To appear in *Easterbrook, S. M. (ed) 1993 CSCW: Cooperation or Conflict? London: Springer-Verlag, pp. 1-68*

1

A Survey of Empirical Studies of Conflict

S. M. Easterbrook, E. E. Beck, J. S. Goodlet, L. Plowman, M. Sharples and **C. C. Wood**
School of Cognitive and Computing Sciences, University of Sussex

1 INTRODUCTION

Conflict is a common phenomenon in interactions both between individuals, and between groups of individuals. As CSCW is concerned with the design of systems to support such interactions, an examination of conflict, and the various ways of dealing with it, would clearly be of benefit. This chapter surveys the literature that is most relevant to the CSCW community, covering many disciplines that have addressed particular aspects of conflict.

The chapter is organised around a series of assertions, representing both commonly held beliefs about conflict, and hypotheses and theories drawn from the literature. In many cases no definitive statement can be made about the truth or falsity of an assertion: the empirical evidence both supporting and opposing is examined, and pointers are provided to further discussion in the literature. One advantage of organising the survey in this way is that it need not be read in order. Each assertion forms a self-contained essay, with cross-references to related assertions.

Hence, treat the chapter as a resource to be dipped into rather than read in sequence. This introduction sets the scene by defining conflict, and providing a rationale for studying conflict in relation to CSCW. The assertions are presented in section 2, and form the main body of the chapter. Finally, section 3 relates the assertions to current work on CSCW systems.

1.1 Relevance to CSCW

Research in CSCW embraces disciplines such as human psychology and social science. Unfortunately, there may be good reasons why the results of work in these areas cannot be applied to CSCW: they might not provide appropriate answers; they might not even tackle the kinds of question asked by designers of CSCW systems. These problems are compounded as researchers in CSCW are unlikely to have a background in all the fields that might provide relevant results, making access to the literature difficult.

This chapter attempts to bridge the gap for one particular topic, by providing a guide to the literature on conflict. Rather than simply surveying the relevant disciplines, the literature is presented in relation to a series of assertions representing beliefs about conflict. This format serves both as a pointer into the literature, and to provide (partial) answers to questions which may arise in the development of CSCW. We also hope to challenge some myths which otherwise may become embedded in implemented systems, as underlying assumptions about the nature of conflict in collaborative work.

In attempting to justify the relevance to CSCW of an examination of conflict, one could equally well ask why it should not be relevant. CSCW is concerned with enabling people to work together. Whether or not conflict is inherent in collaborative work, and whether or not conflict is detrimental to collaboration, it is indisputable that conflicts sometimes develop between people engaged in collaborative activities. If CSCW is about facilitating working together, it must be built on an understanding of collaborative work. This must include an understanding of how collaboration may break down, and how collaborative work can continue even in the presence of conflict. Handling conflict is one of the factors that determines whether a group of people can work together successfully.

We believe that the question of conflict between members of a group is highly relevant to any organisation of group work. To assume absence of conflicts is naive. Inherent differences between individuals' experiences, personalities and commitment make the *potential* for conflict inherent to any group of people.

A CSCW system or other such technology necessarily influences styles of cooperation, by making some things easier and other things harder to do, or by changing or reinforcing power relationships and patterns of interaction between collaborators. This is the case even if the designers did not deliberately set out to influence styles of cooperation. If designers ignore issues of conflict in the explicit part of the design, then their underlying assumptions about conflict, or its absence, become embedded in the system. These assumptions may influence the style of cooperation in unplanned ways, for instance by restricting the means that collaborators have of dealing with conflict.

It is clear then, that any assumptions made about conflict in the design of CSCW systems need to be made explicit. Once made explicit, the assumptions can be validated against an understanding of the nature of conflict, including the causes and development of conflict, the expression (or lack of expression) of conflict, and the potential for resolution. We suggest that such an understanding can best be gained by building on work already done on the subject, as described in the literature.

1.2 Perspectives on conflict

1.2.1 Definitions of conflict

A fundamental aspect of collaborative work is that individuals are not identical, and will approach the same task with differences in their expectations, goals, and preferred styles of working. They will have different amounts of time to commit to the resolution of a problem, and even different notions of what the problem is. These differences will, at times, lead to conflict.

It is easy to cite situations in which most people would agree that there is a conflict (for example: a strike; a lawsuit; a war). It is not so easy to define conflict. When it comes to what exactly constitutes conflict in the general sense, there are many different views. Pondy (1967) points out that the word 'conflict' has been used in the literature to describe variously: antecedent conditions of conflictual behaviour; affective states of individuals; cognitive states of individuals; and various types of conflictful behaviour. Fink (1968) notes that the many different uses of the term 'conflict' in the literature reflect the many different conceptual frameworks for studying conflict. Much of Fink's paper is devoted to the terminological and conceptual confusion surrounding the study of social conflict, from which he concludes that "...scientific knowledge about social conflict has not yet moved to a level of analytical precision superior to that of common sense" (p.430). A plethora of terms in common usage are cited in support of this point, none of which have precise definitions: conflict, competition, tensions, disputes, opposition, antagonism, quarrel, disagreement, controversy, violence, conflict resolution, mode of resolution.

In the past, some authors have used the term conflict in specific ways, for example as the opposite to cooperation (cf. the title of this book), as the opposite to competition (Mack, 1965), or even as a particular species of struggle (Coser, 1956). In contrast, others advocate use of the term conflict in a more general sense: according to Dahrendorf (1959) "All relations between sets of individuals that involve an incompatible difference of objective ... [are] relations of social conflict" (p135).

More recent views seem to agree that a broad definition has the advantage of subsuming a range of phenomena from psychological antagonism through to overt struggle. For example, Putnam & Poole (1987) give the following definition: "the interaction of interdependent people who perceive opposition of goals, aims, and values, and who see the other party as potentially interfering with the realization of these goals ... [This] definition highlights three general characteristics of conflict: interaction, interdependence, and incompatible goals" (p552). Thus, although there is no consensus on the definition of conflict, the preferred view seems to be that conflict should be defined as broadly as possible.

In this chapter, we adopt this broader definition of conflict. This avoids the problem of imposing an arbitrary division, in that any interference or potential interference is treated as conflict, no matter how the parties deal with it. Using this definition, conflict is not the

Social Units	Equal vs. equal	Superordinate vs. subordinate	Whole vs. part
Roles	1 (family role vs. occupational role)	2 (occupational role vs. union role)	3 (social personality vs. family role)
Groups	4 (boys vs. girls in school class	5 (father vs. children)	6 (nuclear family vs. extended family)
Sectors	7 (air force vs. army)	8 (management vs. union)	9 (Department vs. University)
Societies	10 (Protestants vs. Catholics)	11 (free men vs. slaves)	12 (state vs. criminal gang)
Suprasocietal relations	13 (soviet bloc vs. western bloc)	14 (Soviet Union vs. Hungary)	15 (Common Market vs. UK)

Figure 1: The classification scheme for social conflict suggested by Dahrendorf (1959), showing the groupings identified by Fink. Adapted from Fink (1968).

opposite of cooperation, but a phenomenon that may arise whether people are cooperating or not. Successful cooperation depends on how the conflicts are handled.

1.2.2 Classifications of conflict

Given such a broad view of what may constitute conflict, it is useful to distinguish different types of conflict, so that analytical study becomes tractable. A number of different survey papers have been published, each providing its own classification scheme. Some concentrate on the stages of a conflict, others on structural or affective aspects, or on the outcome.

Pondy (1967) identifies three conceptual models to deal with the major classes of conflict in formal organisations:

(1) Bargaining model: conflict among interest groups which are in competition for scarce resources;
(2) Bureaucratic model: conflicts between a superior and a subordinate, or along any vertical dimension in the organisational hierarchy;
(3) Systems model: conflict among parties in a lateral or functional relationship, and in particular, the problems of coordination.

Pondy's model of the development of conflict episodes is described further under assertion L.

Fink's survey provides a number of different classifications used in the study of social conflict (Fink, 1968). For example, he cites an eighteen level classification derived from Chase (1951), which begins with personal quarrels, family versus family, and feuds between clans; passes through racial and religious conflicts; and culminates with cultural conflicts, cold war, and East versus West. He compares this with similar classifications, which distinguish fewer levels, and also with Dahrendorf (1959) who provides a two dimensional classification, with the social unit (roles; groups; sectors; societies; and nations) on one axis, and structural relationship (equal vs. equal; super-ordinate vs. subordinate; whole vs. part) on the other (see

figure 1). Fink populates this scheme with examples of each of the fifteen combinations, and then groups these fifteen into six main types: role conflicts; competition (between equal groups or equal sectors); proportion struggle (between equal societies); class conflicts (between super- and sub-ordinates); minority conflict and deviation (between a part and the whole); and international conflicts.

Putnam & Poole (1987) review the research on conflict from a communicational perspective. Communication is treated as one of the five components of 'conflict situations'; the others being actor attributes (eg. beliefs, skills, cognitive style), conflict issues, relationship variables (trust, power, interdependency), and contextual factors (organisational norms, history of conflict). The review is partitioned according to the level at which conflict occurs: interpersonal; bargaining and negotiation; inter-group; and inter-organisational. The interpersonal analysis focuses on dyadic conflict between constituents with asymmetric power division (eg. manager-minion), while the bargaining and negotiation level covers aspects of coalition formation, and so could be viewed as intra-group conflict.

As can be seen from these surveys, it is traditional to partition the space of conflicts according to the organisational level at which they occur, and, to a lesser extent, whether the relationship between the parties involved is horizontal or vertical with regards to an organisational hierarchy. These classifications clearly reflect the divisions used in social psychology, where empirical studies are necessarily restricted to particular levels. Indeed, Thomas (1976) criticises such studies for focusing on only a small set of variables, although he does point out that this is understandable for an applied field.

Other classifications are clearly possible. Thomas divides his review into two areas, centred around two general models of conflict: a process model, and a structural model. The process model focuses upon the sequence of events within a conflict episode, and is intended to be of use when intervening directly in the stream of events of an on-going episode. The structural model focuses upon the conditions which shape conflict behaviour in a relationship, and is intended to help in restructuring a situation to facilitate various behaviour patterns. Similarly, Patchen (1970), in reviewing formal models of bargaining, identifies four types of model:

(1) Negotiation models, which are used to predict whether two parties will reach agreement, and what the terms of that agreement might be;
(2) Cognitive models, which attempt to explain how parties try to influence one another in terms of cognitive elements, including subjective utilities and perceived probabilities;
(3) Learning models, which focus on interaction as a learning process;
(4) Reaction process models, which describe each action in terms of a reaction to the last action of the other party, according to various characteristics of each party.

In contrast, McGrath (1984), in his book on small group behaviour, examines the literature in relation to the type of task engaged in by groups. He identifies eight types of task, grouped into four categories: generating, choosing, executing, and negotiating (see figure 2). The negotiating category covers those tasks where conflict is prevalent, and McGrath identifies two such tasks: resolving conflicts of viewpoint ('cognitive conflict') and resolving conflicts of interest ('mixed-motive task conflict'). There is also a category covering conflicts of power, including competitions and battles, which McGrath places in the executing category. There is also a distinction between tasks that do not force a competition between group members, and those that directly pit the members against one another, and although tasks involving conflicts of interest or power are clearly in the latter, cognitive conflicts seem to be in a grey area in between. The later chapters of McGrath review the literature for each of the task types. Cognitive conflicts, for example, are studied in social judgement theory, which we introduce under assertion F. Mixed-motive tasks have been studied in game theory (see section 1.4), in which the motives of participants are manipulated by awarding different payoffs for particular outcomes.

Finally, in addition to the levels of conflict discussed above, Putnam & Poole (1987) categorize the research according to which descriptive model is applied to the conflict, and they identify five such models: 'psychological', 'interpretive-symbolic', 'systems-interaction', 'mechanistic', and 'critical theory'. The psychological approach treats conflict as semantic misunderstanding or difference in perceptions and cognitive abilities of conflicting parties, and includes research on bargaining and stereotyping of an opponent's position. The interpretive-symbolic perspective considers ways in which group ideologies are formed and the

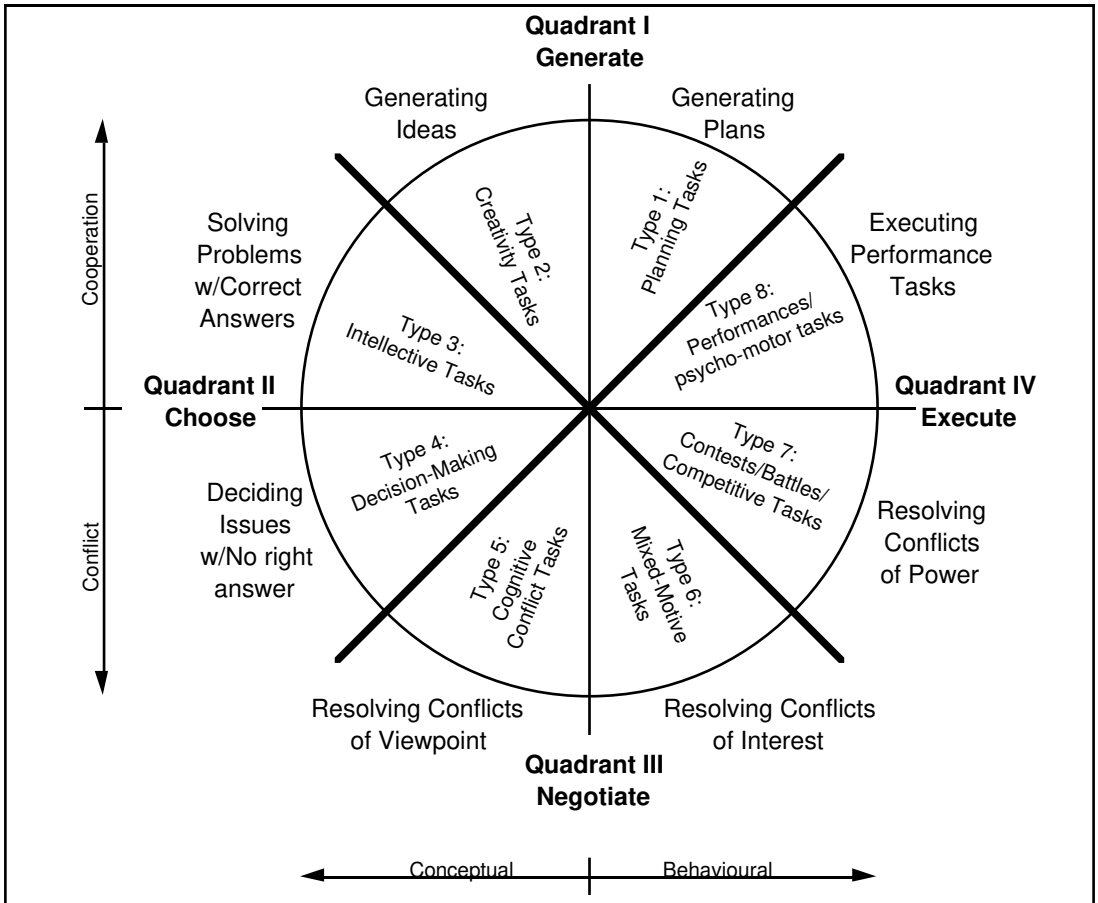

Figure 2: The 'Group Task Circumplex', adapted from McGrath (1984). Note that McGrath uses this typology merely to organise a review of the literature, without making any strong claims about its empirical validity.

organisational impact on shared meanings. The systems-interaction approach considers conflict cycles and phases of conflict development and analyses patterns of messages that evolve into a communication system and result in reciprocity of conflict behaviours and 'locking-in'. The mechanistic view emphasizes communication channels and transmission of messages. The fifth perspective, critical theory, is related to the interpretive-symbolic approach. This focuses on the structures of meaning that embody and reinforce domination. "Communication enters into critical theory as the cumulative effect of multiple messages that form consensual meanings, constitute the hidden structures, and provide critical insights into the subtle patterns of domination." (p554).

1.3 The literature

The literature surveyed in this chapter is drawn from a number of areas of research. We have concentrated mainly on empirical work in the survey, because we are primarily concerned with providing evidence for or against the assertions. However, the empirical work is often driven by theoretical concerns, which may vary according to the field or research from which it is drawn. Hence it is useful to have an overview of the concerns of the different areas on which we draw, in order to provide a context for the survey. In this section we give a brief overview of each of the main fields we have examined.

1.3.1 Disciplines

The *sociology* of conflict is concerned, in part, with how social order is challenged and maintained. There are fundamental differences in perspective on society and social order. An individualist perspective is that social order is maintained by the consent which individuals give to institutions to set regulations, in return for the protection of the individuals' rights and well-

being. A pluralist perspective is that the framework of societal rules is maintained in the 'general interest' of the society as a whole, to contain disorder and to adjudicate the claims of rival groups. From a Marxist perspective it is the ruling class, using the instruments of the state, which imposes order and suppresses dissent. In each of these perspectives social order is achieved, at least in the short term, but never without conflict. From an individualist perspective, the drive to maximize advantage over others will lead to competitive tension. From a pluralist perspective, different social groups have differing goals and competing claims for scarce resources. A Marxist sees endemic conflict in the fundamentally opposed interests of the ruling and working classes. There is disagreement over how deep is the stability of societies and how strong is the desire of individuals and social groups to maintain social order. Hall (1982, p. ?), for example, suggests that "the social order is always really quite precarious. It rests on a very delicate set of balances." Strauss (1978) points out that in fact, most social conflicts are resolved by cooperative means, often unconsciously, and that, despite this, very little attention is paid to these cooperative mechanisms.

Social psychology studies the cognitive aspects of social interactions, and is particularly concerned with small group behaviour, while the applied field of *organisational psychology* is partly concerned with team-work within organisations, and how communication and co-ordination of teams can be effected. Early work tended to assume all conflict was undesirable, and so should be eliminated, although empirical studies in the last few decades have demonstrated that conflict is an inevitable feature of group interaction. Moreover, Robbins (1974), among others, has advocated that conflict management should include not just resolution of conflict, but stimulation of conflict too. This is a result of observations that conflict has a useful role in organisations, in providing a stimulus to innovation, as it involves questioning and evaluating received wisdom. It is also a major weapon against stagnation and resistance to change.

Cognitive science is concerned with developing computational models of the processes, systems and principles that make behaviour possible. Much of the research to date has been concerned with representing the knowledge of single experts or idealised knowledge (what a person *ought to know*) and so has been little concerned with inter-personal or mental conflict. Recent developments in cognitive science have included the construction of logics to model beliefs and assumptions (Ramsay, 1988) and the development of computational models of multiple minds and social groupings. Distributed Artificial Intelligence (DAI) questions the assumption that a single self-consistent knowledge base can demonstrate intelligence (Huhns, 1987). Conflicting knowledge is handled by allowing different agents to develop and maintain alternative hypotheses, with the premise that intelligence is an emergent feature of cooperative behaviour. However, most DAI systems assume benevolent agents working towards the same goal. Rosenschein (1985) notes that in real world situations, perfect cooperation never happens, as the goals of any two agents will never coincide exactly. While conflict can arise in the process of acquiring knowledge from human experts, knowledge-based systems rely on a consistent 'knowledge base' for their inference mechanisms to work. If that knowledge is acquired from human experts then any inconsistencies in understanding or interpretation must be resolved (Easterbrook, 1991).

1.3.2 Theoretical Paradigms

Bargaining theory is an attempt to produce descriptive models of bargaining processes, and is especially concerned with commerce and politics. Patchen (1970) surveys models of bargaining theory and notes that the more complete models include wider concerns than bids and outcomes, including how participants influence each other's behaviour, and factors such as the cost of various actions and the cost of delaying agreement. Bargaining theory frequently makes use of the joint outcome space (Thomas, 1976) as a tool for illustrating how the parties perceive the options in a conflict (see figure 6, under assertion V). Note that there may be possibilities not perceived by the participants, which provide better resolutions. Bargaining theory does not indicate how these might be found, concentrating instead on the process of bidding and counter-bidding.

Game Theory is defined as the theory of rational decision in conflict situations (Rapoport, 1974). Participants are regarded as players, and game theory examines the strategies used by the players in the process of trying to achieve particular outcomes. In contrast to the joint outcome space, game theory often makes use of the payoff matrix (see figure 3). This reflects

the assumption that the set of outcomes is known (though not necessarily finite), and that associated with each outcome is a calculable payoff for each player. Limitations of game theory include the restricted sets of available actions, and the assumption that the payoffs for any action are known with certainty by all players. However, game theory does produce some useful information about the kinds of strategy that can be used to induce cooperation and how various strategies reward the players (Axelrod, 1984).

		Prisoner B	
		Not Confess	*Confess*
Prisoner A	*Not Confess*	1 year each	10 years for A and 3 months for B
	Confess	3 months for A and 10 years for B	8 years each

Figure 3: The payoff matrix for the prisoner's dilemma. Each player must decide, in isolation from the other, whether to confess to a crime that the judge is sure they both committed. By confessing each will implicate the other, and their joint best strategy is for both to keep quiet.

Decision theory offers a prescriptive approach to decision making, via analysis of sets of pre-specified alternatives. The interesting problems in this context are concerned with resolving multiple conflicting objectives (Keeney & Raiffa, 1976). Decision theory assumes a single entity is making a choice, in contrast to conflict where there is more than one entity, each with a different perspective. It has a role in conflict resolution in helping participants to evaluate bids, to justify such evaluations, and to persuade the other participant(s) that a solution is satisfactory.

Group Decision Making is the normative study of how individual preferences can be combined into a group decision. Luce & Raiffa (1957) defined the problem as that of finding a method, or welfare function, for combining individual preference rankings into a social preference, which satisfies properties such as fairness and representativeness. Work on group decision making extends decision theory to cope with more than one decision maker, but still suffers from the assumption that all the options are known.

1.4 Background on the assertions

As we have mentioned, the main body of this chapter is structured around a series of assertions about conflict. Each assertion is labelled with a letter, to facilitate cross-referencing, and we have grouped the assertions into a number of categories, roughly corresponding to the phases of a conflict episode. Before we present the assertions, some explanation of their origins may be useful.

The assertions are phrased in a variety of ways: some are intended to be contentious, while others seem relatively innocuous. In each case we have tried to give an impression of what the literature has to say on the matter, weighing up both the evidence for and against the assertion. In this section we explain some of the rationale for the assertions we have chosen, and our reasons for attempting to answer them. To our surprise, it proved difficult to provide definite answers even to some of the most ingenuous assertions, and some of the most obvious strawmen. The last part of this section discusses why this was so.

