Computer Supported Cooperative Work (CSCW) **1**: 95–118, 1992.

On the Social Organisation of Organisations

MARINA JIROTKA[1], NIGEL GILBERT[2] & PAUL LUFF[3]
[1]*Centre for Requirements and Foundations Programming Research Group, University of Oxford Computing Laboratory, Oxford OX1 3QD, UK, EMail: Marina. Jirotka @prg.oxford.ac.uk;*
[2]*Social and Computer Sciences Research Group, Department of Sociology, University of Survey, Guildford GU2 5XH, U K, EMail: gng@uk.ac.surrey.soc;*
[3]*Department of Sociology, University of Surrey, Guildford GU2 5XH, U.K., and Rank Xerox Cambridge EuroPARC, 61 Regent Street, Cambridge CB2 1AB, UK., EMail: Luff.EuroPARC@rx.xerox.com.*

(Received 29 October 1991; in final form 7 May 1992)

Abstract. This paper considers a range of theoretical approaches to the understanding of organisations and the implications these views have for the design of computer supported cooperative work systems. Organisations have often been seen as structures which can be divided into hierarchically ordered parts or as networks of informal relations. Organisational theorists have also considered organisations to resemble organisms with needs for survival in potentially hostile environments or as information processors, with decision-making as their most important characteristic. More recently, developments in the social sciences have suggested that radical reconceptualisations are necessary for the study of work settings. Consequently, these developments have attracted attention due to their potential to inform system design. This paper reviews some of these efforts and comments on some of the outstanding problems that have to be overcome if studies of everyday work settings are to inform the design of systems to support collaborative work.

Key words. Organisations, Social Science, CSCW, Ethnography, Ethnomethodology

1. Introduction

The increasing attention paid to computer supported cooperative work has been a major motivation towards looking more widely at the social context of human-computer interaction. CSCW forces attention on issues such as interpersonal communication and coordination, and how these are mediated by, and may be assisted by, computer technology. It has inspired or encouraged a stream of research on computer-mediated communication (e.g. Winograd and Flores 1986, Bowers and Churcher 1989), on group behaviour when interaction is through a computer network (e.g. Finholt et al. 1990, Bikson and Eveland 1990) and on methods of managing interaction (e.g. Greenberg 1991, McCarthy et al. 1990) all of which have noted the significance of social context.

* We are grateful to John Bowers, Christian Heath, Graham Button, Matthew Bickerton, Stephen Lee, Ivan Leudar, John Churcher, Robin Wooffitt and the three anonymous reviewers of the paper for their help and comments on earlier versions of this paper. The paper originated from work done while the first author was at the University of Surrey as part of a project on Theories of Multi-Party Interaction, supported by British Telecom.

At the same time, there has been a gradual realisation that even understanding how people work with systems designed for individual use requires that attention be paid to the local context (Suchman 1987, Winograd and Flores 1986, Whiteside et al. 1988). It is increasingly being recognised that users' actions and interpretations are informed by and embedded within particular social settings; the social context acts as a resource for users to interpret and give meaning to their actions.

While the importance of the social context has only recently become evident to those concerned with human-computer interaction, it has long been the major focus of those interested in the social impact of computer use within organisations. The influence of the organisation on members' activities, the consequences of the design of computer systems for organisational behaviour and the effect of the structure and dynamics of organisations on the shape on the computing systems within it, have all been matters for attention (Kling 1980, Hiltz and Turoff 1978, Hiltz 1982).

Though there has been an increased recognition, due to these different influences, of the significance of the social and organisational context, both the ways that organisations have been conceptualised and the ways that the relationships between context and action have been theorised have been very varied. This paper aims to identify the main strands of thought in these literatures and to show how they relate to the design of CSCW systems.[1] In the following sections, we discuss a number of approaches to the study of organisations, beginning with the classical and conventional idea that the essence of an organisation is in its structure, as represented, for example, on an organisational chart. We then consider some of the criticisms which this approach has attracted and describe some other approaches advocated by sociologists of organisations. In the final sections of the paper, we explore the implications of some relatively recent developments in the social sciences and comment on their potential implications for the design of CSCW systems.

2. Organisations as structures

2.1. STRUCTURING THE WORKPLACE

Perhaps the most pervasive view of organisations sees them as structures divided into parts that are ordered hierarchically, reflecting lines of command and control. Individuals in an organisation perform tasks assigned according to a strict division of labour. This perspective emerged towards the end of the nineteenth century as expanding markets, larger and more complex factories and the growth of a new engineering profession led to a need to rationalise the workplace and its management through systematising the administration, control, production and planning of factory work. In response, several theories influenced by the prevailing ideology of scientific rationalism, conceptualised organisations as systems

which could be designed to maximise their efficiency. Classical Management Theory and Scientific Management were typical of these theories and still influence modern management techniques.

Classical Management Theory (Fayol 1949, Mooney and Reiley 1931), focuses on the design of the total organisation, viewing it as one structure divided into interdependent parts or functional departments, each of which is characterized by a pattern of precisely defined jobs. These jobs are organized in a strict hierarchical fashion, with designated lines of authority from superior to subordinate. Because the authority relationships are so clear cut, they can be represented in an 'organisational chart' which captures the structure of the whole organisation.

