

CAN COMPUTER-MEDIATED ASYNCHRONOUS COMMUNICATION IMPROVE TEAM PROCESSES AND DECISION MAKING?

Learning From the Management Literature

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Effective communication is critical to most organizational processes, including team collaboration and decision making. Face-to-face communication is commonly assumed to be superior to all other forms of communication, yet face-to-face communication does not cope well with organizational constraints such as time pressure or the geographic distribution of team members. A partial answer in overcoming some of these constraints may be computer-mediated asynchronous communication (CMAC). CMAC enables increased and more equal team member participation, offers flexibility over time and distance, creates time for additional reflection and thought by participants, and archives a permanent record of all discussion. CMAC overcomes some of the drawbacks common to face-to-face communication in some circumstances, thus enhancing organizational communication, team collaboration, and decision-making effectiveness.

Keywords: *asynchronous communication; computer-mediated communication; team processes, decision making*

The strategic landscape of business was described as “wicked” over 20 years ago (Mason & Mitroff, 1981). Today’s business environment is even perhaps more wicked because of the even quicker pace of global commerce that often demands fast decision making and more team collaboration in an increasingly fragmented context. Time pressures, however, have deleterious effects on team processes, decision outcomes, and communication effectiveness generally (Perlow, 1999; Rudolph & Repenning, 2002; Waller, Zellmer-Bruhn, & Giambatista, 2002). Complicated linkages

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among organizational elements, including dynamic and uncertain social, political, and economic environments, ambiguous and incomplete information, and conflicting internal organizational interests, also contribute to less effective communication processes. Constantly changing communication technology adds to this complexity, creating both opportunities and constraints. Effective communication is critical to business success and in coping with an increasingly complex environment, yet individuals, teams, and organizations are often challenged in finding processes that enable effective communication practices.

This article examines 25 years of business communication and management literature to reach an understanding of how computer-mediated asynchronous communication (CMAC) can improve organizational communication, team processes, and decision making, in some instances. For the purpose of this article, "effective communication processes" means that intended recipients accurately receive messages in a time-efficient manner. This article examines how time pressures affect and change organizational communication and decision-making processes. The characteristics of traditional face-to-face communication are briefly examined and compared with the characteristics of CMAC. CMAC may be a solution in overcoming some of the problems frequently found in face-to-face communication because effective CMAC encourages team communication and collaborative sense making and allows team members to be in different locations or time zones, thus enabling quick decision making without compromising quality. CMAC is not suggested as a solution to all communication problems, and these limitations are acknowledged. The article closes with suggestions for needed research regarding CMAC in organizations.

TEAM COMMUNICATION AND THE DECISION-MAKING PROCESS

Decision making, team processes, and communication effectiveness are influenced by various organizational characteristics, including organizational structure, culture, information technology systems, and leadership style (Chu & Spries, 2001; Hedlund, Ilgen, & Hollenback, 1998). Communication, therefore, is embedded in social process (Orlikowski & Yates, 2002) and is central to the organizing process (Weick, 1987). Paradoxically, the possibility of effective organizational communication is becoming both easier and more difficult. This article focuses on organizational decision making as a subset of organizational communication process generally, because the problems and issues found in decision making are

often illustrative of the issues evident in business communication. If the business environment is dynamic and unstable (Schneider & Shanteau, 2003), decision making can be especially difficult because historical decision-making patterns and traditional communication processes are likely less effective (Beach & Lipshitz, 1993).

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The use of teams both aids and hinders effective and efficient organizational decision making. Teams are ubiquitous in organizational settings because they can provide broad expertise and can increase the acceptability of organizational decisions, especially if the teams are consulted during the decision-making process (Orasanu & Salas, 1993). Teams can also solve the problem of having too much information for any one person to collect or understand, although teams do incur coordination costs. However, teams often have trouble finding sufficient or convenient times to schedule meetings, finding competent communication systems to enable the sharing of information, and coordinating and synthesizing the contributions from team members. Teams, if diverse, often raise perspectives unique to specific and various areas of expertise or geography, and this also results in added difficulty for some teams in reaching consensus (Hedlund et al., 1998).

