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Participation Equality and Influence: Cues and Status in Computer-Supported Cooperative Work Groups

Suzanne Weisband, Sherry Schneider and Terry Connolly

University of Arizona, USA

Abstract: We examined status effects in face-to-face and computer-mediated three-person groups. Our expectation that low status members in computer-mediated group discussions would participate more equally, and have more influence over decisions, than their counterparts in face-to-face groups was not confirmed. The results suggest that knowledge of status differences and labels were used to form cognitive impressions of other group members. It seems that when group members are aware of the status characteristics of the group, social cues were magnified rather than reduced. Implications of these findings for mixed status cooperative work groups and for the design of computer communication systems are discussed.

Group members often use physical and social cues such as race, sex, and status to categorize people and organize information about them. These perceptions then shape the members' interactions with one another, the opportunities they give one another to speak, the weight they give each other's opinions, and the influence each has on the decisions the group reaches. A considerable research literature on face-to-face groups (see Hackman, 1976; McGrath, 1984; Stephan, 1985) attests to the power and subtlety of such social cues in shaping the tone and content of a group's communication patterns and social behavior.

Computer-supported communication is of special interest in this context as the social and paralinguistic cues available in face-to-face conversation are greatly attenuated. Several studies have found that when groups use computers to communicate, member status and influence have less impact than they do in face-

to-face groups, and there is greater equality of participation (e.g., Rice, 1984; Siegel, Dubrovsky, Kiesler and McGuire, 1986; McGuire, Kiesler and Siegel, 1987; Dubrovsky, Kiesler and Sethna, 1991; Spears and Lea, 1992; Weisband, 1992). In discussions of the equalization phenomenon, it is often assumed that the reduced social cues in computer-mediated group discussions weaken social norms and inhibitions, much like the conditions associated with deindividuation – anonymity, reduced self-regulation and reduced self-awareness (Diener, 1980). Thus, group members communicating electronically are less aware of social distinctions, resulting in increased equality of participation.

In electronic discussions, where social cues and status effects are reduced and participation is more egalitarian, we expect that influence, in turn, will also be more equally distributed. Low status members in computer-mediated groups should have more influence than low status members in face-to-face groups. And they have less reason to defer to the normative influence of powerful, high status individuals. There is, in short, both theoretical argument and empirical evidence to suggest that groups that interact by means of computers are less prone to status effects than are face-to-face groups. As one advocate has written, the medium is "... dizzyingly egalitarian, since the most important thing about oneself isn't age, appearance, career success, health, race, gender, sexual preference, accent, or any of the other categories by which we normally judge each other, but one's mind" (Van Gelder, 1985, p.365).

One goal of this research is to test whether computer mediation raises the influence of a solitary junior member. It is easy to imagine situations in which equalization of the latter sort might be desirable. For example, a lone junior member willing to disagree with the majority in the face of normative pressure may prevent the group from making a disastrous decision (Janis, 1972). Minority opinions have also been shown to contribute to the detection of novel solutions (Nemeth, 1986) and to potentially influence the group outcome when their arguments are presented cogently and consistently over time (e.g., Moscovici, 1985).

But how powerful is this computer effect on participation and influence? In one study that experimentally tested status effects in computer-mediated groups (Dubrovsky et al., 1991), subjects were unaware of the status attributes of their group members (i.e., they were not told that their group was comprised of three freshmen and one graduate student). The considerable literature on category-based impression formation contends that simply knowing the social category of members of our group will strongly affect our perception, memory, and inference of that group or individual member (e.g., Fiske and Neuberg, 1990). That is, once we initally categorize others as members of particular groups – groups about which we have very generalized or stereotypic knowledge – we typically form impressions of them on the basis of the category alone (e.g., Wilder, 1981). We

form these initial impressions to simplify our social environment and reduce our cognitive load. Thus, group members who are sufficiently aware of their status differences may behave, and perceive others as behaving, according to their status categories. It is conceivable, then, that providing group members with appropriate status cues could override the computer effect on equal participation.

It is also possible that high status group members differ systematically from low status members on a number of different personal characteristics. They may be smarter, richer, pushier and more talkative than their low status counterparts (e.g., Strodtbeck, James and Hawkins, 1957), and these differences remain unaltered by computer mediation. Using cognitive theories of intergroup relations, we report here an experiment that replicates and extends previous research on mixed status computer groups (Dubrovsky et al., 1991). Our goal is to test whether the equalization phenomenon holds in groups consisting of one low status member, and where members are aware of their group's different status categories. The design compared participation and influence in face-to-face decision making groups (F) with those in three different computer-supported groups: groups in which the participants were identified (C-I), those in which they were anonymous (C-A), and those in which one member was mislabeled (C-M).