In contrast, Scientific Management (Taylor 1911), focuses on the design and management of individual jobs. The principles of Scientific Management can be grouped into three broad classes. First, managers should be given total responsibility for the organisation of work, thereby leaving workers free to concentrate on manual tasks. A 'thinking' department of managers should be set up to be responsible for task planning and design. Second, all tasks should be thoroughly examined and if necessary redesigned to increase efficiency. By studying the methods adopted, the time taken, the tools utilized and the fatigue generated by any task, the optimum procedure for that task can be discovered. Third, methods should be adopted for the selection, training and monitoring of labour to ensure that work is done efficiently and according to the defined procedures.

The underlying assumption of these theories is that the actions of people can be rationalised and closely defined. Individuals are thereby seen as little more than a product of the forces that impinge on them. Not surprisingly, when these theories have been implemented, their influence has often been considered to be dehumanising.

Braverman (1974) offers a powerful critique of the degradation that Taylorist principles bring to the workplace. Rather than being 'scientific' and attempting to discover what is actually the case, Scientific Management accepts the view of management that it has a troublesome workforce to be kept under control. To secure control in the face of ever increasing competition, management must increase the division of labour into simpler and less demanding tasks. The workforce as a whole becomes more productive, yet individuals become less skilled. Braverman also argues that the introduction of technology into a wide range of occupations will inevitably be used to increase managerial control of the labour process and the 'de-skilling' of workers.

There has been considerable debate about the empirical validity of Braverman's thesis about the inevitability of the degradation of work. Critics have questioned whether technology is necessarily de-skilling and have shown that the work force can indeed resist managerial control (Friedman 1977, Fox 1974; for a review see Thompson 1983 and Wood 1982). Nevertheless, the idea that organisations are composed of people performing tasks within a formal and rigid hierarchical structure is one which has permeated deeply into management

philosophy and appears to form part of the background assumptions of many of those who design computer systems for organisations.

2.2. DIVIDING THE LABOUR OF USERS

Structural theories of organisations have attractions for system designers and, in particular, for designers of CSCW systems. A long standing problem in software engineering is to determine the functions a system is to perform. One solution, characteristic of 'task analysis' (Diaper 1989) and often adopted for the design of single user systems, is to associate tasks with individuals and then break down those tasks into subtasks. Later in the design process, this analysis is used to form the basis for a division of labour between the system and user. For CSCW systems that are designed for cooperating groups of users, the problem is more complex. One solution is to take the structural view of work further and design a division of labour between users, assigning each individual a role and allocating tasks to that role. The Cosmos (1989) system adopts such a solution. It allows for the specification of roles, the allocation of tasks to roles, the definition of a set of messages that may be passed between roles and the permitted sequences of these messages (Wilbur and Young 1988). Although Bowers and Churcher (1989) state that they have no wish to model the "kind of real world entity [that] might correspond to a particular role" (Bowers and Churcher 1989: 216), the examples chosen to illustrate the system seem to associate such pre-defined roles with pre-specified tasks. In the example domain of report production, roles such as Author, Director and Line Manager were identified along with sets of messages to be passed between them. The system would then require the Author to pass a report to the Line Manager before the Line Manager creates and sends an authorisation back to the Author.

It was found that the Cosmos system was viewed by users as too rigid (Bowers, personal communication). Once roles in the system and their associated tasks had been defined, they were impossible to change. For example, a set of tasks could be associated with writing a small document, and another set with producing large, multi-section documents. If, during production, a small report grew into a multisection document, there was no way of easily redefining the associated tasks. A related problem was that the system did not support the definition and creation of previously undefined tasks. For instance, an individual could not tell another that some task was going to be delayed. To do this, the individual had to by-pass the Cosmos system and use electronic mail.

The apparent inflexibility of the Cosmos system may be partly due to the use of a particularly rigid conception of role.[2] However, it may also be due, in part, to the notion of 'task' embodied within the system. Tasks are precisely defined and associated with individual users. This idea of what constitutes a task can lead to

the design of inflexible tools and resources. For example, in ICL's desktop conferencing system, tools and resources have been designed to be under the control of the user who initiates the conference. Consequently, when using a shared sketching space, other users are required to 'borrow' tools, such as the keyboard, from the initiator. The idea that a task is owned by one individual and others can collaborate in the task only through delegation from the owner, is thus built inflexibly into the design of the system.

Systems which just attempt to reproduce the formal vertical lines of control and communication may even hinder cooperation between the workers that they are designed to support. An appropriately designed CSCW system, in contrast, could increase horizontal lines of communications within an organisation and potentially undermine hierarchical levels of authority:

> Cooperative work is not hierarchically organized. The organisation of cooperative work is relatively flat and has an informal character. It relies heavily on horizontal communication.
>
> (Sørgaard 1987: 2)

3. Organisations as networks

3.1. RELATING TO THE WORKER

As a reaction to Taylorism, attention became focused on 'human' issues in the search for a better understanding of organisations. The Hawthorne Studies of the 1920s and 30s were concerned initially with discovering the effects of fatigue, accidents and labour turnover on rest pauses and the physical conditions of work.[3] However, as the studies progressed, they became broader in outlook and took other aspects of the work situation, such as workers' attitudes and their social environments, into consideration.

The significance of the Hawthorne Studies lies in their 'discovery' of the Informal Organisation based on friendship groups and spontaneous, unplanned interactions between their members. The informal organisation is seen as working in parallel with, and sometimes opposed to, the formal organisation. It depends on personal relationships and provides a way for members of the organisation to fulfil their own needs as well as official requirements.