The Decision-Making Process

Decision making is central to teamwork (Glaser, 1996) but also serves as a useful lens for examining the communication process itself. Regardless of the communication medium, or whether the decision is an individual or team decision, the decision-making process follows a relatively predictable and rational format (Nutt, 1998). Initial framing and problem definition provide focus for the rest of the decision-making process, so problem definition needs to be clear and accurate before decision makers move on to subsequent

stages. Prioritizing goals is common prior to identifying alternative decision choices. Goal prioritization is often problematic because goal identification and evaluation can change as additional data are found or as the perspectives of new or different stakeholders are considered. The maximization of expected utility usually overshadows all other decision-making criteria, however this maximization is defined, although common evaluation criteria include measurable costs, timeliness, and the acceptability of the decision to significant stakeholders (Beach & Mitchell, 1996).

The *rightness* of a decision and the effectiveness of eventual implementation are significantly affected by the communication processes used between the organizational stakeholders most affected by the decision (Schneider & Shanteau, 2003). Although final decisions can be only as good as the best alternatives considered, critical data may not be available to decision makers in a timely manner, or information from significant stakeholders may be ignored, and so viable or superior alternatives may be missed altogether. Involvement may be the most important form of participation in decision making (Hartley, 1997), and the communication process chosen affects involvement.

Team Decision Making

Teams often form the basic unit of organizational decision making because they are believed to lead to better corporate performance in terms of increased effectiveness (Coopman, 2001). Team decisions are often perceived to have superior quality compared with individual decisions because teams are able to process greater amounts of information, have collective knowledge and expertise not always available to individuals, and have strength and synergy from a collection of diverse talents. Because of this broader knowledge and expertise, teams are able to define problems more accurately and generate and examine a greater number of alternatives. Teams sometimes have stronger influence over their collective environment than individuals, and this greater influence often enables easier implementation. Numerous disciplines or functional areas may be involved on any given organizational decision-making team, partly because of the interdependence of these areas (Sullivan, 1998) but also to enhance the ease of implementation. Teams sometimes create synergistic effects that result in superior decision making as members correct and amplify one another's ideas. The decision-making process includes subsidiary outcomes such as individual satisfaction and productivity because of involvement and listening affects (Coopman, 2001).

The disadvantages of team decision making follow from the difficulties common to group process, including social pressures to conform and minority domination. Given the time constraints found in most organizations, the major drawback of team processes may be the amount of time required for team members to meet and work together. For example, face-to-face meetings often run out of time for the examination of all alternatives, and many good ideas go unheard simply because adequate time to explore options is unavailable. Team members may not have time to reach consensus, especially if goals or objectives are ambiguous or conflicting (Schmitt & Klein, 1998), negating an expected benefit of team decision making. Typically, the larger a face-to-face team, the larger these process issues loom. A more in-depth analysis of time constraints on team decision making follows.

THE EFFECTS OF TIME PRESSURES ON TEAM COMMUNICATION

Making quality decisions and then achieving the competent implementation of these decisions are basic requirements for effective organizational performance, yet these requirements are often overwhelmed by the time-starved reality of organizational life (Amason & Schweiger, 1994). Time is required to identify issues, to identify and evaluate alternatives, to reach consensus and garner support, to properly implement the decisions, and to evaluate the implementation processes and the outcomes of the decisions. Team members need time to share ideas and critical information (Jarboe, 1996), and team members also need time to facilitate commitment to the decisions and to the team itself (Hirokawa, Erbert, & Hurst, 1996). Decision makers who are under time pressure typically compensate by processing less information and using less rigorous and less complicated decision strategies (Chu & Spries, 2001).

Research in the management literature over two decades has consistently suggested that time pressures reduce decision-making and communication effectiveness (Ben-Zur & Breznitz, 1981). Briefly, the effects of time pressures are as follows (Zakay, 1993):

- Information search and processing are reduced.
- The importance of negative information is increased.
- Important information is denied, discounted, or forgotten.
- The positive attributes of chosen alternatives are inflated.
- Information processing continues only until time is used up.

- Noncompensatory choice strategies become common.
- Incorrect judgment and evaluation become more likely.

Decision making under time pressure may result in suboptimal decisions, mostly because of reduced accuracy and quality in the communication process itself (Maule, 1997). Time pressure can also lead to personal stress and exhaustion or the loss of vigilance on the part of decision makers (Orasanu & Connolly, 1993), again diminishing effectiveness and communication quality. Having sufficient time is critical for effective communication and decision making, yet time is increasingly in short supply in many organizational environments.

