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6 Mediated Group Communication

As a couple, Romeo and Juliet had a lot to talk about, and their communication has become a part of Western culture. But the process of their communication is interesting, informative, problematic, and in the end tragic because they belonged to different groups. The point is that groups are the fundamental building blocks of organizations, communities, society; they mediate the form, direction, and content of individual and dyadic communication. Influential sociological concepts of "group" include reference groups, kinship groups, group stratification, socioeconomic groups and the like. Here, however, we focus on one locus of group communication—small groups. More specifically, we consider communication as mediated not only by its occurrence within a group but also by new communication technology.

This is an interesting topic precisely for the reason that there are not many group media. Rural party lines are rudimentary telephone conference calls; and audio conferencing is not unfamiliar to many organizations. Video conferencing and computer conferencing (CC) are two other group media; organizational teleconferencing in general is discussed in Chapter 9. There has, however, been considerable research on cross-media comparisons as reviewed by Fowler and Wackerbath (1980); Hiemstra (1982); Johansen (1977); Johansen, Vallee, and Spangler (1979: 141-191); Rice (1980b); Short, Williams, and Christie (1976); Weeks and Chapanis (1976); Williams (1975); and Williams, Paul, and Ogilvie (1957; see also Chapter 3). This literature emphasizes that acceptance, use, and consequences of group media are created from complex interactions of the medium (system design as well as coding attributes and interactivity), task, individual traits and motivations, group size and structure, group rules and rewards, access to alternative media, conduct of the group's meetings, and the organizational environment and goals.

For the purposes of this chapter, the term "task" needs to be clarified. Groups can be classified as task oriented or non-task oriented. A task is a specific goal that the group intends to achieve, whether it be to produce a tangible product or an intangible decision. A *socioemotional* task emphasizes the more social interpersonal skills and outcomes, such as negotiation or getting new members to join. A *technical* task involves more factual or cognitive skills and outcomes, such as exchanging information or arriving at a decision based largely on information gathered and/or evaluated by the group. The problem with this categorization, of course, is that many overtly technical group tasks are heavily laden with political and symbolic purposes. For example, what may appear to be a simple attempt to gather information to make an objective decision may be a politically astute negotiation to acquire symbolic power through conspicuous consumption of information (Feldman and March, 1981).

A group may not necessarily be task oriented, in the strict sense of the above terms. That is, a group may be constituted simply to communicate or be sociable in its own right. Indeed, as discussed in Chapters 3 and 5, information system designs not only seldom consider the more pleasurable or playful aspects of communication but, along with regulatory policy and organizational dictates, may often actively discourage or prevent such uses (Marvin, 1983). While acknowledging these purposes, this chapter primarily considers the effects of mediated group communication on task-oriented groups; we must await experimental results from video-conferenced picnics.

This chapter also primarily considers group communication as mediated by computer-based communication systems, and CC in particular. There are several good reasons for this focus. Audio conferencing is limited to a few people at a time, and video conferencing is quite expensive and not accessible to the casual or informal user. Electronic mail and CC are already in use by thousands of people, and are widely available through public and private networks at generally affordable prices. As Chapter 3 briefly discussed, print media are typically judged to have less

"social presence," and they transmit less of the full bandwidth of human communication codes, than do other media. Table 6.1 shows (as does Table 3.2) that, indeed, computer conferencing systems are generally rated more satisfactory for tasks requiring lower amounts of intimacy, conflict, or socioemotional content. Exchanging information and opinions and generating ideas (which *can* be conflictual) seem to be more suitable tasks than bargaining, persuading, or getting to know someone.

There may also be more effort required to achieve facility with such systems. Therefore, many of the research results reported below can be considered to provide the extremes of the possible outcomes; similar research on video conferencing may not reveal strong differences from face-to-face communication.

WHAT IS COMPUTER CONFERENCING?

Excellent descriptions of CC system features, historic development, specific systems, philosophical issues in technical choices, and uses and impacts at the individual, group or social level are provided by Hiltz (1983); Hiltz and Turoff (1978, 1981); Johansen et al. (1979); Kerr and Hiltz (1982); and Rice (1980b). The simplest definition of CC is a computer-facilitated mechanism for recording and using a textual transcript of a group discussion over varying lengths of time, by group members who may be geographically dispersed and who may interact with the transcript either simultaneously or at times of their own choosing. The basic components typically involve a number of terminals dispersed through an organization or a nation, connected through modems and a telephone line to a network's host computer (or directly to the company computer). This computer contains the processing software to connect all users when they log in to the system, and maintains storage of the transcripts.

This is significant: The medium has a memory (Johansen, Miller, and Vallee, 1974). Any user may log in at any time to receive waiting messages, read the latest comments to a common conference, work on a manuscript others have edited, or scan directories and indices for shared interests with other users. Computer conferencing systems may be said to differ from electronic messaging systems primarily because they provide *shared files*. This means that users may jointly contribute to, read, and comment on, a dynamic joint file of text; electronic messaging generally involves sending a discrete file to one or more members, but sharing a file is usually difficult. Because of the shared files, and the processing ability of the computer, a very wide range of communication structures may be offered in a CC system. Basic facilities include messages, conferences, and work spaces—which may be public or private and which may involve specific individuals, a formally defined group, or anyone with access to the system—along with text editing, storage, and printing capabilities. A very public form of CC is developing rapidly. It is called Community Computer-Based Bulletin Boards; there are over 30 in the Washington, D.C., area

TABLE 6.1 Summary of Satisfaction Ratings from Several Sets of Computer Conferencing Users

TASK	*Confravision*[a]	*Conferencing*[a]	*PLANET*[b]	*PLANET*[b]	*MACC-Telemail*[c]	*Experienced EIES Users*[c]	*Staff EIES Users*[d]	*Student EIES Users*[d]	*Experienced Student EIES Users*[d]	*Average*
Exchanging opinions	1.9	-	1.5	2.1	1.9	2.3	3.5	3.1	2.7	2.4
Exchanging information	2.0	2.6	1.3	2.1	2.0	2.4	3.6	3.2	2.8	2.4
Generating ideas	2.7	-	1.8	2.6	3.8	2.8	3.1	3.4	3.0	2.9
Problem solving	2.7	-	3.0	3.4	4.0	3.9	4.4	4.1	2.8	3.5
Resolving disagreements	-	-	3.2	4.3	3.5	4.1	4.5	3.5	4.1	3.9
Bargaining	3.6	3.9	3.3	4.2	4.4	4.1	4.4	4.2	3.8	4.0
Persuasion	3.6	3.9	3.4	4.6	4.3	4.2	4.1	3.9	4.0	4.0
Getting to know someone	4.0	5.1	3.8	4.5	4.8	3.3	3.9	4.6	4.3	4.3

SOURCES:
a. Pye and Williams (1977).
b. Vallee, Johansen, Randolph, and Hastings (1978).
c. Hiltz (1981).
d. Hiltz, Johnson, and Agle (1978).

