

# CSCW: Discipline or Paradigm?

## A sociological perspective

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We argue there is still much confusion about what is meant by cooperative work, and therefore what is meant by CSCW. It does not arise simply where more than one person is involved, and other attempts to delimit the field do not succeed. Since all work is socially organised, it would seem that all work potentially falls within the CSCW domain. If so, then (i) it would not be confined to a particular class of system ('groupware'); (ii) it would not be a small specialism but would extend virtually throughout system design; and (iii) its interdisciplinary character would affect large areas of its contributing disciplines. We defend these consequences, and argue that CSCW is therefore more akin to a paradigm shift for its contributing disciplines than a particular subdiscipline in itself. We also consider not what CSCW *is* but *how it has arisen* in terms of a political economy - the interests of researchers, funding institutions and clients - and a set of ideologies. This sets out a position for contributing disciplines, but leaves open the detailed content of interdisciplinary relations.

CSCW has now acquired considerable momentum. It has engaged the interest of researchers in both academic and commercial environments, gained the attentions of commercial think-tanks, systems houses and service providers, and raised hopes and spirits among potential users/victims. But what is it? This will soon, if it has not already, become a tiresome question, but we think it still worth another round or two. We would not have dared to venture it if we were not also involved with 'real' CSCW at the coalface (Harper et al, 1991; Ackroyd et al, forthcoming; Harper et al, forthcoming).

## Attempts to define CSCW

Most practitioners, we think, get by with assuming three semi-articulated characteristics of CSCW. First, that it involves settings where two or more people interact with each other through a computer. Second, that it is to do with a particular class of system to service such settings (perhaps not just groupware, but something along those lines). Third, that it is interdisciplinary. We will not be proposing that there is any one right answer, and there is something to each of these characteristics, but for a sociological participation they pose some interesting problems.

### Multiple users: multiple disciplines

It seems obvious that cooperation can only be taking place where more than one person is involved. It must therefore be appropriate to consider this as a distinct class of activities or situations, which may call for distinct techniques and design principles to address them. It is this which is calling into being the distinct discipline or subdiscipline of CSCW. We could think of this model as involving a *spatial or territorial metaphor* for the division of labour between areas of academic research. Each speciality would be said to cover a particular 'terrain'; these specialities may, in principle at least, be cumulative in contributing to the sum of scientific knowledge; although there will, of course, be fuzzy edges where they abut and where disciplinary affiliation is unclear.

This model can also accommodate the *interdisciplinarity* which is one of CSCW's strongest features. Because CSCW involves cooperative relations in organisations, system design is likely to be improved by consulting those whose speciality it is to study organisational forms, functions and behaviours. On the 'map', therefore, CSCW can be placed on the boundaries of computer science, sociology, organisational and management studies, perhaps even anthropology; not to mention older HCI concerns which already place it on the boundaries of psychology, linguistics and ergonomics. The task - daunting because of the strangeness of some of the bedfellows but attainable in principle nevertheless - is therefore to constitute a new discipline or subdiscipline by 'bounding' a territory where they overlap while seeking to dissolve some of the demarcation lines within that territory. Meanwhile, *other* areas of computer science and system design continue relatively untouched.

From a sociological perspective, however, the notion of 'cooperative work' is a puzzling one, both in the sense of there being a distinctive class of collective work, and of there being a distinctive class of work which is 'helpful' or 'harmonious'. We rather consider that *all* of work is - ie can helpfully be analysed as - socially organised. We say more about what this means below, but at its broadest it involves the claim that it makes no more sense to consider 'work' as individual than to consider language as individual: they cannot exist outside of a collective

