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# Computer-Mediated Communication and Group Decision Making

## A Functional Perspective

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This study adopts the functional perspective of group decision making as the theoretical framework to examine the differences between computer-mediated communication groups and face-to-face communication groups in terms of their decision-making process and performance. A field experiment was adopted by the study, which was built into a communication course involving two classes in a national university in northern Taiwan. These classes comprised 23 groups of 4 or 5 members each working for their final group projects. Of the 23 groups, 11 (51 persons) were randomly assigned to perform the task via computer-mediated communication, and the remaining 12 groups (61 persons) via face-to-face communication. The data analysis shows that most findings of the study confirm the notions of media-capacity theories. However, the findings of this study do not support the propositions of the functional perspective of group decision making. More detailed findings are discussed in the article.

**Keywords:** *functional theory; group decision making; group communication; computer-mediated communication; face-to-face communication*

Small groups have become an essential part of many organizations in that organizations rely on small groups to perform various tasks related to the organization's operations; thus the issue of group effectiveness has

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received significant attention from both scholars and practitioners. Many factors have been identified as impacting the effectiveness of group performance. Among these factors, the quality of group communication has been consistently discovered to play an important role. A great number of studies have found that the quality of group communication has a significant impact on the effectiveness of the subsequent group decision making. Hence, much effort has been exerted to identify the characteristics of group communication that are able to differentiate effective decision-making groups from ineffective ones (Collins & Guetzkow, 1964; Gouran & Hirokawa, 1983; Harper & Askling, 1980; Hirokawa, 1992; Hirokawa & Salazar, 1999; Kuhn & Poole, 2000; Li, 1998; Salazar, Hirokawa, Propp, Julian, & Leatham, 1994). The functional theory represents one of these efforts that have been made to account for the relationship between communication and group effectiveness. The core notion of this perspective is that several critical task requirements have to be performed for a group to achieve high-quality decision making, and the group relies on group interaction to satisfy these critical task requirements. Therefore, effective decision-making groups are characterized by interactions that are able to successfully satisfy their task requirements, whereas ineffective groups lack these characteristic interactions (Gouran & Hirokawa, 1996, 2003; Hirokawa, 2003; Hirokawa, Erbert, & Hurst, 1996). Many studies have been conducted to examine the propositions suggested by the functional perspective, and most have been confirmed by empirical findings. The functional perspective has thus emerged as a major paradigm in the group decision-making literature (Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002).

With the rapid development of the Internet in society, contemporary organizations tend to adopt this technology to achieve organizational efficiency, and thus computer-mediated communication has become an integral component of the organization's operations. Computer-mediated communication (CMC) allows members to work in their group without having to meet face to face, which has significant savings in terms of resources and time for organizations. In particular, as the use of synchronous, text-based messaging systems becomes prevalent in society, more and more organizations are conducting their teamwork via CMC. Although organizations are eager to reap the benefits from integrating computer networks in their group work, they are also concerned about the outcome of CMC group performance. With the increased use of CMC group decision making in organizations, many studies have been conducted to examine the issue as to whether CMC increases or decreases group performance and what the effectiveness of CMC groups is when compared with that of face-to-face

(FTF) groups (Adams, Roch, & Ayman, 2005; Baltes et al., 2002; Becker-Beck, Wintermantel, & Borg, 2005; Flanagan, Park, & Seibold, 2004).

Baltes et al. (2002) conducted a meta-analysis of the studies that compared CMC group decision making with FTF group decision making and found that although the functional perspective of group decision making has become a dominant paradigm in the existing literature, there are no studies so far that apply the functional perspective to examine the differences between the decision making of CMC groups and that of FTF groups. This study seeks to fill this void in the literature by adopting the functional perspective as the theoretical framework in which to investigate the differences between CMC groups and FTF groups in terms of their decision-making process and performance.

## Literature Review

### The Functional Perspective

The notion behind the functional perspective is that a positive and direct relationship exists between the critical thinking employed by group members and their performance, and furthermore the amount of critical thinking employed by group members can be assessed by measuring the degree to which certain important communication functions are performed by means of group interaction. Thus, this theory argues that the degree to which these important communication functions are performed by a group determines the probability that the group will perform its task successfully. This perspective identifies five critical task functions that group communication needs to perform for a group to arrive at high-quality decision making. These five critical task requirements are: (a) to thoroughly and accurately understand the problem in its decision-making task, which includes the nature, the seriousness, and the possible causes of the problem, as well as the consequences when not solving the problem effectively; (b) to establish the criteria for an acceptable decision, which are the specific standards that a good decision should have; (c) to generate as many of the possible and realistic choices as it can from which a best decision can be made; (d) to assess the positive aspects of each alternative; and (e) to discuss the negative aspects of each alternative (Gouran & Hirokawa, 1996, 2003; Orlitzky & Hirokawa, 2001).

