How Can Human and Design Sciences Cooperate in CSCW?

Workshop report, ECSCW '93, Milan

Yvonne Waern

The goal of the workshop was to collect and analyze ideas on how human and design sciences may cooperate to benefit the development of CSCW research.

The participants were Dr. Ruth Bartels, Siemens/DFKI, Germany; Silvana Mangiaracina, Dipartimento di Matematica, Universita' di Bologna, Italy; Rob Procter, Department of Computer Science, University of Edinburgh, Scotland; Dan Shapiro, Department of Sociology, Lancaster University, England; Gerrit van der Veer, Dept. of Ergonomics, Twente University, The Netherlands; Charles Wood, School of Cognitive and Computing Sciences, University of Sussex, England, and the organiser Yvonne Waern, Department of Communication Studies. Linköping University, Sweden.

Characteristics of participants

Participants in this workshop came from different disciplines and had varying experience of interdisciplinary work. Four participants (Rob, Gerrit, Silvana and Ruth) can be characterized as knowledgeable about computer science, three as knowledgeable about social science (Dan, Charles, and Yvonne). Gerrit and Charles have an interdisciplinary background in themselves (through education or practice). All except Ruth had already worked in interdisciplinary groups for an extended time.

Characteristics of issues discussed

Each participant brought into the discussion one or several issues.

All issues can be regarded as a kind of partial answer to the workshop question.

Silvana's partial answer concerns taking a common problem, and approaching this from different aspects. Her problem was: What happens when communication over a distance is offered through a computer? There are a lot of practical problems to be solved, but also new insights to be gained. The project is ongoing, and input is appreciated. Silvana's own experience was that pupils seem to get enthusiastic, and that teachers get new ideas.

Rob's partial answer concerns the perspective taken in collaborating between the disciplines. He thinks that we should refrain from considering design a particular activity. This would place the designer as the one who decides on the problem and whose purposes the human sciences should serve. Rather he thinks that it is the ongoing development of use that should interest us. He calls this activity *innofusion*, which stands for the frequently-overlooked processes of innovation during the implementation of technologies. By such a perspective, the balance between human and design sciences is more even.

Gerrit's partial answer concerns the strategy and means by which our work proceeds. He thinks that analysis of problems and systems and proper representation of the results would be able to serve the purpose of bringing to each other's awareness our roles, different tasks and goals, even if we cannot overview the problem as a whole.

Charles proposed a framework which might be able to mediate between design and socio-cognitive aspects. This framework takes an analysis of artifacts into their cognitive dimensions as point of departure.

Dan thought that design can agree on some good will, such as supporting the weak parties in collaboration. In every design activity there is a set of restrictions to be obeyed. These can be formulated into "core truths", i.e. statements, which nobody would question, and which always have to be considered. By attending to these core truths and the good will, human and design sciences can cooperate.

Finally, Ruth presented a concrete design project. She is involved in a project which aims at building a knowledge base shell for designers of telecooperation systems. The shell should be able to accommodate the knowledge that actually should be entered in the system. The designer should use the shell to build telecooperation systems by customizing the knowledge of the shell to a new application. She asked questions such as: what are the relevant factors to be considered? What factors influence cooperative work? And which of these should be represented in a development tool?

Discussion

During the discussion of the issues, some general controversies came up.

1. General (decontexutalised) propositions versus contextually constrained descriptions

One issue relates to the question of general (nomothetic) descriptions versus particular (ideographic) ones. Some human sciences (particularly cognitive psychology) have the tradition of looking for general concepts underlying a set of data, whereas other human sciences (particularly ethnography) have the tradition of investigating a single case in very great detail. This issue may be

reflected in different design concerns, and is certainly related to different research approaches within computer systems design. It is interesting to note that most research approaches within CSCW relate to the ideographic approach. Other research in computer design, and "traditional" HCI uses the nomothetic approach. Ruth's problem is phrased in the words of general factors, and Charles' cognitive dimensions clearly reflect abstract, underlying factors. Dan clearly states an ideographic approach. I myself am most experienced with and feel most at home with a nomothetic approach. Silvana, coming from mathematics, also is more familiar with a nomothetic approach.

2. Cooperation as demanded by managerial decisions and cooperation as emerging from social (individual) activities

We spent some time discussing inherent conflicts within all work situations. Managers may want to organize the work in a particular way, whereas workers might want the work organized differently. This probably means that the concept of "cooperation" is different, dependent upon which perspective we take.

This discussion may relate to the distinction between an individual outlook at work (where cooperation is one part of an individual's work) versus work as socially organized and a managerial outlook (where work has to be allocated). The distinction is also related to different ways of conceiving "tasks". From the management point of view a "task" is something which has to be performed, independent of by whom. Thus tasks are "allocated" and reallocated dependent upon the availability of people. From the workers' point of view, "tasks" have a temporal meaning, they take up time, they have to be prioritized and they have to be ordered, and sometimes interruptions occur so that tasks get intertwined. A person attends to another person's task only if the task performance concerns her and she is not too busy with something else to be able to attend.

For me (Yvonne Waern), it is important to understand both these perspectives in relation to CSCW research. If we see work from the outside, as a managerial

question, the support may have the character of information systems or process tracking systems. Organizational problems as task allocation, scheduling and following up of work (for instance work flow analysis) are important from this perspective. Here, the danger of a support lies in the "big brother" syndrome and in loss of freedom and dignity for the workers. The danger also lies in detailing processes to the extent that the everyday variation cannot be coped with, so that the whole chain of compromises and flexible actions breaks down.