context. This not only widens the scope of a sociological approach to work but also calls into question the spatial metaphor of interdisciplinary relations. As it happens, the distinction between one and more than one participants is already familiar because it has often been proposed - along the lines of the spatial metaphor - as the means of establishing a disciplinary division of labour between psychology and sociology. A classical illustration of this would be in contrasting sociological and psychological treatments of a phenomenon such as 'aggression'. On the basis of the spatial metaphor, psychology would be invoked to explain why a man picks a fight in a bar, while sociology would be invoked to account for wars. But there is also a quite different model - a 'searchlight' metaphor, perhaps - in which each discipline offers a competing explanation and perspective on the *same* terrain of phenomena. That is, psychological perspectives might account both for a fight in a bar and for war (and for football hooliganism in between) in terms of instincts, or mental states, or triggers for violent behaviour; while sociological perspectives might account for the same things in terms of the social settings and circumstances in which violence can be forbidden, condoned or expected, or in terms of structured conflicts of interest. Of course, both can attempt to reconcile their explanations, explore common ground and renounce a disciplinary imperialism: no psychologist, for example, would in everyday life try to account for the Gulf War in only these terms, and similarly for sociologists. The point, however, is that the methods and premises of their disciplines will press them towards one kind of account rather than another, and one cannot know in advance how much of a challenge to those methods and premises an attempt at reconciliation may pose. Hence this impacts directly on another tacit assumption of CSCW, that 'classical' HCI, grounded primarily in psychology, was appropriate and adequate for 'individual' systems but is no longer sufficient for collective ones.

It is, nevertheless, true that all work, however complex the interactions it involves, is carried out by individuals. It may therefore make sense, as one approach to the analysis of work (though not as an 'essentialism' of how work arises), to consider the ways in which work processes are 'individuated' - that is, translated into things that persons can do. Various 'mechanisms of individuation' are possible, including organisational forms, the decomposition of work, and of course particular technologies. Hence one could say that there is a *social* process of the *individuation* of work, in which CSCW offers a radical intervention.

### Characteristics of the work process

Of course, there have not only been casual and tacit assumptions about CSCW, but also very carefully considered attempts to delineate the field (eg Bannon & Schmidt, 1991; Schmidt, 1991a). These have tried various means to constrain its range and make it manageable, beside the distinction between single and multiple users (Bannon & Schmidt, 1991, p. 5). Schmidt, for example, proposes that we treat cooperative work as that which is *related as to content*. From this he draws

the subordinate distinctions that cooperative work is different from social interaction at work in general; that it relates to production and not consumption; that it requires some organisational form; and involves deliberate rather than accidental relations (1991a, p. 10). Useful as these distinctions are, we think they also encounter interesting difficulties.

Schmidt argues that,

Cooperative work, as used here, is constituted by *work processes that are related as to content*, that is, processes pertaining to the production of a particular product or type of products. Cooperative work, then, is a far more specific concept than social interaction in the system of work in general. The concept pertains to the sphere of production. It does not apply to every interaction pertaining to the running of, say, a company. (1991a, p. 10, o.e.)

As a prescription for a *concept* of cooperative work this has much to recommend it. Problems arise, though, when we ask in concrete terms what the work process is and how it is to be discovered, since units or aspects of the work process bear no 'flags' with which to identify themselves. It is (as Schmidt agrees) not confined to the organisation, it is certainly not congruent with the organisation's official model of itself, it spills over into endless ramifications of connections and sub-connections. *Practitioners* will be only partially conscious of these relations and only partially able to report them accurately and succinctly. We cannot, therefore, simply ask practitioners to relate these matters to us. If the *researcher* is to trace them, then on what basis? An obvious choice presents itself of following either the *logic of the task*, or the *network of the group*. If the former, then the researcher will be powerfully drawn into idealisations of task processes which reflect his or her existing perspectives and which govern the way in which activities are ruled to be 'pertinent' or 'peripheral' for the task. The result will certainly be limited and may often be 'wrong'; that is, that designing on the basis of these judgements will in the event prove disruptive of the tasks in hand. The latter - the network of the group - is initially attractive because it appears to offer a more empirical approach to the problem: the researcher can *observe* the interactions that really do take place with a minimum of preconceptions about what they must be. The difficulties here, though, are that interactions spill over into each other in an even more uncontrolled way than tasks do. Without some way of categorising them in relation to function and purpose the results are unusable. But if they are so categorised then all the problems of task analysis re-emerge. What is more, some task relations, particularly of the 'coordination' kind (Schäl and Zeller, 1990), may take place without interaction at all.

