MIS Quarterly

RESEARCH ARTICLE

MEDIA AND GROUP COHESION: RELATIVE INFLUENCES ON SOCIAL PRESENCE, TASK PARTICIPATION, AND GROUP CONSENSUS[1]

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Abstract

Organizations deploy advanced communication media such as audio and videoconferencing to enhance and extend group communication interactions. However, established groups (i.e., groups with a history of working together) can view and use the same technology differently from groups without any past experiences of working together. This study examines the relative influences of media condition and group cohesion on social presence, task participation, and group consensus. Results from a controlled laboratory experiment with 45 triads of college students working on a decision-making task showed that media condition (audio conferencing vs. desktop videoconferencing) has significantly smaller influences on social presence and task participation than group cohesion in established groups. The study found that influence of group cohesion over social presence is additive, rather than substitutive, to that of media condition. The study also established that task participation played a more important role than social presence in determining the degree of consensus among group members in computer-mediated communication environments.

Keywords: Desktop videoconferencing, group cohesion, social presence, media richness, group history, group consensus, task participation

ISRL Categories: CB0904, AA09, UF, AI0105

Introduction

As communication and network technologies continue to play an increasingly important role in modern organizations, scholars have attempted to explain how users' perceptions of different communication media are formed and how different communication media influence task outcomes. In one category of research, scholars have focused on the media condition. They have argued that mechanical characteristics of media are the primary forces that influence users'

[1]Ron Weber was the accepting senior editor for this paper.

perceptions of communication interactions, as well as their task performance (e.g., Daft and Lengel 1984, 1986; Dennis and Kinney 1998; Rice 1992; Short et al. 1976). This media-dependent perspective focuses on "invariant" mechanical characteristics of media, such as bandwidth, communication cues, and feedback speed. Typically, however, it does not include contextual and social factors that might influence one's perception of technology. A second category of research draws on a more general social construction perspective of technology (Bijker 1995; Orlikowski 1992). Here, scholars have focused instead on how social factors influence users' perceptions of media and media choices, arguing that media in use (that is, socially constructed media) may exhibit different characteristics than media as conceived (e.g., DeSanctis and Poole 1994; Fulk 1993; Fulk et al. 1990; Lee 1994; Markus 1994; Ngwenyama and Lee 1997; Walther 1995; Yates and Orlikowski 1992). These studies have found that social factors, such as cohesion among group members, organizational culture, and norms, profoundly influence the way in which media are used in organizations. However, they usually have not considered the role of different media conditions.

While these two categories of research address different aspects of communication media choice and use, a greater understanding can be gained by considering their findings together. Recently, scholars have started to synthesize the two categories of research (e.g., Burke and Chidambaram 1999; Carlson and Zmud 1999; Chidambaram 1996; Trevino et al. 2000; Webster and Trevino 1995). However, the relative influences of media condition and social factors on individuals' perception and use of communication media have not been compared directly. Accordingly, in this paper, we report the results of research that compares the relative influences of the media condition and group cohesion on social presence, task participation, and group consensus. We argue that, while the media condition itself will influence the degree of social presence and task participation for zero-history groups, group cohesion will have a significantly larger influence on them than media condition for established groups. Social presence here refers to the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationship (Short et al. 1976).

In addition to synthesizing two categories of media research by comparing the influences of media condition and group cohesion on social presence, this paper also contributes to the literature by examining the role of task participation. The small group literature has found that task participation is an important variable that influences the quality of group outcomes (Green and Taber 1980; Hirokawa 1988; Hirokawa and Pace 1983). In communication media literature, users' perceptions of media have been highlighted as the key variable that influences communication effectiveness. However, task participation and various factors that might influence it have not been fully examined in the context of communication media research.

This paper is organized as follows: We first review the existing literature on media perception and the factors that impact it. Next, we develop our research model and present results from a controlled laboratory experiment that involved 45 triads of college students. Finally, we discuss the implications of our findings for future research and management of communication media in organizations.

Theoretical Framework and Research Hypotheses

Media-Dependent Perspective

Until recently, the media-dependent perspective has largely dominated the literature regarding electronic media and its impact on group task outcomes. This perspective presumes that the mechanical characteristics of the electronic communication system are inherent, and that the fit between these characteristics and the type of the task supported by the system determines the task outcomes. Social presence theory and media richness theory are two prominent theories that reflect this perspective.

Social presence theory (Short et al. 1976) regards social presence as a quality inherent in a com-

munication medium. The theory further argues that communication media that convey more cues would lead to a higher degree of social presence. Therefore, media that provide more communication cues are judged as being warm, personal, sensitive, and sociable. Similarly, media richness theory argues that a medium's "richness"—i.e., its ability to change understanding within a time interval (Daft and Lengel 1986, p. 560)—is determined by certain invariant fixed mechanical characteristics of the medium, such as feedback speed, the number of cues, the degree of personalization, and the language variety. Both social presence theory and media richness theory argue that rich media or media with a high degree of social presence are better suited to ambiguous and equivocal tasks that require resolution of different views and opinions among people. Conversely, lean media are better for uncertain tasks that require the quick transmission of information and facts.

Numerous studies using various forms of computer-mediated communication media, such as group support systems and electronic mail, have found that the use of media with a small number of cues and communication channels tends to "depersonalize" the communication interactions (Rice 1984; Siegel et al. 1986; Sproull and Kiesler 1986). Drawing on this stream of literature, Culnan and Markus (1987) suggest that the mechanical characteristics of the system, such as bandwidth and the number of communication cues, alter interpersonal variables. More recently, Sarbaugh-Thompson and Feldman (1998) found that the overall volume of organizational communication declined as the use of electronic mail increased. Much of the lost communication involved greetings.

