

Cooperative work and coordinative practices: Contributions to the Conceptual Foundations of Computer-Supported Cooperative Work (CSCW)

Opening statement, doctoral dissertation defense

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IT University of Copenhagen, 12 June 2007

Good afternoon.

First of all, I'd like to thank the two opponents, Professor Sharrock and Professor Engeström for their positive assessment of my dissertation as well as for the both critical and helpful comments they have offered.

I guess that anybody who has the major part of his or her work for more than a decade evaluated by highly esteemed colleagues will look forward to reading their assessment with some trepidation. So I was quite relieved to find that they saw merit in it.

I would also like to thank the Academic Council of the ITU for granting me the opportunity of defending the dissertation here today.



The purpose of this opening statement is not to give anything like a summary of the arguments and findings presented in the dissertation. That would be impossible.

The purpose is rather to give the audience – most of whom have not had the possibility of reading it – at least *a chance* of making sense of the discussion that is going to follow.



To put it very briefly, my research is empirically driven and conceptually and technologically oriented. It bridges from field work and sociological analysis to formal modelling and experimental design.

As a result the dissertation does not represent all of my research. It represents the *major* part of this research. It is a dissertation submitted for the doctoral degree in sociology and focuses on my, if you will, *foundational* research into certain classes of work practices. The constructive work – the ultimate aim of this research – is of course implicitly present from the first to the last page but is only *explicitly* represented by a couple of the eleven articles.

My research aims at providing the conceptual foundation for the development of a new type of technology: a technology that will make it possible for ordinary practitioners engaged in professional work – shop-floor workers as well as engineers, doctors as well as nurses – to coordinate their individual activities with less effort, with fewer interruptions, more flexibly, more reliably, more safely, than they can with existing technologies, with pen and paper or with current information technologies.

This may give the impression that my research is concerned with what is called ‘systems development’, that is, the development of methods and tools for investigating specific settings with the aim of building specific systems for those settings. However, while I did this for a living in the 1980s, this is not what I do. My research is not directly concerned with systems development. I do follow this area with positive interest, I have my own opinions about many things there, and it’s an aspect of my teaching. But I have no ambition of contributing to the methodology of building information systems for organizations, at least not directly.

The motivation for my research is rooted in the – not very controversial – observation that the challenge of flexible and horizontal coordination is of increasing importance to our society. Over the last couple of decades organizations have been induced to search for ways in which their various distributed activities can be coordinated horizontally, both internally and externally. Factories and institutions engage in intensive experimentation with new ways of working – such as decentralization of operational decision-making to the shop floor. However, in spite of heavy investments of both money and talent, existing coordination technologies are far from adequate when it comes to supporting horizontal coordination.

This, in my view, is where CSCW comes in. At least, this challenge is what motivates my research.



My research, as reported in the dissertation, falls in two major contributions. This is reflected in the title: *Cooperative Work and Coordinative Practices*.

Let me address the issue of cooperative work first. In order to be able to tackle the challenge of horizontal coordination, we need to be able to determine the target and the scope of our studies. And we need to be able to do so in a systematical and accountable way.

How can we understand the phenomenon for which horizontal coordination is required? What is cooperative work in the first place? Is this something we can reason about and study in anything like a rigorous manner? Is it something we can distinguish from other aspects of organizational life or social life in general?

We have to be specific. All work is of course *social* – but not all work is done cooperatively. When the combine harvester was introduced, large scale cooperative harvesting began to vanish from the countryside. On the other hand, the work of the blacksmith is now largely superseded by large-scale cooperative work in steel plants.

Cooperative work relations emerge and dissolve again, in response to changing requirements and resources. They do so historically, and they do so from day to day, from one situation to the next.

In stead of conceiving of cooperative work as something we *ought* to do, on par with being good to the elderly and to furry animals, we can investigate cooperative work as activities that are *interdependent* in their execution, and are so *observably* and *reportably*. We can investigate how individual activities in the network of interdependent activities are connected technically (causally or temporally or logically).

This has several analytical benefits.

Firstly, it enables us to investigate cooperative work in different settings in terms of the character of the interdependencies: are the activities tightly or loosely coupled, what's the direction of dependencies, are processes reversible or not, are they time-critical or safety-critical. And so on.

