# The Effect of Computer-Mediated Communication on Agreement and Acceptance

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ABSTRACT: This study develops and tests a model of relationships among computer-mediated communication systems (CMCS), group processes, and group outcomes. The group outcomes examined are agreement and acceptance. Agreement is the extent to which members of a problem-solving group hold similar views and solutions about the problem at the end of their task. Acceptance is the extent to which members of a problem-solving group acquiesce to the views and solutions of other members, *while holding reservations about those views and solutions*. The distinction between agreement and acceptance is important because members in agreement are more likely to support the implementation of their solution than are those who merely accept the solution. Based on a laboratory experiment, we find that socioemotional communication (both positive—showing friendliness and supportiveness—and negative—showing hostility and rejection) as well as task-oriented communication play important mediating roles between CMCS use and acceptance and agreement. The findings suggest ways to promote agreement through management intervention and CMCS design. In addition, our findings suggest some intriguing avenues for further research, such as the lack of symmetry between the effects of positive and negative socioemotional communication.

KEY WORDS AND PHRASES: acceptance, agreement, computer-mediated communication, electronic meeting systems, group decision support systems, group performance, group processes, negotiation tasks.

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COMPUTER-MEDIATED COMMUNICATION SYSTEMS (CMCS) ARE COMPUTER-BASED systems that enable entry, storage, processing, distribution, and reception of digitized information [38]. CMCS include computer conferencing systems, electronic and voice mail systems, group decision support systems, and text retrieval systems [27]. CMCS are becoming increasingly pervasive in organizations as a result, in part, of growth in globalization [37], telecommuting [34], and access to facilities that enable computer-mediated communication, such as the Internet. It is widely recognized that CMCS significantly alter communication processes and outcomes in organizations [5, 26]. This, coupled with their increasing use, makes it important to develop a better understanding of CMCS effects on communication processes and outcomes, in order to increase the benefits derived from their use.

Most studies examining the effects of CMCS have focused on group outcomes, such as product quality [42], or on group processes, such as task versus social orientation [44]. These studies add to our understanding of CMCS in organizations. However, without a comprehensive model, which provides an understanding of CMCS effects on group outcomes through their impacts on group processes, it is difficult to design CMCS or group process interventions in order to achieve specific group outcomes [22].

The few CMCS studies employing comprehensive models (e.g., [25, 40]) examine linkages among constructs using correlational analyses. Such analyses are problematic because, for example, they do not partial out the effects of group process constructs that may be correlated with the process and outcome constructs of interest. PLS is a second-generation multivariate analysis technique that permits the simultaneous analysis of multiple criterion and predictor constructs [3], thereby overcoming the problems associated with correlational analyses. This study employs partial least squares (PLS) to better understand the comprehensive relationships among CMCS, group processes, and group outcomes.

The outcomes examined are agreement and acceptance. Agreement is the extent to which members of a group solving a problem hold similar views and solutions about the problem at the end of their task. This is important since it determines group members' support for organized action during the implementation of a problem's solution [7, 14]. Note that agreement differs from consensus: Consensus typically includes *apparent agreement* in addition to agreement as we have defined it [38]. For example, although participants may be willing to go along with some plan, thereby giving the impression of consensus, they may hold reservations about some parts of it. We address this apparent agreement in terms of acceptance.

Acceptance has not been explicitly studied by CMCS researchers. It is the extent to which members of a group solving a problem acquiesce to the views and solutions of other members *while holding reservations about those views and solutions*. Consider, for example, a group's task of proposing five solutions to a problem. A participant may acquiesce to but not agree with some solutions if, for example, he or she (1) is satisfied with the problem-solving process [17], (2) has other tasks pending and is dissatisfied with the inability to apply closure to the current task [48], or (3) does not

wish to create a conflict with another participant [29]. Since acceptance implies that the participant will not resist the problem's solution, it is important for building support during the solution's implementation [14].

This support, however, may be tenuous; to the extent that a participant accepts rather than agrees with others during problem solving, there is a greater likelihood of withdrawal of support during problem solution implementation. This is illustrated by the reaction of the losing party to presidential elections in the United States. The losing party accepts the citizens' decision to elect the other party's candidate because it is satisfied with the democratic election process and supports the candidate's institution as the president. However, the losing party often seizes opportunities to subvert the president's policies.

Agreement and acceptance are related in that acceptance cannot exist unless there is lack of agreement. However, this relationship is not likely to be perfect due to the potential for neither agreement nor acceptance. For example, a participant may neither agree with nor accept the problem solution and, instead, resist it because he or she was shut out of the problem-solving process by dominant participants. (Empirical support for an imperfect correlation between agreement and acceptance is provided later in this paper.)

The path model, shown in figure 1, is developed next, linking CMCS to agreement and acceptance in negotiation tasks [32]. This model is significant in that it (1) examines the effect of CMCS on two outcomes (agreement and acceptance) that are important in the implementation of a problem's solution; (2) exposes group process constructs (socioemotional communication, task-oriented communication, and satisfaction with the process) that mediate the effect of CMCS on agreement and acceptance; and (3) examines these effects in the context of negotiation tasks, for which performance is likely to be sensitive to computer mediated communication [33].

## Hypothesized Model

NEGOTIATION TASKS ARE MIXED-MOTIVE TASKS THAT PROMOTE idiosyncratic interpretations about the target phenomena and have no demonstrably correct solutions [32]. In order to promote agreement or acceptance among group members, these tasks require reconciliation of different information, perspectives, and motives [10, 14, 16, 17, 48]. CMCS can influence the building of agreement or acceptance through their effects on socioemotional and task-oriented communication [25, 33].

We propose that CMCS will affect agreement through: (1) their effects on socioemotional and task-oriented communication, (2) the effect of socioemotional communication on task-oriented communication, and (3) the effect of socioemotional and task-oriented communication on agreement. We propose that CMCS will affect acceptance through: (1) their effects on socioemotional and task-oriented communication, (2) the effect of socioemotional communication on task-oriented communication, (3) the effects of socioemotional and task-oriented communication on satisfaction, and (4) the effects of satisfaction and agreement on acceptance. These paths are illustrated in figure 1 and discussed next.

