REPORT ON THE COLLABORATIVE TECHNOLOGY DEVELOPERS' WORKSHOP

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Introduction

The second Conference on Computer-Supported Cooperative Work (CSCW '88) was held September 26-28, 1988, in Portland, Oregon. This was a conference on how groups work and how technology (especially computers) can help them work. The term "CSCW" refers to this new multi-disciplinary field, which draws on the expertise and collaboration of many different specialists, including social scientists, anthropologists, and computer scientists. "Groupware" is another popular word for CSCW technology.

On the Sunday preceding CSCW '88, a diverse group of people who are building CSCW technologies met for 8 hours to discuss their work and shared concerns. This meeting, called the Collaborative Technology Developers' Workshop, was attended by 20 researchers (listed at the end of this report) representing various collaborative technology development efforts from a variety of places.

This report describes the highlights of the workshop, which were also presented at the CSCW conference in a special report session. The report is divided into three parts as follows.

1. Workshop Purpose and Goals
2. Selected Workshop Discussion Topics
3. Workshop Outcomes

1. Workshop Purpose and Goals

The purpose of the workshop was to provide an interactive forum for people building collaborative technologies.

We had an ambitious set of goals for the workshop:

- initiate relationships and discussion between developers of collaboration technology who are doing related work,
- discuss important issues, problems, and solutions in our work, and
- identify the common threads of our work.

The first, and perhaps most important goal, was met in full. Many new personal ties were established during the workshop. The workshop also functioned as a "kickoff" event for this sub-community in several ways (see Workshop Outcomes section).

On the technical side, we focused on higher level issues and problems and did not get to solutions (at least not detailed technical solutions). More time and perhaps a more structured format might have allowed us to get to a lower level of detail. It also turned out to be more difficult than we had expected to find "common threads" in our work. The broad range of interests of the workshop participants contributed to this difficulty.

2. Selected Workshop Discussion Topics

In this section we summarize some of the discussion from the workshop. As mentioned previously, the discussion centered on higher level concerns and only alluded to many of the difficult, underlying design issues. The issues are highly interrelated but are described here separately for the sake of clarity.

Personalized Views

This issue grew out of a discussion of the appropriateness of WYSIWIS (What You See Is What I See) in different situations. In other words, is it always necessary to provide an identical view of the data to all users of a groupware system? The workshop participants mostly agreed that WYSIWIS is too restrictive for all situations--in fact we agreed that there is a real need for highly personalized views in some situations. When are personalized views of data for particular users allowed? And when are they useful? What about views for specialists? And for handicapped people? It was also noted that providing / not providing WYSIWIS has implications for the underlying data representation and the need for data translation.

Synchronous or Asynchronous

CSCW applications usually focus on supporting groups where the people interact in real time (synchronous) or where the people interact over time (asynchronous).

In both kinds of interactions, notification of others' actions is important. What forms of notification are most important for each? The depiction of group activity may be very different for synchronous and asynchronous situations. For example, in collaborative writing when people are editing the same thing at the same time, it may be important to show where others' cursors are and to whom they belong; but when they are editing the same thing at different times, it may be important to highlight what has changed since a user's last access.

Sometimes interactions shift between synchronous and asynchronous modes (e.g., an attempt at real-time interaction results in leaving an asynchronous message). How do we provide appropriate, seamless transitions between these different modes?

Navigation, Visual Metaphors

What are useful navigation techniques and visual metaphors that assist communication and shared information manipulation among group members?

Single User ◄► Multi User

There are two basic approaches to building collaborative technology: (1) modifying a single-user application for simultaneous group use, and (2) writing groupware based on some model of how groups perform particular tasks.

The approach taken affects the ease of implementation and the range of groupware features that can be supported. The approach taken also affects the answers to the following questions:

- Do multi-user applications degrade gracefully to single-user applications?
- How is self-coordination (e.g., over time) similar to or different from multi-user coordination?
- Peoples' activities range from individual to group efforts—how do we achieve seamlessness (smooth transitions) between the two work modes?

The two approaches were about equally represented in the systems that those of us attending the workshop had built. In the beginning, many of us were biased towards the approach we had chosen in our own work, and we tended to discount the other approach. But by the end of the workshop, we better appreciated that both approaches had significant merit, and we agreed that both approaches deserved further attention.

Embedding Social Protocols in Software

Social protocols are accepted rules or policies which govern interaction (e.g., conversational turn taking). In a group support system, when should software mechanisms be implemented to support particular protocols of interaction? Some workshop participants have found in their systems that some policies are best determined by a group's social process as opposed to embedding social protocols in software a priori.

Others at the workshop had a different perspective on this topic. Their view was that social protocol/policy *determines* the amount of computer support (i.e., the software mechanism) required. Therefore, the question to ask is not "when" but "how much" social protocol should be embedded in the software?

We would like to develop software that is sufficiently flexible so that different policies can be provided at different times. It was mentioned that a group's size might influence how much social

structure software should impose. For example, larger groups might benefit from more structured interactions while smaller groups might require more flexibility. It was also pointed out that physical size is not the only measure of group size—a physically small group can be logically large (e.g., a community task force addressing land use) or a physically large group can be logically small (e.g., the group of people in a community who are interested in preserving land for future generations' enjoyment).