With the recognition of the importance of informal relationships in the workplace came the development of prescriptions for the organisation of work. It was suggested that workers should be allowed to participate in some decision taking, thereby giving them a degree of control over their working environment. It was also realised that efficiency can be gained by ensuring that technology and the

informal organisation fit together harmoniously: hence the phrase Sociotechnical Systems associated with the Tavistock Institute of Human Relations in the 1950s (see Cherns 1976). The sociotechnical approach led to the development of 'organisational democracy' based on workplace groups, initially commencing in experiments in Norway (Emery and Trist 1969) and later extending into Sweden and Denmark (e.g. Ehn 1988).

Although the original emphasis of sociotechnical analysis was on organisational choice at the time that technology is introduced, it has since been widened to allow worker participation in making choices among existing technical solutions. Mumford (1986) has extended the sociotechnical approach into a method for system design, called ETHICS, which allows a more active role for the user throughout the specification and design process.

While the emphasis on the 'informal organisation' does provide a corrective view to the unrealistically rational approach of the 'organisation as structure' theorists, it also has some weaknesses. The basic dichotomy of formal and informal is hard to sustain. In practice, whether particular actions are counted as coming under the informal or formal rubric is often difficult to assess.[4]

Some critics have suggested that the sociotechnical approach is founded on a notion of consensus and therefore takes little account of conflict or industrial relations problems (Brown 1967). Others have suggested that the approach could be considered as another, more sophisticated tool for increasing management control, achieving higher production and fewer disputes (see Rose 1988). Perhaps a more fundamental question is whether it is helpful to make an analytic distinction between the 'social' and the 'technical'. As with the distinction between the 'formal' and 'informal', the division is fraught with conceptual difficulties. It has been argued that such distinctions are best viewed as constructed through a social process and should themselves be a focus of sociological enquiry (Murray and Woolgar 1991).

3.2. DESIGNING INFORMALITY

CSCW systems would appear to be particularly appropriate technologies for enhancing 'horizontal communication' in an organisation and supporting unplanned, informal 'interactions' across departments or within workgroups. The Computerized Coffee Break (CCB), incorporated within the 'Dialog' computerized conferencing system described by Zuboff (1988), is an example of a system with such aims. This facility was set up by workers and was said to be analogous to conversations in hallways and at lunch. The conference system was initially considered very successful, described by some members as taking the place of face-to-face meetings.

After the initial success of the CCB, problems were encountered when managers were included in attempts to develop the 'Dialog' system. Past conversations on the bulletin board remained on the system and

> most managers found that they could not resist the panoptic power the text offered. The new visibility of sociality had provided a technical means by which managers could attempt to control and channel what had always been the most ephemeral aspects of subordinates' behaviour.
>
> (Zuboff 1988: 383).

Some managers began 'deliberate surveillance', entering the system using secretaries' passwords. Names of people in the department who participated in the CCB were recorded and sent together with transcripts of the conversation to division heads. Not surprisingly, the CCB disbanded shortly after. As one informant said, "The social aspects of confidentiality and security haven't been thought through" (*ibid*). The Dialog system encouraged more lateral communication within the organisation as people began to talk to individuals in other departments about work problems. Workers themselves were in no doubt about the value of the system in facilitating the flow of information, but Zuboff concluded that the effectiveness of the system in increasing knowledge in the worker community clashed with the managers' need to feel in control.

Experiments have been conducted with more complex technologies to try to improve informal interaction and sociability. In several research laboratories in the United States and Europe, audio-video networks have been introduced with the aim of increasing the opportunities of contact between researchers (Olson and Bly 1991, Fish et al. 1990, Moran and Anderson 1990). Typically, these allow users two types of view, via cameras and monitors. The first focuses on the head and shoulders of other researchers in their offices. The second offers a general scene of a commons area.

Although audio-video technology appears to afford even greater opportunities for surveillance, the main problems encountered in its use are related to the emphasis placed on informal interaction. For example, Heath and Luff (1991) detail the ways that one particular multi-media system undermines the impact of visual conduct such as body movements and gestures.[5] They suggest that this impairs the technology's value for supporting informal interaction. In addition, as the camera remains fixed on the head and shoulders of the participants, the view that is offered does not allow one party to see the other's work. The system was designed to support what was thought to be the 'informal', that is, interactions in the workplace. However, as suggested above, the distinction between formal and informal activities may be a misleading dichotomy and designing a system which focuses on one or the other may not be sufficiently sensitive to the ways in which participants engage in their work.

Advocates of the socio-technical approach emphasise that its contribution to the design of the workplace lies in the principle of increasing "the ability of the individual to participate in decision taking and in this way to enable him or her to exercise a degree of control over the immediate work environment" (Mumford 1987: 67). This principle has been applied to the design of technical systems and

seems particularly attractive for CSCW systems, partly because of its emphasis on user participation and cooperation in the process of design. Researchers in Scandinavia, where the concept of workplace democracy has been a main theme in systems design, have focused on the relationship between the design of CSCW systems and workplace democracy (Bjerknes et al. 1987). For example, in the UTOPIA project 'researchers and graphic workers have cooperated in the development of powerful skill-enhancing tools for the graphic workers.' (Bødker et al. 1987: 253).

