CSCW
Challenging Perspectives on Work and Technology

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"Organizations typically display inertia through their established routines, institutionalized practices, and taken-for-granted assumptions that inform and reinforce the status quo...Managers not only have vested interests in an existing order, they also tend to be rooted firmly in a given understanding of reality, making acceptance of an alternative structural order and new view of the world problematic"

Wanda Orlikowski (1991)

Introduction

In recent years, the realisation that information technology (IT) and computer-based information systems (CBIS) can be used not simply as means to improve the efficiency of operations, but to provide new strategic possibilities for organisational innovation and development, has begun to be recognised. The convergence and integration of computing and telecommunications, the ubiquitous nature of computing in all aspects of daily work life, including the appearance of mobile facilities, means that there are few aspects of business that are not influenced by the use of computer technology. Such a situation opens up possibilities for both business success and failure. What is evident is that there is little chance of surviving in the game if one simply stands still. The question is not whether one needs to change, but whether one does so reactively or proactively, piecemeal or wholesale. Whatever strategy is selected there are risks associated with it.

The purpose of this chapter is not to discuss information systems (IS) strategy per se, or business opportunities, but to outline an emerging perspective on the nature of work, learning and the role of technology in the workplace that I believe, if accepted, will have a significant impact on the way we go about both organisational re-design processes and the deployment of IT. This perspective has been most clearly articulated and investigated in the emerging interdisciplinary field entitled Computer Supported Cooperative Work (CSCW) over the past several years. This new field is characterised by a number of at times competing voices, stretching over academic research and development groups, technology companies, organisational change agents, and technologically-oriented businesses. A focus on the

multiplicity of cooperative work arrangements to be found in organizations and problems and prospects for their computer augmentation is what makes the area "new".

The differing groups that comprise the field not surprisingly have differing agendas and priorities as to the central issues that need to be confronted in order to produce a technological and information systems infrastructure that will truly support work processes in organizations. The field attracts people from a variety of different disciplinary backgrounds, psychology, sociology, software engineering, design, organisational studies, management, computer science, anthropology, human factors, media studies, etc.[1] It is within this area that I believe there has developed a discussion worth taking note of, that is, a view on the nature of work and organisational learning and its implications for technological and organisational change[2]. This view is different from that prevailing in the field which I would argue is still dominated, implicitly if not explicitly, by a neo-Tayoristic industrial engineering stance. In CSCW we find alternative perspectives on the relation between work and technology, on the details of work, and on how these details need to be understood as we deploy technologies to "support" it. Key features of these alternate perspectives are a focus on collective work activities rather than individual work tasks, on the way learning occurs within work communities, and on the myriad ways in which people in their work activities innovate with and through technology.

While to some, for example those who subscribe to the Business Process Re-engineering (BPR) school, the centrality of work practices in these approaches may seem too static a view to be useful, and to others the perspective on how learning in organizations occurs may appear too radical, the argument here is that these discussions within the CSCW community are likely to lead to some interesting changes in the years ahead, both from a management and an IS viewpoint. I say this from a pragmatic stance, in terms of business innovation, and not simply from an academic position. What I hope to do in the rest of this paper is orient you to some relevant work that has been circulating within the CSCW community concerning the nature of work, recount some stories, and allude to possible implications. In a word, the intent is not to have you embrace CSCW as the answer to all the problems concerning IT and organisational change, but to offer some of the work and technology studies which can be found inhabiting the CSCW arena as interesting signposts towards an alternate path to understanding people, technology and organisational change processes.

Part I : The field of CSCW

In this Section of the paper a brief background on the emergence of the CSCW field, and its key claims and features are delineated.

1.1 Some Background on CSCW

Workgroup computing, collaborative computing, groupware, co-ordination technology, augmented business teams, group decision support systems, cooperative work support, are all

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[1]   Given such a variegated "community", is it any wonder that they do not speak with one voice?

[2]   It is important to note that while this work has been taken up in the CSCW community, the early studies have come from existing research traditions within the social sciences.

terms that have become increasingly common in recent years. Despite this interest, there is still considerable confusion about the exact focus of the area commonly labelled "Computer Supported Cooperative Work", or CSCW, and the reasons for its apparent growth. Is it just a fad, a passing fashion, or does it denote a new approach to problems of harnessing information technology to human needs? Whatever the answer, the area of CSCW appears to have become accepted over the past few years as a legitimate sphere of academic research and development activity, with a growing number of interested researchers and the support of many software developers and end user organizations[3]. What exactly is the basis for this interest? We can distinguish at least four distinct perspectives on the nature of the CSCW field (Bannon, 1993):

1) CSCW as a "catch-all" concept

At the most simple level, it can be argued that CSCW is simply an "umbrella term" with little content other than the idea that it is concerned with people, computers, and cooperation in some form. The utility of such a seemingly vacuous definition is that it may still allow people from a variety of different disciplines, with partially overlapping concerns as to the current state of technology development and the understanding of use contexts, to come together and discuss issues of mutual interest. CSCW in this view is an "arena" where different groups vie for the attention of participants, rather than a coherent focused field. Howard (1988) describes two distinct though very varied communities within CSCW. He coined the term "strict constructionists" to describe those in the field focused on the development of computer systems to support group work, who tend to use themselves as objects of analysis in the provision of support tools. These people, mainly implementers, are interested in building tools - widgets, and they see the area of CSCW as a possible leverage point for creating novel applications. Most of these people equate the CSCW field with Groupware, as they focus on new software applications. Howard denoted those who make up the remainder of the CSCW field, the larger part, as "loose constructionists," a heterogeneous collection of people, some of whom are drawn to the area by their dissatisfaction with current uses of technology to support work processes, others because they see in this area a chance for communities who traditionally have not had a voice in the design of computer systems to have one. Rob Kling has articulated a somewhat different view of the CSCW community to that of Howard. He sees CSCW as a conjunction of "certain kinds of *technologies*, certain kinds of *users* (usually small self-directed professional teams), and a *worldview* that emphasises convivial work relations" (Kling, 1991). This issue, of whether or not CSCW implies anything about shared goals of group members, or convivial work relations, has been the subject of some dispute (Bannon & Schmidt, 1991).