Of the many studies that have applied the functional perspective, three of the five functions—namely, problem analysis, criteria establishment,

and assessment of the negative consequences of alternatives—have been consistently discovered to be positively linked to group effectiveness, whereas the assessment of the positive consequences of alternatives has been found to have a moderate effect on group effectiveness, with some studies having found a significant effect and others having not. The effect in terms of generating alternatives has varied from one study to another, with most studies having a limited impact on group effectiveness. Furthermore, a few studies have examined the relationships between two other functions, namely, the establishment of task procedures as well as socioemotional talk and group effectiveness, and have found that the two functions had a negative effect on group performance. The possible reason for the finding that task procedures and socioemotional talk have a negative impact on group effectiveness may be that most groups have a limited amount of time in which to accomplish their tasks. If they spend too much time on these two functions, this will in turn reduce the time they have available for the other more important task functions (Hirokawa & Salazar, 1999; Orlitzky & Hirokawa, 2001).

The functional perspective has received general support from most of the empirical studies, but there appear to be some inconsistencies that indicate that the significance of the five functions in terms of group effectiveness varies from one study to another. Hirokawa and his associates (Hirokawa, 1990; Hirokawa & Salazar, 1999; Orlitzky & Hirokawa, 2001) attributed these inconsistencies to the nature of the task employed, contending that input variables will become more important than process variables when the tasks are simple. However, as the group tasks become more complex, the five functions will play a more critical role in group performance.

## **Computer-Mediated Group Decision Making**

When investigating computer-mediated group decision making, media capacity theories have been frequently employed to account for the effect of CMC on group decision making (Daft & Lengel, 1986; Daft, Lengel, & Trevino, 1987). The media richness theory, the earliest and most representative of the media capacity theories, emphasizes that the match between task ambiguity and the richness of a communication channel is the key for managers to achieve communication effectiveness. Communication media in organizations vary from one type to another in terms of their information-carrying capacity, with rich media having a high degree of information-carrying capacity and lean media a low degree. This theory suggests that when the task ambiguity is high, multiple interpretations and solutions are possible, and thus a medium with a high degree of information-carrying

capacity is necessary for the task to be handled effectively. However, when the task ambiguity is low, a lean medium is sufficient because the task is simple and predictable. This theory uses the following four criteria to classify organizational media in terms of information-carrying capacity: (a) the speed of feedback; (b) the capacity to carry multiple cues, such as verbal and nonverbal cues; (c) the ability to use natural language; and (d) the degree of personal focus. Based on the four criteria, FTF communication is the richest medium because it allows communicators to have instant feedback, to carry both verbal and nonverbal cues, to use the most natural language, and to have the highest degree of personal focus. In contrast written communication channels such as emails tend to be quite the opposite, and hence they are lean media.

The social-information-processing theory takes a similar view to that of the media richness theory, but it adds one more variable (i.e., the social influence in organizations) to explain the perceived degree of information-carrying capacity of a communication channel. The notion of this theory is that the match between task ambiguity and the degree of media richness is still critical for managers to achieve communication effectiveness. However, managers are not so accurate in differentiating one medium from another with regard to their media richness, and their perception of media richness is more often than not influenced by their personal experiences as well as the attitudes of other employees, rather than by the objective characteristics of communication channels. Based on this model, some lean media, such as e-mail, may be perceived to be relatively rich if most people in an organization favor using them and are skilled at using them (Fulk & Collins-Jarvis, 2001; Fulk, Schmitz, & Steinfield, 1990).

According to either the media richness theory or the social-information-process theory, CMC is a more restricted medium than FTF communication; hence whether CMC groups are more effective than FTF groups depends a great deal on the complexity of their tasks. When the task is complex, FTF groups should perform much better than CMC groups because their members need rich media to engage in a great deal of coordination, persuasion, and expression of opinions in their group interactions. In contrast, when the task is simple, CMC should be a sufficient channel for groups to accomplish their tasks, and thus CMC groups will perform just as well as FTF groups.