Of course, in a sense this is simply what social research is like, and one has to cope with it without undue carping. In investigating the world of work, the complexities and unboundedness of tasks and of interactions simply exist and one must try and make sense of them. The key point, however, is that this is *a part of* the job of analysis, not a prior means of defining and constraining the field so that research can be more efficiently focussed and coherent.

This similarly affects the proposal that cooperative work can be confined to that which is deliberate rather than accidental, and does not spill over into social interactions in work in general. Take the not entirely frivolous example of colleagues who meet regularly in the bar at lunchtime but never exchange a single word related to their work. Yet the relationship established and reinforced in this way would certainly affect the way in which they provide work services for each other at other times. More plausibly, of course, in bars, coffee breaks, and indeed in the office and on the factory floor, conversation will slide constantly and barely discernibly between being work and non-work related. Hence the CSCW projects which aim to support informal interaction do indeed have a point (eg Fish et al, 1990).

Without wishing to labour the point, one could say that there are also difficulties with the distinction between *production* which is organisationally related and *consumption* which is mediated by the market. The social construction of markets and their negotiated and 'imperfect' character are central in debates in institutional economics (Williamson, 1975; Granovetter, 1985) and in sociological discussions of the 'modes of governance' of economic sectors (Schmitter, 1988). In the language of these 'governance' debates, it is, at the least, necessary to consider the ways in which hierarchical, networked, and corporatist forms modify the operation of markets. More mundanely, 'pure' markets can certainly be supported by technological arrangements of a potentially 'cooperative' kind, eg stock exchange dealing systems.

We would argue, therefore, that these and other attempts do not succeed in any practically relevant sense in reducing the entirety of socially organised work to some smaller subset to which we can confine our attentions for the purposes of CSCW. None of this is to deny that there are tasks which *can* be relatively solitary, such as painting a room or word-processing a document. That is, within socially organised work there will be greater and lesser degrees of complexity (though this too will be quite hard to discern). With respect to this we would, however, add: (a) that this is nevertheless a relative distinction and not an absolute one; (b) that it involves a somewhat constraining model of the activity which is quite historical, eg as soon as we are able to, we support collective authoring, common printing, various modes of despatching a paper, etc; and (c) that these examples appear so prominent, significant and ubiquitous precisely because that is where systems have seemed 'obvious' and have fitted well. Once away from this rut, the world of 'individual' work may look much smaller. Nor does this approach deny that work can usefully be analysed in terms of types of cooperation. Schmidt (1991a), for example, proposes that cooperation takes place sometimes for augmentation and sometimes for differentiation of capacities and tasks, for the discount of biases and the integration of perspectives, etc; while Schäl and Zeller (1990) propose a distinction between coordination, collaboration and co-decision. What we are contesting, rather, is any view that there is a mass of 'individual'

tasks that have been relatively well served by computer support but that there is now a separate set of 'cooperative' tasks for which we need to derive specialised techniques for computer support. We maintain that all work is (amongst other things) socially organised; that most significant tasks are *complexly* social; and that it is largely for this reason that they have sometimes been poorly served by computer systems.

What conclusions should be drawn from these difficulties in circumscribing the field? If it does not seem possible to do this then one may begin to wonder whether CSCW is a coherent topic at all. We propose two ways forward. One, which we consider later, is to continue to seek some coherence for the field. The other, which we consider now, is to try to account for the field, not in terms of *what it is* but instead in terms of *how it has arisen*.

## The development of CSCW

In accounting for how CSCW has arisen we do not intend, and would not be qualified, to give a history. We mean rather to consider in quite a speculative way the forces that have motivated participants and pressed them in some directions rather than others. We can broach this in terms of, on the one hand, a political economy and, on the other, an ideology of CSCW. We will also consider some substantive issues which have formed a context for its development. Taken together, these should help to explain how the social organisation of work in general has been translated into particular types of design.

### Political economy

We can distinguish three main 'parties' to the development of CSCW: researchers, funding institutions, and clients. Obviously these can overlap, eg clients can employ researchers. Among researchers we can currently distinguish three main disciplinary affiliations: computer science, HCI, and sociology. These must be understood broadly: HCI to cover a range of psychological and ergonomic approaches; sociology to cover organisational and management studies, anthropology, etc.