Three major consequences of time pressure seem apparent. First, time pressures create problems in sharing information between team members and in achieving team consensus regarding understandings of what the problems actually are. Solving the wrong problem, or solving only a symptom of a problem, is often equivalent to doing nothing at all, while still expending time and energy. Discussion among team decision makers is a common means of sharing and evaluating information and developing common perspectives and assumptions, and discussion takes time (Seibold, Meyers, & Sunwolf, 1996). The need for quick and efficient communication allows less time for conflict resolution, a possibility for any team, and also diminishes the team's ability to reach consensus on the best decision or implementation strategy (Dooley, Fryxell, & Judge, 2000).

Second, the need for speed often results in team members less thoroughly examining alternatives, assuming that the most beneficial alternatives have been identified in initial discussions. Because teams often require the participation of members from diverse functional backgrounds and organizational levels, individual team members often enter a team with somewhat different assumptions and interpretations or preferred communication styles (Mohammed & Ringseis, 2001), and this can slow the team's ability to reach consensus. Team members are always embedded in the larger organizational environments as well as being on a team and so are sometimes pressured by forces from outside the team itself (Coopman, 2001; Seibold, 1995). Effective communication and decision making evolve in part from thoughtful analysis and a thorough understanding of the perspectives of others, yet a lack of time constrains these possibilities.

Third, time pressures result in added difficulty in achieving organizational acceptance of team decisions. Organizational members need to understand why organizational problems are problems in the first place and why certain alternatives are considered and others are not. Organizational members

need to understand why certain decisions are made the way they are and how these decisions may specifically affect them or their cohort. If time is not available for organization-wide communication or consensus building, then implementation problems are more likely regardless of the decision made.

The increased pace of business erodes the time available for discussion and analysis of strategic options (Rudolph & Repenning, 2002), creates problems in achieving both cognitive and effective consensus at least some of the time (Gersick, 1988), and generally diminishes communication quality in many, if not most, instances (Waller et al., 2002). Yet organizational team members seem unable to escape the demand for speed. A significant organizational challenge is in creating communication processes that allow reflective understanding of the meaning and perspectives of others, yet within the increasingly stringent time constraints commonly found in organizational settings. A promising alternative to using face-to-face teams for decision making is CMAC.

THE COMPUTER-MEDIATED COMMUNICATION ALTERNATIVE

Most management literature examining communication uses face-to-face communication as the standard, although face-to-face synchronous communication does not appear to address time-related problems well and may even exacerbate time pressures in some cases. The characteristics of face-to-face interaction have been consistently documented for over a decade (McGrath & Hollingshead, 1990):

- All members present are at the same place at the same time.
- Only one person speaks at a time.
- Speakers often exercise some control over who speaks next.
- Speakers often exercise some control over whether interruptions are allowed.
- Members who are present share time unequally; those absent have no voice at all.
- The audience is usually everyone present and rarely those who are not present.
- The set of potential speakers is everyone present, but only those present.
- There is no anonymity, and so social, power, and status cues are obvious.
- Paralanguage such as nodding affirmatively or frowning is apparent to those paying attention.
- Immediate verbal and paralanguage feedback is possible.
- Enthusiasm or charisma can be conveyed.

Table 1. Asynchronous Online Discussion Compared With Face-to-Face Discussion

<i>Asynchronous Online Discussion</i>	<i>Face-to-Face Discussion</i>
Discussion is from one person to another, or one to many, but also many to many	Discussion is one to one, or one to many, but not many to many
Multiple discussions are under way at the same time, and participants are often expected to participate in several discussions at the same time	There can be only a single discussion under way at a given time in a conference room, and everyone is restricted to a single discussion at a time
Everyone is able to talk simultaneously, so no one is physically blocked, and all participants can be active at the same time	Only one person talks at any one time, and everyone else is blocked, so participants are in listening mode most of the time
The discussion can be democratic, with everyone equally participating and having a voice	The discussion tends to be dominated by a few, with many not having any voice at all (sometimes by choice)
There are few social and political or power cues and no body language	There are many social and political and power cues, with much body language
The discussion operates 24/7 within time frames that can be weeks long, and participants have freedom of choice as to when they participate	The discussion operates for a specific time frame that is rarely more than several hours long, at a specific place, and participants must be physically present to contribute
The discussion can be free of time and geographic space constraints	The discussion is constrained by specific time and geographic limitations
The discussion is archived, creating a permanent record of all discussion	The discussion is not archived, so there is rarely an accurate record of all discussion
Feedback is sometimes slow	Feedback can be instant

Communication through CMAC works in a different physical and social milieu, in which each of the above characteristics is absent or altered. Table 1 indicates that CMAC provides an alternative to some of these face-to-face constraints and characteristics in some instances.

