CSCW: AN INITIAL EXPLORATION'

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Abstract

This paper discusses the origins and development of a new field of scientific research and information technology application called Computer-Supported Cooperative Work, or “CSCW” as it is more commonly called. A number of events happening concurrently in the work place, in technology, the development process, and the organizational milieu are argued to have contributed to the growth of interest in CSCW issues. There remain a number of confusions about the focus of the area, however, which are explored here. Some early experiences with CSCW systems are then discussed, and accomplishments of the field to date noted.
Workgroup computing, collaborative computing, groupware, coordination technology, cooperative work support, are all 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 labeled “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? Where does this new field originate from, and where is it going? Exactly what is ‘new’ in the area? In this short descriptive paper I attempt some answers to these questions. A single paper can scarcely scratch the surface of this topic, and interested readers should investigate other sources for accounts of the field (see, e.g. Bannon 1992, Bannon & Schmidt 1989, Greif 1988, Grudin 1991, Hughes et al. 1991, Johansen 1988, Robinson 1991, Schmidt & Bannon 1992, Wilson 1991). The paper is organized as follows. Section 1 gives a brief historical account of the development of the field. A number of factors that may have contributed to the emergence of CSCW are then presented. Section 3 then provides further detail on the numerous attempts to delineate the core concerns of this new field. Finally, some CSCW systems and the experiences gleaned from use of such systems are briefly discussed in Section 4. The paper concludes with some reflections on the issues raised.

1 A Short History

The birth of the term Computer-Supported Cooperative Work (now commonly abbreviated to CSCW) can be definitively traced to the computer scientists Irene Greif and Paul Cashman back in 1984, when they coined this term as a suitable theme for a small invited workshop focusing on the development of computer systems that would support people in their work activities. It brought together a number of people from somewhat disparate areas, e.g., office information systems, hypertext, distributed information systems, and computer-mediated communication to name a few. Although most of the participants were already well-known within specific research areas, they had not been brought together before to discuss common concerns of developing software to support distributed ensembles of people in their work.

The first open conference with the title Computer-Supported Cooperative Work was organized in 1986 in Austin, Texas. It brought together around 300 people from a variety of backgrounds: artificial intelligence, human-computer interaction, office information systems, computer science, psychologists and anthropologists. Topics covered included: developing and using computer conferencing systems, experiences with computerized meeting rooms, design and use of electronic mail filtering tools, design and use of shared calendar systems, problems of collaborative hypertext and many other topics. Interest in the field has continued to grow, with an even larger conference on the topic held later in Portland, Oregon. There was an interesting shift at this meeting towards concern
with the nature of the design process, with a number of papers, especially several Scandinavian contributions, addressing the issue of user involvement in design as a prerequisite for quality design. At the same time some concerns surfaced about the paucity of papers and demonstrations of actual working CSCW systems.

The enthusiasm for the topic has continued unabated over the years with the first European conference on the topic held back in 1989, see (Bowers & Benford 1991), followed by yearly alternate conferences in North America and Europe to date. There have also been a number of other CSCW-related conferences and workshops on such topics as collaboration technology, group decision support systems and multi-user systems in recent years. 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. Monographs and edited collections of papers are also mushrooming, e.g. (Baecker 1992, Greenberg 1991). Thus, the area of CSCW—however it is characterized, as we will see below—appears to have become accepted as a legitimate sphere of academic research and development activity, with a growing number of interested researchers and the support of many software manufacturers and developers. But what were the pressures and forces that lead to the emergence of an apparently ‘new’ set of issues in the field of information technology development and use? To what extent were existing fields unable to handle adequately the questions that were being posed? In the next Section, several ongoing developments in technology, work, and people’s expectations are shown to have contributed to a concern for the development of technology that fitted more easily to the actual work practices of people. Such forces directly contributed to the emergence of the new field of CSCW.