Secondly, it enables us to investigate and compare cooperative work efforts *irrespective* of their socio-economic form and the organizational arrangements. We can investigate how it is carried out irrespective of whether workers are paid to do it, or do it voluntarily. We can investigate cooperative work arrangements irrespective of whether the workers are employed with the same company or institution or whether their interdependent activities cut across boundaries of ownership, budget, or contractual arrangements.

We can similarly investigate cooperative work irrespective of whether the workers are a team or feel like a team, or whether they like each other, or whether they feel they work towards the same goal. And so on.

Thirdly, by conceiving of cooperative work as constituted by individual activities that are technically interdependent we can make a crucial analytical distinction between cooperative work on one hand and on the other the *secondary* work of ensuring that the *distributed and yet interdependent* activities are coordinated and integrated, – that is, between *cooperative work* and what the sociologist Anselm Strauss called *articulation work*.

I say that it is an *analytical* distinction because it is not always visible to outsiders that work of these two orders is carried out. But the distinction is one that all workers nonetheless apply: They do that when they complain that they have too many meetings, that they are being interrupted in their work by phone calls, that they are not informed of the state of affairs at other workstations, that it takes too much effort to know what goes on in the office next door. It is the distinction workers apply when they say, “Enough talk, let’s get to work!” It is a central concern to all work.



More importantly, this conception of cooperative work and articulation work allows us observe a distinct class of specialized practices that have developed over years, sometimes decades and even centuries, which all are practices of coordination and integration, in short coordinative practices. They range from the uses of simple forms and schedules to highly sophisticated procedures, classification schemes, naming schemes, and so on.

Go to any modern workplace and you will see all kinds of inscriptions, on screens, on pieces of paper, on print-outs, on white-boards. They are ubiquitous and absolutely indispensable.

This is what I consider the primary contribution of the dissertation to be: An attempt to make coordinative practices available for systematic research, to identify essential features of them, and to point to ways in which we may begin to investigate the logics of these practices.

For several years – from about 1991 to the end of the 1990s – my colleagues and I focused on a specific class of coordinative practices that we called ‘coordination mechanisms’. They are characterized by ordering distributed activities according to temporal order and organizational role: in short, who’s doing what, when, where? These practices are what people typically refer to when they today use the term ‘workflow’.

In our studies we found several features of these practices that have far-reaching consequences for information technology for horizontal coordination.

(1) They are centered around (or carried by) specialized artifacts, built for a specific purpose. It may be a simple form to be filled in and passed on to somebody else, such as a fault report form. Or it may be a system of preprinted artifacts, such as a *kanban* system for horizontal coordination in manufacturing.

(2) The artifact supports a specific protocol of coordination, a set of rules regulating how local activities are to be interrelated – with respect to time, schedule, preconditions, roles, etc. It is this *duo* of artifact and protocol we called a coordination mechanism.

(3) Coordinative artifacts and the protocols they embody are typically constructed by ordinary workers or by foremen, project managers, etc., at least originally.

(4) They change over time, as conditions change, as more efficient ways of coordination are found and learned.

(5) They are devised for local purposes. They are subsequently made to somehow align with other special-purpose constructs: the state of one form is updated with respect to the state of another. The whole thing may eventually grow into a complex coordinative practice involving multiple artifacts and protocols, developed in a distributed manner.

(6) In their use, they are normally taken as unproblematic because they have proved their usefulness in the past. It is part of being a competent worker to know – not only *how* to apply them, but also to *take them for granted*. Competent workers also know how to apply the rules in problematic cases. It may not have been explicitly stated in the ‘rule book’ but it is part of competent conduct to understand the rationale of the rules and apply that rationale.

(I’m here quickly skating over some knotty conceptual issues that have kept sociologists busy for decades, concerning the *situatedness* of plans and actions. Chapter 6 of the dissertation deals with this issue at length).

On the basis of these findings my colleagues and I developed a computational environment by means of which it is possible to construct, modify, and execute computational ‘coordination mechanisms’ in a distributed and flexible manner, as well as to link them so as to form more complex ‘mechanisms’.



However, while this line of research was successfully concluded (in the sense that we were able to demonstrate what we set out to do), the *scope* of the research was limited. It was *deliberately* limited. We focused sharply on practices concerned with temporal order of some kind, knowing full well that there are many other important principles of ordering at play in cooperative work, in particular classification.

What has become clear, however, is that ‘coordination mechanisms’ are better conceived of as a special case of coordinative practices. Workflows can not work if actors are not also using, for example, maps, templates, location designators, and so on., as well as classification schemes, nomenclatures, ranking schemes, verification and validation procedures, coding schemes, notations, and so on.