The existing literature in general confirms the perspectives proposed by the media-capacity theories using the following findings: First, compared with FTF groups, CMC groups took from 4 to 10 times longer to finish their tasks because the lack of nonverbal cues made it difficult for the groups to

understand each other (Adams et al., 2005; Althaus, 1997; Baltes et al., 2002; Hancock & Dunham, 2001; Smith & Hayne, 1997). Second, CMC groups were less effective than FTF groups when they were performing tasks that required a great deal of communication. Many studies have applied McGrath's (1984) task complex to classify tasks into four types (i.e., generating, choosing, negotiating, and executing). The four types of tasks differ from each other in terms of the amount of communication required for completing the tasks, with the choosing and negotiating tasks demanding more time than the others. The majority of studies show that CMC groups were less effective than were FTF groups when performing the tasks of choosing or negotiating under the condition that CMC groups were nonanonymous. However, when CMC groups were anonymous, they were as effective as FTF groups (Adams et al., 2005; Baltes et al., 2002; Becker-Beck et al., 2005). Third, CMC groups were less satisfied than were FTF groups in terms of the process and outcomes. Past studies show that when performing the tasks that required a lot of communication, CMC groups, because of the lack of social context cues, felt more frustrated with the process and group outcomes than did FTF groups. Furthermore, nonanonymous CMC groups without a time limit were discovered to be as satisfied as FTF groups, whereas anonymous CMC groups were found to be less satisfied than were FTF groups (Adams et al., 2005; Baltes et al., 2002; Barkhi, Jacob, & Pirkul, 1999; Ocker & Yaverbaum, 1999; Smith & Hayne, 1997; Straus, 1996).

## Research Questions and Hypotheses

As stated above, the functional perspective stresses the importance of the successful performance of critical functions in interactions involving groups in order to have high-quality decision making. Furthermore, three critical functions—problem analysis, criteria establishment, and assessing the negative consequences of alternatives—have been found consistently to have a significant effect on group effectiveness. In addition, empirical studies also confirm that the performance of these critical functions by means of interactions has become critical for group effectiveness when performing complex tasks, whereas input variables have become more important in terms of performing simple tasks (Hirokawa & Salazar, 1999; Orlitzky & Hirokawa, 2001). The literature on CMC group decision making demonstrates that CMC groups are less effective than are FTF groups when dealing with the tasks that require a great deal of communication and that CMC groups are much worse than FTF groups in terms of

communication effectiveness. Based on my literature review, this study develops the following hypothesis:

*Hypothesis 1a:* Faced with a complex task, FTF groups are able to perform the three functions—problem analysis, criteria establishment, and assessing the negative consequences—more successfully than are CMC groups

*Hypothesis 1b:* Hence, FTF groups perform better than do CMC groups in terms of group outcomes.

The existing studies on the functional perspective show that very few studies have examined the effect of task-procedural functions and socioemotional talk on group performance, and only a few studies have found that the two functions had a negative impact on group performance (Orlitzky & Hirokawa, 2001). Moreover, the studies on CMC groups indicate that, because of a lack of nonverbal cues, the CMC groups have had a much smaller amount of socioemotional talk than do FTF groups (Walther, Anderson, & Park, 1994). The existing literature does not have conclusive findings regarding the task-procedural function and socioemotional talk; thus this study uses a research question to investigate this issue.

*Research Question 1:* Compared with FTF groups, what are the task-procedural function and socioemotional talk in CMC groups? And how are these two functions related to group outcomes?

The extant studies on the functional perspective do not have consistent findings regarding the two functions, namely, generating alternatives and assessing the positive consequences of alternatives (Orlitzky & Hirokawa, 2001). Therefore, this study again uses a research question to explore this issue.

*Research Question 2:* Compared with FTF groups, what are the functions for generating alternatives and assessing the positive consequences of alternatives in CMC groups, and how are the two functions related to group outcomes?

## Research Methodology

The existing small group studies are criticized for their use of zero-history groups because these types of groups seldom exist in real organizations, thus the findings from zero-history groups may not be applicable to real-life situations. Therefore, this study has adopted a field experimental design (Wimmer & Dominick, 2003) to compare FTF and CMC groups in terms of their communication effectiveness and group outcomes.