2 The Advent of CSCW

There are a number of changes occurring, e.g. in the field of information systems practice, in the environment of organizations, in technology itself, and in people’s expectations concerning computer systems, which I believe have contributed to the emergence of, and interest in, this CSCW phenomenon. Let us look at some of these changes in a little more detail. They are loosely structured under human and organizational changes creating demand pull for more appropriate technology to support work practices, and technology push factors that together are producing a new set of practices surrounding the design and use of computer systems in organizations.
2.1 Human & Social Factors

The Organizational Environment

The increasingly turbulent environment in which business operates has led to the need for better ways of organizing and coordinating work activities, with more ad hoc task groups and the need for flexible communication structures, in the search for increasing responsiveness, competitiveness, etc. Organizational requirements are demanding better integration, up-to-date information, and access to information “anytime, anywhere” (Johansen et al. 1992). In the area of production systems we see an emphasis on computer-integrated manufacturing (CIM) and just-in-time (JiT) methods, and various other techniques to reduce stock inventory. Computers are being connected both intra and inter-organizationally to assist in this co-ordination process. Many organization strategists believe that successful corporations of the future will be those that manage to make the ‘net-worked’ organization a reality, and see CSCW activities as addressing aspects of this crucial issue, in emphasizing collaboration and coordination activities and their support via flexible information systems that are accessible both in the office, at home, on the factory floor, and even on the road.

People’s Expectations

There is an increasing demand from computer users themselves for more flexible and tailorable user interfaces and additional functionality that would allow people to accomplish their work more efficiently and effectively. While there have been many studies done in the area of human computer interaction (HCI) that have contributed to the design of better interfaces to computer systems, problems remain, particularly concerning incompatibilities between systems, and the inability of many applications to support multiple users effectively. Given that more and more work is being mediated by computer systems, the gaps and inabilities of these systems to support people in their working practices, e.g., where workers in a team need to share and jointly manipulate information, becomes a source of frustration. Again, this has resulted in pressure being put on software and hardware houses by end-users to support greater inter-connection between PCs and available applications that would allow for sharing of applications, multi-user access to facilities, and greater integration of applications at the use level. There is a need for augmenting possibilities for interaction by using the computer to help coordinate activities and support joint problem-solving, for example by providing shared workspaces where people can dynamically create objects and modify them, and shared tools for annotating and writing documents. These concerns are explicitly addressed in the CSCW community, thus making user representatives very interested in the area, as it may provide more useful and usable tools for the workforce.

At another level, people are becoming more knowledgeable about technology and wish to have a say in how their work practices are going to be changed by new
technology. They wish to proactively affect the design, and take part in prototype evaluations. In a complementary development, a number of system developers also wish to support this process of user involvement and are searching for ways in which to support it. They see CSCW as a possible avenue for greater cooperation with workers in the design of future systems (Bodker et al. 1988), through the development of better computer-based tools in this cooperative design and work process. While issues of user involvement and cooperative design should not be seen as the cornerstone of CSCW, it is the case that many practitioners of these techniques are visible in the CSCW community, which has lead to an increased interest in the area from a number of sectors anxious to improve design methods and results — representing both developers and users.

The Turn to the Social

On the research side, a certain amount of dissatisfaction was setting in among members of the HCI community, disappointed with the relevance of many HCI studies to actual design and work practice (Thomas & Kellogg 1988). One feature of concern was the neglect of anything beyond the human-computer dyad. There was a total failure to take into account the situated nature of everyday activity (Suchman 1987) and the way work is “complexly social” (Hughes et al. 1991). CSCW has attracted interest from a number of academic research groups who are concerned with the use of more qualitative methods and field study techniques in order to make HCI work more ecologically valid. This shift in emphasis has also allowed for the participation of groups heretofore more on the fringe of HCI, for example, sociologists and anthropologists, who have been able to find a supportive atmosphere for their empirical studies of work settings in CSCW, see (Bannon 1992). Given the focus in CSCW on the requirements of the work, and thus the need to study the work domain closely, field studies become of central importance.

2.2 Technology Factors

The Search for New Software Markets

CSCW has attracted interest from commercial software developers as it is seen as a possible growth area for new software applications — groupware, in terms of supporting group activities rather than individual activities. While some early groupware products e.g. shared calendaring systems (see below) have enjoyed mixed success, developers are still optimistic. Interestingly, it has been noted by Greif among others, that in the long run, the differentiation of a segment of the software product market in terms of ‘groupware’ may not make much sense, as all software will be groupware, i.e. any particular software application will have the required features to support group use when appropriate. For the moment however, there is a massive increase in the marketing hype for software specifically focused on group support in both real-time and non-real-time settings.
Technological Developments

Tied in with market forces requiring greater coordination and general ‘connectivity’ of computer systems there have been significant developments within the technological arena allowing for infrastructural computer networking. The idea of the isolated PC in the office is becoming an image of the past, with the advent of various forms of local area networking (LAN) that allow for shared resources. Networks support greater connectivity between people, locally, regionally, and globally. Other technical developments in the areas of interoperability, security, transparency, and distributed systems will support the needs of organizations for greater responsiveness and flexibility. Again, a number of these problems are being tackled in innovative ways within the CSCW arena, where investigations of work settings and user demands are putting quite specific and hard-to-achieve requirements for systems to the software engineering community.