Not only do the mechanical characteristics of media influence the degree of social presence and media richness, but they also influence task participation among group members. For example, past research examining the impact of a video channel in small group communication and learning has shown that a video channel can distract group members from the focal task. Olson et al. (1995) found that groups communicating with both video and audio channels spent less time stating and clarifying issues when compared with groups communicating with audio only. Festinger and Maccoby (1964) found that a video signal distracted group members' attention from the audio speech content, particularly if it was irrelevant to the focal task. Similarly, Stephenson et al. (1976) observed that audio-only dyads had more task orientation than dyads with both audio and video channels. In education research, Kozma (1986) notes a short window of engagement, during which learners will attend to material presented via a video channel. After this point, their minds shift away from the materials. Phillips and Santoro (1989) noted that lean media steered users away from irrelevant (i.e., non-task) interpersonal interactions by directing attention to the process and content of problem-solving discussion. Similarly, Smolensky et al. (1990) found an inverse relationship between the frequency of social interactions and decision-making success with electronic communication media.

These studies suggest that communication media with high social presence, such as a video channel, might distract individuals from the focal task. The group decision-making literature notes that active task participation is an important antecedent to positive group outcomes (Green and Taber 1980; Hirokawa 1988; Hirokawa and Pace 1983). However, the relationships among communication media, task participation, and the task outcomes in computer-mediated environments have not been studied in the past. Therefore, such mixed empirical results concerning the impact of communication media on task performance might have arisen because of the lack of attention devoted to task participation.

Taken together, the literature reviewed above suggests that the mechanical characteristics of communication media influence task outcomes by influencing (1) the degree of social presence of communication interactions and (2) task participation. More specifically, communication media with many communication cues and channels, such as desktop videoconferencing, would enhance the degree of social presence, thereby improving the quality of outcomes of equivocal tasks. Yet the same media might potentially lower group member task participation, thus hindering effective task performance by the group.

Therefore, in the context of a zero-history group where there is no source of social influence, we hypothesize:

H1: In a zero-history group condition, a video channel will increase the degrees of social presence perceived by the group members.

H2: In a zero-history group condition, a video channel will lower the degrees of task participation of group members.

Social Construction Perspective and Group Cohesion

Past empirical studies have provided mixed support for the core arguments of media-dependent theories (e.g., Daft et al. 1987; Dennis and Kinney 1998; Rice 1992; Russ et al. 1990; Valacich et al. 1994). The inconsistent results of the use of electronic communication technology become more evident when the outcomes of a particular medium are reviewed. For example, while some studies found video technology to be as effective as face-to-face interactions, or more effective than audio-only environments (e.g., Abel 1990; Valacich et al. 1994), others found no significant effect of video technology (e.g., Alavi et al. 1995; Dennis and Kinney 1998; Meader 1995).

Recently, in response to such inconsistent empirical results, researchers have begun to examine the perception of communication media in "social" contexts (e.g., Carlson and Zmud 1999; Chidambaram 1996; McGrath et al. 1993; Walther 1995). In particular, it has been shown that the richness of communication interactions via so-called "lean" media sometimes can be increased among individuals who know each other. For example, Walther argues that lean media still can support the exchange of rich social information among individuals over time. He found that the exchange of social information over leaner media became as effective as richer media over a period of time. Chidambaram also found that the perceived social presence of group support systems increased as group members spent more time with their communication partners, although initially they found the text-based technology constraining.

Carlson and Zmud make a similar argument more forcefully in their channel expansion theory. They identify four experiential factors—experience with the channel, experience with the message topic, experience with the organizational context, and experience with communication partners—that expand individuals' perceptions of the richness of a given medium. They found that familiarity with a communication partner expanded the perceived richness of electronic mail. Similarly, McGrath et al. found that established norms and relationships among group members enabled them to exchange complex and equivocal information via relatively lean communication media. Taken together, these studies point out that social factors such as cohesion and familiarity among group members can significantly influence the way group members perceive communication media. In particular, these studies have found that the members of a group who are cohesive and familiar with one another can perceive mechanically lean communication media as rich media.

While these studies make important contributions to the literature, they have yet to conduct a direct comparison of the relative influence of such social factors and the media condition on group processes and outcomes. In this study, we examined the relative influences of the media condition and group cohesion on group members' media perception and task outcomes.

Group cohesion refers to members' attraction to the group (Hogg 1992, p. 30). It is often described as a psychological force that binds people together (Keyton and Springston 1990). Group cohesion is an outcome of the group development process (Forsyth 1990; Tuckman 1965). Thus, established groups—i.e., groups with a past history of working together—can form different levels of cohesion among members over time (Spink and Carron 1994; Tschuschke and MacKenzie 1989). A number of authors have argued that group cohesion influences both socio-emotional and task-related aspects in the group process (Hagstrom and Selvin 1965; Mudrack 1989; Mullen et al. 1994; Spink and Carron 1994).