Among researchers in computer science and HCI the development of CSCW can be understood as a reaction to the relative failure of systems to provide the anticipated levels of support in various work contexts (Grudin, 1988). That in turn does not exist in a vacuum. Buyers and users of computer-based systems have arguably entered a new phase of expectations. In the recent past they may have been simply terrified or overawed or implacably sceptical. Now, many are more critical in requiring systems to accommodate to them in ways which they find useful. That has forced a reappraisal of the basis on which systems are designed. It is also, perhaps, a response to a certain disenchantment with aspects of computer

science such as AI, which carried the highest profile and expectations in the early '80s.

So far as sociological participation is concerned, an earlier generation of research which criticised the failure of computer-based systems to recognise that work is socially organised, suddenly found itself pushing at an open door in a remarkable convergence of concerns and interests. This has produced what is (except, perhaps, for management studies) a most unfamiliar situation in which the interdisciplinary participation of sociologists is being actively sought and generously funded. The field is not yet widely enough known for this to have turned into a gold-rush, but that cannot be far off.

Funding institutions can be divided into public sector agencies, and large corporations which fund some basic research, either integrated with their general research effort or devolved to separate 'think tanks'. All of these are now under more pressure to justify their expenditures. CSCW has been able to present an attractive combination since it offers - and may even yet deliver - to make use of significant theoretical departures to break a log-jam in providing services which will enhance efficiency and competitiveness. CSCW has also succeeded in becoming a field in which the US, Europe, and increasingly Japan are in competition.

'Clients' for the most part still do not consist of end users, but software and hardware houses who wish to develop products incorporating the new design philosophy, and service providers such as telecommunications organisations for whom this could offer a new and intensive class of business. They will naturally be tempted to look for quick results, and to 'oversell' new products. When it comes to developing CSCW systems for use in real organisations then some difficult dilemmas are likely to emerge. We mentioned above that for us the notion of 'cooperative work' is a puzzling one, both in the sense of there being a distinctive class of collective work, and of there being a distinctive class of work which is 'helpful' or 'harmonious'. The emphasis in sociology has rather - and perhaps excessively so - been the reverse: to view organisations as sites of multiple structured and overlapping *conflicts* of interest and practice which are, nevertheless, just as much socially organised as cooperation. That means that on top of the practical problems of the analysis of organisations, there will always be the problem of *which* aspects and interests to 'support'. The senior management of an organisation, who hold the reins in terms of ordering and specifying a system, will naturally be resistant to any suggestion that the real social organisation differs from the official model. Yet if they want a CSCW system at all it will be precisely for the power which the recognition of this organisational complexity can release. Practical and political problems for the designers of systems are therefore inevitable, since they will have to confront sponsors with the official 'lies' about their organisations!

However, there is also a broader sense of the political economy of the relationship between clients and CSCW systems, which stems from arguments about qualitative changes in the world of work. Recent theories of reorganisation and technical change have developed around notions of 'flexible accumulation' (Aglietta, 1987; Piore and Sabel, 1984; Atkinson, 1986). In these accounts a contrast is drawn between 'Fordism' and 'post-Fordism' as systems, or regimes, of production. Fordism, in the ascendancy from the early years of this century until roughly the 1970s, involved the mass production of relatively standard commodities, with the production line as its archetype. But it also involved a regime of mass consumption of those standard commodities. The true novelty of the system lay not just in the Taylorist methods of work decomposition and supervision, but in the fact that, for the first time, the consumers of these mass products were broadly the same people as their producers, rather than capital or luxury goods produced for élites by the toiling masses.