NOTE: Ratings based on average of responses to seven-point scale: 7 = completely unsatisfactory. Tasks and groups not generally comparable across studies. Cross-system averages are not weighted for study sample sizes.

alone. Anyone with a modem and a terminal may call in to "post " and read notices or exchange private messages. The rapidly expanding array of online information and communication services available to the public is described by Grossbrenner (1983).

Much more complex facilities include virtual text, online polling, highly structured group communication processes, interactive education courses, computing, experimentation, and the like. An analysis of how uses and users evolve within such a system, along with in-depth charts of system features, is provided by Hiltz and Turoff (1981). The authors report that various system services (such as private or public version of messages, conferences, and work spaces) show significant differences in usage, which indicates that they "have their role and function in the computer augmentation of human communications" (p. 746). Many of these services are not available in electronic mail, and as their importance to users increases with increased experience with such systems, the simpler mail systems will eventually discourage or stunt possible applications (Hiltz and Turoff, 1981).

Computer conferencing, as any medium, has its weaknesses. Some of these include the following:

(1) the written mode is disliked for certain statements;
(2) direct interpersonal and nonverbal feedback is missing;
(3) users may participate in the group infrequently;
(4) negotiations may be more intransigent or rigid;
(5) a perceived need to communicate is highly important, as is leadership;
(6) multiple threads to the conference discussion may develop and create confusion or information overload (Johansen et al., 1979).

The remainder of this chapter will consider more specific aspects of group communication and decision making as mediated by CC.

ALTERNATIVE PERSPECTIVES ON DECISION-MAKING IMPACTS

There are two primary schools of thought on the likely consequences, and thus the appropriate uses, of CC for group decision making (see Barefoot and Strickland, 1982; Kiesler, Siegel, and McGuire, 1982). The first is the classic behavioral/information processing model of decision making, or the "cool" school. This perspective argues that positive and accurate decisions come from groups with low conflict wherein more information than opinion is exchanged, and such exchange is relatively equal and frequent. The idea is that many problems are well solved by a dispassionate discussion of retrievable factual information or informed opinion. Group decisions tend to have higher quality than the average of the decisions of the individual group members, but not necessarily as high as the best member's decision (Davis, 1969). Reducing affective cues will remove "irrelevant" considerations, such as status, charisma, prejudices,

and physical or minority personal attributes. For example, a study of actual brainstorming groups showed that group members with high output of ideas perceived fewer status differences in the group (Jablin and Sussman, 1978).

One conclusion from a comprehensive controlled experiment comparing group performance across several media argued that the largest performance differences occurred when the group had, or the channel created, imbalances among members (Weeks and Chapanis, 1976). For example, face-to-face allows the weaker side to enhance its position, and particularly for matters of conflict and opinion rather than of cooperation and fact. The authors also concluded, however, that the presence or absence of voice was the primary differentiation between media, and not visual cues; this possibility is opposed by research showing that "transmitted nonverbal cues tend to increase the positivity of interpersonal evaluation", as tested by controlling for communication channel (Williams, 1975). Groups with high affect may suffer from "groupthink," in which groups avoid conflict and threats to their credibility, even at the cost of making crucial decisions (Janis, 1972).

The "warm" school, on the other hand, emphasizes the human relations inherent in groups and which lead to more integrative solutions. Group norms, affective bonds, trust, and commitment are important both in and of themselves and because they encourage intuitive, experiential solutions. Nonverbal communication aids the transmission of contextual clues, values, and implicit goals. The assumption here is that routinization, explicitness, and efficiency work against the development of appropriate decisions. Negative affect, polarization, flaming, and intransigence may result when communication is not regulated by group affect, or by the warm communications gained in the elevator, at the water cooler, through organizational culture, and in face-to-face encounters. Indeed, if affective and social cues are missing, group discussions can give rise to disinhibition or highly emotional reactions rather than rational decision making.

There are additional distinctions that inform this debate. One is the nature of the task communication. Routine communication may be more susceptible to the advantages of "cool" decision making. Nonroutine communication—handling personal matters, crisis problems, uncertain conditions (the kind of decisions higher-level managers are likely to make)—needs a higher quality of effort, is less amenable to formalized procedures, involves more ambiguous goals, and requires credibility (Kiesler et al., 1982).

One aspect of nonroutineness may be the level of politicization in the group or in the problem; in that case, lack of affect and potential disinhibition may just exacerbate the condition and fragment the group. On the other hand, such increased polarization may *improve* the diversity of solutions and the level of group commitment, particularly in highly novel situations.

Indeed, the psychological distance imposed by mediated communication can allow a greater expression of emotions, especially negative ones (Barefoot and Strickland, 1982). More specifically, extreme levels of

intimacy (high or low) tend to be avoided by people, so media that suppress intimate cues may be evaluated as more appropriate for tasks of high intimacy (Williams, 1975). For example, treatment-seeking clients concerned about drug, tobacco, or alcohol use rated a computerized interview (compared to a traditional face-to-face interview or self-reporting) less friendly but shorter, more relaxing, lighter, and more interesting (Skinner and Allen, 1983). Similarly, Griest and Gustafson (1973) found that suicidal patients preferred a computerized interview over an interview with a physician. Thus, the perspective taken on the fundamental nature of group decision making, the nature of the communications, and the acceptability of emotionality all contribute to an assessment of the utility of CC.

We might add that cognitive psychology suggests three other perspectives on the potential interaction between mediated communication, affect, and decision making, according to Sims (1982), who cites the following theoretical considerations.

(a)"Prototype-matching" is a model that assumes that we try to match perceived characteristics of a situation with associations and characteristics held in memory, as a short cut to full processing and recategorization of each new event (Cantor and Mischel, 1977). A reduction in available characteristics (because of reduced medium bandwidth or feedback) might decrease the likelihood of such matches, with attendant frustration and emotional responses.

(b)In some cases we "automatically" evaluate the process stimuli; in other cases we must perform "controlled" processing. Again, with reduced availability of stimuli, users may be forced into slower and less relaxed controlled processing (Bargh, 1982).