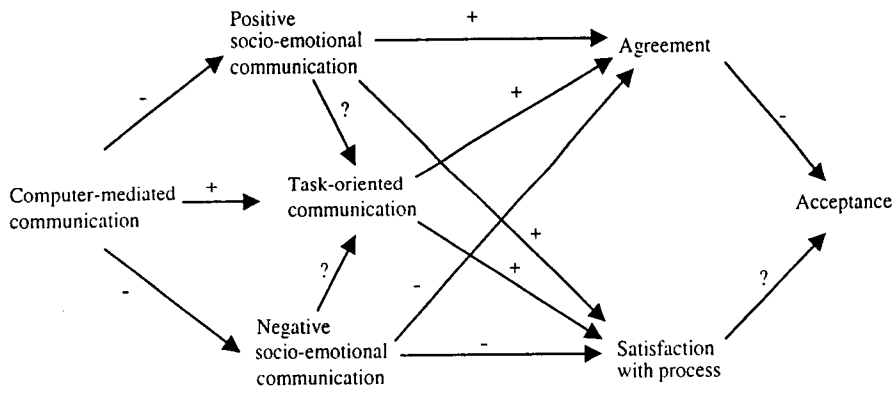



*Figure 1.* Hypothesized Model

## Effects of CMCS on Socioemotional and Task-Oriented Communication

Social presence and social information processing theories suggest that CMCS will affect socioemotional communication. Social presence theory indicates that, compared to face-to-face communication, the fewer nonverbal cues in CMCS will lead to lower social presence; social presence is the feeling that one is involved with other people [41]. With lower social presence, one is less likely to engage in communication that focuses on the interrelationships among group members, that is, socioemotional communication [2]. Socioemotional communication can be positive (showing friendliness and supportiveness) or negative (showing hostility and rejection). Thus, social presence theory predicts that, compared to face-to-face communication, CMCS will lead to less positive and negative socioemotional communication [25].[1]

According to social information processing theory [45, 46, 47], the limited bandwidth, the requirement of typing, and asynchrony (e.g., a lag between message creation and transmission) in CMCS slows down the exchange of socioemotional messages. In initial computer-mediated encounters, the incidence of socioemotional communication will be relatively less compared to face-to-face encounters, though during subsequent encounters this difference disappears because group members get accustomed to and overcome the limited bandwidth, the typing requirement, and asynchronicity. The effect of the typing requirement on reducing the incidence of socioemotional messages in initial CMCS encounters relative to face-to-face encounters is expected to be especially severe when groups are provided rewards that value both speed of task execution and output quality. In order to accomplish their tasks quickly while not compromising quality, CMCS groups may compensate for slower input rates associated with typing by further reducing socioemotional messages [5].

Therefore,

*Hypothesis 1: In presence of group rewards that value execution speed and output quality, there will be less positive and negative socioemotional communication during initial CMCS encounters relative to face-to-face group encounters.*

As described above, social information processing theory suggests that initial CMCS encounters are likely to be more task-oriented than face-to-face encounters, because the limited bandwidth and asynchronicity of computer-mediated communication increases the need for regulating interaction [24, 49]. In addition, groups have been found to exchange the same number of remarks in face-to-face and computer-mediated encounters when they are allowed to deliberate for as long as it takes to reach a consensus [15, 44, 49]. Taken together, these findings suggest that groups engaged in initial computer-mediated encounters when allowed to reach consensus will exchange more task-oriented messages than face-to-face groups. This relationship is likely to hold when groups are provided rewards that value speed of task execution and output quality, since, as described above, CMCS groups will tend to sacrifice socioemotional communication for more task-oriented interaction [5]. Therefore,

*Hypothesis 2: When allowed to reach consensus, and in the presence of group rewards that value execution speed and output quality, there will be more task-oriented communication with CMCS than with face-to-face communication.*

## The Effect of Socioemotional Communication on Task-Oriented Communication

Socioemotional communication may affect inhibitions, which are likely to reduce task-oriented communication. West [50] suggests that a supportive and friendly atmosphere created by positive socioemotional communication is likely to reduce such inhibition, while a nonsupportive and hostile atmosphere created by negative socioemotional communication is likely to increase inhibition. However, an alternative mechanism suggested by Sara Kiesler and reported by Connolly et al. [9] indicates opposite effects. According to this mechanism, members of a group with greater positive socioemotional communication have a greater attraction toward their group, and therefore communication inhibition increases due to a desire not to look foolish [9]. Consequently, greater positive socioemotional communication is likely to be associated with higher levels of such inhibition whereas greater negative socioemotional communication is likely to be associated with lower levels of inhibition.

Socioemotional communication can also influence task-oriented communication by providing feedback about the functioning of group members [2, 9]. Participants may view negative socioemotional communication as a rejection of their ideas. In a context in which group members have an opportunity to earn individual rewards based on the extent to which their ideas are adopted by the group, participants may attempt to make up for the rejection by making more task-oriented comments. Positive socioemotional communication may be viewed as a signal of acceptance of ideas and lead to reduced

task-oriented communication. Based on the above discussion it is not possible to determine the direction of the overall effect of socioemotional communication on task-oriented communication. Therefore,

*Hypothesis 3a: In presence of individual rewards that value adoption of one's ideas by others, positive socioemotional communication will be related to task-oriented communication.*

*3b: In presence of individual rewards that value adoption of one's ideas by others, negative socioemotional communication will be related to task-oriented communication.*

## The Effect of Socioemotional and Task-Oriented Communication on Satisfaction with Process

According to Bales's Interaction Process Analysis (IPA) framework [2], socioemotional communication largely serves as feedback regarding the adequacy of the problem-solving process. By suggesting that problem-solving attempts are adequate, positive socioemotional communication will lead participants to be more satisfied with their problem-solving process. Conversely, by suggesting that problem-solving attempts are inadequate, negative socioemotional communication lead participants to be less satisfied with their problem-solving process. Therefore,

*Hypothesis 4a: Positive socioemotional communication will result in more satisfaction with process.*

*4b: Negative socioemotional communication will result in a less satisfaction with process.*

