The 1988 Conference on Computer-Supported Cooperative Work: Trip Report

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The 1988 Conference on Computer-Supported Cooperative Work: Trip Report

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Computer-supported cooperative work (CSCW) is a new research field focused on the role of the computer in group work. On one hand it is technology-driven, motivated by such things as distributed computing, network file systems, electronic messaging, and high-bandwidth communication channels. On the other hand, it is socially-driven, motivated by studies of group interaction.

On this background, the 2nd ACM Conference on CSCW (September 26-28, 1988 Portland, Oregon) was a successful merging of sociology and technology. As a technocrat and computer user, I found myself on the edge of my seat during the descriptions and video presentations of novel systems. With "Cruiser," I could wander through a virtual hallway and strike up communications with anyone I happened to bump into, without actually leaving my physical office. I could use the Andrew Messaging System for sending off multi-media mail, such as rasters, complex line drawings, and bits of animation. Through Object Lens, which integrates hypertext, databases and a rule base, I could create intelligent agents to help manage my information-rich world.

In spite of the high creativity component, the conference was not just a show of innovative ideas. As a scientist and designer, I was impressed by both the empirical foundations behind many of the systems, and the evaluations of these systems during real use. I was taken by those designers who considered the targeted users to be partners in the design process, by first studying the sociology of the group's interaction in the work setting, discussing with the group how a computer system could provide real support, and then designing the system hand in hand with them.

To my surprise, there was very little hype. Although conference participants believed CSCW important, most seemed to recognize Lucy Suchman's sentiment that:

> "...technical development must go hand in hand with the discovery of just what the human enterprises are for which these new technologies might prove useful, and what commitments are involved in designing them to be so."

What's in a name?

What does CSCW mean? Does the general assertion that "it provides computer support for work processes involving more than a single user" give the field any realistic definition? Is it just a buzzword with little meaning? Or is it a generic term that acts as an umbrella to a variety of specializations that already fit well into other recognized domains? A panel discussion on this topic did not come out with any strong conclusion, except that it is too early to pigeon-hole CSCW.

Perhaps the best way to capture the CSCW flavor is to review work performed within its auspices, as exemplified by the papers in this conference. In the remainder of this report, I will try to give you the essence of the current interests of CSCW researchers by summarizing each conference session. Of course, I cannot hope to capture and convey the substance and promise of these papers in a few lines, and I do not describe every single paper. My aim is to whet your appetite and to entice you to find and read the proceedings.

Remote communication between distant sites

In today's international society, our image of a business meeting is usually a formal gathering held in a conference room, perhaps with participants flown in from distant sites. The much advertised notion of video conferencing (VC) was projected as

the closest thing to being there. Dedicated conference rooms linked by high-bandwidth communication lines were envisaged that would allow people located in different cities to meet without the usual time waste and travel costs. Yet there are only about 100 VC sites world-wide, a figure that falls far short of the expected promise. Carmen Egido of Bellcore gives two main reasons for this failure. First, vendors gave VC an ill-conceived image as a replacement for face to face meetings. Second, VC is based on inadequate needs assessment methodologies. Most formal interactions are not suitable for video conferencing, and travel is not reduced. Rather, Egido notices that VC actually increases the physical face-to-face meetings, and argues that it is best viewed as a supplement, rather than a replacement of the normal meeting process.

A shift in thinking is required. It is not necessarily planned meetings that are best supported through computer mediation, but informal meetings. Robert Kraut, Carmen Egido, and Joanne Galegher, also of Bellcore, argue that many interactions are required for people to find partners for collaborative work. Since communication between people has an exponential decay with distance, CSCW could bring people into contact through frequent, unplanned, high-quality, and real time interactions that come at a low personal cost. This is where Robert Root's imaginative Cruiser prototype comes in. Described as a social interface, it is a multi-media desktop communication system. The Cruiser user can walk around a virtual hallway and, just as in real life, can take a peek into open offices and start conversations if desired. A real time video link is opened between the visitor and the occupant. For privacy, "doors" can be kept wide open, slightly ajar, or closed.

Work settings and applications

When collaborations within everyday work settings are examined, potential applications of CSCW may come to mind.

Anthony Gorry and his colleagues from the Baylor College of Medicine examined how members of a biomedical research group could coordinate efforts and share information. Their aim is to allow a researcher to scan, filter and manage information, to use the information for decision-making, and to disseminate it to the rest of the team and to outsiders through a "web" of interactions. In their implementation, users can structure or filter their information and their collaborations through sets of templates (structured messages), each tailored to fit a task. Templates exist, for example, for searching on-line medical databases and for sending and selectively receiving mail. Through templates, a uniform interface is created between group members and sources of information. Furthermore, all information can be pasted and presented in a hypertext system which allows its users to share information to the degree appropriate to their activities.