It is envisaged that one advantage of a participatory design process is that systems designed in this way will support the tacit knowledge and skills of the users (Greenbaum 1988). However, it is unclear how the process can reveal this tacit knowledge. Carter and Harper (1991) describe a participatory design exercise to implement a system to encourage communications between architects and surveyors in an architectural practice. Despite securing the involvement of members from both professions, the final system was unsuccessful and was not used. They suggest that this may be because the design ignored the details of the actual day-to-day communicative and work practices of the architects and surveyors.[6]

4. Organisations in environments

4.1. SURVIVING IN AN ENVIRONMENT

Accepting that the internal structure of an organisation is indeed heterogeneous, many organisational theorists have examined the place of the organisation in its wider environment. They suggest that the environment is fundamental to an understanding of how organisations are shaped, in terms of both their external boundaries with the outside world and their internal structure. These theorists have stressed that organisations should be open to their environments and should attempt to secure and maintain good relationships with their customers, competitors and suppliers. The organisation itself is viewed as a set of interdependent subsystems and by attending to the interfaces between these subsystems, potential problems may be resolved. Thus, this approach emphasises the identification of boundaries both within the organisation and between the organisation and the outside world.

Some of these ideas have become subsumed under the term Contingency Theory. Proponents of this theory emphasise that organisations are open systems which need sensitive management in order to balance internal needs with external environmental changes. Thus, it is management's responsibility to obtain a 'good fit' between the tasks, the environment in which the tasks will be performed and the style of management. Different types of management are suitable for different

tasks and different types of organisation are needed in different types of environments. Burns and Stalker (1961), one of the earliest proponents of this approach, identified the environmental conditions which, they suggest, make various organisational structures more or less successful. Mechanistic or bureaucratic types of organisation are appropriate in more stable, certain environments. Organic, less formalized structures are more successful in uncertain environments. They suggest a continuum of 'types of organisations' ranging from the mechanistic to the organic. Kanter (1983) parallels this distinction in terms of 'segmentalist' and 'integrative' organisations. Further research has attempted to identify 'species' of organisations and analyse each species' success at coping with different environmental situations (Mintzberg 1979, Miller and Friesen 1984).

Lawrence and Lorsch (1967) argue that styles of organisation need to vary within organisations because each sub-unit develops a structure appropriate to its sub-environment. Like Burns and Stalker's, their study suggests that in stable environments, hierarchical, bureaucratic forms of integration are successful, and in fluctuating, unstable environments, integration needs to be achieved through multi-disciplinary and specially constructed teams.

Other theorists have argued that the environment plays a major role in determining the survival of an organisation. For example, Aldrich (1979) and Hannan and Frieman (1977) have attempted to explain the factors involved in the rise and decline of different organisations. Related studies suggest that scarcity of particular resources are paramount in determining the growth, development and decline of organisations. Survival ultimately depends on the company getting a resource niche and outdoing their competitors (see Pfeffer and Salancik 1978).

The relative success of organisations has also been analysed in terms of economic or market factors. Williamson (1975, 1986) suggests that organisations are the methods by which society lowers the cost of exchanges or 'transactions'. In this view, all transactions which take place in society are either conducted in a market or within an organisation. The costs of transactions relate to the costs of creating, enforcing and maintaining the 'reciprocal obligations' that hold team members together. Markets and hierarchies are seen as alternative mechanisms for conducting these transactions; when markets are no longer efficient, transactions are subsumed within the hierarchical structures of organisation. An example of this transformation occurs when organisations merge. Transactions then change from being governed by the rules of the market to being governed by the internal rules of the hierarchy. Organisations which deal with their transactions in the most efficient way are the ones that survive.[7]

The degree to which the environment affects an organisation is the source of much controversy. If resource scarcity and competition are over-stressed, there is little room in the theory for the effect of managers, decision makers and other organisational members on an organisation's outcomes. The approach then becomes deterministic and shares some of the weaknesses of Social Darwinism,

which overlooks occasions when resources are plentiful and ignores the possibility that individuals have choices about whether to compete or to collaborate (Morgan 1986).

More broadly, the suggestion has been made that conceiving of organisations as organisms in environments makes them appear to be 'living' things with 'needs' for survival, stability and growth (Silverman 1970). Furthermore, the identification of definite boundaries between the organisation and the 'outside' world may be problematic. For example, an organisation constructs a boundary around itself through such devices as logos, mission statements and corporate identities. Nevertheless, it establishes links with the outside by mobilising alliances with other companies and creating relationships with customers, thereby drawing them into the organisational 'network' (Callon personal communication).

4.2. TAILORING SYSTEMS FOR ENVIRONMENTS

By considering the effect of the wider environment, theorists have sought to explain the heterogeneity of components within the organisation. The nature of this heterogeneity has important implications for the design of systems to support cooperative work. Systems might either be designed as generic tools or be made 'tailorable' to allow individuals and groups to develop their own ways of working. The widely attributed success of electronic mail may be due to its generality across a range of sub-organisations. Lack of such generality may be one reason why other CSCW tools have not been adopted (see Galegher and Kraut 1990).

A number of tailorable systems have sought to give users more control e.g. Quilt (Fish et al. 1988), Information Lens (Malone at al. 1987). However, it is difficult to determine the dimensions and the level of granularity of tailorability that should be provided. For systems that are used synchronously by users situated in separate locations, different individual choices about the appearance of their screen images can have adverse effects on the interactions between participants (Tatar et al. 1991). In co-present environments, particularly in situations where an individual's screen is being monitored by other participants in the workplace, customisation can undermine the coordination of activities (Bentley et al. 1991).