## The Field Experiment

The experiment was built into a communication course with two classes in a national university in northern Taiwan. There were 23 groups of 4 or 5 members each working for their final group projects. These groups were created at the beginning of the semester and were required to complete a class exercise over the course of a week just 1 month before the semester ended. Hence, when group members worked on this class exercise, these groups had been working together for almost two thirds of the semester. The class exercise, a winter survival task, asked the groups to choose 10 out of 30 items for survival in winter that they would have to rely on until a rescue team found them after their plane crashed in a forest in Northern Canada. Ten of the 30 items were the most important items needed for people to survive in winter, 10 were the second most important, and the remaining 10 were useless items. Ten points were to be given for each of the most important items, 5 points for each of the second most important items, and 0 points for each of the useless items. This task was a type of intellectual task that contained problem solving with verifiably correct answers; it was also one of the tasks of choosing in McGrath's (1984) task complex.

Eleven of the 23 groups (51 persons) were randomly assigned to perform the task via CMC, and the remaining 12 groups (61 persons) via FTF communication. For the CMC groups, a website was created for them in which members were able to enter their own chat rooms to discuss the task with their group members. Group members had to set up a time beforehand and went to the chat rooms simultaneously. Group members were told that there was no time limit. When they logged in, first of all, they had to read the instructions regarding how to complete the task and then they started the text-based discussion. Their discussion was automatically recorded for later analysis. After they finished the task, they were also required to fill out the questionnaire separately and send it back via e-mail to the research assistant. For the FTF groups, each of the 12 groups had to sign up for a time with the research assistant, and each group came to the laboratory room at the assigned time. After the group members sat down around a table in the laboratory, they were given the task and the instructions regarding how to complete the task. Group members were told that there was no time limit, and when they finished their discussions, they called the research assistant, who came to pick up the finished task. Their group discussions were videotaped, and after completing their task, they were instructed to fill out the questionnaire separately and to give it to the research assistant. The winter survival task was translated into Chinese and was checked by three graduate

students who were bilingual to make sure that the translation was correct and understandable to Taiwanese students. The subjects did not have any knowledge of the study purpose, and they regarded this task as one of their course requirements.

## Major Variables

One of the major variables in this study was communication quality that was measured by the performance of the five critical functions in terms of group interactions that have been identified by the functional scholars. The five functions are: (a) the task-relevant function, which is performed by communicative acts to understand the group's task or assignment; (b) the problem-analysis function, which is performed by communicative acts to define the problem and to understand the problem; (c) the criteria-relevant function, which is performed by communicative acts to establish a set of criteria in order for a group to evaluate the available alternatives; (d) the positive-evaluation function, which is performed by communicative acts to evaluate the positive consequences of one alternative if it is adopted; and (e) the negative-evaluation function, which is performed by communicative acts to evaluate the negative consequences of one alternative if that alternative is adopted. In addition to the five critical functions, this study also examined two other functions: (f) the task-procedure function, which is performed by communicative acts to understand the procedural aspects of performing the task; and (g) the socioemotional function, which is performed by communicative acts to entertain group members or to release tension in group interactions.

The second major variable of the study was group outcomes that were measured by means of two methods: the objective group outcomes, which were the scores that groups obtained by performing the winter survival task; and the perceived group outcomes, which were assessed by asking group members a set of questions regarding their perceptions of group performance, communication quality, and their personal contribution to the group task.

## Data Coding

Interaction analysis is a coding scheme that uses standard procedures to examine verbal behaviors in terms of functions, meanings, and patterns embedded in communication (Putnam & Fairhurst, 2001). This study adopted interaction analysis to analyze the performances of the functions identified by the functional scholars in group discussions to measure the

quality of group communication. The functional coding scheme developed by Hirokawa (1987) was employed to examine how well each group performed those important functions that had been identified by the functional scholars. This study used communication utterances of 2 min instead of a speech act as a unit of analysis because the researcher found that a speech act was too short to assess accurately how well it performed a communication function, and there were too many speech acts that were too short to be coded accurately. A communication utterance of 2 min contains about 20 speech acts, and a speech act was defined as "an uninterrupted verbal utterance; the speech act begins when a speaker starts talking and ends when he or she finishes" (Fisher & Ellis, 1990, p.130).