2.3 Changing practices

The earlier information systems goal of ‘automating the office’ has been discarded on both practical and theoretical grounds. Information-flow diagrams of office activities do not, in any literal sense, specify how work actually is accomplished: handling ‘routine’ discrepancies, bending the ‘fixed’ rules, contextualizing aspects of the work, etc. This does not mean that they are without any merit, but it does mean that they cannot be assumed to ‘capture’ office work, and serve as an adequate base for automating office activities. The idea of an office being a place where people perform a set of well-structured tasks according to prescribed procedures has given way to a view of the office as a social community where work is accomplished through the locally situated activities and interactions of office members. Ethnographic studies of office environments have carefully documented aspects of this rich interactive world, constructed by the participants (Gerson & Star 1986, Suchman 1983, Wynn 1979).

Recently, IS researchers have accepted the need to understand more fully the practices of people at work, in order to build more appropriate supportive technology. The shift in emphasis can be seen in the change in terminology from ‘automating’ the office to ‘supporting’ office workers with ‘office information systems’ where computer systems are seen as support systems for the human workers, rather than as replacements for them, see, for example. (Woo & Lochovsky 1986, Hewitt 1986). CSCW, through its emphasis on the support aspects of the technology, and with its interdisciplinary community, including ethnographers and others who focus on work practices, has attracted interest from many researchers in IS who see the need for further understanding of work place practices as a key aspect of improving the quality of IS designs.

This brief outline of issues is simply indicative of some of the contributory factors that have exerted pressure for change in the design, development and use process concerning information systems in organizations. The argument is
not that any such set of factors ‘caused’ CSCW to emerge, but rather, that concerns such as these (and a host of others besides) made people open to new ways of discussing and conceptualizing issues concerning the design and use of information systems in organizations. Debate continues as to the novelty of the problems and the nature of the solutions that are the topic of CSCW. For of course, in some sense, CSCW is not ‘new’. Computers have always supported, or perhaps disrupted, collaborative work activities, from the earliest days of mainframe computer system applications, but one could argue that the above changes have heightened the awareness of system developers to the need to support the increasing variety of cooperative work arrangements that can be found in modern organizations. Taken loosely, this simply means that it is being recognized that in most work situations the accomplishment of work involves multiple individuals, together with their computer-based tools, and that many inefficiencies in work practice stem from inadequate computer-based support for the smooth interleaving and coordination of tasks across people and machines. Such a loose definition of a field is somewhat problematic, and there have been a number of attempts to articulate a more comprehensive vision of the CSCW field. Let us now look at some of these attempts to provide a clearer and more coherent account of nature of this new field.

3 Defining CSCW

Despite interest in the new field there is still no universally accepted definition of CSCW (Wilson 1991). Indeed, whether CSCW can be viewed as a new field of research in its own right has been questioned by some. As a way into some of the confusion and controversy for the reader, we can distinguish at least four distinct ways of viewing CSCW.

(1) CSCW as simply a loose agglomeration of cooperating and at times competing communities

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 allows 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. 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 emphasizes 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 1989).

(2) CSCW as a paradigm shift

Hughes et al. (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 distinct research field. 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 organized 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’, realizing that much work on people-technology systems has systematically avoided issues of the social organization 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 1988). 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 ignore settings in everyday organizational life where issues such as power and politics play a large role. The ‘group’ focus has also been criticized, based on difficulties of enumerating properties of ‘groups’ as found in the work place.
The relevance of many group studies undertaken in lab situations to workplace situations have also come under criticism.

(4) CSCW as technological support of cooperative work forms

Barinon & Schmidt (1989) 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 1991), 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. 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. Lyytinen & Ngwenyama (1992) argue in a somewhat similar vein to Schmidt and Bannon, but utilizing Giddens’s ‘structuration theory’ as an over-arching conceptual framework. This emphasizes the duality of structure and process, and in the context of CSCW applications views them as rules and resources that can be drawn on and affected by social actors.