Our three-person groups consisted of two MBA students (high status) and one undergraduate (low status). In both the face-to-face (F) and identified (C-I) conditions, we informed each group member of the name and academic level of each of the other members at the outset. The anonymous (C-A) condition provided a low level of anonymity to the participants. We told subjects that their group consisted of two MBA students and one undergraduate, but we did not identify individual members. Subjects only knew the network locations ("Person A", "Person B" etc.) of the other group members. In the mislabeled (C-M) condition, we told subjects that their group consisted of two MBA students and one undergraduate, but the group was actually comprised of three MBA students. We then told two MBA students which one group member (actually an MBA student) was an "undergraduate." This "low status" student was unaware that he or she had been relegated to this position. As in the anonymous condition, we only revealed the network locations ("Person A", "Person B" etc.) of the other group members.

Hypothesized effects of group participation and evaluation

There are several *a priori* comparisons between conditions which allow us to replicate and evaluate status awareness on participation and influence in face-to-face and computer-supported groups. Our first comparison is between correctly-labeled computer-supported and face-to-face groups, i.e., differences between the C-I, C-A, and F conditions. In all three conditions, group members are correctly

told that their group consisted of 2 MBAs and 1 undergraduate.

> Hypothesis 1: If status awareness overrides other social effects of the medium, then low status members will participate more equally in the anonymous condition (C-A) as compared to the identified (C-I) and face-to-face (F) conditions. This suggests that reduced social awareness in the anonymous condition will protect the low status members from negative evaluations.

Comparisons of the computer-supported groups who are identified by their name and status (C-I) to computer-supported groups who are incorrectly told who the undergraduate is (C-M) are particularly meaningful.

> Hypothesis 2: If personal characteristics override other social effects of the medium, then "low status" members will participate equally in the mislabeled condition (C-M) as compared to the identified condition (C-I), and these "low status" members will be evaluated the same as other high status members in both conditions.

> Hypothesis 3: If status awareness overrides other social effects of the medium, then "low status" members will participate equally in the mislabeled condition (C-M) as compared to the identified condition (C-I), but "low status" members will be evaluated lower than high status members in both conditions. This suggests the evaluations will be based on stereotypes or negative perceptions of the social category.

> Hypothesis 4: If status awareness overrides other social effects of the medium, then "low status" members will participate less than high status members in both conditions, and "low status" members will be evaluated lower than high status members in both conditions. This suggests that "low status" members will infer negative cues from the high status members and be intimidated into not contributing as much to the group outcome.

Method

Subjects

One hundred five business students participated in this experiment: 75 MBA students (53 males and 22 females) and 30 undergraduates (11 males and 19 females)

were asked to pick one of four experimental sessions to participate in. Within each experimental session, subjects were randomly assigned to three 3-person groups. Computer malfunctions and other technical difficulties caused the loss of some data, but usable data were obtained from 91 groups. Of those, 27 groups met face-to-face, 24 groups participated in the identified computer condition, 27 groups in the anonymous condition, and 13 groups in the mislabeled condition. Given the proportion of males and females in our subject pool, randomization within experimental session produced representative numbers of mixed-gender groups.

Decision tasks

Three ethical decision tasks were used in this experiment (see Weiss, 1990). Each task required group members to make an ethical evaluation of the conduct of a computer professional in a hypothetical situation. We chose the three scenarios that had the most moderate means and largest standard deviations on pre-test ratings of ethicality. The first task involved a student offering limited access to a pornographic questionnaire ($\bar{x}$ = 5.8, sd = 2.3), the second involved monitoring others' electronic mail ($\bar{x}$ = 4.8, sd = 2.5), and the third concerned the development and sale of marketing profiles from public information ($\bar{x}$ = 5.2, sd = 2.4).

Research design

The design was a 2 x 4 x 3 (status x communication modality x decision task) analysis of variance design in which communication modality and ethical dilemma were repeated. Order of communication condition was counterbalanced within experimental sessions (i.e. during each session, some subjects participated in face-to-face groups first, some participated in anonymous groups first etc.). Order of presentation of decision tasks was also counterbalanced between sessions.

Procedures

Participants in each session were randomly assigned to three 3-person groups prior to their arrival. When subjects arrived for their experimental session, they were handed a uniquely numbered card with instructions on where they were to go for each of the three tasks. For the computer conditions, each participant was assigned to one of 24 terminals in the University of Arizona's Electronic Meeting Room. The terminals were networked into eight groups of three, with group members widely separated from one another, not knowing to which terminals they were connected. Face-to-face groups met in one of three small rooms adjacent to the computer facility.

