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A Survey of Empirical Studies of Conflict

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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
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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

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)	vs. f1.42 role

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:

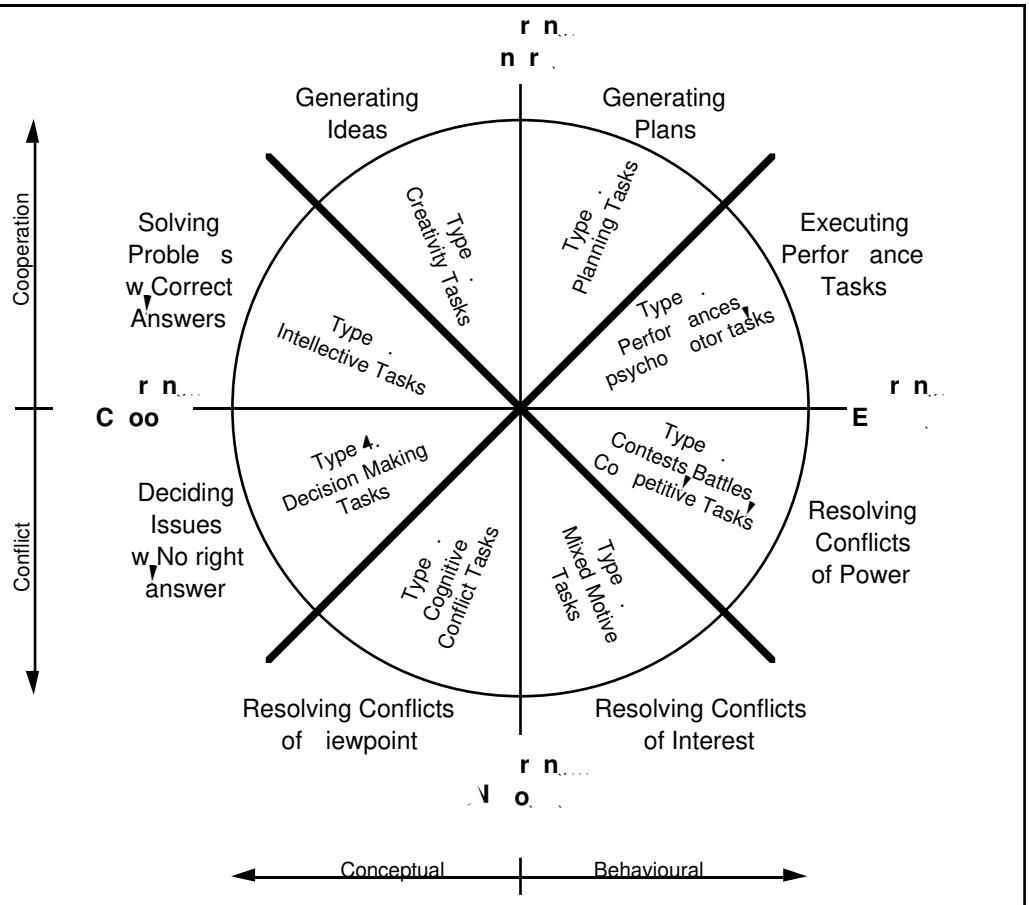

Figure 2: The 'Group Task Circumplex', adapted from McGrath (1984). Note that McGrath uses this typology merely to organise a review of the literature, without making any strong claims about its empirical validity.

organisational impact on shared meanings. The systems-interaction approach considers conflict

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

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.

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 wexpWorod through CL6K.Wn masbis85iating obj. To our surp0 6910 l 690Sth sg

"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.

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.

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

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 of ar Tw iccept mamayry) isrom votgonisms bn cls

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 transformtrast p

to first order change which is orderly and gradual. For small groups, 2bopmd order change results in a transformtrast of attitudes st focal issues. The model describes how members unconsciously acceptlopvert roles to dramtraze the central conflicts of the group, to reflect negative attributes ('scapegoat') amd positive attributes ('charismatic prophet'). The process by

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-responsit

final transition is the infusast of new meaning. At any of the transition points, the group may fail to make the transition and seek regressive solutions. The model is presentmenas a downward vortex, 2piralling around the central issue, which acts as a focus to offset the defensive pull toward regressive solutions. The entire model is presentmenpartly to explain empirical observations of the individual phases, amd partly to investigate the theoretical proposition that when facment .13a difficult issue, the group members either reactnt .13a sense of denial and seek a regressive solution or choose to deal with the unenttainty. The model is normtrave in the sense that it indicates in which direction the group should move in order to develop.

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

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.

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

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)

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 aspectfonfmnglg proro coirrational otialinterpeparate8 18 -12n

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

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.