(5) CSCW as Participative Design

As noted by Howard (above) the CSCW community contains within its ranks a number of people who are proponents or practitioners of participative, or participatory, design (Clement & Van den Besselaar. 1993). Their focus is on developing alternatives to traditional systems design, alternative ways of doing design, of involving users, etc., see. e.g., (Greenbaum & Kyng 1991). It is the involvement of what has come to be called the Scandinavian school of systems developers in the CSCW community that has lead some people to equate the CSCW area with participative design (PD) practices. This is in my opinion, a clear mistake that can only add to confusion surrounding both fields. While certainly various forms of user involvement are important to the development of successful CSCW systems, use of such techniques or ideas does not automatically signify any focus on cooperative work as variously discussed above. Nor, in many cases, are PD researchers interested directly in computer support for the design practices they are proposing. 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. At the same time, the interests of PD and CSCW can overlap. For example, the software development process itself can be seen as a form of cooperative work which is supported by computers, and thus is an interesting and quite legitimate domain for CSCW studies. However, equating CSCW and PD entails unnecessary restrictions for
each field of endeavour, and serves to confuse their different research goals and agendas. Part of the confusion has been caused by the fact that a number of members of the CSCW community are also members of the PD community. This should not obscure the differences between the nature of the two fields.

Which of the perspectives listed above is correct? Perhaps this is the wrong question to ask, as perspectives can be more or less illuminating, in certain contexts, rather than being clearly right or wrong in any absolute sense. It is important to be aware of the different frames of reference that people apply to the area of CSCW, in order to better interpret their position. There are some implications of the different perspectives however, in terms of an agenda for CSCW research and development which should be noted. From perspective (1) above, CSCW is mainly a convenient rack or stall on which to hang a variety of topics, around which communities gather, and it may be replaced rather easily by another name, or fad, so long as it brings along some of the communities that are gathered around the CSCW stand. In other words, while the CSCW phenomenon may have been useful in community building, it is a hollow shell. While this may be regarded as an overly cynical position, it might also be labeled extremely pragmatic, and is the view held by many outside observers of the CSCW field, who see little in the way of a distinct conceptual framework, methodology, or research agenda in the CSCW field. The second perspective also views CSCW as more of a convenient place holder that draws attention to the social in any person-technology situation, rather than delineating any specific form of work or technology. It also does not see CSCW as constituting a natural field of inquiry in its own right. This perspective is widely held by people in the social sciences attracted to the CSCW fold.

Perspective (3) captures one of the more pervasive perspectives on CSCW, found especially among software engineers and information technology consultants. There is a distinct ‘technology-push’ flavour to much of the argumentation in support of this position, namely that groupware technology will help solve many of the problems in organizations and the economic environment. With a few notable exceptions (Grudin, Kling, Suchman) this view is very prevalent in North America, especially among software houses. This is not to claim that European views are superior, rather the small number of CSCW adherents in Europe adopt a variety of positions on the matter, and fewer large corporations have committed to the concept to date. Perspective (4), while seen by many as overly prescriptive, does have the advantage that acceptance of this perspective allows one to define more clearly the nature of CSCW as a research area — understanding the nature of cooperative work, mechanisms of interaction, and their computer support (Schmidt 1991). The last perspective listed above, seeing CSCW and PD as synonymous, while currently held by a number of people, is based on a mistaken understanding of the nature of each of the fields, each of which have a distinct arena of study, although there may be overlaps in their activities at times.

While cognizant of the arguments made by those who view CSCW as ‘merely’
a paradigm shift, the position taken in this paper is that CSCW can be seen as a new research field involved in exploring a wide range of issues concerning cooperative work arrangements and its support via information technology. A focus on the multiplicity of cooperative work arrangements and their computer augmentation is what makes the area ‘new’. While earlier work in the ‘office automation’ field has at times concerned itself with such issues, the new field should not be seen as simply an extension to office automation or management, information systems, as CSCW entails both a wider remit 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. Such a view of the field opens it up to a wider mix of disciplines than simply computing and software engineers, encompassing cognitive and social psychologists, work sociologists and anthropologists, organizational theorists, and many others.

In sum, there are a variety of views on the nature of the CSCW field, each with adherents, and each with consequences for the development of the field, as noted briefly above. That the nature of the CSCW field has been, and continues to be, the subject of debate as we have shown here is not necessarily problematic. In any area of science, the definition of the field—its core concerns and its boundaries—is best viewed as ‘contested terrain’, even more so as the field struggles to find a unique identity, so it can set itself apart from its progenitors. The simple fact that, there is dispute is symptomatic of a healthy debate about the underlying issues of computer support, the nature of work, the role of groups in organizations, etc., which should be clarified over time. Nevertheless, for the purposes of this exposition, and to make my own perspective on the field explicit for the reader, the paper will adopt the perspective identified as (4) above in the remainder of the paper.