2) CSCW as a paradigm shift

Hughes, Randall & Shapiro (1991) argue that we should conceive of CSCW as a paradigm shift in the way we think of designing computer support systems of all kinds, rather than as a

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[3]   The first open conference on Computer-Supported Cooperative Work was organised in 1986 in Austin, Texas. It brought together people from a variety of backgrounds: artificial intelligence, human-computer interaction, office information systems, computer science, psychology and anthropology. The general focus was on issues concerning technology support for groups. The bi-annual Conference has grown in size and stature over the years, as has the related European Conference. Many journals in the areas of office systems, human - computer interaction, decision support, and software engineering now include CSCW in their list of topics, and some new journals with a more specific focus on CSCW have emerged (CSCW, Organizational Computing). Monographs and edited collections of papers are also mushrooming (e.g. Baecker, 1992, Greenberg, 1991).

distinct research field concerned with a specific form of work . This position has similarities to the views of Suchman (1989), who describes CSCW as "....the design of computer-based technologies with explicit concern for the socially organised practices of their intended users." Both these views deny any special prerogative to particular user groups, technologies, or forms of work in what constitutes CSCW. Rather the emphasis is on "the turn to the social", realising that much work on people-technology systems has systematically avoided issues of the social organisation of work and their implications for the design of appropriate support technology.

3) CSCW as software for groups

A quite different conception of what the field is about can be discerned among those who focus on the computer support of "groups" or teams as the hallmark of the field . This has given rise to the term "groupware" to distinguish the computer products marketed in this area (Johansen, 1988). While this view is most commonly found among information technology and business consultants, it can also be found among software developers and researchers. For example, Irene Greif, one of the originators of the term CSCW, defines it as "an identifiable research field focused on the role of the computer in group work" (Greif, 1988a). As noted by Kling and Howard (above), many adherents of this view tend to focus on small teams or homogeneous groups with convivial work relations, and thus pay little attention to settings in everyday organisational life where issues such as power and politics play a large role. The "group" focus has also been criticised, based on difficulties of enumerating properties of "groups" as found in the work place.

4) CSCW as technological support of cooperative work forms

Bannon & Schmidt (1991) define CSCW as "an endeavour to understand the nature and characteristics of cooperative work with the objective of designing adequate computer-based technologies". Here the emphasis is on understanding cooperative work as a distinctive form of work (Schmidt, 1990), and on supporting these cooperative work forms with appropriate technology. This broadens the scope of the field considerably beyond that of computer support for groups. In this framework, "cooperative work" does not imply any notion of shared goals or conviviality, but rather people engaged in work processes related as to content. While having some overlap with perspective (2) described above, this approach focuses on specific work forms and practices, and the nature of the mechanisms that evolve to facilitate the co-ordination of cooperative work. Critics of this approach argue that the distinction between cooperative work and individual work is problematic in everyday work situations, and that this approach has too functionalist a perspective, neglecting subjective factors of participation and cooperation.

5) CSCW as Participative Design

The CSCW community contains within its ranks a number of people who are proponents or practitioners of participative, or participatory, design (PD) (Clement & Van den Besselaar, 1993). Their focus is on developing alternatives to traditional systems design, alternative ways of doing design, of involving users, etc.(Greenbaum & Kyng, 1991). While certainly various forms of user involvement are important to the development of successful CSCW systems, and there is an overlap of interests and concerns, the terms are not by any means completely synonymous. Indeed, many successful participative design practices e.g., Future Workshops, Wall Charting, etc., are noticeable by the complete absence of computers in supporting the

ongoing work of the group. Nevertheless, the opinions and experiences of the PD movement exert an influence on the field.

The purpose of this paper is to show the relevance of certain work appearing in the CSCW field to the management of organisational change and IT. Thus, I do not wish to dwell on the details of the above distinctions here but simply note that the position taken in this paper is congruent with the perspectives labelled (2) and (4) above. Put more simply, CSCW involves the exploration of issues concerning cooperative work arrangements and their support via information technology. Such a view of the field opens it up to a wide mix of disciplines - computing and software engineering, cognitive and social psychology, work sociology and anthropology, organisational theory, etc. Our task now is to demonstrate that CSCW is not simply the re-packaging of earlier IS frameworks, but does have some genuinely new insights - insights that are relevant to today's business concerns of organisational change and deployment of new technology. So, the next section describes some of the distinctive features of the CSCW field, before moving on to show how work in this field may impact on organisational understanding and the effective deployment of new technologies.