1.4.1 Where they come from

The assertions we have used arose from several sources during our investigations of the literature. Some were generated by writing down our initial preconceptions about conflict, and hence represent our own assumptions derived from the folklore, or filtered through from some previous exposure to the literature. We include these deliberately, as we suspect they may be shared by others working in CSCW. For example the assertion "Styles of handling conflict vary with gender" seemed obvious when we wrote it, but analysis of the literature revealed some confusion on this issue (see assertion W). In some cases our preconceptions were challenged, while in others they were confirmed.

The bulk of the assertions were unearthed during our literature search, and represent those questions and hypotheses considered in the various fields we have examined. For example,

"anonymity and physical separation contribute to conflict" summarises the theme of a hot debate in the empirical study of the effects of computer-mediated communication, and has been used to explain some peculiarities in the use of electronic mail (Lea & Spears, 1991; see assertion H).

Some of the assertions appeared relatively late in the writing of this chapter, when it became apparent that there were important issues in the literature which we had overlooked, as they had not fitted into any of the assertions we had. In some ways these are the most interesting: if they did not emerge from our initial brainstorming sessions, nor from our first trawl of the literature, then they might equally well be overlooked by others involved in the design of CSCW systems. An example of this type is the assertion on saving face (assertion Y). There is a literature on the role of face-saving in conflict resolution (Brown, 1977), and there are important implications for CSCW. For instance, CSCW systems may make the outcome of a conflict more explicit, and hence reduce the opportunity for face-saving.

Finally, there are some assertions which we wanted to include, but for which we could find nothing in the literature. Although it is possible that we have overlooked entire areas of the literature, our suspicion is there are some important issues that have not been explored previously, and we flag these in our conclusion as possible areas for future research.

1.4.2 Why they should be answered

The assertions we have covered encapsulate at least some of the questions about conflict which need to be addressed in CSCW. Hence, simply stating them in this chapter may help designers to question their own assumptions about the role of conflict, and recognise whether they make any of the assumptions we describe. This will lead to an increased awareness of these issues in relation to the design of CSCW systems.

However, simply stating the assumptions is insufficient, in many cases: they need to be questioned and dissected. CSCW needs prescriptive results, and trying to establish the truth of the assertions goes some way towards providing specific guidelines for the design of CSCW systems. In this chapter, we provide an analysis based on existing literature. Further work is needed to examine the applicability of this analysis in respect of CSCW systems, and the domains to which they are applied.

1.4.3 Why they are difficult to answer

Having established the relevance of the assertions, and the genuine need for answers to them, it turns out that we cannot provide definitive answers for most of them. There are a number of reasons for this.

First and foremost, many of the assertions themselves are ambiguous. Taken at surface value, they appear to offer common sense principles, which explains their appearance in the literature as hypotheses about group interaction, and as assumptions underlying CSCW systems. When examined closely, many of the assertions resist the attempt to pin down a precise meaning. Part of this problem is terminological: different authors use different definitions of key terms, and different fields of study put emphasis on different aspects of a definition. An immediate example of this is the problem of defining the term 'conflict' itself. Selecting a broad meaning for the term does not help here, as few assertions are general enough to apply to all the many manifestations of conflict. Examination of the assertion must then involve asking to which type of conflict is reference being made.

The simplicity of many of the assertions also causes problems. Although it is tempting to look for simplistic relationships between cause and effect, these rarely exist in the social sciences. There are also methodological problems: conflict is a complex phenomenon, and it is hard to devise experiments which isolate particular variables. Many of the results are open to interpretation. There are, at times, assumptions hidden in the work which makes it impossible to interpret each piece of research without access to the assumptions of the researchers. Part of these assumptions may rest in the culture of the area from which the paper comes, and consideration of the audience to which it is addressed.

2. ASSERTIONS ABOUT CONFLICT

In this section we present the assertions about conflict. We have clustered them into a number of categories according to the aspect of conflict to which they refer: the factors that affect

whether conflict will arise (occurrence); the specific causes of conflict (causes); the role that conflict may play in group interactions (utility); the processes involved in an individual conflict episode (development); approaches to handling conflict, including resolution techniques (management); and the outcomes and long term effects of conflict (results). These categories are not intended to be exhaustive, nor even clearly defined, but simply provide a convenient way of organising our discussion of different aspects of conflict.

2.1. Occurrence of conflict

A) Conflict is inevitable

Whether or not conflict at large is inevitable depends on how you view the fabric of society. Marx attempted to show that conflict was a necessary outcome of antagonisms between social classes. In a capitalist society the interests of the ruling class, to buy the labour of workers in order to make profit, is incompatible with the needs of the proletariat. Conflict, it is argued, is not random, but a systematic product of the structure of society. It is a necessary part of class consciousness and social change: "Without conflict, no progress: that is the law which civilization has followed to the present day." (Marx, 1947, p80; cited in Dahrendorf, 1959, p9).

To Dahrendorf also, conflict is endemic in society, but it arises primarily from the structure of authority. Every society is founded on inequalities in power and authority, resulting in the coercion of some members by others: "The authority structure of entire societies as well as particular institutional orders within societies (such as industry) is...the structural determinant of class formation and class conflict" (Dahrendorf, 1959, p 136). Conflict between social classes is just one aspect of "the differential distribution of positions of authority in societies and their institutional orders."

A more subtle analysis of conflict, based on Hall (1982), is to view it as a clash of ideologies. Ideologies are "sets of ideas, concepts, images and propositions which we use to represent to ourselves – and thus make sense of – how society works and our relationship to it." (Hall, 1982, p. 14). They colour all aspects of social life from voting patterns to inter-personal relations and they are developed through social practice. Ideologies reflect the opinions of individuals and groups, and societies have ruling ideologies around which the social institutions cohere. The liberal-democratic ideology of Western European and North American societies recognises a plurality of interests and assumes that individuals will compete to maximize their own interests. This competition is fostered and controlled by a range of institutions which have evolved to ensure 'fairness' and stability, from the law courts, to arbitration procedures for industrial disputes, to chairpersons and agreed agendas at meetings.

The surface appearance of liberal-democratic institutions is one of stability and minimisation of conflict. But to benefit from the institutions it is necessary to accept the dominant ideology, to 'play the game', with its assumptions that there will be 'winners' and 'losers', both in particular competitions and in society as a whole. Those who, through choice or circumstance, reject the liberal-democratic ideology, come into conflict with the entire weight of institutionalised procedure. The fact that people adopt the liberal-democratic position explains popular consent for harsh measures, such as wage cuts, and the acceptance of authority and arbitration to manage disputes. The fact that liberal-democracy is an ideology, one which favours social order and inequalities of wealth and power, explains the larger conflicts of interest and outlook in society. This analysis explains why conflict is inevitable in (liberal-democratic) society and furthermore, it suggests that those people who do not subscribe to the dominant ideology of the society or group will be regarded as deviant and may be a source of conflict. However, the analysis cannot predict the onset of conflict in any particular setting.

Experimental studies with small groups, such as Brehmer (1976), have shown that although conflict within any given group may not be inevitable, it is very likely to occur: even when there are no differences in the goals, interests and motivations of the collaborators, their individual prior experiences will give them different cognitive viewpoints on issues. Pendell (1990) also found experimental evidence that deviant behaviour and conflict are normal elements of small group decision making. Deviant behaviour is not necessarily related to conflict, but the perceived deviants who did initiate conflict were 'opinion deviants', who presented incompatible views and tested others' opinions and solutions.

In conclusion, although we cannot say that conflict is inevitable for every particular situation, the structure of society is such that conflict forms a integral part of it. Conflict is inevitable in society at large. Similarly, although conflict may not be inevitable for every possible group, the tensions that lead to conflict are apparent in most groups. Furthermore, there may be particular types of group for which conflict *is* inevitable: for example, Unger (1990) suggests that conflict is inevitable in group psychotherapy because of the nature of the group and its task.

B) The more cohesive the group, the less conflict there is

Cohesiveness can be defined as sense of *we-ness*, "a dynamic process that is reflected in the tendency for a group to stick together and remain united in the pursuit of its goals and objective" (Carron, 1982), although Mudrack (1989) warns that some studies have used different definitions. Owen (1985) cites research that indicates members of highly cohesive groups are more satisfied, more effective, and communicate more frequently and more positively than members of low cohesive groups. Hence, it would seem that cohesiveness reduces conflict.

Weinberg *et al.* (1981) found that lack of cohesion ("problems resulting in maintenance of the group" p.84) was the greatest cause of conflict in 70% of 125 naturally occurring groups encountering some interaction problems, but they accept that "lack of cohesion" is such a broad category that it subsumes a number of potential conflicts. "One could argue that cohesion is an umbrella problem, containing within it several other categories" and that "cohesion is not really the most common problem, merely the broadest category" (p.90). They cite Shaw (1976) on the role of leadership in creating cohesion through the coordination of individual contributions.

However, there are disadvantages to cohesion. Evans & Jarvis (1980) suggest that "too cohesive a group may cause members to be more concerned with the group itself than with the purpose for which the group exists". Although there may be less conflict, the group may be less productive. Wood (1989) provides a specific example. The unsuccessful group described in her case study (see assertion E) were more committed to the group as a group than to the task, and she suggests that "when a norm of cohesiveness exists, members are well advised to ensure that they are not preserving the group at the expense of the work at hand" (p.444-5).

Hence cohesiveness can be taken too far. *Group-think* is a term that describes how individuals in certain types of cohesive group engage in self-censorship of deviations from the majority decision, to preserve the group's (or their own) cohesiveness and confidence in the decision (Janis, 1972). Gero (1985) provides experimental evidence of group-think, and states in conclusion "I would again emphasize the importance of disagreement to the outcome of group decisions. ... If disagreement is suppressed, the conditions of group-think may develop and threaten the quality of the group's decision". We discuss group-think further, and ways of reducing it, under assertion J.

Finally, the cohesion of a group is closely related to its composition, and hence is also related to the level of conflict. Collaros & Anderson (1969) found that heterogeneous teams (in terms of skills and abilities) experience more conflict, at first, in their interaction processes. Although such heterogeneity may be necessary to reach creative problem solutions, too much diversity of expertise may inhibit those who feel more or less knowledgeable. On the other hand, Dyson *et al.* (1976) show that homogeneous groups are more likely to make high risk decisions, a phenomenon generally known as 'shift-to-risk' or 'risk-shift'. This is closely related to group-think. Bass (1980) suggests that where task accomplishment depends on "smooth, conflict-free, coordinated efforts among the members" (p.467-8) then homogeneous membership should prove more productive, but if the creative solution of a complex problem is more important than speedy, smooth interaction, then a heterogeneous group is more desirable.

C) Occurrence of conflict varies with the development of the group

The classic model of group development is presented in Tuckman (1965). This model identifies four phases in development of a group which have been labelled as: forming, storming, norming, and performing. The phases describe behaviour of the group members in relation to both the group structure and the task. The first phase describes the initial formation of a group, and involves orientation for the task and testing of the group structure. The second phase, storming, was derived from empirical observations of group interactions which consistently reveal a sharp rise in negative reactions in the second meeting of the group. Phase three

involves the creation of group norms and the strengthening of cohesion, while real progress on the task comes in phase four, performing. Tuckman & Jensen, (1977) add a fifth stage: adjourning.

Although Tuckman's model originated from studies of therapy groups, it has been successfully applied to other types of interaction; Tuckman (1965) distinguishes training groups, laboratory groups, and natural groups. Many studies have supported the model. For example, Maples (1988) attempted to identify subjective characteristics of each phase from diaries kept by group members. In particular, she found that storming was marked by concern, conflict, confrontation and criticism, and that these characteristics were absent from the other phases.

Such empirical investigations of the model appear to show that occurrence of conflict reaches a peak at an early stage in group development, after which the group gains cohesion, and the level of conflict subsides. Hence the model relates conflict not only to lack of cohesiveness, but also implies that both are tied in with the maturity of the group. What the model does not indicate is whether this only applies to a particular type of conflict, or even just to a particular reaction to conflict. The model has its origins in the interaction process analysis developed by Bales (1950), and the empirical studies which support it only measure the social-emotional responses of group members. Hence, it is possible that what the model is really showing is that the group learns to deal with conflict and suppress emotional responses. If this is the case then the model says very little about the underlying level of conflict throughout group development.

Although the utility of Tuckman's model has been questioned, the view that groups move through discernible developmental phases is widely held. Cissna (1984) reviews the handful of studies which did not find developmental phases, but notes methodological and conceptual problems with all of them and concludes that the negative evidence is unconvincing. On the other hand, he points out that there are likely to be aspects of groups which do not develop, while other aspects do; that groups may develop in idiosyncratic ways (there is far more evidence to support the notion of group development in general than there is to support any particular model of development); and even that some types of groups do not change. He suggests that it is more useful to identify significant differences and similarities in group development among various types of groups, and to relate variations in developmental processes to group outcomes such as cohesiveness.

In contrast to generalised models of group development such as Tuckman's, Gemmill & Wynkoop (1991) present a model of the psychodynamics of a group transformation. The model is concerned with second order change – disorderly, discontinuous change – as opposed to first order change which is orderly and gradual. For small groups, second order change results in a transformation of attitudes on focal issues. The model describes how members unconsciously accept covert roles to dramatize the central conflicts of the group, to reflect negative attributes ('scapegoat') and positive attributes ('charismatic prophet'). The process by which these roles are accepted and integrated is known as reparation.

The model has a number of phases and transitions as follows (see figure 4): the first phase is 'hanging on' which involves intellect only; once the defensive boundary has collapsed, the 'working through' phase is reached, involving emotions only; expanding the emotional boundary leads to 'letting go', with a confluence of intellect and emotions; and taking self-responsibility leads to 'moving beyond' in which intellect and emotions are integrated. The final transition is the infusion of new meaning. At any of the transition points, the group may fail to make the transition and seek regressive solutions. The model is presented as a downward vortex, spiralling around the central issue, which acts as a focus to offset the defensive pull toward regressive solutions. The entire model is presented partly to explain empirical observations of the individual phases, and partly to investigate the theoretical proposition that when faced with a difficult issue, the group members either react with a sense of denial and seek a regressive solution or choose to deal with the uncertainty. The model is normative in the sense that it indicates in which direction the group should move in order to develop.

Regardless of the validity of either of these models of group development, one would expect the longevity to have a bearing on the cohesiveness and on the level of conflict. Ford *et al.* (1977) consider the issue of group tradition or lifespan and its impact upon various measures of group performance. Their results present no conclusive evidence that established

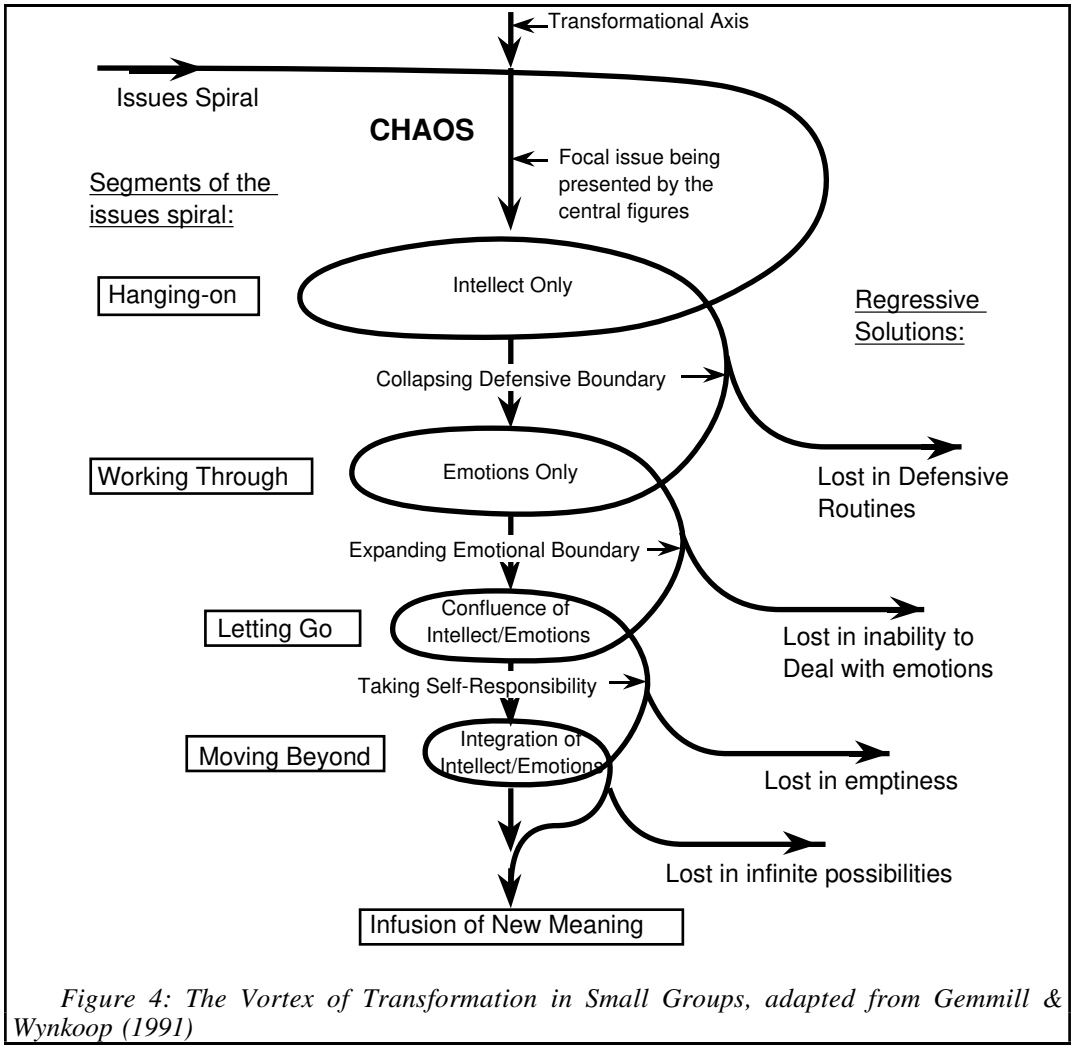

Figure 4: The Vortex of Transformation in Small Groups, adapted from Gemmill & Wynkoop (1991)

groups perform a decision making task better than ad hoc groups but they suggest that further research should consider the impact of different intervention techniques such as the nominal group technique (Moore, 1987) for groups with varying life spans.

D) The more communication there is between people, the more opportunities there are for conflict

Communication is carried out for a purpose within a developing context, and it can vary in both amount and quality. Weinberg *et al.* (1981) found that in 22% of groups encountering interaction problems there were problems with communication patterns. This category included difficulties caused by inadequate networks, unclear speech patterns, or inattentive listening.

There is no one-to-one relationship between communication and organisational conflict. Simple formulae such as "more communication will reduce conflict" or "ambiguities in communication lead to conflict" have been refuted in various empirical studies (Putnam & Poole, 1987). Putnam & Poole concentrate on communication, as it is so fundamental to conflict: the very "activity of having or managing a conflict occurs through communication" (p550). They point out that the mechanistic view of communication, with its emphasis on channels and transmission of messages, is central to many studies of conflict. This, they argue, leads to research in which the medium or mode of communication is manipulated, and different types of networks investigated.

Research on the effects of different communication networks is reviewed by McGrath, (1984). Centralised communication nets (where all communication has to travel via a central person at the hub of a wheel) have been found to be very efficient for transmission of information. But if the task is complex, and not reliant simply on information, then the wheel

loses its relative task efficiency advantage, and the onus on solving the problem falls to the person at the hub of the wheel. In the 'circle' each member is connected to two other members, but no one member is more central than the others. Although information cannot be routed to one node as efficiently, each group member feels equally central. It is the level of satisfaction with the structure that is more likely to affect conflict than the efficiency of the arrangement. For example, McGrath points out that in a circle group, all members have a relatively high satisfaction, as does the person at the hub in a wheel group. On the other hand, peripheral members of a wheel report much dissatisfaction.

The bandwidth of communication available seems to have a greater influence. McGrath points out that the amount of communication and amount of influence in the group is much lower in restricted bandwidth communications than in face-to-face groups. Different modes of communication, such as face-to-face, electronically mediated audio-visual, or text only, provide different bandwidths, with face-to-face communication providing the richest interactions. One finding is that the narrower the bandwidth the more task-focussed the interaction becomes, since interpersonal and social aspects are not conveyed, due to the absence of non-verbal cues. In some circumstances, the interpersonally rich conditions may produce 'noise' that distracts from the task and under such conditions, the relatively lean modalities may deliver more efficient task performance – provided the leanness does not eliminate necessary cues – but there will be no pattern of interpersonal relations and members will not be very interpersonally satisfied. McGrath concludes that "group members *prefer* relatively rich communication modes, need them for some tasks, and do better in them for some – but not all – tasks" (p181, orig emphasis).

It could be argued that the opportunity for conflict increases with the communication bandwidth, as there is more opportunity to perceive both conflict of values and motivation, and affective conflict. However, this is not found to be the case. High bandwidth media (eg. face-to-face) permit group members to exercise 'regulatory functions' in their interaction, thus achieving a better success rate in conflict resolution (fewer abandoned discourses), suppressing the use of high-risk conflict strategies such as bluffing (Crott *et al.* 1980), and decreasing the readiness to harm one's opponent (Milgram, 1965). Presumably there would be less miscommunication as well: Curtis *et al.* (1988) observed that textual documentation is ineffective for communication amongst software development teams, as it does not resolve misunderstandings. One further problem with low bandwidth communication is that the relative anonymity may lead to de-individuation (neutralisation of individuals' distinguishing characteristics) which may make group members more critical, more probing and hence generate more conflict. We discuss de-individuation further under assertion H.

The concentration on networks and bandwidths obscures the possibility that it may matter more *what* is communicated than how. Saine & Bock (1973, cited in Putnam, 1983) found that groups which fail to agree on procedural matters spend time on procedural issues rather than substantive issues. Agreement on procedural issues guides the task activity of the group and facilitates the integration of substantive issues.

We could examine the inverse of this assertion: "the less communication there is, the fewer opportunities there are for conflict". If conflict is a communicational activity, then this is trivially true. However, Pood (1980) suggests that disagreements, and competitive and violent behaviours are not actually conflicts, but are communicational responses to conflict. Examples of extreme conflict involving very little communication can be found. Inter-racial prejudice is one such example, and is the concern of the 'contact hypothesis', which states that interaction between individuals from different groups will reduce inter-group tension (Hewstone & Brown, 1986). Although authors such as Pettigrew (1986) have criticised the contact hypothesis as being so loose and general as to be untestable, it nevertheless contains an element of truth for particular types of group.

