

# Distributed collective practices: A CSCW perspective

Kjeld Schmidt  
Center for Tele-Information  
Technical University of Denmark  
DK-2800 Lyngby, Denmark  
*schmidt@cti.dtu.dk*

Simply put, the research area of computer-supported cooperative work — or CSCW — can be defined as an attempt to explore how information technology may be designed and used so as to enable people engaged in cooperative activities to accomplish their work more efficiently and effectively (Bannon and Schmidt, 1989; Schmidt and Bannon, 1992).

It is not quite as simple as that, of course. Opinions differ, also regarding the overriding question of what CSCW is all about. However, the different approaches can roughly be grouped into two loosely defined research programs.

For large sections of the CSCW community the aim is to utilize IT to help cooperating actors to *overcome the effect of physical distance* among them, by providing some kind of artificial IT-based environment in which the actors can interact as freely, or almost as freely, as if they were in the same room. This approach to CSCW has been rather popular in CSCW for many reasons: it is intuitively easy to see the point of it and devise how IT might be applied, and it does not seem to involve more or less intractable conceptual problems. It appeals to ‘Stop talking, start doing’ oriented people.

Other CSCW researchers pursue aims that are more radical and which perhaps involve greater risks. Embracing the fact that cooperative work is inexorably distributed, this program explores the idea that information technology, in some form or another, may augment the ability of cooperating workers of *managing the complexities* they are facing in coordinating their distributed and yet interdependent activities, irrespective of whether the actors work in the same room or not, or irrespective of whether the actors form a small tightly knit team or a large, loosely coupled cooperative arrangement, such as a software design project (cf., e.g., Schmidt and Simone, 1996).

That is, while the first-mentioned program can be said to aim at overcoming physical distance among actors, the radical program aims at managing the complexity of coordination.

Now, the two programs are not really alternative programs. In fact, the vision of overcoming distance by means of some artificial environment raises some very fundamental problems. What originally seemed to be a intuitively simple and straightforward research strategy has turned out to be problematic. The seemingly pragmatic program of emulating face-to-face interaction raises exactly the same kind

of problems as the radical program, namely the problem that we, in order to support cooperative work by IT, *need to understand the practices through which workers coordinate, align, and integrate their various individual activities.*

In pursuing these issues we cannot take for granted that actors have 'shared goals' or a 'shared understanding'. To the contrary, in order to investigate how IT might support cooperative work we need to investigate the very practices through which cooperating actors develop 'goals' that, to all practical purposes, can be said to be 'shared' in so far as they are taken for granted by the actors, or the practices through which actors develop an understanding that, to all practical purposes, can be said to be shared in the very same sense.

Consider a work setting in which multiple actors are engaged in a joint effort. While doing the job, the different actors are responsible for different aspects of the process in so far as they are positioned differently in the setting, they handle different objects or kinds of objects, they cope with different categories of situations, wield different types of tools, etc. Due to their different physical and organizational location, they perceive the world differently and face different local contingencies. They may also, in another sense, see the world differently in that they may have different professional backgrounds, and so forth. They nonetheless routinely, day in and day out, coordinate and integrate their individual and local contributions, mostly successfully. Indeed, they do it in such a way, typically implicitly and without negotiation or other forms of focused interaction, that it is *as if* their distributed activities are 'seamlessly' integrated.

This may seem miraculous, and yet it's an everyday occurrence so utterly mundane that we all experience it in our daily working lives without even noticing. In Lessing's words, 'The greatest miracle of all is that the true, the genuine miracles, can, and should come to, seem so commonplace to us.'<sup>1</sup>

The fact that cooperative work is routinely and seamlessly integrated surely comes across as a miracle, but how is this feat accomplished in actual practice? Through which practices are the myriad constituent individual actions of the cooperative effort aligned and meshed? Through which practices is order accomplished in the course of the ongoing joint effort?

These are the basic sociological research problems of CSCW.

The various social science disciplines and paradigms are of little help in understanding these practices. Not only because they do not have ready answers, which they of course do not, but also and more seriously because of fundamental conceptual and methodological shortcomings that have become apparent in CSCW and, I presume, in other research areas as well.

