of groupware. In this respect groupware is similar to office automation systems. IT applications in other areas such as decision support systems and production systems are more clearly linked to the team tasks.

The second area — team technology — is made up of elements of the technology (both hardware and software) utilized by the team. The functional features of these applications that are important for team performance are, for example, the provision of infrastructure, memory, models and feedback.

The matching between levels and sectors (socio- and technique) will determine the level of performance. The CSCW and groupware literature reflects little evidence regarding benefits and performance of the systems. Proponents often content themselves with the bland statement that the benefits are so patently obvious that a more stringent and scholarly effort to establish their character and extent would be a wasteful use of scarce R&D resources.

The cited patently obvious benefits are exclusively related to behaviourial performance, such as the generation of text (the more, the better and the quicker, the better). Here the similarity with office automation is clear. The team's internal and external efficiency are hardly ever broached. This is also related to the fact that the applications are often used by ad hoc constellations of individuals in an organisation that have no real tasks or business goals. Our issue can boil down to "What teamware has relevance for teams?"

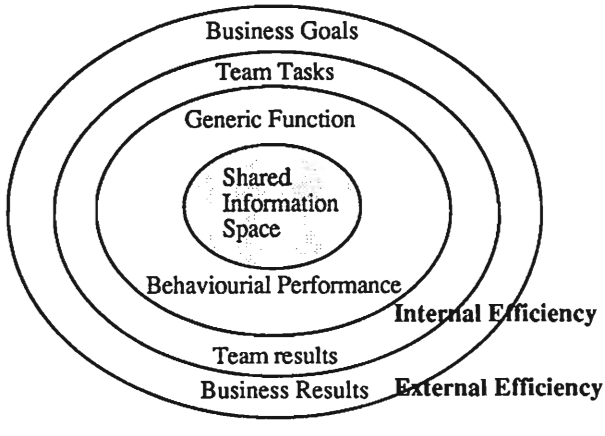

Figure 3 The analysis of the contribution of groupware to improved performance in teams.

A fundamental axiom of Sociotechnical system thinking is that whatever decisions are made about or within any one of the organisational subsystems they should meet the demands of the remaining others. A strategic decision to utilize "groupware" as a means of conducting team business needs to make a careful assessment and a matching process of the overall team business environment together with the team task nature. Cultural and quality issues may impact the selection and use of the most appropriate groupware technology. It may be that a redesign of a company's organisational structure and processes could be warranted to achieve full utilization of the new systems' potential.

Part 1
Impressions from visits to some development groups at vendors and universities

Chapter 1 R & D Organisations

1.1 Collaborative Technologies Corporation

by P G Holmlöv

The setting

It takes an hour to rent a car in Austin. (Or to rent automobiles, the phrase used by Lynn Bigelow, secretary to the founder and CEO of Collaborative Technologies Corporation, Dr Gerald R Wagner.) Reason is, most rental car agencies at the barn-sized airport of this university town seem to be out of cars, or rationing the ones they have.

By the way, it takes one hour or more to do pretty much anything in Austin; if you drive out by car to get hamburgers five minutes away, you are likely to return very much later because most access roads running along the main roads are one-way only and you must choose another way when returning than the one you were shown when you rode out. Everything takes overlong time, that is, except going to CTC from the hotel they advise you to stay in — this is a two-minute walk, a mean feat even in the humid heat of Tex-Mex Austin.

That two-minute walk was well worth our while. We were kept very busy for most of one day in what Jerry Wagner grandly calls his Collaboratory — the usual slightly under-sized conference room, with eight or nine PCs on the oval conference table, and a large on-the-wall screen where the output appears from the participants' computer screens. This was the first view we got of a working groupware application, so the visit with CTC may well have coloured our appreciation of how team work systems best should be shaped and how far they can go.

CTC — product and market

Before 1987, when Jerry Wagner founded CTC, he perceived that a technology to support group activities didn't exist, and that nobody

cared. Not many people seemed to care all that much after 1987, either, as Jerry Wagner for a long while funded CTC operations out of his own pocket, with some of the resources he had acquired when he sold his shares in a lucrative business he owned previously. On the other hand, today 60 to 70 universities around the world have what Jerry Wagner calls major research programs on groupware, and CTC has received venture capitalist funding.

CTC have developed and are marketing VisionQuest — "software to support group work". VisionQuest has had a number of other names, including Clarity; and the company once was called OmniQuest. To date, 45 universities in the States have obtained the VisionQuest software free of charge, and "several" use it. Free use for universities seem to be an important marketing tool for Jerry Wagner, one that he also used in the past. Commercial marketing has just started. VisionQuest costs from USD 40,000 (for a twenty-user version), and there are slighter recurring fees for updates etc.

VisionQuest was devised to assist groups in meetings involving problem-solving. The market for such a product would seem to be enormous, as Jerry Wagner estimates that problem-solving is the purpose for 25 percent of the 20 million face-to-face meetings elapsing each day in the States, with an average length of 90 minutes and involving 7 participants. He observes that more and more business work involves the use of business teams these days; and he credits their use to the organisational strategy of flattening the organisation and widening the control span, and to the recent fad for Total Quality Programs, such as the Malcolm Baldridge National Quality Award, established by Congress 1988 and gaining interest from 167,000 companies.

According to Jerry Wagner, VisionQuest can shorten meetings by half; and the break-even for any organisation who purchases VisionQuest would be at a mere 2—3 percent reduction in meeting time. As he is talking — mostly — of "synchronous" VisionQuest meetings going on at "same time, same place", Jerry Wagner doesn't attribute the alleged efficiency of groupware tools to the fact that most people are away from their rooms half of the time and meetings are hard to schedule; instead, he insists that VisionQuest helps meeting attendees to Prepare!, Focus! and Be productive! Why? Because the literature suggests that the most common problems in face-to-face meetings are: lack of agenda or goals; getting off the subject; and too lengthy proceedings.

Jerry Wagner points out a number of important concepts that distinguish VisionQuest from other groupware applications, although he prefers not to use that term. VisionQuest is designed to deal with and capture the entire process. VisionQuest builds on a dialogue metaphor — it assists dialogues rather than meetings. And documentation of the use of VisionQuest is done — automatically! — with a library metaphor in mind, where all dialogues on-line become a corporate meeting.

A closer look at VisionQuest

The VisionQuest program has a number of computer tools, or exercises, to be selected by the users from a menu. Group members can use these tools either when at the same location — this is what we saw in the CTC Collaboratory — or when distributed "in time and space", working on laptops and small modems. Computer tools allow groups first to surface and share new ideas, new assumptions, and possible solutions; then to evaluate, prioritize, and allocate resources among these ideas; and finally to document this whole process quite seamlessly. The tools are:

- Brainwriting
- Comment Cards
- Compactor
- Point Allocation
- Ranking
- Rating
- Scoring
- Subgroup Selection
- Voting

When group members log in, they can choose from a number of listed dialogues — convening, pending, or completed. If a dialogue for a specific purpose doesn't already exist, a facilitator will set up a dialogue with a number of tools or exercises that may be altered as the dialogue goes along. Each exercise will carry a text (much like a header) and a short instruction. In contrast to other systems, though, the role of the facilitator is less pronounced, and almost anybody can be one.

Everything that is typed by a participant will appear on the screen of every other participant, but how this is achieved of course differs among the various tools. Statements typed in during the "brainwriting" session are fed to all PCs as soon as each author hits the Return key. When a participant has finished ranking or rating comments or ideas, every other participant is notified that another vote has been cast and then can access the new, slightly changed total score — not the personal score from the person who made the latest contribution. In fact, nothing can be attributed to any single person: everything is anonymous (unless of course participants opt to "sign" their comments or change the rules).

The output from one session or exercise — for instance, all comments entered during "brainwriting" — can be imported to all other VisionQuest tools, with or without filters. A "filter" works so that, say, the top ten rated ideas may be further elaborated on in a Comment Cards exercise while the remaining thirty-something are temprarily discarded.

At any point during the use of VisionQuest, anybody can request and instantly receive a printout of the (current) status of that dialogue. The documentation will show the time of the request and the name of the participant asking for the printout. Printouts will show, e.g., low and high scores, averages, ranges and means. VisionQuest supports 400 different printers.

Further, every contribution to the dialogue is stored on disk and can be printed at a later point in time. VisionQuest sessions can then serve as — rather exhaustive — transcripts from group meetings.

Personal comments

I was elated when I had seen VisionQuest, and had worked with it for some time. Part of the explanation is, I felt I had seen it before. Why, most of these tools were core of, or came packed with, the computer conferencing programs I used in the seventies and the eighties. Voting procedures were standard tools of the early computer conferencing packages, and of course idea generation — among geographically dispersed groups, working in different "time windows" — is one of that medium's stronger sides.

But *why sit in the same room?* I think this may be wise, because VisionQuest then may overcome one of the weaknesses of computer conferencing — and perhaps of groupware, when used at "different times, different places" — namely that "the self-activated nature of the medium may inhibit the use".[4] Johansen, Vallee and Spangler report that "Regularity of individual participation is sometimes difficult to enforce..." is what they are referring to, and we have all encountered that, from both sides. It is better to have a captive audience.

Why elated? Because I agree with one of what I consider the key findings of Johansen and Vallee and their research team at the Institute for the Future: "*Computer conferencing promotes equality and flexibility of roles in the communication situation.*" More information, more messages, possibly more valuable ideas are output per time unit, as each group member is typing away, and "air time" is divided more evenly, than when everyone has to take turns in talking and a chairperson may or may not dominate the meeting. I did feel it was worthwhile to type research topics related to Information Technology and Management; in a few minutes, our group of 5 came up with 46 ideas. (We then sorted, ranked, and rated our 46 ideas for a considerably longer time, but that's a different and less elating story.) And I did not think it was strange that we typed more than we talked during the dialogue in the Collaboratory, in contrast to some of those in the TELDOK group who didn't come to Austin and then reacted strongly to this facet of the GroupSystems proceedings.

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4 See Johansen, R., Vallee, J. and Spangler, K. (1979) *Electronic Meetings: Technical Alternatives and Social Choices.* Menlo Park, CA: Addison-Wesley.

If I may compare VisionQuest to the GroupSystems software of University of Arizona and Ventana Corporation, I for one like that CTC stress that VisionQuest should be portable, to be used by dispersed teams, and that the role of the facilitator is played down in comparison with the omniscient facilitator in command of GroupSystems sessions. However, that conceptual advantage also means that VisionQuest arrived later to the marketplace and hasn't achieved as much recognition. In a comment to an earlier version of these notes, Bob Johansen sees the race between the two as a close one; and Paul Saffo finds that "the two systems appear to be taking different philosophical paths — in the long run they may not compete directly at all; (the) choice between (GroupSystems and VisionQuest) may come down to personal taste, like choice among word processors".

What about the marketing strategy behind CTC and VisionQuest? The name VisionQuest doesn't properly identify the product offering — our Californian friends, who should know, think it sounds "to Californian". If ever a name suggested "vaporware", VisionQuest is that name. Most organisations would rather repeat-buy a plain paper cup than to send a knight to quest a vision such as the Holy Grail. As for promotion, to give away free copies of VisionQuest to universities may be a good idea, as the product to these prospective users belongs to a whole new category they have never sampled before. However, the key must be if free ownership could be converted, first to real use (over which CTC seemingly have little control), and then to sales, as professors and students go to work elsewhere and get budgets with which they can purchase software.

Is there a problem to be remedied by computer tools supporting group activities? Bob Johansen has remarked that groupware, if we may call VisionQuest that in this context, is the first emerging technology he has found in 20 years that is driven by user needs, and I see his point. Jerry Wagner positions VisionQuest as a cure for meetings involving problem solving activities, and there are quite a few of those around even as we speak. Of the 1,791 face-to-face meetings described in 1974 to researchers from Communication Studies Group by customers of what is now British Telecom, a "cluster" of 16 percent of these meetings focus on problem solving (and to a lesser extent with information seeking); but problem solving also appears in 40 percent of the other meetings.[5]

But is groupware, or other systems and products for team work, what the doctor should order? CTC believe that dialogues supported by VisionQuest are more efficient than face-to-face meetings, in that participants tend to focus on the agenda when locked to the computers. Short et al. report that choice of medium — face-to-face meetings or other methods — does impact on the time used to reach a solution in a

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5 Short, J., Williams, E. and Christie, B. (1976) *The Social Psychology of Telecommunications*. London: Wiley.

problem-solving situation. As compared to telephone meetings, "face-to-face discussions were longer but failed to produce better solutions". However, "written media were considerably slower than the others", although still, as telephone and face-to-face meetings contained ten times more messages than written media, "... the less-rich media are more efficient (per message though not per minute, in this case)".

It is worth noting, though, that the seminal experiments referred to by Short et al. were set up in 1971—1972 and involved hand-writing, not keyboard-typing! Writing a few years later and on typed messages, Robert Johansen et al conclude that "written communications ... are less efficient than other media" in that "written negotiations take more time, are more rigid, and are more susceptible to developing intransigent positions", "it is sometimes difficult to focus the discussion...", "problems take longer to solve in written mode", and "participants are sometimes reluctant to make certain statements in writing". — However, researching a decade later, Gail Rein and others at MCC find that — as six experts, independently and without knowing what they are rating, assess solutions produced by teams who have worked in a meeting room session, in "ordinary" pencil-and-paper mode, and in a PC environment, respectively — they rate meeting room solutions as *qualitatively better* than solutions reached through the other kinds of means.

So one may hesitate about the efficiency of computer systems enabling team work. For trained researchers who know their keyboards, and for generating ideas ("brainwriting"), groupware systems seem to be *productive* enough — 46 ideas in a few minutes! Perhaps we should take notice of the warnings Johansen et al leave concerning other plausible weaknesses of computer conferencing and the like — "computer conferencing could easily be used to confuse other participants", "the volume of information ... can sometimes become overwhelming", and "... multiple topic threads can appear; information overload can thus result". The massive output from even a short groupware session is relatively unprocessed; it must be peeled and sauteed and seasoned before it may be digested.

Comments from the group

In one of the sessions at the GroupSystems facility in Tucson, TELDOK study group members were able to write down their comments and views on the systems they had previously used, seen, or heard about. Selected comments on VisionQuest were:

- I would describe it as a toolbox for group interaction. It contains a brainstorming feature ...; they call it brainwriting. They also allow for any number of different ways of scoring, voting, rating, etc.
- More than anything else VisionQuest is a system for decision making support. It very much has the feel of an automated voting system and is as a matter of fact based upon a systematic voting process.

- One of the most valuable characteristics of the system which makes it flexible, is that you always have the possibility of returning on your steps and change your previous votings.
- You have to be a firm believer in ranking techniques to have ample use of the system. The system itself is a very nice software job accomplished in a short time with few programmers.
- The greatest risk with the system (as with most automations) is that you become locked by the processes needed by the system, thus impairing creativity rather than stimulating it.
- The fact that you in a certain sense are able to work with all of the steps involved in decision making at once is very powerful.
- When they started out by saying that many meetings are loss of time because of lack of agenda, I was reminded that one of my MIT friends was amused to see that in Sweden every meeting always has an agenda. So perhaps THIS very rationale for groupware is more valid in the U.S.?
- What was really astonishing was the number of ideas — in a rather realistic setting, real problem — that were generated in a very brief period of time.

1.2 IBM National Federal Marketing

by B G Wennersten

IBM is one of the companies in the U.S. that heavily supports development and use of electronic meeting systems. IBM donated USD 2 million to the University of Arizona in 1986 to shift research efforts and to stimulate the development of a functional meeting system, which in its IBM product version has been given the proprietory name TeamFocus.

Today, IBM has some 30 TeamFocus-equipped meeting rooms in the U.S. and Canada, all of which were established after 1988. To date, this technology and information have spread through IBM in a low-key manner, primarily by means of personal communication and commitment on the part of individual enthusiasts. We were told that there is a waiting list for new rooms at IBM, and that existing rooms are heavily utilized.

IBM currently markets TeamFocus on a limited basis to universities and selected major customers such as Procter & Gamble and General Motors. IBM has 12 TeamFocus customers in North America. A software user-license costs USD 50,000. We visited a computer-supported meeting room at IBM's federal sales and marketing centre in Bethesda, Maryland, where some 1,200 employees market IBM products to U.S. agencies, including the Armed Forces and NASA. Activities at this centre account for 10 percent of IBM's U.S. sales and 5 percent of world sales.

The meeting room we visited is one of 30 in use at IBM companies in the U.S. and Canada and was constructed in 1989. This particular room is used by personnel for meetings featuring brainstorming, evaluations, planning and consensus-building. The room is highly popular, and "... is fully booked for weeks ahead", says Martha Morris, our host. We spent four intensive and interesting hours in a room called the Decision Support Centre or the TeamRoom. It is based upon the systems developed by the University of Arizona.

What did we encounter? What is TeamFocus?

The TeamFocus concept comprises four parts:

1 The meeting room is furnished with tables set up in a horseshoe fashion. Each of the 14 workstations (a maximum of 20 is possible) has a PS/2 screen and a keyboard. At the front of the room is a similarly equipped workstation for the facilitator. The short wall at the front also has a film screen for a ceiling-mounted video projector linked to the TeamFocus system. The screen can also be used by an overhead projector. Flanking the screen are whiteboards.
2 Each workstation is linked to a local area network (LAN) and uses specially developed TeamFocus software with all the tools required to support a meeting.
3 A facilitator or team guide, well-versed in group dynamics, leadership principles and TeamFocus tools helps the group reach the desired results during the meeting.
4 A systematic thinking process.

The TeamFocus process

The facilitator plays a key role in TeamFocus. IBM has trained some 150 people as facilitators. These individuals were selected on the basis of their ability to work in groups effectively and smoothly regardless of subject, level or organisational affiliation. They have also been trained in the use of TeamFocus tools and the process itself. We met three experienced facilitators in Bethesda: Martha Morris, Nancy Gordon and Barbara Katchmar. They pointed out that "No meeting is held in this room without a facilitator, who is vital to the success of the meeting."

Another important person is the initiator of the meeting, i.e. the individual who has a specific problem and who has summoned the group together to tackle this problem. The facilitator and the initiator get together to plan the meeting. "We decide the purpose and the goal of the meeting, and how we can best present the issues that the group is to discuss and solve. We also select the TeamFocus tools most appropriate for the meeting at hand", says Nancy Gordon. The planning discussion also results in an agenda. The facilitator gets his or her own schedule.

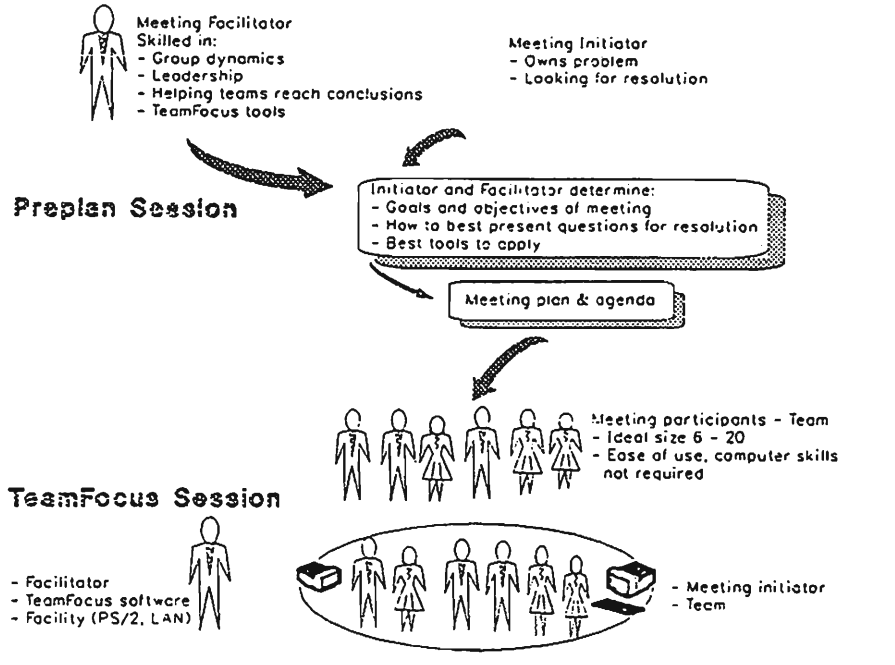

Figure 1.1 Steps in the TeamFocus process.

A group can consist of between 6 and 20 people who do not need to be experienced with computers. The facilitator runs the meeting with the aid of TeamFocus according to plans drawn up in advance with the initiator. The facilitator is usually responsible for leading the meeting, initiator normally playing a less prominent role.

What can TeamFocus accomplish?

One category of meeting activities includes generating ideas, discussing problems, producing specifications and developing plans. The TeamFocus tools used here are Electronic Brainstorming and Topic Commenter.

The next type of activity in a normal meeting involves sorting and organising existing ideas and proposals. The tools used here are Idea Organiser and Topic Commenter. The next step is to place the proposals in a list of preference with the help of the TeamFocus tool, Rank Order Voting. Finally, the group can require active support in formulating instructions or a plan, normally an activity plan (who does what and when). This is when the TeamFocus tools, Topic Commenter and Policy Formation, are used.

When is TeamFocus used?

IBM uses TeamFocus on a variety of levels within the company (everything from senior management and administrators to developers, marketing staff and legal personnel) and for different types of meetings. Here are a few examples:

- planning
- brainstorming
- discussion of sensitive issues
- problem-solving in a project, for example
- developing team spirit
- developing common guidelines
- producing specification requirements
- negotiations
- systems analysis and design
- market assessments and business development

A typical TeamFocus meeting

A typical TeamFocus meeting has been prepared by the facilitator and initiator prior to its start. The purpose and goals of the meeting have been clearly established. The meeting begins with brainstorming, which is accomplished by having all participants enter their ideas into the TeamFocus system simultaneously. The group then enters a more analytic phase by arranging and structuring these ideas, in order to establish priorities, discuss results and select the most important points to pursue. At this point, participants begin to formulate the principal proposals for activities. Once a consensus has been reached, activities plans are detailed for the various participants (who does what and when). Participants leave the meeting with a full set of minutes.

Experiences from using TeamFocus at IBM

IBM regards the following experiences as its most important to date:

- TeamFocus cuts the time required for meetings by 40—75 percent.
- Subjects are covered to a greater extent through the voicing of various views (especially critical) and the generation of ideas.
- No single individual or group of individuals is allowed to dominate the meeting, which means that the expertise and skills of all the participants can be used more efficiently. A greater number of individuals play an active role in the meeting than under normal circumstances.
- TeamFocus meetings are usually much better prepared than ordinary meetings.
- Less time is devoted to "defending territory", which helps the process.
- Documentation of the meeting is improved dramatically.

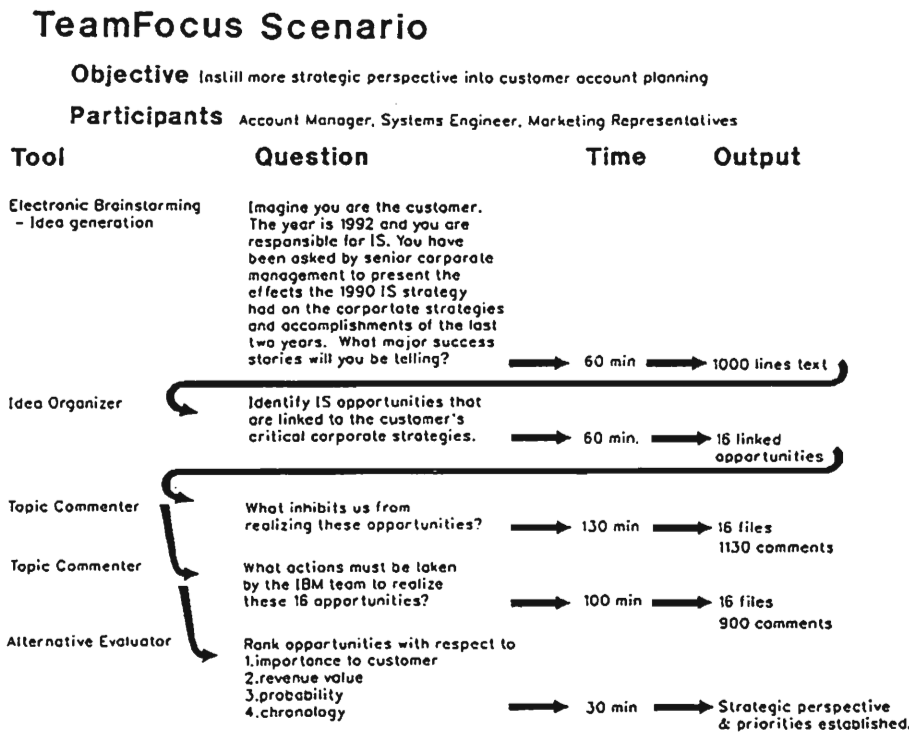

Figure 1.2 The TeamFocus scenario.

Why does TeamFocus boost productivity?

All contributions are keyed in anonymously via a terminal. IBM believes that this promotes a more open attitude toward expressing opinions without worrying what others will think, and allows contributions to be judged on their own merits instead of the merits of the individual who made them. The participants' concentration on the content of the proposals instead of the personal image of each individual should avoid much of what often causes a meeting to move in the wrong direction. The focus on unnecessary details and emotional outbursts may be eliminated. Consequently, much can be accomplished in a short period of time.

Each participant may contribute to the meeting from the start. No one need sit passively because others are dominating the meeting. All ideas and opinions may be expressed. Large amounts of information can be handled in parallel in the same time it would normally take for one or two people to present their proposals orally. This should be

compared with the sequential process of a conventional meeting. The system provides a full account of what happened at the meeting, both on paper and on disk. The normal procedure involved in brainstorming requires someone to write on a board (someone has to copy) or a flip-chart (someone has to produce a legible version). TeamFocus, on the other hand, provides each participant with a printout at the end of the meeting. In addition the fact that this method saves time in a number of ways means that many participants find meetings held in a TeamRoom or a Decision Support Centre to be highly enjoyable and meaningful.

What do the users at IBM have to say?

IBM's National Federal Marketing operation in Bethesda, Maryland conducts more than 100 meetings at the Decision Support Centre in the course of a year. Here are a few comments IBM quote from users' internal evaluations:

- "... an extremely productive tool. We completed a three-day job in one day."
- "... a *very* important component in the decision-making process. I felt that we accomplished more on behalf of the company in one day than we had achieved in the past two months."
- "An excellent tool for collecting and compiling data."
- "A fine method for conducting a meeting ... very satisfied with what we have accomplished today."
- "Documents happenings immediately, makes it possible for each individual to contribute and remain focused on the meeting."
- "An excellent tool ... everyone can express his/her views and still agree in a much more objective and tidy manner than in conventional meetings."
- "A fantastic labor-saving method for reaching decisions in a group."
- "Unique! Saves time. I'm impressed."
- "Easy to use."
- "Anonymity is excellent! We made more progress today than during the past year. It was fun, too. Everyone contributed."
- "Quick ... easy to use ... productive ... time-saving ... reduces frustration ... eliminates many conflicts."
- "We can all speak at the same time. I love it!"

IBM users' general view of TeamFocus was positive and enthusiastic. Although everyone probably has something to complain about, all groups were eager to return for a new meeting. The DSC room is constantly booked, and it is necessary to book well in advance before you can get time for the room. "It's well accepted and is heavily used", says Nancy Gordon, one of the facilitators.

There were a number of negative experiences, as well. Not everybody understands and accepts the whole idea of TeamFocus the first time around. This means that productivity is not as high as it could be in some meetings. Nor is the anonymity of the system entirely positive. Some individuals find it boring and non-motivating not to receive appreciation for a good idea. Some people have problems thinking at the keyboard. (Most of the IBM people are used to this, but among those who do not use keyboards on a regular basis, this can present a problem. As a rule, however, lack of experience at the keyboard is no problem.) Even though expressions of emotion can be indicated on a a screen [smile = :), laughter = :D, anger = :X, boredom = :0, etc.], this can seem to be a limited and unnatural way to communicate. Certain personalities in fact feel slighted, since they can no longer communicate via their oral talents, dramatic flair, body language, etc.

Continued development at IBM

IBM is steadily increasing the number of TeamRooms (Decision Support Centres) in the U.S. and Canada. Is development moving toward a graphics interface? Efforts are currently focusing on a version designed for distributed systems, i.e. conducting TeamFocus meetings with participants spread out among different places. The working name for this system is Geiger.

How we worked at TeamFocus

In order for the four of us from TELDOK to get a feeling of what it is like to use TeamFocus support in a meeting, Nancy Gordon, our facilitator, asked us to discuss the following subject: "How would you envision the TeamFocus product being used in your organisation?"

Nancy Gordon gave us an introductory brainstorming task: "Please come up with some ideas." We all received the statement on our screens. We sat quietly and concentrated on coming up with a first idea. I wrote down my idea, as did other others. It only took a couple of seconds for us to produce the first ideas. In fact, four ideas were produced within 30 seconds.

Directly after keying in my first idea, a second idea (I don't know whose) appeared on my screen. I was supposed to elaborate on this or, if I preferred, provide a second of my own idea. Someone else in the group (I don't know who) elaborated on my first idea. As soon as I entered a new idea into the system, I received another angle to reflect upon. In this respect, it was exactly like an ordinary, oral brainstorming session. We continued to work quietly. Attention was focused on the screens and on the task at hand. Everyone was busy writing down ideas. After 8—10 minutes, our facilitator, Nancy Gordon, interrupted us. In the short time we had been working, some 30 ideas had been generated.

It was now time for us to see which of these ideas we could use. This was accomplished with the help of a TeamFocus tool for organising ideas. Each of us, supported by the Team Focus process, arranged the ideas into suitable groups and wrote generic headlines. In the space of a few minutes, we arrived at a short list of seven potential replies to the question: "How would you envisage the TeamFocus product being used in your organisation?"