Finally, we might also observe that a decrease in communication may serve to intensify a conflict. Thomas (1976) points out that if a party uses communication to manipulate or control another party (or is suspected of doing so), then trust is reduced to the point that communications from that party cease to be believed, or even listened to. This pattern has been observed in labour relations. Such breakdowns in communication allow the conflicting parties to maintain distorted stereotypical views of one another, and to feed their hostility. Thomas cites as examples maintenance of army morale by preventing fraternisation with the enemy, and political assassins, who fantasize that their targets are devils.

Overall it would seem that the assertion is not supported by the evidence. In fact, conflict *can* be reduced by better communication, where 'better' refers not just to the pattern and the bandwidth of communication, but to the effectiveness of the communication. In section 3.1.3 we discuss this last point further, in relation to problems with the use of video links in CSCW systems.

E) Clearly defined roles reduce conflict

Baker (1981) reviews work on the division of labour in small groups and distinguishes two key concepts: differentiation and specialisation, both of which provide measures of interdependence of the group members. Task differentiation describes the extent to which the work is divided into a large number of subtasks relative to the size of the group. Task specialisation is the degree to which tasks are able to be performed by a small subset of the group. The latter is a better measure of interdependence, because "as task specialisation increases, the group becomes dependant on fewer individuals for the completion of each task" (p96). Baker comments that an increase in task specialisation leads to more cohesion, but that this simultaneously leads to more actor specialisation, which reduces cohesion and tends to isolate individuals. Actor specialisation, in this context, is defined as the extent to which group members spend all their time on particular tasks. He suggests that plenty of face-to-face communication and the development of a collective identity is needed to counteract these processes.

There may be problems if the roles are imposed undemocratically: Moreno (1953 – cited in Bass, 1980) noted "formal...groupings which are superimposed upon informal, spontaneous groupings by some authority are a chronic source of conflict". Also, groups may perceive a difference between formal and informal roles. Wood (1989) describes a case study of a group which believed that adherence to formal group structures would inhibit creativity. For example, the group agreed to work as equals rather than in any hierarchical arrangement, refused to designate a chairperson, and were determined to reach decisions through consensus. The group failed to achieve their task after fifteen months. The lack of clearly defined roles meant that no one person had responsibility for focusing the group's attention. Furthermore the group tended to avoid conflict and critical discussion, preferring to suppress their anxieties about progress in the name of politeness. Although it is not clear how much this was due to the lack of role assignment, Wood concludes that failure to use task-holding mechanisms "increases the likelihood that a task group will evolve into an informal group that fails to complete the task" (p445).

Chapter 8 offers another view of the assignment of roles in collaborative groups; For a discussion of the role of leader, see assertion Q.

2.2. Causes of conflict

The assertions in this section are concerned with particular causes of conflict. We do not attempt an exhaustive coverage of the many potential sources of conflict. Such attempts may be found elsewhere. For example, Deutsch (1973) lists the following issues involved in conflicts:

- control over resources;
- preferences and nuisances, where the tastes or activities of one party impinge upon another;
- values, where there is a claim that a value or set of values should dominate;
- beliefs, when there is a dispute over facts, information, reality, etc;
- the nature of the relationship between the parties.

Robbins (1989) groups the conditions under which conflicts arise as:

- communicational, including insufficient exchange of information, noise, and the semantic differences that arise from selective perception and difference of background;
- structural, which includes the goal compatibility of members of the group, jurisdictional clarity, and leadership style;
- personal factors, including individual value systems and personality characteristics.

F) Conflicts arise from misunderstandings as opposed to illwill

While the lists above help to characterise conflict, they do not offer any hint about how to detect and differentiate the different types. Part of the problem is that the causes of a conflict are

not necessarily reflected in its manifestation. Deutsch (1969), for example, makes a distinction between manifest and underlying conflict. Raven & Kruglanski (1970) relate this distinction to personal and impersonal conflict, in that the manifest conflict may appear to be impersonal, such as children quarrelling over a toy, while the underlying conflict may be personal, in that the children might be using the toy as an excuse to quarrel because they really do not like one another. Deutsch terms these displaced or 'pseudo-' conflicts.

However, such a simple relation between manifest and impersonal conflict is unlikely. Both personalised (or 'affective') and depersonalised (or 'substantive') conflicts can be observed to occur in group interactions (Putnam & Poole, 1987), and some studies have compared the occurrence of the two. Intuitively, one might expect a highly cohesive task-focussed group to have little illwill, hence little affective conflict. In fact Pace's (1990) findings indicate that this might not be so. High consensus groups (ie. effective decision making groups) differed from other groups not so much in the amount of conflict, but in the group's ability to differentiate personalised and depersonalised conflict. In particular, such groups are better able to identify and understand positive (cooperative) conflicts, and can use them to clarify the issues prior to forming a common perspective (Folger & Poole, 1984)

While negative, personalised conflict can be regarded as illwill, depersonalised (substantive) conflict does not necessarily equate to misunderstanding. In this context, misunderstanding could refer strictly to miscommunication (see assertion D), or it could include problems arising from differences of interpretation of a situation, and cognitive dissonance. If we define misunderstanding as referring to problems of communication, this excludes the 'real' substantive conflicts, over which there is no miscommunication, and no personalised clash. These might concern the substance of the task, and the meta-task, ie how to go about the task, including how the group is organised and the relationship between the members.

Social Judgement Theory examines exactly this type of conflict (Brehmer & Hammond, 1977). The focus of this area is differences in cognitive views of a problem, and in particular differences of policy. This is in sharp contrast to much research on conflict which concentrates on motivation and conflict of interest. The cognitive differences are observed in the exercise of individual judgement on tasks with uncertain information. Experiments in social judgement theory are deliberately set up to exclude affective elements, so that the cognitive process of making judgements can be studied. Findings suggest that there is no significant reduction in the amount of conflict when affective factors are excluded. Also, conflict persists because people give up their judgement policies too rapidly, in the process of seeking new policies which resolve the conflict. This premature abandonment then causes them to appear inconsistent. Such conflicts are hard to resolve because participants lack the necessary insights into their own policies (Brehmer, 1976).

G) Technological mediation introduces conflicts

The use of technology to support group interactions seems to affect the behaviour of the group, and there is much anecdotal evidence concerning the quirks of facilities such as electronic mail. Disciplined empirical studies are harder to come by. As Kiesler *et al.* (1984) point out, research on the impact of computer technologies tend to concentrate on cost and technical facilities, neglecting the social psychological aspects. While the psychology of individual users has received much attention in the HCI literature (eg see Norman & Draper, 1986), social aspects have not, as they pose methodological problems. The changes that introduction of a technology cause in an organisation are difficult to recreate experimentally, and field studies do not usually provide the comparative data needed. With the current interest in CSCW, recent research has sought ways of studying the social aspects; subsequent chapters of this book present some of this work.

Some limited studies have been conducted. For example, Sainfort *et al.* (1990) conducted a study of group decision making, comparing use of videotape, the use of a computerized decision support system (DSS) and a control group with neither technology. In subsequent questioning, groups with access to the two technologies perceived greater progress in reaching a resolution, and rated that resolution significantly higher than did the control group. Also, the group using the DSS generated more alternative solutions to the problem than those using videotape. However, it is not clear how much of this effect can be traced to the appropriateness of the technology to the problems tackled. Clegg (1988) points out that many problems with

the introduction of new technology can be put down to the inappropriateness of the technology chosen.

One area of technology which has been studied from a social psychological viewpoint is the use of computer mediated communication (CMC). It has been widely reported that the anonymity afforded by electronic communication leads to, among other things, a reduction of normal restraints on behaviour. This effect is believed to be a result of de-individuation (Jessup *et al.* 1990; Lea & Spears, 1991), which we discuss under the next assertion.

H) Anonymity and physical separation contribute to conflict

Use of computer mediated communication (CMC), such as electronic mail, does more than just speed up the flow of information. It may change the pattern of communication, the distribution of information, and it may change the nature of interactions between people (Sproull & Kiesler, 1986). In particular, CMC provides the possibility for anonymous engagement in group activities, and it is this anonymity that has been the focus of many studies, and much speculation. Note however, that CMC does not have to be anonymous.

By varying the amount of communication available, Crott *et al.* (1980) discovered that there is an increased tendency for more aggressive and less cooperative behaviour when communication channels are restricted, and in particular, when there is no voice component. Their study compared the behaviour of pairs of students in a bargaining game in which one participant has much greater payoff possibilities than the other; however, the participants could only discover this through communication. Of particular interest in this study was the observation that audio communication reduced the use of bluffs and other high risk/aggressive behaviour modes, but did not significantly equalize the participants' payoffs.

Jessup *et al.* (1990) conducted a laboratory experiment to compare the use of group decision support systems in which comments were identified by name with those in which all contributions are anonymous. They conclude that "GDSS anonymity serves to detach an individual from his or her comments and from others" and they "suspect that this leads to a reduction in normal restraints on behaviour". Although their experiment could not tell them why GDSS anonymity had this effect, their suspicion was that it was a de-individuation effect; in other words, an effect of the loss of a sense of individuality among participants. However, they also discovered that the size of the room in which the subjects were situated had a much greater impact on de-individuation than any changes to the software.

De-individuation arises when cues necessary to distinguish different people are missing. Kiesler *et al.* (1984) point out that CMC fails to provide "individuating details about people that might be embodied in their dress, location, demeanour, and expressiveness". They list the following aspects of CMC that provide the conditions for de-individuation: time and information processing pressures; absence of regulating feedback; dramaturgical weakness; lack of status and position cues; social anonymity; and the lack of a mature etiquette. They investigated these empirically using groups of three given a choice-dilemma problem. Groups using CMC took longer to reach consensus, participated more equally, showed greater choice shift, and were less inhibited. Three possible explanations are offered for these findings: absence of feedback between speaker and listener delaying consensus formation and leading to frustration; less influence and control by a dominant person; or depersonalisation causing group members to be more impulsive and more assertive. The experiments were not detailed enough to support any one of these explanations and doubt was expressed about any generalisation of the results.

Sproull & Kiesler (1986) showed that e-mail reduces social context cues, and hence people behave irresponsibly more often and focus on themselves rather than others in salutations and closings. However, they did not compare this behaviour specifically with other modes of communication such as memos, telephone, and face-to-face. Despite this, their conclusions about the utility of email are positive, in that although email clearly changes organisations, many of the changes are for the better, including increased social communication, uninhibited behaviour allowing new ideas to flow, and the reduction of geographic, temporal, departmental and status barriers.

Lea & Spears (1991) criticise the explanations for changes in behaviour put forward by Kiesler's group, including the absence of social cues, breakdown of social constraint through de-individuation, and the exposure to a greater pool of arguments leading to polarization. In particular, the weakening of social norms through de-individuation is questioned. An

alternative view of de-individuation is put forward which emphasizes the role of the social context. In this view, de-individuation associated with immersion in a group enhances the salience of the group, and hence strengthens norms, while if the group identity is not already salient, then de-individuation only serves to strengthen one's sense of individuality, and so weaken group norms. This was investigated empirically by situating each subject in a separate room to create de-individuation, and in the same room for individuation, while varying group immersion by altering the wording of the initial instructions and the headers of the messages. As predicted, the results showed that subjects in de-individuating conditions, where the group identity was strong, were significantly more polarized in the direction of the group norm. This polarization was not associated with uninhibited behaviour.

2.3. Utility of conflict

From our discussions so far, it should be clear that conflict is not necessarily dysfunctional. The assertions in this section consider how conflict can be productive. The idea of productive conflict is not new; Dahrendorf (1959) puts it this way: "May we perhaps go so far as to say that conflict is a condition necessary for life to be possible at all? I would suggest, in any case, that all that is creativity, innovation, and development in the life of the individual, his group, and his society is due, in no small extent, to the operation of conflicts between group and group, individual and individual, emotion and emotion within one individual. This fundamental fact alone seems to me to justify the value judgement that conflict is essentially 'good' and 'desirable'." (p208)

I) Conflict can be productive

Deutsch (1969) suggests that most of the literature has concentrated on the destructive effects of conflict and has failed to deal adequately with cases where conflict has productive consequences. In his view, its very pervasiveness is indicative of a number of positive functions: "It prevents stagnation, it stimulates interest and curiosity, it is the medium through which problems can be aired and solutions arrived at; it is the root of personal and social change" (p.19). In addition, it can be a useful and enjoyable way of stretching oneself to limits, and it can help to establish group and individual identities. He suggests that conflict can lead to "arousal of the optimal level of motivation" (p.21) to solve problems and move beyond the status quo. Necessary circumstances for such action rest on a non-threatening and non-pressurised environment and confidence in one's capacities to deal with the situation. Indeed, he stresses the importance of cognitive resources for dealing with conflicts creatively.

Thomas (1976) also refers to ways in which the literature on conflict tended to concentrate on its elimination or avoidance, but suggests that there is growing recognition that interpersonal and inter-group conflict often serve useful functions. He itemises a number of these based on his review of the literature. First, conflict can serve to maintain optimal levels of stimulation in conditions of boredom and low tension, where people may welcome divergent opinions, competition, and, at times, overt hostility. Second, like Deutsch, he also suggests that the confrontation of divergent views can produce new perspectives and more comprehensive views, leading to superior decisions. Supporting this view, he cites Hall's studies of group decision making (1971), in which he concludes that "conflict, effectively managed, is a necessary precondition for creativity" (p.88). Third, aggressive behaviour is not necessarily irrational or destructive in conflict situations and "the aggressive pursuit of apparently conflicting goals by two parties may well lead to constructive outcomes" (p.892). Two parties actively seeking to improve their own lot may succeed in forging a new set of conditions which is of mutual benefit and may constitute progress. Viewed from this perspective, the suppression of conflict may impede progress and help maintain the status quo.

Further, he suggests that conflict can foster cohesiveness and stability within a group where there is inter-group hostility. Power struggles can help to determine the balance of power and the group can then be organised consistent with this balance, which will give a more stable structure.

The recognition of these positive attributes of conflict has lead to a more balanced view which acknowledges that there are aspects of conflict which can be both destructive and productive. Rather than a consideration of its elimination and avoidance, the emphasis has shifted to the effective *management* of conflict (Robbins, 1989). In research on group work in software development Pasch (1991) suggests that argumentative dialogue (in which concepts

or models are suggested, challenged, possibly refuted, and met by counter proposals) is necessary to the creative process of design. Indeed, he comments that "vehement situations are considered as normal" (p.559) but a framework of consensus on such things as working practices, roles, and acceptable behaviour is a prerequisite.

It seems that conflict can be productive. It may be that some conflicts which are more concerned with the power struggles, personal antagonisms and competition between groups may be more negative than positive. However, conflict concerned with ideas and issues has a positive effect on the resulting decision and should not be suppressed. The utility of issue-related conflict is discussed more fully under assertion J, concerning 'group-think'. The utility of issue-related conflict may depend on whether people take a positive attitude towards it: we discuss attitudes to conflict under assertion V.

Supporting the notion that the synthesis or exploration of divergent views can lead to superior decisions is a body of educational research, influenced by Piagetian theories, which suggests that conflict is necessary to generate learning and that articulation of differing perspectives can lead to re-evaluation. The work of the Genevan school (Doise, Mugny and Perret-Clermont, 1975; Mugny and Doise, 1978) suggests that cognitive development arises out of cognitive conflict between individuals, whether at different levels of cognitive development or simply with different viewpoints, and this causes cognitive restructuring (see chapter 4). Perret-Clermont (1980, p.195-6) states that "for a task to have educational value, it is not sufficient for it merely to engage children in joint activity; there must also be confrontation between different points of view". Glachan and Light (1982, p.258) suggest that merely perceiving a conflicting viewpoint is insufficient to induce learning. Their research leads them to infer that "interaction between inferior strategies can lead to superior strategies or, in other words, two wrongs can make a right". They suggest that it is the disruption of established inefficient strategies which can lead to the perception of better strategies. This work is based on children's cognition, but it is perhaps not too fanciful to suggest that some similar processes are at work when adults engage in conflict which is based on conflicting opinions and views.

J) Actively eliciting conflicting viewpoints can reduce group-think

The 'group-think' phenomenon was presented by Janis (1972) as one possible contributing factor in his analysis of various poor US foreign policy decisions including the Bay of Pigs fiasco. Conditions for group-think include (1) that the group should be highly cohesive, (2) that there is a preference for a leader's voice and (3) that there is insulation from experts. In group-think there is a sense of invulnerability where the risks of making a poor decision are ignored, past decisions are rationalised and not critically reappraised, and information and expert opinion which might conflict with the consensus is not sought. Loyal group members are expected not to dissent from the consensus view and are sanctioned if they do: there is self-censorship by individuals and also the emergence of 'mindguards' who try to protect members of the group from information and opinion which might cause them to doubt the consensus. The members of the group thus maintain high cohesion, certainty of their correctness and an illusion of unanimity by artificially suppressing their critical faculties. Moorhead *et al.* (1991) describe a particularly disastrous instance of group-think in the decision to launch the space shuttle Challenger (see assertion M).

Janis (1972) recommends various structural measures be taken to guard against group-think such as encouraging the group to air doubts, having impartial leaders, forming subgroups within the group, having discussion with people from outside the group, and having a 'devil's advocate'. Gero (1985) argues that all these can be interpreted as ways to "positively sanction conflict as desirable and necessary" (p491). She found that in general, group members have anti-disagreement norms if they are expecting to participate in a consensual process. This could give rise to a self-fulfilling prophecy where disagreement is suppressed and group-think develops. Though consensus is desirable at the end of a decision making session it is counter-productive to try to reach consensus from the start as alternatives will not be properly considered and the quality of the decision will suffer. The premature self reinforcing consensus associated with group-think might be contrasted with 'vigilant appraisal' where, in an atmosphere of trusting personal relationships, there is healthy suspicion of one another's ideas, explicit discussion of the issues, acknowledgement of the risks of a decision and the possibility of reversals of judgement.

There are problems with encouraging conflict however. Priem & Price (1991) found that people expect less harmony where the decision making process uses devil's advocacy or dialectical inquiry than they do in consensus decision making. They expect to have less confidence in the result (unlike group-think where the participants display certainty that they are right) and there may be less enthusiasm for implementation of the resulting decision as a result.

It seems that a healthy balance, where participants feel free to voice their disagreements about the issues under discussion in a cooperative atmosphere, is most likely to steer between the problems of group tension and the danger of group-think.

2.4. Development of conflicts

K) Conflict has to be resolved for parties to continue to work together

Much effort is devoted to resolution of conflicts, in the belief that they hamper the ability of people to work together. This is clearly appropriate if the conflict is dysfunctional for the group. However, it is possible that some resolutions are more dysfunctional than the original conflict; for example, from an external perspective, a standoff in a power struggle may be preferable to the defeat of either party. Furthermore, we have shown (in assertion I) that conflict can be productive. Hence the question then arises as to whether conflicts hamper the ability of parties to work together, and where they do not, whether resolution is desirable.

Smith & Berg (1987) point out that to talk about 'working through' or resolving conflict is misleading, because conflicts are part of the nature of a group. To emphasize the point, they identify seven fundamental paradoxes of groups, covering identity, disclosure, trust, individuality, authority, regression, and creativity. For example, the first paradox is that people think about their identity in terms of the variety of groups to which they belong, and they think about a group identity in terms of the different individuals which comprise it. The paradox of trust is that for members to trust a group, the group must trust its members; hence individuals wish to know whether the group will accept and trust them before they trust the group. The point made is that any group embodies a number of contradictions, so that groups have to accept them as part of their nature, rather than seeking to resolve the conflicts that arise from them. Smith & Berg suggest that simply recognising and coming to terms with these conflicts is sufficient.

On the other hand, Baxter (1982) warns that if avoidance is frequently used for coping with conflict, then the end result may be a 'super-conflict' of stockpiled issues. By saving up unresolved conflicts, it becomes harder to reconcile the parties involved (see assertion R, on entrenched positions). Baxter noted a pattern of conflict avoidance, or 'fight-flight' in the groups she studied, and uses this to explain her observation of a marked increase of information-giving during conflict resolutions in later stages of the group activity. Specifically, members of the group were explicitly summarising the implications of particular resolutions, in order to link them with previous unresolved conflicts. In this way the stockpile of unresolved issues is reduced.

L) Conflicts follow a set pattern

Although many theoretical treatments of conflict present a series of stages of individual conflict episodes, the empirical basis of many of these models is unclear. In most cases they simply offer frameworks for investigation of conflict rather than descriptive (or even prescriptive) models. For example, Pondy (1967) treats conflict as a series of episodes (see figure 5), with each episode including the stages: latent conflict (conditions); perceived conflict (cognition); felt conflict (affect); manifest conflict (behaviour); and conflict aftermath (conditions). This pattern, which distinguishes latent tensions from perception of conflict and subsequent action, is also adopted in similar models by other authors (eg. Robbins, 1974; Thomas, 1976). However, the stages are vague, and reflect an emphasis on the role of perception, and a suggestion that conflict must be be perceived before it is felt, and felt before it is acted on. The latter point is not so much a testable hypothesis, as a definitional issue.