(c)Related to these two theories is the notion that we process inputs according to "scripts" or schemas of expected sequential events. Writ large, these scripts mold our most obvious as well as subtle behavior, particularly in public settings. Insufficient cues may lead to the use of inappropriate scripts, or may demand the generation of new ones, both with perhaps frustrating consequences (Abelson, 1981).

Most of the controlled experiments discussed below tend to follow the cool school in their assumptions, but analyses of the results provide information for the warm perspective as well. Of course, the cost of the rigor of controlled experiments is some generalizability. In general, real-world contexts are missing from most of the studies, although one did use organizational staff in their work settings. Other groups, primarily students, did not have any ongoing history in which group norms and affect would have influenced their behavior. This kind of experiment is rather discrete, in that the process of group structuring and development is condensed into a few hours. Further, it may be unlikely that a CC user would "flame" as strongly in an ongoing business context as some subjects did.

These experiments typically utilized either a ranking decision (e.g., rank-order 15 items found in a plane wreck in terms of their importance for survival) as judged by survival experts, or a human relations problem

(e.g., decide what to do about an apparently incompetent forest ranger) judged more qualitatively by local experts in personnel management. Perhaps the most detailed model for this kind of cross-media controlled experiment can be found in Weeks and Chapanis (1976). A methodological description of such research, emphasizing the role of the computer in running the experiment, appears in Hiltz, Turoff, Johnson, and Aronovitch (1982).

Subsequent sections will refer to Table 6.2, a summary of several controlled experiments using CC and face-to-face communication as treatments, and various aspects of group decision making as outcomes.

PHASES IN GROUP DECISION MAKING

Groups seem to pass through a regular series of phases on their way to a joint decision (Bales, 1955). Insofar as it seems likely that different kinds of information and resources are crucial at different phases, CC may have differential acceptability and utility in different group phases. This section reports the few CC studies on this topic.

Different authors conceptualize these phases in different ways. Perhaps the best known are those identified by Interaction Process Analysis (Bales, 1950). Bales suggests that there are task and socioemotional components, each comprising three phases, each of which has active and passive forms. The progression, then, has group members who (a) give/ask for orientation, (b) give/ask for evaluation or opinion, (c) give/ask for control, such as suggestions, (d) agree/disagree, (e) manage tension by asking for help, withdrawing or joking, and (f) integrate group comments by showing solidarity or antagonism.

Using this typology, Hiltz, Johnson, and Agle (1978) and Hiltz, Johnson, and Rabke (1980) analyzed the interactions (using audio, video, and textual content) of groups in face-to-face versus CC conditions, and in technical versus human relations tasks, as part of ongoing research (see Hiltz, Johnson, Aronovitch, and Turoff, 1980). The authors found more tension release, agreement, and asking for opinion in the face-to-face condition; the HJA78 experiment also found more disagreement in this condition, along with considerable nonverbal and nonlinguistic communication. The HJR80 experiment found some differences between the kinds of task: The human relations problem elicited more solidarity and greater tension in the face-to-face condition, while the technical task elicited less tension in the face-to-face condition than in the CC group. Note that the face-to-face condition emphasizes the more socioemotional phases (opinion, agreement, tension) and in particular seems to elicit behaviors that can diffuse group tensions (such as agreement, tension release, and asking for opinion). There are few differences in the categories of task management: orientation, exchanging suggestions, and integration (although antagonism is a part of integration). However, the decision phase (agreement and disagreement) is more pronounced in the face-to-face groups. This may support the cool school, because, as Hirokawa (1983)

TABLE 6.2 Results from Selected Controlled Experiments Involving Group Decision Making and Computer Conferencing

	OUTCOMES					
Treatments	*Time to Decision*	*Consensus*	*Amount of Communication*	*Equality of Participation*	*Choice Shift*	*Decision Quality*
KSM82-1[a]	$p < .01$[b]		$p < .01$	$p < .01$	$p < .05$	
F[c]	quicker[d]		most	least	less	
C	slower		least	most	more	
CA	slower		medium	medium	more	
KSM82-2	$p < .01$		$p < .01$	$p < .01$	$p < .01$	
F	quicker		more	less	least	
C	slower		less	more	most	
E	slower		less	more	medium	
KSM82-3			$p < .01$			
CE	equal		more	equal	equal	
CS	equal		less	equal	equal	
MURREL83						$p < .05$
CE	equal		equal			higher
CS	equal		equal			lower
JHT81		$p < .01$				
F		higher[e]	more		less	equal
C[f]		lower	less		more	equal
HTJ82						
CL		equal[g]	more			
CF		equal	less			

(Continued)

Table 6.2 Continued

Treatments	OUTCOMES: *Time to Decision*	*Consensus*	*Amount of Communication*	*Equality of Participation*	*Choice Shift*	*Decision Quality*
HJA78				$p < .05$		
F	quicker	All groups	more	less		
C	slower	Two of six[h]	less	more		
CA	slower	All groups	less	more		
WC76	$p < .01$		$p < .01$			
F	slower[i]		more			
V	slower		more			
A	slower		more			
T	quicker		less			

a. KSM82 = Kiesler, Siegel, and McGuire (1982).
1 = 18 groups of 3 students each.
2 = sample size not given.
3 = 12 groups of 3 students each.

MURREL83 = Murrel (1983).
18 groups of 4 each. Task had a "correct" ranking. An electronic messaging system was used as a conferencing medium, with entries appearing simultaneously in a "window" on the screen, or appearing sequentially and read after the full message was sent.

HJT81 = Hiltz, Johnson, and Turoff (1981). Fully reported in Hiltz, Johnson, Aronovitch, and Turoff (1980). Portions published in Hiltz (1982).
16 groups of 5 each (wide age range as they were continuing and returning education students). Two tasks: one human relations and one with "correct" ranking.

HJT82 = Hiltz, Johnson, and Turoff (1982). Portions published in Hiltz (1982).
24 groups of 5 each, staff members of various organizations.
4 conditions: (no) terminal feedback by (no) formal leader (assigned on basis of group's post-practice evaluations).

HJA78 = Hiltz, Johnson, and Agle (1978).
12 groups, not randomly assigned (pilot experiment). CA included private (one-to-one) messaging.