I have therefore, over the last decade, (together with colleagues in Vienna) begun to investigate the whole range of coordinative practices and how multiple coordinative artifacts are combined into sometimes widely ramified clusters or ordering systems.



Let me now highlight what I consider the contribution.

The research reported on in the dissertation does not have the character of a research *project*. It was never that well delimited. It is rather a research *program*, or even more to the point: the research has aimed at *building* a research program. This is made explicit in the subtitle of the dissertation: *Contributions to the conceptual foundations of CSCW*.

What has been achieved then?

1. Cooperative work has been identified as something we can study systematically, as a category of work practice, distinct from organizational and socio-economic form, and irrespective of what feelings of companionship actors may have. Cooperative work practices have been made a researchable phenomenon.

2. This in turn has cleared a path for making coordinative practices, their methods and techniques, a researchable phenomenon as well.

3. The dissertation offers investigations of some kinds of coordinative practices and has identified key features of these practices: the central role of coordinative artifacts and their associated protocols. It has shown that coordinative practices often – if not generally – involve entire clusters of such coordinative artifacts, ‘ordering systems’. It shows that there is a second-order logic to this clustering – that the same general schemes and notations are reused and recombined endlessly.

4. These investigations may also serve loosely as examples of how such investigations may be performed. Perhaps the main contribution of the dissertation lies here, in offering, not a paradigm, but some examples that other researchers may want to emulate, extend, develop.

5. It has been demonstrated that it is – in principle, at least – technically feasible to create computational environments by means of which ordinary workers, not programmers, can define and execute ‘coordination mechanisms’ in a fully distributed and flexible manner. For this purpose a notation for defining computational coordination mechanisms was specified. But how this is to be implemented of course lies outside of the scope of the dissertation, as it requires competencies I do not want to claim to possess.

Having said all that, it is important to point out that the research program that I have contributed to defining and developing, is far from completed.

Many issues are still open, even wide open. Of these the most interesting may be this. By showing that there is a second-order logic to the way in which coordinative artifacts and protocols are composed and clustered – that the same general schemes and notations are reused and recombined endlessly – my research suggests that there be something of great sociological interest – and technological potential – in trying to identify, articulate, and analyze what might be called ‘*the grammar*’ of the composition and clustering of coordinative artifacts.



Let me conclude this brief opening statement with a few remarks on the relationship of my research to sociology and social science at large.

The problems I have been investigating are not problems for which much help can be found in the body of sociological theorizing. The reason is simple: Work and work practices are not exactly topics that are the center of raving attention in sociology, not if we compare with classic topics such as race, class, and gender.

More importantly, when sociology does address the domain of work it is often not *how* work is actually performed but rather the *conditions* of work that are being investigated. It is as if the technicalities that are an essential aspect of cooperative work are somehow considered beyond sociology. As if work and the technologies of work are not immensely social phenomena!

That said, I hasten to add that my understanding of cooperative work is indeed indebted to great sociologists and social scientists. Let me just name the school of German sociology of work spearheaded by Popitz in the 1950s. And later social-science studies of writing systems and other literate techniques by Jack Goody and Roy Harris. And further back, classical political economy, especially Adam Smith, Charles Babbage, and Karl Marx, who showed the way by making the then emerging forms of systematic cooperative work a topic of analysis. And of course also the fantastic body of ethnographic studies of cooperative work that has been produced over the years by researchers in CSCW and in related areas such as sociology of science and human factors research.

Apart from that, my strategy has been *and is* to stick close to the ground – to what my colleagues and I can observe.

But when you are outside of the pale, beyond the conceptual protection of a discipline, in the *intermundia* between disciplines, you have to be alert to the multiple domains of discourse you're traversing. This applies even more when you're investigating the practices and reasoning of members of a profession you do not belong to yourself.

Two schools of thought have been of particular value in this regard.

First, phenomenological sociology, in particular Alfred Schutz. His analysis of 'the natural attitude' – the *practical* attitude of being concerned with getting the job done, of taking well-tested methods for granted, of relying on typifications – this analysis offers a solid basis for making work practices a researchable phenomenon in their own right.

At the same time, and for the same general purpose of navigating safely across multiple domains of discourse, 'ordinary language' philosophy – Wittgenstein and Ryle in particular – again and again turned out to be of invaluable help.