CMAC is communication that allows many individuals to speak to many other individuals, 24/7, regardless of geography or time zone. CMAC is a specific genre of communication characterized by a generally recognized communicative purpose and with common aspects of form (Orlikowski & Yates, 1994, 2002). Common CMAC attributes include that CMAC team members can access computer-mediated virtual sites devoted to their tasks or problems at their individual convenience, have access to

read and study contributions made by others on these sites 24/7, and then make their own contributions when personally convenient.

The challenge in CMAC teams is to capture the content and process quality benefits of face-to-face teams while attempting to reduce or remove detrimental factors common to synchronous communication. Besides time pressures, other problems with synchronous face-to-face communication include difficulties caused by large group sizes, status effects, issues caused by time or geographical distance differences, and inaccurate group memory. These problems can be reduced or eliminated by using CMAC teams. This article is concerned only with the broader conceptual possibilities of CMAC in team and organizational communication and decision making and so is focused on commonly used e-mail technology and the use of computer-mediated discussion rooms; I do not examine specific technologies or software.

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The use of computer-mediated communication technology such as e-mail has become almost ubiquitous in daily management practice. Orlikowski, Yates, Okamura, and Fujimoto (1995) suggested that computer-mediated communication may enable organizational members to work with more flexibility, to span contexts and boundaries, and perhaps to collaborate more effectively. The diffusion of computer-mediated communication technologies over the past 20 years increases the ability of organizational members to communicate, collect, and distribute information faster and enables the creation of geographically dispersed teams, which adds opportunity for increased diversity. Computer-mediated technologies have made communication with various people easier (Yoshioka, Herman, Yates, & Orlikowski, 2001), allowing team members to cross physical, social, temporal, and psychological boundaries at an astonishingly low cost. Computer-mediated technologies allow team member participation that is no longer physically tied to particular locations, and expertise can be called on whenever and wherever

needed. CMAC enables interactive and collaborative work because it allows one-to-one, one-to-many, many-to-one, and many-to-many communication interactions (Berry, 2004), whereas many-to-one or many-to-many communication is difficult in synchronous interactions. CMAC allows parallel and simultaneous responses by many people instead of serial, one-at-a-time responses, as found in synchronous communication. Computer-mediated communication technologies may offer benefits for team communication, participation, and commitment in the decision-making process. Computer-mediated communication technology has the potential to change organizational structure and may even have significant secondary effects on team behavior and decision-making processes (Kiesler & Sproull, 1992).

Computer-mediated communication technology has therefore become a powerful human resource tool in leveraging employees' expertise in some instances, although any communication medium both enables and constrains information sharing and understanding. CMAC is unlikely to be the best option if instant decisions or feedback is required because CMAC discussions evolve over hours, days, or even weeks, depending on deadlines and team agreements. However, the opportunity cost for individual members to find 10 or 15 minutes at a personally convenient time to participate in CMAC is low, so CMAC responses are usually timely. CMAC team members have an opportunity to be more thoughtful than in face-to-face discussions because of the availability of time to pause before responding and thus are more likely to respond when prepared instead of responding immediately, as is often required in synchronous communication.

The differences and specific advantages of CMAC compared with face-to-face communication may become increasingly crucial as timely communication and decision making continue to be concerns for organizations. CMAC provides advantages over synchronous communication in four specific ways, and in some situations these differences may be critical. The four apparent advantages are (a) more active and equal team member participation, (b) flexibility over time and distance combined with low-cost ease of changing team size quickly, (c) the availability of time for team members to reflect or collect additional data before response, and (d) instant and evolving archived records of the discussion. Each of these advantages is discussed below.

Active and More Equal Participation by Team Members

CMAC enables efficient discussion with large teams because it allows people to communicate many to one or many to many as easily as communicating one to one or one to a few. Asynchronous communication teams

can theoretically be unlimited in size in terms of information transfer, but convergence issues do limit size if effective discussion is desired or needed between all members. It is important to note that there is a difference between a team member's ability to participate and the member's willingness to participate. CMAC enables and allows widely democratic participation, although typical organization power, hierarchy, and culture issues likely constrain this ability to some extent.