Thus far the paper has been concerned with giving some background to the emergence of the CSCW field, and the different conceptualizations of its object, of study. In Section 4, we turn to look at some applications within the purview of CSCW, and note some of their features, in an attempt to show the relationship between topics discussed in CSCW fora and practical applications. Have we learned anything in the design of systems as a result of the new field?

4 Early Experiences with CSCW Systems

In this Section we briefly examine a number of applications, both commercial and research-oriented, that have been the focus of attention in CSCW circles. While
not all of them (e.g., basic electronic mail) can be perceived as arising directly from work in CSCW per se, they have been chosen due to their visibility in the context of discussions about CSCW and Groupware. They simply serve here as exemplary systems in the CSCW field. New research systems and commercial products are being announced continually, but our purpose here is simply to give some examples of systems which have been developed and which have had some form of evaluation, however minimal. The purpose here is to learn some lessons from the successes and failures of aspects of these systems, for future use. The list of systems includes some focused on the communication function, some on coordination, others on meeting support, and finally a step on the road towards more general ‘platforms’ or environments for a variety of CSCW type applications.

4.1 Applications focused on Communication

Electronic Mail

Electronic mail (email) is seen by many as the clearest example of a ‘groupware’ application that has made a significant impact in the workplace. It is distinct from many groupware applications in that it is not focused on the support of tightly-knit groups, but can provide opportunities for networking within and across organizations. Having the ability to send messages electronically to people connected either via a local area network throughout an organization or a wide area network around the world has undoubtedly given new opportunities for forms of remote collaboration undreamt of in the past. Some argue that e-mail is actually the only CSCW application that has been accepted and clearly been a success in the marketplace (Grudin 1991). Clearly, this application pre-dates the CSCW field per se, and so cannot be claimed as a success story for the nascent field directly.

Bullen & Bennett (1990) in their large interview study of use of a variety of groupware tools in organizations, found that the basic electronic messaging capability available on all these systems was seen as far and away the most valuable feature. Indeed, they go further and note: “... given the choices existing in information technology tools today, the people we studied used what we are calling ‘message functions’ almost exclusively” (Bullen & Bennett 1990).

The MIT Information Lens Project

The Information Lens system (Malone et al. 1987) has been the subject of a number of research reports and the ideas behind it have now been incorporated into several commercial products. The system is designed to support people in managing their electronic mail. It provides capabilities for organizing mail based on various aspects of the incoming message. It allows users to make message templates of various forms and have rules that act selectively on these ‘semi-structured’ messages. It helps the sender to structure messages appropriately:
and can serve a reminder function for what information is necessary for certain announcements (e.g., to remember to specify the location of a meeting) as well as helping the receiver to sort incoming mail appropriately, rather than, as at present, have all kinds of messages mixed together in the incoming mail file.

In an empirical investigation of the use of the Information Lens system, Mackay (1990) was able to show that even people without significant computer experience could create and use rules. She also noted wide variability in patterns of use of the system. Of particular interest was the observation of how one person managed to exploit a debugging feature in an early prototype of the system to use Lens in a novel way. This use then spread among users, and subsequent versions of the system provided explicit support for this new use. Thus the very conception of what Lens was, and how it was to be used, changed for the design team as they witnessed the way people actually used their prototype system. This provides a very powerful example of how important ongoing testing and evaluation studies are as the original design idea becomes articulated and reified in a particular piece of software. On another level, it changes how we think of the design process, and the actors which it encompasses, as we see original ideas about what the tool is and how it can be used coming from the ‘users’ themselves.6

The Coordinator System

This commercially available system is one of the most talked about CSCW applications due to its articulation of a well-developed theory of ‘language as action’ that has exerted considerable influence in the research community (Winograd 1988). It also has strong advocates in the commercial world who find that use of the system has increased their productivity enormously. The actual system can be simply described as a fancy electronic-mail and project-management system. The system is built on the belief that human action is based on conversations, primarily conversations of a particular form, for action. Thus people using the system do not simply send mail, but make requests, or promises, or offer or decline to perform certain activities. (The system does allow for ‘free-form’ responses, but this choice indicates abdication of the underlying framework on which it is built). Within this framework, the system then keeps track of the commitment made by individuals. Bullen & Bennett (1990) note how the ability to link messages in some electronic messaging systems (e.g. in Higgins, The Coordinator, All-in-One) was found in practice to be a very useful facility. Through its concept of a ‘conversation’, The Coordinator supports this linking quite explicitly. At the same time, there is quite bitter dispute between different groups as to its explicit design goal, which is to change the way people in organizations think and act. Whether speech act theory is an adequate theoretical framework on which to erect a computer-mediated communication system is open to question (Bowers & Churcher 1988) but, as Robinson (1991) notes, the main complaint against the system in use has been that it seems to exclude negotiation. Great care is required in the construction of group tools in order to ensure that the system does
not embody untenable assumptions about the nature of group communication and group activity. What is required now, however, is closer analysis of actual uses of the system, as the extant case studies (Johnson et al. 1986, Bikson et al. 1988, Carasik & Grantham 1988, Bullen & Bennett 1990) are limited in a number of ways, which makes it difficult to interpret their findings unambiguously.