Studies of negotiation offer more detailed analyses, being more concerned with prescriptive models. For example, Gulliver (1979) presents two models of the negotiation process: a cyclic model and a developmental model. The cyclic model shows how behaviour and information from each party affects the other, and the developmental model describes a number of phases, including: search for arena, agenda definition, exploring the field, narrowing the differences,

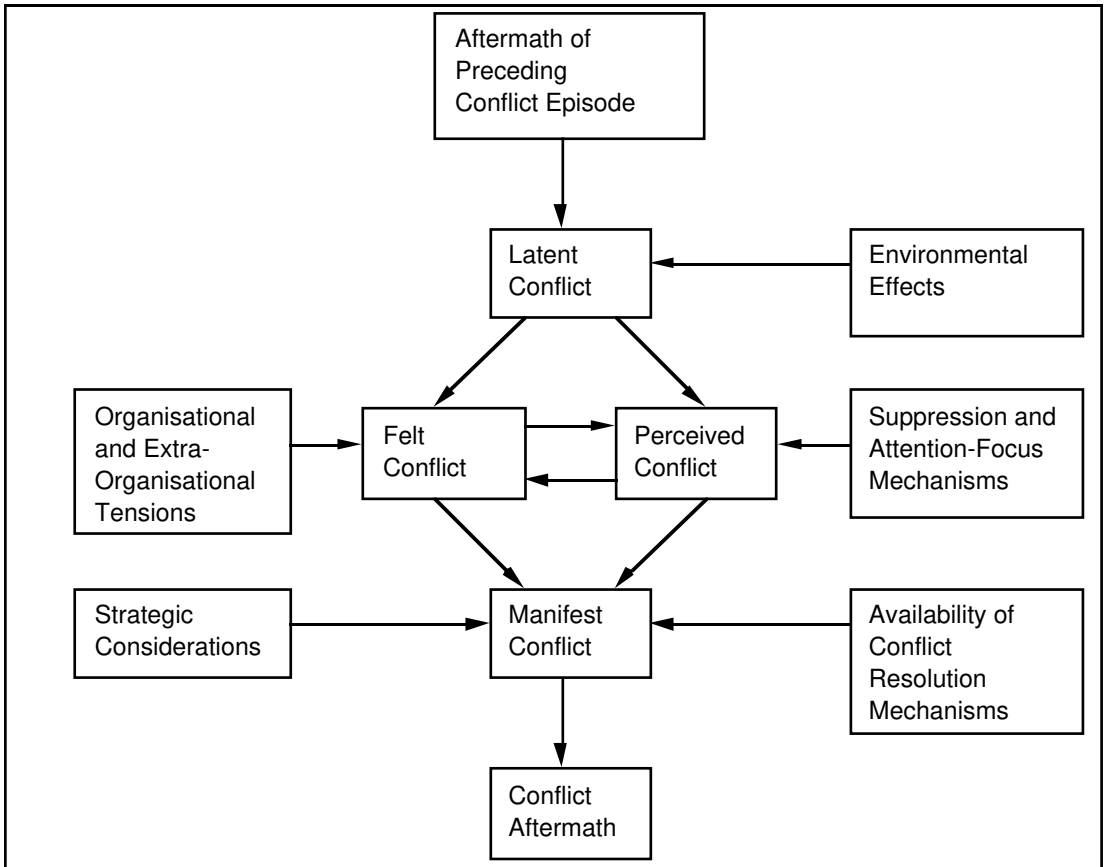

Figure 5: The dynamics of a conflict episode, adapted from Pondy (1967).

preliminaries to final bargaining, final bargaining, ritualisation of outcome, execution of outcome. These models are supported by a number of apt examples that come from empirical observation, but these do no more that illustrate the plausibility of the models as theoretical frameworks. Effectively, the models are generalised ideals, and are not intended to be rigidly applied to particular empirical cases. Also, the models are intended for formal negotiation, rather than conflict resolution in general, and hence their applicability may not be very wide.

M) Styles of handling conflict vary with pressures of time

Many studies of group behaviour have ignored temporal aspects, other than recognition that a group may develop through a series of phases as time progresses (see assertion C). In recognition of this, McGrath (1991) puts forward a theory of group activities that explicitly recognises that any action not only takes its meaning from the context, but also from its timing: if an action is regarded as conflictful at one point, it might not be seen so at a later time. The theory suggests there are three generic temporal problems: temporal ambiguity, in that it is not clear when events will occur or recur; conflicts between temporal requirements; and scarcity of temporal resources. These are handled by the group through scheduling, synchronisation and time allocation, and by individuals by making temporal commitments, negotiating event sequences, and regulating task interaction. The mismatch between these group and individual responses leads to problems of establishing and enforcing deadlines, coordinating dynamic teamwork, and resolving demand-capability mismatches.

McGrath goes on to point out that time is basically 'lumpy' in that neither periods of time, nor bundles of activity can be efficiently subdivided without limit, and periods of time are not always interchangeable for particular activities. Pressures of time strongly affect the rate at which work is done, in a process known as *entrainment*. This refers to the synchronisation, or loose coupling, of the phase and periodicity of two or more activities. Typically, groups that are given shorter times to do a task work faster, while those given more time work slower. Through entrainment, these rates persist: a group will continue to work at the same rate on

subsequent tasks, even if the allotted time is varied. Kelly *et al.* (1990) discovered that this general result does not necessarily hold if groups encounter difficulties with the task. They explain the anomalies by considering capacity and capability. If the group feels the problems are to do with capacity – where steady progress was made, but time ran out – then they will work faster in subsequent trials. On the other hand, if the group feels the problem is one of capability – progress slows because the problem needs deeper thought or is beyond the ability of the group – then they will work at a slower rate on subsequent trials, in order to try and produce better quality solutions.

Although Kelly *et al.* do not refer explicitly to conflict, the results are clearly relevant. Perception of a capacity problem implies that the group perceives the quality of their solutions to be adequate – they will work faster and ignore doubts and conflicts. If the group perceives a capability problem they will take more time, and pay more attention to task related conflicts. Note that although this result strictly applies only to entrainment – how pressures on an initial task affect rates on subsequent similar tasks – there is a more general result. Group members are more likely to ignore conflicts when deadlines approach if they feel adequate to the task. For example, Moorhead *et al.* (1991), in their analysis of the decisions made leading to the launch of the ill-fated 'Challenger' space shuttle, suggest that a limited time frame leads to pressure to agree. Group leaders then push forward a particular point of view rather than directing group activities towards critical appraisal. This leads to an atmosphere of group-think (see assertion J).

N) Size of a group affects the occurrence and resolution of conflict

In a lengthy presentation of a framework for studying teamwork, Bass (1980) points out that the effects of the size of a group are hard to isolate from many other factors. However, he points out that in larger groups, the patterns of interactions are vastly more complex, and this has a number of implications. The first of these is that in large groups cliques are likely to form, both because of communication barriers, and where there are differences of opinion. In particular, minority views often lead to cliques which are then likely to conflict with and compete with the rest of the group.

Bales & Borgatta (1955) observed groups ranging in size from two to seven members, and demonstrated a number of trends which illustrate two factors: larger groups mean less talking time per person and each person has to maintain more relationships. Bass cites a study by Gibb (1954), which investigated a public relations problem given to a variety of groups of sizes up to 96. The groups spent 30 minutes listing suggested solutions and 30 minutes evaluating them. In the larger groups there was a larger percentage of team members who reported that they had ideas they did not express, and a larger percentage of members who never talked directly. Members who failed to interact felt more threatened in the larger groups: they felt their ideas might be misinterpreted, they felt it was easier to let someone else speak, or someone else put forward their idea before they had formulated it. The results of these two studies are broadly comparable, even though they investigated substantially different ranges of group size.

If members of a larger group are unable to contribute as much, or are suppressing their contributions, then the level of disagreement should decrease. Bales & Borgatta substantiated this, but note that the observer had more to observe with the larger groups, and may have missed signs of tension. However, this does not explain away all their results, and they put forward two further explanations. Firstly, in larger groups, the roles required by the task may be allocated over a larger number of persons, increasing the chance that each role will be performed by someone without much difficulty. The second reason is that larger groups offer more anonymity for people who are more likely to conflict when forced into greater involvement.

The conclusion must be that occurrence of conflict increases in smaller groups, and that this is at least in part because each member is more fully engaged in the task. However, this does not imply that the conflict is destructive. Adding members to a group does not necessarily increase the resources of the group, due to the increased complexity in communication patterns (Brooks, 1975). Also, extra members may be redundant. However, Bales & Borgatta warn that for small groups, it may matter more whether the group has an odd or an even number of members, as even-sized groups can spend longer in deadlocked situations.

O) (The course of) conflict is culturally sensitive

That different cultures have different attitudes to conflict is self-evident. There are many books on conducting commercial negotiations (eg. Scott, 1988) which present lists of "dos and don'ts" when negotiating or bargaining in different parts of the world. Such tips reflect the fact that different cultures display conflict in different ways, and expect different behaviours when resolving conflicts. However, it is not so self-evident to what extent culture affects perceptions of conflict, treatment of conflict when it arises, and even ideals for what constitutes a good solution to a conflict. These issues become particularly important when considering the prospect of global networks in which communication barriers between cultures are removed.

Many studies have compared conflict and conflict handling in particular national cultures, and discovered variations. For example, Corsaro & Rizzo (1990) compared disputes among American and Italian children, using conversation analysis, and discovered that peer disputes, and especially the discussions surrounding them, play a more significant role among the Italian children. While disputes among the American children were relatively straightforward, the Italian children embellished their arguments, and seemed to consider participating in the dispute more important than any resolution. In keeping with the ethnomethodological approach, these differences were not hypothesized beforehand, but emerged from analysis of the data.

A more common approach involves identifying cultural traits and examining how these affect conflict. For example, Leung (1987) examined the cultural dimensions identified by Hofstede (1980), and showed that *individualist* and *collectivist* societies had marked differences in their preferences for mechanisms for conflict resolution: in individualist societies (eg. the US) there is a preference for adjudicatory procedures, in which an independent judge makes the final decision; while in collectivist societies (eg. China) the preference is for bargaining and mediation. In explaining this result, Leung identified reduction of animosity as a key factor, and offers two explanations: the preference for bargaining and mediation could be a result of a stronger desire for animosity reduction, or it could be that both societies desire animosity reduction to the same extent, but differ in how they expect this to be achieved. A subsequent study (Leung *et al.* 1990) looked at 'cultural femininity', where 'feminine' cultures emphasize cooperation friendliness and sympathy for the weak, while 'masculine' cultures value achievement, recognition and challenge: Dutch and Canadian subjects were used as examples of 'feminine' and 'masculine' cultures respectively. This study supported the hypothesis that both cultures would desire animosity reduction, but would differ in how they expected this to be achieved. The Canadian subjects preferred confrontational methods as more likely both to grant them more process control, and to reduce animosity, while the Dutch subjects preferred compromise for the same reasons. Note that although the traits are referred to as 'masculinity' and 'femininity', they have little to do with gender, and the above study found no significant variation with the sex of the subjects. (See assertion W for a discussion on gender and conflict).

Kozan (1989) points out that commonly cited cultural dimensions, such as the empirically derived dimensions of Hofstede (1980), do not explain all the differences. In a comparison of the conflict management styles of Jordanian, Turkish and US managers, Kozan expected to find many similarities between the two middle-eastern cultures, and much contrast with the US. In fact there were many differences between all three, and although particular features of the cultures studied could be found to explain the results, these features are not reflected in the generalised cultural dimensions.

The mix of cultures within a group also makes a difference. While the studies described above examine separate cultures, Zamarripa & Krueger (1983) compare mono-cultural groups with inter-cultural ones, in particular looking at leadership norms. Their key finding was that mixed cultural groups initially had a varied set of norms, while mono-cultural groups had very similar initial norms, especially where the members of the group were from the same social class. Furthermore, the variance of norms within each group only changed slightly over the group's existence. In other words, the implicit norms of members of the inter-cultural groups did not converge significantly, even though some negotiation of norms was taking place.

Two conclusions may be drawn: preferences for handling conflict do vary significantly between cultures, and cultural differences in a group complicate the negotiation of group norms, which in turn degrades task performance. However, broad cultural traits provide relatively poor predictors of preference. At first sight it might seem that these conclusions imply that many of the studies of conflict described throughout this chapter are of limited value,

as they draw on a fairly narrow mix of cultures. However, as Leung *et al.* (1990) point out, the differences are quantitative rather than qualitative, and the different cultures have much in common in terms of their rationale for preferring one resolution method over another. For example, in Leung's later study, both cultures clearly preferred harmony-enhancing methods over confrontational ones; the difference lay in the degree of this preference.

P) Personality has little effect on the development of conflict

There is a popular belief that people's personalities strongly affect the way they handle conflict, yet the psychology literature suggests the opposite, that personality does not have a great effect. For instance, although Putnam & Poole (1987) include 'actor attributes' as one of four major variables in conflict situations (see section 1.2.2), they subsume gender, beliefs, skills, and cognitive styles, as well as personality, within this category. In their survey, they conclude that personality traits have very little to do with the style of conflict strategy. This is consistent with other authors who suggest that although the participants in conflicts attribute a lot to personality, this is in fact a fallacy (eg. see Blake & Mouton, 1962).

Terhune (1970) takes a closer look at this question. He notes that sociological studies tend to discount personality as less interesting than situational factors. There are also methodological problems: personality characteristics appear to affect behaviour in some situations but not in others. Terhune cites many game theoretic studies of personality and conflict, and shows that the conclusions are remarkably equivocal, with the effects that have been discovered in some studies not replicated in others. There are also problems with measuring personality and assembling sufficient numbers of subjects with particular personality traits.

A later game theoretic study, that of Hermann & Kogan (1977), supports Terhune's suggestion that personality may have its greatest effect on the initial behaviour of participants. The participant's approach to negotiation is determined, in the absence of other constraints, by his or her personality. Their study showed that traits such as self-esteem and cognitive complexity affect whether a person expects to cooperate or compete, and also affect a person's expectation of what the opponent will do. Once a negotiation is underway, the personality of the other person is far more important, in that the course of a negotiation will depend on how each participant reacts to the other. Hermann & Kogan identify two types of personality characteristic as important: interpersonal style (eg. tendency to conciliate, suspiciousness, etc); and decision style (eg. cognitive complexity, dogmatism, and risk-avoidance).

In contrast to the task game theoretic studies, Sternberg & Soriano (1984) conducted a psychological study of responses to stories presenting conflict situations. The stories covered conflict at personal, organisational and international levels, and for each, subjects were offered a choice of specific resolutions, covering modes such as physical action, wait-and-see, third party intervention, and so on. The study showed that subjects had preferred modes of resolution which applied across different situations. Furthermore, the preferences were related both to perceptual styles and personality. Personality traits such as needs for deference, autonomy, dominance, and change were shown to be mildly predictive of resolution preferences, and in particular whether a subject was likely to choose an intensification or a mitigation style. Similarly, Jones & White (1985) found empirical support for linkages between personality characteristics (affiliation, deference, and aggression) and preferences for different modes of conflict resolution (smoothing, forcing and confrontation), where the preferences were associated with actual behaviours.

In conclusion, it seems that although many researchers have dismissed the role of personality in deciding the course of conflicts, there is *some* evidence that *some* personality traits are correlated with *some* attitudes towards conflict (see also assertion V). However, in many cases the effect of personality is overshadowed by situational and perceptual factors, and one of the reasons some studies have found correlations is that they manage to minimize these other variables. Part of the problem with both game theoretic and psychological studies of personality and conflict is that they tend to isolate the subjects from their everyday situations. Hence it is not clear whether any effects (or non-effects) of personality in these studies apply outside the abstracted situations examined in the studies.

2.5. Management and resolutions of conflicts

Q) A strong leader is needed to resolve conflict

The issue of leadership in small group behaviour is a complex one, and can affect conflict in a number of ways. The selection of a leader might itself lead to conflict. Bass (1980) considers the possibility of two or more group members having equal leadership potential. If the person chosen as leader has both the highest esteem and status, then little conflict is likely, but if this is not the case, and different members have potential to be the most influential, then conflict may arise if they do not share the same approaches to the group's problems. Shaw & Harkey (1976) tested this empirically, by setting up congruent and incongruent groups. In the congruent groups, the status of the leader was assigned to the member high in self-reported initiative and social boldness. In the incongruent group, such a person was assigned the status of a follower. As expected, congruent groups were more effective in accomplishing the group task. The one effect on interaction processes was the tendency of the leaders of incongruent groups to interrupt discussions more frequently than did leaders of congruent groups. If the chosen leader does not behave as a leader should, then group tension increases.

So the appropriateness of a choice of leader, and the subsequent performance of an explicitly chosen leader may affect the occurrence of conflict. To establish whether a strong leader is an asset in conflict resolution, however, requires an examination of the nature of leadership. Homans (1950) presents the thesis that a leader gives the group what its members want. Dyson *et al.* (1976) found in their empirical studies that this was "not entirely substantiated" (p125) because some leaders get from groups what they want as opposed to the other way round. They also found that leaders are likely to have attitudes similar to the other group members, and hence it is difficult to say much about the effect of the leadership.

Gemmill (1989) questions the assumption that such a role as leadership exists in the general sense. In an earlier paper (Gemmill, 1986), he examines the history of the concept of leadership, arguing that a process of reification has elevated an ambiguous expression to the status of a leader role which determines the effectiveness of a group and the satisfaction of its members: "It is assumed by researchers and practitioners that because there is a word (leadership), there must be an entity to be studied. Nothing, of course, could be further from the truth, as it is a matter of personal preference and value judgement as to what empirical referents are connected to the label 'leader role' or 'leadership'" (p41). He argues that the role of leader is a projection of feelings by the group members created to avoid confronting their own lack of control. The displacement of positive feelings, such as confidence and skill, serve to support the idea of the superiority of the leader, and the displacement of negative feelings, such as uncertainty and aggression, serve to support the notion of the leader having the ultimate responsibility for developments in the group and its members.

Central to this process is that it is an unconscious protection against disturbing the perceived status quo: an individual can continue believing in the reassuring idea of responsible and knowledgeable leaders who determine the courses of groups and their work. Because this preserves the social order, it is experienced as reassuring for both those assigned leadership and those assigned following roles. However, as it restricts the expression of the full potential of (all) the individuals concerned, this ultimately reduces group effectiveness. In Gemmill & Kraus (1988) and Gemmill (1989) this thesis is developed further to explore the more general process of creating roles, including various scapegoats, in groups. This and other roles are a product of, and serve to deflect, feelings which the participants have but do not accept in themselves. The result is to stifle creativity in the group.

This literature does not address the question of resolution of conflict as such, but does deny the call for a strong leader as it questions the validity of creating a 'leader' role. In more formal groupings, such as those studied in organisational behaviour, the existence of leadership is taken for granted. In this case, the question is more to do with how a given leader should lead, as opposed to whether leadership *per se* is useful. The issue of strong leadership could be interpreted as one of autocratic versus democratic decision making. Again, general answer concerning the effectiveness of either of these styles is not apparent, as the effectiveness of any particular style of leadership depends on the situation (Howell *et al.* 1986). Clearly, an autocratic leader may appear to help resolve conflicts, but might really be causing them to be suppressed, while a democratic leader might simply prolong the conflict.

The above implies that evidence that strong leadership is a prerequisite for conflict resolution is equivocal. The effectiveness of any particular leadership style, or indeed whether a leader is needed at all depends on the particular conflict. When designing group activities (eg. for CSCW systems), one must be careful about the assumptions about leadership which become embedded in the design.

R) Conflicts are unlikely to be resolved if participants argue from entrenched positions

If participants become entrenched this makes exploration of the middle ground difficult. This may occur where participants have opposing basic beliefs, values or principles which they believe must be mutually exclusive. If this sort of polarisation occurs participants may be unwilling to attempt to understand one another's positions. This sort of conflict has been termed 'competitive conflict' (Pace, 1990) and is characterised by defensiveness, hostility and escalation. Pace contrasts this with 'cooperative conflict' which is "positive, supportive and peace-keeping in nature".

One of the major problems identified with polarization is that the resulting entrenchment stifles creativity (Fisher & Ury, 1981). Authors such as de Bono (1985) put great emphasis on the role of creativity, and suggest that the best way to resolve a conflict is to reformulate the problem. However, creativity is hard to study experimentally, although it is possible to find case studies. For example, Hare & Naveh (1985) describe the role of creativity in the Camp David Summit of 1978. At the beginning of the summit meeting the participants were far apart on many of the issues, but through a creative process of reformulating problems and altering the composition of the group, a successful outcome (ie. a peace treaty) was arrived at. Several important steps were taken to foster creativity, including reorganising the groups when it became apparent that face-to-face talks between the leaders were not working, and introducing a draft treaty prepared earlier to divert attention away from the sticking points. This treaty went through 23 drafts as it bounced back and forth between participants, but most importantly it remained a focus for a problem solving process.

These considerations would tend to suggest that the advice of Fisher & Ury (1981) to detach the originators from their viewpoints is sound. On the other hand we could argue that ideas need champions. This is especially the case for more radical ideas. Moscovici & Zavalloni (1969) observed that the most extremist or the most committed individuals made greater efforts to persuade the group members that their response was the right one and that the group should accept it. They usually succeeded, and as a result, the consensus was in their favour. Consequently, the common decision was far more extreme than the average of the individual choices before the discussion. If these people had not argued strenuously in favour of their own position, then it is unlikely they would have achieved the same outcome.

In conclusion it seems likely that separating people from their positions will foster creativity, and hence may lead to a quicker or better resolution of conflict. However, it is by no means certain that this is always desirable, let alone always possible. De Bono (1985), for example, argues that such a separation is not possible, and that a third party needs to be introduced to design a resolution (see assertion U). Also, such an approach may lead to the problems associated with anonymity and depersonalisation discussed under assertion H. What may be more important is the effect of the resolution process on the participants. A confrontational process may be very costly, while a collaborative problem solving process is likely to be mutually rewarding (Deutsch, 1973). Detaching people from positions may be one way to achieve the latter.

S) Articulating conflict helps in its resolution

There is little doubt that a group which talks about a task will perform significantly better than one which does not. A recent study by Elias *et al.* (1989) confirmed that a session of task-focused self-disclosure between group activities had a significant positive effect on group cohesiveness, commitment to task, and productivity. There is also evidence that conflicts which are not articulated may accumulate to produce breakdowns in group interaction (Baxter, 1982).

These observations have lead to an interest in techniques for making conflicts explicit. An example of a CSCW system which assumes this goal is Argnoter (Stefik *et al.* 1987 – see section 4). Lane *at al.* (1982) note that matters such as who will make decisions may be

decided at a covert level or at an explicit level, and if they are made covertly, then they are open to different interpretations by group members. On the other hand, making things explicit should enhance understanding and focus the group members on the same set of issues. Hence they studied the effects of intervention in a group to persuade them to strive for acceptance – generating a group solution that they could all accept. By varying the instructions, the experimenters made acceptance an explicit group goal, which increased the quality of the group decision, increased the individual acceptance of the group decision, and produced a persistent increase in quality of subsequent individual responses. On the other hand, asking a group to strive for quality actually decreased both the group's decision quality and the individual member acceptance of the group decision. The explanation offered is that making acceptance an explicit group goal turns it into a norm, and creates a more favourable climate for offering and discussing ideas.

We could even go so far as to say that conflict cannot be resolved unless it is expressed. Pace (1990) uses the term differentiation to refer to the group process of identifying and understanding the parameters of a conflict. This involves making the conflict explicit, recognising the issues involved, and having individual views acknowledged by the other members of a group. Pace identifies four aspects of conflict which are salient for differentiation: (1) the strength of the disagreement; (2) the level to which the disagreement is personalised (embedded in interpersonal relationships, emotions and personalities, as opposed to being more purely concerned with task focussed issues and ideas); (3) the competitiveness of the dispute (see the distinction between cooperative and competitive conflict in assertion R); and (4) centrality (how important the issue is for the disagreeing member and the group – this will influence how willing they are to compromise). Pace found that differentiation of depersonalised conflict was very important for group consensus and cohesion. On the other hand, the results suggest that a thorough differentiation does not ensure that consensus will be reached, and that for personalised, competitive conflicts, a prolonged differentiation process can damage personal relations in the group.