Interaction Baseline

There is a tendency to compare real-time technologies for collaboration to face-to-face interaction (e.g., "Was that video interaction just as good as face-to-face?"). This places an emphasis on the technology as a replacement for face-to-face interaction. We favored the view that technology should be viewed as *augmenting* interaction over distance or time.

Social Scientists + Technology Builders

We discussed at considerable length the critical need for collaboration between technology builders and social scientists in realizing effective and useful collaborative systems. For example, technology builders need social scientists to help identify system requirements and to help evaluate prototype technologies.

There are two big problems in working together:

1. Prototypes are built faster than they can be evaluated.
2. Technology builders have a vision they are trying to realize in their prototypes, while social scientists are trained to measure the observable—unfortunately, the vision is not observable.

The mismatch of time scales and the vision/observable dichotomy cause another problem: technology builders tend to use the technology themselves and assume that since it works for them it is good. *Technology builders must remember that they are not typical users.*

We generated several suggestions (none of them new) which might help overcome these problems in working together. Cross-training in the other's discipline(s) is a good first step. Interdisciplinary programs (such as those at UC-Irvine and the Sloan School at MIT) are a step in the right direction. Where possible, projects in this field should tap both social and technical expertise.

3. Workshop Outcomes

In addition to the issues presented in section 2, the workshop produced a number of suggestions, recommendations, and future plans.

The workshop recommended that more technical "how-to" papers be accepted for the CSCW '90 conference. Papers that discuss the difficult problems and design tradeoffs in building CSCW systems should be encouraged and even solicited. We recommended that the CSCW '90 program committee include one or more of the workshop participants to ensure that such papers are solicited and receive fair consideration.

Several follow-up workshops will take place as a result of this workshop:

- Phil Gust (Hewlett-Packard Labs) is coordinating the next Developers' Workshop to be held in early 1989, (contact Phil, gust@hplabs.hp.com, or one of authors of this report if you are interested in participating).
- Skip Ellis (MCC), Mark Abel (U S WEST Adv. Tech.), and Enrique Godreau (Xerox PARC) are organizing an IFIPS workshop on groupware to be held in Palo Alto, California, in August 1989 (watch forthcoming issues of major journals for the call for position papers).

Another result of this workshop was enthusiasm for Lester Ludwig's (Bellcore) idea to create a national multi-media network. This network would connect the major multi-media collaboration projects around the U.S.A. The idea is akin to the original idea of creating the ARPANET in the late 60's. Lester envisions that interconnecting the major research efforts in multi-media systems will allow us to share and build on each other's work. In fact, the work of creating such a network will itself bring the various players together as it provides a clear, common goal. During the conference, several of the workshop members discussed this proposal with representatives from agencies such as the National Science Foundation, the Office on Technology Assessment, and the Human Computer Interaction Consortium. Anyone interested in helping this idea become a reality (especially those of you with power or money) should write Lester at:

Lester F. Ludwig
Bell Communications Research
NVC 1A-221
331 Newman Springs Road
Red Bank, New Jersey 07701

And finally, we set up two information exchange mechanisms:

- Kevin Crowston (MIT) is setting up an ARPANET newsgroup (to join send a message to *cscw-implementors-request@mc.lcs.mit.edu*),
- Larry Koved (IBM) is setting up a distribution center for working papers.

For more information on anything discussed in this workshop report, please contact Mark Abel or Gail Rein.

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The Workshop Participants

The 20 workshop participants are listed below along with a phrase describing their research interests or focus.

Mark Abel, U S WEST Adv. Tech.
collaboration over space & time

Sid Ahuja, AT&T Bell Labs
multi-media conferencing

Steve Bulick, U S WEST Adv. Tech.
collaboration over space & time

Rich Clayton, Bellcore
shared windows & conferencing systems

Kevin Crowston, MIT Sloan School
collaboration over space & time

Skip Ellis, MCC
collaboration & coordination systems

J. Robert Ensor, AT&T Bell Labs
multi-media conferencing

Scott Fisher, NASA Ames
virtual environments & TeleScience

Harry Forsdick, BBN
real-time multi-media conferencing over large geographic distances

Simon Gibbs, MCC
real-time multi-user systems

Enrique Godreau, Xerox PARC
supporting the design process, shared spaces

Phil Gust, Hewlett-Packard Labs
multi-user interfaces

Leonard Kawell, Iris Associates
collaborative authoring systems

Larry Koved, IBM Watson Research
real-time conferencing systems

Keith Lantz, Olivetti Research
replicated architectures, collaboration transparency, & personalized views

Lester Ludwig, Bellcore
large-scale multi-media telecommunications networks

Gail Rein, MCC
interfaces for real-time collaboration systems

Mark Shepherd, Bell Northern Research
collaboration over space & time

Mark Stefik, Xerox PARC
collaborative meeting environments

Doug Vogel, U. of Arizona
meeting environments