Post-Fordism - though the theory comes in different versions (Bagguley et al., 1990, pp. 18-26) - denotes the breakdown of this 'virtuous circle' of production. It is assailed partly from within, as the production line system meets its limits of efficiency and increasing resistance; and partly from without, as the demands of consumers move beyond the standardised mass commodity. The response of producers is claimed to be, on the one hand, the development of more specialised, innovative, differentiated and prestigious goods and services, sold into 'value-added' niche markets (Bourdieu, 1984). On the other hand, the structure of production also changes, being organised into smaller, more autonomous and responsive units capable of rapid shifts in what they produce and the processes by which they do so. This in turn is achieved through 'flexibility' (Atkinson, 1986). First, flexible technology, and particularly information technology, which allows relatively small runs of frequently changing goods and services to be delivered at high efficiency. Second, functional flexibility, whereby in place of the old demarcations and specialisations, workers are expected to exercise initiative in deploying a range of skills to suit the demands of the moment. Third, numerical flexibility, by which firms employ a 'core' of these valuable multi-valent workers, and a 'periphery' of low-skill staff who can be hired and fired to suit changing conditions. And fourth, subcontracting, allowing firms to externalise peripheral functions and distribute risk.

There is a deep ambivalence in the debates as to whether these developments mark a further turn in exploitation and the dominance of capital, or a broader societal development to which capital is forced to respond, with at the least mixed fortunes for labour, and a newly acknowledged position for the consumers of goods and services (Harvey, 1988). The emerging 'information society' is dependent on new kinds of computer system, and CSCW could be seen as an archetype of such developments. More concretely, to survive these transformations work organisations require support from advanced information



systems that can facilitate the coordination of distributed decision making. This is illustrated by the efforts in the area of Computer Integrated Manufacturing to integrate formerly separated functions such as design and process planning, marketing and production planning, etc.; and by the efforts in the area of Office Information Systems to facilitate and enhance the exchange of information across organisational and professional boundaries (Schmidt, 1991b).

Given this overall context, there are two points of departure for the designers of CSCW systems. First, there are those areas of organisational life where the need for sophisticated computer support is felt most acutely, and where there are therefore market pressures and opportunities. However, since awareness of CSCW has not really penetrated amongst 'end-user' clients, that is not a category which yet exerts much force. There are indeed pressures in both public and private sectors to turn to computer systems as panaceas for problems, sometimes as little more than icons of modernity and purpose; but these do not as yet produce a demand for CSCW as opposed to any other kind of system. That, perhaps, is why designers are freer to take the second point of departure, namely the tools and problems that they already have. It will, as it were, always be easier to 'start from here'. Some tools have been discovered almost by accident to have CSCW properties - email is the most obvious example (Fafchamps et al., 1991) - and they form the basis for more deliberate development. It has often been remarked that CSCW developments betray a certain reflexivity in reflecting the work problems that their designers themselves experience - supporting either co-located or distributed design meetings, for example! That is an appropriate start, but will eventually prove too limited a sphere. It will always be the case, however, that existing techniques will impose a framework and limitations on design, which is why it is no bad thing for the 'strict constructionists' to have their head (Bannon & Schmidt, 1991, p. 7), at least as one avenue of development.

There is certainly no other sense, from our point of view, in which some categories of work are appropriate for computer support while others are not. 'Computer supported cooperative work' makes no more sense as a category than 'paper supported cooperative work'. This is not only to make the obvious point that a computer is (just) a tool. Rather, it is that both would be similarly absurd as a means to contain or define a set of work activities. Hence, just as focussing on *cooperative* work is not a means to delimit the field of CSCW, nor is focussing on *computer supportable* work.

## Ideology

Ideologies in relation to CSCW cannot be divorced from a political economy since ideologies are not just independent and stable world views, but fluid constructions and rationalisations in a changing context. Academic disciplines justify themselves in various ways, but common to them all, of course, is the entertainment, game and career of intellectual activity. Those aspects of computer science that are

concerned with designing systems for users have also an ideology of service: contributing to the capacity for creation and production (and sometimes - in terms of funding rather often - for destruction). For HCI such a notion is necessarily central. Sometimes that involves a more critical notion of service which is concerned about *who* benefits from systems and what uses they are put to; others are content to follow a market-led notion of utility. When systems seem to be failing, that is a problem for either version.