This last point leads us to express a note of caution. If articulation of conflict is used as a prelude to resolution, then conflicts which should not or cannot be resolved perhaps should not be articulated. For some conflicts, suppression may be a sensible approach if it avoids a senseless confrontation: we discuss this point further under assertion K. Furthermore, too much concentration on conflict may over-emphasize its importance. Price (1989) studied the effects of messages concentrating on conflict between groups (as opposed to within groups), and concluded that such messages encourage people to think in terms of their group membership, thus reinforcing stereotypical images, and increasing polarization.

T) People can be trained to handle conflict in a constructive way

Many of the assertions in this chapter describe factors which affect whether conflict will occur, and how it will be resolved. Given at least an initial understanding of these issues, it seems likely that training has a role in conflict resolution. Deutsch (1969) points out that conflicts may be constructive or destructive, depending on, among other things, the frame of mind of the participants. He asserts that a mutual willingness to resolve the conflict in a cooperative way will lead to a constructive conflict. The question then becomes in what ways can training help?

In assertion S we argued that articulation of conflict was a necessary precondition to resolution. If this is the case, then training people to articulate perceived conflicts should be helpful. Hence communication skills are important: the way in which the conflict is communicated may determine its utility in the group process. A useful distinction here is between 'regulated' communication, where information is shared and issues debated, and 'unregulated' communication, where participants attempt to injure or eliminate other parties through verbal abuse and hostile behaviour. In a study of groups engaged in problem solving using either regulated or unregulated modes of communication, Pood (1980) showed that more effective decisions were reached where a regulated mode was used. If the resolution process is to remain constructive, then the articulation of it needs to be regulated.

Related to the articulation of conflict is awareness of group processes. Gemmill (1989) argues that covert roles arise from pressures for group members to find outlets for unexpressed and unexpressable feelings by assigning them to certain individuals in the group: scapegoats. The more group members are aware of the scapegoating process, the more accurately group members will perceive themselves and each other, and the greater their capacity to resolve

interpersonal conflicts constructively within the group. This implies that it is possible to train people, through awareness, to become better at interacting in group situations.

Another way in which training may help is to provide group members with specific strategies for dealing with conflicts. Deutsch (1973) reports on studies of strategies used in games, and found that strategies like 'turn-the-other-cheek' fail, whereas non-punitive but reward-giving strategies tend to work best. They encourage an opponent to reciprocate, and hence cooperate rather than compete. There is a large body of work in game theory (eg. see Axelrod, 1984) and in negotiation (eg. see Gulliver, 1979) devoted to the development of successful strategies. However, it is not always clear that strategies that work in abstract games and formal negotiations are useful in the complex reality of group interaction.

Finally, previous experience plays a role. Although it has been shown that both individuals and groups will improve performance on repetition of particular tasks (Axelrod, 1984), it is not so clear that experience of one type of conflict can help with others. Thompson (1990) examined this question using various negotiation tasks, and showed that people were able to apply some negotiation skills learnt in one task to different situations. However, not all skills transferred in this way, and in particular, experience did not appear to improve the subjects skill at finding compatible interests between participants.

We have argued that training in articulation of conflict, regulated communication, awareness of covert roles and group processes, and use of specific strategies may all help to produce constructive resolution behaviour. Elsewhere in this chapter we discuss the use of particular conflict management techniques, such as 'consensus', 'a strong leader', 'third party intervention', and so on. However, none of these techniques by themselves offer a universal panacea, and training needs to include both a range of techniques and an awareness of their limitations.

U) Difficult conflicts need a third party to introduce a resolution

This assertion is made by de Bono (1985), who claims that the introduction of a third party is necessary because the participants become "bogged down by tradition, training and complacency, in the argument mode of thinking", and "simply cannot carry out certain thinking operations because these would not be consistent with their position in the conflict". However, he argues the case rather strongly: are third parties really necessary?

It is clear that third parties can play a useful role. Deutsch (1969) points out that interested third parties often provide the attitudes, strength and resources that are crucial determinants of whether participants in a conflict will favour a cooperative or a competitive approach. Two roles of third parties are introduced: the encouragement of cooperative resolution, especially by powerful and prestigious third parties; and the provision of problem-solving resources. One particular type of third party intervention is the group facilitator (Viller, 1991), who coordinates the discussions of the group to ensure that each member is participating fully.

While not providing an answer to the question of the need for a third party to resolve conflicts, Deutsch (1969), and Viller (1991), point to useful roles which are performed by third parties. By implication, the deliberate introduction of a third party into a conflict or a potential conflict may well help in its resolution. However, there appears to be no reason to believe that this will always be the case. The key point may be under what conditions the intercession of a third party is likely to be most beneficial.

One area in which a third party appears to be necessary is resource conflicts. Edney & Bell (1984) investigate the conflict inherent in the consumption of scarce resources, in particular they investigate the 'tragedy of the commons', in which common resources are over-consumed when all members of a community have equally free access to them. Through a series of game-like studies they discovered that artificially tying the individual's outcome to the rest of the group is good for the group, preserving the commons, and promoting perception of cooperation. However, they go on to consider the practicalities of applying this result, and in particular the political difficulties, in which such an action may be seen to reduce individual freedom where is it imposed by a super-ordinate authority.

V) Different people prefer different approaches for tackling conflict.

There are clearly many different ways in conflicts may be tackled, some of which we have discussed in preceding assertions. Furthermore, there are many different types of conflict, and many different ways in which conflict may manifest itself. Studies such as Sternberg &

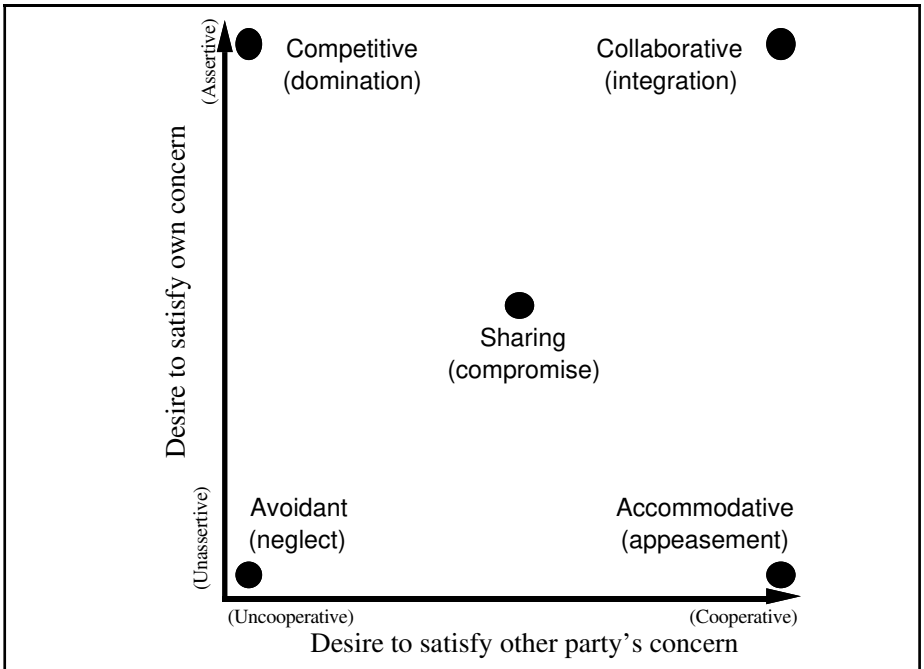

Figure 6: Behavioural modes of tackling conflict with (in brackets) the outcome sought in each mode. Adapted from Thomas (1976)

Soriano (1984) show that people are predisposed to handle conflicts in particular ways; the interesting question, therefore, is whether individual preferences or predispositions can be generalised to produce a model of responses to conflict. Such a model might then be used as a basis for principled study of the factors that affect preferences

A number of different models have been proposed with which to classify responses to conflict. For inter-group conflicts, Blake *et al.* (1964) identify three possible assumptions which might determine strategy for conflict management. These are:

1) Disagreement is inevitable and permanent;
2) Conflict can be avoided since interdependence between groups is unnecessary;
3) Agreement and maintaining interdependence is possible.

Clearly, the assumption made will determine the mechanism chosen for managing the conflict. For example, the first assumption implies that the points of view of the conflicting parties are mutually exclusive, and some means of selecting a winner is needed, whether through struggle, third-party decision, or fate. The second assertion implies some form of withdrawal or indifference is needed, while the third would lead to a search for an integration or compromise.

Another commonly used model offers five different orientations that an individual might have to conflict, based on a two dimensional space of possibilities. The two dimensions are assertiveness (or desire to satisfy one's own concern), and cooperation (or desire to satisfy the other party's concern). The resulting space offers five interesting conjunctions, as shown in figure 6. Note that these refer merely to a single party's orientation, which may change upon interaction with other parties to the conflict. Thomas (1976) describes, for each orientation, the conditions under which it is likely to be useful:

1) Competitive – one participant seeks to dominate the process, without regard for the others. A competitive mode may be useful for quick decisive action, or where unpopular actions are perceived as necessary for important issues.
2) Collaborative – participants seek to understand their differences and achieve a mutually beneficial solution. This may be appropriate where participants' insights and commitment are important and need to be merged rather than compromised.
3) Avoidant – the conflict is recognised to exist but is suppressed by one or more parties, or handled by withdrawal. It may be useful where an issue is unimportant, where the

potential disruption would outweigh the benefits of resolution, or where information gathering is most important.

4) Accommodative – a party becomes self-sacrificing to appease another, and places the interests of the other above their own. It may be useful when issues are far more important to one party than another, where one party is losing and needs to minimise loss, or where there is a desire to build harmony and gain social credits.
5) Sharing – each party makes some concessions in order to reach a compromise. This is most appropriate where temporary settlements or expedient solutions are needed, especially under time pressure, or where goals are directly opposed.

Thomas argues that each of these five modes is appropriate in some circumstances, and hence individuals should use situational factors to choose an appropriate response. The more aware people are of the possibilities the more likely a suitable mode will be used.

Although this model has been widely used to develop instruments for measuring conflict style, it is not without its critics. Volkema & Bergmann (1989) raise two concerns: firstly, the model does not cover demonstrative responses that often occur in interpersonal conflict, such as revenge, regression and various forms of aggression; and secondly, instruments developed from it tend to focus on abstract, generalised principles, and so are more indicative of intended rather than actual behaviour. They investigated these concerns by asking subjects which of a large number of specific responses they have used, might use and would never use. Cluster analyses revealed a group of emotive responses as well as groups of confrontational and withdrawal responses. Daves & Holland (1989) point out that the model assumes the perspective of the person whose style is examined, and that the 'other party' might view actions very differently. Factor analysis of self and subordinate ratings revealed that a three-dimensional space might be more appropriate, with the dimensions: openness, distribution, and control.

A completely different model is offered by Druckman *et al.* (1977), who compare the interplay of values and interests in resolution of conflicts, and identify two perspectives which have driven empirical research. The first is that participants balance interests against their values, with the empirical question being to find out which are assigned greater weight. The second perspective is that values and interests interact, each deriving from and influencing the other, with the empirical question being how the relationship between the two affects the intensity of a conflict. From their investigations, they conclude that the relative importance of the two varies with context, so for example, interests were far more important than ideology in a prison services dispute, while the reverse was true in a population policy negotiation.

There are of course many factors which affect the preference, which we discuss elsewhere: culture (see assertion O); gender (assertion W); personality (assertion P); size of the group (assertion N); effect of time pressures (assertion M); technological mediation (assertion G) and the structure of the group (assertions D, E, and Q). Finally, assertion Y describes variations in individuals' perceptions of outcomes.

W) Styles of handling conflict vary with gender

In a section of his paper dealing with conditions which influence the course of conflict resolution Deutsch (1969, p28) mentions, *en passant*, that "The strategy and tactics associated with competitive struggle may seem more manly or intriguing than those associated with cooperation". This assertion is not empirically based, but reflects a general assumption that women favour a more collaborative approach to conflict resolution than men. Given the widespread belief that there are gender differences operating in the management of conflict, the literature is marked by its failure to address this issue. Here we survey some of the studies that have given more than just a passing comment on the issue.

Putnam & Poole (1987) briefly review the literature on the effects of gender differences on choice of conflict behaviour. They cite Jamieson & Thomas' (1974) findings that men tend to use 'forcing' resolution styles, while women favoured 'compromising' ones (cf. figure 6). Other studies, though, conclude that there is no difference in the choice of conflict resolution style. Renwick (1977), for instance, examined the impact of sex differences on the management of interpersonal conflict in the work environment, but found that the sex of a supervisor was unrelated to female subordinates' perceptions of conflict management, and no

differences were observed between methods adopted by either male or female subordinates to deal with disagreement.

Mabry (1985) comments that neither the specific question of male and female participation in groups, or the issue of gender-mix as a factor in small group composition, has received adequate attention. He cites Nemeth *et al.* (1976) as failing to find significant differences between male and female members of simulated jury deliberation groups on the frequency of positive or negative social-emotional acts, or the frequency of questions asking for task-oriented statements. Other studies (Aries, 1976; Ellis & McAllister, 1980; Strodtbeck & Mann, 1956), by contrast, report findings which support the traditional sex-role conceptions of male and female behaviour.

It seems that the preconceptions of traditional sex-roles have a significant effect. For example, Bartos (1970) discovered that negotiators tend to be tough against women, and furthermore, gender of the other party was the *only* 'first impression' factor that correlated significantly with toughness across all the experiments. The conclusion is that in American society, women are *expected* to play submissive roles. Piliavin and Martin (1978) found that these traditional sex-role expectations about participation and domination were more valid for same-sex groups rather than mixed-sex groups. They suggest that group members tend to adapt to what they perceive to be the expectations of other group members, according to traditional sex-roles. This adaptation hypothesis is also supported by Eskilson & Wiley (1976), who found that both men and women exhibit more leader-like behaviours in same-sex groups, as opposed to mixed-sex groups, although the proportion of men and women in group composition was a significant variable.

Mabry (1985) argues that these studies do not take adequate account of the effect of task characteristics. Accordingly, Mabry investigated the combination of effects by varying both group gender compositions and the task requirements under which they were working. Results for the 44 groups studied show that both these factors have some influence. Gender differences were found in respect to some variables (female or mainly female groups displayed less disagreement but more tension than other groups, for example), though differences generally varied more with task structure than with gender. Structured tasks produced more dominance behaviours generally, but all-male groups responded more aggressively to such situations than did other gender composition and task structure combinations, but "the presence of one or two women in these groups apparently suppressed the incidence of dominance behaviour" (p92). There was no evidence of gender difference on task-related communicative acts. This seems to question the broadness of our assertion: according to Mabry's research, it is a combination of gender and task structure which affects behaviour, and he concludes that small group interaction is not substantively affected by the gender composition of groups.

Given the centrality of communication in both the generation and resolution of conflict, examination of differences in the ways men and women use language may be enlightening. Tannen's (1991) thesis is that because adults learn their ways of speaking as children growing up in mainly separate social worlds of same-sex peers, then "conversation between women and men is cross-cultural communication" (p47) and "each group interprets the other's ways of talking in terms of its own" (p244). Broadly speaking, women use language to create connections and intimacy, whereas men use language to promote and identify status and independence. She suggests that women are more at ease with speaking in small groups of known individuals (rapport talk) and that men are more confident with public speaking (report talk).

In the light of this thesis, Tannen explores the belief that males are competitive and prone to seek conflict, whereas females seek cooperation and affiliation. She suggests that this is over-simplistic, as conflict can be a means of creating involvement with others and can provide a kind of bonding for men. Her view is that gender-based language differences largely account for different attitudes to conflict, as men tend towards a more antagonistic style of disputation. Women are inclined to misinterpret and be puzzled by the adversarial nature of men's ways of speaking and miss the ritual nature of friendly aggression. But women's "enactment of community can be ritualised just as easily as the enactment of combat" (p150). This appearance of community among women can mask power struggles and profound differences in points of view, and hence "men can be as confused by women's verbal rituals as women are by men's" (p.151).

It is difficult to draw coherent conclusions from all these studies. The studies that found no gender difference in conflict style seem to be contradicted by those that identify gender composition of groups as significant in determining group behaviour. We have covered two key factors: the effect of preconceptions of traditional sex-roles, and the differences in communication styles between men and women. This is an important and complex topic, and we have done little more than raise the issue as one that requires consideration. We would also suggest that the design and use of CSCW systems are not necessarily gender neutral.

2.6. Results of conflicts

X) There is a positive relationship between levels of participation and satisfaction

This assertion is commonly held in the software engineering community, and used as an argument for involvement of users in the development process. Wastell explores issues of user involvement further in chapter 2; here we concentrate on the issue of participation in conflict resolutions in small group interaction. Thomas (1976) found that satisfaction of group members increases if they feel able to articulate conflicts without fear of disrupting the group, while Gibb (1954) found that members tend to be less satisfied in larger groups. Clearly, both these factors influence levels of participation, and it may be that it is the level of participation that determines member satisfaction.

Hagen & Burch (1985) studied participation directly, and found, perhaps unsurprisingly, that participation by all group members resulted in higher satisfaction. A more interesting observation is that perception of conflict and tense or anxious emotional tone lowered satisfaction, but that this effect is reduced in later stages of group development once the group develops a bond.

However, the relationship between participation and satisfaction is not as simple as it may appear. Firstly, it is not clear exactly what satisfaction is. Pood (1980) distinguishes two types of satisfaction: satisfaction with the interactions of the group (social satisfaction) and satisfaction with the resolution (decision satisfaction). Although conflict management techniques have a positive effect on social satisfaction, decision satisfaction does not increase through the realisation and management of conflict. Pood postulates that this is because the conflict is never really resolved as far as each individual is concerned, a point we discuss further under assertion K.

Also, there are other factors which affect satisfaction independently from participation levels. Wall & Nolan (1987) concentrate on perceived inequity, showing that inequity is negatively related to satisfaction with the group and positively related to the amount of perceived conflict, especially affective conflict, within the group. In another study they showed that inequity can be reduced, and hence satisfaction increased, using integrative conflict management techniques (Wall *et al.* 1987). However, they did not directly study any relationship between participation and inequity.

Kimberly (1987) addresses another source of satisfaction in small group decisions: division of labour. Members of a group seek to integrate the distribution of task skills and the division of labour in a group. Places in the division of labour are referred to as positions. For a member of a group, if the person's skill is too high for his/her position, the position is not sufficiently demanding and boredom results. This reduces rewards based on performance. If the skill is too low for the position, the part of rewards based on position incumbency is high, but the person cannot perform adequately in the position, so the reward based on performance is low. Both types of mismatch produce dissatisfaction.

Finally, Falk (1981) discusses the use of unanimity in group decision making. The results of his study of role-playing groups using majority rule, unanimity or no decision rule, challenge the notion of the superiority of unanimity rule over majority. In fact, the type of decision rule which best promotes participation of all group members and attainment of high quality solutions depends on initial distribution of power. While unanimity strengthens and maintains equality in groups where there is already an equal distribution of power, majority rule has greater potential for equalizing power distribution in unequal power groups. Greater equality in distribution of power among group members facilitates group discussion leading to higher quality solutions, and greater satisfaction.

It seems that although a relationship between participation and group member satisfaction is evident, there are many other factors which mitigate satisfaction. Furthermore, participation itself does not guarantee successful resolution, and insistence on unanimity in group decision making may be counter productive in groups with unequal power distributions. Additionally, DeStephen & Hirokawa (1988) question the use of informal democratic discussion groups as a basis for conclusions about members' feelings of agreement and satisfaction, pointing out that immediately after a decision exercise, group discussion will act as a group reinforcement.

Y) The 'loser' in a conflict will try to save face, and the 'victor' may help the 'loser' do this

When negotiating resolution of a conflict the issue of loss of face may be as important to the participants, if not more so, than the substantive issues. A fear of loss of face may lead participants to avoid a resolution, and even to escalate the conflict. Hence, when negotiating a resolution, it may be important to build face-saving elements into any agreement, to make a compromise or capitulation more palatable. This might be achieved by trivialising the subject of the conflict, spuriously claiming that no concessions have been made, or stressing the importance of agreement itself. Our assertion claims that these face-saving measures are cooperatively negotiated.

There is clear evidence that face-saving occurs, and that people are willing to help others save face. Sermat (1964) demonstrated the presence of the face-saving motive, using the prisoner's dilemma, played against an unconditionally uncooperative opponent. Players who believed their opponent was absent exploited the situation more often than players who thought their opponent was being informed of the outcome of each game. Evidence that the need to save face sometimes becomes more important than resolution comes from studies of international relations. Swingle (1970) cites the Cuban Missile Crisis as a prime example. An escalation of the crisis by President Kennedy was deemed necessary, as the threat to the reputation of the presidency and the country were perceived as far more pertinent than the military threat. Offers from Khrushchev to negotiate over mutual withdrawal of missiles from Cuba and Turkey were spurned by Kennedy, even though he had already ordered removal of the missiles in Turkey several months before.

An interesting question concerns the source of the motive to save face. Brown (1977) offers two fundamental explanations. Firstly, there is a paradox in the necessity of yielding to achieve agreement, and the strategic value of not yielding, so as to increase one's outcome. This leads to a problem for negotiators of offering a concession without appearing to weaken their bargaining position. An appearance of strength is needed because of uncertainty about the other party's intentions, while the cost of not reaching agreement may be high. The second explanation is that it is a result of social norms that place a positive value on shows of strength, and a negative value on weakness and deference.

Brown goes on to survey work on face maintenance, distinguishing between *face-saving*, which is anticipatory and preventative, and *face-restoration*, which is reparative of damage already done. The distinction is useful because they affect the conflict resolution process in different ways. Face-saving manifests itself in verbal behaviour in the use of disclaimers, hedges and vagueness, which soften the negative effect of statements. It also leads to various overt behaviours, usually designed to keep weakness hidden, including: on a large scale, deployment of resources and staging demonstrations as displays of strength; and on a smaller scale, procrastinating, introducing irrelevancies, and preoccupation with procedural issues. Face restoration manifests itself in threats of future resistance, and coded retraction or modification of (or reduction of commitment to) previous statements now seen as damaging.

A number of other situational factors affect face maintenance. For example, anonymity should reduce the need to save face. Swingle (1970) discusses a number of game theoretic studies that support this suggestion, in the case where subjects are led to believe they will not ever meet their opponent. Also, whether the opponent, or other parties have knowledge of the cost of various face-saving measures affects their deployment. Note, that in this case the face-saving might not be reduced: In Brown's (1968) study, the participants found other ways of retaliating, outside the rules of the games, in order to restore face.