Electronic groups used a software tool called GroupOutliner. This tool divides

the screen into two halves. Messages to be sent are typed and displayed in the bottom half of the screen. Pressing a function key "sends" the message to the top half of the screen, where it is displayed along with messages from other members. Scrolling through the upper screen allows group members to read all previous messages.

On arriving at the experimental session participants in the computer conditions initially took their seats at the first computer terminal number listed on their cards. Those assigned to face-to-face initial conditions were asked to take a seat in the back of the room while general instructions were delivered. All participants were then given paper copies of the experimental tasks and asked to rate privately the ethicality of the actors in the three scenarios. After these initial ratings were collected, the participants were told that the purpose of the experiment was to study how groups communicate and make decisions face-to-face and electronically, and that they would be discussing as a group the same scenarios they had just rated privately. They were told that each 3-person group consisted of two MBAs and one undergraduate.

Further instructions differed by condition. In the face-to-face groups, the subjects were asked to introduce themselves by name and educational status, and were prompted to provide both items. Members of computer identified (C-I) groups were asked to sign-on to their group conference by typing in their first and last names and indicating whether they were MBA students or undergraduates. Computer anonymous (C-A) group members were asked to sign in with a non-identifying statement, (e.g., "I am Person A") and were asked not to disclose any personal information. Those in the computer mislabeled (C-M) condition were asked to log on just like anonymous groups. The manipulation was achieved by a note at two of the terminals stating that "Person B" was the undergraduate, while "Person B" (an MBA student) was told that the group was anonymous. In the computer groups, all messages were collected automatically. In the face-to-face groups, all discussions were recorded on audio tape for later transcription.

After the introductions, participants were asked to discuss the problem to consensus. When all groups had agreed on a decision a short questionnaire was distributed to evaluate subjects' expertise, comfort and prior experience with computer communication systems, perceptions of the task, and perceptions of their own and others' contributions. The face-to-face participants then rejoined the others in the computer facility, and participants moved to the second position on their index card to work on the second task with an entirely new group. Some simply switched terminals, others moved to one of the outside rooms for the face-to-face condition. The procedure was repeated for the third task. At the end of the third task, a longer questionnaire was distributed to evaluate subjects' computer experiences, preferences for face-to-face and computer communication technologies,

and communication apprehensiveness. Subjects were then debriefed and thanked for their participation.

Dependent measures

Our hypotheses mainly required group-level analyses permitting orthogonal within-group comparisons of high and low status members as a function of the group's communication modality. We predicted that high status members would participate more than low status members. Participation was measured by the number of remarks an individual made during each group discussion as a fraction of the total remarks made in that group. Each separable thought a group member uttered during discussion counted as a "remark" (see Weisband, 1992). Two coders independently divided subjects' statements into remarks and counted them. We also compared the number of remarks made during each "turn" to determine how much participants talked when given the opportunity to do so. As in previous studies, we evaluated differences among groups in choice shift, defined as the absolute difference between the average pregroup preferences of individual members and their group decision (e.g., Myers and Lamm, 1976). We predicted that the final group decision would be closer to the high status members' pregroup opinions than to the low status member's pregroup opinion, especially in the face-to-face group . We also collected questionnaire measures of each participant's rating of his or her own influence on the final outcome relative to that of his or her fellow group members.

We computed Gini coefficients for each group on participation and peer-rated influence. We expected that groups communicating electronically would participate more equally than would face-to-face groups. We predicted that peer-rated influence would reflect this equality. The Gini coefficient sums, over all the group members, the deviations of each from equal participation, normalized by the maximum possible value of this deviation (Alker, 1965). The coefficient thus takes values between 0 and 1, where 0 means perfect equality. For a set of observed participation rates, X_1, X_2, and X_3, the Gini coefficient (G) is calculated as $G = \frac{3}{4} \sum_{i=1}^{N} |X_i - \frac{1}{3}|$.