Some studies have shown that cohesive group members exhibit more positive, personal, and favorable communication interactions (Hogg 1992; Lott and Lott 1965; Piper et al. 1983). Kerr and Jermier (1978) hypothesized that group cohesion would meet the group members' affiliative needs. Thomas and Griffin (1983), meanwhile, concluded that group cohesion could create a more positive task design, while Narayanan and Nath (1984) found that highly cohesive work groups showed more positive superior-subordinate and peer-to-peer relations. These studies imply that cohesive groups will have sociable, warm, and personal interactions between members, which is likely to enhance the social presence of communication interactions over a given communication medium.

Group cohesion also appears to influence task participation and performance (Evans and Dion 1991; Hogg 1992; Hoogstraten and Vorst 1978; Klein and Mulvey 1995; Narayanan and Nath 1984; Podsakoff et al. 1997; Spink and Carron 1994). According to Klein and Mulvey, to Hogg, and to Lott and Lott, increased task performance by cohesive groups is due primarily to more-frequent, less-inhibited, and improved task-related communication.

We argue, therefore, that group cohesion will increase social presence and task participation among the members of established groups. Drawing on recent empirical findings (Carlson and Zmud 1999; Chidambaram 1996; Walther 1995), we suggest that for established groups, group cohesion will have a greater influence on social presence and task participation than will media condition.

H3: In an established group condition, group cohesion will increase the degrees of social presence perceived by the group members.

H4: In an established group condition, group cohesion will increase the degrees of task participation of group members.

H5: In an established group condition, the influence of group cohesion on social presence and task participation will be larger than that of media condition.

H6: The direct influence of media condition on social influence and task participation will be lower in the established group condition than in the zero-history group condition.

Finally, we argue that social presence and task participation will positively influence task outcomes. Specifically, in the context of decision-making tasks where the desired outcome is a high level of consensus among group members, we expect that a high level of social presence will improve consensus among group members. In this regard, Short et al. (1976) argue that a high level of social presence helps people to overcome and to reconcile their differences of opinion in decision-making tasks. Similarly, Daft and Lengel (1986) argue that a high level of media richness is necessary for a negotiation task, for which the goal is a consensus among group members. The model also posits that a high level of task participation enhances group consensus (McGrath 1984). Thus, we hypothesize:

H7: A high degree of social presence will improve group consensus.

H8: A high degree of task participation by group members will improve group consensus.

Figure 1 presents the research model tested in this study. In this model, we want to compare directly the relative influences of group cohesion and media conditions on social presence and task participation. As shown in diagram (a), we propose that media condition will have a significant influence on social presence and task participation for zero-history groups where there is no source of social influence. However, as shown in diagram (b), we propose that group cohesion will have a significant influence on social presence and task participation for established groups that have developed different levels of cohesion over time. Because zero-history groups have no prior basis for forming group cohesion, we do not include the group cohesion construct in the model for zero-history groups.

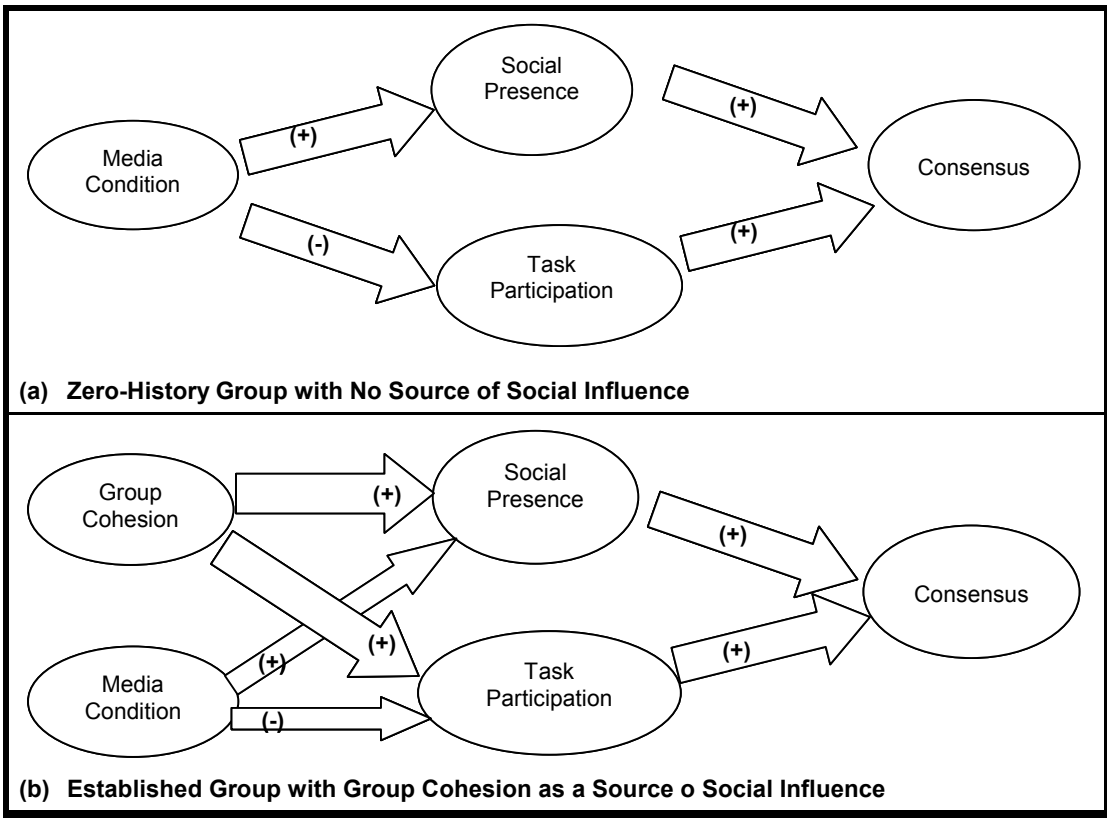


Figure 1. A Conceptual Model of Group History and Electronic Communication Technology

Method

To test our research model and hypotheses, we conducted a laboratory experiment in which we manipulated media (audio conferencing vs. desktop videoconferencing) in two different group history environments (zero-history vs. established). Both were between-subject manipulations.