WC76 = Weeks and Chapanis (1976).
48 pairs of male students. Two conflictive and two cooperative tasks.

b. In some instances significant difference concluded, but level not reported.

c. A = audio only.
C = computer conferencing with messages identified by participant.
CA = computer conferencing with anonymous comments.
CE = computer conferencing with entries appearing simultaneously.
CF = computer conferencing with substantial feedback of group agreement and performance.
CL = computer conferencing with formal group leader.
CS = computer conferencing with entries appearing sequentially.
E = electronic messaging.
T = teletype used like electronic messaging.
V = video conferencing.

d. Rank orders of differences in outcome across treatments when differences are reported as significant. Blank means outcome not tested/reported.

e. In human-relations task, all F reached consensus, only 1 C did; in objective ranking task, half F did, no C did. See text for qualification.

f. Feedback provided on terminal to group in form of each person's ranking.

g. Significant interaction only between feedback/leader—lowest consensus with neither, highest with leader and no feedback.

h. System crash did not facilitate consensus.

i. More communication for conflictive problems versus cooperative ones. Cooperative problems solved by all groups, as intended by researchers. These results for conflictive problems did not speak to group problem accuracy, but to effects of "persuader" on "persuadee."

points out, "successful" groups tend to start their discussions by analyzing the problem (orientation and control) rather than by immediately searching for solutions.

This discussion of group phases needs to be qualified by the fact that Hirokawa, using a different set of phases, found no other phasic differences between each type of group and indeed found no single uniform sequence of phases across groups. Another article came to similar conclusions. Seeger (1983) reanalyzed the original group-phase research (Bales and Strodtbeck, 1951) and found that well-acquainted groups do *not* follow the widely accepted sequential phases. Indeed, the sequential phases occurred *only* in the process of group formation, not in the process of problem solving. Thus, the phasic differences reported by Hiltz and colleagues may apply only to initial group meetings, and may have occurred *precisely* because the groups were not previously ongoing groups with a task history.

Related findings by several researchers at the Institute for the Future have provided the conceptual basis for designing a CC system specifically for mathematical modelers (Lipinski, Spang, and Tydeman, 1980; Tydeman, Lipinski, and Spang, 1980). They identify these tasks or phases in group problem-solving: conceptualizing, searching, structuring, implementing, evaluating, and documentating. Their primary argument is that the structuring, evaluation, and documentation phases require the kinds of task communication better served by CC than by face-to-face (structured, delayed, written responses). Conversely, the suppression of affective and nonverbal cues in the early stages of the group process—just when "phases" may be most crucial—may reduce group members' ability to evaluate others' skills, knowledge, and leadership ability. I will return to this question later in this chapter.

SPEED, CONSENSUS, ACCURACY, AND SHIFT

Research in general finds that it takes longer to transmit the same amount of communication in electronic print form than verbally (Johansen et al., 1979: 148, 152; Krueger and Chapanis, 1980; Hiltz and Turoff, 1978), although this may be an advantage when there is no deadline and users can take more time to reflect before responding. Not only can the verbal channel transmit more words per time unit for a given individual (but not when more than several people are involved), but the mechanics of conferencing necessarily create delays (such as typing speed, transmission speed, and read-out speed; also see Hiltz and Turoff [1978: 412]). The controlled experiments reported in Table 6.2 support this finding: It takes less time to arrive at a decision in a face-to-face group. When the experiments have time limits, this fact also takes the form of less consensus, because the CC groups have had less effective time in which to consider the problem.

The studies also support a common result when comparing decision making by different media: Agreement on the group's decision tends to be

lower in CC groups (Kerr and Hiltz, 1982: 155). The difference between media tends to be greater with human-relations tasks, just the sort the warm school feels requires more affective cues. As mentioned above, when groups have longer periods, the level of agreement seems to improve in CC groups; indeed, increasing consensus in CC groups is strongly associated with typing speed and prior experience with terminals (R = .49, .67, respectively; HJT82). The explanation is not that typing per se leads to better decisions, but that operational factors or time constraints can degrade the ease with which group communication occurs; after sufficient training or decision time, the level of agreement is determined by group processes as filtered by the medium.

What is more important is that the face-to-face context both puts more pressure on members to agree, or to agree that they agreed. In the HJT82 study, in half of the face-to-face groups the members reported (in writing after the experiment) different group decisions. Thus, "consensus" may be only apparent. Further, the level of agreement is not necessarily related to the quality or accuracy of the decision. The HJT81 experiment found no significant relationship between the two. Indeed, because there is increased diversity of ideas, and fewer sanctions or effects on deviants in CC groups (HJA78) members can "hold out" for their decision, and they may be right! Indeed, in one study, "the highest-rated solutions . . . were made by the minorities (with respect to the group solution) in the CC condition who refused to agree with the solutions proposed by the majority"(HTJ82).

This does not mean that everyone is intransigent, just that it is easier to be so. In fact Kiesler et al. (1982) and Siegel, Kiesler, and McGuire (1982) found not only that CC group members were emotionally aroused (one measure was that they ate significantly more malt balls while in group discussion than did subjects in face-to-face condition) but also showed greater shifts from their original position.

In summary, then, CC groups may show less consensus, although this may be partially due to technical factors that improve with experience; this lack of consensus may have nothing to do with the group's quality of decision; and the warm aspects of group decision making do operate in the sense that correct members may be able to hold out, while others display riskier behavior than in face-to-face groups or they display disinhibition (Reid, 1977; Remp, 1978). Bales (1955) suggests that in an ongoing series of meetings, initial levels of consensus have strong consequences for later meetings. If it is generally high in the first few meetings, then levels of consensus and ranking of leaders in subsequent meetings oscillate, but eventually stabilize, and antagonism declines. With early low consensus, there is high turnover in later rankings, more inequality in participation, and stable consensus may take a long time to build. An implication of this finding is that initial meetings might best be held face-to-face to mobilize generalized agreement (as well as to provide social introductions to later conference members), but followed up by CC to emphasize problem-solving performance.

LEADERSHIP EMERGENCE AND FUNCTION

Some people regularly emerge as group leaders. This is partly due to identifiable personality traits known as "latency of verbal response"—the delay in a person's response given an opportunity to respond (Willard and Strodtbeck, 1972)—and "response duration"—the extent to which a person tends to talk once the opportunity is available (Koomen and Sagel, 1977). Both of these are highly correlated with one's actual participation in group communication (Hiltz and Turoff, 1978: 107). People differ in these traits; if there were no other factors, people would still have differential participation in group discussion because of such differences. In the early stages of the group process, this differential participation is the greatest influence on the selection and emergence of a group's leader, although a leader must be accepted by the group, which provides reinforcement and a perceptible willingness to follow (Hare, 1976; Strickland, Guild, Barefoot, and Patterson, 1978).