Ciborra (1988) has suggested further dimensions to the flexibility which should be built into CSCW systems. Using ideas from the transaction cost approach, he argues that analysing the nature of transactions may be a good starting point for understanding how individuals 'survive' as a team (Ciborra and Olson 1988). As organisations have to cope with contingent environmental factors, technologies should facilitate, "the inevitable process of 'reinvention' and make available the work arrangement surrounding the system" (Ciborra 1988: 241). Sørgard (1988) suggests that the transaction cost approach is useful for the characterization of cooperative work, but only has limited applicability to

particular kinds of 'organisation'. He argues that the transaction cost approach is most appropriate for 'markets' and can only be a partial characterisation for 'groups'.

The heterogeneity of sub-units within an organisation also has implications for the process of design. In an attempt to bring different 'stakeholders' together throughout the phases of design, Checkland (1981) has developed a method of analysis (Soft Systems Methodology or SSM) which attempts to accommodate different interests and draw out a consensus on objectives. Checkland sees organisations as composed of individuals and groups possessing different evaluations of the situations in which they are involved. Occasionally their evaluations will overlap, but there can be significant differences in their 'world views' that have to be managed. The critical exercise in SSM is to get individuals and groups to delineate the boundaries of the system in question. However, the method can be hard to apply, relying heavily on the role of facilitators to reach consensus. It may also not reveal the tacit work practices of the individuals the system is designed for (Bickerton forthcoming).

5. Organisations as information processors

5.1. 'BOUNDED' DECISION MAKERS

One view of organisations maintains that the analysis of information processing and decision making is fundamental to understanding management. This emphasis on the information processing aspects of organisations was initiated by Simon (1960) and later developed by researchers such as Cyert and March (1963). In what has been termed the 'Decision Making Approach', Simon explores the parallels between human and organisational decision making. In contrast to 'mechanistic' theories, Simon states that organisations can never be truly 'rational' because members of the organisation have limited information processing abilities. Arguing that individuals have to take action on the basis of limited information about possibilities and their consequences, can consider few alternatives to a course of action and cannot accurately predict outcomes of events, Simon suggests that individuals can, therefore, only achieve a limited or 'bounded' rationality in their decisions. Consequently, they 'satisfice', that is, they look for a course of action based on 'good enough' decisions which are informed by basic rules-of-thumb and limited information. According to Simon, the concept of bounded rationality is institutionalized in the structure and functioning of the organisation itself. Decision making in organisations is fragmented and routinized in order to make it more manageable and hierarchies of control simplify the communication channels required.

Rather than illustrating the limits of organisational rationality, it has been argued that Simon's interpretation of organisations actually serves as a rational-

ization for bureaucracy (Morgan 1986). Bureaucracy has bounded rationality embedded in its structure and limits the extent to which individuals can make decisions. Complex problems are solved by fragmenting attention and action in order to control and manage situations better.

In a powerful critique, March (1991) deconstructs theories of rational choice applied to organisations and argues against the centrality of decision making. March (1988) recommends that the rational 'technology of reason' should be supplemented with the 'technology of foolishness'. Foolishness, or playfulness, would allow managers to act before they think and make decisions with consequences for the future without knowing what will be wanted. Furthermore, by identifying apparent contradictions in the nature of decision making in organisations, March (1991) emphasises that managers appear to spend little time making decisions, the decision processes being occasions concerned with other matters: typically being 'arenas for symbolic action' involving 'rituals of choice'. Similarly, Feldman (1988) counters the view that data analysis has an effect on subsequent decisions, by describing how analysis is done because managers believe it *ought* to be done.

5.2. SUPPORTING INFORMATION PROCESSORS

Social psychological studies of groups regularly identify 'errors' and 'biases' in group information processing and decision making. These results have been used to justify the introduction of computer-based Group Decision Support Systems or GDSS (Vogel and Nunamaker 1990). Some GDSS incorporate specific models of decision making (e.g. UM EXPRES, Olson and Atkins 1990), some provide support for general activities like argumentation (e.g. SIBYL, Lee 1990) and some provide an environment for meeting groups (e.g. CoLab, Stefik et al. 1987). However, despite substantial efforts to evaluate and improve them, and positive comments by users, GDSSs have not been widely assimilated into organisations; nor does there seem much likelihood of significant adoption in the future (Kraemer and King 1988). This may be due to their focus on decision making as a purely rational process and their intention to support and, if possible, improve the group's decision-making rationality. This aim, of course, assumes that organisation members intend to be rational decision-makers.[8]

Adopting a rather different approach to information flow in organisations, some researchers have developed systems to support users of electronic mail. For example, the IMail system (Hogg 1985) allows senders to attach to their messages scripts that perform certain actions in the receiver's environment. The Information Lens allows receivers of messages to define rules which will file or reroute messages depending on their context (Malone et al. 1987). Interestingly, in analysing the usage of the 'intelligent' facilities of Information Lens, Mackay (1990) reports that, rather than the rules being used as *a priori*, automatic filters

of mail, they tended to be applied manually, after the mail had been received and when the users considered they were needed.