CMAC may also largely overcome evaluation apprehension, the free-riding of team members, and communication or production blocking. Evaluation apprehension is the reluctance of team members to offer suggestions or ideas because they fear that they or their ideas will be rejected (Dubrovsky, Kiesler, & Sethna, 1991). CMAC may reduce evaluation apprehension because many ideas can be presented simultaneously and in a format that feels more anonymous because of missing social cues. Asynchronous team members can still free-ride or not participate, but this nonparticipation becomes increasingly obvious through the evolving archive of the discussion to those paying attention. Production blocking is a problem with synchronous communication because one speaker physically blocks all others from speaking, essentially forcing everyone else in the group to wait their turns before speaking (Valacich, Dennis, & Connolly, 1994). CMAC removes the physical constraints that cause communication or production blocking, although simply because individuals can talk does not mean that they will. There is usually a greater volume of discussion in CMAC groups than in face-to-face groups (McDaniel, Olson, & Magee, 1996).

Pragmatically, the combination of the ability of everyone to talk simultaneously, the removal of many social, political and power cues, and the amount of talk possible because of reduced production blocking, CMAC should be more egalitarian. Because the discussion is open to a greater number of ideas and perspectives, decision making and the implementation process should be enhanced. What is not clear is how much traditional organizational power dynamics interfere with the potential of the CMAC technology.

Early research found that anonymous computer-mediated communication is sometimes more uninhibited and negative than face-to-face communication (Valacich, Jessup, Dennis, & Nunamaker, 1992). Flaming, for example, is a known computer-mediated communication issue, although perhaps no more prevalent than face-to-face confrontations in synchronous communication. Organizational task teams using CMAC are rarely literally anonymous, however, because team members are often known to one another, by reputation if not through prior face-to-face interaction.

Because most members are known, CMAC flaming in the organizational environment should have consequences that diminish inappropriate behavior or language. Language used by team members in established computer-mediated work groups is generally the same as language used in face-to-face groups (Matheson & Zanna, 1989), although exceptions occur in any work setting. CMAC may feel more anonymous, however, and this likely has both positive and negative consequences.

Computer-mediated communication generally filters out nonverbal and related status cues, and this filtering is likely both an advantage and a constraint on effective communication, depending on the situation. CMAC groups can benefit those who may be shy about speaking in public or those who are discounted in face-to-face discussions because of status effects (Weisband, Schneider, & Connolly, 1995). The lack of visual cues in CMAC may allow more focus on the task and less focus on the social and personal aspects of interaction (Hollingshead & Contractor, 2002). On the other hand, virtual teams sometimes feel less personal and relational than face-to-face teams, perhaps because of a lack of paralanguage, although some research claims that positive relational aspects on computer-mediated teams converge with those of face-to-face teams over time (Walther, 1994). Research is needed to further understand the carryover of status effects from the face-to-face environment into the virtual environment, because personal knowledge of other team members may inhibit the democratic possibilities of the CMAC environment, if participants are aware of or care about these status effects.

In CMAC, everyone more or less talks at once through their postings in the discussion space, and then the archived record waits for team members to individually read and respond to the discussion. CMAC is different from face-to-face communication in that asynchronous communication times are rarely scheduled, although this is possible, and although the communication parameters for the timeliness of discussion are preset and understood by the team, this medium still allows all team members the flexibility to participate and contribute 24/7. In theory, however, CMAC team members can be more equal participants than in synchronous face-to-face teams (Weisband, 1992) because of more equal access and ability to talk when personally convenient. The impact of high-status or first-speaker members should be somewhat diminished in CMAC (McLeod, 1996) because everyone on an asynchronous team can advocate positions or perspectives before reading the responses of others. Orlikowski and Yates (1994) found egalitarian tendencies online, whereby expertise and knowledge trumped organizational status or hierarchy effects.

The expectation for each team member to post an initial response prior to reading or responding to the postings of others can be built into the rules of engagement established by any given CMAC team. Some early research suggested that computer-mediated communication may initially hinder the interaction process and performance of teams (Dubrovsky et al., 1991; Valacich et al., 1992), although these process and performance issues seem to fade over time as the teams work together (Arrow et al., 1996). CMAC allows a more complete collection and interpretation of data by many members of a team instead of collection and evaluation by only a few, so CMAC teams may generate more diverse opinions and a wider range of alternatives than most synchronous teams (Weisband, 1992).