Priorities must now be assigned. We completed this task quickly, carefully guided by our facilitator, by taking a vote, i.e. each of us arranged the seven proposals in the order we believed to be best. TeamFocus immediately projected the group's collective ranking onto the film screen. We felt TeamFocus would be most valuable when "discussing difficult and complex matters in controversial issues". TeamFocus would also probably be highly useful "each time a group has to solve a problem and reach a consensus". Its third application would be to create a "superbrain for making prognoses and market assessments." Our fourth use concerned "product development and documentation". The material was printed out simultaneously, and the entire process took less than 30 minutes.

How long would it have taken us to reach the same conclusions in an ordinary manner, and would we have reached the same conclusions so undramatically? We were shown statistics to the effect that our group was so heterogeneous (our members came from several organisations) that it would have been extremely difficult to reach a consensus using conventional meeting forms. The Kendall Coefficient of Concordance for our group was 0.17, which constitutes an unusually low value. The coefficient normally lies around 0.5. A group with one-hundred percent unity would have a coefficient of 1.0.

How did we like working with TeamFocus?

All contributions, including the generation of ideas and the structuring and voting processes, were made anonymously in the TeamFocus system. This made it easy for us to focus on the task at hand and to contribute. We all jumped into the thick of things at the same time, and because we were working in parallel, we really felt that our collective productivity was high. Having the meeting documented immediately was excellent. This is especially valuable when reading the TeamFocus printout later, as it provided a great deal more than would have been the case with a conventional meeting where notes were kept by hand.

TELDOK reflections surrounding TeamFocus

B G Wennersten, Wennersten InfoNetwork AB

After having participated in a couple of brief practice sessions with an instructor in the "driving seat", I have the following observations:

The fact that all participants in a brainstorming session can work in parallel and that everyone can concentrate on the task at hand instead of on the behaviour of others, seems to result in high productivity — at least in terms of quantity and probably even in terms of quality. In only a short period of time, numerous ideas are generated and documented much better than in traditional meetings.

One disadvantage I have noticed, which I believe could pose a problem for many participants, is that the meeting tends to be highly text-based. I am used to expressing my thoughts and ideas via a keyboard, but I often feel a need to support these with discussions and diagrams. There was no possibility of doing this at the meetings in which I participated. Although traditional meetings are based on cooperation through oral discussions, drawing on the board, etc., communication in electronic meeting rooms is mainly confined to writing at a terminal: the production of text seems to be the key to exchanging information between participants. For the individual who would rather speak than write, for the individual who needs to draw a picture to present an idea and for the individual who must see a picture in order to comprehend, communicating exclusively by writing must constitute a far too narrow channel for a meaningful exchange of thoughts and ideas. Everything must be sent and received via a screen, which could cause some participants to become frustrated at not being able to contribute to their best ability, for example not being able to formulate thoughts in "X" number of letters on a screen.

In the course of a brainstorming session, the amount of material grows until it becomes difficult to grasp on a screen that can only show 25 lines of text. When it is time to group ideas, it becomes even more difficult to maintain a grasp on the information and to know what you are doing. Here is where I missed the possibility of making a mindmap in order to set up a suitable structure or of using Post It labels to help keep track of my thoughts.

Certain text contributions from fellow participants (for example, keywords or incomplete sentences) were difficult or impossible to comprehend and were thus, for the moment, meaningless or disturbing, as they tended to steer my chain of thought in the "wrong" direction: "what's this got to do with the problem?". This was where I missed being able to give or receive a direct explanation or further development of an idea, which is possible at a verbal meeting.I am not sure how this problem is solved in a TeamFocus session.

It is quite easy to become angry with one another in text communication. Three lines, if they contain criticism, irony or humour can "hurt" much more than if the same information had been presented verbally, which usually requires more time, employs more tact and is forgotten easier. With TeamFocus, all contributions are made anonymously. This would lead you to believe that it is impossible to link a

contribution to its author. This is not the case in practice, however. It is quite easy to judge who has written what, thanks to the style of writing and the opinion itself, among other things. Does this mean that participants could become involved in conflicts during a TWS-based meeting that are difficult to discover and handle?

What is it that makes the initiator of a meeting decide to hold it in the TeamRoom instead of in a conventional room? Are there certain issues, purposes or participants that make a particular meeting a definite candidate for the TeamRoom? Obviously, every meeting cannot be held in a TeamRoom. Does this mean that there is a difference in attitude toward ordinary meetings and TWS-supported meetings? I believe that it is vital that participants be able to see one another and speak to each other, as in a normal oral meeting. This allows participants to discuss, pose questions and receive elucidations in order to complement difficult areas of the text-based work. In the Arizona room, participants only see the backs of necks, and it is difficult to carry on a conversation across the room. The horseshoe arrangement of furniture in the IBM TeamRoom, however, provides a much better atmosphere for meetings.

After two to three sessions at the University of Arizona and IBM, I gained five important insights:

- The ability and efforts of the facilitator are decisive to the success of the meeting.
- The purpose and goals of a meeting must be well prepared by the initiator and the facilitator. This is true for all meetings, of course, but since we are normally careless, the facilitator's effort probably serves to make a TeamFocus meeting well prepared.
- The design of the room must permit eye-to-eye contact between participants (consider the Arizona room, which practically cuts off participants from each other).
- Text-based information only probably is not enough to ensure that each participant can voice his/her opinions best. Oral discussions, graphics on a board, etc. are also necessary.
- Under the above conditions, TeamFocus can substantially improve a) meeting productivity, b) the quality of decisions, c) each participant's possibility of contributing to the collective effort and, consequently, each individual's feeling of involvement and affiliation with the group.

Kristina Sundberg, Infologics AB

The rooms are called Decision Support Centres. In the presentation we received, emphasis was placed on management issues and the importance of being able to criticize ideas with managers present. I wonder:

How can "the boss" carry out his/her decisions if the employees do not dare to voice critical views? I was a bit surprised over the emphasis placed on the "critical issues" aspect — TeamFocus eliminating a disturbance or potential conflict instead of contributing a positive element to the decision-making quality and a common basis for implementing decisions and plans. The chief argument for the system, in my opinion, is improved efficiency. Short, efficient meetings with direct access to available documentation and a facilitator who ensures that everyone "talks about the same thing" appeal greatly to me.

Please note: I believe that some of the advantages attributed to the use of TeamFocus can be achieved in ordinary meetings, too, for example with access to a facilitator, better preparation and a systematic use of various existing brainstorming methods.

There is an advantage to receiving documentation immediately after a meeting, despite the fact that comprehensive documentation of numerous thoughts and ideas could lead to different interpretations of the material later. I also wonder how this type of documentation would fit into the Swedish practice of documenting and saving decisions made by public administrations and keeping them accessible for the general public.

The system seems to offer the possibility of rationalizing different working processes through work elimination. By reducing unnecessary report writing and establishing groups in a manner that would incorporate different views from various functions at an early stage, it would be possible to design a product that is simple to manufacture and to provide market feedback on product development.

Naturally, the enthusiastic presentation we received was coloured somewhat by the fact that TeamFocus is still a new product. Moreover, it is difficult to comprehend the use and benefits of TeamFocus, which still has something of a pioneer atmosphere about it. I assume that no group has had the opportunity to work with TeamFocus so much, either at the group or personal level, that the problem of "overuse" has arisen. How much can an individual work with TeamFocus before becoming exhausted?

I am positive to TeamFocus. I believe that this type of tool can be of great benefit to different types of meetings. It was extremely interesting for me to compare my impressions from the University of Arizona demonstration and from the IBM presentation. My conclusion is that the benefit is mainly dependent upon the ability of the facilitator to prepare and lead a meeting. Without a capable facilitator, the benefit of a tool declines to a point where it only simplifies documentation. Therefore, it is important to stress the fact that a facilitator is not only a documentation resource but a professional leader of meetings. The user interface of this software could be improved, but this is a minor detail.

1.3 Lotus Development Corporation

by Kristina Sundberg and Randall Whitaker

Introduction

While the area of CSCW or "groupware" has been the focus of widespread research, actual commercial products targeted at supporting work groups have been few in number. Perhaps the largest marketing effort to date has been the promotion of Lotus Development Corporation's product Notes. Since the introduction of Notes about two years ago, most of the trade press has ranged from positive to enthusiastic toward Notes, in terms of value for purchasers and providing an example of an enterprise-wide group support application.

Why should any group need Notes?

We began with the basics: who is Notes designed to support, and how does Lotus define that target clientele? Lotus describes Notes as "a network-based software product for group communication". The focus is on data sharing among members of one or several work groups, using a communications network.

As the constitution of a work group vary considerably, distinguishing factors are: proximity; common tasks for a number of people; and/or similar functions for the members. The first factor — proximity — can be evaluated in terms of Bob Johansen's time/space matrix. The second factor —common tasks are delineated by the goals shared among group members, while the third factor — similarity of function is delineated by the activities those group members share. What problems arise then during the lifetime of a group?

Eric Sall pointed out three main challenges that affect a workgroup:

- *Training and assimilation of new work group members.* As the group is initially formed, and as it is augmented over time, new personnel must learn what the group is all about and how to effectively participate in its mission(s). To minimize problems for new members, there should be a maximization of (1) access to pertinent information about the group and its work and (2) prior familiarity with group tools.
- *Information interchange among work group members.* Work groups need not be in the same place, nor must they work at the same times. They must share information in accomplishing their common task, and impediments to such sharing will reduce their productivity. Productivity would presumably be enhanced by providing tools which allow easy data interchange within a stable environment. Such ease of use is provided by sophisticated graphical user interfaces combined with integrated software.

- *Knowledge loss incurred when work group membership changes.* During the history of a work group, members may leave. When this occurs, productivity may suffer due to loss of accumulated "knowledge" regarding the task. This loss can be minimized if the group maintains a shared data resource (e.g., a "group memory"), essentially a database into which work information is collected on an ongoing basis. Establishment and maintenance of such a resource would be enhanced if the tools supporting it were integrated with the tools for routine information interchange.

All these factors concern the means by which a work team is able to identify itself, record this identity (both in static/structural and dynamic/historical terms), and make the record(s) available to themselves and to others.

How can Notes help, what's new?

One reason to use Notes is that it can be said to provide a *shared information space* — a common data resource linking work team members for communications and holding their joint informational resources, giving access to a full-function information marketplace to all people attached to the system. As an ideal, this is the sort of thing which has been promoted for three decades by Doug Engelbart. As a marketable product, this is not an inaccurate way of characterizing Notes.

This unified and shared information space can be characterized by many shapes or application areas and support several modes of communication:

- one to one communication (E-mail)
- one to many (broadcasting of written messages)
- many to one (reporting or tracking of information)
- many to many (conferencing)

But none of the above mentioned modes of communication is new. These functions have already been available through the use of one or more applications, often at the expense of convenience on the part of end users. E-mail, fax, or file transfers got data from one site to another, but any organisation of the messages for subsequent access was left to the imagination. Databases of shared documents allowed flexible, easy access to information, but often required users to patch together the means for data transfers. Applications available to date (e.g., KOM) which purport to offer both types of functionality have not generally managed to do so with a high degree of "user-friendliness".

The fact that Notes' functionality has been previously available (e.g.,through electronic mail or database management systems) has caused something of an identity crisis — what, after all, is new about this product? According to Eric Sall, Lotus' first contribution has been

to integrate these functions into a unified shared information environment.

The communications portions of Notes operates as a document transfer environment, similar in most respects to most E-mail systems. Unlike other mail applications, though, Notes permits correspondents to mix images, graphics, imports from spreadsheets or word processors, and also permits formatting support data with and within the messages they send. Embedded within this environment are the mechanisms for tracking, organising, and accessing those shared documents — mechanisms which are configurable to meet specific workplace requirements. Finally, Notes provides a consistent interface for its customers plus the ability to import and export data to/from a selection of other popular applications software.

The second Lotus contribution has been the organisational scope for the product. It is intended to support and enhance the operations of an entire enterprise. Other commercial software packages offering similar functions had not attempted to encompass an entire organisation. One must look not at the functions which Notes offers to individual users, but at the functions it provides entire groups of users, up to and including an entire enterprise. This scope was supported by Lotus' initial marketing strategy, a "wholesale" approach in which customers invested in many licenses at once. This broader perspective on the product and its positioning is the key to understanding what is novel about Notes.

Structuration of messages in the Notes environment

Eric Sall noted that one of the problems in setting up an integrated application for work team communications was the degree of structuration to be supported — i.e., the degree to which messages and their distribution were to conform to set patterns. Notes was designed to support a variety of functions, thus requiring Lotus to allow for a variety in structuration. Eric Sall offered the following chart to illustrate some of the structuration issues:

Degree of Structuration:	*Interactions among Users*	*Dissemination of Messages*	*Routing Patterns*
High	Reference Material	Forms	Tracking
Low	News	Mail	Discussions

Flexible discussions or E-mail may be employed where there is no common task shared by correspondents, while the sharing of "reference" data and the need to coordinate team members via "tracking" imply that communications are carried out with regard to some common goal. Low structuration activity is supported by the communica-

tions functionality of Notes, while the high structuration activity is supported through the organisational and retrieval functions.

Communications features of Notes

Notes can be viewed as a communications package in and of itself, but the issue arises as to whether it can interface with other communications systems and/or modalities. To some extent, it can. Eric Sall said that there are built-in interfaces to E-mail systems, some on-line services, and fax. Integral support for message communication involving mobile pagers or beepers is still in the experimental stage as is communication according to the X.400-protocol standard.

Notes as a group activity support tool

It is important to remember that Notes is not designed to be a dedicated group tool for word processing, idea generation, etc., in the sense of multiple users having mutual control and access to one joint product. The shared information space for Notes users consists of documents which may be updated by a single user at a time. There is no provision for multiple users to generate a single document jointly — this type of group editing must be "simulated" through merging of many documents into one larger collected document. As such, Notes cannot easily serve as a meeting support tool of the ShrEdit (University of Michigan) or GroupSystem (University of Arizona) type. On the other hand, Notes is not intended to serve this sort of role. One Notes user (Texaco) uses the SAMM group support tools (developed at the University of Minnesota) for such meeting support outside the scope of Notes.

Proliferation of Notes

Lotus Notes has been on the market since December 1989 and today still represents the only commercially available product which offers different types of work groups all these functions interlinked. A wide variety of customers have used the product on a sustained basis, and results have generally been enthusiastic. Price-Waterhouse has been one of the most cited "showcase" user sites for Notes, with some 80 servers and 5000 users spread over 70 sites. Price-Waterhouse sent representatives to the CSCW '90 conference in Los Angeles to answer questions about their adoption of the product; they had unmitigated praise for the effects Notes had already had on their operations. Similar testimonials have come from Texaco and MCI, and Lotus is ready to point out the successful sites. The proportion of acceptance over time was not mentioned, but it appears that the majority of Notes clients are positive about their experiences. No specific negative experiences were related, and in only one case — British Airways — do we know that clients decided to discontinue the use of the product into their organisation.

Eric Sall pointed out to us that the decision to use Notes is often made on a company-wide basis. To get a successful start is it important to use a planned approach in regard to which applications to start with and how these are championed within the company. Some common applications that seems to be fairly easy to get going are distribution of information, E-mail and support for sales and services.

Lotus' own Notes use

As of April 1991 Lotus had been using the product internally for about a year, serving as a primary means for communicating among Lotus' worldwide offices. Issue-oriented or task-oriented groups interact through the messaging system and coalesce into cohesive discussion circles via the "group memory" effected through Notes' database capabilities.

Perhaps more interestingly, Notes has served as the vehicle for interactions between Lotus and its customers. During the beta test period for Notes version 2.0, Notes itself served as the main venue for test site feedback, customer support, and discussions of design modifications. One surprising aspect of Notes usage among clients was their desire to use Notes to communicate with *their* customers, just as Lotus had done with them.

Another very interesting effect of using Notes is the productivity gains possible within the sales organisation. The management can, for example, follow the field activities closely and get an overview of not only the present situation, but also the history and the plans. This is something which is not offered by conventional electronic mail or by the so called sales management systems. As Eric said "you get the street feel".

A third application we were told about was the daily newsletter, broadcasted via Notes. This newsletter became a really hot topic in Notes. The newsletter contains the last two weeks of pertinent corporate and industry news items sorted into a number of categories. Interestingly these daily news bulletins in Notes are catalysing a whole lot of interaction in Notes, i.e. electronic mail and conferencing. Probably because it is so easy for the user to toggle between the applications, i.e. when reading a news item, it is easy to write and fire off a message to someone or to a group of people.

Notes' impact(s) on corporate culture

If Notes is an enterprise-wide product, one would assume it would have enterprise-wide consequences. We asked Eric Sall about the impacts of Notes on "corporate culture". There were several points made. First, due to the limited time during which Notes has been on the market, there is not a lot of experience to relate. Second, Eric claimed that Notes was neutral enough to be used in quite different corporate cultures. As an example, he contrasted the relatively loose, casual

Lotus style with the more highly constrained, structured style of Price-Waterhouse. It would seem, that the users defines their applications in accordance with their corporate culture, i.e. "loose" companies allows a wider variety of applications while the more structured companies tend to defines fairly strictly defined applications.

It seems, though, that some users have identified the opportunities to make themselves visible within their organisations with the help of contributions in Notes. This phenomenon, using Notes as a "career ladder", is observed in most user organisations, and it seems to be a feature of value to management, as competence, not only can be distributed within the organisation, but also identified for future promotions, etc.

Although Lotus' Notes links with customers serves as a point for accretion of anecdotes, impressions, and the like, Lotus is not currently pursuing any organized evaluatory study of Notes. Sall noted, however, that Price-Waterhouse is working jointly with MIT on a study of organisational/cultural impacts.

Notes usage to promote organisational self-improvement

Given the ability of Notes to serve as an "enterprise memory", we asked about any experiences with Notes in the context of organisational self-improvement, e.g., total quality management (TQM) programs. Sall mentioned that QDM (Quality Data Management) had implemented a TQM program using Notes as the IT infrastructure. He also cited the example of a U.S. Air Force application of Notes in setting up a TQM program covering supply and storage functions.

Marketing Notes

According to Eric Sall the customers motives to buy Notes are often strategic, a desire to improve time-to-market, to capture valuable information in the company or just to solve practical difficulties with company-wide communications. Today the target customer is therefore often a person holding an executive office, such as IC-managers or operations managers.

Lotus' initial marketing strategy for Notes was a novelty. The original product package was coverage for up to 200 customers, at a cost of $62,500 U.S. This mass packaging was due to the organisation-wide scope of the product and the recognition that there would have to be extensive support given customers during their adoption of the product. The original price tag included 5 days of system engineer's time for installation and training. This strategy made many potential customers apprehensive; there seemed to be no way to try out Notes without making a major financial commitment. Lotus has now changed its marketing, and Notes is available through value-added retailers on a per-unit basis at a suggested retail price of $395 U.S. per user.

Notes' expansion

Lotus is still developing and extending Notes. A Macintosh version is in the pipeline, but Sall could not quote a delivery date. A third-party company (Sandpoint) is developing a product named "Hoover" (vacuum-cleaner) designed to link Notes to on-line information services. Queries could be sent from a Notes user, automatically routed to the appropriate service, and the query response routed to a Notes document. Another company, Desktop Data, has a product which takes wire news feeds and merges them into a Notes server, providing a user front end.

Until now Notes has been rather cumbersome for remote users on the road, i.e. laptop users. Though it is possible to remotely log into Notes and work on-line, it is a slow and often tedious process. Our host, Eric Sall, told us that he never uses Notes on-line when he is travelling, which is a drawback. Now, however, Notes supports the ability for remote users to exchange mail or other kinds of information while connected, and then work on them off-line. Any mails or additions to databases these users make while off-line will be automatically routed or updated when the user next connects to the server.

Notes has already come to Sweden, although it is currently available in an English language version only. Trial usage has begun at multiple sites, including Statistics Sweden in Stockholm. Carrie Snyder and Steve King took the opportunity of our visit to ask several questions about English/Swedish language considerations in configuring Notes for the Swedish market. Current thinking on the subject is that the screen displays and on-line help facilities will all be in Swedish, while the hard documents (with the possible exception of a tutorial) would be in English.

Some technical details

The heart of Notes is its shared databases. The databases are physically located on servers. The servers are either accessed via a local network (LAN), via a bridge and high-speed connections to another LAN or via a dialled asynchronous telephone line. Today Notes runs on several PC (IBM-compatible) network hardware and software systems, for instance Novell Netware, 3COM, IBM PC-LAN and Banyan VINES using IBM OS/2. Workstations connected to a server may be any IBM compatible PC running IBM OS/2 Presentation Manager or Microsoft Windows 3.0.

Each server has a copy of the databases that are shared between two or more servers. Updating of the databases is done by replication of the databases between the servers, either at fixed intervals or in real time, as specified by the systems manager. For security Notes allows encryption of a whole or a part of a message, a part of or an entire database. Optionally an user might have all incoming messages encrypted. The

encryption is based on RSA public key, in accordance to the X.500 standard. Notes also uses digital electronic signatures to detect attempts to tamper with a message during its travel.

Notes is structured as a client/server-function, with a user interface that is compliant with the SAA/CUA-guidelines. To a user Notes is presented as a series of six folders. On each folder, or workspace, users place icons representing whatever databases they use: electronic mail, continuing discussion, archival information such as catalogues and lists, and so on.

Within the Notes environment Notes provides tools for building applications. To help customers get started a variety of templates is included in the product, for instance Client Tracking, Discussion, Document Library, Name & Address Book or Status Reporting.

Reflections on Notes

Kristina Sundberg, Infologics AB

I got a very favourable impression of Notes. Having been a user of, sometimes, up to five different E-mail and conferencing systems and suffered through more or less successful attempts to file transfers, joint editing and forwarding of messages, Notes seemed very nice, indeed. Also, it didn't take long for me too see several practical applications that could be useful in our company. Of course it is pretty easy to get enthusiastic about a product that seems to offer what Notes promises, especially when we "only" got a demonstration during our visit, we did not have the time to sit down for a hands-on session. I also found the user interface attractive, it seemed, to me, easy to use with a good use of space and colour on the screen to structure the information. In this aspect Notes also compared very favourably to existing E-mail and conferencing systems.

I would have liked to hear a bit more about the process for a company of getting started to use Notes. If a may make a comparison to KOM/PortaKOM-like conference systems, there seems to be a period where there is not really enough information, or users, in the system to get a widespread natural daily use. To minimize this period, there is also the very practical question of who will take the time to enter the missing "basic" information, such as customer descriptions, address books etc.

One aspect we didn't discuss in detail is what happens when the amount of information in the system and databases grows. It would be very interesting to, in some years, to see what effect this kind of an *available* organisational memory or archive will have. Will it be used as the possibilities promise or will it become an easy-to-use communications tool, with the "memory" locked away on back-up tapes in a fireproof vault?

Randall Whitaker, Department of Computer Science, University of Umeå

Notes is a tool to support the interaction and mutual tasks of groups, but it is groupware of an entirely different sort from the meeting room support systems which dominated the TELDOK presentations and visits. It is intended to support widely distributed users throughout an organisation, providing them with an ongoing medium for electronic meetings and work. The meeting room facilities the TELDOK group visited were designed for limited duration use by any single group. While the meeting room facilities had computer support for collecting, merging, storing, and manipulating shared data products, none of them were configured for the size and complexity of shared data to be found in Notes databases.

I cannot help but draw parallels between Doug Engelbart's AUGMENT system and Notes, at least in terms of their organisational scope; their emphasis on providing a powerful, flexible data sharing environment for "knowledge workers"; and their merger of telecommunications with advanced data retrieval mechanisms. Notes seems to represent the first commercial appearance of one single product aspiring to Engelbart's three-decade-old vision. Another point of comparison is that Notes resembles the sort of organisational data/information resource which Engelbart claims is an essential element of his Bootstrap Initiative for organisational renewal.

The importance of Notes is not discerned by simply looking at it as a combined messaging/database product. One must step back and see this as an *organisational* tool before its novelty becomes apparent. As the first commercial such organisational tool, I believe Notes is (sorry for the pun) noteworthy. Given the size and apparent commitment of Lotus to the product, I further believe that Notes will be with us for a long time.

One limitation of Notes is that it can handle only shared data (e.g., messages). Groups must simulate joint access in manipulating documents into one shared product (group editing). As such, Notes is an appropriate support tool only for those groups which generate and manipulate documents. Lotus recognizes this in their literature and their presentations to us.

Peter Docherty, Institute for Management of Innovation and Technology

Like my colleagues, I could not fail to be impressed by the sheer professionalism we met at Lotus Development. First impressions, though based solely on the vendor's presentation and with no opportunity for own hands-on experience, were very favourable. The product "Notes" would seem to constitute a powerful datasharing environment, an early example of the next generation of products beyond E-mail and conference systems. As a "different time/different place" product, it

serves the area of most import in CSCW. Randall Whitaker's association to Doug Engelbart's vision of organisational support with the AUGMENT system seems very appropriate. At the corporate level there are exciting links that can be made between Notes database facilities and the current developments and debate regarding organisational memory and, in extension, organisational learning.

Lotus professional launching of Notes seems to have met a strong need in the marketplace. Notes has been given a very positive reception and is selling like hot cakes. Lotus has extreme confidence in the quality, scope, flexibility and viability of their product. After roughly three years on the market Lotus can with confidence refer to third-party evaluations of twenty Notes installations, as well as to on-going MIT-research into the organisational and cultural impacts of the product on their biggest customer Price-Waterhouse. Top management in that customer had perceived that Notes was "dissolving" its formal bureaucratic culture and wanted to establish the mechanisms involved and their control. These studies should do much to facilitate other management's decisions to invest in such support systems.

B G Wennersten, Wennersten InfoNetwork AB

What I consider to be the main attraction of this system is that it offers an integrated shared information space, or a fullfunction information marketplace, to all people attached to the systems — much more than a conventional electronic mail and conferencing system does — either these people are working within a corporate structure or or a virtual organisation of ad hoc type.

The possibility to easily establish logical work groups seems to be very good — much better than in a conventional mail or conference system, as different forms of information (more or less structured) and more or less interaction can be practiced in the system. It is, to some extent, possible to use Notes for group editing of documents. But so far, it does not yet seem to be the ultimate solution.

The ease with which meetings take place in Notes is remarkable. Why? Compared to a plain electronic mail or conference system, Notes offers so many more applications that the users more frequently are working with the system during the day. Consequently, the user can with very little time and effort participate in many meetings, respond to many questions (either directed to the user specifically or of the type "does anybody know?") and read information relevant to the job.

Acknowledgements

We would like to thank our Cambridge hosts for their hospitality and willingness to frankly discuss both Notes and its potential for the future: Eric Sall, Carrie Snyder, and Steve King. We would further like to thank Per Ahlstedt of Lotus Development Nordic AB for his assistance in setting up this visit.

1.4 Microelectronics and Computer Technology Corporation

by Ulf Peters

The MCC is a consortium consisting of different companies in the IT sector. The company carries out precompetitive research programmes and projects on issues of direct interest to its contractors. Its projects often involve the development of both hardware and software. Each one of the shareholders may propose a topic of research, and in order to guarantee that each shareholder gets a chance to influence the overall programme, they are all represented on the board. The individual research project is financed by the underwriting of interested companies — which may or may not be shareholders. The current Engelbart Bootstrap initiative is, for example, being formed under the auspices of the MCC.

The TELDOK group was received by Gail Rein and Jeff Conklin, both in collaborative technology research. Gail Rein illustrated the development of MCC and the profile of its business idea by describing the projects which have been running for the past few years. The individual projects succeed each other to a large extent in chronological sequence, forming a line of development where results from one project become input to the next. The first project in the CSCW area was the "Project Nick" on electronic meeting rooms. The findings of this then helped defining the next one: the "Liza" project which dealt with the development of a groupware toolkit. The "gIBIS" project developed a group hypertext and the "GROVE" project a real-time group outline editor. The following "Visex" deals with shared windows and the recent "Jiva" project works with coordination technology. The latter project focuses the need to bring all the results from the different projects together in a comprehensive concept for collaborative technology.

MCCs pay special attention in their work with collaborative technologies to a set of problems that normally have to be dealt with — but are seldom addressed — in the development of new systems, namely the dynamics of a group of people interacting with one another. From the very beginning in the "Nick" project, MCC has taken a very interesting approach to the problems facing the system developer by using the methodology *"Group Metre"*. This elevates the human factor from simply being a problem related to the physical and cognitive ergonomics of a given system, to actually being one of the building blocks of the system as such.

The "Group Metre" methodology starts by defining the different "roles" existing in the group and then goes on to study thoroughly the interaction between them. This is done irrespective of the particular technology that might be involved. The whole group process is studied

and everything that happens is recorded. The analysis is visually represented in a matrix form, describing the meeting in terms of interactions between the identified situations that arise over time. The picture of the meeting thus obtained is especially interesting, as the *emotional* development of the group as such is also taken into account. If the group is tense, hostile, friendly, relaxed or elated — all is carefully recorded and taken into account. The analysis scheme is based on Bales[6] (1950) "Interactive Process Analysis" method for the study of group behaviour. Only when this has been done, does the attention turn to technology and each of the studied situations is analysed to see if "new technology" can in some way be of use. Rein stressed that the central point of the procedure is that the social factor in human behaviour must be an integral part of the development of technology for groups. This is an absolutely necessary condition for the systems to have any realistic chance to succeed.

The taking into account of the emotional development of the group and the stressing of the importance of the social dynamics in the technology development, makes the term "collaborative systems" a very fitting one. The results so far have been so interesting that the shareholders have been and are strongly committed to the development of the projects.

Jeff Conklin in his turn described a path of work which has gone from an original focus on electronic mail and bulletin boards for support of software systems design, to a focus on the group decision making process. The central question that Conklin poses is: Is it possible to explain why a system turned out the way it did by measuring and understanding the group dynamics involved in its development process? The question is valid for any type of system, for instance the designing of a highway network to regulate the flow of traffic.