Participants

Participants were recruited from an undergraduate introductory computer literacy course at a business school at a large state university in the United States. A total of 45 triads (24 audio conferencing and 21 desktop videoconferencing; 24 zero-history and 21 established) participated in the experiments. Among the 135 participants, 51% were female, and the average age was 21 years. No participant had used desktop videoconferencing prior to the experiment.

Task

Past research showed especially mixed results in terms of the role of "rich" media for equivocal tasks. Therefore, we used a task that had no clear decision-making criteria and no demonstrably correct answers. The "Van Management" task (Mennecke and Wheeler 1993) was selected. In this task, the participants were asked to select a recipient of a new van from a group of five sales managers whose biographical information and reasons for needing the van were provided. All participants had exactly the same information, and the goal of the task was to come to an agreement as a group. The groups were allowed to choose

only one recipient. Because the task had no demonstrably correct answer, it was classified as a decision-making task (McGrath 1984).

Independent Variables

Group Cohesion

Zero-history and established groups were recruited from different sections of the same course. Participants in the zero-history group condition were scheduled individually and first met their teammates when they came to the experimental session. To minimize possible in-class contacts among the participants, all the experiments with zero-history groups were completed before the mid-point of the semester.

Participants in the established group condition were asked to form a group of three at the beginning of the semester for a semester-long project. In addition, they were required to complete two computer-programming projects as a group before participating in the experiment. Experimental sessions for the established group condition started after the mid-point of the semester. Thus, by the time these groups participated in the experiment, they could be characterized as established (McGrath 1984). To verify group history, participants were asked at the end of the experiment how many hours they had worked together prior to the experiment. On average, the groups in the established group condition had worked together for 32.6 hours, while those in the zero-history group condition had worked together for fewer than 0.05 hours ($p < 0.001$).

Instead of performing explicit manipulation of group cohesion for the study, we measured the degree of naturally occurring group cohesion among group members in the established group condition during the course of their semester-long project. The degree of group cohesion was measured using Evans and Jarvis' (1986) Group Attitude Scale (GAS). The GAS measures the affective aspect of group cohesion (Evans and Dion 1991). It has been used in previous computer-mediated communication (CMC) research that has examined the influence of technology on group cohesion (Alavi et al. 1995; Anson et al. 1995). The GAS has 20 items on a nine-point scale, whereby 1 = strongly disagree and 9 = strongly agree, such that a higher score represents a higher degree of attraction to the group. The GAS was administered immediately after the session.

Media Conditions

Groups were randomly assigned to a media condition. For the audio conferencing treatment, group members were located in three separate rooms with a three-way conference call and computer application-sharing capability. For the desktop videoconferencing treatment, group members in three separate rooms were connected via desktop videoconferencing systems that provided full motion video, audio, and computer application-sharing.[2] Group members were given a brief introduction to the tool and were asked to perform a warm-up session that lasted about 15 to 20 minutes. The point of this exercise was to familiarize them with the media environments to which they had been assigned.

Mediating Variables

Social Presence

Social presence was measured using the original measure developed and tested by Short et al. (1976). As previously noted, social presence refers to the degree of salience of the other person in the communication interactions and the consequent salience of the interpersonal relationship.

The social presence measure has been used in several empirical studies reported in Short et al., as well as in other studies (e.g., Chidambaram 1996; Straub and Karahanna 1998). A higher score represents a communication interaction with a higher degree of social presence. Four items were measured immediately after the session, using a seven-point semantic anchoring scale.

[2]For this study, AT&T's Visitium systems connected via two ISDN lines that provide a bandwidth of 128 kilobits per second. were used For audio conferencing, the same two ISDN lines were used.

Task Participation

Task participation was measured using the instruments developed and tested by Green and Taber (1980). These are five Likert-type items measured on a five-point scale. A higher score represents a higher degree of participation in the task process.

Dependent Variable

Consensus

Group consensus was measured by examining the changes in each participant's decision preferences after his or her group had reached a consensus. Immediately after the session, each participant was asked how the decision should be made, independent of what the group had decided. We then counted the number of participants who picked an alternative sales manager —that is, a manager who was different from the one that was chosen by the group—as the recipient of the van in the case (minimum = 0, maximum = 3). If the group reached a high level of consensus, individual participants would show no shift from the manager selected by the group. As such, a low number of individual members who shifted their choices indicates a high degree of consensus among group members.

Analyses

We performed our analyses at the group level. In order to ensure that participants' perceptions could indeed be aggregated at the group level, we examined whether sufficient convergence existed among participants in each group on all perceptual measures. An inter-rater reliability coefficient (James coefficient) was used to examine the intra-group reliability of responses (James et al. 1984). The average intra-group reliability scores for the perceptual variables used in this study ranged from 0.74 to 0.86. This demonstrates that sufficient convergence existed among participants in a group, based on these measures. We then calculated the average scores of the individual items for each group and used those scores in our analysis at the group level.