Suchman and Trigg observed that we have to uncover the largely unarticulated detail of what people actually do when they work together if we are to design technology that supports collaborative practices. Charlotte Linde of the NASA Ames Research Center embraced this challenge by questioning the common (and perhaps naive) assumption that the authority status of participants within an organization is fixed. Through extensive videotapes, she observed a flight officer and pilot on board a helicopter engaged in police missions. The pilot is responsible for all on-craft decisions, while the officer is responsible for the actual police mission. She observed a quite complex social structure. In particular, the "authority status" of crew members was subject to moment to moment negotiations, invoked as a normal, unremarked background condition of the ongoing daily operations. Linde suggests that negotiating authority is quite common in most collaborative work, and that it would be a mistake to rely only upon the formal organizational hierarchy when deciding upon the authority of participants.

Perspectives on evaluation

One sure sign of professionalism in a field is the presence of self-criticism. Considering the cost of designing and building a CSCW application and its impact on an organization, realistic criticism is especially important. Jonathan Grudin of MCC presented a well-written paper of why CSCW applications fail, a paper which I believe should be read by anyone considering computer-supported collaboration. He notes several telling reasons for failures that seem common to less than successful systems. First, there is a disparity between those who will benefit from a CSCW application and those who must do additional work to support it. For example, an automatic meeting scheduler is of benefit to a meeting organizer, but the burden is placed on each group member to keep their calendars up to date. Second, there is a decision-making failure that leads to ill-fated development efforts, due to the lack of management intuition for these applications. Since groupware is used by many people with different organizational roles and responsibilities, one manager's visions and intuitions about a system would mis-represent its actual use. Third, there is a failure to learn from actual experience because it is extremely difficult to evaluate these applications. Proper evaluation requires methodologies from sociology and anthropology, fields that are largely absent in current research and application environments. Grudin suggests that we must be aware of these problems if we are to overcome them.

Unlike most American approaches that try to package a set of techniques together to do a job, designers in Scandinavia start out with a problem situation defined by workers, and work beside them in order to develop a new system that is "owned" by the workers. Joan Greenbaum of the Aarhus University in Denmark exemplifies this approach by taking a historical perspective of work organization and management strategies. In essence, she argues that the Scandinavian view of user participation in the design process is part of *building democracy in the workplace*. She indicates two central issues in the move to workplace democracy. First, democracy needs to be viewed as active participation in planning and decision-making, thus making worker involvement far more than techniques for improved human-computer interfaces. Second, CSCW means that computer systems need to reinforce forms of cooperation that enhance the chance for a more democratic workplace. For example, information flow in a CSCW application could emphasize lateral movement, as opposed to the top-down flow through authority normally seen in management. Planning functions could then move from current rule-based bureaucratic realms to situations where groups assume the stronger role.

Structured communication technologies

Certain types of communication contain a well-defined structure. A mail message, for example, usually has three primitive fields: a sender, an address, and a body. If the structure is well-articulated, a CSCW application can take advantage of it, as illustrated by the two systems below.

Kum-Yew Lai and Tom Malone from MIT introduced Object Lens, a second-generation version of their fairly well-known Information Lens. Object Lens contains two fundamental ideas. First, passive information can be represented as semi-structured objects, where each object is defined as part of an inheritance hierarchy. For example, consider the added structure as one goes down the following hierarchy branch:
"Thing—Message—Action Request—Meeting Proposal"
Whereas a message may be a primitive mail form, a meeting proposal may include time, place, decision requests, and so on. By defining and modifying templates for these objects, users can represent and interact with many different kinds of information. Second, active rules for processing information are represented as semi-autonomous agents. When creating these agents, users specify rules for automatically processing information in different situations. A rule triggered by incoming

news from a bulletin board may, for example, sort the interesting and topical news into appropriate folders, discarding the rest. With these two ideas, Object Lens integrates object-oriented databases, hypertext, and electronic messaging with intelligent routing. The seemingly simple user interface of Object Lens belies the work effort of building it.

Jeff Conklin and Michael Begeman of MCC presented gIBIS, a hypertext system that captures early design deliberations on large complex problems. It is based upon the Issue Based Information Design (IBIS) methodology that views design as a rhetorical process, with a set of issues that can be generalized, specialized, responded to, questioned, argued and so on. As with Object Lens, gIBIS is based to a large part on semi-structured messages. Through its well-designed interface, participants propose and respond to issues in structured ways that eliminate unconstructive moves such as name-calling and argument by repetition. To the authors' credit, they not only present but also evaluate and criticize their work based upon preliminary observations of its use.