The processes by which such systems are developed are extremely complex, involving very many subprocesses resulting in subdecisions. Each subdecision forms an input for new phases and subprocesses, etc. The very complexity of the work thus makes it extremely difficult to go back to look at a decision made at an earlier stage and understand what lay behind it. This is especially difficult as the organisation does not systematically record, "memorize", why or how a specific decision was arrived at. This makes it virtually impossible to evaluate if the decision is still valid and adequate. Added to this, circumstances and the social situation and relationships within the group which made the decision will also have changed.These are factors of fundamental importance for the understanding of group work, as Rein pointed out previously.

The problem thus focused on by Conklin is the one of "corporate memory" — corporate memory not only in the aspect of retaining a

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6 See Weick, K.E. Systematic Observational Methods. In: Lindzey, G. and Aronson, E. (1968) *The Handbook of Social Psychology*. Reading, MA: Addison Wesley.

record within the organisation of *what* actually happened and *how* the decisions were made, but also an understanding of *why* the decisions were taken the way they were. The ability to retain a corporate memory in this sense is of enormous value, not only in complex technical development projects, but also in procurement processes, legal proceedings, etc. The common denominator for all of these different potential applications is the ability to review continuously a complex process and reevaluate decisions taken earlier during that same process — in a way a sort of "real-time, self-correcting navigation instrument" for complex processes.

Conklin suggests a model for human discussions which is a counterpart to the Bohr model of the atom. The analysis of the decision making process of groups focuses on three main factors which he sees as "elementary particles", parallels to the ones of Bohr:

- The *issues*, which are the questions or tasks to be performed and which are the cause for the group meeting in the first place.
- The *positions*, which are the different points of view of the participants. They normally represent the specific interest of the participant presenting them, but they also constitute different proposals for solutions.
- The *arguments*, which are all the different motivations put forward by the participants in support of their respective positions.

In order to capture the market based on this need to document decisions and rationales, Conklin has recently formed a new company, "Corporate Memory Systems" (CMS), as a spin off from MCC. The company has just received its first contract from a large electricity company in Texas for the introduction of a corporate memory system. Two lines of development are being pursued: hypertext, capturing decision process linkages, and groupware. The *Indentitest* system is employed for minutes of meetings and decisions which are essential to their system. An extended field study will be made at NCR. Results so far are mixed but promising and the installation of a system is feasible. One of the two main potential problems regarding the system is how to collect the necessary data for the analysis of the meetings. A number of methods are possible, like video taping the meetings, taking extensive minutes of the meetings, or making careful descriptions of them afterwards, but the uncertainty remains that each method of data collection may influence the course of the meeting itself in a particular way. The other main potential problem is if the system will be able to identify *all* parts of the process that need to be reorganized. If all parts are not identified, the resulting improvement might just not be good enough, and if on the other hand the system is too ambitious, the process might become far too expensive. These question-marks may however be cleared up as practical experience is gained.

I feel that the approach taken to the topic of collaborative systems at MCC is undoubtedly very stimulating. It was interesting to see how far their work had developed. It was fascinating to notice a sort of "renaissance" in the attention paid to the irrational and emotional elements of human nature in the context of development of computer systems. The strong focus on the social group mechanisms introduces a widening of perspectives to systems development which might bring the computer systems closer to human nature. Hopefully this could be one step on the road to a good man/machine interface, built on the terms of reference of *man* — not the machine. MCC is making good progress and it will be very interesting indeed to follow their work in the future.

1.5 NCR Corporation

by Bengt-Arne Vedin

Once upon a time, there was a tale of Snow White and the seven dwarfs. Then it became IBM and the BUNCH. This had nothing to do with Butch Cassidy and the Sundance Kid, but rather with some initials:

B Burroughs
U Univac
N NCR
C Control Data
H Honeywell

Now Honeywell is profitable again, having spun off its computer activities to NEC and Bull, while the latter now facing record losses. CDC is almost constantly restructuring in its efforts to return to economic health. Burroughs and Sperry Univac have combined into Unisys. NCR has been the only traditional computer manufacturer outside IBM that has stayed relatively undeterred by the constant turmoil. But after almost half a year of hostile courting from ATT, NCR CEO Exley gave in, and as of May 1991, NCR merged into ATT.

The attraction of NCR to ATT stems from its solid basis in the financial, retail, and distribution markets; cash registers still being of solid importance. NCR has never, however, we learned at Atlanta, been a pioneer. If it is now going into software, it is doing so reluctantly. The six months of debate over the ATT offer, and various concurrent anti-takeover measures, have of course in the meantime slowed down "business as usual".

The position of K C Burgess Yakemovic in the company is interesting, however. She is one of a small team that is concerned with social and human aspects of information technology. They focus on more

than physical ergonomics. They collaborate with universities, primarily Georgia Tech. It is only a short walk from Burgess Yakemovic's office to the powerful laboratories of the Georgia Tech computer department.They are collaborating on multimedia with Georgia Tech; the research is done at the university and the development from prototype to product is done by NCR.

While not a leader in software development, a large company such as NCR is keen on coordinating its various efforts. They, as many others, are trying to manage teams collaborating in networks, or teams of teams. The key to success in such joint efforts lies in keeping in mind the metaproject or program goals, and continuously tracking progress at various nodes in the network. Electronic mail, groupware, etc. may geared to such coordination tasks, directed at managing what is caught by the term "work flow". NCR has not only started using but also introduced to the market a work flow environment, called "*Coordination*".[7] Electronic mail is at the core of the system, and files are shared, as is task management.

K C Burgess Yakemovic shared with us her basic scepticism towards the more exaggerated promises for groupware. She judged it important not to let any particular technology set the agenda, but rather real problems.

So far, there have been too many solutions, looking for problems to be solved. Those responsible for developing these systems have tended to overlook basic human behaviour, individual and collective. But there is also much more to learn about cognitive and social aspects, highlighted only through the emergence of this technology.

Being a large computer company, NCR interacts frequently with MCC. K C Burgess Yakemovic thus has a regular exchange of views and experiences with the groupware team at Austin, and has been involved in discussing the various prototype products developed there.

An example of a joint venture between NCR and MCC is a project conducted by Burgess Yakemovic and E. Jeffrey Conklin and reported to the CSCW '90 conference. Their paper was called *Report on a Development Project Use of an Issue-Based Information System*. The paper is important because it is one of the few studies done on a real group of people, if only the in-crowd, using computer support to get their work done. The field study concerned software development in a group of five people during two years at NCR. The issue focussed on how to capture information on *why* certain actions are taken, an attempt to capture *decision rationale*. Failure to do this has proved very costly in large development projects where such information is soon forgotten.

To overcome the problem the IBIS method was used. IBIS structures Issues (problem statement), Positions (statement of possible resolutions

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7 Lotus is another example presented earlier in this chapter.

of an issue) and Arguments (pros and cons of a position). The group used Indented Text IBIS, itIBIS, the first 18 months and them switched to Graphical IBIS, gIBIS, during the last 6 months.

The observations made during the introduction of the method and itIBIS showed that they were accepted by the group because the system analyst, Yakemovic, used to file information for later use, i.e. the new technology was an improvement on her existing method. Other factors important for acceptance were:

- management support
- introduction at the very beginning of the project
- the training provided
- familiarity with the tools used (PCs and text editors)
- that all members of the group had long previous experience with commercial software development (on average four years)

Observations on the capture of information showed that it improved the quality of notetaking and that it was easy to find what you were looking for in the notes.

Observations on the development process showed that:

(1) It helped the group to detect errors in the requirement analysis and design,
(2) It improved productivity in meetings and
(3) It improved communication between the team and other departments.

To conclude, IBIS functioned as:

(1) a qualitative GDSS (Group Decision Support System) in that it provided a non-intrusive framework for problemsolving,
(2) a conversation structuring device and
(3) a group memory.

One improvement of gIBIS would be to make it portable so as to be able to use it meetings.

The future of IBIS

As far as we were able to understand from what Yakemovic said, Conklin was not and is not interested in empirical studies with IBIS. The only documented empirical use of it seems to be the abovementioned paper. IBIS has been around for at least five years now as a research prototype. It would be interesting to know if anyone is planning to really develop it into a product.

1.6 Ventana Corporation

by Mattias Söderhielm

The Ventana Corporation is the result of Electronic Meeting Systems (EMS) research conducted at the University of Arizona (UA). A small but ambitious, high-growth company established in 1989, Ventana markets and further develops the University of Arizona's GroupSystems software. The company currently has 23 employees, 10 of whom work in research, and sales amounting to "a few million dollars", according to President Donald Coleman.

Thanks to UA's cooperation with IBM, Ventana has a several-year, multimillion-dollar contract with IBM that allows both IBM and Ventana to market this software (IBM had had exclusive sales rights up until the autumn). To date, there have been approximately 100 installations of GroupSystems, of which about 20 were sold by IBM and roughly 10 by Ventana. The remaining installations (about 35) have been made at IBM and various universities around the world. Ventana is currently marketing its system aggressively, using productivity enhancement as its principal sales argument. Utilizing research findings from UA to support its argument, Ventana maintains that GroupSystems boosts meeting productivity by some 50 percent, while reducing the time required from decision to execution by a minimum of 50 percent.

Ventana is about to enter a distribution agreement with companies in Germany and Switzerland and is seeking distributors in the Netherlands and Great Britain. Although no European distributor has been appointed yet, the company has carried out a few installations at European companies, including NCR in Augsburg and Smith, Cline & Beeham in Paris (which uses a portable system for sales personnel in eight European countries). Ventana does not have any marketing activities planned for Scandinavia at the moment.

The universities that have purchased GroupSystems have received a substantial discount on the software in return for conducting research on EMS and informing Ventana about their findings and activities. The majority of major universities in the U.S. have installations, and there are also a few in such European cities as Oslo, Manchester, Lausanne and Ljubljana.

The project is primarily being conducted in departments of administration, economics, information systems, etc. No psychological or linguistic research has been carried out on GroupSystems so far. Foreign experience with GroupSystems indicates, according to Ventana's Cynthia Garfield, that the software performs well in non-American corporate cultures. No difference in behaviour or results has been observed in foreign groups.

Donald C. Coleman, President and CEO of Ventana, described GroupSystems to us during our Visit. He was assisted by Marie

McDermont, who works in the Marketing Department and who was our facilitator for the day, and by Cynthia Garfield, who had recently returned from a demonstration in Paris. Mr. Coleman explained the basic tools available in GroupSystems:

- *Electronic Brainstorming (EBS)*: sends ideas more-or-less randomly to other participants for comment or to inspire new ideas.
- *Idea Organisation*: allows participants to categorize information that has been created by EBS, for example. These categories are then made public in order to establish a common structure.
- *Voting*: provides different opportunities to examine the various opinions in the group. Methods include ranking, yes/no answers and multiple-choice questions.
- *Topic Commenter*: allows participants to give their opinions on a number of subjects specified by the facilitator.
- *Alternative Evaluation*: gives participants the opportunity to "grade" different alternatives in accordance with certain criteria. The alternatives and the criteria are defined by the facilitator. Results are presented as a statistical evaluation of the responses. This makes it possible to see the differences in opinion within the group.
- *Policy Formation*: lets the facilitator initiate work on a final document, for example. A draft is sent to the participants who revise the document and send the results back to the facilitator, who then makes the appropriate changes. This process is repeated until the final document is ready.
- *Briefcase*: is a collection of small tools that can always be used regardless of the main tool is being employed. The collection includes Mood Meter and Quick Vote.

  The current price for these tools is USD 42,500. Ventana also offers a number of additional tools for USD 15,000.
- *Stakeholder Identification*: allows participants to identify individuals they believe will be affected by a particular plan, to state what they believe these individuals think about the plan and to indicate whether they think these individuals are for or against the plan. The results are plotted on a graph.
- *Group Outliner*: is a tool that utilizes a hierarchical form (outline) to allow participants to comment on subjects.
- *Group Writer*: allows participants to develop a text simultaneously.
- *Group Matrix*: permits participants to indicate the relationship between two categories in a matrix form. One category is represented by columns and the other by lines. The relationship can be expressed with figures or words.
- *Group Dictionary*: allows participants to define key concepts. The definition of each concept is agreed upon through discussion.
- *Questionnaire*: lets the facilitator send a questionnaire to each participant.

GroupSystems is intended for eight to 25 DOS computers, one of which is used exclusively as a file server and one of which is used by the facilitator. These are linked to a local area network (LAN) and can either be stationary or portable computers. The user interface is based entirely on texts with some pseudographics. This allows the user to navigate by pressing the "Alt-F), pg Up and Esc" keys. This is very easy to learn, even if the user has little previous computer experience. The fact that the entire system is hierarchical is a major disadvantage, however, as this prevents the user from switching tools easily. Instead, the entire group must stop working with the one tool, and the facilitator must start up the other tool. This procedure is extremely time-consuming. A system that would allow windows to facilitate easy changes would be better.

When asked whether Ventana plans to switch to the Windows operating system or any other platform, Mr. Coleman said that negotiations were under way that are aimed at developing the EMS system for the Apple and UNIX worlds. Dr. Ben Martz, Vice President of R&D, said that no resources had been allocated for this purpose to date, however. A transition to Windows would mean, according to Dr. Martz, that the entire program would have to be rewritten.

The facilitator plays a major role in the current system, even if Ventana claims that a two-day training course is adequate to get a facilitator started. If a group is homogeneous and not too large, it is relatively easy to lead. If the group would not normally require a facilitator, then the GroupSystems facilitator does not require any special training. A trailor-made training program is available at a cost of USD 1,500 per day for groups of no more than six. The program is designed to help a facilitator cope with difficult groups (such as our TELDOK group). Ventana says that it has not had any problem selling the facilitation training program. IBM, on the other hand, has encountered problems. Other services offered include meeting-room design, USD 5,000; maintenance and facilitation support for 10 percent of the software cost annually; and technical support for USD 1,000 per day.

Changes in the system that are in the works, according to Dr. Martz, include improving the voting tool and the accord between the various parts of the system (which was originally developed separately) and the user interface. A version that will facilitate meetings held simultaneously in several locations is also under development. BellSouth already uses a 1.5 Mbit/s link between the local area networks in two TWS rooms to hold long-distance meetings. This solution involves hardware only, however. The system is also about to receive routines which will permit distributed meetings, with links between the various places that are no faster than some 10 kbit/s. Moreover, it will also be possible to hold a meeting without having a special facilitator, as this function will be assumed by one or more participants.

Although Ventana is not planning to incorporate video into the system (for example, a special window on the screen), the company is

testing the use of a video teleconferencing system together with GroupSystems. Ventana believes that it is important to complement electronics meetings with face-to-face communication, even if it is via video. A minimum requirement for a simultaneous TWS meeting held in different locations is the possibility of talking to one another, which is easy to accomplish using conference telephones.

The link between Ventana and UA is still strong, and two developers actually work at both places. UA is doing research into the long-term changes that can be made to GroupSystems. One of the more esoteric projects that Dr. Martz hopes to incorporate into the system one day is artificial intelligence (AI), especially a so-called semantic network. A number of simple functions that help the user find his way around in a meeting are already available. For example, key words can be defined in advance and the system can inform the user when these words appear in a comment. What UA is trying to achieve is more intelligent routines that will enable the user to define abstract concepts of interest, so that the system can provide him or her with texts from other participants that are related to these concepts. A type of filter function that would divide meetings into submeetings once a discussion becomes to "broad" could also be incorporated in to the system.

If Ventana switches from DOS to more user-friendly and less hierarchical operating system and if Ventana takes advantage of the research findings from the universities using GroupSystems, the company can be expected to achieve a dominant position on the EMS market. But competition should not be underestimated, nor should the company rely blindly on IBM's assistance. If this were to be the case, Ventana would simply become another one-day wonder on the software market.

Chapter 2 University Institutions

2.1 University of Arizona

The work of the MIS department at the University of Arizona

by Peter Docherty

Our host at the Department of Management Information Systems (MIS) at the University of Arizona was assistant professor Douglas Vogel whose research interests bridge the business and academic communities in addressing group support system development, implementation and evaluation issues.

The MIS department at the University of Arizona is one of the most well established and prodigious groups working in the field of CSCW — mainly in the area of electronic meeting systems (EMS). It is engaged in two types of research: 1) developmental — attempting to create improved work methods and 2) empirical — attempting to evaluate and understand them. The initial work of the group in this field focused on the development of tools and techniques to support groups of analysts and users in the construction of information systems.

The second phase began in 1984 with the construction of a special-purpose meeting room to support the same-time/same-place meetings of these groups. It was this historic room that we had the opportunity of visiting in its final months of service before being replaced by a new room with a radically new design. The sense of history we felt on entering this room roused memories of NASA control rooms and SAC war rooms from the cold war era. The room would suffice to give us some impressions of basic CSCW applications but with a definite risk that its obsolescence would do CSCW a disservice. Those of us moving on to IBM's own facilities would be able to compare today's systems at Gaithersberg with yesterday's at Tucson.

The Arizona group's experiments in phase two of its programme went beyond systems development to encompass strategic planning. Phase three saw the establishment in 1986 of four major research projects with IBM. By late 1991 the department will have seven meeting room facilities which can address different kinds of problems. Its "GroupSystems" software is used in EMS facilities at 22 universities and 12 corporations. By January 1992 IBM will have 56 such facilities. More than 20 laboratory experiments and 15 doctoral dissertations have been carried out at Arizona.

The theoretical point of departure in the Arizona group is that the effects of EMS are contingent on a myriad of group, task, context and technology factors that differ from situation to situation. Group characteristics that can affect processes and outcomes include (but are

not limited to) group size, group proximity, group composition and group cohesiveness. Context characteristics include organisational culture, time pressure, evaluative tone and reward structure. There are at least four theoretical mechanisms by which the EMS can affect the balance of gains and losses in the meeting: process support, process structure, task structure, and, task support (Figure 2.1). Process support can be provided by the EMS in at least three ways: parallel communication, group memory and anonymity. EMS can support process structure globally by providing agendas or specifically, e.g. via talk queues. Methods for improving task structure include problem modeling and multicriteria decision making. Task support can be assisted by organisational memory.

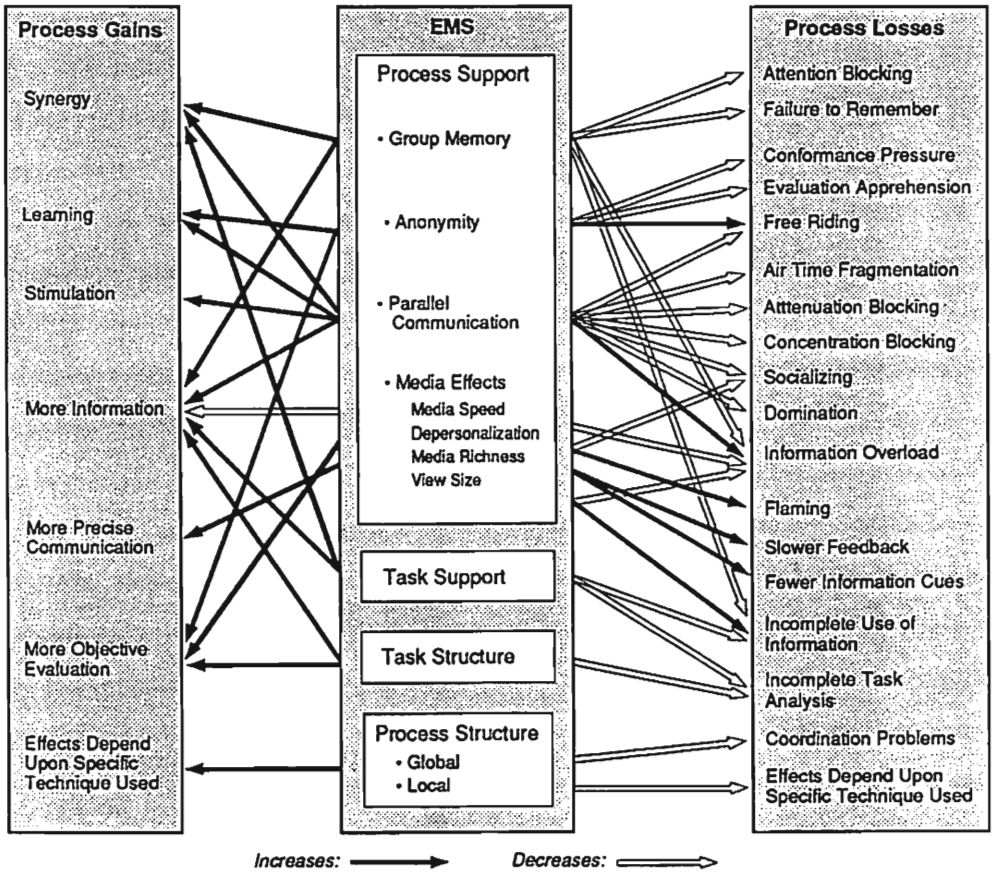

Figure 2.1 Potential EMS effects. (From Nunamaker et al., 1991)

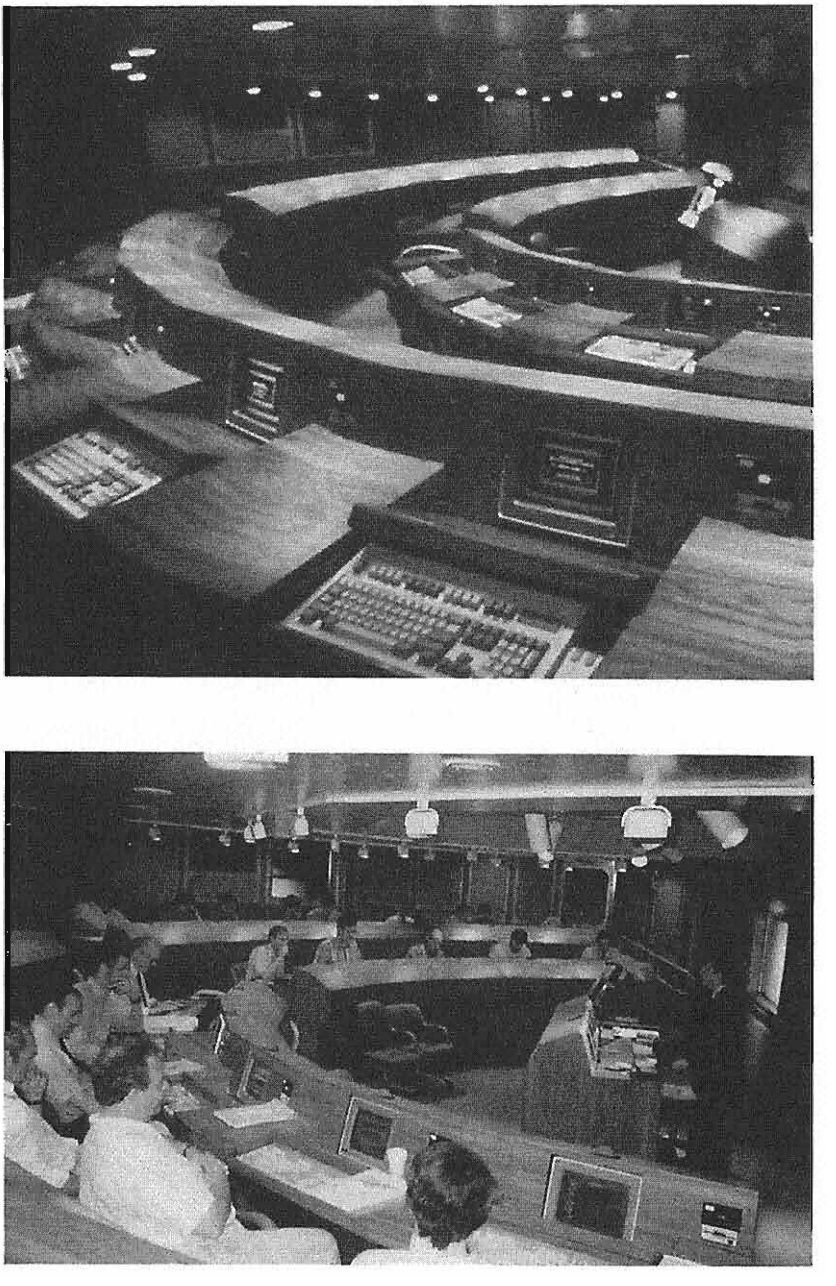

Figure 2.2 The collaborative management room at the University of Arizona.

The room we visited was used for Arizonas early work on supporting large groups that meet at the same time and place. The general design of the GroupSystems builds on three basic concepts: an EMS meeting room, meeting facilitation and a software toolkit. Figure 2.2 shows a picture of this meeting room. It is based on a number of personal computers linked to a network, arranged in a horseshoe shape and set up like an amphitheatre. A large screen video display and other audio-visual aids, such as whiteboards and overhead projectors, are located at the front of the room.

The person chairing the meeting, its leader/facilitator,provides four functions: 1) technical support by initiating and terminating specific software tools, guiding the group through the the technical aspects necessary to work on the task. 2) chairing the meeting, maintaining the agenda and assessing the need for agenda changes. 3) agenda planning (together with others) to highlight the principle meeting objectives and developing an agenda to accomplish them. 4) providing organisational continuity by setting standards for use, developing training materials, maintaining the system, and acting as champion/sponsor, which is key to successful technology transfer.

The GroupSystems software toolkit provides tools in five areas:

1 Session planning and management
2 Group interaction
3 Organisational memory
4 Individual work
5 Research data collection (Figure 2.3)

The GroupSystems allows distinct styles of process support with different amounts of electronic and verbal interaction, ranging from the situation where only one person enters the information in the system and verbal behaviour predominates, to the interactive style in which the parallel, anonymous electronic communication channel with a group memory is used for almost all the group communication. Virtually no one speaks.

Figure 2.3 shows how the Arizona group classifies group activities — each class being supported by specific software tools:

1 Exploration and idea generation, covering the development and exploration of issues relevant to the task.
2 Idea organisation, covering the synthesizing, structuring, and organising of ideas into specific alternatives which may follow from the generation of ideas.
3 Prioritizing, in which the group evaluates these alternatives.
4 Policy development and evaluation, via such formal methodologies as stakeholder analysis.

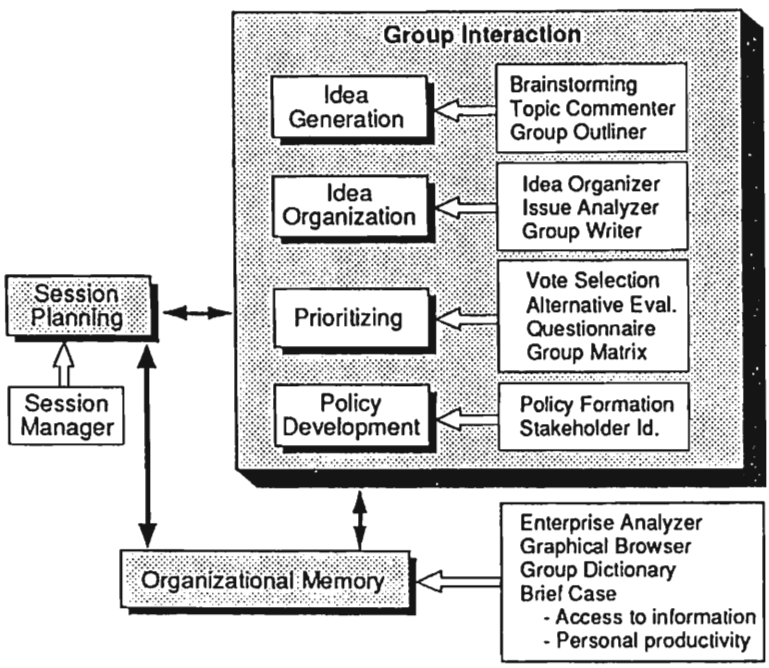

Figure 2.3 GroupSystems tools. (From Nunamaker et al., 1991)

The empirical laboratory experiments carried out by the Arizona group are aimed, amongst other things, at developing contingency theories to identify the best fit between specific EMS components and the specific group, task, and context characteristics. Their work has focussed on the variables: anonymity in EMS meetings, size and proximity of groups, evaluative tone and task activities. There is very little evidence that anonymity leads to increased performance and some evidence that the reduction of social cues leads to behaviour outside social norms.

Their EMS research indicates that the optimal group size depends on the situation and can, in some cases, be quite large — an important moderating variable being the type of facilitation provided. Performance is affected by such information characteristics as ambiguity, uncertainty and equivocality. There is weak support from Arizona and Indiana that the interactive (largely nonverbal) form of EMS meeting generates more ideas and gives greater satisfaction than other forms. Again, regarding idea generation, distributed groups remain more task-focused and thus more productive than proximate groups. Regarding evaluative tone, their laboratory tests indicate that a critical tone and anonymity may improve idea generation, but also lower participant satisfaction.

The basic finding of the Arizona group to date is that the effects of EMS *are* contingent on the situation — fewer benefits accruing to to small, cohesive groups working in supportive contexts. Other general conclusions are:

- even subtle differences in group situations may result in significant differences in performance,
- that EMS and non-EMS meetings *are* different has been established, but why has not been completely explained.

Researchers at the University of Arizona claim that group work is enhanced in a many situations due to the following:

- All participants can work simultaneously (human parallel processing).
- Everyone participates in accordance with the same conditions.
- Behaviour that can negatively influence a meeting is prevented.
- It becomes practical to have large groups and effectively utilize a group's collective expertise, experience and information.
- It is possible for a group to choose from among a broad spectrum of structured or unstructured techniques and methods to complete a task.
- Access to external information can be gained.
- Results can be saved from one meeting to another in an organized manner.

Hands on the electronic meeting system at the University of Arizona on the 15—16 April, 1991

by Herbert Söderström

Ventana is an archaeologically interesting cave used by stone-age indians, not too far from Tucson, Arizona. Excavations are currently under way. It is more likely that this historic site provided the source of the commercial name VENTANA, the electronic meeting system (EMS) tested by us, than the homonymous-sounding name of Ventura, which was what we first believed. (Ventura is a typographic PC system that has conquered the world.)