Flexibility Over Time and Distance

Technologies to aid communication at a distance have existed since the early use of smoke signals. CMAC can answer, in part, the demand for increased organizational flexibility because asynchronous team members can exchange information regardless of location or time zones, work schedules, or temporary local crises that might interfere with normal work flows (Chu & Spries, 2001). CMAC allows for work to be done with a distance between team members, and working at a distance is increasingly common, although the availability of CMAC is only one of many factors influencing this shift. Orlikowski and Yates (2002) claimed that CMAC allows more temporal control over work and, incidentally, over personal time as well. More personal control results in greater autonomy and more flexibility (Orlikowski & Barley, 2001). It is important to note that as a consequence of distance or logistical constraints, a CMAC team may be the only alternative to not having a team at all.

Many topics or communication threads can be in process at the same time, much like dealing with several agenda items simultaneously. Many aspects or parts of an issue can be dealt with by the same decision team or by several teams simultaneously. CMAC enables the creation of specialized subteams, with team members from dispersed locations, to be formed almost instantly to work on specific issues or problems when necessary. There are different types of discussion threads in CMAC, but the most productive appears to be the concurrent thread, in which members participate in several discussions or projects simultaneously. Yates, Orlikowski, and Woerner (2003), for example, found that using multiple concurrent threads of discussion resulted in faster task completion times, partly because of created synergies between the discussions and projects. Other communication

technologies used for team communication, such as video or telephone conferencing, lack the flexibility of CMAC because they are synchronous and therefore impose transaction costs that constrain team size, autonomy, and flexibility simply because team members need to be available at the same time, even if not at the same place, for communication to occur.

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Members of CMAC teams can do their work in short time blocks that are personally convenient because these time blocks do not need to be synchronous. It is easy to visualize an individual attending multiple asynchronous virtual meetings in a series of short time blocks that total 1 hour each throughout the day or week or month, whereas scheduling a 1-hour synchronous meeting for many team members from many locations could be frustrating if not impossible. Any face-to-face meeting requires time to schedule, time to physically get to the meeting room, time waiting for team members to arrive, and then, significantly, time waiting for a turn to speak because of communication blocking. Escaping from the time and scheduling cost of arranging or attending face-to-face meetings is a pragmatic yet significant advantage of CMAC. However, having the ability for work and discussion to evolve 24/7 does not guarantee that this will increase effectiveness. Raffoni (2000) was emphatic that an explicit communication plan and a work expectation system are required for effective CMAC.

CMAC allows the possibility of creating a greater quantity and quality of information in the decision-making process through the simultaneous evaluation of many alternatives by a large number of people. As well, CMAC increases the possibility for rapid decisions because of the simultaneous consideration of multiple alternatives (Eisenhardt, Kahwajy, & Bourgeois, 1997). CMAC may also reduce the likelihood of premature commitment to any one option, because team members can shift quickly between options and more easily compare the consequences of the various alternatives. Because alternatives are often difficult to assess in isolation, the simultaneous evaluation of multiple options allows team members to compare the strengths and weaknesses of several alternatives simultaneously, building

confidence that all viable alternatives have been considered in some depth but also providing quick fallback positions. CMAC allows rapid strategy or process change as new information becomes available, and this rapidity can result in more effective communication because all team members are immediately informed of these shifts instead of continuing to work toward old objectives or under old understandings. Waiting weeks for the next face-to-face meeting only to discover such a shift in direction or strategy is a classic consequence of ineffective teamwork and communication in synchronous teams.

Greater Opportunity for Reflection

Interpersonal communication is the essence of organization because it creates structures that then affect what gets said and done and by whom. Interpersonal communication is not usually dependent on a single genre, however, and multiple genres interact with one another in creating the totality of communication within an organization (Orlikowski & Yates, 1994). CMAC allows team members the opportunity to pause before responding, and if established as a group norm, this pause may be beneficial to organizational functioning. This pause enables reflective instead of more reactive responses, which is a common consequence of synchronous communication, in which an immediate response is expected. The technology and norms of most CMAC allows for complete and uninterrupted responses from everyone, although technical ability does not guarantee practice. The lack of temporal sequence in CMAC, when combined with the number of ideas being discussed concurrently, may encourage thorough and rigorous discussion (Berry, 2004). Logically, this pause prior to response also allows CMAC team members time for additional research or to find and review information, which may lead to greater depth of analysis. Orlikowski and Yates (1994) made specific mention of embedded messages in CMAC, which is the ability to insert all or part of a previous message into a new message. This insertion is documentation or confirmation of points made in earlier stages of a discussion, or even other discussions, thus creating interdependence and continuity in the discussion.