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,

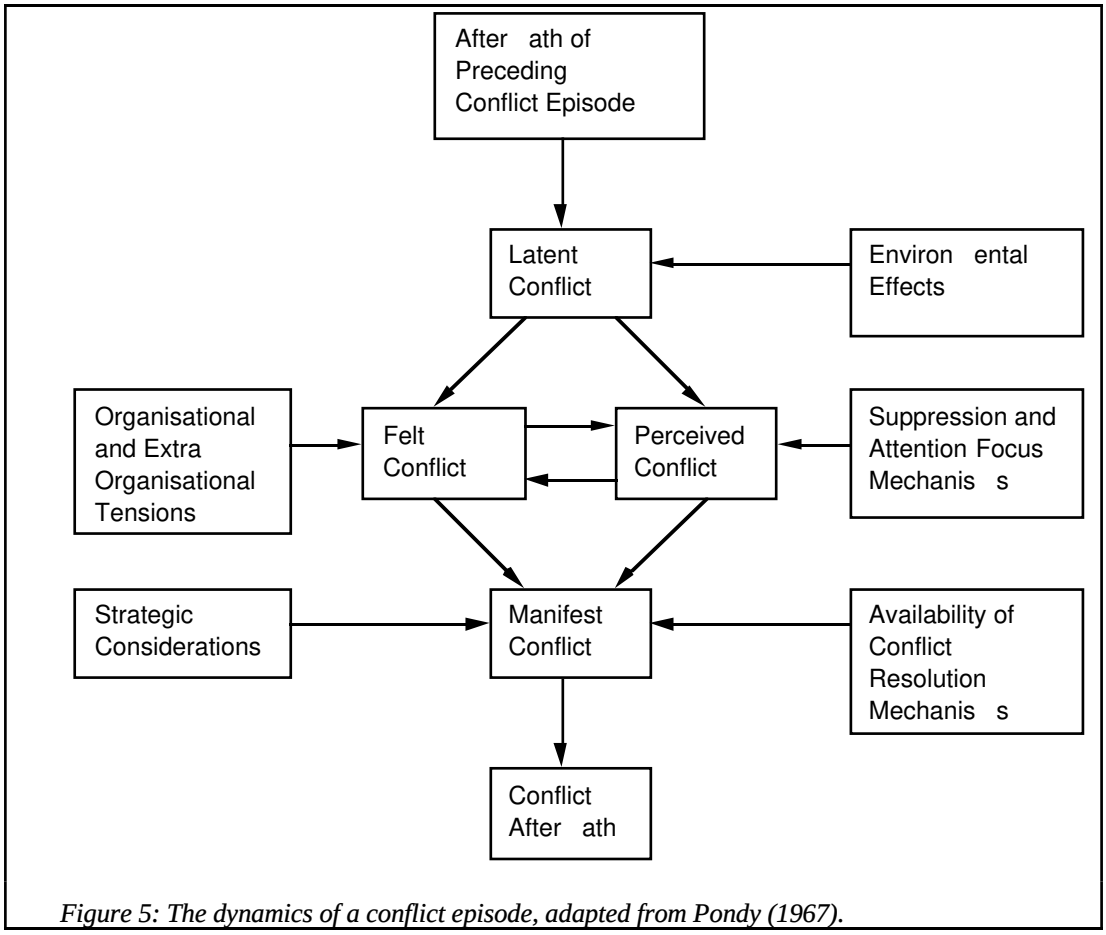

Figure 5: The dynamics of a conflict episode, adapted from Pondy (1967).

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.

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

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That different cultures have different attitudes to conflict is self-evident. There are many books

2.5. Management and resolutions of conflicts

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 surom

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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.

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.

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.

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.

This assertion is made by de Bono (1985), who claims that the introduction of a third party is

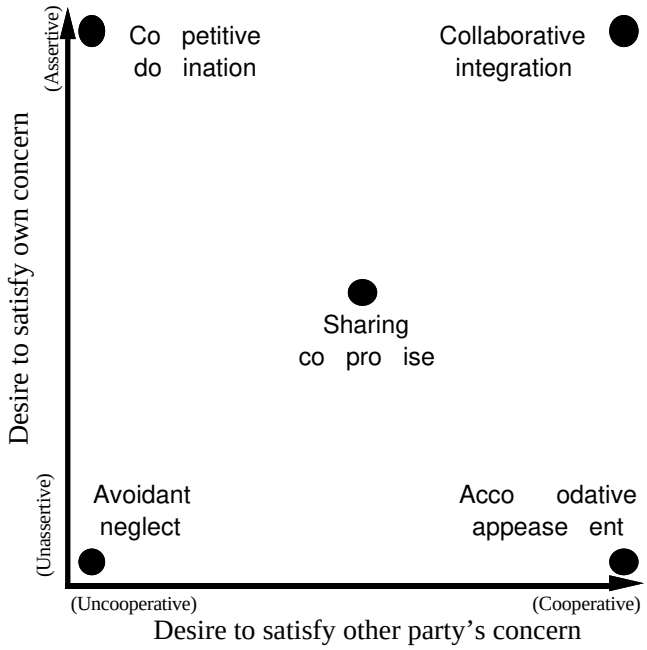

Figure 6: Behavioural modes of tackling conflict with (in brackets) the outcome sought in each mode. Adapted from Thomas (1976)

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

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-

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

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

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.

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

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.

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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

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,

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).

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);

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

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 co0.09/iscope diratescors whi.19 T systsu h plasea roo CSCW presof and0.1 Tc c 0.2212 Td 1.003 Tw (are survexent ecope ow ofage and c

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