Greater task-oriented communication will lead to greater satisfaction with process [43]. From a cognitive perspective, more task-oriented communication enables more thorough consideration of a problem, which leads to better performance and therefore results in greater satisfaction with process [36]. From an affective perspective, task-oriented communication promotes high-order needs, such as self-expression, respect, and independence, which increases participants' satisfaction with process [36]. Therefore,

*Hypothesis 5: Task-oriented communication will increase satisfaction with process.*

## The Effect of Socioemotional and Task-Oriented Communication on Agreement

When members of a group communicate, they tend to generate social pressure toward similarity of opinions and the consequent agreement among members [18]. This pressure is greater the more the group is attractive to a member [18]. Because more

positive socioemotional communication leads to greater attraction toward the group [9], the pressure to conform and consequent agreement will be higher with more positive socioemotional communication. Because more negative socioemotional communication leads to less attraction toward the group [9], the pressure to conform and consequent agreement will be less with more negative socioemotional communication. Therefore,

*Hypothesis 6a: Positive socioemotional communication will lead to more agreement.*

*6b: Negative socioemotional communication will lead to less agreement.*

Task-oriented communication enables participants to gain recognition and a sense of self-worth and to observe others' viewpoints. This promotes agreement by reducing their resistance to suggestions and changes of opinion [31]. Therefore,

*Hypothesis 7: Task-oriented communication will lead to more agreement.*

## The Effect of Satisfaction and Agreement on Acceptance

Satisfaction with the process implies fewer complaints about problem-solving activities, which makes one more likely to accept views and solutions with which one does not agree [17]. The earlier example of the losing party during the U.S. presidential elections describes how satisfaction with the process is associated with acceptance. In contrast, acceptance may also be associated with lower levels of satisfaction with the process. Participants are motivated to end a dissatisfying process [30]. Therefore, instead of prolonging a dissatisfying discussion until agreement is reached, participants may accept the views and solutions of others in order to bring the discussion to closure quickly. The acceptance of others' views and solutions in order to end a dissatisfying process may be additionally hastened by an opportunity for earning a group reward for quicker task execution. Therefore,

*Hypothesis 8: In the presence of group rewards that value execution speed, satisfaction with process will be related to acceptance.*

As described earlier, there is a negative correlation between agreement and acceptance since, by definition, acceptance cannot exist unless there is lack of agreement. (Agreement is the extent to which members hold similar views; acceptance is the extent to which members acquiesce to the views of other members *while holding reservations about those views.*) However, because it is possible to have neither agreement nor acceptance, this correlation is not likely to be perfect. For example, a participant may neither agree with nor accept the problem solution and, instead, resist it because he or she was shut out of the problem-solving process by dominant participants. Therefore,

*Hypothesis 9: Lack of agreement will lead to more acceptance.*

# Method

## Research Design

AS PART OF A COURSE ASSIGNMENT, NINETY-FOUR UNDERGRADUATE STUDENTS (71 percent males and 29 percent females; 84 percent junior level and 16 percent senior level) enrolled in an introduction to management information systems course at a large university participated in a laboratory experiment. At the beginning of the semester, these participants were randomly assigned to thirty-one mixed-gender groups; thirty groups consisted of three members and one group consisted of four members. The groups worked on course assignments with deliverables before and after the study. Thus, the groups had histories and expectations of future interaction.

In order to manipulate the mediation of communication by a computer, four communication systems were employed, two that required a computer for communication and two that involved face-to-face communication. Two communications systems were employed in each of the conditions described below in order to reduce confounding due to the specific nature of the communication systems themselves. The four communications systems were:

- *Face-to face system 1: Unsupported face-to-face meeting.* During each unsupported face-to-face meeting, participants sat down at the conference table in a conference room to perform their task. The conference room was equipped with a blackboard, which was in full view of the participants during their discussions. Each participant recorded important points raised during discussions on paper.
- *Face-to-face system 2: Supported face-to-face meeting.* During each supported face-to-face meeting, participants employed a shared group editor called ShrEdit. Participants sat face-to-face and performed their tasks by speaking to one another as in unsupported face-to-face meetings. However, each participant also employed a common ShrEdit document to record important points raised during discussions. This document was available on 20″ computer monitors placed in specially designed tables in front of participants. The monitors were placed and fitted at angles that permitted all participants the same views of each other that participants in the unsupported meetings had.
- *CMCS 1: Electronic conferencing.* With the electronic conferencing system, Confer II, participants could not see or hear one another. Messages were exchanged by posting responses to a conference topic set up for each group. Confer II appended sender names to all responses. Responses were stored in an electronic file accessible by all participants. Participants viewed responses through 14″ monitors.
- *CMCS 2: Electronic mail.* With the electronic mail system, participants could not see or hear one another. A mailing list was set up for each group. To send a message, participants entered the mailing list name for their group. Mailed messages, with sender names appended, were received immediately and resulted in a statement of message receipt on the monitors of the participants. No

communication records were maintained; participants deleted electronic records of incoming messages after reading them. Participants viewed messages through 14″ monitors.

During the study, each group performed two tasks, one pertaining to substance abuse and the other to student housing (see appendix A for problem statements). A group solved one problem in a face-to-face setting on one date and the other with a CMCS (Confer II or electronic mail) on another date. To the extent possible, the ordering of the communication systems and problems was balanced across groups.

This research design included a simulation of several organizational conditions. The groups had histories and expectations of future interaction, which are typical for organizational groups [12]. Like problems encountered by members of an organization, the problems assigned to the subjects were relevant to them. In order to encourage a stake in the task and encourage serious participation, the following rewards were offered: Groups were evaluated according to the problem they solved (housing or substance abuse) and the communication system they used. For groups in each problem–communication system pair (there were seven or eight groups in each pair):

- The group with the best plan earns $8 per person.
- The group with the second best plan earns $6 per person.
- The group with the third best plan earns $4 per person.

Students were told that the goodness of any plan depended on both its quality, as determined by experts, and how quickly it was done. Consistent with organizational conditions, the quality–time tradeoff was left ambiguous. Data analysis reported below indicates that participants generally cared about both the quality of their output and the time that they spent.