The lack of immediacy in CMAC teams compared with synchronous teams allows time for a thorough digestion of other team members' comments and more thoughtfulness in composing responses (Walther, 1996). However, this lack of immediacy can also slow down the decision-making process, so CMAC is likely not the best choice of communication medium if immediate decisions are required.

This need for balance between immediacy and autonomy underscores that CMAC is not suitable in all instances as a decision-making or team process communication tool. Kiesler and Sproull (1992) found that CMAC teams experience more difficulty in reaching consensus than face-to-face teams, and this problem may be exacerbated because of the amount of additional data and information available to the virtual team. This problem is tempered by the awareness that organizational communication is rarely confined to a single genre (Orlikowski & Yates, 1994); thus, the CMAC communication can easily be supplemented by more immediate communication genres, such a telephone or even face-to-face meeting. Having experience as a member of CMAC teams, or following an explicit team charter of participation expectations, may also resolve some of these issues.

Archived Memory

Computer-mediated communication creates and allows a review of an exact and permanent archived record, and this record is an important difference when comparing CMAC and the traditional synchronous face-to-face meeting. The retrievable and accurate CMAC discussion record is different from memory or minutes resulting from a face-to-face meeting. One characteristic of synchronous meeting records is that the record is often focused on outcomes, not on the process that resulted in the outcomes. Yoshioka et al. (2001) suggested that a CMAC archive allows participants to understand the why as well as the how and what, and thus the archive turns into a knowledge repository that can be accessed by everyone to allow the reuse of organizational knowledge. A second aspect is that the minutes of a synchronous meeting often lag the meeting by days or weeks. In contrast, everyone in the CMAC team has a common, instant, and evolving record of the proceedings, although interpretation of this archived record can remain idiosyncratic.

The evolving CMAC record can be constantly revisited and reexamined, thus allowing for a near instant historical review of the process and the outcomes. Orlikowski and Yates (1994) noted that the archive allows participants to revisit prior discussions but, it is important to note, allows new members to also have a complete record of prior discussion, decisions, and the decision process. The technology of CMAC enables reorganizing and channeling communication or information almost instantly, so the need for repeating information to new constituents or temporarily missing team members is removed. It seems likely that personal and team accountability increases in CMAC because understandings, agreements,

and assigned responsibilities can be confirmed in an archived record that is accessible to everyone.

LIMITATIONS TO THE CMAC ALTERNATIVE

Some of the benefits of CMAC may also be constraints, depending on contingencies. Perhaps the major detriment of CMAC is the time required to read, comment, and process the data available in the ongoing discussion. More individuals contribute and give feedback in the ongoing CMAC discussion, which should be a positive, but this process also requires all other members to read and process this increased volume of data, which may be a negative. This added time requirement is partly offset by the 24/7 nature of CMAC, which allows team members the autonomy of when to respond to the discussion, and also offset by the lack of nonproductive time spent attending or commuting to face-to-face synchronous meetings. For example, catching a 2-hour flight to attend a 2-hour meeting and then returning on the return flight will essentially take a full 8-hour day, compared with perhaps spending less than 1 hour making a contribution through a CMAC discussion at a personally convenient time.

The demands and role of the technology have an effect on communication, but this effect is tempered by the institutional context (Orlikowski & Barley, 2001) and the human role (Orlikowski & Yates, 2002). The opportunities available through CMAC may be constrained by old organizational communicative practice. Weick (1987) explained that the nature and role of communication in organizations constantly evolve as organizational members interact with one another and with their social institutions. The availability of new communicative forms, such as CMAC, when combined with the constant demand for faster and better forms of interaction, should influence the nature of organizational communication (Yates & Orlikowski, 1992). Yet team and organizational members still need to learn how to use new media effectively (Yoshioka et al., 2001). Orlikowski et al. (1995) found that new communication norms evolve as members use the new technology and that these new norms are strongly influenced by the intervention of a few skilled individuals who shape how others use the technology. These new norms may overcome old cultural communicative norms over time. Thus, new technology availability does not mean effective use of the technology unless championed by purposeful organizational leadership and training in use of the new technology. Regardless of technological ability for new, different, and perhaps more effective communication, old communication patterns and norms may persist.