The idea of organisations as information processors has led some researchers to suggest that recent innovations in information technology might be useful for understanding organisational behaviour. For example, Crowston et al. (1988) have utilised concepts from an object-oriented approach to computer system design to develop a model of organisational information processing in terms of messages that individuals send to each other and their processing of those messages. Crowston et al's model has been used in an analysis of a case of organisational change in an electronic manufacturing firm. They suggest that it may be possible to generalise such models and use them, in the form of computer simulations, to predict and explain organisational change.

Crowston et al. (1988) suggest a radical way in which technology could impact on the shaping of organisations. There is a substantial body of literature which deals with the effects of information technology on organisations, these effects range from changing work roles (Zuboff 1983), the centralisation and decentralisation of activities (Carter 1984) and the elimination of entire levels of management (Leavitt and Whisler 1958).[9]

As stated previously, March (1991) suggests that it may be misleading to focus on the significance of decision making in organisations. A 'decision' appears to be a concept that requires further analysis. In this, it seems to be similar to many other concepts that theories of organisation have left unanalysed, including the very notion of 'organisation' itself. Bittner (1965) has criticised the use of such common-sense terms in the study of organisations. While recognising that some concepts in scientific inquiry have to be left unexplicated, utilising common-sense concepts in the analysis of actors who themselves use those concepts is deeply problematic. For example, in proposing possible variations in the uses of the concept of organisation, Bittner posits a 'gambit of compliance' where organisational members, through skill and craftmanship, can comply with formal rules while "finding in the rule the means for doing whatever needs to be done" (Bittner 1965: 246). Although such concepts as 'efficiency', 'formality' and 'informality' have been utilised by organisational theorists, it may be that, as Bittner suggests, a programme of research is required that studies the use of such concepts in the specific organisational settings in which they are used.

6. Organisations as constructions

6.1. DESCRIBING ORGANISATIONAL LIFE FROM WITHIN

An approach to the understanding of organisations has emerged in the social sciences that has attempted to move away from utilising *a priori* categories for

analysing the workplace. The foundations of the approach lie in its emphasis on ethnography and the importance it places on experiencing and describing organisational life from within.

The term ethnography has been used in association with a variety of theoretical orientations within both sociology and anthropology. The use of ethnography as a research method is necessarily embedded within some analytic framework. This can be seen in the organisational literature where methods of participant observation have been used in association with analytic orientations from anthropology to examine the role of symbols, myths and rituals in corporate cultures and subculture.[10]

Hughes and his colleagues (Hughes 1958, Becker et al. 1961) have developed a conceptual framework within which they attempt to understand work and organisations, and professional and occupational conduct from the standpoint of the participants, explicating the ways in which they perceive and manage their roles and responsibilities and their dealings with colleagues and clients. Organisations and occupational conduct are considered as embedded within social interaction and social relations, and the essence of sociological enquiry is to gain systematic knowledge of institutional life as it emerges within the accomplishment of the day to day tasks and responsibilities of the participants themselves.

The core of Hughes and his colleagues' framework lies in the concern with the relationship between work and an individual's self and identity, and the ways in which occupations and organisations develop a rhetoric loaded with prestige and status through which the members present themselves and others. This thoroughly social conception of self and identity has led to a concern with career and status passage, in which individuals in institutional life systematically pass through standardised shifts in understanding and perception towards their work and others: the *rites de passage* of particular organisations and occupations. The concept of 'career' has been developed within a framework of organisational cultures and the forms of occupational socialisation through which 'neophytes' pass. The organisational culture provides routine practices, sets of collective representations, bundles of definitions and understandings concerning the nature of one's work and its performance. An essential part of organisational culture is the ways in which personnel develop routines for handling mistakes and managing emergencies. These routines emerge in interactions with colleagues and clients, and from these everyday interactions, organisational personnel develop and preserve distinctive procedures for undertaking the tasks and activities of institutional life.[11]

A classic example of the use of this methodological and conceptual framework can be found in Strauss et al's (1964) study of psychiatric institutions and ideologies. Their study reveals the ways in which members of distinct occupational and professional groups establish a working consensus within an organisational framework. This consensus enables them to deliver patient care and coordinate their actions with each other. The practices and philosophies they develop are essen-

tially fragile, and at any point can be subjected to challenge and renegotiation. Strauss and his colleagues demonstrate the ways in which organisational life is flexible, continually in flux and motion and the outcome of the practices and procedures of all those who happen to interact with the institution and its services.

Echoing Hughes' concern with the ways in which occupations develop rhetorics through which members present themselves and others, there have been a body of studies that examine the occupation of scientists. Collectively, this research has been termed the 'sociology of scientific knowledge' which encompasses work from a wide range of perspectives. For example, Gilbert and Mulkay (1984) utilise the notion of empirical and contingent discourses; scientists present their own work using the former and their rivals' work through the latter. From ethnographic studies of scientific laboratories, Latour and Woolgar (1986) reveal the ways facts are constructed and processed, the routine practices of scientists as they quest for credibility, and the trajectories of their careers. Latour (1987) suggests that in striving to make their claims credible, scientists map out chains of associations for themselves which are available for analysis. Thus, he develops a view of science as the building of networks, or actor-networks (see also Callon 1986). Crucial to this form of analysis is that it makes no analytic distinction between artifacts and human actors. In any network, there may be a range of 'heterogeneous objects': people, organisations, objects and money (see Law 1988). Within its rubric, it challenges the very distinctions between 'science' and 'technology' or indeed of the 'social' and 'technical'.