We used a structural equation modeling technique called Partial Least Squares (PLS).[3] Among the many benefits of structural equation modeling tools, compared to traditional multivariate statistical methods such as MANOVA or multiple regression combined with exploratory factor analysis, is their capacity to estimate simultaneously both the structural component (i.e., path model) and the measurement component (i.e., factor model) (Fornell and Bookstein 1982; Fornell and Larcker 1981; Hayduck 1987; Loehlin 1992). We chose PLS among several structural equation modeling tools, including EQS, AMOS, and LISREL because, unlike other tools, PLS does not require a large sample size (Barclay et al. 1995; Fornell and Bookstein 1982). Furthermore, PLS is more suitable when the objective is causal-predictive testing, rather than testing an entire theory (Barclay et al. 1995; Chin 1998a, 1998b). Given that the model presented in the previous section has not been tested in its entirety and considering the sample size of 45 groups, we opted to use PLS.

Results

To test our research model, we ran PLS twice: first, to test the model shown in Figure 1(a) with the zero-history group condition sample (Model 1); and second, to test the model shown in Figure 1(b) with the established group condition sample (Model 2). For both models, the media condition variable was dummy coded with audio conferencing as "0" and desktop videoconferencing as "1." The results are presented in two stages: tests of the measurement models and tests of the structural models.

Test of the Measurement Models

We tested the measurement model for each sample separately by examining (1) individual item reliability, (2) internal consistency, and (3) discriminant validity. We assessed individual item reliability by examining the loadings of the

[3]We used PLS-GRAPH version 2.19 to run PLS for our study.

measures on their corresponding construct. The PLS results showed that several items for GAS and task participation had low factor loading scores. Although a common rule of thumb suggests that the factor loading should exceed .7, it is also important to retain as many items as possible from the original scale to preserve the integrity of the original research design, as well as the comparability of the results with other studies that use the same scales (Barclay et al. 1995). According to Barclay et al. and to Duxbury and Higgins (1991), well-established scales sometimes show poor factor loadings when they are used in causal modeling. Barclay et al. noted that

> since most scales are developed for a particular theoretical and research context, it is not surprising that some of the scales (or scale items) do not display the same psychometric properties when used in theoretical and research contexts distinct from those in which they were first developed. (pp. 295-296)

Duxbury and Higgins also observe that "[the common rule of thumb regarding the .7 factor loading score] is generally not applied when standard scales from the literature are used" (p. 66). Low factor loading scores may also be a result of the small sample size.

Given that all the scales used in our research were standard scales from the literature that have not been used in causal modeling in the past, we dropped three items from the original GAS and two items from task participation that showed extremely poor factor loading (below .5) from our final analysis. Item 3 of task participation in Model 1 and item 1 of social presence in Model 2 showed low factor loading scores below our cut-off point of .5. Because these items exhibited acceptable factor loading scores in the other model of the study, however, we included these two items in our final analysis. Table 1 shows the factor and cross-factor loadings of retained items for both models.

Internal consistency was examined using the composite scale reliability index developed by Fornell and Larcker (1981), which is a measure similar to Cronbach's alpha. Fornell and Larcker recommended using a criterion cut-off of .7 or higher. Table 2 shows the internal consistency of each scale used in the study. All constructs met the recommended criterion for both models.

In PLS, the discriminant validity of items is assessed using criteria similar to a multi-trait/multi-method analysis (Barclay et al. 1995). One criterion is that the construct represented should share more variance with its measures than it shares with other constructs in a model. To assess discriminant validity, Fornell and Larcker suggest use of the measure of Average Variance Extracted, the average variance shared between a construct and its measures. This measure should be greater than the variance shared between the construct and other constructs in the model. Table 2 shows the correlation matrix for the constructs of both models. The lower triangle represents the results from the zero-history group sample, while the upper triangle represents those of the established group sample. The scores in the diagonal of this matrix are the square roots of the Average Variance Extracted. For adequate discriminant validity, the diagonal elements should be greater than the off-diagonal elements in the corresponding rows and columns. Results shown in Table 2 indicate that both samples met this criterion. Another criterion is that no measurement item should load more highly on a construct other than the construct it intends to measure. An examination of factor and cross-factor loadings (Table 1) showed that all items satisfied this criterion for both samples.

Tests of Structural Models

Figure 2 and Table 3 show the results of the structural models for both samples. In the zero-history group condition, we hypothesized that video channel would enhance social presence and lower task participation (H1 and H2). In the zero-history group condition, the results of the PLS analysis of Model 1 suggest that media conditions significantly influenced the social presence of communication interactions and task participation. Compared to audio conferencing, the beta coefficients of paths from media condition to social presence and task participation indicate that desktop videoconferencing increased the scores

Table 1. Loading and Cross-Loadings of Measures

	Cohesion	Social Presence		Task Participation	
	(E)	(Z)	(E)	(Z)	(E)
Cohesion					
1	**.89**		.64		.59
2	**.86**		.60		.43
3	**.85**		.46		.62
4	**.68**		.31		.30
5	**.52**		.32		.09
6	**.89**		.54		.36
7	**.86**		.60		.37
8	**.88**		.61		.25
9	**.75**		.40		.41
10	**.75**		.56		.56
12	**.74**		.43		.43
13	**.79**		.65		.65
15	**.56**		.29		.29
16	**.52**		.30		.30
17	**.58**		.42		.42
18	**.52**		.31		.31
20	**.53**		.31		.31
Social Presence					
1	.18	**.76**	**.42**	-.12	-.02
2	.70	**.92**	**.94**	-.24	.39
3	.65	**.79**	**.95**	-.20	.27
4	.28	**.88**	**.67**	-.09	.07
Task Participation					
1	.17	-.26	.19	**.84**	**.62**
3	.32	-.12	.36	**.25**	**.50**
5	.54	-.03	.21	**.76**	**.92**

Note. Factor and cross-factor loading scores are shown separately for zero-history group sample (Z) and established group sample (E), except cohesion. Largest factor loadings for each item are boldfaced and underlined. Only the items retained after the preliminary analysis are shown here. The numbers shown in the first column represent the original number as it appeared in the questionnaire.