Because communication is central to the organizing process and is embedded in everyday social practice (Orlikowski & Yates, 1994), a change in communication process or communication technology may result in changes to organizing processes or social practices. In CMAC, team members depend on one another in different ways, so team norms, roles, and procedures are often different from those found in face-to-face teams.

Some of the benefits of CMAC may also be constraints, depending on contingencies.

Yates and Orlikowski (1992) would identify CMAC as a communication genre; genres are independent variables that influence communication behavior and outcomes. Genre use evolves over time as organizational members make sense of the new media and adapt their behavior to fit the media. Orlikowski (2000) claimed that three conditions combine to influence the use of any media: conventional understandings that members construct to make sense of their workplace, the technological properties of the technology or communication system, and institutional support, including the social structures of the organization itself. The core consequence of the melding of these three conditions with a new technology or system is a change in how work is enacted in the workplace. It is unlikely that all three conditions are in sync at all times, and this could explain, in part, the possible cultural and use constraints on CMAC. Many organizations likely have better technical capabilities than they make use of, and this lag may be caused by cultural norms. The cliché of the CEO who is unable to turn on a computer comes to mind, and similarly, the preference of many individuals in organizations for face-to-face communication, even when better alternatives are available, may be examples of this cultural or operational lag. In short, the communicative technology is often underused because of old norms carried over from old communicative systems. The use of CMAC is still in flux.

OPPORTUNITIES FOR FURTHER RESEARCH

This article raises several questions, especially because many of the espoused benefits of CMAC are based on rather sparse literature. Questions that need further clarification and research include the following:

- Given the amount of autonomy on CMAC teams, including the freedom of choice of when to respond, the nonparticipation of team members can create problems. How can organizations create a sense of urgency and responsibility within CMAC teams so that work gets done or decisions made?
- Given that knowledge of status and social effects is a common problem inhibiting participation in face-to-face teams, how does knowledge of status and social effects inhibit equitable and authentic participation by all team members in ongoing CMAC teams?
- Given that some CMAC teams have greater difficulty reaching consensus than face-to-face teams, which procedures or processes are the most effective in enhancing consensus building on CMAC teams?
- Does CMAC hinder the initial interaction and performance of inexperienced CMAC team members, and if so, how much time or experience is necessary to overcome this problem? How can inexperienced CMAC team members be brought up to full participation and productivity quickly?
- Given that size issues affect the effectiveness of communication on face-to-face teams, how do size issues affect CMAC teams? Does the amount of comment and detailed discussion in the virtual environment compensate for or exacerbate large-size effects?
- How is motivating team members different in CMAC teams compared with synchronous, face-to-face teams?
- Does the use of CMAC, and the time pause available in CMAC, increase the collection of additional data and information compared with data collection or added information in synchronous, face-to-face teams?

CONCLUSION

Computer-mediated communication has brought about radical changes in understanding communication, teamwork, and decision making. Unlike synchronous, face-to-face teams, computer-mediated teams do not have to be copresent in time or space to collaborate, share information, or make decisions. These developments and new channels of communication have shifted our understanding of teams from same time, same place to any time, any place (Hollingshead & Contractor, 2002). The core purpose of teams, regardless of communication type, is to enhance organizational effectiveness; thus, CMAC teams should be seen as an available tool to help organizations increase efficiency and productivity through effective teamwork and decision making.

Although sharing some similarities, CMAC is different from face-to-face synchronous communication. CMAC allows the creation of virtual teams. CMAC allows input from the many instead of just the few. Some CMAC teams appear to work collectively with fewer power-dynamics and

social-cue problems than found in face-to-face interaction, but not in all cases. CMAC teams can quickly be changed in size to include additional experts as needed or to form subteams. CMAC can allow time for research or for seeking outside counsel, and discussion and information are easily shared electronically among a large number of team members. CMAC creates a permanent and evolving record of discussions, creating a database to document the expectations and responsibilities of team members. Although not a solution to all team process problems, CMAC does offer an opportunity for improved organizational teamwork and decision.

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