1.2 What's new in CSCW?

For many people working in the information systems field, it is difficult to comprehend the recent surge of interest in CSCW issues as if these issues were totally new and deserving of a distinct field within information systems research. Surely many of the topics have always been important in information systems. However, a major development that gives impetus to the rise to CSCW *as a field* is the current transformations in the organisation of work. Changes in the environment in which businesses work requires companies to improve their innovative skills, operational flexibility, and product quality. To meet these demands, work organizations must be able to adapt and innovate rapidly and to co-ordinate, in a comprehensive and integrated way, their distributed activities across functions and professional boundaries within the organisation or within a network of organizations (Schmidt, 1991). Work organizations thus require support from advanced information systems that can facilitate the co-ordination of distributed decision making. Simultaneously, the proliferation of powerful workstations in cooperative work settings and their interconnection in large-scale networks provide the technological foundation to meet this need. CSCW thus entails both a wider remit than traditional IS as regards the different settings in which it is appropriate to study cooperative work arrangements, as well as a more explicit focus on the support requirements of cooperative work and the way people create, manage, disable, modify, etc. computer-based mechanisms of interaction than is seen in the other fields. Thus studies in areas such as computer-aided design (CAD), computer-integrated manufacturing (CIM), computer-aided software engineering (CASE), etc., are all relevant to the CSCW field to the extent that they study the use of computers to support cooperative work in different domains. A focus on the multiplicity of cooperative work arrangements and problems and prospects for their computer augmentation is what makes the area "new".

For purposes of clarification, and as an aid to understanding the focus of the field, it may be useful to note the relationships between CSCW as currently constituted and other, related fields. We thus note its relationship to the areas of Office Automation (and Office Information

Systems), Groupware, Human Factors (HF), Group Decision Support Systems (GDSS) and Business Process Re-engineering (BPR).

  • *Office Automation and CSCW*

The early computer systems developed to 'automate the office' were built by designers who implicitly assumed much of the traditional procedural conception of office work (Ellis & Nutt, 1980, Hammer & Sirbu, 1980, Zisman, 1977). These types of systems are suitable for office work that is structured around actions where the sequence of activities is similar, but they do not deal well with unanticipated conditions. As Suchman (1983), Wynn (1979), Gerson and Star (1986) and others have shown, much daily office work involves more than the "execution" of office procedures, so the simple procedural model has been discredited (Barber, 1983). The need to develop office systems that play more of a support role for people in their work has been acknowledged. However, as noted by Schmidt & Bannon (1993), building computer systems where the work is seen as simply being concerned with 'information flow,' and neglecting the articulation work needed to make the 'flow' possible, can lead to serious problems. Technological support of work should aim at supporting the self-organisation of cooperative ensembles as opposed to disrupting work by computerising formal procedures. The organisational models embedded in CSCW applications should be treated as *resources* for competent and capable workers rather than as executable code. That is, the system should make the underlying model accessible to users and, indeed, support users in interpreting the procedure, to evaluate its rationale and implications. It should support users in applying and adapting the model to the situation at hand. The system should even support users in modifying the underlying model and creating new models where appropriate in accordance with the changing organisational realities and needs. The system should also support the documentation and communication of decisions to adapt, circumvent, execute, modify etc. the underlying model. In discussion of such topics, and the development of supportive systems embodying them, the CSCW community goes well beyond the normal boundaries of OIS discussions.

  • *Human Factors and CSCW*

While undoubtedly one large topic of discussion within CSCW concerns what could be termed "human factors", it would be a mistake to assume that the usual set of HF concerns, expressed for example in the concepts and frameworks employed within the human-computer interaction (HCI) community, would adequately cover the conceptual frameworks and research topics encountered in the studies of work and technology found in CSCW. Specifically, traditional HF approaches focus too much on individual skills and capacities and do not explore the whole issue of the sociality of work. This limitation has in recent years lead to the search for extensions to existing conceptual and methodological frameworks in order to take these factors into account (Bannon & Bødker, 1991). For example, within the dominant cognitive science tradition in HCI, we see an extension of the basic conceptual apparatus in a number of directions, e.g. examining the role of artifacts in human cognition (Norman, 1991), and the way cognition is distributed among people and artifacts - "distributed cognition" (Hutchins, 1990). Whether or not it is possible that simple extensions to existing frameworks will suffice is still a matter of debate.

  • *CSCW as Groupware*

For some, the terms CSCW and Groupware are synonymous. In an earlier paper I discussed why this view was problematic (Bannon & Schmidt, 1989). The problem stems partly from too close a focus on developing software packages for groups, rather than on developing supporting technology for cooperative work forms. Perhaps Greif (1988b) is correct in viewing Groupware as a passing fad, or phase, in that all software in the future will be Groupware to the extent that it will support cooperative work patterns, e.g., word processors facilitating joint authoring, just as state-of-the-art software is now 'user friendly'. The term Groupware provides a technological focus which is too narrow for an adequate understanding of the multiplicity of social forms of cooperative work in the world and their technological support requirements .

• *GDSS & CSCW*

Group Decision Support Systems (GDSS) are certainly one aspect of CSCW activities. Nevertheless it is important to note that most of the GDSS work does not share the same set of concerns evident among many of the CSCW community concerning the nature of work and how to study work. The models used tend to be extensions of work in the decision support systems field and tends to eschew detailed study of organisational   practices. The approach can be critiqued on a number of grounds (Whitaker, 1992). The point here is not that one perspective is necessarily more "correct", but rather to point out that much of the literature that appears under the rubric of GDSS stems from a different tradition and different practices to the work I am focusing on here in CSCW.