To return to the assertion, it seems that many studies of face maintenance have concentrated on situations where the motive originates from the opponent, because of a need to maintain a strong bargaining position, or simply because of not wishing to have the opponent declare

victory. In this case, cooperation to avoid face loss is out of the question, and escalation of the conflict might be the only course of action. If the motive originates from other audiences, then it is plausible that the participants might cooperate to include face saving measures. This may depend on how much they can conceal from these audiences, and how much they know about each other. There are too few studies of cooperative face maintenance to draw any firm conclusions.

Z) Groups use sanctions to enforce resolution decisions

The effect of possible sanctions on decision making is well known. Gross *et al.* (1958) showed that people perceive expectations of themselves from other relevant parties, and behave accordingly. However, there are likely to be many competing expectations, and the choice of behaviour depends on the legitimacy of each set of expectations and the likely sanctions that might be applied for non-conformity to those expectations.

One type of sanction is rejection from the group, which is frequently applied to members who deviate from group norms. Katz (1982) investigate the factors that lead to rejection from the group, and discovered that rejection is greater for a deviant who has not conformed previously than for one who has. He also investigated the link between status and rejection, but could find no support for his hypothesis that rejection is greater for a high-status deviant than a low-status deviant, where status is defined in terms of competence at a task, perceived acceptance, aptitude for unfamiliar tasks, and social ability, as well as location in a business hierarchy. This latter hypothesis derives from Wahrman (1977) who suggests that the higher a person's status in a group the stronger the expectation that that person will conform to group norms. The results of Katz's work indicate that previous conformity is more important than status in determining whether a deviant will be rejected.

Wahrman (1977) also discusses the differences between individual responses to deviance and the sanctions that the group applies, pointing out that group members tend to react to nonconformity by negotiating an interpretation of the meaning of the behaviour. Hence, group applications of sanctions cannot be predicted by examining the reactions of the members in isolation. In fact his study showed that group discussion is used to demonstrate commitment to the group norms publicly, so that subsequent punishment can be more lenient, and group cohesion and loyalty can be maintained.

3 CSCW SYSTEMS

In the previous section we have examined some of the folklore surrounding conflict in group interactions, in the light of empirical studies described in the literature. We will now attempt to set the design of some established CSCW systems in the context of that literature. To some extent, we have inferred the attitudes of the designers of these systems towards the significance, development, management and utility of conflict among their systems' users.

The CSCW systems discussed are categorised according to their function (with respect to conflict). It should be noted that the categorisation is not claimed to be complete, or the categories to be disjoint – others have adopted different classifications, and even assigned different categories to systems discussed below (eg. see Wilson, 1991a; Ellis *et al.*, 1991).

3.1 Computer-Mediated Communication (CMC) systems

All groupware involves computer-mediation of communication in some form. For the purpose of this review, we regard a system as belonging to the CMC camp if the emphasis of its support for communication rests with:

- the quality and type of information shared. Eg. real-time video, asynchronous text, contextual information;
- how collaborators may control those information channels. Eg. issues of privacy, awareness of other collaborators, and selection of audience;
- the effects of the medium on the communication. Eg. eye gaze behaviour in a video conferencing system, object reference through an audio communication system, speed of transport, and deindividuation.

CMC systems as such do not mediate conflict. However, their design can and does influence the occurrence and course of conflict amongst the collaborators who use them for communication.

The systems discussed are grouped according to the principal medium of communication. It is reasonable to assume that those designers who have chosen the higher bandwidth communication channels have done so in an attempt to improve the quality of the communication, so reducing the likelihood of misunderstandings arising (see assertion F), to support team building, thus reducing conflict by building group cohesion (assertions B) and reducing anonymity (assertion H), and possibly to allow users a little more scope in choosing a conflict management strategy when conflict does arise.

3.1.1 Textual Communication

The most basic, and most widely used medium for computer supported communication is text. The following discussion illustrates the two main types of textual communication – electronic mail, and synchronous conferencing. Individual systems differ very little, so there is little point in mentioning more than one or two examples of each type.

Electronic Mail (email)

By far the most widely used asynchronous, text-based CMC system is email. As a communication system, email has a number of advantages:

- message delivery is fast, compared to postal mail and even to the telephone, as there is no need for both parties to the exchange to be available simultaneously (Ehrlich, 1987);
- some contextual information is included in the message. The header of the message contains the message's sender, audience, subject, date of creation, and possibly a reference to a previous message in an on-going conversation. All of this helps the recipient of the message better interpret the message's content;
- messages are not ephemeral. Once received, they can be reread, archived or forwarded to other individuals.

Unfortunately for its users, email is also a rich source of conflict. Sproull & Kiesler (1991) have reported the de-individuating effects of the electronic isolation of composers of email messages from their audiences, a process which can cause users to 'flame' one another, i.e. to over-react to each other's messages, causing a rapid escalation in expressed hostility. This phenomenon is discussed further under assertions G and H.

Another problem associated with the use of email lies with the ease with which users can 'delegate' work to others – the 'requesters'/'performers' imbalance (Mackay, 1988). The tasks off-loaded are often information requests, where the task of retrieval becomes trivial for the sender of the message, but at the expense of the receiver. Further, the combination of the sense of distance from one's actions and the lack of status cues in email messages means that established organisational norms may be disregarded in this new task management strategy (Sproull & Kiesler, 1991). In other words email may undermine the established roles of individuals within a group or organisation, which adds further complications to the notion that clearly defined roles reduce conflict (assertion E).

For an analysis of these problems for a specific electronic mail system, see Pliskin (1989), who relates experiences of BITNET mail, and in particular the effects of the medium on group work.

Text Conferencing

Text conferencing systems are the synchronous counterparts to email systems – they support the passing of text messages between users, and differ from email only in that all users are expected to be simultaneously using the system. Nearly every CSCW system with a shared object and the ability to represent text can be used as a text conferencing system. We will focus on those systems which are specifically intended to support conversations between users, rather than those which users may adapt to that purpose.

McCarthy *et. al.* (1991) report on a series of experiments to determine the facility with which users of a text-based, synchronous communication system can establish a shared understanding, or common ground. They found that common ground was particularly difficult to achieve in pure message passing systems because the medium does not possess some of the

characteristics suggested by Clark & Brennan (1991) as necessary for minimum cost grounding, significantly: 'co-presence', 'visibility', and 'audibility'. Miles *et al.* (1992) go on to explore some ways in which text-based conferencing could be extended to support at least some aspects of the 'co-presence' and 'visibility' aspects of face-to-face communication. Other researchers have foregone text as the sole medium for communication, and started experimenting with higher bandwidths.

3.1.2 Audio Communication

In the past few years, there has been a quite marked increase in the number of computer systems which make use of audio input/output, and this seems to be particularly true of CSCW systems. While some of this increase can be attributed to the technology becoming cheap and available (i.e. free, in some form, with many types of computer workstations), it is more likely that it represents a general move away from pure text-based communication.

Computer mediated audio communication is not necessarily a replacement for textual communication: many systems, such as Quilt (Leland *et al.*, 1988), offer both text and audio facilities. Chalfonte *et al.* (1991) report that collaborators prefer to use voice and text communication for different level issues in their collaboration, voice being preferred for the higher level concerns. Further, messages sent through the audio channel are inherently less 'reviewable' than their textual counterparts (Clark & Brennan, 1991).

Wang's Digital Voice Exchange (DVX)

Ehrlich (1987) discusses the use of a voice messaging system, DVX, in various organisational contexts. DVX allows users to send messages to one another for subsequent reviewing and processing. Messages contain header information (such as the sender's identity), can be annotated and forwarded by the recipient, and can be sent to groups of people via distribution lists.

Comparing DVX to 'pink slip' paper telephone messages, the system it replaced, she finds that DVX messages share many of the advantages of text-based electronic mail systems, but with the added benefit of the message medium; since the sender's voice is accurately recorded, all the verbal cues are preserved in the message, helping the recipient better understand the context in which the message was composed.

Audio Windows

Cohen & Ludwig (1991) describe Audio Windows, their prototype audio output/gesture input system. Audio Windows combines digital signal processing with a spatial sound presentation system to control the apparent location of audio sources in the user's environment.

The application of Audio Windows to synchronous computer conferencing is described. Consistent, manipulable spatial positioning of conferees lets the user subconsciously identify the source of contributions to the conversation, creating a feeling of co-presence through the generation of an 'aural image' of the collaborators. This addresses some of the problems of conflicts generated by feelings of physical separation (assertion H).

3.1.3 Video Communication

One step further up the ladder of communicative bandwidth lie video communication systems. Although a number of such systems exist, they tend to be restricted to expensive machines with access to high speed local area networks, due to the volume of data which has to be transmitted and processed to maintain a video channel. Like other media, there is a synchronous/asynchronous distinction in video communication, the latter being commonly referred to as video mail. Video mail can be regarded as an extension of voice mail. The systems discussed below support real-time video conferencing.

Rank Xerox EuroPARC

EuroPARC, at Cambridge, UK, has been equipped with a multi-media infrastructure, which allows users to establish audio/visual communication with others throughout the labs, controlled from their workstations. Heath & Luff (1991) report the results of an extended period of naturalistic observation of the system in use. They found that users of the video communication facility act as if they were physically co-present with their conferees. For example, users were observed attempting to echo the postures of their colleagues, a technique

used to indicate likemindedness. Unfortunately, many of the non-verbal cues deployed in face-to-face communication – such as gestures, body movements and gaze behaviour – are apparently not noticed by listeners, disconcerting the speakers and degrading the quality of the communication.

This reinforces the suggestion in assertion D that effective communication matters more than communication bandwidth. While video mediation does introduce significantly better awareness of the status and disposition of one's partners in a conversation, the increase in communicative power does not seem to be commensurate with the increase in telecommunications bandwidth required over an audio connection.

CRUISER

CRUISER is a computer-mediated audio/visual communication tool in use at Bellcore's New Jersey Labs (Root, 1988). The system interconnects individuals' offices, which are sufficiently physically separate to make it inconvenient for the users to meet with any frequency. CRUISER differs from the majority of other CMC systems in that it is designed for social, rather than task-oriented, interaction. Root emphasises the importance of group cohesion (assertion B), citing research which attributes the effectiveness of an organisation to the quality of the social interactions between its members.

3.2 Information Sharing Tools

Information sharing tools are intended to help individuals in groups communicate with one another, and as such can be thought of as computer-mediated communication (CMC) systems. However, whereas the emphasis in CMC is on the transport of information, information sharing tools concentrate on the ways in which the meaning of the information can be more effectively communicated, and on the function of each message in the continuing dialogue between users. Hence such systems have been designed to reduce the amount of misunderstanding caused by differing interpretations of messages, as suggested in assertion F.

Information Lens

Information Lens (Malone *et al.*, 1987) works with an asynchronous message passing system, such as email, providing tools to filter messages based on the structural information which has been associated with them. The addition of this structural information serves to clarify each message's content. User controlled selection of messages tackles two additional sources of conflict within email: namely, the effects of sending too much and of sending too little mail to an individual (see assertion D). The former, the lack of selectivity, will overwhelm the recipient, causing resentment; the latter, for important messages, inappropriately places the non-recipient in the outgroup, casting doubt on the sender's motives. Both are addressed by allowing the sender to better express the content of the message and its intended readership, and the receiver to better select which messages to read.

NLS/AUGMENT

NLS/AUGMENT (Engelbart, 1984), the first implemented hypertext system, has many facets which support collaboration. With respect to the creation of a shared artefact (a shared document, a shared understanding), the AUGMENT Mail system is of particular note. This supports collaborators sending structured documents to one another, in particular documents containing 'citations', NLS/AUGMENT's hypertext link facility. Citations refer to globally accessible information (e.g. contributions 'published' in NLS/AUGMENT's electronic journals), and the cited material is immediately available from the document being viewed.

Heavy use of the citation facility allows collaborators to situate their communications much more firmly in the context in which they are to be understood, presumably reducing misunderstanding (assertion F).

The Coordinator

The Coordinator (Winograd, 1988) is an integrated office automation or 'workgroup productivity' tool, which clarifies and structures communication through its 'conversation manager'. This module is based on a speech act model of organisational conversations, with the illocutionary force of each message being made explicit, and constrained by the conversational context of the message.

A number of assumptions about conflict underpin the design of the Coordinator. The assumption pervasive to information sharing tools, that conflict is caused by (interpretative-symbolic) misunderstandings (assertion F), is evident in Flores' belief that a deeper understanding of the commitments involved in conversation enhances people's ability to communicate effectively. Moreover, the language/action perspective assumes that conflict is inevitable (assertion A), and its subsequent treatment of conflict is based on the articulation of conflict aiding its resolution (assertion S), and possibly the belief that conflict itself is productive (assertion I).

However, the theoretical underpinnings of the Coordinator themselves may be the cause of conflict. Dietz & Widdershoven (1991) compare Austin and Searle's speech act theory with Habermas' theory of communicative action. They conclude that the former is seriously flawed because its disregard for the orientation of collaborators makes it impossible for the Coordinator to distinguish between genuine cooperation and that inspired by the desire to avoid sanctions. Cosmos (Bowers & Churcher, 1988) is a structured message system based on Habermas' theory. Aside from its claimed more stable theoretical basis, Cosmos's designers treat conflict in the same way as Flores and Winograd.

Amsterdam Conversation Environment (ACE)

The Amsterdam Conversation Environment (Dykstra & Carasik, 1991) is described as a semi-structured application to support group interaction in face-to-face meetings. 'Semi-structured' indicates it is built with the intention of extension and development by its users. Instead of imposing a rigid structure on the conversation, the designers of ACE concentrate instead on facilitating the construction of new concepts and behaviour.

3.3 Concept Development Tools

These tools recognise conflict as a central component of group work, and in particular the development (or design) of concepts. The design process is regarded as "a dialectic between goals and possibilities" (Stefik *et al.*, 1987), with the goals and possibilities mutually inspiring one another as the concept is refined. This is clearly related to assertion I, that substantive conflict can be productive.

It is possible for individuals to apply this technique, but it is most effective when used by groups. In group use, these systems can be thought of as information sharing tools. However, the distinction made here represents the different emphases and attitudes towards conflict.

Cognoter

Cognoter (Stefik *et al.*, 1987), a tool in Xerox PARC's 'Colab', is a group outliner, providing support for brainstorming, organising and ultimately evaluating ideas. Participants do not normally prepare for Cognoter – the purpose of the tool is to help the members of the group air and discuss their ideas in a highly interactive environment. Individual ideas are generated in private workstations, and once complete are posted to a shared 'liveboard', where other users may then inspect and develop them. The simultaneity of note generation, and the isolation in which the notes are generated, free the group members from the effects of 'evaluation apprehension' (discussed below in section 3.5), and encourage more (conflicting) viewpoints to be expressed (assertion J).

Interestingly, in a later review of Cognoter's user acceptance, Tatar *et al.* (1991) found that the private generation of notes disconcerted some users and frustrated others. This is the flipside of the effect of assertion J: although users were being encouraged to compose notes containing conflicting viewpoints, the restriction on the 'visibility' of their status and actions (Clark & Brennan, 1991) was a source of conflict to the rest of the group. On balance, Tatar *et al.* decided that the conflict was too disruptive, and designed a new version of Cognoter, called Cnoter, which provided shared, rather than private, editing facilities, and enforced a much more rigid 'What you see is what I see' (WYSIWIS) paradigm on the liveboard and individuals' workstation screens.

IBIS

The concept of an Issue-Based Information System was developed by Kunz & Rittel (1970) with the purpose of developing a tool to support the coordination and planning of political decision processes. The original model of rhetoric has been widely adapted and used to

represent design argumentation (e.g. Conklin & Begeman, 1988; Rein & Ellis, 1991; MacLean *et al.*, 1989; McCall, 1989; Goodlet, 1988). All of these tools aim to support groups developing shared designs by providing a gross model of design deliberation to which all contributions to the design must conform. The model imposes structural ('rhetorical') constraints on where and in what manner classes of contributions may be added to the design.

The whole IBIS paradigm is focussed on the elicitation of alternative viewpoints ('positions'), a process which is clearly based on the assumption that eliciting conflict is productive (assertions I and J), and that the expression of the conflict in an objective form aids in its resolution (assertion S). In addition, since the shared data object, the design artefact, is a hypertext of semantically labelled nodes and links, additional information is associated with each piece of text in the network. This information can assist in the process of reconstructing the context in which the text was generated (see assertion F).

Distributed NoteCards

Trigg *et al.* (1986) describe the development of 'Distributed NoteCards', an extension of the Xerox PARC NoteCards hypertext system, intended to support collaborative development of hypertexts. They focus on the need for collaborators to make themselves 'mutually intelligible', concluding that collaborators do this by communicating at two meta-levels, 'annotative' and 'procedural', over and above their substantive interchange.

It is assumed that collaborators have other communication channels available to them to support their procedural and annotative discussions, since Distributed NoteCards provides none. Even with external communication facilities, it would be difficult to use Distributed NoteCards effectively, because of the problems of establishing common ground, which also applied to text-based CMC systems (see section 3.1.1).

3.4 Group Decision Support Systems (GDSSs)

GDSSs support their users in making a one or more choices from a set of proposals. The original proposals normally form part of the task specification, and are constructed before the decision making process starts. However, once support is added for the proposals to be augmented during the decision making process, as ideas arise, then the distinction between GDSSs and concept development tools becomes marginal.

Argnoter

One of the components of Xerox PARC's 'Colab', intended to support 'proposal meetings', where the purpose of the meeting to select the best proposal from a number of competing, and possibly unexpressed, alternatives. Argnoter (Stefik *et al.*, 1987) directly addresses the major sources of conflict in proposal meetings, namely 'owned positions' (personal attachment to a proposal; assertion R), 'unstated assumptions' and 'unstated criteria' (assertion F).

3.5 Computer Support Meeting Environments (CSMEs)

A fairly recent development in CSCW has been the construction of custom-designed meeting rooms, packed with groupware intended to support a range of professional meetings requirements, such as group decision making, brainstorming, and so on. As such, CSMEs as a field overlaps (most notably) with group decision support systems and concept development tools. CSMEs are similar to GDSSs and concept development tools since they are designed with the same general attitude to conflict: that if it is there, it should be brought out, represented and discussed (see assertion S).

Arizona GroupSystems

The University of Arizona has developed what is commercially the most popular CSME, the GroupSystems environment (Valacich *et al.*, 1991). The main theoretical foundation for GroupSystems is the concept of process losses and gains. The central aim of the environment's design is to "reduce or eliminate" the process losses, which are caused by dysfunctions of the group interaction.

For the purposes of this review, the most import process losses addressed are: (a) 'evaluation apprehension', where group members hesitate to contribute, fearing negative comments from other members; and (b) 'incomplete analysis', where group members fail to

use available information to challenge assumptions held by other members. Tackling these losses involves encouraging group members to express conflicting views (assertion J).

One other process loss which GroupSystems' designers want to reduce bears mentioning: 'socializing', which is described as "dysfunctional non-task related behaviour"! While they concede that some group socialising is necessary, their attitude contrasts sharply with, e.g., Dykstra & Carasik (1991), the designers of ACE.

Finally, an integral component of GroupSystems is the facilitator, who controls the environment, and, in particular, governs access to the shared workspace. Experience of using GroupSystems (Mantei, 1991), however, reveals that the facilitator is not an arbitrator (assertion U), but instead is a perpetual source of conflict! This may be due to problems of leadership (see assertion Q).

EDS's Capture Lab

Mantei (1988) presents the design concepts of Electronic Data Systems' 'Capture Lab'. A significant feature is the attention paid to ensuring that participants feel that they are in the immediate presence of their counterparts, thus addressing the effects of deindividuation (assertion H).

One type of meeting supported by the Capture Lab has a 'designated scribe', an individual positioned between the CSME and the other meeting participants. Mantei observed that the other participants would get frustrated if a large amount of information had to be communicated to the scribe. If each party could express their ideas directly (therefore reducing the amount of interpersonal, direct communication), rather than having to go through a scribe, then the opportunity for conflict would be reduced (assertion D).

As for Arizona's GroupSystems above, it is asserted that the group should be organised so as to minimise non-task related conflict, presumably by minimising non-task related interaction.

CAVECAT

The two CSMEs above are intended for use in specially designed meeting rooms, supporting face-to-face meetings. CAVECAT (Mantei *et al.*, 1991) supports distributed meetings, where participants use desktop videoconferencing from their own offices to collaborate. However, CAVECAT's impact on users is similar to that of the synchronous CSMEs. One difference is the perception of co-presence. Since CAVECAT's users were not physically co-present, the reduction of participants' sense of separation became a design issue (cf. assertion H). Unfortunately, use of the system where some of the users shared an office made it difficult to achieve uniform perceptions of co-presence, especially since the quality of the network audio connection was quite poor.

A related issue is the participants' perception of social distance: without physically changing position, a participant could be made to appear remote or overly close, simply by altering the video image size on the monitor. Normal social control mechanisms could not be deployed to re-negotiate the social space, since the perception of distance was not shared between the parties.

3.6 Collaborative Writing Tools

One of the most popular application domains for CSCW is the support of collaborative writing (Sharples, 1992), presumably since this is an activity relevant to all researchers and designers. In spite of its popularity, none of the systems currently available support the scope and complexity of collaborative writing, as Wilson (1991b) and Leland *et al.* (1988) note.

Writing complex, expository documents is a design task, and therefore systems in this section will bear resemblance to the 'concept development tools' of section 3.3 above, though the designers of the latter are more immediately concerned with the elicitation of conflict. The systems here also have similarities to those for 'information sharing', section 3.2.

The emphasis of much of the work in supporting collaborative writing has been on the manipulation and representation of the shared document, rather than on the communicative aspects of the task (Leland *et al.*, 1988), and within the support of communication, conflict appears to have been overlooked.

ShrEdit

ShrEdit, a 'shared editor', is the University of Michigan's attempt to provide computer-support for simultaneous, multi-user editing of a shared document (CSMIL, 1991). Olson and Olson (1991; and Olson *et. al.* 1990) established the theoretical framework for shared editing, combining the results of observational studies with analyses of existing group editors. Focussing on the cognitive aspects of collaborative activities, they concluded that a suitable architecture to support collaboration involves:

- a shared workspace, containing a single information object (e.g. document);
- no constraint on the size and complexity of the shared object (unlike, say, a whiteboard);
- easy editing of the shared object (again unlike a whiteboard);
- both shared and private views of the object;
- the ability to construct a variety of useful views of the object.