In the face of such limitations, turning to other disciplines is one avenue to explore, and it is very striking how desirable 'interdisciplinarity' has become in the eyes of public and private sponsors of research. One could see this in part as a response to a new climate of accountability, in which the need to deliver real solutions has produced a certain radicalism of approach. It must also, no doubt, relate to the depoliticisation of social science in the 1980s. Whatever the causes, this implies a renewed faith in the 'unity of all the sciences' which, as we have suggested, has its ideological aspects too (Anderson et al., 1989). There are also variations in ideological climate which have real effects on the development of CSCW. For example, Scandinavian experiments in forms of civil society and mixed economy have been reflected in a 'human relations' emphasis in organisational and political structures in which labour movements, broadly conceived, have been much more empowered; though these have come under sustained pressure in the 'market' decade of the 1980s (cf. Lash and Urry, 1987). This has also been reflected in the topics considered suitable for research funding and the criteria applied in evaluating them. Bowers and Benford (1991a, p. 313) point to what one might term a distinctive 'Scandinavian school' of CSCW, which is concerned to develop design methodologies which are themselves cooperative and participatory, which respect existing skills, and which can play a role in promoting workplace democracy (Ehn, 1988; Hellman, 1989; Bødker and Grønbaek, 1991; and see the contributors to Bjerknes et al., 1987).

### Organisational change and design transparency

All this, however, leaves untouched what is perhaps the most fundamental question, namely why, if organisations are so complex and impenetrable, it is only now that an interdisciplinary approach seems so necessary. Since technological changes have been continuously taking place in organisations, this amounts to asking what it is that makes computer-induced change different, and why a computer system need be treated differently than any other tool. We argue that a combination of two features helps to explain this.

The first is the organisational *dynamics* of the introduction of computer-based systems. It is hard enough to generate an adequate picture of how an organisation functions, but even that is not sufficient. The intention of introducing a system is not to reproduce exactly the situation that was there before but to change and, hopefully, improve it. The purpose, as Schmidt puts it, is 'therapeutic' (1991a, p.

5). Even if that were not the aim it is still inevitable that there will be major changes in the way that tasks are carried out. In Winograd and Flores' terms, 'design is ontological' (1986; Bowers and Benford, 1991a, p.313). Introducing a system is to throw a stone into the pond of the organisation. However, that in itself does not amount to a difference between computers and other technologies since any major technological innovation can be expected to have such effects. The most that can be said - and it relates to debates of more than a century's standing about technological determinism in accounting for social change - is that some technologies are more 'powerful' than others. That is, they can seem to offer such huge advantages (from the perspective, at least, of some of those involved) that it is 'worth' the wholesale disruption of organisational forms and practices which they entail. That could be applied historically to the development of a centralised power source as a major factor in calling into being the factory system, and it could be applied to the role of the mainframe in centralising a whole range of functions which have since, with further technological change, been re-distributed.

The second and we think more distinctive feature is to do with the way in which technological change is accommodated. Members of organisations exercise great ingenuity in putting to work the human and material resources that they find to hand to serve their purposes - which may not, of course, be fully congruent with the formal purposes of the organisation. When changes are introduced people quickly learn their characteristics and discover how to get the best out of them. In this process of familiarisation, adaptation and 'old-handing', they use their knowledge and experience to modify what they can to suit them, and work around the rest. There is always, therefore, a substantial gap between the design or concept of a machine, a building, an organisational plan or whatever, and their operation in practice, and people are usually well able to effect this translation. Without these routine informal capacities most organisations would cease to function.

When computer systems are introduced people do the same. They explore the system's characteristics and turn them to use as best they may. The problem, however, is that there is a large difference, amounting we think to a qualitative difference, in the extent to which users are able to understand *how* a computer system functions so that they can tune it to suit them, by comparison with most of the other artefacts - including other technological artefacts - with which they have to work. This links to 'transparency' in system design and indeed to the whole notion of an interface. Since users *cannot be expected* to understand what the system is *really* doing, in algorithmic terms, in carrying out functions, these must nearly always be presented in terms of a metaphor. This process of protecting the user from knowledge of the operations of the system is, of course, precisely what is meant by 'transparency', though this is clearly a misnomer since in fact it is *opacity* which is the service delivered to the user. It is very hard to see how this problem can be addressed, but the effect is to make users significantly less

empowered in relation to the technology and to limit the ways in which they can exercise ingenuity in old-handing the equipment. They are, in effect, uniquely at the mercy of the skill of the designer in constructing the metaphor for the interface, in a way which anticipates all the needs which may arise in practice. That is a task which designers will not usually be in a position to fulfil, and certainly not when working alone.