There is evidence that group members can more easily identify who was the group's leader, who provided the best ideas, who was an effective guide to the group's process, and who was most likable, in face-to-face groups than in CC groups (HJA78; Murrel, 1983). Even small distinctions between a leader and followers in a group increase goal and task-oriented behavior (HJT82). Hence, differences in leadership emergence between media have implications for subsequent task performance; so it is significant that the emergence of a leader seems to differ across media and in particular is less likely in CC groups (Kerr and Hiltz, 1982: 155).

The warm school would say these identifiable cues are important for group performance; the cool school would say that in general the choice of leader based upon such cues may not be based on other more relevant attributes. For example, in the HJT82 experiment, the group's choice of leader correlated .45 with the number of comments made by the leader in the pre-experiment practice session, yet there was no correlation between the leader's number of comments and the quality of the leader's decision. Similar findings—that those who talk more are chosen more often as leaders—are found in related literature (Jablin and Sussman, 1978). Further, the quality of the group's decision was highly correlated (.54 to .71) with the quality of the leader's initial ranking, along with the quality of the ranking by the individual with the best actual solution. The implication here is that the fate of a group's performance often depends on its choice of a leader, which tends to be based on sheer amount of early communication, which is largely influenced by two personalty traits having to do with propensity to talk, and not with the characteristics needed to perform the task.

This experiment also helps resolve a question raised by Barefoot and Strickland (1982) with respect to leadership suppression in video conferencing: Do mediated communications suppress leadership *emergence* or, instead, suppress leadership *dominance*? Evidence from this experiment suggests that emergence, rather than dominance, is suppressed, although the capabilities of a CC system allow other group members to diffuse or

counter attempts at dominance. One can enter comments at any time, and even choose not to read certain entries; useful comments, no matter who entered them, can be brought to bear on the topic.

It is particularly in the area of human relations tasks, as the warm school argues, that strong leadership seems to be most needed in group decision making (HJT82); Hiltz and Turoff (1978: 107, 123); Johansen et al. (1979: 153); Kerr and Hiltz (1982: 155). Other general tasks for which a leader is needed in CC groups include

(a) overcoming organization inertia against using such technology (Johansen, DeGrasse, and Wilson, 1978),
(b) entering new members,
(c) providing administrative and systems-use comments, and
(d) providing indexes to comments on a regular basis (Hiltz, 1981).

Indeed, the least "successful" group in a two-year experiment using a nationwide CC system involving several subdisciplines of dispersed researchers was the one with a highly inactive formal leader (Hiltz, 1981, 1983).

FACILITIES FOR FEEDBACK, DOMINANCE SUPPRESSION, AND SIMULTANEITY

Not only does CC have by definition more facilities than electronic mail, but even CC systems should evolve to fulfill the needs of users; indeed, the evidence summarized above shows that users' expectations of and satisfactions with system features change with increased usage (Hiltz and Turoff, 1981). In particular, the authors argue that features especially important to experienced users should include (a) facilitating long-term group communication, (b) allowing active user control of the system, (c) supporting the handling of complex documents, and (d) permitting individual tailoring of the system.

A few experiments have attempted to investigate the consequences of three special features: group feedback, suppression of dominance, and feedback. The HJT82 experiment in Table 6.2 had two treatments: in one, the groups selected a formal leader on the basis of evaluations formed during practice sessions; in the other, a substantial amount of ranking and group agreement information was provided over the terminal as feedback for the group's decision making. There was no significant main effect on consensus or quality of decision, although there was a significant interaction, as discussed in the section on leadership above. The authors suggest that terminal feedback reduces the effect of the most knowledgeable leader (perhaps by forcing a compromise). Also, there were significantly fewer comments in the feedback condition. Perhaps, the report offers, feedback should go to the leader only.

A tangentially related study on the use of a decision support system (such as described in Keen and Scott Morton, 1978) found that the efficacy

of feedback by software that facilitated searching for good solutions seemed to depend on the complexity of the problem (Madeo and Schriber, 1980). With only four variables to consider, users receiving feedback performed just as well as users without feedback; but with eleven variables, they reached a significantly better decision (and without more time or effort). Thus, it may be that effects of computer-generated feedback are more salient for *complex* problems, as well as being more useful to a *leader*.

Another facility that may be programmed into the structure of groups using CC is a priority device for allocating entry time based upon past amounts of contribution. This would be more plausible for real-time (synchronous) conferences, and in fact has been developed for video conferences to maximize the benefits from expensive video bandwidth and transmission costs (Stodolsky, 1981). In this manner, communication apprehension may become less of an obstacle to participation by specific (and perhaps expert) group members, over and above the more equal participation that comes from CC use anyway. In the brainstorming study mentioned earlier, group members with higher production of ideas reported less communication apprehension (Jablin and Sussman, 1978). The fear here, of course, is that natural differences in quality of contributions would be suppressed in favor of more equal participation. The programming could easily include weighted priorities, an override mechanism, or just notations of cumulative percentages of comments from each member. A controlled study of the use of an expert-based model for arriving at equitable decisions in awarding social services showed that there was a significant increase in the equity of decisions compared to users without the decision support system. However, when the modeled decisions were programmed to be inequitable, users did not blindly conform to the models, and did not make inequitable decisions (Boyd, Clark, and Hanson, 1980). The idea here is to provide discretionary decision-making aids.

Even with synchronous conferences, differences in the presentation and access of comments are possible. One choice is between presenting the comments sequentially, after each one has been completely entered by the participant, or offering "virtual" commenting, whereby each member's comments appear on all other members' terminals just as they are being entered. The first condition may be termed "sequential" while the second may be termed "entry driven." Table 6.2 shows two such experiments: KSM82-2 and MURREL82. Neither shows many differences, except that in the first one there was more communication in the entry-driven mode, while in the second experiment this mode led to a higher quality of decision. Users preferred the entry-driven mode over the sequential mode (60% to 30%) in the KSM82-2 test.

A related test compares CC, where all comments are public, to electronic messaging, where some comments may be sent to selected individuals and are, thus, private. This facility would be especially consequential in negotiations or decisions susceptible to coalitions or high-affect bonds. In the KJA78 and KSM82-1 trials, these two conditions are similar in their differences with face-to-face, but show a slight

difference with respect to amount of communication: There was less in the CC condition in the second trial. This is likely due to the increased generalizability of public comments or to increased motivation in individualized messages.