The concentration in 'constructivist' approaches on notions such as the negotiation and the construction of meaning have led some critics to suggest that the focus of these studies has shifted away from the practices of the individuals they are studying. Echoing an earlier distinction made by Garfinkel (Garfinkel and Wiley 1980), Button (forthcoming) has suggested that constructivists are not sufficiently sensitive to the details of the production of work. Often the work is merely re-described ironically and in the process, both the experience of those that produce the work and the interactions through which it is produced are lost.

6.2. RECONCEPTUALISING COOPERATION

Constructivist approaches to the study of science and technology require a reconceptionalisation of notions of cooperative work in CSCW. In many respects this will involve attempts to collapse long held dichotomies such as, between the technical and the social, the formal and the informal and the high and the low level (see Star forthcoming). In addition, certain notions from constructivist analyses are already being applied in the domain of information technology. For example, building on the work of Latour (1986), Star (1989) has developed the concept of 'boundary objects'.

Star looks at scientific communities as a model for distributed artificial intelli-

gence and, in particular, on the way knowledge is disseminated and used in that community. Boundary objects live in more than one social world and are used differently by members of those worlds. The objects are both plastic enough to adapt to local needs and constraints but robust enough to maintain a common identity across sites, times or social worlds. Suggested types of boundary object are: repositories, platonic objects, terrains with coincident boundaries and forms and labels.

Star's work can be located within a wider body of research, termed 'distributed cognition', that aims to conceptualise the ways individuals collectively perform tasks and activities. This work seeks to link individual cognition, the social process of negotiating meanings, the activities in which individuals are engaged and the artifacts in the world. Many of its themes reflect current research on social actors and networks outlined above. For example, Hutchins has explored the uses of navigational instruments in the work of personnel on the deck of a large ship (Hutchins 1990) and the roles of dials as external memories in the cockpit of an aircraft (Hutchins and Klausen 1990).

This approach appears to suggest a framework for understanding cooperative work. However, much of the research is still in its preliminary stages and therefore it is unclear what the full implications will be for the process of designing CSCW systems.

7. Organisations as productions

7.1. REVEALING WORK PRACTICES

Following the programme of research suggested by Bittner (1965), several researchers have sought to detail the practices and practical reasoning of participants in the workplace, aiming to avoid basing their analyses on unexplicated social scientific concepts, even if these appear to be derived directly from common-sense. This type of analysis has been commonly termed 'ethnomethodological', following remarks by Garfinkel (1967) advocating the study of the methods employed by members in settings. Garfinkel's analysis of the practices of investigators of equivocal cases of suicide can be seen as a prototype for this research. The study details the ways in which investigators reason from the 'remains' left after a death to formulate a "*recognisably* rational account of how the society works to produce those remains" (Garfinkel 1967: 17).

Subsequently, 'ethnomethodologists' have explored many everyday work settings, including those of scientists (Lynch 1985), mathematicians (Livingston 1986), police (Cicourel 1968) and public bureaucracies (Robillard et al. 1983). Most of these studies rely on ethnographic data, sometimes supplemented by audio or video recordings, to explore the systematic ways through which participants achieve their work.

A recent analysis of organisational work explicates the work practices and prac-

tical reasoning of individuals in a particular firm (Anderson et al. 1989). Focusing on financial accounting practices, this study reveals how the very arrangement of furniture immediately makes available organisational knowledge about the division of labour, the allocation of roles and the processes being carried out. Changes to any of these would be accountable and be made apparent, both to fellow participants and for analysis. For example, when there are changes in the division of labour, as when one member 'covers' for another, this will be revealed by furniture or artifact re-arrangement. The analysis also reveals the participants' practices and practical reasoning concerning the handling of invoices: how an invoice can reveal its position within a temporal sequence of activities by means of its physical location and the way it has been filled in, annotated and stamped. The explication of such details of everyday work are a feature of ethnomethodological studies, revealing the tacit practices through which work is accomplished.

Ethnomethodology has an uneasy and controversial relationship with other social sciences and is not without its critics. For example, the emphasis on the explication of work practices and practical reasoning has led some critics to point to the apparently trivial nature of its revelations. In addition, despite *explicitly* adopting goals that differ from those of other 'methods' in the social sciences, ethnomethodology has been criticised for ignoring structural considerations such as class and power.[12]

7.2. WORK PRACTICES AND DESIGN

The ability of ethnomethodological studies to reveal details of work in specific settings has attracted several research institutions to explore possible ways of relating such studies to the design of computer systems. In particular, the details of interactions of participants in the workplace have been considered useful for the development of systems that support groups of individuals, whether they are co-present or dispersed geographically.[13] At present, however, there are difficulties in transforming observations derived from these studies into useful advice for system designers. Also, it is unclear whether studies of single, specific settings can yield analyses which are helpful in the design of systems intended in other settings. The communicative practices outlined in the workplace projects at PARC (Goodwin and Goodwin forthcoming), the study of London Underground (Heath and Luff, this volume) and the study of air-traffic control (Harper and Hughes, forthcoming) suggest that such generic issues may indeed be emerging.