With the exception of the last item, the design of ShrEdit rests upon this architecture.

Note, however, that there is no mention of a mechanism for users to communicate with one another. Hence, ShrEdit has neither a conferencing facility nor the ability to include 'meta-level' text, i.e. text which is not intended to form part of the substance of the document. Olson *et al.* (1990) expect that other channels of communication will be available to the users, and it is clear that users of ShrEdit are intended to rely on communication around, rather than through, the tool.

The design of ShrEdit is not influenced by the desire to recognise, elicit or manage conflict. In face-to-face use, it is expected that the normal social control protocols will deal with these aspects of collaboration. Indeed, ShrEdit has few mechanism to prevent non-productive changes to the text, which may result from on-going conflict amongst its users: the designers rely on the pressure of the social presence of the other users to prevent such destructive behaviour.

PREP

PREP is a 'work in progress' editor (Neuwirth *et al.* 1990), with the focus on support of the social and cognitive aspects of co-authoring and commenting. In particular, PREP supports the annotation of draft documents, allowing each new commentor to add comments, keeping them distinct from the existing text and comments, while maintaining the relationship between each comment and the fragment of the original document annotated. PREP only supports loosely-coupled collaboration, which in this context means that there is no support for shared or simultaneous editing of the draft document. In fact the only document writing strategy available in PREP is draft passing.

PREP users are given roles when they start to edit a draft document. Currently, they can be either a 'co-author' (i.e. with permission to edit the base document), or 'commenter' (with only sufficient privilege to annotate the base document). These roles seem scarcely more than a gloss on the access privileges for the base document, but they can be seen as an attempt to address assertion E, that defined roles reduce conflict.

Co-authors of the document may communicate with one another through the plan of the document – which is very much like a special set of annotations on the document content. The purpose of the plan is to allow co-authors to communicate their intentions for specific sections of the document, in the hope that revisions to the text will maintain this purpose, or at least not change it accidentally. Clarifying the purpose of the text may well avoid conflict over subsequent re-interpretations (assertion F).

GroupWriter

Malcolm, the designer of GroupWriter, treats support for collaborative writing as document version management (Malcolm, 1991). Indeed, from a user perspective, there is scant difference between using GroupWriter in a writing group and using it alone: the changes made by other authors might as well have been made oneself earlier.

The tool is designed to support asynchronous collaboration. Although it is possible for more than one user to be editing the document at one time, the changes made by each will not be immediately visible to the others. Communication facilities are provided, but only in the form of anchored annotations. As a communications mechanism, these annotations are weak as

GroupWriter does not record the name of each annotation's creator: thus it is not possible to reply to a comment, other than by attaching another note to the text.

Malcolm asserts that the lack of group organisation facilities in GroupWriter allows writing groups to choose their own organisation. However, the lack of such facilities in the tool, by restricting the flow of meta-level information between co-authors, is likely to lead to tensions and misunderstandings in the group, both sources of conflict (assertion D).

GROVE

GROVE (Ellis *et al.,* 1990; 1991) is a real-time group editor for the production of shared outlines. Each user of GROVE has the power to configure their workstation to provide any combination of private, (sub-group) shared, and public views of the outline. Each group (i.e. shared or public) window indicates which of the other group members also have access to that window, so that each user is aware of the form of the other group members participation.

GROVE also supports a number of locking strategies on the shared document, but the designers' preferred mode is one where GROVE performs no locking whatsoever. This is only possible because of the very sophisticated groupware concurrency mechanism employed, which transforms editing operations before application to the shared document on the basis of a state vector transmitted by the user's GROVE process along with the edit operation, and on a log of operations already applied to the document. This mechanism is necessary, for example, to prevent corruption of the shared document when two users simultaneous attempt to fix a typo by deleting a character – only the first operation is applied, the second being transformed to the null operation.

This anarchic editing mode was chosen to encourage users to develop social protocols to mediate their interactions. The effectiveness of this strategy depends on users communicating their intentions to each other before commencing an edit operation. This communication, of course, need not be verbal. The fact that the incidence of destructive behaviour abated after some use of the system supports a relationship of conflict to the development of the group (assertion C).

Finally, GROVE does not support explicit communication between users, and therefore distributed sessions are supplemented with other communication channels, such as audio over speaker phones. As for text-based CMC, this interferes with deictic communication and hinders the establishment of common ground in the conversation.

Quilt

In contrast to the majority of collaborative writing tools, Quilt focusses on communication, annotation and the social aspects of collaboration (Leland *et al.*, 1988). This has important results:

- message passing is fully integrated. Messages can be sent by users to named others, on a user's behalf by the system, when a predicate on the system's representation of the document becomes true, and by the system from the task definition (e.g. when a deadline is approaching). The messages themselves, though sent by email, can be anchored in the text of the document.
- typed annotations are the central elements in the representation of the document. Indeed, the text of the document is merely a set of 'base document' annotations, linked to show the flow of the text.
- the role of each group member is precisely defined in terms the tool can use. Each user is assigned a role (e.g. 'reader', 'commenter'), and the document a 'collaboration style', which defines, for all action and annotation type pairs, what a user in that role can do.

Quilt goes to some length to help users attain a shared understanding of their text: public comments, anchored to an obscure part of the text, can help convey the function of that piece of the text in the document; anchoring and voice format 'revision suggestion' annotations help clarify the focus, nature and extent of such a revision; while 'major change notification' email messages allow the authors a chance to tell their cohort the significance of the change. (See assertions F and D.)

However, Quilt does not support synchronous working, which the designers consider a deficiency. Without a synchronous mode, it is very likely that the collaborative group will use other means to execute those parts of the task which benefit most from "quick associations

from group members" (Olson *et al.*, 1990). It is quite likely that latent conflicts will surface during these face to face meetings, to be resolved using social protocols, rather than being expressed and managed through Quilt. Without such coordinating meetings, Quilt is likely to suffer from the pathological consequences of technological mediation and the effects of deindividuation (see assertions G and H).

Aside from its support for annotations, Quilt's other pillar is its sensitivity to 'collaboration styles' and the designated role of each user. Assertion E suggests that this is beneficial, but some doubts remain. Groups are not static, and members may re-negotiate their roles. Changing role in Quilt, even only briefly, is necessarily not easy. The inability to contribute is at least likely to cause dissatisfaction (assertion X), and seems to reveal a distrust in promotive interdependence. Secondly, Quilt is neutral to choice of permissions associated with each role in each 'collaboration style'. It would be possible therefore for a role to have so few permitted actions, that a group member given that may cease to participate (assertion K, and X again), or be denied the opportunity to dissent (running against assertions S, I and J).

Contexts

Delisle & Schwartz (1987) describe Contexts, an extension of the Neptune hypertext systems which can be used for collaborative writing. Contexts extends Neptune by providing private views of the shared hypertext database. Only one user may edit a context at a time, and the effects of the editing are not propagated to the shared document until the user explicitly merges the private context back into the master context. It is possible for contexts to overlap, but this is not recommended as Contexts will only detect that the merge operation cannot proceed automatically, and pass control back to the user to determine how the private and modified master contexts should be combined.

Since the contexts are completely private, there is no opportunity for sub-groups to form, and users are not provided with any information as to the activities and/or progress made by their collaborators. Amongst other things, these facets of Contexts will undermine group cohesion, leading to more general conflict between group members (assertion B).

This effect is exacerbated by the lack of support for communication between authors. From the absence of attention to conflict issues, it is easy to conclude that Contexts was developed to explore the technical possibilities of extending Neptune, rather than the interpersonal issues of producing shared hypertexts.

3.7 Shared Workspace Systems

The CSCW systems above have all been custom designed to support collaborating groups of users. There is, however, another approach to providing computer support for group working: the shared workspace. Shared workspace systems commonly multiplex the input and output between a group of users, each with a terminal or workstation, with a single application running somewhere on a common network. For these systems, the wider groupware issues devolve to issues concerning the multiplexing of input – free-for-all, or managed using a suitable 'floor control' strategy – and for each user, the presentation of information about the other group members using the system.

SharedX

Garfinkel (1989) introduces a workspace sharing system called SharedX. This is an extension to the X Window System (Scheifler *et al.*, 1990) which allows groups of users to direct input to a shared X client, and view the output from it on their own workstations. As a tool in itself, collaboration is inhibited by the lack of information on the presence and activities of other users.

Timbuktu

Timbuktu (Farallon, 1988) provides many of the features of SharedX for networks of Macintosh computers. Awareness of presence is slightly improved as Timbuktu provides status indicators in the corner of the screen. Unfortunately, for most Macintosh installations, it is impractical to use Timbuktu for groups of more than two users, as the performance degradation is intrusive.

4. CONCLUSIONS

This paper has reviewed a wide range of literature on conflict, relevant to CSCW. We have argued CSCW systems must build on a thorough understanding of collaborative work if they are to provide appropriate support for group work. Collaborative work is rarely conflict-free, due to the nature of social interaction (see assertion A). Hence, examination of conflict is needed to develop an understanding of how collaboration breaks down, and how collaborative workers deal with conflict, in order to continue to work together.

The survey was presented as a series of assertions about conflict, representing common beliefs and assumptions. In may cases the evidence for an assertion is equivocal. Some suffer definitional problems, while some present methodological problems for empirical investigation. Many of the assertions describe individual factors which affect the occurrence and development of conflicts, but which are hard or impossible to isolate in any naturalistic study. If any single conclusion is to be drawn it is that conflict is a complex, pervasive phenomenon.

Such a survey is necessarily ambitious, and we have had to restrict the scope in some ways. For example, we have intentionally restricted ourselves to empirical studies, although we have introduced theoretical work where it offers insight in interpreting the empirical data. Also, because the survey is aimed at a CSCW audience, we have concentrated exclusively on task-focussed groups, deliberately ignoring other types of group.

At the beginning of the chapter, we suggested that work from areas such as psychology and the social sciences might not be directly applicable to CSCW, as it might not tackle the questions that concern designers of CSCW systems. Furthermore, although our survey should contribute to a general understanding of the nature of conflict, and hence the nature of collaborative work, it might still seem somewhat peripheral to CSCW systems design. However, we maintain that conflict should be a central concern in CSCW. The last section of the survey demonstrates that existing CSCW systems often make simplistic assumptions about conflict, and in many cases these assumptions can be seen to cause problems in the use of the systems. At the very least, we hope to have persuaded designers of CSCW systems to question their assumptions carefully.

In fact, we believe we have done more than that. The survey has identified a number of important factors which need to be taken into account, many of which require further study in the context of CSCW. For instance, group development and group cohesion are both factors which have been largely ignored in CSCW, but which strongly affect how collaborative activities are organised, and how a group perceives and reacts to conflict. Similarly, factors such as size of the group, pressures of time, culture and cultural mix, gender, and personality, each play a role to some extent.

The expression and management of conflict is an integral part of group behaviour. If CSCW is to become anything other than an enabling technology, this aspect of group interaction must be recognised and addressed.

REFERENCES

Aries, E. (1976) Interaction patterns and themes of male, female, and mixed groups. *Small Group Behavior*, Vol. 7, pp. 7-18.

Baker, P. M. (1981) The Division of Labor: Interdependence, Isolation, and Cohesion in Small Groups. *Small Group Behavior*, Vol. 12, No. 1, pp. 93-106.

Bales, R. F. (1950) *Interaction Process Analysis*. University of Chicago Press, Chicago.

Bales, R. F. and E. F. Borgatta (1955) Size of Group as a Factor in the Interaction Profile. In A. P. Hare, E. F. Borgatta, and R. F. Bales, Eds.,*Small Groups: Studies in Social Interaction*. New York: Knopf.

Bartos, O. J. (1970) Determinants and Consequences of Toughness. In P. Swingle, Ed., *The Structure of Conflict*, New York: Academic Press.

Bass, B. M. (1980) Team Productivity and Individual Member Competence. *Small Group Behavior*, Vol. 11, No. 4, pp. 431-504.

Baxter, L. A. (1982) Conflict Management: An Episodic Approach. *Small Group Behavior*, Vol. 13, No. 1, pp. 23-42.

Blake, R. R., and J. S. Mouton (1962) The intergroup dynamics of win-lose conflict and problems solving collaboration in union-management relations. In M. Sherif, ed., *Intergroup Relations and Leadership*, New York: Wiley.

Blake, R. R., H. A. Shepard, and J. S. Mouton (1964) *Managing Intergroup Conflict in Industry*, Houston: Gulf.

Bowers, J., and J. Churcher (1988) Local and Global Structuring of Computer Mediated Communication: Developing Linguistic Perspectives on CSCW in COSMOS. *Proceedings of the Conference on Computer Supported Co-operative Work* (CSCW-88) pp125-139.

Brehmer, B. (1976) Social Judgement Theory and the Analysis of Interpersonal Conflict. *Psychological Bulletin*, Vol. 83, No. 6, pp. 985-1003, November.

Brehmer, B., and K. R. Hammond (1977) Cognitive Factors in Interpersonal Conflict. In D. Druckman, ed., *Negotiations: social-psychological perspectives*, Beverly Hills, CA: Sage.

Brooks, F. P. (1975) *The Mythical Man-Month: Essays on Software Engineering*. Reading MA: Addison-Wesley.

Brown, B. R. (1968) The effects of the need to save face on interpersonal bargaining. *Journal of Experimental Social Psychology*, Vol. 4, pp 107-122.

Brown, B. R. (1977) Face-Saving and Face-Restoration in Negotiations. In D. Druckman, ed., *Negotiations: social-psychological perspectives*, Beverly Hills, CA: Sage.

Carron, A. V. (1982) Cohesiveness in sport groups: implications and considerations. *Journal of Sport Psychology*, Vol. 4, pp. 123-138.

Chalfonte, B. L., R. S. Fish, and R. E. Kraut (1991) Expressive richness: a comparison of speech and text as media for revision. *Proceedings of CHI '91*, pp. 21-26. New York: ACM.

Chase, S. (1951) *Roads to Agreement*, New York: Harper.

Cissna, K. N. (1984) Phases in Group Development: the negative evidence. *Small Group Behavior*, Vol. 15, No. 1, pp. 3-32, February.

Clark, H. H., and S. E. Brennan (1991) Grounding in Communication. In L.B. Resnick, J.M. Levine, and S.D. Teasley, Eds., *Perspectives on Socially Shared Cognition*, pp. 127-149. Washington, DC: American Psychological Association.

Clegg, C. (1988) Appropriate Technology for Humans and Organisations. *Applied Ergonomics*, Vol. 19, No. 1, pp. 25-34.

Cohen, M., and L. F. Ludwig (1991) Multidimensional audio window management. *International Journal of Man-Machine Studies*, Vol. 34, No. 3, pp. 319-336.

Collaros, P. A., and L. R. Anderson (1969) Effect of perceived expertness upon creativity of members of brainstorming groups. *Journal of Applied Psychology*, Vol. 53, No. 2, pp. 159-163.

Conklin, J. and M. L. Begeman (1988) gIBIS: a Hypertext Tool for Exploratory Policy Discussion. *Proceedings of the Conference on Computer Supported Cooperative Work* (CSCW-88), pp. 140-152. Also published as MCC Technical Report Number STP-082-88.

Corsaro, W. A. and T. A. Rizzo (1990) Disputes in the Peer Culture of American and Italian Nursery-School Children. In A. D. Grimshaw, ed., *Conflict Talk: Socio-linguistic Investigations of Arguments in Conversations*, Cambridge: Cambridge University Press.

Coser, L. A. (1956) *The functions of social conflict*. London: Routledge & Kegan Paul.

Crott, H. W., E. Kayser, and H. Lamm (1980) The effects of information exchange and communication in an asymmetrical negotiation situation. *European Journal of Social Psychology*, Vol. 10, pp. 149-163.

CSMIL (1991) *ShrEdit 1.2, a Shared Editor for the Apple Macintosh: User's Guide and Technical Description.* Cognitive Science and Machine Intelligence Laboratory, University of Michigan.

Curtis, B., H. Krasner, and N. Iscoe (1988) A Field Study of the Software Design Process for Large Systems. *Communications of the ACM*, Vol. 31, No. 11.

Dahrendorf, R. (1959) Class and Class Conflict in Industrial Society. London: Routledge and Kegan Paul.

Daves, W. F. and C. L. Holland (1989) The Structure of Conflict Behaviour of Managers Assessed with Self- and Subordinate Ratings. *Human Relations*, Vol. 42, No. 8, pp. 741-756.

de Bono, E. (1985) *Conflicts: A Better Way to Resolve Them*, London: Penguin Books.

Delisle, N. M., and M. D. Schwartz (1987) Contexts - a partitioning concept for hypertext. *ACM Transactions on Office Information Systems*, Vol. 5, No. 2, pp. 168-186.

DeStephen, R. S., and R. Y. Hirokawa (1988) Small Group Consensus: Stability of Group Support of the Decision, Task Process, and Group Relationships. *Small Group Behavior*, Vol. 19, No. 2, pp. 227-329.

Deutsch, M. (1969) Conflicts: productive and destructive. *Journal of Social Issues*, Vol. 25, No. 1, pp. 7-41.

Deutsch, M. (1973) *The Resolution of Conflict: Constructive and Destructive Processes*. New Haven: Yale University Press.

Dietz, J. L. G., and G. A. M. Widdershoven (1991) Speech acts or communicative action? *Proceedings of the Second European Conference on CSCW* (ECSCW'91), pp. 235-248. Dordrecht: Kluwer.

Doise, W., G. Mugny, and A-N. Perret-Clermont (1975) Social interaction and the development of cognitive operations. *European Journal of Social Psychology*, Vol. 5, No. 3, pp. 367-383.

Druckman, D., R. Rozelle, and K. Zechmeister (1977) Conflict of Interest and Value Dissensus: Two Perspectives. In D. Druckman, ed., *Negotiations: social-psychological perspectives*, Beverly Hills, CA: Sage.

Dyson, J. W., P. H. Godwin, and L. A. Hazlewood (1976) Group Composition, Leadership Orientation, and Decisional Outcomes. *Small Group Behavior*, Vol. 7, No. 1, pp. 114-128.

Easterbrook, S. M. (1991) Handling Conflict Between Domain Descriptions With Computer-Supported Negotiation. *Knowledge Acquisition*, Vol. 3, No. 4, pp. 255-289.

Edney, J. J. and P. A. Bell (1984) Sharing scarce resources: Group-outcome orientation, external disaster, and stealing in a simulated commons. *Small Group Behavior*, Vol. 15, No. 1, pp. 87-108.

Ehrlich, S. F. (1987) Strategies for Encouraging Successful Adoption of Office Communications Systems. *ACM Transactions on Office Information Systems*, Vol 5, No 4, pp340-357.

Elias, F. G., M. E. Johnson, and J. B. Fortman (1989) Task focused self disclosure: Effects on group cohesiveness, commitment to task, and productivity. *Small Group Behavior*, Vol. 20, No. 1, pp. 87-96.

Ellis, C. A., S. J. Gibbs, and G. L. Rein (1990) Design and use of a group editor. In G. Cockton, ed., *Proceedings of the IFIP Engineering for Human-Computer Interaction Conference*, pp. 13-25. Amsterdam: North-Holland. Also published as MCC Technical Report Number STP-263-88.

Ellis, C. A., S. J. Gibbs, and G. L. Rein (1991) Groupware: Some Issues and Experiences. *Communications of the ACM*, Vol. 34, No. 1, pp. 39-58. Also published as MCC Technical Report Number STP-414-88.

Ellis, D. G., and L. McAllister (1980) Relational control sequences in sex-typed and androgynous groups. *Western Journal of Speech Communication*, Vol. 44, pp. 35-49.

Engelbart, D. (1984) Authorship Provisions in AUGMENT. *Proceedings of the IEEE Compcon Conference*. Reprinted in I. Greif, Ed., 1988, Computer-Supported Cooperative Work: A Book of Readings, San Mateo, CA: Morgan Kaufmann.

Eskilson, A., and M. G. Wiley (1976) Sex composition and leadership in small groups. *Sociometry*, Vol. 39, pp. 183-194.

Evans, N. J., and P. A. Jarvis (1980) Group Cohesion: A Review and Re-evaluation. *Small Group Behavior*, Vol. 11, No. 4, pp. 359-370.

Falk, G. (1981) Unanimity Versus Majority Rule in Problem-Solving Groups: A Challenge to the Superiority of Unanimity. *Small Group Behavior*, Vol. 12, No. 4, pp. 379-399.

Farallon (1988) *Timbuktu user's guide*. Farallon Computing Inc., Berkeley, California.

Fink, C. F. (1968) Some conceptual difficulties in the theory of social conflict. *Journal of Conflict Resolution*, Vol. 12, pp. 412-460, December.

Fisher, R., and W. Ury (1981) *Getting to Yes: Negotiating Agreement Without Giving in*. London: Hutchinson.

Folger, J. P., and M. S. Poole (1984) *Working through conflict: a communication perspective*, Glenview, IL: Scott Foresman.

Ford, D. L., P. M. Nemiroff, and W. A. Pasmore (1977) Group Decision-Making Performance as Influenced by Group Tradition. *Small Group Behavior*, Vol. 8, No. 2, pp. 223-228.