Table 2. Means, Standard Deviations, Internal Consistencies, Correlation of Constructs

	No. Items	Audio (n = 24)		Video (n = 21)		Internal Consistency[a]		Correlation of Constructs[b]				
		M	*SD*	*M*	*SD*	(Z)	(E)	1	2[d]	3	4	5
1. Media Condition[c]	1					NA	NA	NA	-.27	.14	-.28	.19
2. Cohesion[d]	17	7.51	0.88	7.45	1.00	NA	0.95	NA	**NA/.73**	.66	.55	-.42
3. Social Presence	4	5.35	0.64	5.84	0.71	0.90	0.85	.46	NA	**.84/.77**	.30	-.27
4. Task Participation	3	4.36	0.29	4.22	0.35	0.70	0.73	-.58	NA	-.20	**.70/.71**	-.70
5. # of shifts[c]	1	0.59	0.37	0.50	0.34	NA	NA	.45	NA	.06	-.32	**NA**

[a]Internal consistency was calculated separately for the zero-history sample (Z) and the established group sample (E).

[b]Correlations for the zero-history group sample are shown in the lower triangle and correlations for established group sample are shown in the upper triangle. Boldfaced elements on the diagonal represent the square root of the average variance extracted. The first score in the lower half of the cell is from the zero-history group sample and the one in the upper half of the cell is from the established group sample. For adequate discriminant validity, the elements in each row and column for the sample should be smaller than the boldfaced element in that row or column for the respective sample.

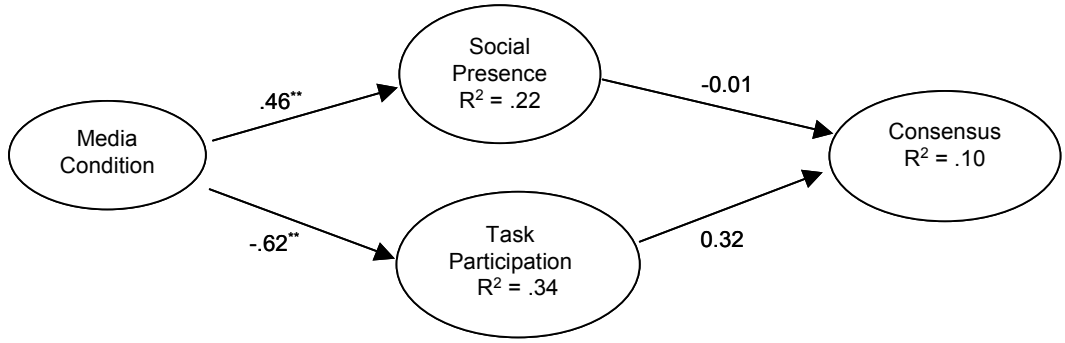
[c]For Partial Least Square (PLS) analysis, this measure considered a single indicator. Therefore, internal consistency and average variance extracted for this measure could not be calculated with PLS.

[d]Only the established sample was included.

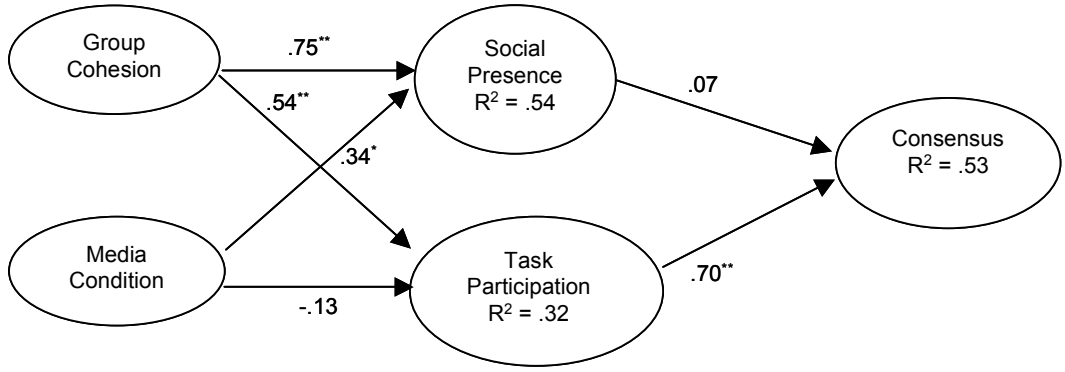
Table 3. A Summary Table of PLS Analyses

Paths	Zero-history Group Sample Beta	(S.D.)	Established Group Sample Beta	(S.D.)
Media → Social Presence	0.46**	(0.57)	0.34*	(0.56)
Media → Task Participation	-0.62**	(0.74)	-0.13	(0.62)
Social Presence → # of shifts	0.01	(1.12)	-0.07	(0.60)
Task Participation → # of shifts	-0.32	(0.60)	-0.70**	(0.67)
Group cohesion → Social Presence			0.75**	(0.18)
Group Cohesion → Task Participation			0.54**	(0.54)
R^2 Social Presence	0.22		0.54	
Task Participation	0.34		0.32	
# of shifts	0.10		0.53	

*$p < 0.05$; **$p < 0.01$ (one-tailed test)



(a) Zero-History Group with No Source of Social Influence



(b) Established Group with Group Cohesion as a Source of Social Influence

*$p < 0.05$; **$p < 0.01$ (one-tailed test)

Figure 2. A Summary of PLS Analysis

of social presence measure by 46% and reduced the scores of task participation measure by 62%. Thus, both H1 and H2 are supported.