Two coders were first instructed to get familiar with the definitions of the seven communication functions. Then, using a communication utterance of 2 min as a unit, they recorded which of the seven functions this unit performed and how well (from 1 to 7) this unit performed the specific function. Furthermore, when several functions were performed in one unit, this unit was broken into as many units as there were functions performed. Two graduate students were trained as coders for the functional coding, and they did not have any knowledge of the study purpose. Two types of coder reliability, unitizing and categorizing, were calculated for the functional coding. The procedure provided by Guetzkow (1950) was used to calculate coder reliability. This formula has two levels: .01 and .05. The more conservative level (i.e., .01) was applied to the calculations of both the unitizing and the categorizing reliability. Guetzkow's procedure for categorizing reliability is regarded as a conservative estimate of reliability because it takes not only the observed agreement between the coders into consideration, but also the total number of units coded ( $N$ ), as well as the number of categories ( $K$ ) used to code those units. The unitizing reliability varied from 95.9% to 100%, with an average of 98.5% for the 23 groups. Categorization reliability ranged from 75% to 93% with an average agreement of 84%.

Moreover, after the coders decided which of the seven functions were performed by a unit, they also had to assess how well this unit performed that specific function (from 1 to 7, with 7 indicating that the function was well performed, and 1 indicating that the function was not performed not at all). Ebel's procedure (1951) was employed to estimate the reliability of the two coders' ratings in terms of how well each unit performed a specific function. The procedure was chosen because it permitted the researcher to include the between raters variance as part of the error variance in the calculation of reliability. In addition, Ebel's procedure was regarded as a convenient and useful method to estimate the reliability of ratings in that it

was derived from the familiar Analysis of Variance (ANOVA) statistic. The reliability of the two coders in regard to the function of problem analysis was .84, for criteria establishment .77, for generating alternatives .69, for the assessment of positive consequences .75, for the assessment of negative consequences .86, for the task procedural function .92, and for the socioemotional function .83.

## Factor Analysis

The study used 22 questions with a 7-point scale to measure group members' perceived group outcomes. The responses to these questions were processed by the SPSS package for the factor analysis of principal components using the varimax rotation. Five factors were extracted from the 22 questions. (See Table 1.)

The first factor contained 10 items, all of which were about members' satisfaction with both the process and group performance and thus was referred to as Perceived Group Performance. The second factor had five items, all of which were concerned with the quality of communication in group discussions and was hence referred to as Perceived Communication Quality. The third factor contained four items that were related to the work pressure associated with the task and was thus referred to as Task Pressure. The fourth factor had three items and was referred to as Perceived Personal Performance because the three items asked members about their personal contribution to the group interaction. The last factor contained only one item and was deleted from the subsequent analysis. After the factor analysis, a reliability analysis was performed on each of the factors. The Cronbach alphas for all four factors were greater than .80, indicating a relatively high internal consistency for each factor.

## Research Findings

### Comparisons Between CMC and FTF Groups

*Group level.* In the functional coding, the coders were instructed not only to identify the number of times each function was performed in each group interaction, but also to measure how well each unit performed the specific function. In this study, I calculated two types of objective group outcomes: One was to count the total points for the 10 items chosen by each group, and the other was to assess how accurate the reasons were for selecting each of

**Table 1**  
**Factor Analysis of Perceived Group Outcomes**

Variables	Factor 1	Factor 2	Factor 3	Factor 4
Perceived group performance				
Employing the best way	.601	.116	-.152	.285
Good understanding	.644	-.052	-.155	.387
Satisfied with outcomes	.704	.433	-.090	.209
Identified with outcomes	.665	.348	-.036	.333
Communication helps	.735	-.047	-.183	.226
Equal contribution	.708	.247	-.019	.196
Being cohesive	.503	.318	.111	.260
Process satisfaction	.633	.559	-.024	.242
Smooth communication	.732	.257	-.103	.068
Communication is necessary	.746	.165	-.083	-.013
Perceived communication quality				
Efficient communication	.494	.630	-.155	.038
Right direction of discussion	.525	.602	.096	.209
Open communication	.197	.734	-.136	.168
Easy to make decisions	.128	.759	-.269	.141
Task pressure				
Time pressure	-.171	-.240	.731	.122
Being emergent	-.134	.035	.832	-.105
Deciding immediately	-.117	-.033	.828	.032
A complete task	.104	-.182	.741	-.132
Perceived personal performance				
Play an essential role	.275	.185	-.043	.837
Consulted by members	.296	.139	.027	.679
Contributing to discussion	.147	.163	-.049	.831
Eigenvalues				
	8.526	2.529	1.516	1.308
Percentage of variance explained				
	24.344	13.505	12.348	11.814
Alpha				
	.9128	.8075	.8137	.8072

the items. Therefore, this study came up with two types of objective group outcomes—the total points for the task and the total points for the reasons. Several *t* tests were conducted to compare the CMC and FTF groups in terms of the time spent for each group discussion, the total units in each group interaction, the number of times each of the seven functions was performed in each group discussion, how well each function was performed in a group, and the two types of objective group outcomes. The results are summarized in Table 2.