• *The relation between BPR & CSCW*

While on the surface there may appear to be much in common between the current management fascination with the concept of BPR and some of the issues mentioned in this paper about CSCW, it is important to note that there are some important conceptual differences as well. Central to the BPR view (at least in the writings of Hammer, 1990 and Davenport, 1990) is a conception of work that is deliberately ahistorical, and linked to tasks and work flows. People are not seen as enabling agents but more often simply as elements to keep the flow moving. While the approach does help focus attention on organisational change and on understanding some aspects of business processes, it is in danger of throwing the baby out with the bath water when it advocates "don't automate, obliterate" (Hammer, 1990). This view does not seem to ascribe any importance to what I would refer to as the "archaeology of work". It is true that in certain cases, the sedimentation of practices that has happened over time has lead to an accretion of - from today's perspective- irrelevant practices in the work process. But it is also often the case that aside from the formal written operating procedures there has been built up a wealth of practices shared in the community that help get the work done (see Part II below). If this tacit knowledge is obliterated through massive layoffs and re-structuring, overall organisational competence may suffer due to the faulty "memory" in the organisation, as the requisite information and skill may no longer be available to the new workforce. Also, much of the BPR framework adheres, implicitly or explicitly, to a management model of change and control that is in many respects akin to the original ideas of F.W. Taylor's Scientific Management. Indeed, Davenport is quite explicit about this, arguing that the "new industrial engineering" that he is advocating is the next step in scientific management, using IT and business process redesign to re-engineer the corporation. Within CSCW, however, there is an alternative perspective on the way work is accomplished that puts greater emphasis one work

practices. This perspective is based on "the capacity of workers to identify problems, decipher them, interpret them within shifting situations, utilise formal and informal social networks in the organisation, and draw upon the fund of knowledge in the community" (Sachs 1994). This approach places importance on the role of the human actors in accomplishing work, and on their evolving learning in communities as a key to organisational development. Focus is as much on the tacit, informal ways in which people organise and support each other, than on the explicit ways this is done. Technological developments must be fitted into this world rather than simply being imposed, if the changes are to take hold. Of course in our brief discussion here we must we must also realise that neither BPR nor CSCW are characterised by clear and uniform and univalent approaches, but the characterisations expressed here are prototypical.

Part II: Uncovering Work in CSCW

In this Section of the paper, I argue that, far from CSCW embodying a naive "human relations" orientation, it provides a vitally important perspective from which to understand work processes and practices, with consequent implications for their support with information technology. The perspectives in the field can help in understanding the apparent paradox of change and continuity that is required in organizations. Our conceptions of what work is determine how we believe it can be changed. Attention to the way individuals and communities of people work and learn is vital as a key ingredient in any planned change process, be it technology-related or not. So, rather than focusing on some of the technological factors also being addressed in the field of CSCW, or specific software products, I will concentrate here on research studies in the field that have given us a richer understanding of the way people work and learn, with and through technology. This is not to downplay the other kinds of studies within CSCW, but is a question of focus for this particular paper, which has as its concern understanding the relation of organisational change and technology[4]. In the next Section, I briefly relate some key features of different schools of thought evident within CSCW concerning the nature of work and learning and use of technology, followed by a series of short vignettes of specific studies that illuminate aspects of these approaches. The purpose of these accounts is to show the utility of these perspectives as a handle to grasp important issues in developing organizations through information technology[5].

2.1 Approaches to Understanding Work

In CSCW, the focus is on cooperative work arrangements that emerge as a result of the nature of the actual work being performed. Thus there is an emphasis on field studies in specific work domains. While traditional task and work analysis methods from work psychology and sociology can contribute here, much interest has centred on more qualitative, interpretative, ethnographic studies of work practices in an effort to understand more fully the "artful practices" of ensembles of workers as they accomplish their work activities. While more traditional sociological and

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[4]   In a forthcoming paper, I plan to investigate specific CSCW applications in the context of organizational change.

[5]   Brown & Duguid (1991) provide a perspective on working, learning and innovation that is very similar in its intent to that described here.

anthropological concepts - division of labour, issues of power and control, symbolism, etc. are of importance to CSCW, there has been particular interest in ethnographic studies, chiefly of an ethnomethodological nature (Button, 1993). This perspective is distinct from earlier critiques of neo-Taylorist management approaches, such as that of Braverman and the labour process school, in its emphasis on the detailed observation and understanding of the mundane practicalities of 'getting the work done'. The emphasis in these studies is on the work that members do in order to make their work accountable to themselves and each other, focusing on the "working division of labour" (Anderson, Sharrock, & Hughes, 1987) as distinct from viewing the division of labour as an analytical category.   This work seems of particular relevance to designers of CSCW systems, where lack of attention to such matters as how the work is actually accomplished by members of the working community has lead at times to the development of systems that fail dramatically (see e.g. Harper, Hughes & Shapiro, 1991).

Ethnography is concerned with describing the activities and practices of people in a setting, though importantly, it is more than that and "attempts to interpret and give meaning to those activities" (Blomberg, et al, 1993). Hughes et al., (1992) characterise their study of air traffic controllers thus: "There is no one method of ethnographic analysis. ... The field workers immersed themselves in the work by spending several months observing activities on and around the suites, talking to staff, and discussing with them the researchers' developing understanding of what controllers do. While attempting to avoid prejudices and to allow the work situation to 'speak for itself' as much as possible, researchers cannot claim to address it innocent of any theoretical orientation; and their results would be much impoverished if they did. The purpose of an ethnographic approach is not so much to show *that* work is socially organised (which is rather easy) but to show *how* it is socially organised."