The tasks are negotiation tasks because of their mixed-motive nature (described next) and because the problems assigned had no demonstrably correct solutions (which was supported by participant perceptions reported later). To create mixed motives, competitive individual rewards greater in value than the group rewards described above were offered. The following rewards were offered to individuals whose ideas, irrespective of their quality, were most represented in their group's plan. Of all individuals in a problem-communication system pair:

- The most represented individual earns $20.
- The second most represented individual earns $15.
- The third most represented individual earns $10.

These rewards based on an individual's representation in a group's plan are competitive [28] because an increase in representation of one individual's ideas reduces the potential representation of others. Results presented later support the success of competitive individual rewards in creating conflict and deception that characterize negotiation tasks due to their mixed motive nature.

## Experimental Tasks

Participants' tasks were divided into an idea generation phase—where alternative solutions were generated—followed by a discussion phase—where group members discussed alternative solutions to determine the list of five best actions that could be taken to solve the problem. During the idea-generation phase, groups in the unsupported face-to-face meetings used the blackboard with designated areas for each participant, to write down their ideas. Those in the supported face-to-face meeting used a common ShrEdit document to type their ideas in designated areas of the document. Groups in the Confer II and electronic mail settings typed their ideas in a Confer II or electronic mail message that they posted to the others at the end of the idea-generation phase.

Groups were required to spend a minimum of twenty minutes on the idea-generation phase and were given the flexibility to spend more time if they desired. All groups began their discussion phase soon after idea generation. Groups in unsupported and supported face-to-face settings discussed face-to-face whereas those in Confer II and electronic mail settings discussed by typing their comments into the respective system and posting them. The research model we proposed pertains to discussions that occur among group members attempting to overcome differences in their views. Consequently, only this discussion phase is the focus of data gathering and analysis.

The following procedures were followed for each task performed by subjects. At the beginning of their task, participants were provided hands-on training if they were using ShrEdit, Confer II, or electronic mail. All training procedures were tested and found to be satisfactory during the pilot studies. Written task instructions were then handed to the participants. These included the problem statement, the required output, the reward scheme, and the procedure they had to follow to do their task. After they read the instructions, important portions of the instructions were reiterated verbally, and they began their tasks. After each group finished its task, a questionnaire was administered (see appendix B). Participants were instructed not to discuss their task experiences with their classmates until after everyone had completed the experiment.

## Data Collection

Data were collected using group meeting transcripts and a posttest questionnaire. Group meeting transcripts were coded to obtain measures of positive and negative socioemotional communication and task-oriented communication. Group meeting transcripts for unsupported and supported face-to-face meetings were obtained from videotapes of these meetings. Electronic mail transcripts were created by adding one of the authors to the mailing lists employed by subject groups. Confer II transcripts were obtained from the archive created by the system.

Because of the time and expense involved in the coding group meetings, only 25 percent of each meeting were coded. The strategy to employ a subset of a group's communication exchanges is considered to be valid and has been employed in past CMCS research (e.g., [44, 52]). Billings et al. [4] reported validity coefficients of 0.8

or better for four-category Interaction Process Analysis (IPA) coding in a 20 percent subset of the total interaction. In addition, a comparison of four-category IPA coding and twelve-category IPA coding suggested that fewer categories required smaller subsets to achieve a given level of validity. The current study employed three broad categories (positive socioemotional, negative socioemotional, and task-oriented interaction) from the IPA scheme [2], while 25 percent of each group's total interaction was coded. Prior research therefore supports the validity of coding subsets in this study.

Past research suggests the emphasis of socioemotional versus task-oriented communication is likely to vary with time and number of messages. It has been found that there is a greater task orientation during the initial exchanges and that this task orientation decreases relative to the socioemotional orientation as meetings progress (see [19] for a review). In order to control this bias, an approximately equal number of first, second, third, and fourth quarter portions were coded. The portion coded for any group was kept the same across its two problem-solving tasks. With minor exceptions, the groups included for coding a particular quarter were balanced in terms of the communication systems employed.

Table 1 depicts the indicators employed for the study's constructs. The indicator of *task-oriented communication* and one indicator each of *positive and negative socioemotional communication* were obtained by parsing and coding group meeting transcripts. Comments in the transcripts were parsed and coded by an assistant who was blind to the study's hypotheses. A parsed comment is defined as a separate idea [9]. After parsing, comments were coded using three broad categories from the IPA scheme representing positive socioemotional communication, negative socioemotional communication, and task-oriented communication [2]. Positive socioemotional communication demonstrated solidarity, tension release, or agreement: for example, "I agree with your idea." Negative socioemotional communication demonstrated antagonism, tension, or disagreement: for example, "Your idea is stupid." Task-oriented communication consisted of giving suggestions, asking for suggestions, giving opinion, asking for opinions, giving orientation, or asking for orientation: for example, "Rent control will prevent the landlords from taking advantage of students." The assistant's parsing and coding showed a 95 percent and 98 percent agreement with the first author, who parsed and coded ten randomly chosen transcripts covering the four communication systems.

Remaining indicators employed in this study were based on the posttest questionnaire, as listed in appendix B. Questionnaire data were averaged across group members before they were used in the data analysis. Group level scores of questionnaire items for positive socioemotional communication (see appendix B.5) were averaged to obtain a second indicator in addition to the coding-based indicator. The same procedure was followed for negative socioemotional communication. The inclusion of coding and questionnaire-based indicators enables a more valid representation of the constructs. The perceptual indicators are important because, although there might be a great deal of positive or negative socioemotional communication, if such communication is not perceived it cannot affect behavior [23]. Results, discussed later and