In general, it seems that refined system features such as these *can* have effects on group processes, but the effects are more limited and are not always present. Groups might want to consider the trade-offs involving feedback, dominance suppression, and simultaneity when they have access to designing the system they will use.

COMMUNICATION LINKAGES

This section considers several components of communication linkages in group decision-making and task performance, although not restricted to controlled experiments. These components include group structure, amount of communication, connectedness, equality of participation, electronic migration, and social structure in an information environment.

Group Structure

The literature on small group networks at first indicated that the more centralized structures facilitated leadership emergence and quicker decisions (particularly for simple tasks) but at the cost of greater errors and less individual satisfaction (Leavitt, 1951; Rogers and Agarwala-Rogers, 1976: 121). These are similar to some of the findings reported in this chapter for face-to-face groups, which, with strong leaders, would be more centralized than CC groups. Later evaluations and replications showed that most effects were due (1) to differences in learning how to use different structures while making decisions, or (2) to nearly unending contingent conditions (Collins and Raven, 1969: 146; Davis, 1969: 103-104; Farace, Monge, and Russell, 1977: Chap. 7; Shane, 1979; Shaw, 1964). However, Doktor and Makridakis (1974) found, through computer simulations, that indeed it took numerous runs for groups to achieve stability in performance, but the groups had inherently different stabilities ranked in the same order as the performance levels of different group structures had been ranked by the early researchers.

Inherent group stability and group performance are not necessarily related, however: Another computer simulation that modeled group behavior over 800 problem-solving runs found that the "all-channel" and "circle" structures resulted in equal performance levels, but that the all-channel structure reached stability in performance level earlier (around 200 runs versus 300)(Shane, 1979). It was concluded, among other findings, that the fewer levels in the group's hierarchical structure, the sooner the stable and optimal performance levels were achieved. Thus, differences in how CC is used to *structure* group communication are likely to affect the group's processes for a good part of its early experiences but

may converge over the long run. These early experiences, of course, may be crucial to group survival.

Increased Linkages

Because, technically, a CC user can send a comment to anyone on the system (and receive messages from anyone else), the nature of group structure is maintained by interest and energy, and less by formal constraints. A CC system facilitates reduced delays in information exchange, maintenance of records and information received, coordination of geographically dispersed group members, and processing of large amounts of information (Johansen et al., 1978).

This naturally means that increased and new communication links may be forged via CC systems. Indeed, that result is found by nearly all researchers of computer-mediated communication systems (Freeman, 1980; Hiltz, 1983; Hiltz and Turoff, 1978; Johansen et al., 1979; Kerr and Hiltz, 1982; Leduc, 1979; Rice, 1980a; Rice and Case, 1983). In some cases the bulk of additional communication linkages were with people who would not have been contacted otherwise (Palme, 1981). This increased communication space seems particularly important for networks of scientific researchers. (See Newell and Sproull [1982] for a fine discussion of extant scientific networks.) In the two-year experiment on the Electronic Information Exchange System (EIES), most researchers who used the system reported spending more time communicating with other members of their scientific community, and the amount reported associated significantly with the total amount of usage as monitored by the EIES computer. Also 44% of the 103 respondents claimed that they increased communication with researchers in other disciplines or specialty areas. Often researchers reported concomitant change or clarification in their understanding of others' interests or of theoretical controversies (Hiltz, 1981, 1983). Johansen et al. (1978) obtained similar responses from 14 groups using their PLANET system over 15 months.

Equality of Participation

As discussed in the section on leadership emergence, there tends to be greater equality of participation in groups using CC as compared to face-to-face. This is due both to the increased technological ability to enter comments at any time, rather than waiting for a turn, and to the decreased influence of affective cues and nonverbal communication, which can cause the group to defer to a leader whose sole attribute may be loquacity. Several of the experiments reported in Table 6.2 and other sources indeed reject the hypothesis of no difference between the two media (Hiltz and Turoff, 1978: 124; Hiltz et al., 1978; Kerr and Hiltz, 1982: 155; Johansen et al. 1979: 180; Kiesler et al., 1982). This increased equality allows more opinions, but may also be associated with less explicit reactions to any specific comment. Further, this finding does not imply that all users use

CC systems equally; typically, usage is still skewed in a negative exponential curve (the "Zipf" curve). For example, in the Swedish KOM CC system, 8% of the users comprised 50% of the messages, 25% comprised 75%, and 63% comprised 90% (Palme, 1981).

Curiously, users seem to develop a schedule for logging-in to a CC system that keeps the number of items per session (in asynchronous mode) down to around 6 items per session (Hiltz and Turoff, 1981). This figure implies that items waiting for a user and dealt with as "chunks" of information, or the 7 (+ or –2) pieces that Miller (1956) and Simon (1974) suggest constitute the amount of information humans can process or keep in short-term memory at once. This notion leads us to a discussion of group ecology and social structure in an information environment.

GROUP STRUCTURE IN AN INFORMATION ENVIRONMENT

Individuals have limits to their information-processing abilities, as implied by the prior paragraph and research in cognitive psychology. These limits seem to apply to one's strong communication links as well. As Killworth and Bernard (1974) have written,

> Perception, or intuition about one's place in the structure (for a given content, in a closed group), is limited to one's own communicants (i.e., about 7 + or – 2 people . . .) and about 70% of one's secondary communicants.

In face-to-face group structures, these limits are also due to physical and financial costs of communication with too many people. In an information environment such as a CC system, however, the conditions may be sufficiently different to create new social structures. This topic is explored in greater depth elsewhere (Rice, 1982; Williams, Rice, and Dordick, 1984), but the following sections summarize this argument.

Groups and organizations are built around formal and informal roles and statuses, and communication between and among members is typically constrained and regulated by these factors (Blau, 1963, 1977; Homans, 1961). Group members who have low status may gain status and access to resources by exchanging needed information with higher-status members. Yet we have seen that in CC systems there are fewer status and role markers available, and even fewer physical or temporal obstacles to communicating with anyone else on the system. This means that users in general, and low-status members in particular, are able to search out other group or system members with shared interests, overriding the initial bartering of status for information.

Yet it seems plausible that given a limited amount of information that qualifies as a needed resource for the group, there is competition for such resources within the group and within a social system connected by an information system. As Hiltz (1981: 66) has written,

> isolates and sociometric stars do not use the system as much as those with moderate numbers of professional connections, who

> seem to have the most motivation to expand their professional networks. . . . what matters to the individual is how many other group members available to communicate with have relatively high professional status.