We entered a dark room with two large, but not unusually large video screens mounted on one of the long sides of a rectangular room. The seats were arranged in tiers in order to provide a better view of the electronic text. Nevertheless, participants sitting in the wings complained that they had difficulty in reading the screens. For some reason, both screens had been placed flush against the wall. It would have been a simple matter to mount them at a slight angle so that each half of the auditorium could see at least one screen.

The auditorium aroused mixed feelings at first sight — it resembled some kind of amateur Houston Control Centre. In front of each seat

was a VDU covered by *Venetian blinds?* and a keyboard hidden under a panel. Upholstered folding seats brought to mind today's theatres. The interior was made of hard plastic imitation of high-grade wood. The image that came to mind most, however, was that of a junior high geography classroom, with Dr. Douglas R. Vogel by the podium surrounded by eager participants. We were now about to test the "truth room", a place where we could write any truth we desired with complete anonymity and without risk!

We had already contemplated the idea of anonymity prior to this "seance". Was it really true that no one could see who had written anything? As we wrote our messages on a local workstation first and then sent the file to the group workstation, it proved to be practically impossible (at least in our group) to see who had done what. Anonymity was guaranteed.

Dr. Vogel was our facilitator, the individual who led the seance. He began by explaining a little of the theory behind EMS, in terms of Robert Johansen's well-known 2 x 2 matrix typology regarding communication in time and space:

Same time Same place	Same time Different places
Different times Same place	Different times Different places

Meetings can be held via computers at the same time and at the same place (the one extreme), as well as at different times and at different places (the other extreme, which is the most common for electronic mailboxes and conferences). A mixture of the two forms is also possible. The distinctions are somewhat obscure, at least for a Swedish social scientist. What is meant, for example, by the "same place"? If a participant is sitting in the first row of the Paris Opera and another participant is in the fourth row of the standing-room area, does this mean they are in the "same place"? Based on the shape of the room and the fact that the word "proximity" was mentioned, it may be possible to agree that the "same place" must allow some form of minimum non-verbal personal contact — a problem which literature cannot express in the digital distinction the "same place/different places" (more about which will be discussed later).

It is clear that the EMS experiments focus entirely on the "same place, same time" aspect. It is possible to exchange views either by writing messages on the group VDUs or by talking at the meeting. We grew more and more anxious to start, as Dr. Vogel continued to explain his basic hypothesis:

As each participant is anonymous, EMS facilitates improved communication between participants generating numerous alternatives prior to the decision.

The time for hands-on experience had arrived. It took some time for us to decide what to discuss. This took place orally, complete with all the characteristics found in meeting where no one is responsible: unstructured ideas, talented and complicated objections, giggling and impatience. Eventually, we agreed to discuss the formulation of our study tour report — a completely idiotic idea which I warmly supported. This was our first experience in working together as a group. Some members of the group had visited other places previously, but it was going to be difficult for the new members to discuss the report before the trip had actually begun! Still, this was what was decided, which obviously influenced the results.

We focused our collective concentration on proposing suitable contents, and the room became filled with the mysterious and mythical sound generated by 25 people using keyboards simultaneously. It conjured up the nostalgic feelings of crayfish clattering around inside a large aluminium kettle on a warm August evening.[8] We were to eager to try *everything*. A few bold individuals created complete tables of contents, others offered comments, comments and more comments. In a fit of suffocation, the computer soon began to scroll large chunks of text on the big screens faster than anyone could follow. In fact, we were only able to cover Step1 of EMS: Brainstorming.

The stress continued to mount for those of us who were in the habit of reading everything meticulously. For some reason, I had decided that I should read everything that was written, that a "meeting" meant that each participant had access to everything produced by the group. Later readings have shown, however, that researchers in Tucson had envisioned a scenario where it was possible to take a coffee break, return and jump straight into the heat of the debate again, thus ignoring the wise views that had been expressed in the meantime. This, in turn, is significant for the concept of the "same time, same place".

One participant took the idea of anonymity quite seriously and refused to reveal his/her identity. He/She referred to himself/herself as "other", and produced a table of contents that won little approval, which might explain why "other" continued to remain anonymous.

The written conversation took place in English in order that the Americans travelling with us and the facilitator might have access to our material. Perhaps this restricted out thought processes too much, as the results were hardly impressive.The majority of us left the session with a distinct feeling of dissatisfaction.

Our frustrating attack on the system prevented us from exploring the full range of its possibilities. Producing ideas is only the tip of the iceberg. The system permits evaluation and ranking of ideas, a special, rather complicated voting process, the division of the material into

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8 Translator's note: Eating crayfish in August, when they are in season, is one of the highlights of the Swedish social calender.

different sectors, the possibility of searching with keywords and, last but not least, the ability to store all the written material from the session on a diskette. We were given a list of everything the system could accomplish. We were also given the diskette containing the sum of our collective efforts, but a later review confirmed our initial feeling of dissatisfaction.

Later on, we discovered some of the reasons for our relative failure. At the Ventana Corporation facilities, the company that markets a commercial version of the university's EMS under the name of Ventana Group Systems, a session is never successful unless the facilitator and the group have agreed on the scope and limitations of the subject prior to the first meeting. We rushed in totally unprepared.

Group Interaction Tools

	Activities Supported	Process Support	Process Structure	Task Support	Task Structure
Electronic Brainstorming	1,2	●	●	○	○
Electronic Discussion•	1,2,3	●	○ to ●	○	○
Topic Commenter	1	●	○	○	●
Group Outliner	1,2	○	○	○	●
Idea Organizer	2,1	○	○	●	○
Issue Analyzer	2	○	●	●	○
Group Writer	2,1	●	○	○	○
Vote Selection	3	●	○	○	●
Alternative Evaluator	3	●	○	○	●
Group Questionnaire	3	●	●	○	●
Group Matrix	3	○	○	○	●
Stakeholder Identification	4	○	●	○	●
Policy Formation	4	○	●	○	●

Activites Supported:
1. Exploration and Idea Generation
2. Idea Organization
3. Prioritizing
4. Policy Development and Evaluation

Process & Task Support & Structure
○ Low ○ Medium ● High

• EDS is used for laboratory research only

Figure 2.4 The UA group interaction tools and their uses. (From Nunamaker et al., 1991)

The size of the group is also important according to the Ventana people. Small groups are preferred. On the other hand, university people said, much to our surprise, that "large groups were found to be more effective than small groups ..." Our general impression was that our group (approximately 25) was far too large, at least if each participant is to be able to read everything that is written. What the University of Arizona is attempting to accomplish initially, according to the presentation material, is to quantify the three aforementioned vari-

ables of a meeting. The university claims that laboratory tests (with students) and field tests (in real environments) yield basically the same results.

Why then did our session fail? The size of the group and the lack of preparation are two key observations. More than anything else, however, it was probably the *lack of requirements* combined with *ambition* that created this peculiar situation. An ad hoc group was to produce a proposal for a report that would later be coordinated by another individual — a worse scenario for group work is hardly conceivable. The results probably would have been just as poor if the entire session had taken place orally, in Swedish. The only thing we succeeded in achieving was demonstrating what EMS cannot accomplish.

The research also exhibited a general lack of scholarly exactitude. The obvious focus of the demonstration was the design of the technology — the facilities offered by the program, VDU presentations and the degree of "user-friendliness". We devoted less attention to what was"really" happening in the group. Such simple background variables as sex, age, education, status in the group, areas of responsibility in the group and the distribution of these variables were not registered (at least not in the printed report or in the discussions).

The "same place, same time" concept is, as I have suggested, problematic. If it is to have any significance in a group-dynamic context, the ability of participants to read each other's verbal and non-verbal signals must be considered. E.T. Hall, a perception psychologist, discusses this phenomenon in his book "The Silent Language" (1959). He distinguishes between *four "zones" of proximity*:

- *An intimate zone,* a few decimetres of distance between players. Whispers are sufficient for oral communication.
- *A personal zone,* up to one meter's distance. Individuals can touch one another and a low conversational tone is sufficient.
- *A social-consultative zone,* where a desk or counter separates individuals. Voices must be raised in order to be heard.
- *A public zone.* Distances of several meters and more. The relationship between a public speaker and an audience, for example.

The "truth room" at the University of Arizona permitted communication in the three most distant of the four zones. Communication with the closest participant in the same row was conducted in a low conversational tone, compared to the closest participant in the next row up, who was separated by a desk. The facilitator maintained a distance that can clearly be characterized as public. The "same place" relationship to the closest participant in the same row was different from the "same place" relationship to the facilitator. This type of problem seems to have been totally ignored. The underlying thought should have been that a presence in the same room has a significant effect on communication. However, given the layout of the room, the relationships

among the different players varied, depending upon where the individuals sat in the room. It was practically impossible for the participant sitting closest to the centre aisle to see a participant sitting in the outermost seat of the next row up.

The Ventana Corporation had provided much simpler, portable equipment that permitted participants sitting around an ordinary table and using portable PCs with a low screen to maintain eye contact with one another. Ventana personnel believed that this provided better conditions for group work. We were unable to test this system, however, due to lack of time.

The entire first part of an EMS session consists of a written run-through of unstructured ideas. At this stage, it is easy to use mathematics to analyze the number of participants. If we assume that the goal is for everyone to have time to read everything and still participate in the writing process, the relationship becomes one of simple mathematics. Dr. Vogel pointed out our common experience — that we write considerably slower than we read. In fact, the difference is considerable. According to Katherine Aschner,[9] the average person can produce about 700 lines per day. Assuming 60 strokes to a line, that works out to roughly 5,000 strokes per hour, or some 80 strokes per minute. Let us assume that the average person reads 10 A4 pages (standard U.S. page size of 8.5 x 11 in.), which corresponds to approximately 20,000 strokes per hour. The situation for a sole author could thus be expressed by the following equation:

$X*5000 = (1-X)*20000$

assuming that the author stops once an hour to read what has been written.

$X = 0.8$

as our author cannot write for a full hour (he would not have time to read). Therefore, writing for 48 minutes and reading for 12 minutes corresponds to a full hour of production. If we now assume that the number of other people writing have the same level of performance, we can calculate the writing-reading relationship for each participant:

$N*X*5000 = (1-X)*20000.$

With additional writers and a different maximum writing requirement for the individual, each individual still can only read 20,000 strokes per hour. And each individual should contribute something as well:

$X = 4/(N+4)$

The numerical relationship between N, number of participants, and X, the relative time allotted to writing, can be expressed as follows:

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9 Katherine Aschner (1984) Ordbehandlingsboken (The Word Processing Book). Stockholm: Liber.

N	1	2	3	4	5	6	7	8	10	25	40	100
X	0.8	0.67	0.57	0.50	0.44	0.40	0.36	0.33	0.29	0.14	0.09	0.0385

As the number of participants rises, the written production of each individual declines toward zero. With 100 participants, each individual averages 0.0385 hours of writing, i.e. 192 strokes or about three lines ... In a group of 9—10 people, each participant already spends 50 percent of his or her time reading what the group has accomplished. In a group of 25 people (like ours), 86 percent of the time is spent reading and only 14 percent writing. 14 percent of one hour is 8 minutes — no wonder we felt such pressure!

These are purely theoretical figures which do not take into consideration time for reflection, re-reading or calculation. Still, this time must be subtracted from the time used to read and write, which is why reading and writing speeds remain proportionately the same: it takes four times as long to write as to read. If the number of writers increases, it becomes difficult to read everything. These assumptions show that maximum group production can never exceed 20,000 strokes per hour if everyone is to read everything. This means that only a speedreader has time to write anything, as an individual who reads at the average speed does not have time to read more! However, the group can become much larger if only a few individuals write and the remaining participants only read ...

The speed of writing establishes the clearest boundaries. If our group had consisted of extremely clever speedreaders capable of speeds up to 75,000 strokes per hour (some 30 A4 pages), the size of the group would have to have been increased from four to 15 before 50 percent of the time would have to be spent on reading. If we remove the restriction that everyone must read everything, a new set of relationships appears. But then we also remove ourselves from the "same time" concept.

Judging from the descriptions of various experiments, EMS should be capable of improving certain meeting routines. We have only ourselves to blame for the fact that our test failed to the extent that it did. Setting up an EMS system is expensive. The spring 1991 pricelist for the equipment we used is as follows:

Software	USD	42,500	
Eight workstations		20,000	
Annual maintenance		4,250	
Facility design		5,000	minimum
Total	**USD**	**71,750**	

If we include the cost of travelling and per diem, the figure for six workstations amounts to approximately USD 82,000. But that does not include the cost of a two-day course in Tucson for up to six people. Furniture is not included, but drawings are provided.

2.2 University of Georgia

by Sven Olofsson and Göran Axelsson

The Department of Management, College of Business Administration, University of Georgia, specializes in group behaviour and decision-making processes. Bob Bostrom, Richard Watson and David van Over are the senior researchers who, together with undergraduate and graduate students, are conducting a large number of projects related to electronic meeting systems (GDSS). Several of these projects are being carried out in cooperation with or under the sponsorship of companies.

The computer-augmented Teamwork Project at the University of Georgia

The Mosvick and Nelson study from 1987, famous for Teamwork Systems promotors, show that managers spend 25—85 percent of their time in face-to-face meetings, and that 50 percent of this time is perceived as being wasted. Meetings are on the increase, due to the tremendous growth in the use of business teams to carry our organisational tasks.There is a need for diverse skills to effectively solve the problems, which often cross departmental or organisational boundaries. The underlying problem is to achieve effective team work, where the teams utilize the expertise of each individual member. These issues formed the point of departure for the Teamwork Project at the Department of Management in the University of Georgia in Athens, Georgia.

Because electronic meeting environments have both social and technical dimensions, the Teamwork Project tries to pay attention to both dimensions and their interactions. With its socio-technical perspective, the Project studies the social impact (attitudes, team cohesion, job satisfaction) and the technical impact (team efficiency and effectiveness) of electronic meetings.

The Project has thus two main research areas:

- research on team technology design
- research on team technology adoption, use and impact

The research program began in 1985 with funding from IBM. Exploration of team technology began in 1987 when the PLEXYS (now named GroupSystems) software was obtained from the University of Arizona. The activities were upscaled in 1988 with the development of an infrastructure at the University to support research, with a generation of income though running electronic meetings, and with the development of a research agenda. The research is a part of the larger Executive 2000 Research Program at the University. A part of that research agenda was the study of the "conference room of the future".

The team technology research programme is centred upon the forging of alliances/relationships with a range of groups and individuals who have a stake in team technology. Allies provide hardware, software, expertise, personnel or money. They can be clients, partners or sponsors. Three outputs are produced: academic research, knowledge to further the development of team technology, and services and facilities to groups using team technology for various organisational purposes. The Teamwork Project emphasizes that the staff must produce a variety of outputs that should satisfy the multiple objectives of those who have a stake in the research.

The physical support for the computer augmented teamwork technology is located at the Department of Management's "conference room of the future", "the Smart Office", and its companion facility "the PC Research Laboratory". Teams that use the facilities can thus expect a customized meeting environment.

The Department has a multi-system approach to team research. The three main configurations that have emerged in the marketplace are implemented at the Department.

1 Workstation-based support is provided through GroupSystems, a toolbox of team support software tools developed at the University of Arizona. Moreover the University of Minnesota's SAMM system and the VisionQuest system are also implemented. This type of system provides maximum IT support to users.
2 OPTION FINDER is a portable evaluation tool, developed by Option Technologies. It provides groups with keypad-based support. A similar system QUICK TALLY is also implemented.
3 The third environment is designed to provide IT support only to the group's facilitator. The Department has focussed on Decision Support System tools that help team members to build a cognitive representation of their situations. One example is COPE. This type of system provides a minimum of IT support to users.

The *research themes* in the Teamwork Project are:

- *Comparison of Technologies.* The focus is on the wide range of technologies that are used to support teams. The research also investigates the relationships between task and technology, and how to find the best match between the two. Another aspect is an investigation of how to best introduce team technology to workgroups that differ with respect to their member's experience with IT.
- *Facilities and leadership.* The focus is on the impact of the process facilitator's role in effectively utilizing computer support for teams. A series of laboratory experiments is being conducted in a joint program with the Indiana University. Some experiments will focus on team development over time and the importance of facilitation in different technological and task environments. A training pro-

gram for process facilitators in electronic and non-electronic environments have been developed. Requirements for an expert system that can act as a meeting adviser have been developed. There is a need for good advice on how to choose an appropriate approach of team technology.

- *Team/Group Development*. Electronic meeting environments influence not only task-related meeting outcomes, but individual and group related outcomes as well. Will technology assist or inhibit group development? The Teamwork Project has focused on the degree of cohesiveness in teams and on the team ability to manage conflicts productively. These subjects can interestingly enough not be found in the vast team technology literature!
- *Team Creativity*. Creativity (development of useful ideas) and innovation (successful implementation of creative ideas in an organisation) are major concerns of U.S. business organisations. The use of technology to stimulate creativity and innovation in teams is thus a very rich research area. A major research program will be developed. Partnerships are being established to help to formulate a shared research agenda.
- *Cross-Cultural Analyses*. A theory of team technology will almost certainly need to incorporate a cultural dimension, as the communication within a group is affected by the team systems. The research agenda includes a continuation of a partnership with the National University of Singapore. It is planned to perform cross-cultural analyses by running experiments at the laboratory and then having them repeated in similar settings in other cultures.
- *Adoption-Diffusion-Impacts of Team Technology*. Training teams to be motivated to effectively use Team Systems is critical to successful adoption. A series of studies in the training area will be performed. Field research will also be used. Issues in the field research are "why do organisations adopt the technology?", "how do organisations adopt the technology?", "for what types of problems is the technology used?", "what are the characteristics of groups using the technology?", "who facilitates use of the technology?", "what is the user's assessment of the technology?".

The Teamwork Project is also focusing their work on specific application domains that warrant special purpose team technology. The *four domains* are:

1 *Systems Analysis and Design*. This is a promising application of group technology. There are two major applications in supporting the social system surrounding systems analysis and design. The first one is support for information gathering from users. This includes joint application development. The second application is support for analysis who could use the technology to brainstorm. Team technology could be integrated with CASE tools. A research agenda is being specified.

2 *Crisis Management.* The increase in complexity and frequency of decision-making in the post-industrial era creates the demand for technology to support crisis management in organisations. Special groups may be designated, and they must work effectively with crisis planning and crisis management if something happens.
3 *Conference room of the future.* A link to the Executive 2000 Programme at the Department.
4 *Collaborative Learning.* To use team technology in a classroom for learning purposes. One area is case discussions.

The published papers in 1990—91 tells in more detail of the recent developments in the Teamwork Project.[10]

A few comments:
The main tasks in the projects are

- to study the use and the applications of teamwork systems
- to provide feed-back to system vendors
- to develop training programs
- to design meeting rooms and technological facilities
- to diffuse team technology
- to offer practical team system facilities to organisations — more than 150 meetings a year are held for clients/partners

The group's work is characterized by the sociotechnological paradigm, focussing the integration of people and technology. The facilitation of creativity is the key issue for the group's work in the 90s. It aims to increase the number of cross-cultural projects in the programme.

This research programme means that the Department is not using only one system. Instead the whole range of systems on the market are being tried out at the Department. System comparisons are regarded as important. The Department has trained people in using the Ventana system, the IBM Team Focus and the Vision Quest as an example.

The Department is also engaged in *field use of systems.* One example is collaboration between the state administration and the local administration in Georgia State, e.g. between the Georgia Department of Community Affairs and other organisations in Georgia. In total 159 counties and 500 municipalities are engaged in the collaboration. The theme of the electronic meeting is "Getting regional development in Georgia on the move". This is the first time in Georgia that a state plan stipulates, by law, that counties must draw up plans. If the county has no plan, it will not receive any state subsidies. One of the problems is that the counties have not had any experience in co-operation before. The OPTION-FINDER key pad system was successfully used in this case.

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10 These reports are listed among the references at the end of this report.

One of the general conclusions is that a meeting without a proper structure can create more harm than a meeting where no electronics is used. But with a good design of the meetings, the team technology is fantastic, it can achieve exceptional results! Two more specific results are: 1) A prerequisite for successful meetings is the facilitator leadership and 2) the key-pad is the most used input device in the U.S.

More specific examples of projects and products (systems under study) are:

- *Ongoing projects deal with:*
- The evaluation of various electronic meeting systems for education, design and decision-making processes.
- The education of facilitators for electronic meeting systems.
- The evaluation of the benefits of electronic mentometer systems used in municipal contexts, among others.
- Individual and group-related creativity.
- Stress in decision-making processes.

Watson and Bostrom presented a simple typology illustrating the extent of the technological component in different EMS-aplications. (Figure 2.5)

Extent of the technological component	**Equipment at the meeting**	**Examples of systems**
Major component	Workstations for each participant and the facilitator	VisionQuest, GroupSystems, SAGE, SAMM, GrapeVine
Medium component	Keybord for each participant and a workstation for the facilitator	Innovator, Multiservey
Minor component	Only a workstation for the facilitator	OptionFinder, QuickTally, DSS, COPE

Figure 2.5 Different levels of technical support to meetings.

A large number of studies of different systems have been conducted by the University of Georgia (VisionQuest, GroupSystems, among others), many of which have yet to be published. Interest has tended to focus on systems employing intermediate technology. A report has been written on OptionFinder, and a couple of projects involving studies of meeting techniques employing OptionFinder have been outlined.

• *Equipment*
The Department of Management has developed a conference environment with workstations and major-presentation capabilities (smart office). It has also developed a simplified laboratory environment with workstations for study purposes.

• *Demonstrations and presentations*
During our visit, we attended demonstrations and presentations of the following:

- OptionFinder
- GrapeVine
- Executive 2000
- SAMM

- *OptionFinder* requires a facilitator. It also requires an IBM compatible workstation, while each group member has a small keyboard with 12 keys, numbers and a few signs (similar to a telephone keyset). The latter can be read by a workstation microcomputer via a series link. An LCD screen and an overhead projector are used to steer the group and to present the results.

  There is a program for structuring questions, processing votes and presenting pictures. The latter makes it possible to depict different types of correlations in scatter diagrams and the like. The price for the OptionFinder "keyboard" for each member is low. Mailbox and word processing functions available in more technologically sophisticated systems are not offered in OptionFinder. In view of its simple technology, OptionFinder does provide a number of other services, however. Applications exercises are sponsored by IBM, which has invested heavily in system evaluation and research aimed at introducting methods and functions.
- *GrapeVine*, which was developed at an Australian university, is a window-based system designed for VMS and All-In-One with a word processor, group secrecy and database storage of information. The software is said to be suitable for various applications required by authorities, administrations, legal and finance/economy departments. Macintosh and OS/2 versions are under development.
- *SAMM* is a Macintosh-based system that uses Hypercard and similar concepts. Originally developed at the University of Minnesota, the system is quick, able to import data from the outside and utilizes multiwindow technology.

Special comment

When planning a study tour, it is difficult to know how to devote time and emphasis on different visiting sites. It is obvious, that the Department of Management at the University of Athens in Georgia has a role which is very sympathetic to the Swedish situation. We are learners, and have limited, if no, experience in CSCW or Team Systems, though many Swedes have experience of E-mail systems (individual and group systems). Topics such as the comparisons of systems, the focus on user problems, the aspects of integration between people and technology are probably the bottle necks delaying the successful use of Team Systems. The Department is a strong candidate for further co-operation with Sweden.

2.3 University of Michigan (CSMIL & Capture Lab)

by Randall Whitaker

Introduction

I regarded the Cognitive Science and Machine Intelligence Laboratory (CSMIL) at the University of Michigan and Electronic Data Systems' (EDS) Centre for Machine Intelligence (CMI) — both located in Ann Arbor, Michigan — as a "must" on the TELDOK agenda. This judgement is based on their recent publications on work team collaboration and their balanced blend of basic research, innovative design, and practical development. The work and resultant experience at these sites addresses (among other things) physical layout, furnishings, mutually user-accessible software, hardware configuration, group interactional protocols, and empirical studies of real-world decisionmaking processes. Our visit convinced us of the importance of these facilities in the areas of: (1) studies on group decision making (basic research); (2) meeting room design and support technology (development); and (3) group support products and services (applications).

Both facilities grew out of an effort jointly sponsored by the University of Michigan and EDS (an information technology component of General Motors) aimed at investigating work team collaboration and prescribing appropriate support technologies. The primary subject was same time/same place collaboration — i.e., meetings — and the main development effort was the construction of meeting environments augmented by information technology. This R & D program underwent an organisational fission, resulting in the two labs we visited.

The Centre for Machine Intelligence, CMI, under the direction of Dr. Marcial Losada, is now an independent facility associated with EDS. CMI conducts research programs in conjunction with the University of

Michigan, Northwestern, Carnegie Mellon, Harvard, and MIT. Its Ann Arbor meeting room is called Capture Lab (a name whose association with the original joint program leads to some confusion). A similar CMI research lab has been established in Cambridge, Massachusetts.

The Cognitive Science and Machine Intelligence Laboratory, CSMIL, under the direction of Dr. Gary Olson, is an interdisciplinary research laboratory sponsored by the Graduate School of Business Administration, the College of Engineering, and the College of Literature, Science and the Arts of the University of Michigan. CSMIL receives additional support from Steelcase (a manufacturer of office furniture), Andersen Consulting,and the National Science Foundation. CSMIL research is done in collaboration with Andersen Consulting and MCC, and its meeting room is called the Collaboration Technology Suite. Due to their proximity, common origin, and mutual interests, the two laboratories maintain close contacts and good relations.

Similarities between the CMI and CSMIL laboratories

Owing to their common origin, there is a great deal of similarity between the CSMIL and CMI labs. Both have as their focal point a dedicated meeting support room with extensive observational facilities. The meeting rooms can be roughly described as elaborated conference rooms, providing central tables around which 8—12 participants may interact directly or indirectly (via their computer workstations). Both are configured for research into group decision making processes, and each site's director expressed the desire to emphasize research activity. The amount of "overlap" between the two labs is sufficient that they can be reviewed jointly. To the extent that we perceived noteworthy similarities, we list them below:

- *Attention given to the physical environment.* Much time and effort has been spent on the design and layout of the meeting rooms and their furnishings. Capture Lab is a stylishly appointed room which is ergonomically and aesthetically pleasing. CSMIL's Collaboration Technology Suite is a highly functional room featuring modular furniture and considerable flexibility in mixing computer support with other display media. Both rooms provide a personable atmosphere in which small groups may interact directly with each other across the table as well as indirectly through a shared data space.

One example of the consideration given to physical layout is the evolution of Capture Lab's central table. Originally, participants had vertical computer displays, angled toward the common wall display at the end of the table. This was meant to minimize the distance between the individual and group displays, with one only having to look up from her CRT to see the wall display. This well-intentioned layout proved to have some disadvantages in use. First, the vertical individual displays were partial obstacles to direct face-to-face interactions among participants. Second, the viewing of both displays in such close

(angular) proximity seemed to result in a lack of "visual privacy" for each individual display. Third, the architecturally-enforced orientation to the common wall display conflicted with the participants' need to orient to each other during direct interaction. Finally, participants reported physical stress and discomfort from the angled arrangement. The current Capture Lab table has the Macintosh displays "sunken" into the table top at a fixed angle, and the participants face directly inward toward the table's centre.

- *Design geared to small groups.* Both the CMI and CSMIL facilities are designed for small groups (8 people maximum for Capture Lab; 12 maximum for the Collaboration Technology Suite). Although Capture Lab can handle 10 participants, Mary Elwart-Keys said that they prefer to limit the group size to 6—8, and that the "best" groups had 4 or 5 participants. This is consistent with previous and concurrent research on group processes. Ms. Elwart-Keys claimed Judy Olson's work at CSMIL indicated an optimally effective decision making group contains 8 people. We were unable to follow up on this claim with Dr. Olson.

- *Extensive support for observation and analyses of group processes.* Both laboratories contained well-equipped observation stations adjoining the meeting rooms. Meeting information (audio/video for the participants, as well as their pooled data from the workstations) can be captured for later analysis. During a meeting session, features of the interaction can be coded according to structured protocols and used to "profile" the individual participants, the entire group, and the patterns of their interaction.

While this capacity for observation and analysis is natural for a research facility, it turns out to be a valuable adjunct to commercial meeting support services. Dr. Losada (Capture Lab) has developed a tool called GroupAnalyzer for the study of group dynamics. GroupAnalyzer, through both statistical and graphical outputs, provides structured representations of the patterns of interaction among participants and shifts in those patterns during the course of a meeting session. These shifts over time provide a dynamic dimension to group process analysis which Dr. Losada believes has been lacking in much previous research.This sort of profile construction and analysis has proven to be a marketable feature of Capture Lab's services. The results are seen as a means for improving the decision making process among participants — i.e., enhancing their ability to function as a group. Dr. Losada said that feedback on meeting dynamics has been favourably received (and specifically sought) by paying clients. Clients' desire for quick feedback has resulted in two analyses being done: the first is a surface overview, while the second is the detailed statistical results derived from the observation team's coded data.

• *Emphasis on easy-to-use personal computers.* Both laboratories provide meeting participants with Apple Macintosh computers as workstations. The Macintoshes are connected into dedicated LAN's with servers. Users view the group's joint work in one of two ways: (1) displayed in a dedicated window on their individual workstations; or (2) displayed on a large projected display, mounted on a wall at the end of the central table. This ability to view both one's own work as well as that of the entire group is the major novelty; otherwise, an experienced Macintosh user would feel right at home with the keyboard, mouse, and software interface conventions.

The initial choice of Macintoshes was considered risky at the time (circa 1986), when these computers were relatively new and underpowered. The primary decision criterion cited was the Macintosh's sophisticated graphical user interface, which afforded a degree of usability deemed necessary for equipping a facility used by non-computer professionals. Both sites indicated that the Macintosh choice has paid off. Neither site expressed any indication of either regretting the choice of Macintoshes or planning to replace them with other platforms. The Macintosh interface remains as sophisticated as any available for microcomputers, and its consistency over time and across models means that users with any Macintosh experience will have little problem adapting to the meeting lab facilities.