4.2 Meeting Support

Shared Calendaring & Meeting Scheduling Systems

There are a number of research-oriented and product-oriented CSCW systems that incorporate an electronic calendar system which can be utilized by meeting scheduling software to provide an automatic meeting scheduling capability. At present meeting scheduling is a difficult and very time-consuming process, and the rationale was that software to handle it automatically could make significant improvements in office productivity. While the idea appears very simple, the practice has shown otherwise, as noted in the case study work of Ehrlich (1987) and in (Bullen & Bennett 1990), and discussed extensively in (Grudin 1989). To summarize his arguments, for one thing, electronic diaries cannot replace paper diaries, as they are not portable, nor do they give the same flexibility and utility possible through use of post-it notes, signs from different coloured pens, clippings, etc., often found in physical diaries. Another problem is that basically all of the people on the system must commit to using the system, i.e. to updating their diaries, before the system can really be used. If only half the group do it, nobody can rely on the system. Yet it is not at all clear what the benefits are to some members in keeping their electronic diaries updated, as the main benefits accrue to senior managers who call meetings (and/or their secretaries). The tradeoff between the work required and the benefits accrued are not equitable. Even if every one commits to do this, there are still problems about giving up control of one’s “free” time. As Grudin cogently argues, free time is not really free. Managers may be willing to have their time scheduled for a meeting with their superior automatically, but not the reverse. It all depends on what the situation is, if somebody is willing to schedule a meeting with certain people. Just as we saw with the Information Lens, people wish to have control of the situation, and thus will often wish to change priorities depending on the situation and their personal context. What would appear to be a relatively trivial affair, meeting scheduling, in practice can involve quite complex, and rapidly changing decision rules that cannot be clearly defined in advance of the actual situation. Ehrlich notes that in cases where electronic calendars are used heavily, the role of secretaries in screening meetings is often crucial to making the system work, so that the meeting scheduling involves negotiation between people and is not automatic. These experiences should make us aware, if we are not already, of how apparent technological fixes to what are primarily social and organizational problems can come unstuck.
Xerox PARC CoLab

This project involved building a computerized meeting environment to support, small (2 to 6 people) face-to-face meetings. A special room was constructed containing several workstations connected on a local area network. A number of software tools were developed to allow users to jointly work on documents and share the same views on these documents (WYSIWIS: What You See Is What I See). The project has now ended. Stefik et al. (1987) describe the design goals of the project and some of the software tools. This system has been the subject of an interesting evaluation project (Tatar et al. 1991), which presents a very thorough analysis of problems in use of the original system, and their cause, together with recommendations for improving the design of one of the tools. The major problems users experienced had to do with the visibility of certain operations and with problems in reference. Studies showed that people at times had problems in interpreting others comments when their views of the shared world did not match. So, for example, if people resized or moved the shared window on the system, peoples references to spatial locations might not always be appropriate for the other participants. This caused considerable disruption to the work of the group. The focus of work on this project would appear to have been more on examining the technical issues involved in developing software for the real-time computer support of groups than on an understanding of how people could or would use such a system in everyday work activities.