The data in Table 2 demonstrate that CMC groups differed significantly from FTF groups in light of the total units in each group and in terms of the

**Table 2**  
**Comparisons Between Face-to-Face (FTF,  $n = 12$  Groups) and**  
**Computer-Mediated Communication (CMC,  $n = 11$  Groups)**  
**Communication Groups**

Comparisons by Function	Number of Times Function Was Performed		Quality of Function Performed	
	<i>M</i>	<i>t</i>	<i>M</i>	<i>t</i>
Problem analysis				
FTF	4.25	2.613*	15.25	2.578*
CMC	2.00		6.82	
Criteria establishment				
FTF	12.17	3.537**	40.58	3.262**
CMC	5.55		18.64	
Generating alternatives				
FTF	15.08	0.533	40.67	.796
CMC	12.64		31.55	
Assessing positive consequences				
FTF	15.33	3.468**	41.42	3.117**
CMC	9.64		25.64	
Assessing negative consequences				
FTF	0.58	1.244	1.92	1.231
CMC	0.18		0.55	
Task-procedural				
FTF	5.67	-1.961	18.67	-2.583*
CMC	8.27		38.00	
Social talk				
FTF	6.25	2.581*	22.67	
CMC	1.64		5.82	2.447*
Overall Comparisons		<i>M</i>		<i>t</i>
Time				
FTF		47.25 min		-1.826
CMC		95.27 min		
Total units				
FTF		62.08		2.817**
CMC		39.91		
Points for the task				
FTF		77.08		0.988
CMC		74.55		
Points for the reasons				
FTF		69.00		0.333
CMC		68.18		

\* $p < .05$ . \*\* $p < .01$ .

number of times that the problem analysis, criteria establishment, assessing positive consequences of alternatives, and socioemotional functions were performed in each group interaction. The CMC and FTF groups also differed significantly in the quality of problem analysis, criteria establishment, assessing the positive consequences of alternatives, task-procedural, and socioemotional functions. This study found that the CMC groups took about two twice as long as the FTF groups did to complete the task, but the total number of communication units in the CMC groups was only about one half those in the FTF groups. The FTF groups were discovered to have a significantly higher means than the CMC groups in terms of the number times the four functions (problem analysis, criteria establishment, assessing the positive consequences of alternatives, and socioemotional) were performed. Similarly, the FTF groups were also found to perform significantly better than the CMC groups in terms of the quality of these same four functions. However, the CMC groups were not found to be better than the FTF groups in terms of the quality of the task-procedural function.

Four hierarchical multiple regression analyses were conducted to understand the relationships between the two types of objective group outcomes and the number of times each of the seven functions was performed in the course of the group interactions, as well as the relationship of these objective group outcomes to the quality of performance of the seven functions. The results are summarized in Tables 3 and 4.

Table 3 demonstrates that among the eight variables included in the hierarchical multiple regression analysis, only the number of times the socioemotional function was performed was negatively correlated with the total points for the group task,  $B = -.669, p < .05$ . A similar finding was also discovered (Table 3) for the dependent variable showing that the only significant predictor of the total points for the reasons was the number of times the socioemotional function was performed,  $B = -.778, p < .01$ .

The data in Table 4 also show a similar pattern, indicating that among the eight predictors, only the quality of the socioemotional function had a significant, negative effect on the two types of objective group outcomes—the total points for the group task,  $B = -.659, p < .05$ , and the total points for the reasons,  $B = -.674, p < .05$ .

*Individual level.* In addition to comparing the CMC groups with the FTF groups at the group level, this study also measured the differences between the two types of groups at the individual level—the members' perceived group outcomes. Four *t* tests were conducted to explore the differences between group members in the CMC condition and those in the

**Table 3**  
**Hierarchical Multiple Regression Analysis for Group Outcomes I**

Predictor Variables	Standardized B	
	Objective Outcome 1	Objective Outcome 2
Problem analysis	.344	.293
Criteria establishment	-.101	.159
Generating alternatives	.092	.209
Positive consequences	-.030	-.291
Negative consequences	.026	.237
Task-procedural function	.026	-.112
Social talk	-.669*	-.778**
Multiple <i>R</i>	.570	.735
Adjusted <i>R</i> <sup>2</sup>	.009	.325
Media	-.437	-.252
Multiple <i>R</i>	.624	.749
Adjusted <i>R</i> <sup>2</sup>	.040	.311
Increased <i>R</i> <sup>2</sup>	0.031	-0.014

Note: objective outcome 1 = the points for the task; objective outcome 2 = the points for the reasons.  
 \* $p < .05$ . \*\* $p < .01$ .