Both labs provide the standard keyboard and mouse to participants, even though they remained interested in alternative input or controller devices. Capture Lab's Mary Elwart-Keys said that a variety of other mice and joystick devices had been tried, but none were yet judged superior to the standard equipment for their use. She stated that for the time being the keyboard will remain important, as it provides the maximum input power and familiarity to users. CSMIL's Gary Olson said that his facility was willing to try other devices also, but that no changes from the standard keyboard/mouse arrangement were foreseen at this time. Both facilities recognize the potential utility of written (pen-based) input, but neither believes that this technology is sufficient for their use as yet.

• *Ability to employ off-the-shelf software.* Both laboratories cited the desire to maximize the usage of off-the-shelf software as a criterion for seeking a widely sold microcomputer platform. This reduces the costly burden of design and maintenance and speeds up the insertion of new functionality into the laboratory environment. Another benefit derives from permitting participants to utilize software with which they are already familiar, rather than having to rely on specialized programs. Any Macintosh program can be run in the private or the public "data space" in Capture Lab, offering the potential for participants to bring their preferred word processors, spreadsheets, etc., into the meeting room.

This does not mean that the labs have completely avoided the need to build software; both facilities have developed group applications for meeting participants and/or meeting facilitators. Reliance on commercial applications (where possible) means that the labs can concentrate their efforts on building tools providing functionality not otherwise available. To give one example, CSMIL has produced the group editing package ShrEdit ("shared editor"), which enables multiple people to work together on common files using Macintoshes networked via either EtherTalk or LocalTalk. The common document is displayed in a window on each user's screen. Each user can then select and edit a section of that common file, subject to constraints imposed to prevent clashes. In addition, group members may edit separate notes (either public or private) concerning the common document in adjoining windows. ShrEdit provides a simple, easily learned means by which group members may work in parallel on their text product. A shared drawing tool (prospectively called ShrIbble ["shared scribble?"]) is being developed.

A second illustration is Marcial Losada's development of GroupAnalyzer — a program which supports coding and analysis of observed group dynamics based on the SYMLOG formalism of R. F. Bales (Losada & Markovitch, 1990). Observers are able to code interactions among group members in terms of time, actor, receiver, whether the interaction was verbal or nonverbal, a descriptive "behavioural code". In addition, they may insert comments. The structured set of coded observations is later processed by an analysis module to produce both a static depiction of "average" behaviour during the session and representations portraying the dynamic history of the session in terms of animated graphic "snapshots", bar graphs for selected meeting segments, and a time series analysis. The static depiction is equivalent to the results of earlier SYMLOG applications, while the dynamic displays are a valuable extension to that procedure.

• *Relatively high degrees of access and control afforded to meeting participants.* Halonen *et al.* (1989) contrast the Capture Lab arrangement with other meeting room installations. They distinguish between (1) *simple hardware* approaches (in which multiple people simultaneously work with one computer, with control of the machine being in the hands of a specific mediator) and (2) *groupware approaches* (in which users employ specialized meeting support software on individual workstations). The simple hardware approach constrains access to the common data space (the computer) and limits individual work; the groupware approach "... restricts users to a small set of specially designed software programs." (p. 3) Capture Lab was conceived as an intermediate approach in which users may all have access to the computer and employ familiar software.

The result of this intermediate approach (which is shared by the Collaboration Technology Suite) is a meeting milieu in which par-

ticipants' interactions may be directed by either imposed structuration (e.g., a facilitator's direction; a set of "game rules") or consensual protocols. Since the room is structured for a small group seated about a common table, participants may use conversational protocols to guide turn-taking. Reliance on specialized software is minimized owing to the ability to use any Macintosh program in the group setting. The net effect is a meeting support environment in which one feels comfortably "natural" interacting, rather than seeming a player in some highly-structured procedure. Control of the meeting may lie entirely with the participants; sufficiently adept users could work with no external facilitation.

• *Direct application spinoffs to sponsors.* Both facilities augment their utility to major corporate sponsors via "replica" facilities located on sponsors' sites. The first version of CMI's Capture Lab was moved and reassembled in downtown Detroit at an EDS office. It is called the Capture Centre, and it provides GM managers with access to decision support tools. This facility is heavily used — reservations must be made 3 months in advance. Andersen Consulting has constructed a facsimile of the CSMIL meeting room in Chicago for their software engineering teams. This replica facility employs the same Macintosh equipment, group software tools, and modular furniture as the Ann Arbor site. In both cases, the replicas lessen the emphasis on research features (e.g., observation areas, recording equipment) while maintaining the central meeting support features. The replicas are utilized as operational facilities for workaday needs, and they represent tangible application of the Ann Arbor labs' work by their respective corporate sponsors.

• *The major technical problem: connecting the support units.* Both facilities reported significant problems with cables and connections. First, there were so many cables for the workstations and attendant electronics that hiding and rearranging them became problematical. Both meeting rooms had hidden most cables beneath the central table. The Collaboration Technology Suite had removable flooring panels under which the main cables were run. Capture Lab reported a problem with their cement floor, into which a cable trench had to be dug. Once hidden, the cables were no major problem in the fixed Capture Lab arrangement. However, the CSMIL facility's multiple modular desk units could not be easily or quickly rearranged due to the cables; as a result, they were not able to take full advantage of the flexibility offered by that modularity.

A second problem concerned the length of cable required to connect the workstations with the file server(s) and other attendant units in an adjoining room. The CSMIL facility ended up paying a large fee for dedicated cables (especially for their video leads), while at CMI a resident "hacker" spent much time coming up with a solution. Both sites

said that wireless alternatives were desirable (and that they had looked at the available options), but neither believed that these alternatives were ready for use yet.

• *The major environmental problem: lighting.* Both facilities mentioned that the room design had been complicated by lighting issues — particularly the problem of glare on the computer display screens. At Capture Lab the displays were recessed into the central table at a fixed angle, and soft indirect lighting was arranged to avoid glare. In the Collaboration Technology Suite, the displays were adjustable from a flat orientation (flush with the table surface) up to nearly vertical. This variability greatly complicated the search for optimum lighting. The CSMIL designers had tried a variety of direct and/or indirect lighting schemes, settling on a mix of the two. In the end, they had to accept a trade-off between display adjustability and occasional glare.

Contrasts between the CMI and CSMIL laboratories

The organisational divergence has not caused any radical disparities between the two laboratories, but it has led to slightly distinctive "characters" for each. Exaggerating the distinctions for the sake of illustration, we can offer the following observations:

• *Capture Lab is more "commercialized" than CSMIL.* CMI provides their meeting support and analysis services on a commercial basis to customers other than their GM sponsors. While we were not given precise pricing for these services, Dr. Losada claimed that Capture Lab was more economical (on a daily basis) than either the Arizona Room or IBM's Team Focus (where the primary cost is for the meeting facilitator). Demand for the facility's services is considerable enough to keep the staff busy. Our Capture Lab hosts all expressed a desire to focus more on research work, while each indicated that the commercial activities had reduced the time available for such research. The Collaboration Technology Suite, on the other hand, remains very much a university research facility. While there may be fewer demands on the CSMIL staff to attend to paying customers, they (like researchers everywhere) must seek sponsorship and support for their activities.

• *Capture Lab provides a physical environment which is "fixed and fine"; the Collaboration Technology Suite environment is "flexible and functional".* There is an interesting contrast between the two facilities regarding their "style" — a contrast most apparent in physical design choices. This contrast can only be illustrated through exaggeration of differences (thus making it tenuous), but it is worthwhile to explore. One may say that Capture Lab tends toward fixed features and fine appointments, while the Collaboration Technology Suite tends toward flexibility and modularity to promote functionality.

The most obvious examples of this contrast are to be found in their central tables. Capture Lab's table is a unit structure coordinated with the room's decor. The participants sit around the table as if at a conventional conference table — facing inward toward the centre. Their Macintosh displays sit squarely before them, sunken into the table surface at a fixed angle. To the left of each display, a panel of the table surface may be lifted to expose a recessed cavity in which each participant's mouse and a floppy disk drive are stored. Individual keyboards are stored in drawers beneath the table. This "hiding" of the storage cavities, the unit table surface, and even the use of compact Apple IIGS keyboards all contribute to the intended maximization of usable table space. The overall effect was an enhanced conference table, with plenty of room for "low-tech"accessories (documents, files, etc.)

The Collaboration Technology Suite's table is actually a collection of modular prototype desks developed by Steelcase (one of their corporate sponsors). These units were designed to provide maximum flexibility across a many conceivable room layouts and workstation display units. To that end, they feature (1) polygonal desktop surfaces, so that they can be arranged in groups of varying size and angular orientation and (2) motorized supports for their large CRT units. These supports, controlled by foot switches, can position the CRT horizontally (flush with the desktop surface), vertically, or anywhere in between.

All this flexibility has been obtained at a cost, though. The Steelcase modular units are heavy (i.e., not easily moved about to take advantage of the promised flexibility), and due to the foot switches leg room is uncomfortably constrained. The design for (and use of) the largest available monitors results in much desktop space being lost. Finally, the polygonal shape of the desktop surfaces reduces the area available for use when the desk units are joined in a "square" arrangement (as we saw them). Even though maximum available table space (e.g., for papers) was cited as a desirable feature, the Steelcase design was deficient in this regard. Our impression was that these units had been overdesigned for breadth of applicability at the expense of utility. In the Tucson seminar, Bob Johansen showed a picture of these units at the Andersen Consulting "replica" facility, and commented that in a few years such a setup would probably seem ponderous and dated. With strict regard to the modular furniture units, we agree.

This is not to say, however, that flexibility is necessarily detrimental. A second example (concerning flexibility of information display rather than physical layout) can be seen in each facility's attitudes toward whiteboards as group displays. At Capture Lab, a pair of whiteboards were provided on the wall opposite the group electronic displays, hidden behind wall panels. We were told that their use was discouraged; participants' use of the electronic displays was preferred. At the Collaboration Technology Suite, two entire walls of the meeting room were made up of whiteboard panels, and we were told that participants were not discouraged from using them as they saw fit. In this respect,

the CSMIL facility seemed to be less constraining and more flexible; we felt it was an environment more suited to the sort of "brainstorming" we employed regularly.

This perceived divergence is one of emphasis, and too much should not be made of it. The relatively "finer" Capture Lab environment is consistent with its role as a vendor of commercial services for management personnel. The tendency toward more fixed features is also consistent with progressive optimization of the facility. The flexibility of the Collaboration Technology Suite is more consistent with its ongoing role as a research laboratory. Of course, those features attributable to the desk units derive directly from the interest and support of their manufacturer (Steelcase).

- *Differences in data captured for analysis.* As mentioned earlier, both laboratories are configured to capture data on meetings for later analysis. There is a slight difference in the data collected. Capture Lab tends to rely on coding attributes of group behaviour in a structured formalism (e.g., the schema required for GroupAnalyzer). The preference for structuration is reflected in a change in the observational equipment and practices to support coding from video monitors rather than direct viewing of the meeting room. This shift affords more uniform access to participants' behaviours by reducing differences in visibility and allowing subsequent review. The Collaboration Technology Suite appeared to lean toward less structured mapping of patterns among participants' conversations and workstation usage. While meetings at CSMIL can be recorded, observers still seem to rely on direct viewing.

Summary of discussions at CMI and CSMIL

We sought to solicit the frank opinions of our Ann Arbor hosts regarding group support technologies, lessons learned, and any potential for the future. The following are some of our summary impressions derived from our discussions.

- *More understanding of group behaviour is needed.* Our contacts at both facilities expressed a concern that the availability of technology does not translate into truly usable products and services. Neither site believes that they have a comprehensive understanding of group decision processes, interactional behaviours, or group dynamics. They see themselves as research facilities with a long list of issues to be explored. The factors which will determine acceptance of meeting support technology are organisational, social, psychological, and ergonomic.

- *There are likely to be cultural differences affecting use and acceptance of meeting support technologies.* Our contacts do not believe that there is one uniform "style" for group decision processes. There are likely to be significant differences among cultures — both organisa-

tional and ethnic. At both sites there was discussion of differences between American and Japanese decision making behaviours, and we pointed out the likelihood of differences between Swedish and American decision making practice in the workplace. We agreed that even if understanding of group behaviour is judged suitable to support prescribing technology for the U.S. marketplace, such understanding must be developed for other cultures before that (or equivalent) technology can be reasonably prescribed.

• *There is much left to do.* Both the Ann Arbor sites are continuing to evolve in terms of physical environments, hardware, software, and activities. Capture Lab's Mary Elwart-Keys pointed out a number of changes which have been effected during the last few years, and she described the present lab, impressive though it was, as "still a prototype". David Halonen (also of Capture Lab) advised that "when you build one [meeting] room, you'd better be building a second one" — both to allow for evolution and to promote research opportunities. CSMIL's Gary Olson indicated that there is much to be explored, even with respect to commercial products such as input devices, furnishings, and display technologies.

• *The groups served to date are a specialized subset of possible users.* These facilities have considerable experience in studying work groups, but our contacts recognized that their "sample" has been somewhat limited in scope. In terms of "real-world" groups, Capture Lab has been used primarily by business managers and designers, while the Collaboration Technology Suite has been used by designers. Our contacts do not presume that these are the only types of work groups which could be helped by computer support tools.

• *These specialized groups still must be prepared for effective use of the meeting room environment.* Even though the users to date have been drawn from a rather specialized population, they must still be acclimated to the meeting room tools and environment. There are (and probably always will be) clients who are unprepared to simply walk in and begin working, no matter how easy the equipment may be to use. One obvious reason is that new participants must learn the features peculiar to the group work systems — e.g., multiple displays or turn-taking protocols. Another is that some of the software they will be using in the group process will be new to them. Finally, some clients may not be accustomed to using computers (e.g., executives who associate computers with clerical subordinates). Training is particularly emphasized in the commercial services provided by the Capture Lab; Mary Elwart-Keys called such preparation vital for effective meetings; clients must be able to utilize the facility with as little time wasted as possible. Information on prospective participants' computer background, software familiarity, task assignments, and position is collected

in advance. This information is reviewed in a screening procedure, and the candidate participants are sorted according to their training needs. Prospective attendees with extreme deficiencies may be eliminated. Those who pass the screening process are then scheduled for advance training in Macintosh usage, the Capture Lab environment and procedures, and the software to be employed in their meeting. Although the time needed for training varies, Ms. Elwart-Keys suggested 1.5 hours as a fair estimate of the median training period.

• *These specialized groups still must be aided in effective use of the meeting room environment.* Capture Lab's services include some degree of facilitation. Mary Elwart-Keys distinguished between *technical* and *process* facilitation: technical facilitators (or *technographers*) operate the support environment during a meeting, while process facilitators guide the participants through their interactions.

Clients may bring in their own process facilitators, and Capture Lab often provides technical facilitation training to these meeting specialists. They are instructed in usage of the Macintoshes and the software to be employed in the meeting. Ms. Elwart-Keys pointed out that the ability to effectively control support technology is important for process facilitators' control over the meeting process itself. Loss of control or perceived incompetence with regard to the technical features can cost the facilitator respect, leading to a loss of effectiveness.

Given the Ann Arbor facilities' relatively low degree of inherent control over participants, we asked if facilitation will eventually be eliminated. Mary Elwart-Keys responded that, on the contrary, she expects facilitators to become ever more prominent in meeting support services. This increased importance will derive from: (1) pressures for effective or productive services as they become more widely marketed commercially; (2) increasing demands associated with more sophisticated support tools and environments; and (3) the need to get meetings "up and running" as soon as possible. These factors do not rely on meeting group size, so one would expect facilitators to remain important for small group rooms (e.g, Capture Lab) as well as larger facilities (e.g., the Arizona Room and its descendants).

• *Establishing a meeting support facility requires major investment.* Our contacts at both sites noted the need of corporate support for construction, maintenance, and evolution of their respective facilities. Even though both laboratories had emphasized small group support and commercially available products, their start-up investments were large.[11] Neither laboratory would have progressed so far without the interest and generous sponsorship of corporations.

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11 We were unable to get specific figures on expenditures.

• *Establishing a meeting support facility does not require exotic equipment.* The Ann Arbor facilities demonstrate that commercially available microcomputers and software can serve quite adequately for a meeting support room. Certainly, both sites had to contend with technical problems and both facilities have augmented commercial software with their own creations. However, their choice of a successful microcomputer platform affords them a stable milieu in which to both overcome those problems and creatively extend their capabilities.

• *Meeting support services are marketable.* Capture Lab's provision of commercial meeting support services demonstrates the marketability of such facilities, at least on a limited basis. Such dedicated facilities provide resources and professional support services which clients do not have elsewhere. Furthermore, analysis and feedback on group dynamics has been an unanticipated "selling point" — today's managers, eager to develop themselves professionally, find structured analyses of their performance valuable. While our contacts did not predict full self-financing capability, they did recognize the ability of service provision to reduce the ongoing costs associated with their work.

• *Meeting support rooms are currently justifiable on specific grounds.* Before visiting the Ann Arbor facilities, we reviewed the literature on dedicated meeting rooms to see upon what grounds they had been justified. It was our opinion that there were three identifiable roles which had been cited for such rooms:

1 *Research testbeds.* Most of the meeting rooms reported in the literature had been established as experimental sites in a university environment (Capture Lab; the Arizona Room) or a sophisticated corporation (Xerox's CoLab). Most surviving rooms are utilized to some extent for research into how groups interact. Both the CMI and CSMIL facilities in Ann Arbor are used for research testbeds.
2 *Meeting environments for specialized clients.* As noted earlier, the clients who have used the Ann Arbor facilities have come from special populations — business executives and/or designers. Due to the early state of the art, such specialized clients are justified based on (a) their importance (as judged by resource allocation) and/or (b) their familiarity with computer usage. It is also worth noting that meeting room facilities are geared toward groups directed toward specific goals (e.g., a decision on some problem). Both the Ann Arbor facilities (and especially their "replicas" located at sponsors' sites) have been used this way.
3 *Sources of meeting support services on a commercial basis.* Of the Ann Arbor sites, only Capture Lab has been offering commercial services. These services should be seen as a profit-making adjunct to the laboratory's research agenda; it would not be accurate to characterize Capture Lab as a purely commercial enterprise.

We asked our hosts at both sites if they disagreed with this assessment, and if they could identify any other bases for justifying development of dedicated meeting support facilities. They recognized the categories listed, and they could not offer any additional ones.

Chapter 3 Presentations to the TELDOK Group

3.1 "The Future of CSCW"

by Paul Saffo and Robert Johansen, referred by P G Holmlöv

Why groupware?

Groupware is the first emerging technology driven by user needs that Dr Robert Johansen has found in twenty years of study.

The attention groupware has received, not least due to Johansen's and his associates' admirable coverage of the subject, is fuelled by the growing importance of business teams in today's corporate America. Business teams, that is a key innovation now in the U.S., and the use of business teams is a very flexible strategy, concludes Johansen. He also notes that the Institute for the Future, where he is a Senior Research Fellow and Director, New Technologies Program, these days receive more private-sector and less public-sector funding. Johansen was joined in this presentation by Dr Paul Saffo, well-known computer columnist and a Research Fellow with IFTF.

Johansen's "maps" of groupware territory

Bob Johansen, together with amongst others Paul Saffo, wrote the first book of groupware "for the rest of us".[12] Here they "map" groupware possibilities in a fashion that would make it possible for a normal business person, who knows nothing beforehand about groupware, to get a basic understanding of groupware options within a few minutes. In addition he or she should be able to use the map to describe his or her needs.[13]

Johansen provides a simple contextual taxonomy of Cooperative Work to discern various kinds of Computer Support. Team members may work at the same place or at different places, at the same time or at different times, which calls for the four-fold typology construed in the map. Of late, Johansen has turned the map slightly. One of his worries is, most research goes on only in one of the cells on the map. This I interpret as, Does the map really cover a connected land mass or are these options merely islands in an unnamed sea?

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12 Johansen, R., Charles, J., Mittman, R. and Saffo, P. (1988) *Groupware: Computer Support for Business Teams.* New York: Free Press.

13 Johansen, R. *"Teams for Tomorrow"* IFTF Paper P-170, Plenary Speech at Twenty-Fourth Hawaii International Conference on Systems Science. October 1990.

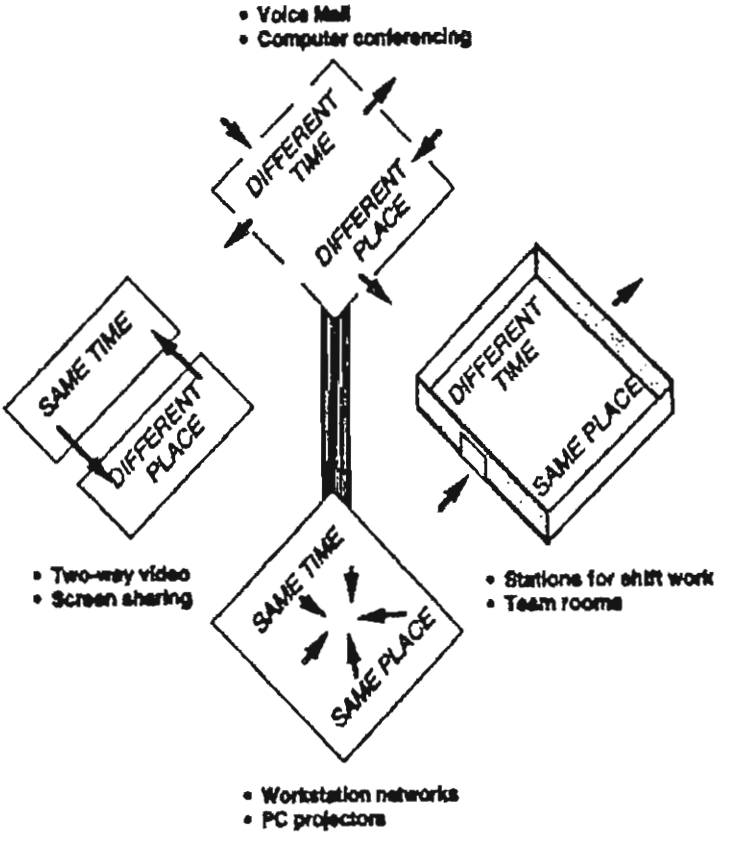

Figure 3.1 Johansen's time and place taxonomy of Cooperative Work situations.

Johansen expects that the growth area and greatest potential for groupware applications is in the intersection between the four cells of the time and place typology, which he calls "Any Time, Any Place". For instance, groups who are happy with a computer-supported meeting may want to make the technology moveable, to use it in their own offices or homes and when they are all dispersed.

As electronic tools are transforming physical space to virtual space, Johansen sees it fit to exchange Same Space—Different Spaces for Same Place—Different Place. Another four-cell matrix attempts to deal with this, along with the notion that group work can either be within the same team, or consist of "teams of teams", as in large corporations or when international regulatory shifts, such as Europe 1992, happen. Indeed, as Johansen points out, teams of teams working across different spaces would call for a much more complex form of coordination.

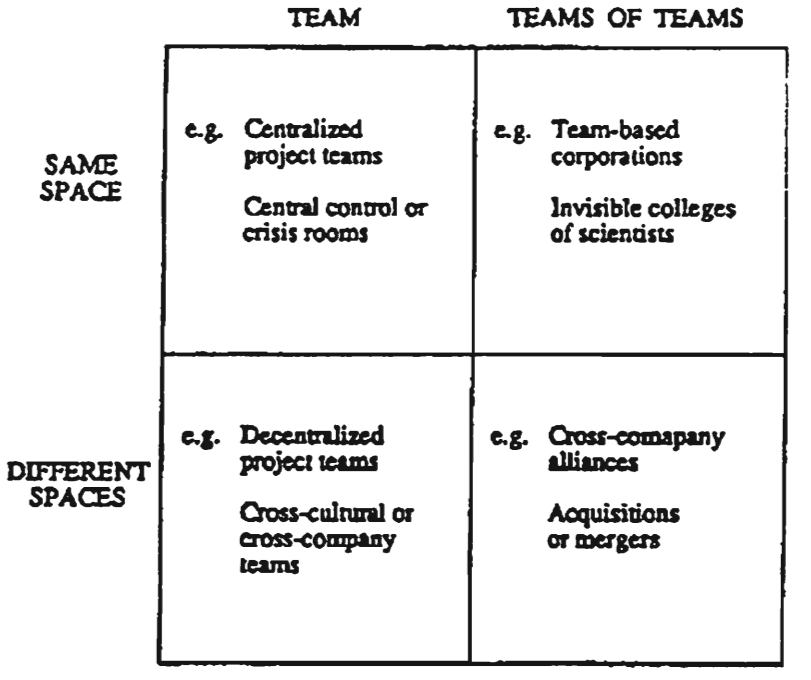

Figure 3.2 Johansen's team/space taxonomy of Cooperative Work situations.

Groupware for "same time, same place"

Looking at the various products offered in the field, especially at those addressing the needs — and pains, in Johansen's vocabulary — of business meetings, Johansen offers insights.

TeamFocus, after extensive in-house testing now an official IBM product, is currently the market leader of all the meeting room packages. It builds directly on University of Arizona (GroupSystems) technology, but the two may well diverge in the future. IBM's in-house TeamFocus rooms strongly reflect the IBM image — "Austerity at any price". IBM have been marketing TeamFocus since late 1990, although what is included in the product is not quite clear. A licence to use TeamFocus software sells from USD 50,000. As in the GroupSystems facilities, a trained stand-up facilitator is required, and IBM offers training as a service to prospective customers.

SAMM, developed at the University of Minnesota and marketed by Anderson Dixon Associates to "Total Quality professionals", is for small leaderless groups, in stark contrast with GroupSystems and TeamFocus. SAMM is being used by IRS (the Internal Revenue Service) and by Texaco, the oil company.

CSMIL (Cognitive Science and Machine Intelligence Laboratory) at the University of Michigan at Ann Arbor have more of a research orientation towards meeting room technology. During normal meetings in Capture Lab, two researchers behind a one-way mirror are busy coding the behaviour of meeting participants in the twelve positive or negative, task-oriented or human relations-oriented interaction categories suggested by Robert Bales.[14] A trained coder can jot down a change in behaviour every three seconds. Three hours after a Capture Lab session, attendees receive such time series data for that specific meeting.

The Electronic Data Services division (EDS) of General Motors have been using Capture Lab for tens of groups as part of their operations. EDS have a partnership with the University of Michigan to support CSMIL. Anderson Consultants are also using CSMIL technology, which according to Bob Johansen is "practical for software engineers".

The CTC (Collaborative Technologies Corporation) EMS product, VisionQuest, can be used without the aid of a trained facilitator, which means that no outsiders need witness company meetings and that these meetings could be arranged more swiftly.

Another system, OptionFinder, is even more of the "quickie group support", notes Bob Johansen, in that participants can roam around the room using wireless keypads (costing three times more than the clumsier wired systems).

Groupware for other times, other places

On the telecommunication side of things, Johansen observes that most of the videoconferencing rooms sold in the States "last year" (1990) were rollabouts, rather than permanent rooms. While the ARCO meeting rooms for video conferencing used to cost USD 750,000, the price tag is now down to USD 100,000. There are about 4,000 meeting rooms worldwide equipped for two-way video conferencing.

The number of conference calls — telephone meetings for more than two parties — increases by 20 percent per year, although there is absolutely no advertising being done.

BellSouth have developed a system for distributed meeting support, which is based on Ventana software (GroupSystems) and comes with a data bridge and an audio conferencing bridge to allow for conference calls and instant sharing of computer output.

AT&T's Rhapsody — now merged with NCR's Cooperation — is the single piece of software that has come the furthest to respond to demands of "workflow computing", a new buzzword Johansen and Saffo and others keep using.

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14 See Weick, K.E. Systematic Observational Methods. In: Lindzey, G. and Aronson, E. (1968) *The Handbook of Social Psychology*. Reading, MA: Addison Wesley.

A real estate holding company in Chicago, Balcor, are using software from Action Technology to offer a service called Business Design Technology.

We are now (April, 1991) probably twelve months away from seeing the new Sharp Wizard Plus, a computer in the laptop-less category which could also help realize software for meetings in and coordination of dispersed teams.

As a way for putting this in its perspective, Johansen and Saffo ask us to bear in mind that Nintendo computer games sales in the States are larger than all business software sales. If and when the residential market adopts groupware-like solutions, something will happen.

Teams for tomorrow

In his October 1990 conference paper on *"Teams for Tomorrow"*, Johansen draws on what he labels a number of "stimulators" — such as the maps of groupware options — to create six very condensed scenarios describing future teams within the decade ending in the year 2000. He presented these scenarios to the TELDOK group.

- The scenario *"Any Time, Any Place"* shows how a single salesperson keeps in touch with his boss, colleagues and customers while he's in his car on the road (actually, sitting under a tree) using a small "dynabook", which is what Apple Fellow Alan Kay called extremely portable and extremely powerful personal computers — intimate computers, he says now — even before laptops began to appear.
- The scenario *"Orchestrated Workflow"* portrays the use of a shared database, where different teams across the company store their work and, with the help of clever computing, can compare their results.
- The scenarios called *"Virtual Team Rooms"* builds on the idea of "virtual reality", as typified by the electronic helmet and gloves which, when worn by a person, enable that person to see and manipulate objects, projected "inside" the helmet and gloves, as if they were real objects within the actual reach of that person. Here, one scenario describes a remote meeting where all participants, whether in Paris or the U.S., wear helmets and data gloves so they simultaneously can "walk" into the same (image of) their meeting room and jointly look at images, models, and video clips that have been prepared in advance.
- The scenario *"Culture Bridging"* tells of a meeting involving participants from many countries — the Swedes arrive last, later even than the Mexican delegates, which the hosts have to explain to Japanese and American attendees — who congregate in a meeting or team room where they can use an automatic translation package which deals with language intricacies as well as with cultural differences and context nuances.