For the established group condition, we hypothesized that group cohesion would increase both social presence and task participation (H3 and H4). The results of the PLS analysis of Model 2 show that group cohesion significantly affects social presence and task participation. As such, both H3 and H4 are supported.

Moreover, in established groups, we hypothesized that group cohesion would influence social presence and task participation above and beyond the influence of media condition (H5). To test this hypothesis, we compared the relative importance of group cohesion and media condition for social presence and task participation. Statistically, we conducted two unpaired *t*-tests. The first compared the beta coefficient from group cohesion to social presence and the beta coefficient from media condition to social presence. The second test compared the beta coefficient from group cohesion to task participation and the beta coefficient from media condition to task participation. Both tests were conducted using the results of Model 2. As we had anticipated, the results of the established group condition indicate that group cohesion had a greater influence than media condition on social presence ($t = 3.397$, $p < 0.001$) and task participation ($t = 3.875$, $p < 0.001$). Therefore, H5 is supported.

We also examined whether the direct influences of media condition on social presence and task participation were diminished statistically in the established group condition, compared to those in the zero-history group condition (H6). To test this hypothesis, we again conducted two unpaired *t*-tests, comparing beta coefficients of Model 1 and Model 2 for the paths from media condition to social presence and task participation. As expected, the direct influence of media condition on task participation was significantly lower in the established group condition than in the zero-history group condition ($t = -2.388$, $p < 0.05$). However, contrary to our expectations, no statistical difference existed between the established groups and the zero-history groups in terms of the direct influence of media condition on social presence ($t = 0.710$, $p = 0.481$). Thus, H6 is partially supported.

Finally, we hypothesized that high degrees of social presence and task participation would help groups to achieve consensus among members (H7 and H8). In the zero-history group, the results suggest that social presence and task participation do not affect the level of consensus among group members, thereby rejecting the prediction of the media-dependent perspective. The R^2 for the dependent variable was only 0.10 with the zero-history group sample. In the established condition, we found that task participation improved group consensus. However, the path from social presence to the level of consensus among group members was not significant. Taken together, H7 is not supported and H8 is supported only in the established group condition.

Discussion and Conclusion

Media, Group Cohesion, and Social Presence

Our results provide support for both the media-dependent and the social construction perspectives. We found that group cohesion influenced the group members' perceptions of communication media in established groups, a finding that supports the social construction perspective. We also found that group cohesion did not reduce the absolute direct influence of media condition over social influence. This finding supports the media-dependent perspective. Furthermore, the influence of group cohesion over social presence appears to be additive—rather than substitutive—to that of media condition. In this regard, our findings are consistent with those of previous studies which found that both media condition and social factors are important and complementary in influencing users' perceptions and use of communication media (Carlson and Zmud 1999; Chidambaram et al. 1991; Trevino et al. 2000; Walther 1995; Webster and Trevino 1995).

Building on Bijker's (1995) notion of interpretive flexibility in the social construction of technology, Orlikowski (1992) noted that interpretive flexibility

of technology is bound by two constraining factors: material characteristics of the technology and institutional contexts. On the one hand, users' interpretations of technology are limited by the physical and material characteristics of that technology. On the other hand, they are also constrained by the institutional and social contexts affecting users during the technology's design and use. Our results provide further support for this argument. The social presence perceived by the participants in the study, particularly in established groups, was bound simultaneously by media condition and social contexts, which was represented by the strength of group cohesion.

Previous studies have argued that communication technology is purely socially constructed, such that mechanical characteristics of the media would play a minimal role in forming users' perceptions and beliefs (Fulk 1993; Lee 1994; Markus 1994; Ngwenyama and Lee 1997). However, our results suggest that media condition might have a more stable influence on social presence than was believed previously. Given the significant influence of group cohesion for established groups, our results suggest that a theoretical integration of the media-dependent and the social construction perspectives might help us to better understand how users' perceptions of communication media are formed.

The significant influence of group cohesion over social presence in established groups that we found in this study does not mean that group history would necessarily enhance social presence. Rather, we simply found a positive correlation between the level of group cohesion and social presence. Therefore, low levels of group cohesion among members of established groups may mean that the social presence of communication interactions among them is also low.

Media, Group Cohesion, and Task Participation

In this study, we also examined the influences of media condition and group cohesion upon task participation, a consideration that has largely been ignored in previous studies in this area. We found that the video channel lowered the task participation by group members, while group cohesion improved it.

Past research of social loafing in groups that used group support systems has shown that the anonymity provided by communication media (particularly lean media with limited social cues) could increase a tendency toward social loafing among group members (Dennis and Valacich 1993; Kerr and Bruun 1983). Our results suggest another possible way that communication media can reduce task participation: rich media with many social cues. While we lack data indicating how and why the video channel lowered task participation in our study, the previous studies described earlier in the paper suggest that the established group members with the video channel might have been distracted due to socialization. Given the influence of task participation on group consensus, future research needs to examine how and why different communication media influence task participation in computer-mediated communication environments.