And, rather than low status, late entrance into the information system may restrict access to these resources. How early one enters a communication system may be the major constraint to individual advancement or even survival as an accepted group member. Consider that leaders may be chosen on the basis of early loquacity. "Indeed, individuals and groups who have early access to information may continue to 'occupy' their information-rich positions and thereby function better or have more power than those who have later access to information flows within the system"(Rice, 1982: 927). Groups themselves may have to compete for information resources, both in the form of energy and effort applied to their task, and in the form of specific information needed to coexist with other groups.

Consider also that given that we have limits on how many people or items we can process, and given that time on a CC system may be longer for a given task than in face-to-face mode, and given that use of the system takes away from other work and social activities, there is an upper limit to how much system communication we can actually commit or afford. So members of groups that operate in electronic space are caught between upper limits on their processing limits and lower limits on the amount of information with which they can survive. The consequence of these dual constraints is that new entrants to an "online community" (Hiltz, 1983) must first search the system widely, making contacts with otherwise unknown members to establish rewarding exchanges, but cease unreciprocated exchanges before their processing and resource limits are exceeded. One final variable of import is whether the group is task-oriented or not.

> Members of a nontask group are freer to explore their informational environment, because their activities are not necessarily detractions from the group's sense of cohesiveness or interferences with an ongoing task; a group can prosper by "scouting" the environment as long as they are stable, because the task focuses internal group communication exchanges and cohesion [Rice, 1982: 928].

The conflict comes when a task-oriented group operates in a turbulent environment and must scan that environment for information about how to respond and reduce the complexity of the task (Galbraith, 1977; Weick, 1969).

Three hypotheses were generated from this basic argument and tested by Rice (1982): (a) Information flows within, between, and among groups will significantly define group roles within a CC system supporting their activities; (b) reciprocity will become a significant attribute of systemwide information flows over time in a large CC system; and (c) groups will occupy information-based roles differently depending on whether they are

task oriented or not. The data were computer-monitored usage statistics, aggregated by month, from two years' usage by over 800 geographically dispersed researchers comprising 10 groups. (This kind of data is described in Chapter 4). Five groups were task groups, three were non-task groups, one group was the system consultants, and one was an aggregation of users who did not belong to a formal group and, thus, represented a random non-task collectivity. Results follow.

(1) Groups indeed were significantly differentiated on the basis of whether their information flows within, between, and across other groups were higher or lower than average flows. These information-based network roles can be summarized in general as carriers (greater than average on all three dimensions), receivers (greater receivers than the average group), transmitters (greater senders of messages), and isolates (less than average on all three dimensions). Over time, groups tended to either occupy certain roles or drift into isolate status, as shown in Table 6.3.

(2) A model of systemwide structure assuming reciprocity as a primary attribute of information flows quickly became an extremely significant description of the data. Figure 6.1 shows the fit of this model over the 24-month period.

Figure 6.2 is a plot of the systemwide scaling of the group weights from months 12 through 20 (as there were one or two more or fewer groups before and after this period). Whereas the plot of the prior period shows no discernible direction, this three-way INDSCAL solution (with time as the third dimension) shows a progression of the systemwide interaction to a unidimensional state. Because the scaled data are the values of the cross-group reciprocity parameters estimated by the interative log-linear network modeling program used, we may interpret this y-axis as a reciprocity dimension. Figure 6.2 is another portrayal of the increased importance of reciprocity in the CC system over time.

(3) Task groups, even if they entered the system as carriers, quickly became isolates. The systems consultants developed into transmitters, as befitting their purpose; the random group developed from transmitters into carriers, presumably because they had no conscious or functional reason to concentrate communication exchanges solely with other members of their "group." Non-task groups generally developed from isolates into carriers.

From these results we might conclude that (1) information flows are indeed major aspects of group structure in an information environment; (2) individuals and groups must emphasize reciprocal exchanges in large computer-mediated communication systems; (3) if a task group requires information from a changing environment, managers of CC-based groups must support selected members as liaisons who can adapt the group based upon external information; and (4) maintenance of an information-rich role requires constant effort in the form of high levels of transmission and receipt of information.

There is a potentially dark side to all this computer-mediated communication, with respect to group social structure. In Chapter 3 we saw that

TABLE 6.3 Probabilities and Frequencies of EIES Groups Transiting Among Four Information-Based Network Roles, Pooled over 24 Months

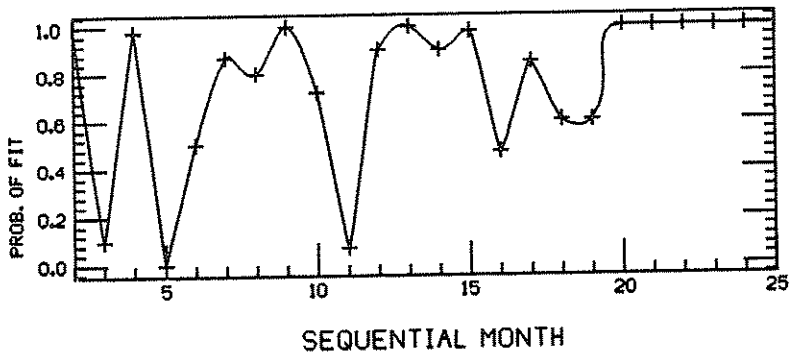
FROM ROLE	TO ROLE: Carrier	Receiver	Transmitter	Isolate	Totals
C	61(a) .85(b) .87(c) .32(d)	2 .03 .29 .01	1 .01 .01 .01	8 .08 .04 .04	72
R	1 .17 .01 .01	0 .00 .00 .00	1 .17 .08 .01	4 .66 .04 .02	6
T	2 .13 .03 .01	0 .00 .00 .00	5 .33 .42 .03	8 .53 .08 .04	15
I	6 .06 .09 .03	5 .05 .71 .03	5 .05 .42 .03	79 .83 .80 .42	95
Totals	70	7	12	99	188

SOURCE: Rice (1982).
NOTE: Cells are (a) = cell frequency, (b) = proportion of outward transitions, (c) = proportion of inward transitions, (d) = proportion of all matrix transitions; chi-square = 133.47; $p < .001$.

organizations, because of their need to rationalize internal information processing, are forcing externalities onto unwary clients and customers. Singer(1983) has extended those earlier thoughts into area of concern he calls "social disassembly."