If we see work from the inside, i.e. from the persons who perform their particular part of it, the support can lie in information sending and receiving (thus communication), giving information about who wants and who can give the information wanted, and solving problems together. Support in terms of asynchronous or synchronous communication is relevant in this perspective, as well as individual task managers and meeting scheduling and preparation. Group decision support systems belong here, too. The problems here may consist in the support being to powerful so that the "fun" in individual work disappears or the support being too awkward to handle, that it adds more to the individual work than that it supports or enhances it.

All support for cooperative work is not as easily categorized into "managerial" or "worker" support. Some systems (for instance office automation or CAD/CAM systems) can be seen from both perspectives and be used in both ways. Often it is the conflict between the workers' interest (to organize work at their own discretion) and the organization's interest (to supervise work) which makes such combined systems problematic (I think of the "ubiquitous" computing environment of Xerox, for instance). In research the "innocent" logging of private data represent another example of this conflict between "inner" (the worker's) interests and external (here: the researcher's).

It seems that most CSCW designers nowadays favour an "inside", worker outlook to a managerial one. Systems are built to support individuals' com-

munication with each other, and the whole complexity of work is left to the human beings in the organization (quite wisely, in my opinion). Office automation is not as popular as it used to be, and the idea of "concurrent engineering" seems to have died before it really was born. Both these two last-mentioned are examples of a managerial approach to CSCW.

Taking these distinctions to design, we find two principle ways of building a support for cooperation: to cover the whole work organization. This corresponds to the management perspective – to develop generic tools which can be used by individuals for cooperative purposes (cooperative extensions of the word-processor, for instance. Extensions may cover awareness of other participants, access control and floor control).

3. Knowledge transfer versus knowledge creation

Ruth's particular problem raised the question of whether humanistic and social knowledge can be transferred to designers for the purpose of building systems. It was generally felt that the idea of knowledge transfer is false, both within the context of a groups of people from different disciplines cooperating with each other and in the context of writing design guidelines for nonanticipated use. Instead, the cooperation between human and design sciences must be regarded as a creation of knowledge, where participants learn from each other and the results cannot be predicted.

Concluding discussion

We concluded the workshop by approaching some higher-order issues, i.e. "who owns the problem", "how is work distributed among experts" and "how do people with different expertise communicate?"

1. Who owns the problem?

In a multidisciplinary cooperation, the problem is usually posed from one perspective to start with. In a research project, the problem may be "owned" by a representant from a particular perspective. This of course affects the phrasing of the problem. It may also be the case that the discipline that owns the problem is responsible to a funding agency,

or a customer, who expects the problem to be formulated, approached and solved in a particular way.

However, as soon as other disciplines enter the stage, the problem formulation will be changed. We used Ruth's problem as a point of departure, and suggested different changes to it. Dan suggested that the situation of the people involved should be carefully studied to start with. Rob had some other good ideas, which I didn't succeed in writing down.

2. How are tasks distributed?

The next problem concerned how the task is distributed. We cannot cooperate all the time, the most efficient way is to distribute tasks according to competence (within the time-limits available). Within a research group, as ours, a task distribution according to competence seems natural, as long as we can identify tasks to match with competencies. In other situations, task allocation is an organizational matter. Examples were given of hierarchical organization of tasks in hospitals, where the task allocation mainly is performed with respect to different time ranges covered. Physicians have a time range of days, nurses cover parts of days, and the assistants minute-to-minute contacts with the patients. Unfortunately, the time-coverage is not the only basis, status considerations also enter, and conflicts in task allocation may be due to these.

3. How do people with different expertise communicate?

Finally we discussed how people with different expertise communicate with each other.

The following categories were found:

Communication of result: In software engineering the result of one person (or team) has to be communicated to the other persons involved in a design project. This is often performed in a sequential way.

Communication via a shared object: For parallel work, a shared object seems important. It is not self-evident that a noncomputerized shared object can be transformed into a computer-based form.

Communication via information systems: Databases of different kinds or hypermedia systems can function as repositories of information needed for different people. Hypermedia systems can provide different ways for sharing information and objects (asynchronous CSCW). In hypermedia, this problem becomes: how to create tailorable hyper-structures, in such a way that any user can choose his best way to access shared objects. Is the access modifiable depending on his changed needs? We agreed that the input to and accessibility of these databases still represent great problems.

Final conclusion (from Yvonne Waern):

All cooperation is constrained by a context (external world, management, etc.) This context affects the goals, methods and opportunities of cooperation. The degrees of freedom for negotiation and communication vary.

Thus, in order to be able to work inter- (or multi-) disciplinary, we have to understand the contextual constraints of ourselves and our partners.

In order to succeed with a multidisciplinary practice, we cannot work with concepts and theories from the participating disciplines. Instead, a particular (design) situation should be approached. Focussing such a situation, it is easier to find the knowledge from the different expertise which can be relevant. This knowledge has further to be adapted to the particular situation.

It is not enough to analyze the chosen problem from different perspectives. In order to proceed towards some solution, analyses have to be combined with visions and syntheses.

During the course of work, the environment might well change. In order to be successful in such circumstances, companies have to adapt to changes. The same applies to multidisciplinary cooperation. I have no ideas about the methods of adaptation, but I trust the flexibility and creativity of expert people involved in a multidisciplinary endeavour.

Yvonne Waern is professor at the Department of Communication Studies at Linköping University. There she is involved in studies of human-computer interaction, cooperation and communication in design and production and comprehension of explanations.

Her address is:

Professor Yvonne Waern, Department of Communication Studies. Linköping University, S-581 83 Linköping, Sweden.

Email: yvowa@tema.liu.se