Ventana GroupSystems

This commercial product is a spin-off from the work of Jay Nunamaker and colleagues of the University of Arizona. IBM’s TeamFocus product is a related spin-off. The system consists of a number of different tools that are intended to assist in aspects of the group decision-making process. There is support for brainstorming activity, for ranking alternative choices and voting on them, for preserving anonymity, etc. Focus has been on the support of co-located real-time teams, but the technology can be adapted for use in remote situations or for non-real-time use. Versions of the system have been the subject of a large number of articles, see (Nunamaker et al. 1991). There have been numerous studies conducted on the system, both in the laboratory and, more recently, field settings. There have been reports of massive increases in productivity based on much shorter lead times for getting decisions made in large groups through use of the system. It can be difficult to assess the validity of these claims, as often the comparison is made between “time taken to reach a decision with the system” versus “people’s estimate of how long it would take to take the decision without the specific technology.” Such figures are difficult to verify. More generally, there is the question of what kinds of meeting are such systems appropriate for? In situations where the group agrees on the general framework of important factors in the decision-making process, then the system may speed up the process, but in situations where the major topic of the meeting is arguing about the very grounds
for making the decision, it does not seem that the rather simple model of decision-making embodied in the system would be appropriate. As the commercialization of the product continues, it will be of interest to observe further evaluations of the system in different contexts of use.

4.3 Coordination /Procedure Systems

DOMINO Office Procedure System

This prototype procedure system is interesting as it has been extensively described in the literature and more recently evaluated informally by some of the design team (Kreifelts et al. 1991). The system makes a number of assumptions about the nature of office work, and provides support for a number of work activities. A working prototype has been developed and in use in a research organization, where initial studies of its use have been performed. The initial system model had been the subject of some criticism concerning its view on work activities, but what is interesting is to see what actually happens when in use. The small internal study of Kreifelts and colleagues shows that, indeed, the system was seen as problematic on the grounds of not allowing for sufficient flexibility, for example allowing necessary informal communication, for lack of integration with other tools—for example electronic mail and spreadsheets. Etc... The point is not that such systems have no future, but that we must take seriously the findings that people do not simply ‘follow procedures’ in an office, and thus office support must be very tailorable and flexible if it is to be of practical use to the people doing the work, see (Robinson & Bannon 1991). It is encouraging that the development group are currently engaged in re-designing the system so as to take into account the experiences of use of the prototype system.

XCP

This was a very early project management or coordination tool developed at DEC that was designed to assist an organization in implementing and maintaining its procedures. According to its authors: “Two of its objectives are to shoulder the burden of managing the organizational complexity and to ensure that necessary communication occurs.” (Sluizer & Cashman 1984). It was to assist in carrying out formal work procedures through defining different roles and obligations in a high-level protocol which was then used in the work situation to coordinate and manage people’s activities. The initial protocols developed were for the software problem reporting area. Early experiences with the XCP prototype indicated that a major difficulty was in developing and then ‘debugging’ the formal protocols which were the basis for the system being able to coordinate work activities. It would appear that XCP assumes that what people do in many work settings is to follow procedures. No wonder the authors note the difficulty involved in developing and ‘debugging’ the formal protocol. The generalization of such an approach to a wide range of office situations seems unrealistic. It appears to
exclude the dimension of ‘task articulation’, which is a key issue related to the work that must be done by people in their specific work situation in order to make the system work, see (Schmidt & Bannon 1992).

4.4 Towards CSCW Environments

Much has been written about the need to provide a more integrated platform for CSCW applications, as presently, many CSCW applications can be seen as ‘islands’ which do not integrate well with other software applications (Schmidt & Rodden 1993). From the point of view of the user, such ‘seams’ between applications are frustrating. More recently, developers have been attempting to develop more suitable underlying development environments for CSCW applications. In the meantime, some developers have adopted an intermediate strategy of bundling together a variety of functionalities which do have some common base, even though this base is not generic across all applications. An example of such a strategy is that of the software house Lotus with its Notes groupware product.

An Example: Lotus Notes

This commercial product 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 organization. While there still exist seams between what is available within Notes and other software applications, the user is now able to perform a wide variety of tasks—sending mail, sharing information, annotating files, developing simple databases, etc.—within a homogeneous environment. A number of companies have taken the strategic decision to purchase such systems corporate-wide, and even globally. Whether such a technology push will lead to successful adoption of such systems is open to question. Studies are just beginning to document what happens in specific settings when this technology is introduced (Orlikowski 1992). 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 little education of users about the utility of Notes for their daily work. She also notes the discrepancy between the organizational culture evident in the firm—a competitive, individualistic environment, and the purported intent of Notes to foster ‘sharing’ of information among people in the organization. Rather than revolutionizing the work environment Orlikowski describes how the system was being used to build applications supporting individual, not group productivity, and mechanizing existing work flows, rather than developing new work arrangements. It should be noted here that this field study took place during the initial six months of implementation of the Notes system in the organization, 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 organization. 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.