Due to the increased decentralization of communications and the ability of any system user potentially to communicate with another system member, "The formal organizational barriers of status, power, personal appearance, charisma, past achievements and communication ability will now count for considerably less." McLuhan early on foresaw these consequences of electronic communication, claiming that the telephone and the telegraph bypassed centralized, delegated authority in organizations (1964: 217, 225, 238). This is exactly the perspective of the warm school of decision-making, but Singer explores some of the more subtle implications. For example, it will be harder to modify content during

FIGURE 6.1 Goodness-of-Fit of Model Assuming Reciprocity of Messaging Between Groups on EIES Computer Conferencing System



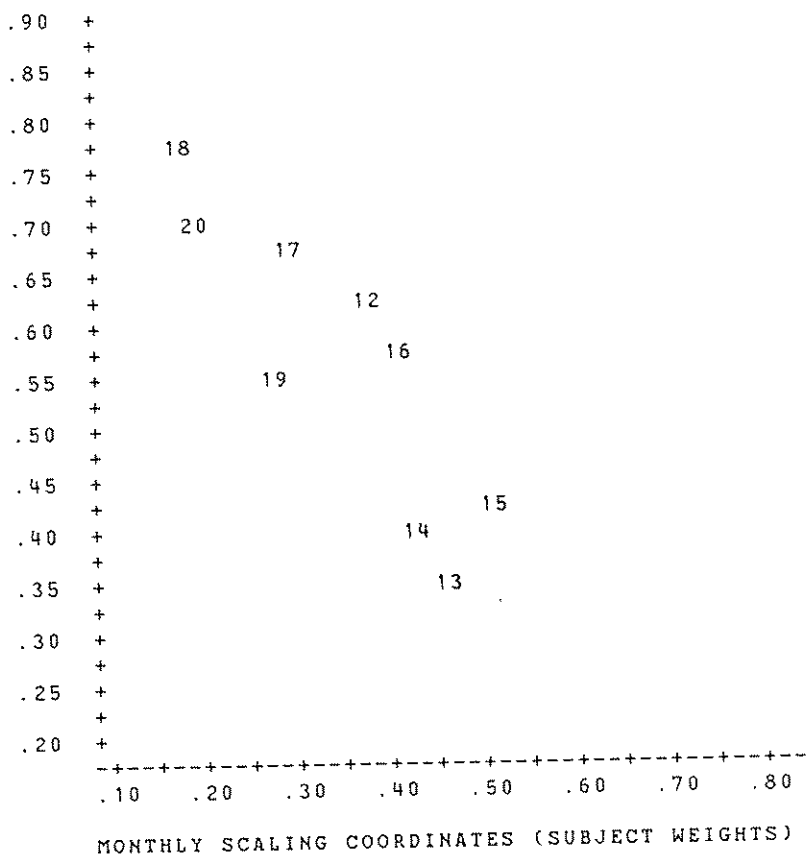
SOURCE: Rice (1982).

interactions because social cues and social contexts will be unavailable; thus, social authority as well as instantaneous reassessments and shifts will decline. Because there will be fewer distinctions (or at least fewer of the more familiar distinctions), there will naturally (by the laws of information theory) be greater uncertainty. Uncertainty as to who is responsible, as to who is in control.

Control need not be construed in an authoritarian manner; control is a crucial aspect of all systems. Schwartz, in a study of social processes, concluded that "social organization is itself a network of interlocking queues . . . a way of organizing obligations" where "strategically placed delays are the preconditions of organizational efficiency" (Schwartz, 1978). A slow dequeueing of obligations, particularly by information-rich individuals and groups, has implications for the stability of certain portions of social structure. Groups themselves may become less salient to individuals who can acquire resources from extraorganizational sources without group support (Albertson, 1977).

Because of this increased communicative ability by groups within organizations, organizations are becoming "mass communication" institutions (transmitting information *to* customers) rather than interactive businesses, and the decreased internal barriers are taking the form of increased barriers to nonorganizational members, such as customers. The social stratification that the cool school wishes to reduce in decision making, and that subordinates wish to overcome in their careers and lives,

FIGURE 6.2 INDSCAL Solution for Dimensionality of Systemwide Interaction Based upon Group Interactions under Model of Reciprocity



NOTE: Both axes portray the range of scaling coordinates (called "subject" weights). Numbers plotted indicate the relative position of each month's reciprocal system interaction. S-stress = .17; R^2 = .71.

is also a constituent and symbol of social organization. These cues and roles bias our actions and decisions, to be sure, but in general they serve to help us survive; they obviate the need to reassess risks, costs, and rewards with every interaction. Cognitive and perceptual biases color nearly every personal decision and evaluation we make, and for the same reason (Tversky and Kahneman, 1974). Singer argues that there is a need for barriers against open communications: "The opening of organizational boundaries simultaneously desocializes messages while eroding authority and identity," leading to irrational authority, reduced responsibility, and "crazy" systems.

SUMMARY

Before all the consequences discussed above come about, people have to accept and use computer conferencing systems. Typically, the strongest influences on acceptance include

- the number of people (particularly prestigious or high-status others) on the system known before one begins using it,
- one's anticipated level of use,
- the relative priority of the kinds of tasks to be performed on the system,
- access to the system and to alternative media,
- a perceived need to communicate, and
- an advocate for the group (to be followed by a moderator who maintains the group on the system.

(See Hiltz, 1981; Hiltz, Johnson, and Turoff, 1982; Johansen, et al., 1978; Johansen, Miller, and Vallee, 1975; Palme, 1981; Rice, 1980b).

But even acceptance and use may be problematic, as this chapter has tried to emphasize. A variety of media, as well as face-to-face communication, may be necessary at different phases of the group's progress, to transmit the differentially valuable cues, affect, power, information, facts, decisions, and evaluations needed for good group performance. Roles of individuals and groups may need to be negotiated or understood; particular system designs may facilitate one at the cost of another. A specific instance is the apparent utility of unequal participation that follows from the emergence of a group leader.

On the other hand, group processes may be custom structured to facilitate the desired goals and values of the group. This notion of "groupware" is emphasized by Kerr and Hiltz (1982: 47), based upon work by the Johnson-Lenzes. Groupware is "the intentional group processes and procedures to achieve specific purposes plus the software tools designed to support and facilitate the group's work."

Finally, we have seen that the pervasiveness of computer-mediated communication may even sacrifice social goals and structure to the

rationalizing as well as liberating needs of groups and organizations using such new media.

There is no cookbook to balance all these conflicting demands and contingencies. However, any organization or group intending to implement such systems has a great responsibility to consider the aspects of mediated group communication outlined here—both for their benefits and for the benefits of individuals not on the system.