However, there are other difficulties that still have to be overcome if ethnomethodological studies of work are to be useful in the design of systems. One concerns the relationship between the fundamental interests of social scientists and computer scientists. The designer of a CSCW system, faced with the requirement that the system should be appropriate to the setting in which it is to be placed, might appear to have the same interest in close observation and analysis

of the setting as the social scientist. However, although ethnographic analyses of interactions in the workplace can highlight systematic, and often robust, features of work practices, they do not and cannot conclude either that these features *should* be preserved or that they *will* be preserved when new technology is introduced.

Given recent appraisals of the problems of securing the acceptance of collaborative technologies (e.g. Grudin 1988, Galegher and Kraut 1990), designers of CSCW systems have a particular interest in making their systems appropriate for their eventual settings. Studies of existing work practices seem to imply that technological solutions have to be 'conservative' in order to be sensitive to work practices. However, this may not be the case and, rather, it may need radical technologies to support certain interactional practices (see Heath and Luff this volume). The challenge for such approaches is how to integrate detailed studies of workplaces into the process of design.[14]

8. Conclusion

System designers are inevitably involved in making assumptions about the nature of organisations. In order to design, they need to understand the context within which their system will be used, the needs of the users and the nature of the work their users are to perform with the system. Designers sometimes explicitly utilise a particular theory of organisational action. More often, the model is implicit and the nature of the assumptions the designer has made only becomes clear from detailed analysis of the system or from difficulties encountered when it is used. Design decisions about system resource allocation and interface issues are often founded only on common-sense notions of social action. While a particular choice about how to conceptualise organisation is embedded in every computer system, the very nature of CSCW systems necessitate that the designer's choices are crucial to the success of the system. Thus, the approach to organisation adopted by CSCW designers is of considerable significance. In particular, designers will find it increasingly hard to avoid becoming involved in debates about how organisations should most appropriately be conceptualised.

However, the various approaches are not alternatives from which the analyst can pick to his or her liking. For while some theories emerged in response to prior characterisations of organisations, others have attempted to reconceptualise the very foundations on which the previous theories rest.

There is, therefore, a progression amongst the theories discussed, with those reviewed last reacting against the alleged errors and omissions of earlier ones. Each successive approach has involved a shift of perspective and has re-focused the debate. In particular, the approaches characterised as 'organisations as constructions' and 'organisations as productions', suggest quite radical reconceptualisations of the idea of 'organisation', although these have not yet been reflected

to any great extent in design for CSCW systems. There do, however, seem to be methodological consequences for the design process and the nature of the social scientific enquiry involved.

The resistance of some computer scientists to consider aspects of their work as 'doing' social science, runs in parallel with the qualms that some social scientists have about 'supporting' system design. Although there are social scientists who remain sceptical about the design process as a whole, others appear to be quite Machiavellian: "If science and technology are politics pursued by other means, then the only way to pursue democracy, is to get inside science and technology" (Latour 1988 :38–39).

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Notes

1. Obviously there are many perspectives on organisation and they cannot all be covered in the space of this paper. Interesting and different outlines of organisational theory are given in Rose (1988) and Morgan (1986).
2. Carasik and Grantham (1988) report that the COORDINATOR system of Winograd and Flores (1986) was unpopular due to a similar rigidity in the way actions were defined.
3. These studies are often attributed to the leadership of Elton Mayo (1933) who has also been called the founder of both 'The Human Relations Movement' and industrial sociology. For an interesting and more controversial analysis of these claims see Rose (1988). Other theorists who adopted alternative approaches to the analysis of individuals' needs in organisations are Maslow (1943, 1968), Argyris (1957, 1964), Herzberg et al. (1959) and McGregor (1960).
4. It may also be that the notion of 'Informal' embodied in these approaches is itself too rigid and inflexible. Studies of work places have revealed the richness of what could be considered mundane informal interactions (e.g. Roy 1960).
5. See also Fish et al. (1990) for a description of problems of reciprocity through Videowindows in Bell Laboratories.
6. For a detailed discussion of other problems associated with achieving workplace democracy see Ehn (1988).
7. Organisations have also been characterised in terms of the ways they deal with contracts (e.g. as constituently, incompletely or informally, Ouchi 1980) or by the degree of opportunistic behaviour and uncertainty they can tolerate (Ciborra 1987).
8. From this viewpoint March (1991) has offered some distinctive directions for technology intended to support decision makers.
9. For other work relating to the effects of computerisation on organisations see Laudon (1977) and Kling (1980).
10. One example of such an approach applied to the analysis of organisations comes from Smircich (1983) who studied the day to day management of an executive group of an American insurance company. She found that although the company fostered values based on cooperation, reflected in the phrase 'We grow friends', on closer inspection, staff rarely took active interest in public debates and meetings. Instead these were treated as ritual occasions.

    There is a great body of research that considers organisations as cultures: on organisational cultures and counter-cultures see Turner (1971) and on occupational sub-cultures see van Maanen and Barly (1984).
11. See Heath (1984) for an extensive review of the work of Everett Hughes.
12. Gellner (1975), Giddens (1976) and Gouldner (1970) make strong criticisms of ethnomethodology,

responses to which are given in Sharrock and Anderson (1986), Sharrock and Anderson (1991) and Sharrock and Button (1991).

13. Recent research initiatives have been undertaken at Xerox PARC (Suchman and Trigg 1986), Rank Xerox EuroPARC Cambridge (Moran and Anderson 1990) and the CSCW Centre at the University of Lancaster (Harper and Hughes, forthcoming).
14. This is the focus of a project underway at the University of Oxford (Jirotka et al. in preparation).