Social Presence, Task Participation, and Group Consensus

Finally, we examined how both social presence and task participation influence the degree of consensus among group members in a decision-making task. Our results showed that neither social presence nor task participation influenced the degree of group consensus in the zero-history group condition. It is unclear why we obtained this outcome. The low R^2 score of consensus of PLS results of Model 1 suggests that other variables not included in our model influence the degree of consensus among the members in the zero-history groups. Furthermore, a closer examination of the results indicates that a lack of variance (.64) with a low mean score (.26) of the dependent variable might have caused the low R^2 score in the zero-history group condition.

In the established group condition, we found that only task participation influenced the level of group consensus. In the past, researchers in the computer-mediated communication field have tried

to understand how group members form their perceptions of communication media. Our results indicate, however, that more research is necessary to evaluate the influences of media condition and social factors on task participation in computer-mediated communication environments.

Limitations

Like other social science research, this project has several limitations. First, this study employs an experimental design such that it inherits the limitations of this research methodology. The high degree of internal validity achieved in such a controlled laboratory experiment somewhat limits its capacity for general application. Therefore, any results from this investigation should be considered in light of task type, group characteristics, technology environments, and context.

Second, the role of group cohesion in relation to social presence and task outcomes was examined in a single session. Future research could employ a longitudinal design in order to determine whether our results can be replicated. That is, instead of performing cross-sectional comparisons between zero-history and established groups as we did in this study, one might follow the life cycle of groups to study how the relative influences of media conditions and group cohesion change over time.

Third, the brief duration that participants spent with desktop videoconferencing is also a limitation of the current study. What we have observed in our research should be recognized as an early usage stage of a new technology. Our objective was not to see how individuals change the way they perceive and use given communication media over time as they become more familiar with the technology. Rather, our primary intention was to examine how individuals in established and zero-history groups respond differently when they are first introduced to a new technology. This initial perception and usage pattern is one of the most critical factors in the successful implementation of a new technology (Tyre and Orlikowski 1994; Weick 1990), especially in voluntary cases (Davis et al., 1989). The current study sheds light on this initial use process.

Implications for the Use of Electronic Communication Technology

For managers, this study illuminates the need to consider group cohesion when various technologies are deployed to support groups. It may be that the same technology will be perceived and used differently by various groups of users, thereby resulting in potentially different outcomes. When deploying desktop videoconferencing systems in organizations, managers may obtain the best results by using them for initial meetings of distributed groups, or meetings of groups that have a fluid membership structure such as virtual or zero-history groups. The practical literature on videoconferencing (Dixon 1998; Stuart 1998; Svenning and Ruchinskas 1984) suggests that organizations that have deployed video technology have experienced different results, based on the prior relationship among participants. Our results confirm this observation.

Also, our results suggest that when limited to lean electronic communication technology with limited bandwidth, managers need to pay special attention to the development of group history and social relationships among members, which can provide additional means of reducing complexity. According to our results, a unit change (in either direction) of group cohesion among established group members, measured in Group Attitude Scale, can cause a change (in the same direction) of social presence by 75%. On the other hand, an addition of a video channel would increase social presence by only 34% for established groups. Similarly, our results suggest that a unit increase in GAS would increase task participation by 54%, while an addition of a video channel would not cause any significant change in task participation. Taken together, these results suggest that, when constrained to lean communication media, managers can focus on improving group cohesion to improve the group's task outcomes.

Future Research Directions

Several directions for future research emerge from our study. First, given that both media condition and social factors influence the ways that group

members perceive and use technology, future research can examine dynamic structuration processes through which new social structures of computer-mediated communication environments emerge. Structuration theory (Giddens 1984) argues that individuals are active creators of social structures, which, in turn, restrict individuals' acts. From a structuration perspective, the results of this study suggest that, in enacting the social structures embodied in communication technology, individuals draw on other sources of social structures (such as group norms) provided by group history, creating "emergent" social structures of the technology. Furthermore, our results suggest that these emergent structures might play a bigger role in determining task outcomes than the mechanical characteristics of the technology. Future research needs to investigate this dynamic interplay between technology and various social structures, using a process-oriented methodology based on structuration theory. Bijker's theory of social construction of technology and Weick's conceptualization of modern technology as *equivoque* also would provide additional theoretical bases for such endeavors.

Moreover, we suggest that the field should broaden its scope of inquiry by including other less studied, yet potentially important, mediating variables, such as task participation. In particular, we suggest that future research should examine more closely both the impact of different media on task participation and the social psychological process surrounding it. Given the important role that task participation played in influencing group consensus in this study, such inquiry might help both researchers and practitioners to better understand how one can improve the task outcomes in increasingly prevalent computer-mediated communication environments.

Finally, a further examination of other communication tools such as electronic mail, group support systems, groupware, and virtual reality could prove valuable. Electronic mail and group support systems are considered to be among the leanest media, while groupware such as Lotus Notes™ can be used to convey a high level of information. Further research of the influence of group history on the quality of communication interaction in such electronic communication environments will help organizations to better use such tools.

Acknowledgements

The authors are extremely grateful to the senior editor, Ron Weber, for the time and attention he has given to this manuscript. We also thank the associate editor and three anonymous reviewers for their many useful suggestions.

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