Table 1 Construct Indicators, Factor Loadings, Average Variance Extracted, and Composite Scale Reliability

| Construct | Indicators | Factor loading | Range of cross-factor loadings | Average variance extracted | Composite scale reliability |
|---|---|---|---|---|---|
| Comp. mediated comm. system | Dummy indicator | 1 | 0.002–0.538 | 1 | 1 |
| Positive socioemotional communication | Mean of y1, y2 | 0.765 | 0.076–0.252 | 0.608 | 0.756 |
| | Indicator based on coding of behavior | 0.794 | 0.079–0.429 | | |
| Negative socioemotional communication | Mean of y3, y4 | 0.899 | 0.045–0.629 | 0.697 | 0.821 |
| | Indicator based on coding of behavior | 0.766 | 0.063–0.324 | | |
| Task-oriented communication | Indicator based on coding of behavior | 1 | 0.089–0.538 | 1 | 1 |
| Satisfaction with process | y5 | 1 | 0.207–0.454 | 1 | 1 |
| Agreement | y6 | 0.772 | 0.007–0.458 | 0.672 | 0.860 |
| | y7 | 0.795 | 0.010–0.542 | | |
| | y8 | 0.889 | 0.007–0.494 | | |
| Acceptance | y9 | 0.803 | 0.063–0.360 | 0.687 | 0.868 |
| | y10 | 0.830 | 0.009–0.440 | | |
| | y11 | 0.853 | 0.031–0.466 | | |

y1, y2, etc. refer to questionnaire items in appendix B.
The "factor loading" column provides loading of an indicator on the construct it represents whereas the "range of cross-factor loadings" column provides the range of loadings of an indicator on other constructs in the model.
The use of factor loadings, range of cross-factor loadings, average variance extracted, and composite scale reliability for reliability and validity assessment is relevant for multiindicator constructs.

presented in Table 1, indicated that both the coding and the questionnaire-based indicators of positive and negative socioemotional communication were reliable and valid.

Indicators of satisfaction, agreement, and acceptance were obtained using a posttest questionnaire (see appendix B). Satisfaction represents an attitude [35], and attitudes should be measured perceptually (e.g., [1, 11]). Agreement and acceptance are

important because of their influence of support for the problem solution during its implementation. Participants' perceptions that they neither agree with nor accept the views of others are likely to be necessary to make them hold back their support during the problem solution's implementation.

## Partial Least Squares Analysis

The theoretical model presented in figure 1 was tested using partial least squares (PLS), a multivariate analysis technique for testing structural models [51]. Barclay, Higgins, and Thompson [3] present the features and benefits of PLS. PLS analysis reported in this study was performed using PLSGraph (version 2.91.02.08).

A PLS model contains both a structural component, representing the relationship among constructs, and a measurement component, representing the relationship between constructs and their indicators [20]. In PLS, indicators may be modeled as reflective or formative [20]. Reflective indicators are determined by the construct they represent and, hence, covary the level of that construct [8]. Formative indicators determine the construct they represent and permit the possibility that they do not covary with the construct they determine [8]. Positive and negative socioemotional communication, agreement, and acceptance were expected to covary with the level of the construct they represented. Hence, indicators of these constructs were modeled reflectively. Since single indicators were employed for task-orientated communication and for satisfaction, PLS analysis is insensitive to whether they are reflective or formative.

## Controls

In addition to the constructs shown in figure 1, the model subjected to PLS analysis contained paths from several control constructs to the model's endogenous constructs. Since our study employed a repeated measure design, we controlled for variance due to the specific nature of groups by including thirty dummy constructs to represent thirty-one groups. We controlled for variance due to the specific nature of the two problems used in the study by employing a dummy construct to represent the two problems. Similarly, we controlled for effects peculiar to the two experimental sessions in the study by including a dummy construct to represent the two experimental sessions. In addition, asynchronicity associated with CMCS can affect group agreement and satisfaction in ways other than via levels of socioemotional and task communication [42]. These effects external to our model were therefore controlled by including direct paths from CMCS to agreement and satisfaction.

## Results

THE DATA ANALYSES PRESENTED HERE ADDRESS THE EXISTENCE of assumed experimental conditions, the reliability and validity of measures, and the testing of study's hypotheses.

## The Existence of Experimental Conditions

The lack of demonstrably correct solutions for the problems employed in this study was checked using a questionnaire item (appendix B.1). Both the substance abuse and the housing problems lacked clear solution procedures. With 1 representing clear solution procedures, the substance abuse mean was 4.50 (s.d. = 0.82, $n = 31$) and the housing mean was 4.66 (s.d. = 0.76, $n = 31$), both of which are significantly different from 1 ($p = 0.000$).

The reward scheme was implemented to ensure that participants approached their tasks seriously by caring about the quality of their output as well as the time that they spent. Responses to two questionnaire items (appendix B.2) indicated that participants cared to a moderate extent about the quality of their output and the time they took to prepare it. With 1 representing a lack of concern for quality or time, the caring about quality mean was 4.84 (s.d. = 0.73, $n = 62$) and the caring about time mean was 4.66 (s.d. = 0.69, $n = 62$, both of which are significantly different from 1 ($p = 0.000$).

Results support the success of competitive individual rewards in creating conflict and deception, which characterize negotiation tasks due to their mixed-motive nature. Questionnaire items were employed to determine the level of conflict and deception (appendix B.3 and B.4). The mean responses concerning the presence of conflict were 2.87 (s.d. = 1.15, $n = 31$) and 2.79 (s.d. = 0.93, $n = 31$) for the substance abuse and housing problems. The mean responses concerning the presence of deception were 1.35 (s.d. = 0.51, $n = 31$) and 1.19 (s.d. = 0.32, $n = 31$) for the substance abuse and the housing problems. All these averages were significantly different from 1 ($p < 0.005$), the point on scales corresponding to the absence of conflict or deception.

## Reliability and Validity

PLS enables the assessment of measurement components by providing principal components factor loadings of indicators. The factor loadings provided by PLS analysis and presented in Table 1 indicated adequate reliability of indicators of all multiindicator constructs, that is, positive socioemotional communication, negative socioemotional communication, agreement, and acceptance. First, the *factor loadings* for the indicators of all these constructs exceeded 0.7, suggesting that less than half of any indicator's variance was due to error. Second, for all multiindicator constructs, the *composite scale reliability*, an internal consistency estimate similar to Cronbach's $\alpha$, exceeded the recommended cutoff of 0.7 [21]. Third, *average variance extracted* by all the multiindicator constructs from their indicators exceeded the recommended cutoff of 0.5 [21].

The indicators of multiindicator constructs demonstrated *convergent* and *discriminant validity* according to two criteria similar to a multitrait/multimethod analysis [6]. Specifically, from Table 2, we can see that the multiindicator constructs shared more variance with their indicators than with the other constructs. Also, as indicated in Table 1, the magnitude of the factor loading of any indicator on its corresponding construct exceeded the magnitude of its cross-factor loadings, that is, loadings on other constructs.