## Discipline or paradigm?

We have argued so far that it does not make sense to define CSCW in terms of interactions with a system involving more than one user, or by specifying some particular characteristics of the work process, or in relation to a particular class of technology. That also, therefore, casts into doubt notions of CSCW as a particular discipline, or sub-discipline, or interdisciplinary combination of subdisciplines. It need not be a great surprise that clear defining features are hard to find, since CSCW is still in large measure a discursive phenomenon. That is, it is not a 'thing' in the real world which must therefore have features waiting to be discovered and then deciphered. It is, rather, a set of theoretical and practical proposals (as well as a set of practices) which have, as we have suggested, an ætiology, a political economy and various ideologies, but not necessarily any formal coherence or consistency. It could therefore be quite mythical to consider either that it must have a hidden coherence to be unearthed, or an 'essence' that can be derived from first principles and then prescribed.

We have, nevertheless, argued that there is a real substantive context in which computer-induced organisational change is qualitatively different from other technological change in ways that make interdisciplinary contributions relevant if not essential. Our view is simple but with far-reaching consequences, namely that CSCW should be viewed not as a specialised subdiscipline but as a general shift in the perspective from which computer support systems - *all* computer support systems - are designed. It would be excessive to label this a paradigm shift in the full Kuhnian sense (Kuhn, 1970), but the term paradigm may not be out of place. It involves recognising and gradually incorporating the view that functions in organisations do not exist in abstract but are - for anything short of full automation - borne by human agents embedded in complex social and interactional settings, which crucially modify the nature and operation of the 'functions' they have in their charge. Any attempt to treat that as pure system is bound to go wrong.

If we are proposing CSCW as a paradigm change for computer science, then how should sociology be affected? Sociology (and, of course, its associated disciplines) has, so far, been presented in a 'service' role for CSCW, in supplying the specialised knowledge of work and of organisations which it needs. This yields three related problems. First, it is hard to see why, other than financially, such a role should be of interest, since it would seem to involve just 'plugging in'

existing knowledge and perspectives rather than original intellectual work. But, secondly, the discipline may not in fact stand up very well to the test of having the perspectives and analyses that it proposes incorporated into designs for support systems in the real world, since they were hardly developed in the first place with such an end in view. That is, it may have some difficulty in delivering on the territory it has staked out. And thirdly, if this confrontation is to produce a change in paradigm for computer science, then why should sociology be immune?

We think that taking CSCW seriously does indeed pose a real challenge for sociology. Much of the sociology of work, for example, makes empirical claims which are testable and operationalisable in principle, but it has hitherto been unclear how it could be tested, and indeed there has been little interest in doing so. It is unlikely, for example, that some of the simplistic claims of the earlier followers of Braverman's work on the labour process could have survived an attempt to put them in place. Hence substantial changes in the discipline should be expected, and indeed are necessary for its contribution to be useful. Sociology should be well able to accommodate such changes, since thoroughgoing shifts of theoretical emphasis occur quite frequently within the discipline. Since the mid-1980s many former theoretical certainties have been swept away. Amongst other things, and particularly relevant for our purposes, this has called into question formerly 'obvious' distinctions between 'theoretical' and 'applied' research. A new theoretico-empirical terrain is being formed, as much in the sociology of work and organisations as elsewhere, and the interdisciplinary confrontations invoked in CSCW can be a formative influence.

We have set out a *position* for sociology in relation to CSCW, but that is not the same as setting out a *stall*. To do that would involve specifying the different perspectives within the discipline with an actual or potential contribution. In doing that, some of the difficulties we have alluded to in reconciling the perspectives of different disciplines would be reproduced on this scale too. For example, although they are superficially close, it is an entirely different thing to analyse the division of labour in the labour process, and to produce an ethnomethodological account of a working division of labour. Setting out a stall for sociology would also involve focussing in a much more business-like way on the direct contributions that could be made to systems *design*, and indeed much of our current research is concerned with making the transition from formulating critiques of existing systems to actively participating in their specification and development. Those are large issues in their own right, however, and must remain as tasks for another occasion.

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