Such approaches, inspired by certain groups of sociologists and anthropologists, have been a core component of the new way of viewing work within CSCW. As an example, we can briefly examine the case of office automation. According to the traditional 'bureaucratic' conception of organisational work, people perform a number of tasks according to a set of well-specified 'procedures' that have been developed by management as efficient and effective means to certain ends. The traditional formal organisation chart is presumed to show the actual lines of authority and the "correct" pattern of information flow and communication. However, this understanding has been proved to be highly idealised and grossly inadequate for analysing and modelling the articulation of real world cooperative work arrangements. Due to the dynamic and contradictory demands posed on a social system of work by the environment, task allocation and articulation are re-negotiated more or less continuously. A number of studies of office work, conducted by anthropologists and sociologists, have emphasised the rich nature of many allegedly 'routine' activities and the complex pattern of cooperative decision-making and negotiation engaged in by co-workers, even at relatively 'low' positions within the organisation (Wynn, 1979, Suchman, 1983, Gerson & Star, 1986). Suchman gives a concise account of this discrepancy between the office procedures that supposedly govern office work and the practical action carried out by office workers. She notes: "the procedural structure of organisational activities is the *product* of the orderly work of the office, rather than the reflection of some enduring structure that stands behind that work" (Suchman, 1983). It is not that office procedures are irrelevant, it is just that these procedures require problem solving activities and

negotiation with co-workers, the result of which can be interpreted as performance according to procedures. The 'informal' interactions that take place in the office thus not only serve important psychological functions in terms of acting as a human support network for people, for example, providing companionship and emotional support, but are crucial to the actual conduct of the work process itself. Evidence for this is apparent when workers 'work-to-rule,' i.e. perform exactly as specified by the office procedures, no more and no less. The result is usually that the office grinds to a halt very quickly.

Yet it is precisely the procedural model of work that has tended to dominate in the work on early office automation and even much more recent office information systems development work as noted earlier. If we are to take on board the observations from ethnographic studies the anthropologist Brigitte Jordan notes how we need to "investigate the ways in which people in the workplace "co-construct" knowledge and skill, drawing on the social and material resources available to them. Attempts to design CSCW technologies, then, must be grounded in a thorough understanding of ongoing work processes and how they are supported (or not) by the physical layout, artifacts, information systems and databases, as well as the social relationships and arrangements of the workplace" (Jordan, 1993). Jordan points to the distinctions between the concepts embodied in process models and workflow representations currently in vogue versus the tacit, implicit, embodied and un-articulated knowledge inherent in work practices, and points to the importance of the concept of "communities of practice" (Lave & Wenger, 1990) - the basic social unit in which work gets done and in which these skills are shared, learned, and evolved.

There are other approaches to understanding work, which while sharing many of the concerns of ethnographers derive from other traditions, for example, Russian-inspired activity or cultural-historical theory (Wertsch, 1981). This approach is built on the work of Vygotsky, Leont'ev and others in the Soviet Union in the 1920's - 1940's and is represented more recently by the work of people such as Cole, Scribner, Engeström, Kuutti and others. Their emphasis is on activity systems, their evolution and development, and on understanding the context in which activities are carried out. "An activity system comprises the individual practitioner, the colleagues and co-workers of the workplace community, the conceptual and practical tools, and the shared objects as a unified dynamic whole" (Engeström, 1991). While the conceptual apparatus of this framework is difficult to apply directly, its focus on the concept of activities, which are inherently collective, not individual, phenomena, and on mediation of activity via instruments, tools, procedures, methods, etc. make it quite *apropos* for CSCW. As such, the approach provides an alternative framework for conceptualising human work activity, mediated by artifacts, and by other people, to the prevalent information processing paradigm in much management and technical work (Bannon, 1990). The Finnish researcher Yrjö Engeström has developed this approach in terms of understanding work activities within a more comprehensive conceptual framework, including a rich fieldwork methodology, entitled Developmental Work Research, which provides mechanisms for understanding both the past history of work practices as well as the development of new work forms (Engeström, 1987, 1991). He claims that this approach challenges many assumptions about work and learning, so that not only individuals change, but they change their collective practice and its institutional frames as well. This work has begun to be discussed within the CSCW community (Kuutti, 1991) and even more recently,

within a management perspective by Blackler (1993), who recounts how the approach provides an interesting reframing of a number of important issues in management and organisational thinking. Significant features of the approach include:" the social origins of motives, the nature and significance of mediating mechanisms in the enactment of activities, the active nature of participation, the relevance of history, and the significance of inconsistency and conflict in activity systems" (Blackler, 1993). Especially important within the context of this paper, Blackler argues that the approach encourages an orientation "away from a concern with the management of experts to a concern with the management of expertise, from an emphasis on plans and strategy to an analysis of activity and activity systems, and from a preoccupation with objective knowledge to a concern with the management of collective instability". Such an approach would certainly seem to be highly topical in today's business environment.