The coordinative practices, i.e., the practices through which cooperative work is routinely and seamlessly integrated, are, of course, highly diverse, varying from

---

<sup>1</sup> 'Der Wunder höchstes ist, Daß uns die wahren, echten Wunder so Alltäglich werden können, werden sollen.' Gotthold Lessing: *Nathan der Weisse*, 1779, Act 1, Scene 2 (English translation in Schutz and Luckmann, 1989, p. 191)

domain to domain, from setting to setting. However, we can identify a several categories of practices that have important features in common. Here I would like to focus on the practices that are generally known as ‘mutual awareness’ or ‘peripheral awareness’ on the one hand and on the other hand the various coordinative practices that involve mediating artifacts.

The phenomenon of ‘mutual awareness’ is well known and easily described: An actor engaged in a particular line of action in a cooperative work setting will typically somehow notice what his or her colleagues are doing or not doing and will adjust his or her own line of action accordingly. And conversely, actors make their activities ‘publicly visible’, that is, available and accessible to colleagues, so that they in turn can adjust *their* activities as appropriate.

How do they do that? Well, that is not well understood at all.

The difficulty arises from the fact that we, in order to understand the phenomenon of mutual awareness, on closer inspection must address *the problem of meaning*, that is, the fact that the world into which a person is born and in which a person acts and interacts is meaningful (Schutz, 1932, 1962, 1964).

In addressing the problem of meaning, we are of course breaking with fundamental propositions of cognitive science, in so far as cognitivism tries to account for human cognition in terms that not only ignores but *deliberately dismisses the problem of meaning* (this is the whole point of trying to account for cognition in terms of the putative cognitive mechanisms) (Dreyfus, 1979; Bruner, 1990; Shanker, 1998).

The point is that when an actor perceives a colleague doing something in the shared setting, he or she observes something that (typically) is immediately meaningful to him or her. To a competent member, making sense is (typically) effortless.

Mutual awareness is not a mental state that arises through some kind of osmosis, as a result of simply ‘being there’. It does not even make sense to conceive of mutual awareness as a mental state that anticipates or explains praxis. It *is* a praxis, or better: *a skillful praxis*. First, in making sense of what others are doing, the actor invokes his or her knowledge of their common field of work, that is, the setting, the tools and the equipment, the behavior of the processes, the standard operating procedures, the norms of professional conduct in that domain, etc. Furthermore, actors do not aimlessly monitor what happens around them. Actors scan for certain cues or indicators of states or state changes of import for what they are doing or will be doing or could be doing.

Similarly, when actors display what they do, that is, make their activities available and accessible to other actors, they do so *selectively*. They display what they deem relevant for colleagues in the particular situation. That is, they modulate their activities in such a way that other will notice what they need to notice, no more and no less. Routine troubles, for instance, are not made conspicuous to others,

unless of course their attention for some reason needs to be directed towards those troubles.

In scanning as well as in displaying, actors relate to their understanding of what is relevant. They are highly — but skillfully — selective. That is, mutual awareness not only implies the problem of meaning but also the complementary problem of relevance. Thus, in order to make serious advances with developing technologies for supporting these coordinative practices, we need to identify (in Schutz's words) the 'typifications' actors employ in order to be appropriately selective in scanning and displaying.

Now, when an actor is scanning what is going on in the cooperative effort, he or she is of course taking heed of the bodily conduct of others: their postures and gestures, their location and movement in space, their gaze and speech, and so on.

However, mutual awareness relies on more than bodily conduct and often does not involve the monitoring of bodily conduct at all.

In making sense of bodily conduct the observer relies on his or her understanding of the domain, the field of work, etc. What the observer sees is not bodily conduct but meaningful activities, technically meaningful. The ATC controller does not perceive 'bodily conduct' but perceives ATC activities.

This observation is, of course, not a new one. It is classical phenomenology. I'm making the point because I would like to take it one step further.

In sociology of work, the deeply material nature of work is typically ignored. The accounts we are given are strangely anemic and abstract, focusing on issues of power, status, class, gender, race, and social control, while the constraints and the urgencies practitioners are facing in their work are passed over or simply ignored. Such studies are, of course, worthwhile for many good reasons, but what they give us is not a sociology of work, but a sociology of the socio-economic regime of work and the concomitant ideological frameworks (cf. Sharrock and Anderson, 1986).

Whereas sociology of work has ignored the material nature of work, cognitive psychology — in a striking instance of deep-seated consensus — has ignored the crucial role of artifacts in human cognition.

The point of departure of any investigation of work is that work is massively constrained, materially as well as in terms of resources and requirements. To use an infamous expression, cooperative work is not a tea ceremony. When engaged in a cooperative effort, actors are objectively and materially interdependent. Their interdependence inescapably has causal aspects, and their actions and interactions are thus both intentional and material.