Table 2 Average Variance Extracted by Constructs (Diagonal Elements) and Shared Variance Between Constructs (Off-Diagonal Elements)

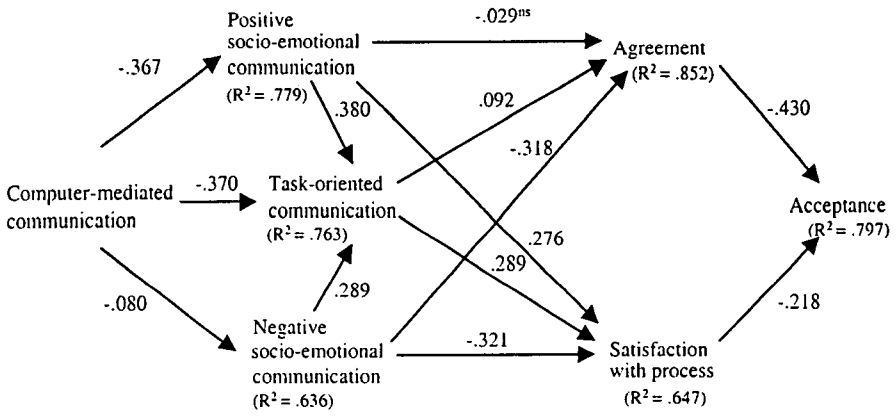
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Comp. mediated comm. system | 1 | | | | | | |
| 2. Positive socioemotional communication | 0.141 | 0.608 | | | | | |
| 3. Negative socioemotional communication | 0.007 | 0.001 | 0.697 | | | | |
| 4. Task-oriented communication | 0.289 | 0.177 | 0.016 | 1 | | | |
| 5. Satisfaction with process | 0.065 | 0.073 | 0.043 | 0.053 | 1 | | |
| 6. Agreement | 0.027 | 0.001 | 0.368 | 0.015 | 0.050 | 0.672 | |
| 7. Acceptance | 0.000 | 0.000 | 0.181 | 0.008 | 0.206 | 0.228 | 0.687 |

The conceptual independence of agreement and acceptance was further supported by a confirmatory factor analysis. A two-factor model in which the agreement items loaded on one factor and the acceptance items loaded on the other was analyzed using LISREL. Since the study's hypotheses were tested using group-level measures of agreement and acceptance, the confirmatory factor analysis was also based on group-level measures. Results suggested a good fit between the two-factor model and the data ($\chi^2(8) = 7.18$, $p = 0.519$; GFI = 0.966; AGFI = 0.912; RMSR = 0.051). The correlation between the agreement and acceptance factors ($\phi = 0.56$) was significantly less than 1 ($p = 0.000$), thereby supporting their conceptual independence. The alternative single factor model in which the agreement and acceptance measures were made to load on a single factor did not show a good fit with the data ($\chi^2(9) = 27.92$, $p = 0.001$; GFI = 0.860; AGFI = 0.673; RMSR = 0.093).

Since a single indicator of satisfaction was used, it was not possible to assess its convergent and discriminant validity. However, nomological validity of satisfaction can be assessed by examining whether the *a priori* expectations about satisfaction in a network of relationships involving satisfaction is confirmed [1]. Positive socioemotional and task-oriented communication are expected to be positively related to satisfaction, whereas negative socioemotional communication is expected to be negatively related to satisfaction. Although satisfaction is expected to be related to acceptance, there was no *a priori* expectation about the direction of the effect. The results of hypothesis testing described in the next section confirm our *a priori* expectations about satisfaction and thus provide a reasonable level of support for the nomological validity of satisfaction.

## Hypotheses

Figure 2 shows the results of PLS analysis of the path model developed in this study. PLS generates estimates of standardized regression coefficients (beta coefficients) for




Note
Paths are significant at p < .01 unless indicated with superscript ns (i.e., not significant).
Results pertaining to paths included for statistical control are not shown in the figure
but are available upon request from the authors.

*Figure 2.* Results of PLS Analysis

the paths in a model's structural component. In order to determine the significance of these paths, jackknifed standard error estimates for the paths were obtained using the blindfolding procedure. An omission distance of 11 was used in the blindfolding procedure (see [39] for a description of the blindfolding procedure). Figure 2 also shows $R^2$ for endogenous constructs, that is, the proportion of variance of an endogenous construct explained by constructs having paths leading to it.

- H1 *is supported*: CMCS were associated with less positive and negative socioemotional communication relative to face-to-face communication (beta = –0.367 and –0.08, $p < 0.01$).
- H2 *is not supported*: CMCS were associated with less task-oriented communication than face-to-face communication (beta = –0.370, $p < 0.01$).
- H3a *is supported*: Positive socioemotional communication had a positive relationship with task-oriented communication (beta = 0.380, $p > 0.01$).
- H3b *is supported*: Negative socioemotional communication had a positive relationship with task-oriented (beta = 0.289, $p < 0.01$).
- H4a *is supported*: Positive socioemotional communication had a positive relationship with satisfaction (beta = 0.276, $p < 0.01$).
- H4b *is supported*: Negative socioemotional communication had a negative relationship with satisfaction (beta = –0.321, $p < 0.01$).
- H5 *is supported*: Task-oriented communication had a positive relationship with satisfaction (beta = 0.289, $p < 0.01$).
- H6a *is not supported*: Positive socioemotional communication was not related to agreement (beta = 0.029, $p > 0.1$).
- H6b *is supported*: Negative socioemotional communication had a negative relationship with agreement (beta = –0.318, $p < 0.01$).

- H7 *is supported*: Task-oriented communication had a positive relationship with agreement (beta = 0.092, $p < 0.01$).
- H8 *is supported*: Satisfaction had a negative relationship with acceptance (beta = –0.218, $p < 0.01$).
- H9 *is supported*: Agreement had a negative relationship with acceptance (beta = –0.430, $p < 0.01$).

Although PLS does not provide an overall indication of model fit, a feel for this fit can be obtained by averaging the variance explained across all endogenous constructs. Based on the values in figure 2, the average $R^2$ for the model is equal to 0.746, which suggests that the model provides a good account of the data.