**Table 4**  
**Hierarchical Multiple Regression Analysis for Group Outcomes II**

Predictor Variables	Standardized B	
	Objective Outcome 1	Objective Outcome 2
Problem analysis	.171	.199
Criteria establishment	.020	.254
Quality of generating alternatives	.150	.247
Quality of positive consequences	.108	-.321
Quality of negative consequences	.096	.259
Quality of procedural function	.062	-.079
Quality of social talk	-.659*	-.674*
Multiple <i>R</i>	.593	.733
Adjusted <i>R</i> <sup>2</sup>	.049	.321
Media	-.341	-.173
Multiple <i>R</i>	.629	.741
Adjusted <i>R</i> <sup>2</sup>	.050	.290
Increased <i>R</i> <sup>2</sup>	.001	-0.031

Note: objective outcome 1 = the points for the task; objective outcome 2 = the points for the reasons.  
 \* $p < .05$ .



**Table 5**  
**Comparisons Between Face-to-Face (FTF,  $n = 61$  Individuals) and**  
**Computer-Mediated Communication (CMC,  $n = 51$  Individuals)**  
**Communication Groups for Perceived Outcomes**

	<i>M</i>	<i>t</i>
Group performance		
FTF	61.9180	-1.823
CMC	59.1961	
Communication quality		
FTF	24.0000	-1.604
CMC	22.7255	
Task pressure		
FTF	12.9180	2.576*
CMC	15.7059	
Personal contribution		
FTF	15.8361	0.114
CMC	15.9020	

\* $p < .05$ .

FTF condition regarding perceived group performance, perceived communication quality, perceived task pressure, and perceived personal contribution. The results of the  $t$  tests are summarized in Table 5.

The data in Table 5 show that group members in the CMC condition differed significantly from those in the FTF condition only in the mean of perceived task pressure, indicating that group members in the CMC condition perceived a significantly higher degree of task pressure than did those in the FTF condition.

## Discussion

### Communication Quality in CMC and FTF Groups

The first research hypothesis of the study predicts that FTF groups will perform the three functions—problem analysis, criteria establishment, and assessing negative consequences—better than CMC groups, and that FTF groups are more effective than CMC groups in terms of group performance when performing a complex task. The research results show that FTF groups performed better than CMC groups, both quantitatively

and qualitatively, in two of the three critical functions—problem analysis and criteria establishment; hence the prediction of Hypothesis 1a was, in general, supported by the findings of the study. However, the data analysis indicates that there were no significant differences between the FTF and CMC groups in terms of the two objective group outcomes—total points for the task and total points for the reasons. Furthermore, three of the four perceived group outcomes—perceived group performance, perceived communication quality, and perceived personal performance—were discovered to have no differences between the CMC and FTF groups. The only difference between the two types of groups was that members in the CMC groups felt a significantly higher degree of task pressure than did those in the FTF groups. Therefore, the prediction of Hypothesis 1b was not supported by the research data.

This study found that CMC groups were significantly less efficient than FTF groups in terms of communication effectiveness: CMC groups not only performed the critical functions less frequently, they were also qualitatively worse than their FTF counterparts, which is congruent with the view of media-capacity theories (Fulk & Collins-Jarvis, 2001). Furthermore, this study also discovered that CMC groups used double the time to complete their tasks but only produced one half the communication units of their FTF counterparts. Therefore, this finding is consistent with the existing literature in that CMC groups took a longer time than did FTF groups to complete their tasks (Baltes et al., 2002).

This study predicted that FTF groups will perform communication functions more successfully and thus have better performance than their CMC counterparts; however, findings showed only that the FTF groups performed their communication functions better, but did not have better group outcomes than did the CMC groups. This finding is contrary to the functional perspective, which asserts that better communication quality leads to a superior group performance. There are two possible explanations for this unexpected finding. First, the study employed a winter survival task for the experiment. This task belongs to one of the choosing tasks in McGrath's task complex, but it actually was not difficult enough to generate the differences in terms of group performance in the two types of groups. In particular, this study had no time limit for the subjects in both the CMC and FTF conditions, which gave the CMC groups more time to increase the quality of their communication. Therefore, although this study found significant differences between the two types of groups in terms of the performance of their communication functions, the differences were not great enough to produce variations in the group effectiveness. Future studies should therefore try to use more difficult

tasks, such as decision-making tasks or negotiating tasks to clarify this issue. Second, this study had only 23 groups to compare the differences between the CMC and FTF groups, and the sample size may have been too small to have statistical significance. When more groups are recruited, this study may be able to arrive at a significant link between the quality of group communication and group effectiveness.