Again this is not sensational news. Some may refer to this duplicity as the 'double character of the work process' (Marx, 1867) or by conceiving of it as a socio-technical system (Emery and Trist, 1965; Woodward, 1965) or 'distributed cognition' (Hutchins, 1995) or as a network of actors and artifacts (Law and Hassard, 1999) or whatever. These are merely different ways of *stating* the

problem. The challenge is to develop the conceptual implications of this insight and understand the intricate interplay of the causal and the intentional, of the material and the cultural.

In order to understand coordinative practices, understanding the material setting is of crucial importance. For example, in order to understand coordinative practices of operators in the control room of a nuclear power plant, one must understand the basic structure of the plant, the processes of energy transformation, the mass flow, the control system, the representations, etc.

The same is true when it comes to domains where the field of work is essentially intangible: the bank, the design team. In these cases the state of the otherwise invisible and intangible field of work is made visible and tangible by means of various representational artifacts: the records of the bank clerks, the drawings of the engineers.

In order to understand this phenomenon, some CSCW researchers have invoked the notion of 'external memory'. While representational artifacts sometimes obviously serves as and can be understood as an *aide memoir*, I find the concept of 'external memory' problematic in this context. Not only because it relies on the highly dubious notion of 'mental workload' (which is based on the cognitivist dismissal of the problem of meaning) but also because of what it ignores: The representational artifact is more than an *aide memoir*: an artifact such as the client file of the bank or the blueprint of the engineers, does more than *retain* information: It makes the state of the otherwise invisible or even virtual field of work intersubjectively observable. Salient features are made conspicuous at-a-glance. One can point and refer to it, one can annotate it and highlight aspects of it etc. *It can be manipulated*.

In order to understand the practices of mutual awareness and the ways in which actors make sense of what is going on around them, we therefore need to investigate the ways in which actors design and use artifacts for coordinative purposes.

In this context, we should perhaps pay special attention to a special class of artifacts that are designed and used for coordinative purposes.

Coordinative artifacts are used in different ways and for different purposes in cooperative work. The following categories are obvious (Schmidt, 1997):

- *Templates*, i.e., artifacts that *specify the properties of the result* of individual contributions, e.g., product standards, drawings, 'style sheets'.
- *Maps*, i.e., artifacts that *specify interdependencies* of tasks or objects in a cooperative work setting, e.g., organizational charts, classification schemes, taxonomies, 'group technology'.
- *Scripts*, i.e., artifacts that *specify a protocol of interaction* in view of task interdependencies in a cooperative work setting, e.g., production schedules, kanban systems, office procedures, bug report forms.

Other categories could probably be added. That is not important in this context. The point is that different kinds of coordinative artifacts determine interaction in different ways. In some cases weakly, in other cases quite strongly. For example, whereas a map does not prescribe a certain sequential order, this is exactly what a script does: ‘if that is the situation, this is what you have to do now...’

More importantly, while coordinative artifacts may determine interaction quite strongly, *they do not determine action causally*. CSCW research overcame that mistake very early on, especially thanks to Lucy Suchman’s work (Suchman, 1987). What is not clear in CSCW, however, is *how* coordinative constructs determine action. Some would even claim that coordinative artifacts do not determine action at all.

From my work, I would say that such a position relies on a mystification of human action (Schmidt, 1997). In the ‘natural attitude’ of a practitioner an actor does not reflect on what to do each step of the way. Faced with the routine urgencies of everyday work, actors ‘follow rules blindly’, to use Wittgenstein’s expression (Wittgenstein, 1938-46). To take Wittgenstein’s apt example, when I draw a line with a ruler, the ruler does not *cause* me to draw the line. It provides a norm which I follow in my action (Wittgenstein, 1937-44).

That is, coordinative artifacts — whether weak or strong — are normative constructs. Having observed that, however, merely means that the problem has been demystified, so that it is now accessible to investigation. The statement raises a number of questions, such as: In what way is the normative function of the artifact reflected in its physical form? How do actors perceive that? How are conventions and protocols formed and negotiated, distributed and used, transferred and applied?

Down the line, this research program leads to another host of researchable questions. For instance:

How can protocols be embedded in computational systems without abandoning actors’ control of the execution of the protocol?

Similarly, can the affordances that make them crucial for the purpose of coordinating cooperative work in modern settings be transferred to electronic media?