In sum, while the developments listed do not all depend on specific CSCW insights for their existence, one can see how the discussions in the CSCW arena concerning the nature of procedures, modelling, the social organization of work, shared spaces, the need for close empirical study *in situ*, etc. provide important insights into the nature of work and how software might support or disrupt this process.

5 Conclusions

So, after this quick tour around some CSCW systems, we come to the end of our initial exploration of the CSCW area. The purpose of the paper was to assist the reader in understanding the nature of this new field, and of some of the ongoing debates within it. Experiences of use of some sample CSCW systems were briefly mentioned, showing some of the problems and difficulties that exist when we attempt to ‘support’ people in their work. Whether the field is built on shifting sand or on a solid base cannot be answered directly, as we saw how there exist a number of differing, incommensurate, views on what constitutes the field, so the answer to the question must be relative to a particular position. From a personal perspective, I believe that while the label CSCW may not survive indefinitely, the issues that are of concern to it will remain as important as they are seen today.

It is important to make clear that the success or otherwise of the ‘field’ of CSCW does not simply depend on the success or otherwise of the groupware systems produced to date. At the very least, the field of CSCW has assisted in the process of re-examining a number of ‘fictions’ concerning how people use tools and perform their work. It has, amongst other things, focused attention on how people work together in different settings, the need for better integration across applications, and has begun to deliver in the form of requirements that future systems for cooperative working will have to meet. The area has also provided a forum for important discussions on the role of models and modelling. In the early days of CSCW there were a large number of papers that described design models to handle various aspects of group activities that seemed open to question, see (Robinson & Bannon 1991). There was little evidence that such models were of any practical relevance to the task at hand, and further, in these papers, no discussion of such issues as possible testing or evaluation of the systems took place. However there seems to be an emerging consensus within the CSCW community about both the necessity for models of aspects of work.
activities and the limitations of certain kinds of models, and so the field as a whole has moved forward to richer understandings of work and of how to support the work process through technology. While debate about exactly what is ‘new’ in the field continues, there is no doubt that the area has succeeded in attracting and holding an interesting interdisciplinary community over the last few years, from both technical and social disciplines. The task that lies ahead is whether these different interests and research traditions can be melded together in order to produce software systems that truly support cooperative work.

Notes

1. An early version of this paper (entitled “Discovering CSCW”) was prepared by the author while working at the Dept. of Computer Science, Copenhagen University, Denmark in 1992 and presented at the 15th IRIS Conference, Larkollen, Norway in August, 1992. The author would like to thank the anonymous reviewers for helpful criticisms of the original manuscript. The support of the EC Esprit COMIC Basic Research Action (through the author’s work on this project with Kjeld Schmidt at the Cognitive Systems Group, Rise, National Labs, Roskilde, Denmark) and the EC Cost 14 Co-Tech Action is also acknowledged.

2. In terms of names, it included people like Doug Engelbart, who in the 1960’s pioneered interactive computing and team support in his NLS/Augment system, Clarence “Skip” Ellis, well-known in the office automation area, Tom Malone, at MIT, who was developing his ideas on organizational interfaces, Randy Trigg, hypertext researcher, Anatol Holt, developer of coordination technology, Carl Hewitt, working on conceptions of office information systems as open systems, Robert Johansen, Murray Turoff and Star Roxanne Hiltz, researching computer conferencing systems, and many others as well as people from co-sponsors MIT and Digital.

3. For example, the journals Organizational Computing (Ablex), CSCW: An International Journal (Kluwer), and the forthcoming Collaborative Technology.

4. For example, Grudin (1991) argues that the CSCW area can be seen as an arena where two different development traditions, that of Information Systems (IS) and Human-Computer Interaction (HCI) converge. He sees the CSCW focus on groups as intermediate between the traditional focus of HCI—on individuals, and of IS—on the whole organization. Similarly, he views the development process for Groupware as requiring a melding of the dominant forms of development work in the other two fields—the contract tradition of IS and the product development tradition of the HCI field.

5. No attempt is made to cover the full range of CSCW applications, or to provide a comprehensive taxonomy for them. In my view, the initial attempts to provide taxonomies have been unhelpful as they usually focus concern on irrelevant dimensions of work activities or technical features of systems (e.g. Johansen’s (1988) 2 * 2 table distinguishing groupware on the ‘dimensions’ of time (synchronous / asynchronous) and place (same place/different place).

6. This issue of use leading to re-design is discussed in more detail in (Bannon 1993).

7. See the excellent discussion of problems with GDSS systems in Ch. 2 of Whitaker (1992).
References