The anthropologist Pat Sachs draws on both general ethnographic and activity theoretic backgrounds for her perspective on work in a recent paper (Sachs, 1994) . Her critique builds on that of figures such as Wynn, Suchman, Blomberg, Orr, Scribner, Hutchins, and herself and others on the nature and organisation of everyday work practices. This body of work, through critical argumentation and extensive field work, has begun to have an impact on a number of fields - including management studies, business administration, information systems development, organisational behaviour, job design, human resource management, training, etc. This increasingly prominent view re-conceptualises the nature of work and organisational life, and the role of information technology support. It emphasises work practices, and the way learning is accomplished within communities of practice. It argues that learning and action are 'situated' (Suchman, 1987), and that work is accomplished via artifacts, in conjunction with others. Much of this work has helped to contribute to the interdisciplinary field of CSCW (Schmidt & Bannon, 1993). Sachs (1994) argues passionately and cogently for the need to re-conceptualise the nature of work, away from what she terms an "organisational" view, to one she labels "activity - oriented". To synopsize these perspectives the organisational view is still the predominant one in organizations today, grounded in scientific management ideas, focusing on training, tasks, procedures, workflow and teams, in contrast to the activity-oriented view focusing on learning, know-how, networks, conceptual understanding, work practices, judgement, and communities (of practice). In line with Jordan's comments, the contrast is between the "documented, visible and articulatable" versus the tacit, silent and "only-understood-by-the group". Finally, she notes: "Because the people who design business processes are ordinarily not the individuals who do the hands-on work, and because business process designers tend to think organizationally rather than employing work thinking, the fund of knowledge about details of work process are generally not incorporated into work process designs (Sachs, 1994)."

Work in the area of cooperative systems development by groups in Scandinavia (Ehn, 1988, Greenbaum & Kyng, 1991, Kyng, 1994) under the Participative Design (PD) label is also relevant to the present discussion, as this approach is concerned directly with building systems that are better fitted to the capabilities of workers, and takes into account both their individual skills and shared practices. A key feature of their work is that computer users are themselves key players in any attempt to improve their work situation. Approaches towards cooperative systems design are well described in Greenbaum & Kyng (1991), which contains several papers by

people with an ethnographic background, indicating the linkages existing between the approaches, notwithstanding their separate origins. The Scandinavian work has also focused on the concrete practices of people at work, as the basis for the development of new tools and practices. Kyng (1994) argues for the need to understand present use as the key to future developments as there is a co-evolution of work and artifacts. He is circumspect about the idea of radical change: "innovation is difficult and tied to whatever already is - for better or worse". At the same time, he is aware of the need for us to build flexible, adaptable systems: "our artifacts should be modifiable, or even replaceable". His argument in based on the belief that "many design artifacts such as requirements specifications, are more directed towards managerial needs for control than towards supporting creative design work, no matter who does the work". The problem of how then to design appropriate systems is handled by the notion of "concretization" and simulation of future work through the development of work situation descriptions & use scenarios. He is thus proposing a method by which designers can, in conjunction with end-users, come to explore the possibilities and limitations of specific tools for specific work practices. Rather than imposing change on people, the approach argues for a process of mutual learning. Due to the interest in building appropriate computer systems, this work helps build a bridge between the ethnographic work with its emphasis on observation and interpretation and computer systems development work, with its emphasis on actual design and construction.

2.2. Some Practical Implications

Let me recap the arguments of the paper to date, and where this paper is leading. Having set out a tent for the CSCW area, as one where interesting debate on the nature of work and its support with IT is being conducted, I have described a set of approaches to understanding work and learning in work that I believe are important for the planning of organisational change, and for supporting innovation in the organisation. This view is in conflict I believe with a number of the assumptions built into process analysis perspectives, including the action workflow model of Flores and his colleagues (Medina-Mora et al., 1992). Inadequate descriptions of work can create serious problems when these are used as the basis for new IS development. We have already noted this when discussing the office automation area. More generally, this topic was recently discussed at a Symposium, organised by the anthropologist and organisational ethnographer Lucy Suchman (1994), at which several presentations were made, including an activity-oriented (Sachs, 1994) and participative design (Kyng, 1994) perspective. All of the papers at the Symposium were concerned about re-shaping the systems development process so that it better reflects the centrality of the work domain for which the computer system is supposed to be designed. The authors wish to support work practices through the (re-) design of work artifacts, and often procedures, processes and settings as well. The work reported differed from much of the literature in business process re-engineering and process modelling in important ways. Specifically, the authors argue that these process approaches tend to leave out far too much of what is involved in the nature of work, specifically the inherent capabilities of the human actors and more particularly the communities of practice around such work.

In the application systems development process workers are asked to evaluate the descriptions made of their work processes by analysts and designers, yet this is often

unproductive, as the representational formalisms adopted are often obscure to the workers. We can question many aspects of this process of representing work. Who makes the representation, who has access to it, what purpose does it have? In many cases rather than clarifying things, the representations used simply obscure actual work processes in a cloud of abstractions that make little sense to the people whose work is supposedly being modelled. Worse, these abstractions are then utilised as the basis for building the new information system, with the result that the inadequacy of these descriptions becomes clear to all in the failure of the resulting system. So, rather than being able to augment work practices with technology, in these situations the technology actually "gets in the way" of doing the work.

Incorporating the experiences of the workers themselves, or "end-users", through active participation in the design process, is an important aspect of the perspectives adopted and described in the papers by Kyng and by Sachs. Grounding design in a deep understanding of the practical contingencies of work practice is the key insight shared by the authors. My own perspective on these issues has been formed over a number of years through interaction with people in the areas of software engineering, information systems development, human-computer interaction and information technology support in end-user organizations. For a number of years, problems have been surfacing in a variety of areas connected to information technology, including requirements "capture", the usability of the resultant systems, and their lack of organisational impact. There has been much discussion over the validity and utility of developing formalizations of work processes. The argument is not whether some level of abstraction and formalization is possible or desirable, but rather, whether such techniques could in principle "capture" all that is required, how to manage what is left outside the representation, and how to allow scope for technology modification and innovation on the part of the workforce (Robinson & Bannon, 1991, Schmidt, 1991).