Garfinkel, D., P. Gust, M. Lemon, and S. Lowder (1989) *The SharedX multi-user interface user's guide, version 2.0*. Research report STL-TM-89-07, Hewlett-Packard Laboratories, Palo Alto, California.
Gemmill, G. (1986) The mythology of the leader in small groups. *Small Group Behavior*, Vol. 17, No. 1, pp. 41-50.
Gemmill, G. (1989) The dynamics of scapegoating in small groups. *Small Group Behavior*, Vol. 20, No. 4, pp. 406-418.
Gemmill, G., and C. Wynkoop (1991) The Psychodynamics of Small Group Transformation. *Small Group Research*, Vol. 22, No. 1, pp. 4-23.
Gemmill, G., and G. Kraus (1988) Dynamics of covert role analysis: small groups. *Small Group Behavior*, Vol. 19, pp. 299-311.
Gero, A. (1985) Conflict avoidance in consensual decision processes. *Small Group Behavior*, Vol. 16, No. 4, pp. 487-499.
Gibb, J. R. (1954) *Factors producing defensive behavior within groups*. Annual technical report of the Human Relations Laboratory, University of Colorado, Boulder.
Glachan, M., and P. Light (1982) Peer interaction and learning: can two wrongs make a right? In P. Light, Ed., *Social Cognition: Studies of the Development of Understanding*, Brighton: Harvester.
Goodlet, J.S (1988) *The development of an Issue-Based Information System for supporting design*. Cognitive Science Research Paper 144, School of Cognitive and Computing Sciences, University of Sussex.
Greenberg, S. (1991) An Annotated Bibliography of Computer-Supported Cooperative Work. In S. Greenberg, Ed., *Computer-supported Cooperative Work and Groupware*. London: Academic Press.
Grimshaw, A. D. (1990) *Conflict Talk: Socio-linguistic Investigations of Arguments in Conversations*, Cambridge: Cambridge University Press.
Gross, N., A. W. McEachern, and W. S. Mason (1958) Role Conflict and its Resolution. In E. J. Thomas, Ed., *Role Theory: Concepts and Research*, J. Wiley & Sons.
Gulliver, P. H. (1979) *Disputes and Negotiations*. New York: Academic Press.
Hagen, B. H., and G. Burch (1985) The relationship of group process and group task accomplishment to group member satisfaction. *Small Group Behavior*, Vol. 16, No. 2, pp. 211-233.
Hall, J. (1971) Decisions, decisions, decisions. *Psychology Today*, Vol. 5, pp. 51-54 & 86-87, November.
Hall, S. (1982) Conformity Consensus and Conflict. In *Social Sciences: A foundation Course*, Block 5, Unit 21, Open University Press.
Hare, A. P., and D. Naveh (1985) Creative Problem Solving, Camp David Summit 1978. *Small Group Behavior*, Vol. 16, No. 2, pp. 123-138.
Heath, C., and P. Luff (1991) Disembodied conduct: communication through video in a multi-media office environment. *Proceedings of CHI '91*, pp. 99-103. New York: ACM.
Hermann, M. G., and N. Kogan (1977) Effects of Negotiators' Personalities on Negotiating Behaviour. In D. Druckman, ed., *Negotiations: social-psychological perspectives*, Beverly Hills, CA: Sage.
Hewstone, M., and Brown, R. (1986) Contact is Not Enough: An Intergroup Perspective on the 'Contact Hypothesis'. In M. Hewstone and R. Brown, Eds., *Contact and Conflict in Intergroup Encounters*. Oxford: Blackwell.
Hofstede, G. (1980) *Culture's consequences: International differences in work-related values*, Beverly Hills, CA: Sage.
Homans, G. (1950) *The Human Group*. New York: Harcourt, Brace & World.
Howell, J. P., P. W. Dorfman, and S. Kerr (1986) Moderating Variables in Leadership Research. *Academy of Management Review*, pp. 88-102.
Huhns, M. N., ed. (1987) *Distributed Artificial Intelligence*. Los Altos, CA: Morgan Kaufmann.
Jamieson, D. W., and K. W. Thomas (1974) Power and conflict in student-teacher relationships. *Journal of Applied Behavioral Science*, Vol. 10, pp. 321-336.
Janis, I. L. (1972) *Victims of Group-think: a psychological study of foreign-policy decisions and fiascoes*, Boston, MA: Houghton Mifflin.

Jessup, L. M., T. Connolly, and D. A. Tansik (1990) Toward a theory of automated group work: the de-individuating effects of anonymity. *Small Group Research*, Vol. 21, No. 3, pp. 333-348, August.

Jones, R. E., and C. S. White (1985) Relationships among personality, conflict resolution styles, and task effectiveness. *Group and Organization Studies*, Vol. 10, No. 2, pp. 152-167.

Katz, G. M. (1982) Previous Conformity, Status, and the Rejection of the Deviant. *Small Group Behavior*, Vol. 13, No. 3, pp. 403-414.

Keeney, R. L., and H. Raiffa (1976) *Decisions with Multiple Objectives: Preferences and Value Tradeoffs*. New York: J. Wiley & Sons.

Kelly, J. R., G. C. Futoran, and J. E. McGrath (1990) Capacity and Capability: Seven Studies of entrainment of task performance rates. *Small Group Research*, Vol. 21, No. 3, pp. 283-314.

Kiesler, S., J. Siegel, and T. W. McGuire (1984) Social Psychological Aspects of Computer-Mediated Communication. *American Psychologist*, Vol. 39, No. 10, pp. 1123-1134, October.

Kimberly, J. C. (1987) Instrumental and Expressive Structures in Groups in Organisational Settings. *Small Group Behavior*, Vol. 17, No. 4, pp. 395-406.

Klein, M. (1991) Supporting Conflict Resolution in Cooperative Design Systems. *IEEE Transactions on Systems, Man and Cybernetics*, Vol. 21, No. 6.

Kozan, M. K. (1989) Cultural Influences on Styles of Handling Interpersonal Conflicts: Comparisons Among Jordanian, Turkish and U.S. Managers. *Human Relations*, Vol. 42, No. 9, pp. 787-799.

Kunz, W., and H. Rittel (1970) Issues as Elements of Information Systems. Technical report S-78-2, Institut fur Grundlagen der Planung i.A., Universitat Stuttgart, Keplerstrasse 11, 7000 Stuttgart 1, Germany.

Lane, I. M., R. C. Matthews, C. M. Chaney, R. C. Effmeyer, R. A. Reber, and C. B. Teddlie (1982) Making the Goals of Acceptance and Quality Explicit: Effects on Group Decisions. *Small Group Behavior*, Vol. 13, No. 4, pp. 542-554.

Lea, M., and R. Spears (1991) Computer-mediated communication, de-individuation and group decision-making. *International Journal of Man-Machine Studies*, Vol. 34, pp. 283-301.

Leland, M. D. P., R. S. Fish, and R. E. Kraut (1988) Collaborative document production using Quilt. *Proceedings of the Conference on Computer Supported Cooperative Work* (CSCW-88), pp. 206-215. New York: ACM.

Leung, K. (1987) Some determinants of reaction to procedural models for conflict resolution: A cross-national study. *Journal of Personality and Social Psychology*, Vol. 53, pp. 265-308.

Leung, K., M. H. Bond, W. D. Carment, L. Krishnan, and W. B.G. Liebrand (1990) Effects of cultural femininity on preference for methods of conflict processing: a cross-cultural study. *Journal of Experimental and Social Psychology*, Vol. 26, pp. 373-388.

Lowe, D. (1986) SYNVIEW: The design of a system for cooperative structuring of information. *Proceedings of the Conference on Computer Supported Cooperative Work* (CSCW-86). Austin, Texas: MCC/STP.

Luce, D. L., and H. Raiffa (1957) *Games and Decisions: Introduction and Critical Survey*, New York: J. Wiley & Sons.

Mabry, E. A. (1985) The effects of gender composition and task structure on small group interaction. *Small Group Behavior*, Vol. 16, No. 1, pp. 75-96.

Mack, R. W. (1965) The Components of Social Conflict. *Social Problems*, Vol. 22, No. 4, pp. 388-397.

Mackay, W. E. (1988) More Than Just a Communication System: Diversity in the Use of Electronic Mail. *Proceedings of the Conference on Computer Supported Cooperative Work* (CSCW-88), 344-353. New York: ACM.

Mackay, W. E. (1988) More Than Just a Communication System: Diversity in the Use of Electronic Mail. *Proceedings of the Conference on Computer Supported Cooperative Work* (CSCW-88), pp. 344-353. New York: ACM.

MacLean, A., R. M. Young, and T. P. Moran (1989) Design Rationale: the argument behind the artifact. *Proceedings of CHI '89*, pp. 247-252. New York: ACM.

Malcolm, N. (1991) *GroupWriter: A Word Processor for Collaborative Document Production.* Research Report 91/435/19, Department of Computer Science, University of Calgary, Alberta.

Malone, T. W., K. R. Grant, F. A. Turbak, S. A. Brobst, and M. D. Cohen (1987) Intelligent Information-Sharing Systems. *Communications of the ACM*, Vol. 30, No. 5, pp. 390-402.

Mantei, M, R. M. Baecker, A. J. Sellen, W. A. S. Buxton, T. Milligan, and B. Wellman (1991) Experiences in the Use of Media Space. *Proceedings of the Human Factors in Computing Systems Conference, CHI-91*, pp. 203-208. New York: ACM.

Mantei, M. (1988) Capturing the Capture Lab Concepts: A Case Study in the Design of Computer Supported Meeting Environments. *Proceedings of the Conference on Computer Supported Cooperative Work* (CSCW-88), 257-270. New York: ACM.

Mantei, M. (1991) Computer Supported Meeting Environments. *CHI '91 tutorial notes*. New York: ACM.

Maples, M. F. (1988) Group development: Extending Tuckman's theory. *Journal for Specialists in Group Work*, Vol. 13, No. 1, pp. 17-23.

Marx, K., Das Elend der Philosophie, Berlin (1947).

McCall, R. J. (1989) MIKROPLIS: a hypertext system for design. *Design Studies*, Vol. 10 No. 4, pp. 228-238.

McCarthy, J. C., V. C. Miles, and A. Monk (1991) An experimental study of common ground in text-based communication. *Proceedings of CHI '91*, pp. 209-215. New York: ACM.

McGrath, J. E. (1984) *Groups: interaction and performance*, Engelwood Cliffs, NJ: Prentice-Hall.

McGrath, J. E. (1991) Time, Interaction and Performance (TIP): A Theory of Groups. *Small Group Research*, Vol. 22, No. 2, pp. 147-174.

Miles, V. C., J. C. McCarthy, A. J. Dix, M. D. Harrison, and A. F. Monk (1992) Reviewing Designs for a Synchronous-Asynchronous Group Editing Environment. In M. Sharples, ed., *Computer Supported Collaborative Writing*. London: Springer-Verlag.

Milgram, S. (1965) Some conditions of obedience and disobedience to authority. *Human Relations*, Vol. 18, No. 1, pp. 57-75.

Moore, C. M. (1987) Group techniques for idea building. Newbury Park, CA: Sage.

Moorhead, G., R. Ference, and C. P. Neck (1991) Group Decision Fiascos Continue: Space Shuttle Challenger and a Revised Group-think Framework. *Human Relations*, Vol. 44, No. 6, pp. 539-550.

Moreno, J. L. (1953) Who Shall survive? Boston: Beacon.

Moscovici, S., and M. Zavalloni (1969) The group as a polarizer of attitudes. *Journal of Personality and Social Psychology*, Vol. 12, No. 2, pp. 125-135.

Mudrack, P. E. (1989) Defining Group Cohesiveness: a legacy of confusion?. *Small Group Behavior*, Vol. 20, No. 1, pp. 37-49.

Mugny, G., and W. Doise (1978) Socio-cognitive conflict and structure of individual and collective performances. *European Journal of Social Psychology*, Vol. 8, pp. 181-192.

Nemeth, C., J Endicott and J. Wachtler (1976) From the ’50s to the ’70s: Women in Jury Deliberations. *Sociometry*, Vol 39, pp293-304.

Neuwirth, C. M., D. S. Kaufer, R. Chandhok, and J. H. Morris (1990) Issues in the Design of Computer Support for Co-authoring and Commenting. *Proceedings of the Conference on Computer Supported Cooperative Work* (CSCW-90), pp. 183-195. New York: ACM.

Norman, D. A., and Draper, S. W. (1986) *User Centred System Design: New Perspectives on Human-Computer Interaction.* Hillsdale NJ: Lawrence Erlbaum.

Olson, G. M., and J. S. Olson (1991) User-centred design of collaboration technology. *Journal of Organizational Computing*, Vol. 1, No. 1, pp. 61-83.

Olson, J. S., G. M. Olson, L. A. Mack, and P. Wellner (1990) Concurrent editing: the group's interface. *Proceedings of INTERACT '90*, pp. 834-840. Amsterdam: North-Holland.

Owen, W. F. (1985) Metaphor Analysis of Cohesiveness in Small Discussion Groups. *Small Group Behavior*, Vol. 16, No. 3, pp. 415-424.

Pace, R. C. (1990) Personalized and Depersonalized Conflict in Small Group Discussions: An Examination of Differentiation. *Small Group Research*, Vol. 21, No. 1, pp. 79-96.

Pasch, J. (1991) Dialogical Software Design. In H-J. Bullinger, ed., *Human Aspects in Computing: Design and Use of Interactive Systems and Work with Terminals*, Elsevier.
Patchen, M. (1970) Models of Co-operation and Conflict: A Critical Review. *Journal of Conflict Resolution*, Vol. 14, No. 3.
Pendell, S. D. (1990) Deviance and conflict in small group decision making: An exploratory study. *Small Group Research*, Vol. 21, No. 3, pp. 393-403.
Perret-Clermont, A-N. (1980) *Social Interaction and Cognition in Children.* London: Academic Press.
Pettigrew, T. F. (1986) The Intergroup Contact Hypothesis Reconsidered. In M. Hewstone, Ed. *Contact and Conflict in Intergroup Encounters* Oxford: Basil Blackwell.
Piliavin, J. A., and R. R. Martin (1978) The effects of the sex composition of groups on style and of social interaction. *Sex Roles*, Vol. 4, pp. 281-296.
Pliskin, N. (1989) Interacting with electronic mail can be a dream or a nightmare: a user's point of view. *Interacting with Computers*, Vol. 1, No. 3, pp. 259-272.
Pondy, L. R. (1967) Organizational conflict: concepts and models. *Administrative Science Quarterly*, Vol. 12, pp. 296-320.
Pood, E. A. (1980) Functions of Communication: an experimental study in group conflict situations. *Small Group Behavior*, Vol. 11, No. 1, pp. 76-87, Sage.
Price, V. (1989) Social Identification and Public Opinion: Effects of Communicating Group Conflict. *Public Opinion Quarterly*, Vol. 53, No. 2, pp. 197-224.
Priem, R. L., and K. H. Price (1991) Process and Outcome Expectations for the Dialectical Inquiry, Devil's Advocacy, and Consensus Techniques of Strategic Decision Making. *Group and Organization Studies*, Vol. 16, No. 2, pp. 206-225.
Putnam, L. L. (1983) Small Group Work Climates: A Lag-Sequential Analysis of Group Interaction. *Small Group Behavior*, Vol. 14, No. 4, pp. 465-494.
Putnam, L. L., and M. S. Poole (1987) Conflict and Negotiation. In L. W. Porter, Ed., Handbook of Organizational Communication: An Interdisciplinary Perspective, pp. 549-599, Newbury Park: Sage.
Ramsay, A. (1988) *Formal Methods in Artificial Intelligence*. Cambridge: Cambridge University Press
Rapoport, A. (1974) *Game Theory as a Theory of Conflict Resolution.* Dordrecht, Holland: D. Reidel Publ. Co.
Raven, B. H., and A. W. Kruglanski (1970) Conflict and Power. In P. Swingle, Ed., *The Structure of Conflict*, pp. 69-109, New York: Academic Press.
Rein, G. L., and C. A. Ellis (1991) rIBIS: a real-time group hypertext system. *International Journal of Man-Machine Studies*, Vol. 34, No. 3, pp. 349-368.
Renwick, P. A. (1977) Effects of sex differences on the perception and management of superior-subordinate conflict: an exploratory study. *Organizational Behavior and Human Performance*, Vol. 19, pp. 403-415.
Robbins, S. P. (1974) *Managing Organizational Conflict: A Non-traditional Approach*. Englewood Cliffs, NJ: Prentice Hall.
Robbins, S. P. (1989) *Organizational Behavior: Concepts, Controversies and Applications*. Englewood Cliffs, NJ: Prentice-Hall.
Root, R. W. (1988) Design of a Multi-Media Vehicle for Social Browsing. *Proceedings of the Conference on Computer Supported Cooperative Work* (CSCW-88), pp. 25-38, New York: ACM.
Rosenschein, J. S. (1985) *Rational Interaction: Co-operation Among Intelligent Agents*. Ph.d. Thesis, Report No STAN-CS-85-1081, Dept of Computer Science, Stanford University, Stanford, CA.Axelrod, R. (1984) *The Evolution of Co-operation*. New York: Basic Books.
Saine, T. J., and D. G. Bock (1973) A comparison of the distributional and sequential structures of interaction in high and low consensus groups. *Central States Speech Journal*, Vol. 24, pp. 125-130.
Sainfort, F. C., D. H. Gustafson, K. Bosworth, and R. P. Hawkins (1990) Decision support systems effectiveness: Conceptual framework and empirical evaluation. *Organizational Behavior and Human Decision Processes*, Vol. 45, No. 2, pp. 232-252.

Scheifler, R., and J. Gettys, with J. Flowers, R. Newman, and D. Rosenthal (1990) *X Window System: the Complete Reference to Xlib, X Protocol, ICCCM, XLFD*, Second Edition. Digital Press.

Scott, B. (1988) *Negotiating: Constructive and Competitive Negotiation*. London: Paradigm.

Sermat, V. (1964) Cooperative behaviour in a mixed motive game. *Journal of Social Psychology*, Vol. 62, p217-239.

Sharples, M., Ed. (1992) *Computer Supported Collaborative Writing*. London: Springer-Verlag.

Shaw, M. (1976) *Group Dynamics: The Psychology of Small Group Behavior*. New York: McGraw-Hill.

Shaw, M. E., and B. Harkey (1976) Some effects of congruency of member characteristics and group structure upon group behavior. *Journal of Personality and Social Psychology*, Vol 34, No 3, Pp 412-418.

Shaw, M. L. G., and B. R. Gaines (1988) A Methodology for Recognising Consensus, Correspondence, Conflict, and Contrast in a Knowledge Acquisition System. *Proceedings, Third AAAI Knowledge Acquisition For Knowledge-Based Systems Workshop*, Banff, Canada, Nov 1988.

Smith, K. K., and D. N. Berg (1987) A paradoxical conception of group dynamics. *Human Relations*, Vol. 40, No. 10, pp. 633-657.

Sproull, L., and S. Kiesler (1986) Reducing social context cues: electronic mail in organizational communication. *Management Science*, Vol. 32, pp. 1492-1512.

Sproull, L., and S. Kiesler (1991) Two-Level Perspective on Electronic Mail in Organizations. *Journal of Organizational Computing*, Vol. 2, No. 1, pp. 125-134.

Stefik, M., G. Foster, D. G. Bobrow, K. Kahn, S. Lanning, and L. Suchman (1987) Beyond the Chalkboard: Computer Support for Collaboration and Problem Solving in Meetings. *Communications of the ACM*, Vol. 30, No. 1, pp. 32-47.

Sternberg, R. J., and L. J. Soriano (1984) Styles of Conflict Resolution. *Journal of Personality and Social Psychology*, Vol. 47, No. 1, pp. 115-126.

Strauss, A. L. (1978) *Negotiations: Varieties, Contexts, Processes and Social Order*. San Francisco: Jossey-Bass.

Strodtbeck, F., and R. Mann (1956) Sex role differences in jury deliberations. *Sociometry*, Vol. 19, pp. 3-11.

Swingle, P. (1970) Dangerous Games. In P. Swingle, Ed., *The Structure of Conflict*, New York: Academic Press.

Tannen, D. (1991) *You Just Don't Understand: Women and Men in Conversation*. London: Virago.

Tatar, D. G., G. Foster, and D. G. Bobrow (1991) Design for conversation: lessons from Cognoter. *International Journal of Man-Machine Studies*, Vol. 34, No. 2, pp. 185-210.

Terhune, K. W. (1970) The Effects of Personality in Cooperation and Conflict. In P. Swingle, Ed., *The Structure of Conflict*, New York: Academic Press.

Thomas, K. (1976) Conflict and Conflict Management. In M. D. Dunnette, Ed., *Handbook of Industrial and Organizational Psychology*, pp. 889-935, Chicago: Rand McNally College Publ. Co.

Thompson, L. (1990) The influence of experience on negotiation performance. *Journal of Experimental and Social Psychology*, Vol 26, pp. 528-544.

Trigg, R., L. Suchman, and F. Halasz (1986) Supporting Collaboration in NoteCards. *Proceedings of the Conference on Computer Supported Cooperative Work* (CSCW-86), pp. 1-10. Austin, Texas: MCC/STP.

Tuckman, B. W. (1965) Developmental sequence in small groups. *Psychological Bulletin*, Vol. 63, pp. 348-399.

Tuckman, B. W., and M. A. C. Jensen (1977) Stages of small-group development revisited. *Group and Organization Studies*, Vol. 2, pp. 419-427.

Unger, R. (1990) Conflict Management in Group Psychotherapy. *Small Group Research*, Vol. 21, No. 3, pp. 349-359.

Valacich, J. S., A. R. Dennis, J. F. Nunamaker, Jr. (1991) Electronic meeting support: the GroupSystems concept. *International Journal of Man-Machine Studies*, Vol. 34, No. 2, pp. 262-282.

Viller, S. (1991) The Group Facilitator: A CSCW Perspective. *Proceedings of the Second European Conference on Computer Supported Cooperative Work*, Amsterdam, September.
Volkema, R. J., and T. J. Bergmann (1989) Interpersonal Conflict at Work: An Analysis of Behavioral Responses. *Human Relations*, Vol. 42, No. 9, pp. 757-770.
Wahrman, R. (1977) Status, deviance, sanctions and group discussion. *Small Group Behavior*, Vol. 8, No. 2, pp. 147-168.
Wall, V. D., and L. L. Nolan (1987) Small group conflict: A look at equity, satisfaction, and styles of conflict management. *Small Group Behavior*, Vol. 18, No. 2, pp. 188-211.
Wall, V. D., G. J. Galanes, and S. B. Love (1987) Small, Task-Oriented Groups: Conflict, Conflict Management, Satisfaction, and Decision Quality. *Small Group Behavior*, Vol. 18, No. 1, pp31-55.
Weinberg, S. B., S. H. Rovinski, L. Weiman, and M. Beitman (1981) Common Group Problems: A Field Study. *Small Group Behavior*, Vol. 12, No. 1, pp. 81-92.
Wilson, P. (1991) *Computer Supported Cooperative Work.* Oxford: Intellect.
Wilson, P. (1991b) An Overview of Computer Supported Cooperative Work (CSCW): a new IT paradigm. *Proceedings of the Conference on Advanced Information Systems* (AIS '91), 19-21 March 1991, London: Springer, pp. 125-138.
Winograd, T. (1988) A Language/Action Perspective on the Design of Cooperative Work. *Human Computer Interaction,* Vol. 3, No. 1, pp. 3-30.
Wood, C. J. (1989) Challenging the Assumptions Underlying the use of Participatory Decision-Making Strategies: A Longitudinal Case Study. *Small Group Behavior*, Vol. 20, No. 4, pp. 428-448.
Zamarripa, P. O., and D. L. Krueger (1983) Implicit Contracts Regulating Small Group Leadership: The influence of culture. *Small Group Behavior*, Vol. 14, No. 2, pp. 187-210.