## **The Task-Procedural Function and Socioemotional Talk**

The first research question of the study tried to compare the differences between the CMC and FTF groups regarding the two additional functions—the task-procedural and socioemotional functions—and to examine the relationships between group effectiveness and the two functions. The study data demonstrate that FTF groups were found to perform the socioemotional function more frequently and their functions were of higher quality than those of CMC groups, which is consistent with the findings of existing studies that because of a lack of social cues, group members in the CMC environment engaged in significantly less social talk than did those in the FTF condition (Walther et al., 1994). Furthermore, this study also discovered that both the number and the quality of the socioemotional function had a significant, but negative, effect on the two objective groups' outcomes—total points for the task and total points for the reasons. This finding confirms the result obtained in a few studies in the literature that social talk has a negative impact on group effectiveness (Orlitzky & Hirokawa, 2001). The reason for social talk having a negative effect on group performance may be that social talk not only takes away the time that should be used to perform other important functions in group discussions, but it also lowers the degree of vigilant communication that is critical for group effectiveness. This study also found that CMC groups had a better score in terms of the quality of the task-procedural function than the FTF groups did, but did not differ from the FTF groups in the number of the task-procedural functions performed. Moreover, this study did not find a significant relationship between group outcomes and the number or the quality of task-procedural functions performed. Past studies show that the task-procedural function had a negative effect on group effectiveness because when a group spent too much time on this function, this in turn reduced the time for the more important functions (Orlitzky & Hirokawa, 2001). It is possible that the sample size of this study is too small to reveal a significant relationship between this function and group performance. Future studies should employ a greater sample size to further explore this issue.

## Generating Alternatives and Positive Consequences

The second research question compared the two functions—generating alternatives and assessing positive consequences—in the CMC and FTF groups and examined the relationships between the two functions and the group effectiveness. The data analysis shows that the FTF groups performed the assessing positive consequences function more frequently and at a higher level of quality than did the CMC groups did, which is consistent with media-capacity theories that state that FTF communication allows groups to communicate more efficiently than does CMC, a lean communication medium (Fulk, & Collins-Jarvis, 2001). However, this study did not find a significant relationship between the performance in terms of assessing the positive consequences of alternatives and group performance. The possible explanations for this finding should be the same as those for Hypothesis 1a, namely that the task employed in the study is not difficult enough to generate a significant relationship between this function and group performance, and the sample size may be too small to reveal statistical significance.

The study data show that the CMC and FTF groups did not differ from each other in terms of either the number of times the generating alternatives function was performed or the quality of performance of this function. Furthermore, no significant relationship was discovered to exist, either between the number of times the function was performed or its quality, and group performance. These findings are congruent with past studies that discovered that the function of generating alternatives had a limited effect on group performance. This study also found that the function of generating alternatives did not exert a significant influence on group performance (Hirokawa & Salazar, 1999; Orlitzky & Hirokawa, 2001).

## Conclusions

This study has adopted the functional perspective of group decision making to examine how CMC affects group performance, and the data analysis shows that most of the findings of the study support the notions of media-capacity theories. However, the findings of this study do not support the propositions of the functional perspective of group decision making. Thus future studies should try to employ a more complex task as well as a greater sample size to further investigate this issue. Moreover, this study closely examined group discussions and arrived at the following two unexpected findings. First, very few conflicts occurred in the interactions of the

23 groups. The possible explanation for this finding is that this study engaged Chinese students who belong to a collectivistic culture. People in collectivistic cultures very much cherish harmonious relationships among group members (Chen & Chung, 1994; Kim, Aune, Hunter, Kim, & Kim, 2001; Ma & Chuang, 2001); thus this study found that very few conflicts emerged in the group discussions. Second, group members tended to use narratives to justify their choices, and most of the narratives were derived from famous Chinese operas characterized by acrobatic performances. This finding demonstrates that Chinese culture influenced the narratives told in group settings, which should in turn have affected the quality of group communication. Future studies should try to understand how Chinese culture influences the communication behaviors of group members, and how that affects group performance.

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