Practical experiences in system development

How does one get started in designing systems for collaborative work? The presenters in this session, all from Scandinavia, shared their practical experiences of system development using approaches that are novel to American researchers. The Scandinavian approached, as introduced in a previous section, is best summarized by a quote from Grudin's paper:

> "…start out with a problem situation defined by workers, and work beside them a long time in order to develop a new system that is 'owned' by the workers… This is very different from traditional systems development… You can't simply package a set of techniques to do the job."

Berman and Thoreson share their experience of a cooperative systems development project involving centralization of several previously independent surgical departments in a hospital. A few simple cases illustrate that the conventional development process is wrought with conflicts, contradictions and challenges. In particular, the design of a cooperative system can neither be pushed by technology, nor by the workers view of what they require. Rather, the process is collaborative, where both designer and end user forward and evaluate ideas during system development.

From Aarhus University, Morten Kyng offers one such design methodology in the paper "Design for a dollar a day". He steps through the Scandinavian experiences with end user participation, and reviews several tools and techniques which will: 1) establish possibilities of alternative forms of work within the workplace; 2) evolve the local work situation through a cycle involving situation analysis, goal discussion, and investigating possible courses of actions; 3) create a vision of new and different uses of technology; and 4) view the design through mock-up simulations.

Finally, Bjerknes and Bratteteig describe their experiences with the "ultimate test" of a CSCW system built according to the Scandinavian approach by evaluating its use several months after installation. Through a series of flashbacks of diary clips and analysis, they bring us through the design process, giving the reader insight as to what happened, and why things were designed a certain way. The result of their ultimate test did more than show a system in active use, for it described several surprising work habits that had developed.

Most participants at CSCW '88 received the Scandinavian approach with both respect and excitement. This is not a surprise, for Scandinavia was following the collaboration theme throughout the design process.

Enabling technologies and environment

Another research product from the Bellcore labs is Quilt, a tool for collaborative document production. Unlike other collaborative document systems which support only direct authoring aspects, Quilt emphasizes and supports the communication vital to good collaboration. For example, structured hypermedia links allow people to attach text and voice annotations to the document, specialized as revision suggestions, public comments, and directed messages. The necessary coordination between collaborators is enhanced via activity logging, notification and triggering mechanisms. Access permissions can be set by the author to reflect the varying roles of collaborators (as writers, commenters, reviewers), while user-customizable definitions for such things as document and annotation types make the system both flexible and extensible.

Randall Trigg, the creator of the Xerox Notecards hypertext system, tackled the "lost in hyperspace" problem—the difficulty of navigating through complex hypertext networks. Unlike sequential documents, the rich inter-connections in hypertext may make it difficult for the unguided reader to follow paths preferred by the author (eg introductory tours through the document). Trigg introduces two new Notecard techniques to ameliorate this problem: "tabletops" and "guided tours". A tabletop records a specific set of notecards (hypertext fragments) and their layout on a screen. A guided tour is a graphical interface that allows one to navigate between tabletops. Normal notecards can further supplement a tour by pointing to and annotating other cards on the tabletop. In this way, an author can "guide" the reader through the text. Is this is the start of meta-hypertext?

Synchronous communication

Two papers from Xerox PARC concerned work surface artifacts produced during meetings, such as notes, drawings, and annotations. The conventional view considers these artifacts as a medium for storing information and conveying ideas, and pays little heed to how they are created. In the first paper, Tang and Leifer used detailed transcripts of design sessions to examine the possible purposes behind activities of a small design team who share a drawing surface. They found that artifacts, when combined with a person's gestures, are just as valuable for representing ideas and for engaging attention. A graphic evolves along with ideas into a final artifact, and gesturing is used for pointing and focusing attention during the collaboration. They conclude that too much attention has been paid to the artifacts left behind from collaborative meetings. In many cases, these are just marks that are inherently meaningless. The process of creating drawings and gesturing to them may be as important to the design process as the drawings themselves.

The same result is furthered in the second paper. Here, Bly observed designers communicating through three different media: face to face; over a video link that included a view of the other person and their drawing surface; and over the telephone. From her observations, she hypothesizes that the actions, uses, and interactions on a drawing artifact are as important to the effectiveness of many design collaborations as viewing the final artifact. Also, allowing designers to share drawing space activities increases their attention and involvement in the design task. When interaction over the drawing surface is reduced, the quality of the collaboration decreases.