The problem here is that a data structure in a computer may be considered an artifact in an abstract functionalist sense, but it does not exhibit some of the crucial features which make coordinative artifacts so immensely useful: It is not tangible or mobile in the same way as a blueprint or a form. It cannot be placed on a desk or a chair or on a pile of items on the shop floor. Nor can it be posted on a wall. It may be made visible but not necessarily visible *at a glance* in the same way as an artifact.

I’m not saying that it cannot be done. I’m merely saying that it is not straightforward. And that we do not really know how to do it.

# References

- Bannon, Liam J.; and Kjeld Schmidt: 'CSCW: Four characters in search of a context,' in *ECSCW'89: Proceedings of the First European Conference on Computer Supported Cooperative Work, Gatwick, London, 13-15 September, 1989*, 1989, pp. 358-372. - Reprinted in *Studies in Computer Supported Cooperative Work. Theory, Practice and Design*, Bowers, John M. and S. D. Benford, Eds. North-Holland, Amsterdam etc., 1991, pp. 3-16.
- Bruner, Jerome: *Acts of Meaning*, Harvard University Press, Cambridge, Mass., 1990.
- Dreyfus, Hubert L.: *What Computers Can't Do: The Limits of Artificial Intelligence*, Harper & Row, New York, 1979 (Revised edition; 1st edition 1972).
- Emery, F. E.; and E. L. Trist: 'The causal texture of organizational environments,' *Human Relations*, vol. 18, February 1965, pp. 21-32.
- Hutchins, Edwin L.: *Cognition in the Wild*, MIT Press, Cambridge, Mass., and London, England, 1995.
- Law, John; and John Hassard (eds.): *Actor Network Theory and After*, Blackwell, London, 1999.
- Marx, Karl: *Das Kapital. Zur Kritik der politischen Ökonomie. Erster Band* (Hamburg, 1867); in K. Marx and F. Engels: *Gesamtausgabe (MEGA)*, vol. II/5, Dietz Verlag, Berlin, 1983.
- Schmidt, Kjeld: 'Of maps and scripts: The status of formal constructs in cooperative work,' in S. C. Hayne and W. Prinz (eds.): *GROUP'97: Proceedings of the ACM SIGGROUP Conference on Supporting Group Work, Phoenix, Arizona, 16-19 November 1997*, ACM Press, New York, N.Y., 1997, pp. 138-147.
- Schmidt, Kjeld; and Liam J. Bannon: 'Taking CSCW seriously: Supporting articulation work,' *Computer Supported Cooperative Work (CSCW): An International Journal*, vol. 1, no. 1-2, 1992, pp. 7-40.
- Schmidt, Kjeld; and Carla Simone: 'Coordination mechanisms: Towards a conceptual foundation of CSCW systems design,' *Computer Supported Cooperative Work. The Journal of Collaborative Computing*, vol. 5, no. 2-3, 1996, pp. 155-200.
- Schutz, Alfred: *Der sinnhafte Aufbau der sozialen Welt; eine Einleitung in die Verstehende Soziologie*, J. Springer, Wien., 1932.
- : *Collected Papers. Vol I. The Problem of Social Reality*, Edited by Maurice Natanson, Martinus Nijhoff, The Hague, 1962.
- : *Collected Papers. Vol. II. Studies in Social Theory*, Edited by Arvid Brodersen, Martinus Nijhoff, The Hague, 1964.
- Schutz, Alfred; and Thomas Luckmann: *The Structures of the Life-World. Vol. II*, Translated by Richard M. Zaner and David J. Parent, Northwestern University Press, Evanston, Illinois, 1989 (German original, 1984). - Work completed 1960-70 by T. Luckmann.
- Shanker, Stuart G.: *Wittgenstein's Remarks on the Foundation of AI*, Routledge, London, 1998.
- Sharrock, Wes W.; and Robert J. Anderson: *The Ethnomethodologists*, Ellis Horwood Publishers, Chichester, 1986.
- Suchman, Lucy A.: *Plans and Situated Actions: The Problem of Human-Machine Communication*, Cambridge University Press, Cambridge, 1987.
- Wittgenstein, Ludwig: *Remarks on the Foundation of Mathematics* (Manuscript, 1937-44), Translated by G. E. M. Anscombe, Basil Blackwell Publishers, Oxford, 1978.
- : *Philosophical Investigations* (Manuscript, 1938-46), Edited by G. E. M. Anscombe, Basil Blackwell Publishers, Oxford, 1958.
- Woodward, Joan: *Industrial Organization: Theory and Practice*, Oxford University Press, London, 1965.