## Discussion

THE RESULTS SUPPORT THE EXISTENCE OF A COMPLEX SET of links from computer-mediated communication to agreement and acceptance. However, hypotheses related to some of the paths were not supported. In addition, portions of our model included competing submodels: The links from socioemotional communication to task-oriented communication and the link from satisfaction to acceptance were based on competing theories. We next reconcile our results with the associated theories.

Contrary to H2, face-to-face communication was associated with greater task-oriented communication than computer-mediated communication. It was suggested that, when groups are provided rewards that value speed of task execution and output quality, CMCS groups may try to gain time by cutting down on socioemotional communication but, in order to maintain output quality, they are not likely to cut down on their task-oriented interaction. This hypothesis was based on research that allowed groups enough time to reach consensus. In accord with that research, we also allowed groups time to reach consensus; however, in contrast to that research, we included rewards that valued speed. These rewards effectively limited deliberation time, thereby causing CMCS users to cut down on task-oriented communication as well as socioemotional communication.

Various perspectives were employed to hypothesize the effects of positive and negative socioemotional communication on task-oriented communication (H3a and H3b). Our findings of a positive relationship between positive socioemotional communication and task-oriented communication combined with a positive relationship between negative socioemotional communication and task-oriented communication are not in accord with any of the three theories upon which H3a and H3b were based. This may have resulted from the offer of group as well as individual rewards to study participants. By making the group more attractive to its members, greater positive socioemotional communication within a group may have made group rewards more salient than individual rewards. Because a group's chances of earning the group reward increased with the quality of the output produced, group members may have worked harder to produce a better-quality output by increasing their task-oriented communication. On the other hand, by making the group less attractive to its members,

greater negative socioemotional communication may have made group rewards less salient than individual rewards. This would lead to increased task communication because (a) the opportunity to earn individual rewards was based on the extent to which an individual's ideas were represented in the group's output, and (b) negative socioemotional communication may be viewed as a rejection of one's ideas, leading participants to make up for this rejection by making more task-oriented comments.

Hypothesis 6 suggested that (a) pressure toward agreement is greater the more the group is attractive to a member, and (b) because more positive (negative) socioemotional communication leads to greater (less) attraction toward the group, agreement will be higher (lower) with more positive (negative) socioemotional communication. Although this relationship held for negative socioemotional communication, it did not hold for positive socioemotional communication. We can find no obvious explanation for this lack of symmetry, except to point out that symmetry also does not exist between socioemotional communication and task-oriented communication. As addressed in our conclusions, the potential for lack of symmetry between positive and negative socioemotional communication is an important area to investigate in future research.

Competing perspectives were employed to suggest both positive and negative impacts of satisfaction on acceptance (H8). In this case, when faced with a dissatisfying discussion, participants brought closure quickly by accepting the views and solutions of others. (This is in contrast with the competing perspective, which suggested that satisfaction with process would lead to fewer complaints about the process and, in turn, to acceptance.) The quick closure of dissatisfying discussions may have been supported by the opportunity for earning a group reward for quicker task execution. Such an opportunity can hasten the acceptance of others' views and solutions in order to end a dissatisfying process.

## Conclusions

CMCS CAN ALTER COMMUNICATION PROCESSES AND OUTCOMES IN ORGANIZATIONS. This, coupled with their increasing use, makes it important to develop an understanding of CMCS effects on communication processes and outcomes in order to increase the benefits of CMCS use. This study developed a path model linking CMCS to agreement and acceptance via intermediate constructs that included positive and negative socioemotional communication, task-oriented communication, and satisfaction with the process. This study is significant in that, in addition to examining these intermediate linkages, it simulated several important organizational conditions. Organizational conditions included group histories and expectations of future interaction, relevant problems, group rewards that valued quality and execution speed, and competitive rewards that emphasized individual contributions to the final output.

These conditions mitigate external validity concerns associated with laboratory studies [12] while extending CMCS research to a combination of conditions not found in previous CMCS studies. For example, Hiltz et al. [25] employed time-limited tasks and omitted rewards. Walther [44] offered rewards, but the rewards did not induce

mixed motives, as did the group and individual rewards offered here. Our results increase our understanding of CMCS effects, yielding insights for managers, CMCS design, and CMCS research.

## Insights for Managers and CMCS Design

This study suggests that agreement among participants can be enhanced through management intervention as well as by CMCS design aimed at increasing task-oriented communication and reducing negative socioemotional communication. For example, prior to group meetings managers can establish ground rules that inhibit negative socioemotional communication while promoting task-oriented communication. This intervention can be supported through CMCS design that, for example, prompts users for task-oriented communication and sends negative socioemotional communication back to the originators for reconsideration.

Participants' support during solution implementation may be more tenuous when they accept rather than agree with others' views and solutions. When faced with a dissatisfying group process, participants may accept others' views and solutions in order to terminate the process. In contrast, when participants are more satisfied with the process, they are more likely to continue their deliberations, thereby increasing the potential for greater agreement. Satisfaction can be enhanced by increasing task-oriented communication and reducing negative socioemotional communication as suggested above. Satisfaction can be further enhanced by increasing positive socioemotional communication through, for example, management ground rules and CMCS prompts.

When negative socioemotional communication is controlled, increasing the level of overall communication can increase the level of agreement by increasing positive socioemotional communication and task-oriented communication. However, time pressure can reduce overall communication. Therefore, when agreement is important, managers should consider deemphasizing the importance of the time taken by the group to finish their task. In addition, speech-to-text conversion software can be employed to reduce the inhibiting effects of typing on overall communication.

## Insights for Researchers

The confirmatory factor analysis and testing of H9 indicated that participant agreement and acceptance are relatively independent constructs, and that group members may accept while not agreeing with others' views and solutions. There may be situations in which high levels of agreement are not feasible and acceptance is a viable alternative to agreement. Our results suggest that lower levels of satisfaction with the process may be related to higher levels of acceptance. Future research should examine other ways in which acceptance could be promoted when high levels of agreement are not feasible.

We examined participants' satisfaction with the problem-solving process, which is one component of participants' overall satisfaction. It would help our understanding

if additional components of satisfaction were explored. For example, it is reasonable to propose that satisfaction with the CMCS, satisfaction with the outcome, and satisfaction with the other participants may be relatively independent of each other, each having important influences on acceptance.