In the final paper Marilyn Mantei from the University of Toronto described how hard it was to design Capture Lab. The Capture Lab is a face to face meeting room that included a computer console for every participant and a shared electronic blackboard. She discussed three seemingly trivial but ultimately important design decisions made: seating arrangements; inter-viewing distances between participants; and access protocols to the shared blackboard. Problems for seating include political ones—issues such as table

shape, chair placement, and blackboard location were critical if they were to reflect the existing power structure of the attendees—and physical ones that concerned viewing of the screen and effective lighting. When interviewing distances are too great, or computer monitors are obtrusive, Mantei noticed that participants would not speak to each other as much as they normally would. This problem was solved by recessing monitors into the table, and by including an optical illusion on the table surface that made people appear closer together than they really were. Access protocols to the shared blackboard was found to depend on the meeting type. For example, interactive meetings saw all participants writing to the board; "rotating scribes" (the most common) saw people take turns acting as funnels of information; and the designated scribe saw one person responsible for entering all information. Mantei's lesson is that CSCW is much more than software, and must also cover political, physical and social processes. Even a seemingly trivial detail can change the nature of meetings held in a room.

Electronic mail

Perhaps the greatest success story in CSCW is electronic mail (email). A case study of email use poignantly illustrates this success, as offered by Everland and Bikson from the Rand Corporation. Their study considered two slightly different groups in a natural office setting. Both groups comprised two types of people: normal employees who worked in the office, and ex-employees (retirees) who were usually at home. While members within each group could communicate between each other in conventional ways, one group also had basic email facilities. They found that retirees using email had a much higher rate of communication with other members of the group when contrasted with those who did not have email. Also, communication did not cluster as much when email was used—the boundary between cliques was not as sharp. In this case, email was successful in keeping retirees and their expertise involved with the office. The overall interpretation is that email significantly and directly affects the outcomes and the process of cooperative work.

The Andrew Messaging System is built on the premise that mail is more than just text. Its important points are that it is a combined mail/bulletin board facility, and that it is multi-media. One can, for example, transmit line drawings, rasters, animations, and spreadsheets; ask for responses to a message via mail that asks its reader to select from a list of choices; and compile articles into magazines for further distribution on the bulletin board. Through the examples of how Andrew was actually used at Carnegie Mellon University, Borenstein and Thyberg leave a positive impression of what advanced email technology could offer.

Finally, MIT's Wendy Mackay claims that email is more than just a communication system, for it also supports a variety of time and task management activities. She studied email users and rates them in several categories, each with quite different habits and objectives. Prioritizers concentrate on the problem of managing incoming messages. Archivers concentrate on archiving information for subsequent use, and delegators delegate mail by passing it on to others. Mackay's study indicates that mail use is strikingly diverse, and that designers of email should recognize this diversity by designing systems that provide flexibility over a wide range of users.

Perspectives

The final session gave the audience perspective on the area of CSCW. Reder and Schwab remind us that there are usually many channels of communication available to people within a work group. As a consequence, a CSCW system will assume a variety of socio-functional niches, competing with other electronic or traditional communications systems. Many variables affect how a system fits into an existing communication environment (eg functional equivalence between systems,

organizational decisions, nature of the task, etc). When multiple communication channels are available, people should be expected to—and will—switch between them. For example, an email communication may be continued by a face to face meeting, perhaps followed by several phone calls and a reminding memo. Reder and Schwab argue that the choice of the communication channel and the switching between them are a natural part of a persons communication strategies and tactics, and must be considered when installing a new CSCW system in the workplace.

Don Norman closed the conference by asking several fundamental questions about CSCW. Why use it? Where should it be used? What is its role? He said that there are serious problems in the CSCW area because we have to understand how people work together, an understanding we lack. Unlike standard interface design, we cannot rely on our intuitions, for a CSCW system has to differ for each user. Norman introduces the intriguing term "distributed cognition" as a new area of study. Since knowledge, skills, and people are distributed, we need methods for understanding how all interact with each other.

There you have it. The conference was exciting, and the proceedings well worth reading. Proceeding copies may be ordered prepaid from:

ACM Order Department,
PO Box 64145
Baltimore, MD 21264 USA

Related work can be found in:

- the December 1988 issue of *Byte*;
- Irene Greif's book entitled "*Computer Supported Cooperative Work: A Book of Readings*" (Morgan Kaufmann Publishers);
- *ACM Transactions on Office Information Systems* (see vol. 5/2 1987 and 6/3 1988).