- The scenario *"Just-in-Time Learning"* depicts how a team member in a protective suit enters a hazardous zone to work with robots in cleaning up radioactive debris, as he and the robots are receiving instructions on how to proceed in the exact split second from on-looking team members all across the world.
- The scenario *"Window to Anywhere"* looks at a video wall meeting involving team members from three different countries. At each location, two entire walls (in a sharp angle) are used for displaying attendees at the two other sites. As the meeting progresses, other participants can be roped in to join the meeting.

3.2 "The Bootstrap Initiative"

by Doug Engelbart, referred by Bengt-Arne Vedin

Every organisation, be it a corporation or a government institution, has a primary task, its core business activity, to produce a product, system, or service. New technology as well as new requirements, new knowledge and new tools make it feasible to improve on and further develop this core activity. Thus we may identify a secondary function, which encompasses the improvement of the system producing the end product, that core business. Such secondary activity might include developing new training programs; implementing electronic mail; improving quality awareness.

But the secondary activities are also open to improvement. This would then happen through third order processes. They might be, for example, developing tools for improving decision making; project management methods; and certainly groupware development.

We could actually go on and denominate fourth and fifth and sixth order processes, improving improvement of improvement. But what applies at the third order stage would apply in a rather similar way on the higher orders.

By the end of World War II, young navy boy Douglas C Engelbart was inspired by Vannevar Bushs prophesies of the coming information technology power. Engelbart set out to create a better world, utilizing the burgeoning computer technology. He was so full of foresight, and so dedicated to improving technology to suit humans, that he beat even the fast changing information technology. Today, many of his inventions, such as the mouse, windows systems, and others, are standard. But he actually perceived and developed these novelties even before technology was ready, often chastened for being on the wrong track. He was not.

Engelbart terms those improvement processes "bootstrapping" methods. The reason is that there is the potential for sizable leverage in working more efficiently and of course in adapting to the changing environment and the various challenges and new opportunities. A

small resource increase on the tertiary level might give rise to considerable benefits for the core activity, while an investment of the same magnitude might make almost no impression if rather directed instead to the core.

Resources are always limited. A design question is actually how resources should be allocated between these primary or core activities, and the secondary and tertiary. (Engelbart terms them A, for core activity, B, and C.) Tertiary processes concern getting better at improving oneself; second order activities might reduce product cycle time, and tertiary order efforts reduce improvement cycle time. This is rather pertinent now, when time is increasingly becoming a, perhaps *the* crucial competitive weapon.

At all levels, primary through tertiary, needs and opportunities must be identified, solutions must be developed and implemented, and there should be a feedback loop for learning.

As human beings, we are endowed with certain genetic capabilities; they are perceptual, motoric, and mental. We may develop skills and acquire knowledge; we may learn. We exist in human systems, constituted by culture and language, customs and procedures, organisations and methods. There exist tools that we have developed to augment our capabilities, such as practical tools and machinery, vehicles, media and facilities.

Every development, every augmentation involves development of both these sides. To take advantage of new technologies, organisational prerequisites may be met, and an adequate language must be developed. Secondary processes must be tailored to the content of the core activity. Tertiary efforts, however, depend mostly upon secondary work processes, but not so much on the content. Therefore, there is common ground between vastly different organisations, with profoundly dissimilar core activities. This is the Bootstrap Initiative: Engelbart's attempt to bring a number of organisations together, to develop the understanding, the tools, and the human systems necessary in order to improve tertiary efforts.

Each organisational development would produce a record of various documents in a broad sense, memoranda, minutes of meetings, reports, measurement protocols, and so on. The basis for this would also exist on the individual level; Engelbart calls this "One person's knowledge workshop". Some of the resources are resources as well as records, like phone lists or rolodexes. What happens if two persons decide to share such knowledge domains?

On the basis of meetings and deliberations and studies and reports, almost all recorded, some decisions are taken and the organisation sets out to pursue some agenda, denoted in a "handbook" of budgets and plans, requirement specifications, time limits, legal contracts, product brochures, and manuals. The development from those recorded deliberations to decisions, which form the handbook, is of course influenced by what is happening in the organisations environment. That is to say,

new technologies, market information, industry trends and forecasts, scientific and other literature, business intelligence, and macro economic trends.

Much as Edward de Bono has pointed out that we do a lot of thinking but are only trained at mathematics and other problem solving, never at thinking itself, its theory, practice or improvement, the "handbook cycle" of turning the process that is documented through records into the handbook of organisational procedure is less understood and developed; it is rather performed pragmatically, by tradition and intuition.

If those involved in this process were empowered to understand what is going on, and if they were given the tools to coordinate the complex process of turning records into handbook items, then the process might be improved upon greatly.

Such methods and procedures are, as indicated, not generic to just one company or activity. Rather, there is the potential for collaboration. The more variety among the collaborating partners, the better, because that would help the system become more general, less parochial. It would be easier to go beyond existing practices since the varying practices between industries should minimize the risk for mistakes.

One way of achieving this is to develop and implement an infra structure, linking the various records and handbook items. This would be an open hyper document system; open because it should be flexible. Given the proliferation of computers, communications, and software systems, it should be open also independent the make or type of equipment.

The various types of knowledge that would be linked are those important to the primary or core activity, such as that related to marketing and production, engineering, management, customers and suppliers (outside the boundaries of the company as a legal entity), procurement, quality function, and so on — all depending upon what is relevant to the core activity.

Since the "hyper system" should encompass all types of records and handbook items, it must cope with everything from video to text and audio. There must be privacy and secrecy provisions.

There should be several levels in the hyper document system, from the more private, sometimes ephemeral, mail, over shared files to journals, and, even, offline documents.

Doug Engelbart developed the mouse, out of several candidates because it turned out to be the most convenient, the most rapid human interface. Similarly, in the hyper document system, it should be easy to access files or parts of them — to zoom in and out rapidly.

Like with the mouse, Engelbart has developed a very fast and efficient system for editing, searching, and handling objects or text in a computer. He proposes that everyone rely upon familiar names and natural associations; his metaphor is "if you think of the dial on your

microwave oven, you associate to it directly and you see it in your head without going through the rigmarole of a hierarchy like house, kitchen, workbench, oven dial". Of course, we have to learn to use such augmentation tools, synthetic cultural inventions, for example when we break out of linear presentations, into hypertext and alike.

Files may be organized hierarchically, and levels be recalled individually; for example the principles outlined in a report may be recalled without their supporting evidence. In the Engelbart system, it is also very easy to mark a word, a sentence, a paragraph, etc. It is not done the MacIntosh way, running through the exact text, but just one click with the mouse and one command, specifying that the whole paragraph where the cursor is placed should be moved or deleted or emphasized (It does not matter where in that paragraph the cursor has been placed).

The systems used by the aircraft manufacturers McDonnell Douglas and Northrop, order their suppliers hierarchically. The first level consists of some 200 in each case; the second of some 2000, and the third level of 4000 or so. These different organisational units must collaborate; they share legal obligations, but they also participate in a technical development that underlies what eventually might become legal contracts. When the two large aircraft manufacturers team up together, with their suppliers brought into the process, we may have differences. However, the goal is that there will be a number of people, teams, and organisational units collaborating.

Engelbart forecasts WYSIWIG (what you see is what I get, which might be a nuisance apart from at the final production stage) giving way for WYSIWYN (what you see is what you need). That would include the option of seeing different presentations based on the same hyper document system, perhaps just differently presented, perhaps also differently selected or structured. Integrated, open systems architectures would be needed.

The front end, the terminal interfacing with the user, should be his or her general tool. So it should preferably be developed separately from "the backend", supplying the application work. The frontend could be regarded as a specific application program, also allowing for the individuality of the very person using it, taking into account, e.g., his or her proficiency.

Among the features of the hyper system would be multimedia; the same document would mix video, spreadsheet, sound, etc. Viewing can be tailored to the viewers taste or needs. There would be links to other documents. And there would be a library system for searching documents indicated through such links. Documents would be structured so that searching within them is simplified, and "recirculation" of parts of them facilitated.

When individuals communicate, it should be possible to share windows at teleconferencing; they would work as if sitting side by side. If they are involved in activities such as computer-aided design, the databases of the CAD system should be linked to the hyper system. Doug

Engelbart assessed that, for a large aerospace company, such a system might save at least $300 million a year.

3.3 "Legal Aspects of Computer-Supported Team Work"

by Peter Seipel, professor of law and information technology, Stockholm University

Introduction

Computer support of different types of cooperative work gives rise to a number of legal issues. One of the sessions at the TELDOK 1991 Groupware Study Tour served to give an overview of these issues and an opportunity to discuss various legal implications for individuals, groups, and organisations. The initial presentations were given by Stephen R. Bell, attorney at law (Squire, Sanders & Dempsey, Washington, D.C.) and Peter Seipel, professor of law and information technology at the Faculty of Law, Stockholm university.

Not so few

Groupware in the context of the seminar means creating and using specialized computer aids for various kinds of working teams, primarily in the area of commercial activities. Such work may involve video teleconferencing, shared databases, computer conferencing, input of written texts via scanning, and group voice mail, for example. The tools may be intended to support groups meeting face-to-face as well as groups which never come together physically in one place at one time. In consequence, the electronic networks may be narrowly local, regional, national or international.

The tasks to be solved may be of many kinds. For example, some tools (hardware as well as software) are intended to support "chatting" and similar informal and unstructured activities of a group. Other tools may assist in preparing offers and the formation and follow up of business contracts. Electronic environments can be created to support particular efforts, such as administrative tasks, knowledge acquisition, polling or negotiations. The purpose may be associated with a special occasion or with day-to-day work of a routine character.

The general and highly flexible nature of the groupware tool box implies that we must expect to meet a considerable number of related legal problems. In fact, almost all areas of the law are touched upon in one way or another. We must also expect to encounter these legal problems at all the different levels involved in the use of groupware tools: the level of the individual, of the group, of the project, of the organisation, of the particular business sector, and so forth.

Basically, groupware can be seen as one component of a general development which changes the traditional environment for all kinds of human communication and transactions. Some of the changes may be observed quite easily whereas others are more difficult to understand and describe: for example, the increasing use of electronic means for registration and storage of traditional written information necessitates new legal solutions in many situations — the concept of "electronic documents" must be integrated into the web of rules concerning formal procedures, evidence, archives, and so on. Compare this phenomenon with the more subtle changes associated with human interaction in computer networks: general views on information ownership, attitudes with regard to privacy protection, the increasingly obscure borderline between the private sphere and the work sphere of individuals, the differences between "trusted users" and "outsiders", etc.

It should also be noted that not only is the legal domain at issue extensive; it is also in many respects uncertain. According to Stephen Bell, up till now none of the 11,000,000 reported state and federal court cases in the U.S. directly addresses the concepts "decision support services" or "groupware".

Computer law in general

Computer law or information technology (IT) law may be divided into six main areas:

- Acquisition of IT products and services
- Telecommunications and media regulation
- Privacy protection
- Security and vulnerability
- Freedom of information and user participation
- Automation in public administration

The divisions and their labels are somewhat arbitrary. Nevertheless, they provide a both a useful overview and a scheme which facilitates understanding of IT law as a whole.

Groupware does not relate narrowly to any one specific area of IT law. For example, to the extent that public authorities begin using groupware tools, legal issues will arise in practically all of the six areas. The following are some examples:

- contracts regarding acquisition of groupware services
- regulation of dedicated networks used by groups of public authorities
- protection of personal data in relation to administrative matters which are being handled via electronic means
- protection of data against unauthorised access
- citizens' access to electronic documents held by public authorities
- regulation of decision-making which involves use of groupware tools

However, rather than systematically going through all the six sub-areas of IT-law and discussing all kinds of groupware in relation to them, we will focus on groupware used by business teams and concentrate on some issues of particular importance in this context.

Customer/vendor relations

Groupware tools will increasingly become standardized and be marketed as packages, not least software packages. For example, one computer manufacturer has composed a set of groupware tools (word processing, E-mail, file sharing etc.) as an addition to the Windows 3 system. In this context we meet the familiar conflict between *mismatching user expectations and vendor warranties*. It is not uncommon that vendors wish to disclaim almost all warranties. For example, a contract may state that there is no warranty "that the function contained in the program will meet your requirement or that the operation program will match your requirement or be uninterrupted or error free". Such disclaimers are looked upon differently in different legal systems: for example, in the U.S. they are accepted by some courts; in Sweden they may be in conflict with Section 36 of the Contracts Act which contains a general provision directed against unreasonable contract terms. Not least in a new and uncertain area such as groupware, users and vendors should try to define their expectations as precisely as possible. Of course, such efforts must be based on a proper understanding of the product as such. If the parties are unable to define the product, legal disputes are not far away.

The basic principle is, of course, freedom of contract. However, to the extent that groupware becomes frequently used to support various business activities it is not unlikely that there will be a public concern for the quality of marketed products. Possibly, standards and minimum requirements will be formulated which will also affect contract formation and the warranties offered by the vendors.

Privacy protection

Evidently, groupware support presupposes recording and keeping of many kinds of data which are sensitive from the individual's point of view: personal calendars, communication habits, messages sent by E-mail are but a few examples.

The complex of privacy laws is often difficult to overview and is perhaps less systematic than one would think. In the U.S. specific federal statutes protect specific types of information such as credit and education. Particular mention may be made of the Electronic Privacy Act of 1986 which protects electronic communication and remote computing systems. In Sweden the 1973 Data Act constitutes but one piece in a complicated jigsaw puzzle of "register laws".

It should be evident that privacy protection laws have far-reaching consequences for groupware systems. The design and use of such

systems must necessarily take into consideration all kinds of legal requirements and corresponding expectations of privacy.

Labour law

Questions concerning the dividing line between private and work-related activities appear to be closely tied to the concept of groupware: for example, it allows people to participate in a business meeting at a time of their own choice and from any location. And private chatting and other kinds of private communication may be both frequent and difficult to distinguish from professional activities. There is also the issue of whether employees should be free to choose what type of working tools they prefer; it is a fact that people react differently to the use of electronic tools and that they tend to use them differently.

As for the legal consequences, problems may arise with regard to the possible liability of the employer for acts committed by employees in groupware systems. Work hours and physical presence in an office may be of small significance in the new electronic environment. There is also the issue of the employer's control and review of what goes on in E-mail systems, for example. Finally, various legal complications involving the organisation of work and the contents of work tasks may materialize.

It must be expected that trade unions will become increasingly aware of such issues and that they will wish to have a say in the design and use of groupware tools. Perhaps, even detailed aspects will be regulated in future collective agreements.

Copyright issues

Numerous copyright issues relate to groupware. One obvious category concerns the interest of those who create and market the tools in safeguarding their rights. Since groupware is a relatively new and even experimental concept, this interest will encompass not only detailed program solutions and similar "low level" creations but also overall ideas and general concepts on which the new products are based. Copyright law is not foreign to such "higher level" protection even though there is much uncertainty associated with it, not least under Swedish law. In U.S. legal doctrine these issues are often discussed under the heading of protection for the "look and feel" of computer software.

A second category of copyright issues has to do with the result of work performed with the aid of groupware. For example, there is the question of anonymous work products in situations where many have cooperated to produce a certain result and the contributions cannot be distinguished from one another. It is therefore advisable to regulate the rights of different participants when disputes over intellectual property rights can be foreseen.

Similar issues concern the use of pre-existing works in the groupware context: for example, to what extent does the rule permitting so called "fair use" allow participants to store and use materials which have been created by other parties? It should be noted that it is possible to automatically re-arrange information, to extract certain pieces from it, to integrate it into other information, and so forth. It cannot be taken for granted that the end result of such activities reveals the degree to which other people's work has actually been used. Succinctly put, the question of copyright protection tends to fuse with questions regarding protection against unfair competition, or, more precisely, protection against uses of information which are contrary to honest commercial practices.

Security

A groupware system is, almost by definition, a sensitive system:

- It is likely to store all kinds of sensitive information
- It may be used by a large and changing number of people
- It will reveal communication patterns, work procedures, and work habits

Security protection is to a considerable extent based on existing criminal law. Thus, unauthorized use of a system is as a rule penalized in national legal systems as is unauthorized alteration and destruction of data. Special criminal sanctions are directed against such offences as unauthorized divulging of trade secrets and spreading of information which is injurious to other parties. In the latter respect, groupware may give rise to difficulties because of the uncertain nature of the medium: Is it "written" or is it "oral"? When does it begin to serve as a mass communication medium? To what extent should activities in a groupware system be regarded as "commercial speech"? These distinctions are legally significant (to say the least) and have been known to involve complications even with regard to traditional media and communication situations.

In some respects the system of criminal sanctions may be incomplete or deal with offences in more or less awkward ways. For example, it appears to be uncertain how Swedish law would treat so called trafficing in passwords, i.e. the spreading of information about secret passwords, sharing lists of secret passwords, and similar activities which facilitate unauthorized access and increase the threats to existing systems.

As groupware systems become more common and their use more widespread it appears to be essential that security standards are developed. At least in crucial respects, the level of security should be known to the users: for example, to what extent data are encrypted and to what extent logs are kept on messages and usage activities. Up till now it appears to have been common to regulate such matters in con-

tracts, i.e. on a more or less case-to-case basis. Possibly, there has also been a tendency to assume that all users may be considered to be trusted and, thus, to accept a relatively low level of security. The computer system of the Swedish Riksdag (parliament) — which may be looked upon as an embryonic groupware system — may be used as an example. A couple of years ago a study revealed that the members of the Riksdag were not aware of the fact that their E-mail messages were being kept and could be retrieved even after they had been "deleted" by the sender. The reason was, of course, the need for back-up copies — one kind of security protection created risks for another.

The discussion of security in fact leads very far. There is the issue of appropriate security standards which is being dealt with both by organs such as the U.S. National Institute of Standards and Technology (NIST) and the Swedish Standards Institution (SIS) and in contracts regarding use of groupware systems. The creation of standards is to some extent connected with consumer protection, i.e., simply put, the protection of all ordinary users of the new tool. From this point of view it is natural to emphasize the broader social interest in security arrangements in groupware systems: they come to be looked upon as similar to road traffic safety, for example.

Particular security issues are associated with business uses of groupware systems when it comes to matters involving authentication of messages, acceptance of electronic signatures, and criteria which decide what is an "original" and what is a "copy" of a particular message. The discussion of these issues and related ones is relatively recent. It is complicated not least by involving both intricate technical matters and basic legal concepts. It also leads further into the vast field of questions of evidence and of control and auditing in general.

The interface between the private and the public sector

Although business uses of groupware is our main concern, a few words ought to be said about the relations to the public sector.

It must be expected that groupware will contribute to the breaking down of walls between private and public information handling activities. The phenomenon is already very much visible in areas such as taxation, personnel administration, and so called EDI (electronic data interchange for trade, transport and administration). It has to do with the creation of direct information links between private and public organs, use of common information pools, coordination of information handling processes, uniform messages formats, and similar things.

In mixed private and public information systems the legal situation also becomes mixed up. For example, in Sweden the question of openness according to the rules on the right of access to "public documents" has to be dealt with. Existing rules may allow the public to use the computer terminal of a public authority to gain access to data held in a computer operated by a private organ. The basic prerequisite is that the

public authority can access the data at issue using routine measures such as an available communication program and an information retrieval system. Authorization to access the data is of course also presupposed.

Another category of issues relates to administrative decision-making procedures. Mixed groupware systems allow new forms of contacts between public authorities and private organs. At least in Sweden, this phenomenon is at present reflected in administrative procedural rules only in a rather fragmented way. It concerns such subjects as the permissibility of using electronic channels for official purposes, obligations to print hard copies, communication of information about administrative decisions, and the creation and maintenance of electronic archives.

International aspects

A number of advantages and uses of the groupware concept are associated with international activities. This involves additional legal concerns. We may group them into four categories:

- Trade-related issues
- International regulation
- Harmonisation of national legal regimes
- Questions of applicable law

The trade-related issues concern, among other things, the right to participate in particular groupware activities — bidding for contracts, offering particular services, creating special interest groups, sharing experiences etc. Examples from other areas — airline ticket reservation systems, for example — demonstrate that the conditions for the establishment and use of groupware systems may have to be considered from competition and free trade viewpoints.

As for international regulation, privacy protection has already generated a number of conventions, recommendations and guidelines. The most recent initiative is from the European Community. It involves both a suggested general personal data protection directive and an initial part of an intended body of sectoral directives, viz. a directive concerning the protection of data and privacy in the context of public digital telecommunications networks, in particular the integrated services digital network (ISDN). It is not unlikely that in the future international groupware systems will be the subject of such specialized, sectoral regulation. One may compare with, for example, systems for automated bibliographic information retrieval where the European Association of Information Services (EUSIDIC) has issued numerous guidelines, recommendations and codes dealing with access to systems, keeping of information, downloading, re-use of information that has been obtained from the systems, identification of those active in the system, etc.

One example of the need for harmonisation of national legal rules has to do with contract formation, i.e. rules which decide how and to what extent transactions among a number of subjects make these subjects obligated to one another to perform what has been promised. The concepts, the conditions, and the traditions of this field of law vary from country to country — with regard to formal requirements, rules concerning implied contracts, conditional contracts etc. Clearly, national laws may take quite different views on the legal consequences of activities which have been performed in an international groupware system.

The final category involves issues as to which particular national should govern a certain event or case, i.e. problems of so called conflict or choice of laws. In situations involving international groupware systems one can think of many situations where there are several jurisdictions interested in the controversy. Even well established principles of the doctrine of choice of law, such as the principle of letting the place of making a contract decide which country's law ought to apply (the "lex loci contractus" principle), give rise to difficulties in an environment where geographically distributed activities are the rule. It may be noted that in the field of personal data protection it has so far not been possible to agree upon choice of law rules with respect to which national data protection law ought to govern a particular conflict. The Organisation for Economic Cooperation and Development (OECD) made an attempt in connection with the drafting of its 1980 guidelines governing the protection of privacy and transborder flows of personal data without being able to formulate any workable solutions.

Conclusion

The richness of the groupware concept — a flexible information tool box for human interaction of many kinds — is reflected in its legal framework. The above description is but cursory — it leaves out several problem areas as well as any number of details. Nevertheless, it ought to reflect the significance of the legal framework and, not least, the peril of neglecting it.

Groupware can be discussed at a number of levels. The technical level involves matters ranging from hardware requirements of particular network set-ups to ergonomic and graphic design criteria for information on computer screens. The application level comprises such concerns as general experiences of problem solving in groupware systems and strategies for creating groupware systems for particular tasks. Without doubt, the development of groupware will require a lot of attention to both technical and application matters. Many claims, ideas and suggestions connected with the new buzz word still appear immature and uncertain. Experimentation and hard development work will put them to the test. But it is essential not to postpone studies of the legal aspects: quite on the contrary, they ought to form

part of such experiments and development. All too often in the history of computing and information technology, legal concerns have surfaced at a late stage. When an application leaves the sheltered environment of pilot studies and the narrow circle of trusted users, then, and not until then, does the necessity to inquire into legal aspects begin to be felt sufficiently strong to motivate involvement by legal experts. From personal experience I can confirm that such conduct ought to be avoided: legal work also needs time for experimenting, evaluation, reflection, discussions, compromises, and so forth. There is no ready legal tool box from which one can select and immediately apply standard solutions for complex computer applications such as groupware.

The lawyer is needed already in the laboratory and law needs a laboratory to develop its strategies and solutions.

Part 2
Participants' personal reflections from the tour

Participation in the short seminar at the University of Arizona was the common denominator in the groupware visits for the members of the disparate group that made up this TELDOK study group. The personal itineraries of the individuals differed in practically every case. Some participated solely in the seminar, some made company and university visits before the seminar, others made such visits after the seminar, while still others made visits before and after the seminar. The group itself was very heterogeneous in its knowledge and experience of and interest in groupware. It included experienced groupware researchers, vendor representatives and experienced and potential users. It is thus important to bear in mind that the personal reflections presented below reflect widely ranging personal points of departure and are based on widely different experiences from the tour. We feel however that it is valuable to share with you these reflections on the state of the art presentations we experienced.

1 Rolf Andrén

"When you assemble a number of people to have advantage of their joint wisdom, you inevitably assemble with those people all their prejudices, their passions, their error of opinion, their local interests, and their selfish views. From such an assembly, can a perfect production be expected?"
Benjamin Franklin, 1787

Do you feel that meetings often take unwanted turns, derail or end up on a cul-de-sac? Do a few individuals dominate meetings to such an extent that people who are not extraverts fail to voice their opinions? Is the productivity of meetings low? If you answered yes to the aforementioned questions, you are not alone. It has been this way for centuries, which is evident from Benjamin Franklin's statement above.

Brainstorming

Two sessions were held in the University of Arizona Electronic Meeting Room. The first involved "Electronic Brainstorming" under the title: What are the key issues in providing automated support for groups?

Each PC-user could enter a "key issue." The other participants received a random sample of the material generated and could comment on the various suggestions. All contributions and comments were made anonymously. This resulted in a large number of comment-chains, such as the following example:

1 Fun.
2 ... and yet some seriousness (at the end of the day).
3 Preserving the individual's personal integrity.
4 Is that important in a working environment?
5 Nothing wrong about fun.
6 Essential that proposer can screen own contributions before they are made public with identity of proposer.

The session lasted less than 30 minutes. Productivity, as measured in the number of lines, was reasonably high and resulted in a five-page printout. The quality of the result was dubious, however. It was also difficult to profit from the printout, as each chain of comments was unstructured. It was difficult to determine whether a comment referred to the original contribution or was simply a comment on another comment. In order to be useful, the material must undergo further revision.

It should, however, be feasible to use technical aids to generate ideas and suggestions in a variety of contexts. Positive features include the fact that everyone can work simultaneously, that it is possible to become more creative thanks to inspiration from the ideas of others, that everyone is anonymous and that no one is dominated by other participants.

The chief disadvantage, in my opinion, was that meetings tended to be too impersonal. Although we all sat in the same room and could establish personal contact with each other, we were, in practice, isolated at our PCs. In order to boost the quality of the results, suggestions should be discussed in a traditional meeting where more subliminal factors of human interplay, such as body language, tone of voice, etc. can be used.

Evaluation of suggestions

The second session lasted several hours and utilized the "Idea Organisation" tool, which was referred to as "Group Outliner" in this context. The subject was the report TELDOK was to issue concerning this study tour.

Four stipulated individuals provided suggestions as to the formulation of the report. In addition to this, other participants were permitted to make suggestions anonymously under the title of "other". The suggestions were structured, and the five basic documents were linked to three types of comments: *pro*, *con* and *other*. Participants were permitted to accept arbitrary basic suggestions and comments and to state

their own views. A large volume of text was generated. Comments were supposed to be anonymous, but the system did not designate senders so each participant had to initial his/her contribution. Many failed to this, however, so a large number of the comments were anonymous anyway.

Although there was a rudimentary structure to the information, the results were still felt to be unstructured. There are no aids available that can process comment-chains that branch out, which made the documents difficult to read. Which comment applied to what? A primitive browsing technique also made it difficult to obtain an overview of the material produced. In order to change from a *pro* document to a *con* document, it was necessary to return to the main menu and indicate which document you wanted to read or comment. If you wanted to make the same comment on more than one document, it was necessary to write it each time.

Another disturbing feature was the fact that each time a suggestion or comment was made, it was impossible for the author to revise it. Mistakes could only be rectified by writing a special message ("X" should read "Y"), for example.

The session concluded with the use of the "Vote" tool. Suggestions concerning the formulation of the report were ranked by each participant. The results were presented in an integrated order of preference and as an evaluation of the group's consensus (low!). Each participant could also see to what extent his/her own order of preference concurred with the group's.

This was probably the least meaningful section for the group. We were completely at the mercy of technology. In a traditional meeting, we would undoubtedly have tried to combine some suggestions, pick the best from each and compromise, which was not possible when presenting a simple order of preference. Here again, the results of this session can hardly be considered a decision. The material can, however, serve as a basis for further revision and decision-making.

Same time, different places

In our experiments, everyone sat in the same room. We were told that it was possible to link up to participants in other places and meeting rooms with similar equipment. A modified version of the software was used in these meetings. This was not demonstrated, however.

In its continued study of geographically dispersed meetings, the University of Arizona has begun construction of a new room similar to the "Arizona Room" especially designed for such meetings. The equipment is similar to that found in the "Arizona Room", but also features two "video walls" where TV images of the two groups can be projected.

Concluding remarks

Perhaps the brief experience of the study group is insufficient to draw adequate conclusions. It is also possible that my not-too-positive assessment of groupware is unjust. Nevertheless, based on the information I received and my limited experience, I do not believe that the benefit of this system motivates the cost (the "Basic Toolbox" software costs USD 40,000, to which must be added the cost of hardware and constructing a special room).

I believe that this is very similar to a computerized conference system. Although Group System does contain a number of tools, for example voting, that have no direct counterparts in a conference system, I still feel that the functions of the two systems overlap one another to a high degree. Aside from the fact that a conference system does not normally permit parallel work, it offers, in my opinion, major advantages; the most superior of which being the possibility of obtaining a well-arranged structure.

From a cost-benefit aspect, a conference system is definitely better. The marginal investment for a new user of a conference system is about SEK 500 (with an in-house system), while the cost per user in a Group System could be hundreds of times higher.

2 Hans Bergendorff

My impressions from The University of Arizona and from Ventana Corp. were the following:

1 *I was not impressed!* It was an almost Kafkaistique experience to hear 30 people in the same room concentrating on communication with each other through a computer key board clicking away like mad. One almost felt as if it was not a group of 30 professionals making serious deliberations but rather the corporate typing pool. I think this is yet another case where a solution is looking for a problem. Many of the tools available to group participants seemed to have little use (in how many meetings do we normally vote) and be rather impractical to use (it turned out to be rather impossible to conduct a multi-subject debate in the more structured way a normal computer conference allows you to).