The positive impacts of both positive and negative socioemotional communication on task-oriented communication suggest that the relationship of positive socioemotional communication on a construct is not necessarily the opposite of that of negative socioemotional communication, as may be inferred from the literature (e.g., [9]). This lack of symmetry was also demonstrated by the relationships of positive and negative socioemotional communication with agreement. It would aid our understanding to identify circumstances under which such symmetry does and does not hold.

The explanations provided for several of our findings suggest that the existence of both individual and group rewards can play important roles in the impact of CMCS on group outcomes. Future research should test these explanations by manipulating group and individual rewards.

Although the study simulated important organizational conditions to overcome some of the limitations of laboratory studies, its generalizability is limited by the use of small student groups. Future work should investigate the study's results in a field setting with groups of different sizes. Furthermore, the study's results may be peculiar to the attributes of the communication systems employed. For instance, a computer-mediated system that supports multiple dialogues is likely to stimulate more task-oriented ideas than one that does not support multiple dialogues [13]. The CMCS employed in this study were not observed to support multiple dialogues, which may have resulted in less task-oriented communication.

In summary, this study took a step toward opening the "black box" that surrounds the path from CMCS to agreement and acceptance. It developed and tested a path model linking CMCS to agreement and acceptance via intermediate constructs that included positive and negative socioemotional communication, task-oriented communication, and satisfaction with the process. The results yielded considerable insights for managers, CMCS design, and CMCS research, which would not have been possible without a comprehensive path model.

## NOTES

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1. In accord with Bales [2], the amount of positive or negative socioemotional communication refers to the frequency rather than the strength of socioemotional communication.

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## APPENDIX A: Problem Statements Provided to Participants

*Substance Abuse Problem*: The Students' Association is concerned about the prevalence of substance (drugs and alcohol) abuse among students on the University campus, and it would like you as a group to come up with a written plan to reduce this problem. Your plan should include what you as a group think are FIVE best actions that can be taken to solve the problem. Rank order the actions you suggest in terms of their attractiveness, with the most attractive ranked as #1. WHILE JUDGING THE ATTRACTIVENESS OF ANY ACTION, TAKE INTO CONSIDERATION THE VARIOUS PROS AND CONS OF THAT ACTION. You should try to look at the problem from multiple perspectives.

*Housing Problem*: The University Administration is concerned about the problem of student housing. The Administration would like you to come up with a written plan to reduce the housing problem for its students. Your plan should include what you as a group think are FIVE best actions that can be taken to solve the problem. Rank order the actions you suggest in terms of their attractiveness, with the most attractive ranked as #1. WHILE JUDGING THE ATTRACTIVENESS OF ANY ACTION, TAKE INTO CONSIDERATION THE VARIOUS PROS AND CONS OF THAT ACTION. You should try to look at the problem from multiple perspectives.

## APPENDIX B: Questionnaire

THESE ARE THE ITEMS IN THE QUESTIONNAIRE ADMINISTERED to participants. Headings are provided here for the purpose of organizing the items. Questions in sections 5 and after were preceded by instructions to the respondents to focus on the discussion phase of their task while answering those questions. Where provided, the designations at the beginning of some of the questionnaire item (y1, y2, etc.) are in reference to Table 1.

1. *Lack of demonstrably correct solution*:

   To what extent was there a clearly known way to solve the problem you just faced? (1 = to no extent at all, 4 = to a moderate extent, 7 = to a large extent) (reverse coded).

2. *Caring about quality and time*:

   To what extent did you care about the quality of the plan produced? (1 = to no extent at all, 4 = to a moderate extent, 7 = to a large extent).

   To what extent did you care about the time taken to produce the plan? (1 = to no extent at all, 4 = to a moderate extent, 7 = to a large extent).

3. *Conflict*:

   Describe the amount of conflict that existed among you all during your discussion. (1 = to no extent at all, 4 = to a moderate extent, 7 = to a large extent).

4. *Deception*:

   How often did you deliberately try to misinform your group members? (1 = never, 4 = moderately often, 7 = very often).

5. *Positive socioemotional communication*:

   y1. How often did your group members display positive feelings (of friendliness, support for your views) towards you during the discussion? (1 = never, 4 = moderately often, 7 = very often).

   y2. Describe the NUMBER OF STATEMENTS made by your group members that made you feel good (for example, statements that evoked *laughter*, statements that indicated *friendliness* towards you, statements that indicated *support* for your views)? (1 = none at all, 4 = a moderate number, 7 = many).

6. *Negative socioemotional communication*:

   y3. How often did your group members display negative feelings (of hostility, rejection of your views) towards you during the discussion? (1 = never, 4 = moderately often, 7 = very often).

   y4. Describe the NUMBER OF STATEMENTS made by your group members that made you feel bad (for example, statements that indicated *hostility* towards you, statements that indicated *rejection* of your views)? (1 = none at all, 4 = a moderate number, 7 = many).

7. *Satisfaction with the process*:

   y5. Describe your level of satisfaction with the problem solving process you went through today. (1 = not satisfied at all, 4 = moderately satisfied, 7 = very satisfied).

8. *Agreement*:

   y6. If YOU were to propose a plan at the end of your group meeting, describe how different would it be from the one proposed by your group? (1 = not different at all, 4 = moderately different, 7 = very different).

   y7. To what extent are your views about the topic of discussion DIFFERENT from those of others in your group? (1 = to no extent at all, 4 = to a moderate extent, 7 = to a large extent).

   y8. Describe the similarity of your views to those of others in your group about the topic of discussion? (1 = very different, 4 = moderately different, 7 = very similar).

9. *Acceptance*:

   y9. How often did you accept somebody's view without holding the same view yourself? (1 = never, 4 = moderately often, 7 = very often).

   y10. What portion of the plan your group proposed was such that YOU would have proposed it differently but you nevertheless accepted it? (1 = a small portion, 4 = a moderate portion, 7 = a large portion).

   y11. To what extent did you accept the views of others without holding the same views yourself? (1 = to no extent at all, 4 = to a moderate extent, 7 = to a large extent).