However there seems to be an emerging consensus within the CSCW community about both the necessity for models of aspects of work activities, the limitations of certain kinds of models, and the need to allow for local adaptation and innovation, so the field as a whole has moved forward to richer understandings of work and of how to support the work process through technology. There is recognition of the way both systems and work practices need to co-evolve in use. As Mackay notes:" Software does not remain static when it is introduced into an organisation. People in the organisation evolve their individual patterns of use, share them with each other, react to external changes, both technical and non-technical, and sometimes pro-actively modify the system to produce significant innovations." (Mackay, 1990). A perspective on either work or technology that neglects such factors is liable to run into problems. Let us now look at some examples of how change was effected in organizations through IT, and some of the concomitant issues that arose.

Investigating experiences of IT deployment and Organizational Change

In a recent survey, Bullen & Bennett (1990) examined a number of different "groupware" systems and their effects in a variety of organizations. Their conclusions were of interest, both from an IT and organisational change perspective. They point out that much of the functionality of the systems were not being utilised, as the benefits to the people were marginal, or not perceptible. This alludes to an important point, especially relevant when dealing with CSCW

systems, that has been pointed out by Grudin (1989), namely that it is often the case with these systems that certain people stand to benefit from their use, while others are required to do more work. At another point, Bullen & Bennett take some of the IT people to task, noting: " rather than looking at 'fancy' innovative functions for groupware systems, designers should be focusing on how to better solve the basic need of office workers, i.e. managing large volumes of information." (Bullen & Bennett, 1990). However their major claim was that organizations were not seriously considering the nature of work and how it could be redesigned, and how technology could help to enhance work processes. Their finding showed that most people were just using new technology to perform the old routines. Once again, the study also pointed to the need for champions within the organisation to promote change, for matching people's expectations of the technology to the reality, for the need to improve the quality and focus of training, and for the need to allow time for use of systems to evolve in the organisation.

As a specific example of the kinds of issues that Bullen and Bennett describe, the field study by Wanda Orlikowski (1992) on the implementation and uptake of Lotus Notes™ in one branch of a large consulting firm is instructive. Notes has generated an enormous amount of interest since it was first announced (Marshak, 1990). While difficult to describe succinctly, it can be seen as providing a client-server architecture for developing a number of applications to support communication and information sharing in an organisation. Orlikowski's research has pointed out a number of problems in the implementation strategy adopted by this particular firm, which was a "brute force approach", with minimal education of users about the utility of Notes for their daily work. She notes the discrepancy between the organisational culture evident in the firm - a competitive, individualistic environment, and the purported intent of Notes to foster "sharing" of information among people in the organisation. "In situations where the premises underlying groupware are incongruent with those of the organization's culture, policies, and reward systems, it is unlikely that effective cooperative computing will result without a change in structural properties. Such changes are difficult to accomplish, and usually meet with resistance (Orlikowski, 1992). "

Rather than revolutionising the work environment Orlikowski describes how the system was being used to build applications supporting individual, not group productivity, and mechanising existing work flows, rather than developing new work arrangements. This field study took place during the initial six months of implementation of the Notes system in the organisation, so it is possible that over time changes will take place, and new work practices will evolve. What the account does tell us, however, is that we need to be careful in assuming that simply installing the technology will produce far-reaching changes in the organisation.[6] Other studies that I have had access to tell a similar story - that organisational change is only observed when there is a sustained high-level commitment to change, of which the technology is but a part. Simple "technology-push" strategies will not re-shape the organisation.

In the paper referred to earlier, Sachs (1994) describes an interesting case of an operational support system in an organisation called the Trouble Ticketing System (TTS). This system was a large data-base that also functions as a scheduling, work-routing and record-

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[6]   We also need to be aware that, because Notes is such a general purpose environment, it will be difficult to discuss general aspects concerning the success or failure of Notes, as much will depend on the quality of the local programming applications built on top of the Notes substrate.

keeping technology. This computerised dispatching system while deemed "organizationally" more effective on certain criteria, was systematically making the work of the people on the ground more difficult. She notes: "The translation of each turn of talk into a single ticket reduced an effective network of co-workers who could troubleshoot together into something like a relay-race, handing-off pieces of work to the next runner, creating an aggregate of dissociated workers" (Sachs, 1994). Sachs shows several instances of how this system systematically reduced the competencies of the people using the system, and thus effectively reduced the overall competence of the organisation. Some of the measures of effectiveness used to evaluate the system totally ignored aspects such as training on the job, an important part of the work. So for example, the system was configured so that "efficient work" for an individual was interpreted as doing several jobs a day and simply accumulating tickets, irrespective of whether such a work pattern actually created further problems down the line and actually increased workload in the overall system.

What makes this case doubly interesting is that Sachs and her colleagues not only point to the deficits of this system, but, having analysed the assumptions built into the original TTS system, they had the opportunity to re-design the system, in order to put back into the system some possibility for workers to communicate with other workers about the problems they were encountering. They were able to re-establish some sense of a community of workers, who could support each other on the job. The new system is in use and by all accounts is effective. One consequence noted by Sachs is that managers are now thinking more about the concept of work activities than simply work tasks.