2 *Technology seemed to be part of the problem* — IBM:s pre-Windows environment is pretty constraining. Graphics is nice to have.

3 *Using computers to make meetings more productive certainly is not a bad idea — but then one would like to have some useful tools available.* That is if everybody in a meeting has access to a PC which is connected to a large screen and to other peoples PC:s through a network one could make some pretty useful things such as

- express oneself more clearly with the help of pictures. With a MacDraw-type software meeting participants could make nice "overheads" to convey their message better and they would not be limited to their pre-prepared OH:s and could do them according to the actual needs of the meeting
- if the PC was hooked up to databases and some spread-sheet software was available the quality of the discussion could be improved considerably. One could base the discussion on correct facts and assumptions and by making some calculations directly be able to throw out the oddball ideas quickly without wasting too much time on them.
- if a good mailing function was included it would easily be possible to conduct some lobbying without leaving the meeting (i.e. one could have a little conspiracy not only together with ones neighbours at the meeting table).
- communications with the outside world could also be improved if everybody had a computer at the meeting.

4 Conclusion: *Tucson is maybe not at the frontier.* There was an exhibition at my MIT-conference where a lot of GroupWare was on display and from the quick walkthrough I was able to make I got the impression that there was a lot more useful stuff in MIT than in Tucson.

5 Another conclusion: *The problem of coordination is important.* One of the big challenges for firms in the 90-ties will be to effectively coordinate different functions, which may be geographically dispersed, so as too make the company fastmoving and able to rapidly adapt to the needs of the market. I think this is very important for my business where competence is often distributed across Sweden.

(A PS: I have now heard at least two people claim that they invented the mouse: Doug Engelbart and Håkan Lans [the man with the colour graphics patent]. Maybe one of them was first, maybe ...)

3 Peter Docherty

The field of CSCW appears fascinating and exciting. I was personally disappointed that other commitments prevented me from participating in more of the visits to vendors and researchers. When my immediate fascination has been tempered by sober reflection, my reaction has been to search in the literature to see if the salestalk really holds, for example:

- What is meaningful in the discussion of productivity and efficiency in meetings? (Holmlöv cites Johansen et al.'s warnings: "Computer conferencing could easily be used to confuse other participants", "the volume of information ... can sometimes become overwhelming", and "... multiple topic threads can appear; information overload can thus result".[15]
- Does anonymity really enhance participation and performance? (The Arizona experiments cast much doubt on that sales argument for EMS.)

When checking the literature, it is easy to find articles about the development of specific applications and in some cases laboratory studies from a few universities that have managed to arrange sponsorship of extensive research programmes in the CSCW field. The elements that were missing to sway the balance to a clearly positive stance for CSCW were:

a) integrated case studies from the "real world" of companies that had installed and utilized CSCW over a period of time. (The case study methodology seemed to be at variance with the research paradigm of the the "laboratory experimentation" institutes visited. The Arizona group for example had no difficulty in citing such organisations with whom they had cooperated over a longer period but which they had not documented in any fashion.)
b) longitudinal studies of the results of CSCW efforts. How are the results of the CSCW activities used and how do utilisation and behaviour patterns change over time? (A possibly untypical example is our own experience of the Arizona meeting room in which the TELDOK study group produced an outline for this report, which was then modified by the editorial board.) Are the results of CSCW sessions qualitatively different from "ordinary noncomputer-supported" work? Are they qualitatively better? Are they accorded more weight by management?

Bob Johansen and Paul Saffo pointed out in Tucson that "groupware" is *not* a new technology at all — it is a new spin on usage for existing capacities. And what we saw had very little to do with teams at work: multiple active subjects sharing a common object. What we saw did not include socially constructed meanings and cultural aspects, the topics of power, control and conflicts, the continuous reconstruction of work and its means. It would be very useful to complement the growing body of laboratory experience with studies of "real production teams". (Some such studies are to be found in the literature.)

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15 After discussions with representatives for the TELDOK editorial board, we decided not to include the printout from our Arizona EMS meeting on the theme "The structure of this report" as an appendix in this report on the grounds that it was a) massive and b) unprocessed and thereby, largely unintelligible.

4 Ulf Essler

We didn't see any TWS - Team Work Stations. We would have had to go to Japan to see them. The concept is Japanese and comes from Ischi at NTT.

Even if we had seen them they wouldn't have satisfied the intentions of this tour which was so heavily geared towards seeing (IBM-) products. The Team Work Station is not a product but a prototype. I am going to refer to the decidedly mixed bag of technology I saw as Groupware in this text.

The potential of Groupware in working life

As it is Groupware is very much a new technology. There are few products on the market and not one of them has been a success. In fact, I suspect that most of them are hard pressed to show a profit at all.

What has to happen if this is to change is that the group take precedence over the technology. A group of people has to decide if their work is in need of the support this technology can provide. Areas for support might be communication, coordination and decisionmaking.

Another relevant question is: Are people working in groups at all? Experience from the public sector in Sweden indicates that working life there is organized according to Taylor's principles of Scientific Management e.g. in a tiered and fragmented work organisation. No groups as far one can see.

Factors promoting or constraining the development of Groupware

As Gary Olsen, Director of the Cognitive Science and Machine Intelligence Laboratory at the University of Michigan pointed out: The power of our workstations are going to increase rapidly and our networks are going to be there to send and receive anything we want. This means that people separated in time and/or space can be working together through computers and telecommunications. This is clearly a promoting factor.

Another promoting factor is that all meeting rooms have massive backing from industry. General Motors supports Capture Lab at EDS Centre for Machine Intelligence. Arthur Andersen & Co., and Steelcase Inc. among others supported the building of the Collaboration Suite at the University of Michigan. IBM supports the Arizona room at the University of Arizona.

A third promoting factor is war and other crises where physical transport is threatened. Terrorist organisations succeeded in making videoconferencing very popular during the Gulfcrisis.

One factor constraining development of Groupware is the way working life is organized (as pointed out above). If people do not work in groups, the technology will not diffuse.

Another factor is the clumsiness of the technology. It is still very much in the way of real work. It takes too much attention of the individual person just to manoeuvre it.

A third constraining factor is the price of the technology. This refers especially to meeting rooms that require major investments to build and maintain. There is also the fact that it now seems clear that GDSS requires facilitation which adds to the cost of its use.

The future of Groupware

The future lies, as far as I can tell, in distributed solutions, synchronous or asynchronous: In situations where the technology clearly adds value to work. Meeting rooms have yet to demonstrate that they add value to work in a way that makes the investment worthwhile.

In the literature I find later that, among other things, the majority of OptionFinder users are external consultants and that it has a very well established customer base within IBM worldwide.

I understand that meeting facilitation is a big industry in the U.S. I also read in my notes from the University of Georgia that meeting facilitation is one of its main research areas. The team technology research program began at the Department of Management in 1985 with funding from an IBM grant. I also understand that IBM is marketing it's products in the meeting room business like this; the equipment is being sold for a low price and the facilitation is being sold for a high price. I suppose it makes sense to do research on the things one your sponsors are interested in.

If I compare what was presented in the University of Georgia with what was presented at the University of Arizona. I find that there are similarities. The most striking one being that in both places I, and everybody else in the group, am cut off from the information space by a facilitator. In none of the places do I have access to what we as a group have done together. Not to mention that I can't communicate with the group members through the technology.

In the PC Research Lab at Georgia, it was even worse than in the Arizona room in that the facilitator was hidden behind not only upright PCs on every desk but also by an office wall. I presume that you don't need two people to run the show; one technician and one facilitator.

Something goes under the name of team technology or collaborative technology (1) should let me communicate with the other people in the group, (2) should let me communicate with the facilitator and (3) should not cut me off from the result of our work ... As it was, the technology isolated me from the group.

The other meeting room at the University of Georgia was the Smart Office the "conference room of the future" of which I can't say anything other than that it looked like a very polished product.

5 P G Holmlöv

I love serendipity. In 1986 I went to a conference to learn about the use of videotex in marketing — I thought. However, I rapidly learned that videotex was dead, in the States, for a while; and indeed, two of the largest videotex operations had been closed down within a month from the start of what was to be the last-in-a-row of videotex conferences arranged in the States. The lasting impression from that trip was instead a heavy report (penned by Jeff Conklin) on groupware kindly copied for me by Bob Johansen, together with the introductory remarks on that subject he generously bestowed on me.

This study trip, of course, was devoted through-and-through to the subject of groupware, or whatever it should be labelled. These are early days, but I think what I will remember most aren't the groupware sessions and visitations *per se*, but rather my meeting with a Chief Technical Officer I used to know many years ago. This was the innovative founder (and once the CEO) of a small start-up company in the Valley which was recently acquired by Lotus. His company now has a user base of one million, which makes it compete neck-to-neck with the other dominating provider of E-mail for PCs (and Macs, PS/2 or UNIX machines) in LANs. Always a man with great audaciousness and a great probing mind, his words now, repeatedly, were: "We don't as a rule make things first — the new companies who do, don't make money. You've got to get your user base and then to educate your users. You've got to make a business to make money." Also, he remarked that some of the conferencing features of the E-mail tool he brought to the new company he simply yanked out because otherwise they would have bewildered his first users.

It may be a coincidence that Bob Johansen also pays his homage to happenstance. This is in a book he has recently co-authored.[16] Here, authors remark that "basic groupware structures such as E-mail, voice mail, or conferencing room technologies" should be available to make serendipity happen. It is interesting to note that Johansen and his co-authors do lump together such diverse and pervasive technologies as E-mail and voice mail under the groupware umbrella. In fact, he — in this agreeable volume and elsewhere — makes a point of covering the waterfront, when he sets out to identify applications in each and every cell of his four-quadrant map of groupware.

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16 Robert Johansen, David Sibbet, Suzyn Benson, Alexia Martin, Robert Mittman, and Paul Saffo (1991) *"Leading Business Teams. How Teams Can Use Technology and Group Process Tools To Enhance Performance"*. Reading, MA: Addison-Wesley OD series.

If there's a lesson to learn from Johansen and my Chief Technical Officer friend, I think that — at least for now — runs counter to Johansen's laudable research ambitions to try to categorize every piece of equipment as belonging to the groupware family. Typology is one thing, acting in the "real world", as our graduate students say, another; and I believe he will agree on that. Only very few prospective buyers in the marketplace would care if this or that bundle of software is or is not a *groupware* application *per se*. Groupware developers should keep their tools clean and simple so that users can learn to employ them one by one, step by step, in a forgiving and natural habitat. "Kill all your darlings", Faulkner said, and I think this applies to new ideas for groupware as well — yank out the neatest pieces, and put them back in first when users request to have them there.

Another astute groupware student, Skip Ellis, with whom I chatted briefly as he had just gotten out of the Software Technology Program at MCC in Austin, observes a difference between what he calls groupware *tools* and groupware *systems*. Tools, such as ForComment (an software package already available which lets co-authors edit the same manuscript from various locations and then identifies each author's/editor's corrections), are much cheaper to install and easier to implement. Systems affect entire organisations and demand much more of their users: they must all be willing and they must all do their part to make it work. Not surprisingly, Skip Ellis echoes his former colleagues at MCC, Gail Rein and Jeff Conklin, when he insists that the most promising avenues for groupware tools and systems deal with the coordination of team work.

Meeting rooms are on the easy-to-use, tool-like side of Skip Ellis's spectrum (although meeting rooms may certainly cost a fortune to prepare) in that their use is very incremental. Various groups can use a meeting room before it gets company-wide recognition, the use may be quite scattered over time, and the tools in the room may be tested out one at a time. I personally feel at home in a room with computer support for meetings; although this needn't be a permanent meeting room. The meeting room we saw and worked in at the University of Arizona is too large in my mind — most meetings involve less people, and it must be a mistake to let them share a PC.

In a chance meeting just the other day, somebody told me she thinks that what her organisation really needs is a Portable, or Virtual, Meeting Room. Of course the virtual meeting room is already included in Bob Johansen's latest scenarios for the business teams of tomorrow. But my point is that we can set up portable meeting rooms as part of E-mail and conferencing systems with today's technology; we could have done that several years, even decades ago, although today's electronic meeting rooms are probably more humane and can be practically identical to ordinary meeting activities.

And when we walk into conference rooms and lecture halls — why, it would be silly not to bring the PC where we prepared our lecture notes, our transparencies, the papers we are going to present, the calculations and statistics and database searches we base this on... Permanent meeting rooms show the world that the fruits of intellectual work may well be displayed in front of a whole group just as they are toiling; I often wish I could display slides and program output on a screen on the wall, and that anybody could direct his or her output to the same screen, for everyone instantly to share, comment, discuss, and further elaborate.

One gruesome aspect of the permanent meeting room, as most clearly embodied in the GroupSystems facility, is that certain providers rely on the use of a trained outside expert — a coordinator or facilitator — to run the show. IBM have been amazingly receptive in acquiring the right to sell GroupSystems technology under their TeamFocus brand name, and I am sure that not least the notion of an omniscient and omnipotent facilitator has tickled Big Blue quite pink. This way, the provider of TeamFocus meeting facilities can invite customers and even competitors to spell out their corporate strategy in a "brainwriting" session.[17] After that session, the TeamFocus provider will have all this vital information permanently stored in their own computer system, and they will even get paid for picking the brains of their unwitting customers. Come into my den, the Panther said... The parts of me that hate rigour and control hate this facet of current meeting room technology.

What I do love with meeting room technology, and the tools this rests on, is its ability to turn the tables on an ordinary meeting. Widespread use of a new communication system within a firm makes for new informal liaisons, for information permeating the organisation, and for an altered balance of power, perhaps power distributed to each participant. When I have been crouching at the farthest end of the tallest conference table at my School, peering at the autocratic chairperson, the vision of an electronic meeting system which, in Bob Johansen's words, "promotes equality and flexibility of roles in the communication situation" is what's kept me going. An electronic meeting room system, or to an even greater extent, a Portable Meeting Room, would strip any chairperson of his or her power to decide what to discuss and when to make the decision; although the result in some instances may be some sort of temporary anarchy.

If there is a trend in this field — if there is a field — it surely must (I hope it will) be along the same route that the Software Technology Program researchers at MCC are going: from computer-armed meeting rooms, to coordination technologies. In a sense, this is related to the

17 IBM TeamFocus terminology for brainstorming via keyboards.

potential for Portable Meeting Rooms. I think coordination technologies have been sorely needed for centuries. Most of our working time — at least the time we count as "work", since we often don't really look upon meetings and conferences as productive "work" — is probably spent outside of meetings, and an increasing portion may be so, if Jerry Wagner of CTC and others can cut meeting time in half as promised. The time outside of meetings we tend to work alone, although our output still has to coordinated with the efforts of others. Here electronic links can be of immense service unless they disrupt ordinary work activities.

6 Björn Magnusson

I must agree with professor Percy Tannenbaum's idea about meetings: "It's nice to be in a nice place." Tucson and the Arizona Inn are nice places. For this reason, we should remember that any theme or subject selected for the meeting could have been a success.

If we ignore this bias, what do we have left? The impression and feeling that we cannot ignore the fact that a large organisation is dealing with its perhaps most expensive activity the meeting. It was clearly demonstrated to us that an Arizona Room with this equipment can definitely render a meeting more effective. While TWS may not be able to accomplish miracles with our administrative and decision-making processes, it can certainly make some of them more effective. Maybe even to the extent of justifying purchasing equipment in the USD 100,000 price range.

At Statistics Sweden, numerous hours are devoted to various types of meetings each year (1,600 employees). If CSCW could be used to render these meetings more effective and achieve the same results in one-third of the time, the equipment would pay for itself in one year.

However, I neither can nor want to suggest anything along these lines. Someone quoted something from a paper about CSCW meetings: "Almost as good as not having any meetings at all and, much better than an ordinary meeting — and takes much less time." This would seem to indicate that we should approach the idea of making teamwork more effective from another basis.

Technology has something of a beguiling effect, and once we have tried it we may want to continue, it was pointed out. But will this new feeling last long enough to make a new technology as natural as everyday food in group work? Hopefully, someone will set up an Arizona Room at a training centre, so that real problems and tasks can be tackled. For the next few years, however, technologies for PC networks with office-information systems will probably suffice. In fact, these systems could pave the way for systems similar to CSCW.

7 Sven Olofsson

1 The entire field seems to still be in its infancy even though development has been under way for quite some time. It is difficult to understand why the first phase is moving so slowly. The simple systems presented as market-ready (VisionQuest, GroupSystem, GrapeVine) are hardly restricted by existing PC technology. Perhaps there is a very important element missing in the systems that have been introduced.

2 All of the systems shown to us lack a number of crucial elements for a meeting system. For example, they do not have built-in graphics or the facilities to add them, the possibility of conducting dialogues in meeting communications, multimedia (speech, images).

3 The research projects under way suffer from the most common megalomaniac characteristics inherent in new fields. They attempt to solve all problems at the same time, and they tackle the most difficult problems first. Examples of this include research projects involving the full spectrum of meeting sociology and the decision-making and creativity process at MCC and the University of Georgia. This could be due to the fact that it is easy to obtain R&D funds now, as computer manufacturers are searching for new mass applications.

4 Many of the features desired in meeting systems already exist in software tools, such as CASE, which steers the work process, provides documentation and permits parallel efforts. Even CAD programs have some features that meeting systems could learn from. In any case, it should not be difficult to identify areas with a more specific problem, for example software and hardware design, technical and medical error-detection, which would lead to more practical functions.

5 All of the squares in Mr. Johansen's time/place matrix are not of equal interest to a teleoperator. That the squares dealing with different places should be the most interesting aspect sounds a bit insidious to me. This is also a question of whether or not this applies to the priorities of corporate-users. This was not noticeable in the systems we saw.

6 All the systems presented seem to have exaggerated the importance to meetings of brainstorming sessions, voting and reaching a consensus. The need to steer a meeting does not seem to be as large in Europe as in the U.S.

8 Ulf Peters

The study tour has been rewarding in a double sense: firstly, the interesting insight into progress so far achieved within the field of group ware, (or "cooperative systems" as the case might be), i.e. the status of the technology so far, and secondly, the state of the art of the develop-

ment of the fundamental concepts behind those technological solutions.

My impression is that what we have seen is "naive enthusiasm" over technology. This is not in itself a negative thing. It is always better that something at least gets tried, otherwise we will never move ahead at all. Granted that, I would like to focus on another effect of this approach: the taking for granted of the relevance of the fundamental concepts. It is not a coincidence that the term "groupware" is applied to a physical room where all the technology is located and where you go with your colleagues to experience the new phenomenon of working in a cooperative system. The term "cooperative system" actually describes what it is all about: the new technological terms of reference indicating the new possibilities and limitations for a group working as a team. The new technological developments offer many possibilities to widen and change those terms of reference, but the focus on the "conference room" puts a limit to the development of these same possibilities.

All the efforts we have seen and which go under the label of "groupware" have had the ambition of improving the efficiency of group work. But in practice they have actually been designed to improve one particular aspect of the work being carried out in a group: the meeting situation. The "meeting" is a form of work for groups, and it is a form that has been evolved against the background of the ruling technological limitations for groups so far. The whole point of new technology is that it breaks the limitations the old technology put upon the forms of organising work. If the new technological possibilities are applied to the old forms of organising work (=the "meeting"), then the only thing that has really happened is that we have strengthened the old ways of working without actually introducing anything new into the process. What we want to do is to find new ways of working for groups, not only to make the old ones easier.

When focusing on the meeting situation for the group, the focus is actually put on that aspect of group interaction where technological help is needed the least. A meeting is in fact the only occasion when a group can work at ease *as a group*, since it is only at a meeting that the group meets in a natural way — eye to eye. The basic issue is if it is possible to break that barrier and to help groups work in group form also when they are not physically together. It would thus have been more interesting if, for instance, the Arizona room had been set up with terminals isolated from each other instead of having been set up in a traditional university auditorium, with the "teacher" down in front and the "pupils" spread out in a fan in front of him. The traditional way of thinking about group work was far too obvious. As a matter of fact, it was interesting to see how the exercise actually developed when we tried out the groupware: everyone, dutifully enough, worked with his or her keyboard as instructed, but when it came to the really creative and spontaneous process of group inter-

action, it was done by ignoring the terminals completely and talking directly with the other participants. After a while, when the *group* activity was satisfactorily finished, everyone would turn back to their respective terminals and dutifully key in their contributions as instructed.

My guess is that once the novelty of the thing has worn off, the system might be found to be more of a nuisance than a help in the creative process of a group. Had the configuration of the "room" been in the form of isolated cubicles for each work station, thus simulating distance, a more realistic appreciation of what the technology could do in order to overcome the limitations of being in different places, would have been obtained.

In parallel with the limitation of "different place" there is also the limitation of "different time" which is addressed by groupware concepts. The usual way of presenting their interrelationship is by way of a matrix with "place" on one axis and "time" on the other. The picture thus obtained contains four alternative combinations: same place-same time (=the traditional meeting), same place-different time, different place-same time, and different place-different time. It seems to me, however, that the problem pair of place/time might not be the most adequate way of looking at the issue. Strictly speaking there is actually only *one* problem addressed by groupware: the problem of different place. The problem of "different place" in this context must be defined as a group of people having to interact without being physically together. Seen in this light, the problem of "different time" is only one aspect of the "different place" problem. If two people are supposed to interact and A is London and B is in Paris, their problem is much the same as if A were in London on Monday and B were in London on Tuesday.

Quite apart from the question of the possibility of widening the horizons of the organisational forms of group work, there is the other main theme: the stimulation of creativity itself. One fundamental characteristic of the creative process is its non-linear path — the "creative chaos". This characteristic makes it extremely difficult not to inhibit creativity when introducing the technical systems which were intended to help it along. The demands upon flexibility, the need to be able to act spontaneously, the need always to be able to go back to previous phases of work in order to revise what has been done are gigantic but necessary requirements if these systems are to have any real chance of making a contribution. The interesting system presented by Jerry Wagner at CTC came a long way along this road of making the systems accept the human terms of reference instead of the other way round, but the road still to be covered is enormous. It is, after all, only if you as a user get the feeling that the system is part of you and not just something outside of you and that you are working with, that your creativity will really be helped.

9 Don Petterson, CTC

The factors promoting Team Work System (TWS) come from business and technology. Accelerating competition in a global marketplace requires teamwork and flexibility. The proper expertise needs to be brought to bear on a problem, wherever it (the expertise) is located. Frequently, teams of experts (who may not be collocated) must collaborate. Fortunately, the technology is both sophisticated and inexpensive enough to make this both feasible and cost effective.

The constraining forces are mainly sociological. Human nature has a resistance to change and a strong scepticism of something new. TWS technology must be transferred the way all other technology is transferred — by champions through layers of society, each more resistant to change.

Regarding the next important step in TWS, several things are going on simultaneously. One is a richer understanding of the modalities other than "same time, same place". A second is the integration of emerging TWS pieces into a more complete environment. This integration effort will help refine a taxonomy of TWS products. The third is the development of a "corporate memory" based on the data captured by the TWS.

10 Agneta Qwerin

What is so special about CSCW? Or do we need yet another concept in this already crowded field?

My first, immediate impression upon entering the Arizona Room was a feeling of: "Help! I'm in the wrong place. This isn't a room where people meet to arrive at a common goal. It's a control centre for strategic space operations or some sort of a war room."

Does a room filled with equipment and state-of-the-art technology help people communicate better and make creative decisions? Is the collective sound of the chattering of keyboards a measurement of creativity and good decisions? Or, more pointedly: What is the goal, and what are the means? Is this a classic example of a solution looking for a problem, i.e. technological possibilities for meetings that could involve a number of problems?

People have met since the dawn of time to inform each other, develop and expand their knowledge. At work, this process includes not only the exchange of information and knowledge, but the opportunity to influence assessments, convince each other, make collective summaries, arrive at group agreements or allow someone else to make a decision. The larger the organisation, the greater the number of players, interests, positions and wills to balance.

Meetings with numerous participants cost a great deal of time, money and energy. Consequently, efforts to rationalize meetings and find appropriate aids are quite natural. Blackboards, flip-charts and overhead projectors are classic aids for visualizing and summarizing thoughts, proposals and decisions. Recently, the extremely simple process of writing on sticky labels and grouping them on walls or boards has caught on. "Post-it" will soon have acquired the same status as Kodak or Xerox.

Telephones, faxes, electronic mailboxes and message and conference systems of all types have, along with the PC, become part of our daily lives. Today, we are able to communicate and reach agreements even though we are in different rooms, different places and different time zones.

Groupware, TeamWork Systems ... do we need to make up new names? I believe that we should stop for a moment. Are we talking about forms and computer-supported/electronic aids for work within a specific timeframe, for a well-defined group with previously established, concrete goals, where everyone is able to participate, contribute and elaborate on the contributions of others and receive some sort of common documentation? If so, then there is adequate reason for establishing a new concept.

A previously established, concrete goal is a must, however. If this is lacking, then there is no reason to create a new concept or a new name. Without this goal, we find ourselves in some sort of a technological arrangement, where a new concept is simply another piece of the "emperor's invisible clothing".

The secret of a meeting

We realize that very little in our message is actually determined by the *words* we use. Conversations and dialogues also consist of gestures, eye contact and the personal relationship between the individuals involved. It is a question of how we *use* words, tones, facial expressions and body language to express our message. This type of nonverbal communication both facilitates and hinders understanding. How often do we encounter double messages?

CSCW contains no nonverbal signals other than the sound of keyboards. To this extent, it is straight forward communication without double messages. All participants, however, must have the same verbal skills. Information of use to all participants in a meeting assumes a common-concept mechanism, a common language in terms of nuances and a functional level of communication ("I understand you, and you understand me"). Robert Johansen expressed this as follows: "A good oral meeting group is always a good computer group."

The effectiveness of a meeting

Is CSCW effective? This is a question of quality versus costs, and of what can be gained versus what might be lost. Sometimes, a truly effective meeting takes place during a coffee break. CSCW has no coffee breaks at present. And that presents us with an interesting thought: What would happen if a three-dimensional coffee cup with accompanying aroma appeared on tomorrow's screen?

Today, the system offers direct documentation. In conventional meetings, documentation requires time. Man's desire to document thoughts and decisions after a lively and interesting discussion is known to be low. Energy has been expended. The documentation phase seems onerous and boring, a low-stimulation *One-Person Task* after having experienced the meeting. CSCW documentation is not biased or edited. It contains no hidden purposes. It reflects exactly what was said. Everyone has had the opportunity to contribute, assuming a reasonably homogeneous level of knowledge and computer skills. Speed is also an important factor. It is stimulating to formulate your own thoughts and to watch them pop up on the screen. It is also disheartening to see that others are far ahead in other chains of comments.

Who wants to pay for CSCW?

The Arizona Room is a research and development environment, hardly a marketable prototype. Ventana, which is responsible for marketing and sales of the TWS system, also offers a short-term rental program for the entire system: hardware, software and facilitator. If Mohammed will not come to the mountain, the mountain will come to Mohammed. Would Swedish customers be interested in purchasing services such as these in order to vitalize and render meetings more effective? Could a Swedish training centre offer CSCW services at a profitable level? Which markets exist? How often would the room/rooms need to be utilized?

CSCW in tomorrow's Swedish business community

If we believe that telecommuting is on the increase, i.e. that more and more people will spend one or more days each week working at home with the help of modern technology to accomplish what used to be done at the workplace, then CSCW will become reality. A successful reality.

If technology allows us to sit at home and work, then physical presence will no longer be a significant factor. We will even be able to participate in meetings without having to rush after a bus, train, plane and taxi only to arrive at a meeting totally exhausted. This can only be better for the meeting in question, for myself and for the other participants.

11 Kristina Sundberg

Teamwork systems for a distributed consulting company

I participated in the seminar in Arizona and the visits to the University of Arizona, Ventana Corporation, Lotus Notes and IBM TeamFocus. I tested two complètely different types of CSCW tools; those for achieving more effective meetings (same time, same place) and those for working in a distributed group.

My impression is that we witnessed emerging technologies and aids. Although still in the starting blocks today, these tools will probably soon be available to innovative companies. It will, however, take some time before they can be used by and be of benefit to the general public. I am fully convinced that use of the tools and systems of the type we saw will eventually become widespread.

Why do I say this? As far as dispersion and use are concerned — they are needed. I would be willing to bet that every TELDOK employee has attended a less-than-effective meeting at one time or another or has requested and waited for information from another individual. The needs are obvious.

Those of us in the Infologics group work mainly in project form, with members located in Karlstad, Stockholm, Uppsala, Linköping, Malmö or Gothenburg. Consequently, we need to find effective forms for working together. We need aids that will facilitate group work, and I am convinced that we will be among the initial users. I also feel that an aid along the lines of Notes, for example, will be of greater benefit to us than a tool for meetings. Notes would be able to help us spread information between different locations and keep our "day-to-day contact" alive. I do not believe that we should allow ourselves to be swept off our feet by these technologies, either, as quite a few of these aids and tools already exist, such as conference systems, electronic mail, fax, etc. They facilitate work, but they are not the panacea to all our problems. Infologics' experience to date with electronic mail and conferences is that aids such as these help keep a group "alive". The ability to see and hear one another on a frequent and regular basis seems to be a necessity for the "grapevine" to function properly.

The systems we saw which aimed at rendering meetings more effective still required participants to be at the same place. When Infologics employees gather together, we usually try to hold several meetings in a row, each of which deals with different issues. This makes the cost of travelling relatively cheaper. Another way to boost the value of a meeting would be to introduce video conferencing/data communication. My guess is that integrations such as these will eventually come about, even if it requires quite some time. My impression from our visit to the University of Arizona is that these types of integrations are still being researched and are quite far from the product stage.

One of the reasons why CSCW may require quite some time to catch on is that a focus on Notes, for example, would require substantial work in applications development and a change in working methods, as well as investments in equipment and communications networks. However, as one of our hosts at the Lotus Development Corporation said about Notes: "It's a strategic investment. We sell it on the strategic issues, usually to the top level."