The final study I refer to here is related to the previous one, in that it also deals with the attempt to support work activities through technology. The focus of Orr's (1992) work is on organisational learning, and how this can be made manifest. Unfortunately the study tells as much about the difficulties of embedding a changed view of the workplace and workers in the organisation as it does about change with or through technology. While the technology employed in this case (portable radios) is a little unusual, Orr documents how this tool was introduced and used among a community of repair technicians over several months. Orr notes how the goals of the project were threefold, to enhance the view of the worth of the repairmen's role in the company (related to that much abused term "empowerment"), to look for unnecessary hindrances to practice, and to see ways in which technology might hinder practice. One rule was that from the outset managers were not allowed have radios, a clear negation of one of the tenets of scientific management concerning the locus of control in the organisation. From the perspective of the technicians, Orr notes several important benefits. The feeling of not being alone was one important factor, another was a strengthening of the feeling of belonging to a workgroup. Technical consultation and moral support was also possible. So the introduction of the radios did seem to support the development of the work community, which was one of the major goals of the study.

However, at another level, change was not so evident. For example, Orr notes that the relationship of the workers to the corporation did not change. Partly, he sees this as due to organisational obduracy. Since this initiative did not emerge from the corporate centre tasked with developing IT to support the service people, support from this centre was lacking. Secondly, during the trial study, emphasis switched to demonstrating "improved productivity"

rather than enhanced work practice, and so the bottom line was to be in terms of "reduced headcount" as a result of the new technology. Finally, focus moved to the technology per se, the radios, rather than to how the technicians developed their practice with radios. So, the study gives an honest appraisal of the difficulties that can still be encountered, even within a progressive organisation, when one tries to move away from the "organisational thinking" described by Sachs to an activity-oriented one.

Part III: Concluding Remarks

Due to the variety of issues and concepts discussed in this paper, and the somewhat different orientations evident in the material, the reader at this stage may be a little confused as to the central theme of this paper. Let me try to restate the position. Organizations are undergoing change irrespective of technological developments, although the technology can be a key contributing factor. Likewise, technological developments may also create organizational restructuring, even if such organizational changes were not planned as a part of the technological change. There are thus a large variety of ways in which technology and organization can interact. But, ultimately, changes in technology and/or organization depend on and affect people in work. Our perspective on the nature of work thus has an important bearing on how we implement changes in technology or the organization, or, most likely nowadays, both.

A key message in this paper is to critique management orthodoxy, based on industrial engineering perspectives, as to the "location" of knowledge about work. This knowledge exists most firmly in communities of practice, and not directly in the management. Thus, any attempt to support work through information technology must be sensitive to these communities, and build on, rather than destroy successful practices. It is here that the PD work described earlier can help us. Yet often we find that in the design of applications, the representations of work that are used as the basis for the design are seriously flawed. Designers are "automating a fiction" as Beau Sheil (1983) so aptly put it. Similar criticisms of process engineering models of work are made. Once again there is a gap between representation and practice. Even after specific technologies have been developed, their deployment in organizations and their impact are not deterministic. Recently, much attention has been paid to how technologies evolve in use, and thus use can be seen as the basis for innovation. The upshot of all this is that both computer-based information systems designers and organizational change agents need to understand:

a) the inherent complexity and vitality of existing work communities

b) the fact that learning at work often occurs at such sites

c) the need to introduce change in a way that supports key aspects of these practices &

d) that adaptation and innovation occurs in these communities.

If we take these points on board, then our views on organizational and technological matters must undergo a radical transformation from the existing norm. The approach adopted here goes beyond enlightened HRM positions, expressed for example by Peter Keen, when he says: "Business needs to treat people like machines. It accords the machinery of IT - the hardware, software, and other components - care, long-term planning, and commitment....much rarer is the firm that acknowledges the importance of education, which is the equivalent of maintenance for people, and has a formal organizational plan that looks ahead in detail at job, career, and skill

changes and needs (Keen, 1991)." While Keen's sentiments are an improvement over traditional management, they still tend to partition aspects of work into individual tasks and competencies, and do not focus on either the details of work, nor on the importance of work communities for learning and innovation[7].

With respect to technology, this new approach has an impact on the way system requirements are gathered and how we represent work activities in systems. Regarding organizational learning and development, this approach breaks down the artificial doors that have existed at times between the concepts of working and learning, and throws light on the activities of working communities as the site for learning and innovation in the organization. It is my belief that within the CSCW field these messages are currently being learned. The intent is not to tout CSCW as some solution to the problems facing organisations today in their development and use of IT, but as an arena in which important perspectives are available on the nature of work, learning and the use of technology, which if taken seriously, could lead to innovations in how organizational change is planned and initiated. One aspect of this approach would be the realisation that work communities should not be viewed as seedbeds of recalcitrance but as containing rich tapestries of stories and anecdotes on how work is done. As such, it can be the basis for evolving new practices and even innovations, if given the chance. Management practices today are still dominated by a limited view of how people work, which affects both the change process and the utilisation of IT in organizations. Paying attention to the details of work can provide useful insight into what aspects of work could benefit from re-design, in a way quite different to the usual depiction's of process analysis. We have shown how over the past few years a richer perspective on work has been evolving within the design community, one that is informed by ethnographic and other forms of field studies of work. It is the incorporation and discussion of the implications of such views for the design of IT that makes the area of CSCW so pertinent, in my view, to the concerns of people here today interested in IT & Organizational Change.

Acknowledgements

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[7]   Of course, such communities may on occasion also act as constraints, but I wish to emphasise their positive contribution - which has often been insufficiently appreciated.

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