The Infologics group currently has (at least) one terminal per person and is linked up to (at least) one international network for electronic mail and conferences. What then is the problem? When it comes to communication with other companies, we lack the ability to transmit files simply, to seek information simply, to address simply and to print out simply. Moreover, we also seem to suffer from the common phenomenon of being fully occupied with our day-to-day work.

12 Mattias Söderhielm

The study tour was an impressive arrangement, which ambitiously tried to cover the whole emerging technology of CSCW. Regrettably, I only had the possibility to follow the tour in Tucson and Georgia.

The visit to Tucson was heavily centred around the University of Arizona's Collaborative Management Room and Ventana's GroupSystems software. Although our trial session there suffered from the lack of something worthwhile to discuss and the large size of the group, I still got the impression that this kind of CSCW under better conditions can be very helpful in increasing meeting productivity. The disappointment expressed by some was probably in part based on too high expectations, no doubt fueled by the impressive setting that was more akin to a space mission control centre than a meeting room.

Yet I do not think that one should let the negative experiences overshadow the positive sides of the system. The idea of interaction by means of writing no doubt lets people who do not have the self-confidence to actively contribute to a normal meeting, share their views in anonymity. The anonymity will also let people who normally hesitate to say what they think, out of fear for some kind of repercussion from the people they criticize, to make sincere and helpful contributions. Because written communication is only a part of the human ability of expression, some people may have problems communicating their views in the beginning, but my experience with bulletin board systems tells me that most people adapt quickly to typing their contributions. If the written communication then is complemented by verbal communication, I do not see that any of the positive sides of normal meetings are lost in electronic meetings of this kind.

The benefit of making your contributions without having to wait for the others to finish was a positive experience; the negative side of it

was that you could not respond to everything you wanted to respond to, because of the speed with which text was generated by the other participants. I think that this was mainly due to the large number of participants and the heterogeneity of the group, yet it showed us that the idea that it would be possible for much more people to meet than normally, was (at least with the current technology) wrong.

Technology still has a far way to go in terms of user-friendliness. The cramped screens and the hierarchic configuration of all the systems I tested made it hard to see the overall picture, instead all one saw was a number of seemingly disconnected details of the discussion.

A contrast to the large system of the University of Arizona was the simple OptionFinder of the University of Georgia. Here we found a small system consisting of a personal computer and a number of key pads that could do much of the sophisticated polling, ranking and voting that the Ventana system of the University of Arizona was capable of, for a small fraction of the cost of the larger system. With this system you can easily identify differing opinions and thereby concentrate the discussion on the really controversial issues. A prerequisite is of course that everybody feels that he or she can speak freely, or else the differences will only show in the anonymous polling. For meetings, where this is not possible to achieve, e.g. in strictly hierarchical organisations, you would have to resort to a larger system with workstations for the participants.

The Macintosh based CSCW system also developed by the University of Georgia was not very impressive, although one must hasten to say that what we saw was a pre-release version developed in HyperCard. It was like the Ventana system very hierarchical and made little use of the potential of the Macintosh user interface. Still I think that the approach of using a small system of portable computers was a step in the right direction, and if they go ahead and develop a second version from the ground up, making use of the advantages of the graphical user interface, as they have said they might, the result could be very interesting.

What we did not see much of was meetings, where not all participants are present at the same time. This might be very useful and natural in certain situations, e.g. when you need time to make your replies. This might be the ideal method to keep in touch in between same-time meetings, but I do not think that it can totally replace a same-time meeting.

In spite of the versatility of CSCW, I as a student cannot see that we today would be able to implement it in the area of education, other than maybe as a preparation for the students for the time after graduation — be it in research or in business. This is mainly due to the one-way nature of communication in our present system of higher education. It would have to be drastically reformed in order to make it possible to take advantage of CSCW.

One must realize that although it is now several decades since Douglas Engelbart first conceived CSCW, the technology is still very much in its infancy. Maybe in five years we will have the technology that does not force the users to do things a certain way: flexible, non-hierarchical systems that are adaptable to the natural way of holding a certain meeting. I am convinced that Artificial Intelligence (AI) in the longer term can help lessening the confusion some users experience today, acting as some sort of a counsellor. With the help of AI, a user could be alerted if, in some part of the meeting, something is discussed that interests this user. AI could also help the user in filtering away things that he or she is not interested in. With the help of this technology you would also be able to increase the number of participants drastically.

I also envision a system, where you can mix different media like text, pictures and video on your large screen, drawing from internal or external databases the information you need. The use of on-screen videophones would also reduce the need for same place interaction. Inventions like wall-size screens will certainly help bringing this about. Even further into the future lies the technology of virtual reality, where you can construct your own meeting-place, tailor-made for a certain meeting, without the need for all persons to be in the same place.

But let us not stray too far. It will take time before CSCW technology becomes really versatile and is a natural component in every meeting. Yet we should not be too downhearted either. I think that we with time will learn how to use this technology to our maximum advantage. As Paul Saffo of the Institute for the Future puts it: When a technology first emerges, people tend to get overly enthusiastic and think that it will achieve all that it promises instantly. When they then find out that it does not, they tend to get overly pessimistic and think that it never will, even if it eventually does achieve what it once held in promise.

13 Birgitta Thornander

"All of us are smarter than any of us."
People who are usually quiet, fell more encouraged to participate.
A lot of information is generated in a short time.
Better planning and discipline before meetings.
There is a tendency to information overload.
It is very time-consuming and requires much work to structure the information generated.
CSCW often eliminates oral communication and body language.
What will CSCW mean to transport companies in the future? (Different Places)

14 Bengt-Arne Vedin

Doug Vogel as Captain Nemo. He is playing his computer like an organ. We are the fascinated and slightly awed passengers onboard this submarine, sorry, this lecture hall, each of us with her or his dedicated periscope. This one looks like a computer screen, accessible as our conductor directs.

I am sure that Doug Vogel never saw himself as Jules Vernes tragic hero, mastering his several computer projectors and other technology equally perfectly, however. The contrast between on the one hand that setting, given the constraints of the university lecture hall and the technology at the time of installing it, and on the other hand the less assuming portables of Ventana, especially, and CTC was stark. Those contrasting views of CSCW systems tie in with two faces of one of the (two) perspectives that I would like to apply when reflecting over my own experiences from ten intense days of visits to American installations of groupware, collaborative technologies, or whatever we might call them. One perspective stems out of the *tradition of creativity enhancement*, that is multiplying individual creativity through group interaction. The other perspective is that of *intellectual technology*.

Beginning with the latter, I would like to expand the framework somewhat, abstaining from looking towards electronic mail and groupware singularly. Let me introduce Daniel Bells notion of intellectual technologies first. It will actually lead in the direction of creativity. In his book on "The coming of post-industrial society", Bell introduces the notion of social technology; we may, for example, regard different types of organisations as social technologies. In pre-industrial society, man's task was a "game against nature"; in industrial society, it is "a game against fabricated nature". In post-industrial society, the game is between persons, with the aid of intellectual technologies, based upon information. These technologies are arising alongside machines.

An intellectual technology would be the substitution of algorithms, of programs if need be, for intuitive judgments, and problem solving rules might be embodied in instruction sets and computers. Bell talked of "organized complexity", and that organisation would be impossible without its primary tool, the computer.

Michael Scott Morton of the MIT sees three developments, together forming the core of intellectual technology. Those were planning methods, such as PERT; furthermore the calculation methods embodied early on in spreadsheet programs; and then artificial intelligence. Bell mentions Markov processes, Bayesian statistics, and forecasting as examples of intellectual technology.

I have suggested (in my book Technology, Tumbling Walls of) that computer triggered or assisted brainstorming, lateral thinking etc. (with programs like IdeaFisheer and IdeaGenerator) should be included in intellectual technology, as should information technology based attitudinal studies such as those performed within the VALS, PRIZM,

A C Nielsen, and other frameworks. Those studies would certainly not have been practical without computers and some other information technologies. Finally, groupware would also belong to this family.

Somewhat simplistically, we may describe intellectual technologies along two axes. One would be from creativity and free generation of ideas to planning, forecasting, project management, feedback, and the associated control. This is also a process of organising complexity, to repeat Bells phrase. The other would go from manipulation and control not of a project but rather of peoples minds or group interaction to open discussion and participation.

In several of the presentations we were offered, facilitator roles were stressed or played down. You now understand my two contrasting experiences initially, given this conceptual background. If you are in the hands of a facilitator, you are also more open to manipulation and influence or are you not? But influence and manipulation are only words for experiences on a continuum including also education and informing and coaching. The interesting point here is rather that the same program, the same type of equipment, the same features could generate very different impressions, very different ambiences. Probably very different settings for coaching and participating.

I am of course referring to the Arizona University setup versus the Ventana portable. Interestingly enough, the less sophisticated room just an ordinary meeting room and the more "primitive" setup at Ventana (I am referring to wires across the table etc.) made that installation more open, cozy, more inviting, biting. (I am not attempting to badmouth Arizona University, only trying to capture a feeling that I would not have had hadn't we been able to have this experience, and to compare. Do my feelings and reactions pertain to me solely ?)

At Ventana, we didn't have the time to try the process out in any meaningful sense. But judging from our experiences with CTC, which also featured a more humble and, again, less inhibiting installation, it would seem as if the need for a facilitator increases the more formal and stylished the setup is.

This resembles me of my, and others, experiences of brainstorming and variations of that. The Creative Problem Solving Institute at Buffalo, the Planned Invention company, and others have tried to develop processes that are independent of any "facilitator", of the creativity and/or charisma of the person running the creative effort. Synectics (a company as well as a method), on the other hand, makes no bones of the necessity of having someone sufficiently proficient with the method itself, though not necessarily with the problem at hand.

A new experience to me was the quite distinct feelings created by the different physical setups or environments, shaping quite different group interaction styles, one focusing directly on the "organist" or conductor, the other fostering interaction between everyone in the

group. So it did not seem to be neither the method nor the personality or style of the conductor-facilitator that mattered most.

We met several rationales for utilising groupware. One was the ambition to capture for the Malcolm Baldrige Award, the prestigious annual U.S. Prize for Quality. This requires the creation of a corporate quality oriented framework, bordering on corporate culture. On might claim that this specific focus.

Another rationale was that for "corporate memory": it is necessary to be able to document the various decisions taken during the development of a project or a system, the various undertakings when managing a complicated process.

Guarantees, legal procedures, cost claims may all depend upon the availability of such documentation, proving the rationality and establishing that sound procedures have been followed. Here, "organising complexity" takes a particular form of project notetaking or automatic minute registration.

I mentioned some qualms about how to make a creative process, say brainstorming, sufficiently productive. Without any computer tools considered, creative idea generation methods have been employed for some fourty years. It was interesting to see that the team at Georgia University at Athens was exploring groupware while also relying upon previous experiences of creative processes. Earlier during the trip, we had already experienced what was called "brainstorming" and "brainwriting" at several instances.

To sort and sift among ideas is a crucial part of the whole series of events, pertaining to systematic creative idea generation, see below. At Georgia University, one area of research included the application of keypad voting(another, actually, facilitator studies). This, in turn, ties in, at a basic level, with preference studies of the A C Nielsen type. Various grading, voting, and other selection or prioritizing procedures were, in fact, prominent tools in the different systems for supporting team work that we studied.

As usual, when a new technology is applied to an old problem, there are attempts to reinvent the wheel; new discoveries of old truths are necessarily made. I am particularly thinking of the claim that so many more new ideas are generated when the computer allows everyone to produce his or her own input, without waiting for someone else to stop talking. This has been found out, quite a while ago, in some very interesting studies of groups generating ideas as groups but under a "brainstorming regime". What has not happened as yet is the potentially productive crossbreeding between "brainstorming one by one" and the creative influence, and motivation, created through the interaction within the whole group.

My final remark (hinted at above) and we discussed this in Athens is the fact that any list of 250 odd ideas from a brainstorming session is bound to be regarded if not as rubbish, then as thoroughly frustrating. The point is that there are a number of preparatory and refinement

and postproduction steps that must be pursued, or the effort was all, or mostly, in vain. This is something that will be discovered, once more, as groupware is being developed and introduced. My belief is that the learning process should gain from previous arduous attempts to develop, and study, say, the Creative Problem Solving method, and others.

15 B G Wennersten

Computer supported meetings

One of the most comforting discoveries during the few computer supported meetings I have attended, is the efficiency with which a brainstorming session can take place.

My experiences from many regular meetings is quite the opposite. Only a few people are really able to contribute to creative solutions. One reason for this is that when people meet and discuss face-to-face there is a loss in the process. People spend most of the time listening to others. Or people are *not* listening to others, because they are too busy thinking about what they themselves are going to say. People spend some time telling others their ideas. And some people in the group may not contribute very much, which could mean that good ideas are never heard. The process loss is normally getting bigger the larger group it is.

- *Our gloomy reality.* The rather gloomy reality is that brainstorming groups tend to produce fewer ideas than the total number of ideas produced by the individual members of the groups when they work alone (findings by Diehl and Stroebe 1987).

Typical for a regular brainstorming session is that the group memory is usually rather weak. Notes on flipcharts or whiteboard are frequently scarce. Not seldom there are time consuming arguments about the meaning of the notes, etc. Additional time has to be used after the meeting to write documentation or minutes. When this finally reaches each one of the participants the content of meeting is almost forgotten.

All these factors are well known to all who participate in meetings. Sometimes such meetings could be painfully time consuming and improductive.

- *Pain.* This pain, which most of us might feel from time to time, could well be the major force during the coming years which will make us turning our interest to computer supported meetings (same room, same time).

Given that the meeting is well prepared in advance and that there is an experienced facilitator who are conducting the process ... given that, there seems to be so much to gain from the use of computer support at meetings.

• *Productivity gains.* The process loss, so typical for regular meetings, seems to be dramatically reduced. In a brainstorming session all individuals can "talk" at the same time, thus contribute at a peak level. No one in the group is doomed to be quiet because of one or two dominant persons who take all the air time.

Every contribution has of course to be written into the system, and this might be a disadvantage to some people. Or maybe not? Actually I think this could be beneficial in the long run. The reason is that it takes some effort and concentration to formulate the idea in writing compared to just presenting it orally. At the same time, all participants are activated. When formulated succinctly in writing, the new idea is more often easier for others to understand compared to the same material presented orally with many more words, maybe vagueness and an "off the cuff" structure.

• *Anonymity leads to more fruitful atmosphere.* One other fascinating feature, besides the parallelism in the meeting process, is the possibility for each participant to contribute under full anonymity. This seems to take away much of the time consuming, painful and sometimes blocking meeting politics which put persons rather than matters into focus. Knowing that nobody in the meeting really knows who is saying what, seems to induce a very reliefed atmosphere into a meeting. I get a feeling that almost any sensitive topic could be discussed in a fruitful and civilized way with the support by a computer system.

Next step: workflow support

Computer supported meetings in the same room at the same time are only one aspect of groupware. The next, and more difficult step, is to implement various types of computer support for workflows in dispersed organisations. In this field our studies of the Lotus Notes environment are of special interest.

As defined by Patricia Seybold Office Computing Group *workflow* is the sequence of actions or steps used in various business processes. Automated workflow applies technology to the process, though not necessarily to every action. Workflow also implies that more than one person is involved in the process. Most workflows have both sequential steps and parallel steps.

• *Promising.* Computer supported workflow is very promising. Eventually, all office computing applications will fall into the workflow category. Here is why:

Very few of us work in a vacuum, where no one else depends on our work to complete theirs, and where we are responsible for every step in a process, from conceiving of the need for the process to putting away the final related documents.

Most people depend on information from colleagues to complete their tasks and vice versa. In such an environment we create processes and procedures to ensure that the right information gets to the right people at the right time. Unfortunately, most of us are better at doing the individual tasks that makes up the process, than monitoring the process itself.

• *Facilitation of the process.* Computers are good at keeping track of things. Once the process is programmed, the system will remember it, making sure the proper information is sent to the proper person or application. If asked, it will also give you status information when you need it. Workflow systems should not only monitor and report status, but also facilitate the process itself. There are, according to Seybold, several way to facilitate the process:

- notifying the user that there is step or action to be performed
- providing the user with the tool(s) to complete each task
- providing the tool with the proper data to complete the task, and
- allowing the user to see where tasks fit in the complete process

• *Helps groups of people do their jobs.* The processes and procedures are unique to each organisation. They are the way people do business. What makes workflow computing so exciting is that it helps groups of people do their jobs, facilitating both the individual tasks as well as the flow of information between tasks. Additionally, it lets you know what's going on.

One interesting example from the field of personal computing is how macro commandos have been so widely used. In the beginning macros were only for the very advanced spreadsheet users. Today it is very easy for the common word processing user to take advantage of macros. It is a way to automate individual tasks.

A workflow system automates the flow or sequence of tasks throughout the organisation. It makes each one's job easier and, hopefully, makes individuals and processes more productive.

Notes' role in workflow support

I was fortunate enough to meet the people at Lotus in Cambridge, MA, to learn more about Lotus Notes. I was surely very impressed by this product's abilities. The more I learn about Notes, the more I am convinced about its future success.

• *A coming de facto standard.* Since the first release a couple of years ago this product has received rave reviews. Notes is considered to be one of the most important software environments in office computing for the coming years by many analysts. A second release, refined, came in spring 1991. Predictions are that Notes will become a de facto standard in many large corporations and medium-size businesses around

the world. Furthermore, during the summer 1991 there was an significant agreement between Lotus and IBM which is going to put Notes at a very central position in the IBM environments, more specifically Notes will be incorporated in the IBM OfficeVision product line.

- *A platform for group information management applications.* One of the most interesting features is that Notes offers a platform for group information management applications. Also ordinary business people, if computer-literate that is, can develop their own applications. These applications are naturally shared and distributed among groups of people within and across organisational boundaries. Therefore, I consider Lotus Notes could be the base for the true networked organisation.

  It is getting more and more important that business people can design their own applications according to their very specific needs. The business realities could change quickly and it is vital for people, and the organisation, to respond accordingly. There is no time to wait for application developers to come in and do the new applications or modifications. There should also be efficient tools which could be used by the business people themselves. Lotus Notes seems to contain tools of the right kind, but reports are that the learning curve could be somewhat steep for the end users.

- *Common information space.* Lotus Notes offers a lot more than conventional mail systems and conferencing system do. It is a common information space with several text-based applications that can be viewed by the degree to which the make use of a) interaction and b) structure. That could be new bulletins, reference data bases, electronic mail and status reports. travel authorizations and purchase orders, project management and conferencing within special interest groups.

  To make this common information space available to people in an organisation could be of tremendous future value (compared to today's much more limited value of the intraorganisational use of electronic mail and plain conferencing systems). As our organisations are getting more and more distributed, there are far too many people who know little about what is going on in the organisation. Each person has only a small part of the puzzle, and it is very difficult for anyone to understand the true big picture. That could mean lost opportunities and alienated employees among other things.

- *For the learning organisation.* We hear more and more talking about the need for learning organisations and the need for flexibility. The real challenge here is to find a way to get the knowledge out of the individual's heads and into the shared knowledge base available for the entire organisation. This way, more people can have both the big picture, as well as the opportunity to see how their activities contribute to the whole.

Lotus Notes is well-suited both to capture knowledge in a distributed organisation and to disseminate shared knowledge. In the last two years there have been a number of organisations implementing Notes in some scale. One important experience is that the benefits will not come automatically as soon as Notes is available to the employees. The success will depend a lot on the organisational culture. If people are used to share information freely, the implementation of Notes will be easy. In other organisations where people traditionally tend to keep their secrets and the level of communication ability is low, the implementation of Notes will not easily take root.

• *Ease the burden of information overload.* We are living in times when information overload are affecting us more and more. The effects (stress, tunnel vision, low quality work, improductivity) are not at all harmless. We need methods and tools to ease the burden of information.

One major trend — in order to overcome the information overload — is that we want to see only the information we need in the context we need it. We definitely do not want meaningless information pushed at us in undigestible form. The ideal situation would be if we ourselves could design the way we access, view and organise the information we need. Lotus Notes gives users the opportunity to customize different views of the same information. Also it is possible for users to easily refine such views, like adding comments, etc.

These qualities make Notes, it seems, to one of the most exciting office computing environments for the 1990's.

16 Randall Whitaker

The study tour was a valuable look at a dynamic R & D field, but it was by no means a comprehensive view. The focus of the Tucson seminar and the auxiliary site visits was overwhelmingly on "same time & place" meeting support systems (the Arizona Room; Capture Lab, etc.). Meeting room applications do not and never will represent a major portion of the groupware market. Any reflection on the TELDOK tour must be tempered with the realization that we neither saw nor addressed the full spectrum of groupware applications.

More importantly, we must not fall victim to the belief that there is a fixed definition for this phenomenon in the first place. There remains persistent confusion over what "groupware" (or CSCW, or any of the related terminology) actually denotes. Those meeting support facilities and tools prominent on the 1991 TELDOK agenda are but a subset of group decision support systems (GDSS), which are themselves but a subset of the wide range of applications addressed under the general heading of "computer-supported cooperative work" (CSCW). Bob Johansen has outlined 17 distinct types of IT support for

team work, listed 14 competing labels for this R&D area, and cautioned repeatedly about the dangers of getting tangled up in definitions. However, he noted in Tucson that such confusions over focus and identity are (to him) positive indicators of an area's value.

The central term for research and development in this area is "CSCW"; the central term for marketing is "groupware". Within the research community, there has been endless debate over the proper terminology, connotations, and emphases. No one doubts that issues of matching IT to groups and entire organisations are critically important. Few dispute that previous recognition of such issues has been hampered by narrow disciplinary interests or technical/marketing considerations. Many of the concerns attributed to the CSCW community are not new at all (witness Doug Engelbart's work over the last 30 years). What *is* new is that the technology's capabilities, packaging, and marketing are finally addressing an enterprise-wide vision. Bob Johansen and Paul Saffo pointed out in Tucson that "groupware" is *not* a new technology at all — it is a new spin on usage for existing capacities.

To summarize, I feel that the 1991 TELDOK venture offered an informative view of *some* of the aspects of this ill-defined and wide-ranging field. We have not surveyed the breadth (or depth) of this area, and the merits and potentials we assess are limited to the few products and services viewed.

Meeting support technology and Sweden

What does this "groupware" business mean for Sweden? Let me start with those meeting room installations which dominated this tour's agenda. What we observed in Arizona and elsewhere are expensive, dedicated installations which have been realized with large corporate investment. Justification for such facilities relies on some combination of three factors:

(1) their use as research laboratories;
(2) their employment as decision support tools for some specialized (often elite) group; and/or
(3) their availability as centres for vending decision support services on a commercial basis.

I repeatedly confronted hosts at meeting room sites with these three options (previously gleaned from literature and conferences); not one challenged the list or offered a distinct alternative. The research aspect is the one most justifiable in Sweden today, because we must look into how Swedes collaborate before we can evaluate technology supporting such collaboration. Groupware applications are designed to accommodate (or even guide) interactions among work team members, and interactional patterns are the foundation for cultural patterns. This

means that cultural differences will have a greater impact on acceptance of groupware than acceptance of individual productivity tools.

Most of the meeting support work surveyed on the TELDOK tour derives from the work at the University of Arizona — work based on large-scale groups regimented into a "legislative" model of architecture and activity (as experienced in the "Arizona Room"). Some Swedes' impressions of the Arizona Room experience were negative because it didn't "fit" the way they work in such groups. Particular points of conflict cited included:

- the size of the meeting group;
- the wide spatial distribution of participants;
- the lack of opportunity for interpersonal conversations;
- the authority hierarchy in which a facilitator controlled the course (and, potentially, the substance) of the meeting;
- the funnelling of all contributions through text and the PC; and
- the requirement that the group dissociate into individuals to participate in the computer-supported process.

Though anecdotal, these impressions collectively indicate a need to address meeting support systems with respect to *Swedish* styles of work activity. Where (and how often) would a facility like the Arizona Room be used in Swedish work life? How prevalent are meeting groups of 20 —30 people? How prevalent are meetings in which the primary task is (e.g.) the sort of brainstorming; choice selection; ranking/prioritization routines embodied in the software?

Much meeting support work is grounded in American corporate culture — one in which workers ingrained in individualism must be "retrofitted" to operate effectively in groups.[18] The resulting products and services (e.g., GroupSystems; Capture Lab) incorporate some sort of feedback or analysis for the meeting participants themselves — a dimension of self-improvement which has become a selling point to managers. We should question whether self-development in group work is a selling point in Sweden, where citizens are taught to work in groups from childhood, and "groupwork" (grupparbete) is a generic term instead of computer jargon.

Factors promoting proliferation of groupware in Sweden

Groupware would seem quite applicable to some portions of Swedish work life, judging from the meeting support facilities we saw. One example is in public sector decision making, where access to policy formation is distributed (e.g., government, labour, and management in

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18 The issue of "retrofitting" or "retraining" American users for group activity was a repeated theme at the CSCW '90 Conference in LA (October 1990), and these were the terms used to address that issue.

the case of work life issues), and decisions are commonly circulated for comment and critique (remiss) prior to finalization and implementation. These processes involve groups which could benefit from meeting support facilities (for policy formation); shared information spaces or message systems (remiss processes); and coordination systems (for overall scheduling and tracking). Another example is in planning (typically centralized, yet still subject to broad accessibility), where participants need to weigh options and trade-offs before reaching consensus.

However, I feel that a greater potential is illustrated by CSCW applications not so well represented on our agenda — ones which address:

(1) distribution of work activity over time and space;
(2) telecommunications as both empowering and constraining users; and
(3) the complexities of building and maintaining large shared data spaces.

These distributed/communications/shared information factors are of great concern for Sweden — a sparsely populated country with a well-developed communications infrastructure and a high incidence of what Engelbart calls "knowledge workers". With regard to the Swedish public sector, these factors are of particular importance in ongoing efforts to both decentralize control of services to regional or local authorities and decentralize provision of those and other services. More broadly, group support tools emphasizing these factors are more likely to become widespread successes in Swedish work life than meeting support facilities.

Factors constraining proliferation of groupware in Sweden cultural differences among organisations and nations

As noted above, groupware is designed around interaction — the factor varying most among cultures. Most groupware researchers with whom I spoke stated that (1) more must be learned about group dynamics and processes in general; and (2) there is a likelihood of significant impacts arising from cultural differences. Acceptance of American-developed products or services should be preceded by careful consideration of how those products fit Swedish workplaces and work styles. Those tools and services which realize specific interactional models (e.g., The Coordinator's commitment tracking; the GroupSystem/Team Focus reliance on a "legislative" process) are the ones most likely to suffer when transplanted into another cultural environment. Those tools which provide relatively open-ended group support (e.g., group editing tools like ShrEdit; shared data environments such as Lotus' Notes) are more likely to be accepted.

Lack of research into the impacts of cultural differences

The meeting facilities we saw and their derivative products were produced in the U.S.A. with massive corporate support; this means: (1) they embody presumptions about how Americans work in groups, and (2) it would be costly to purchase or reproduce their products. Sweden is, by and large, a consumer of computer technology rather than a producer. The "easy way out" would be to simply buy and install American products — a major mistake in those cases where the tools embody distinctly American work styles. Research is needed to identify those areas in which Swedes have their own "style" of group activity, and analysis will then be required to evaluate any impacts such culturally-delineated stylistic differences may have. Such work is not yet underway, and the community best equipped to approach it — social scientists — is not generally involved in IT evaluation.

The tendency to exaggerate expectations

Most groupware researchers with whom I spoke feel that while some group tools are marketable today, the technology is certainly not "ripe". Multiple contacts made reference to the overblown expectations associated with AI in the 1980's (especially knowledge-based systems — KBS). There is a danger for similar hype and disappointment with CSCW/groupware in the 1990's. KBS faltered in part because of their impact on patterns of authority and autonomy; these individual productivity tools and their implementation disturbed the socio-political environment in the workplace. Why shouldn't we expect similar disturbances as systems are installed in support of the very interactions which delineate that socio-political sphere?

The tendency for technology to drive users

There has to be a practical limit to the things IT should be applied to. Funnelling interpersonal interactions through a computer network may be justified in distributed work environments, but what does it accomplish in (e.g.) a meeting room? For that matter, one must wonder about the extent to which the capacity for technological support controls the scenarios into which it is inserted. Is the Arizona Room large due to the spatial demands of 25+ workstations and attendant support equipment, or were the workstations and associated equipment required to try and link together 25+ meeting participants in such a large chamber? Just because we *can* put so many people in such a room, each with his/her own PC, does not mean that we automatically *should* do so.

Failure to recognize the non-technological facets of this phenomenon

During 1989/1990, the study group "Teknikstöd för Grupparbete", within the public sector IT initiative UtvecklingsRådet, found widespread interest in group IT support, particularly for decentralized, distributed applications. However, there seemed to be a lack of understanding of what decentralization and distribution meant for organisations. This was evidenced by a common (mis-)conception that distributing a workplace in time or space could be accomplished with no effect on the current manner or degree of authority wielded by management. CSCW or groupware implementation is not just a technological exercise — it affects users, the work teams they comprise, and the organisation(s) in which those teams are embedded. Such IT innovation requires concomitant organisational innovation. Those who adopt groupware without recognizing this need for balanced technical/organisational innovation are not likely to realize the potential benefits.

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Appendix:

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TELDOK was initiated in 1980 by the Board of Swedish Telecom to *facilitate early and easy-to-read documentation on the use of telecommunicating information systems.*

TELDOK aims at documenting, as early as possible, working applications of new information systems and arranging study trips and seminars directly related to this task

TELDOK's aims include, to...

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- Publish, distribute, and–where needed–translate to Swedish, while comparing to the Swedish situation, information on the use of new telecommunications systems at work
- Arrange study trips and seminars directly related to the preparation and dissemination of information pertaining to practical applications of telecommunicating information systems at work

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