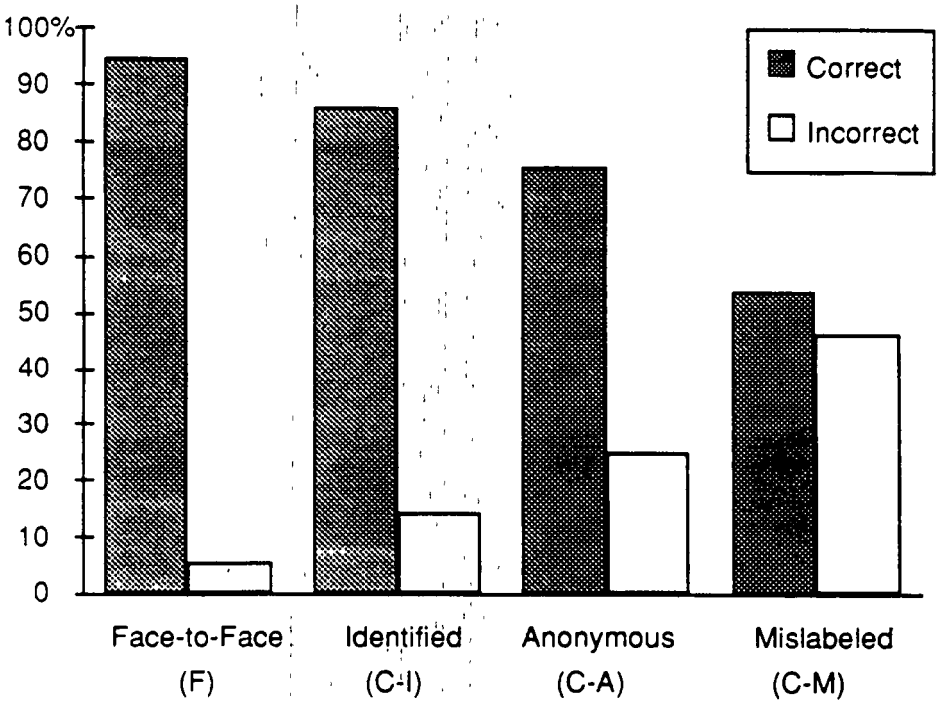
Results

Preliminary analysis

Not surprisingly, the MBA students were older than the undergraduates ($\bar{x}$ = 28 vs 22, $F_{1,193} = 47.6$ $p < .001$), but there were no differences between MBAs and undergraduates in their use of computers and electronic communication.

As a manipulation check, we asked each group member who they thought the undergraduate was. The respondent could either give the name (or letter) of a particular group member or they could reply, "Don't Know." Figure 1 shows the results. Except for some guessing on the part of high status members in the anonymous and mislabeled conditions, on the average a large proportion of group members (80%) responded correctly across all four treatment conditions.

Figure 1. Proportion of group members who correctly answered the question, "Who was the undergraduate?"



Participation and Influence Effects

Table I reports the results of group participation and influence effects. Looking at participation measures first, we see that face-to-face groups exchanged significantly more total remarks than computer-mediated groups did ($F_{3,73} = 5.9$, $p < .001$), replicating our initial findings. Face-to-face groups also took slightly more "turns" during their discussions, than did computer-mediated group discussions ($F_{3,73} = 2.4$, $p < .10$), and they said more during each turn ($\bar{x} = 2.3$) than did members communicating electronically ($\bar{x} = 1.8$), $F_{3,73} = 6.6$, $p < 001$

Table I. Results of Group Participation and Influence

Group Measures	Mode		Status High	Status Low	Status Diff	Significant F Values Cond.	Status	C x S
Participation Measures								
No. Total Remarks	Identified	(C-I)	28.6	25.0	3.6			
	Anonymous	(C-A)	30.6	25.2	5.4			
	Mislabeled	(C-M)	19.8	23.0	−3.2			
	Face-to-Face	(F)	55.5	44.3	11.2	* * *	*	*
No. Total Turns	Identified		17.0	14.0	3.0			
	Anonymous		16.7	15.1	1.6			
	Mislabeled		13.6	12.9	0.7			
	Face-to-Face		23.8	20.7	3.1	†	*	
No. Remarks/Total	Identified		0.36	0.29	0.07^a			
	Anonymous		0.35	0.28	0.07^a			
	Mislabeled		0.31	0.37	-0.06^b			
	Face-to-Face		0.36	0.28	0.08^a	*	* *	*
No. Remarks/Turn	Identified		1.9	1.8	0.1^a			
	Anonymous		1.9	1.7	0.2^a			
	Mislabeled		1.5	1.8	-0.3^b			
	Face-to-Face		2.4	2.2	0.2^a	* * *	†	
Influence Measures								
Choice Shift	Identified		1.5	2.7	−1.2			
	Anonymous		1.5	2.4	−0.9			
	Mislabeled		1.4	1.7	−0.3			
	Face-to-Face		1.4	2.4	−1.0		* *	
Self-Rated Influence	Identified		0.38	0.36	0.02			
	Anonymous		0.40	0.37	0 03			
	Mislabeled		0.36	0.40	0.04			
	Face-to-Face		0.36	0.34	0.02			
Peer-Rated Influence	Identified		0.33	0.26	0.07			
	Anonymous		0.33	0.27	0.06			
	Mislabeled		0.33	0.28	0.05			
	Face-to-Face		0.34	0.31	0.03	†	* * *	

[a] To test our hypotheses, we conducted planned comparisons using Dunnette's test to compare the identified computer condition (C-I) with the other three modality treatment means. Means not sharing a common subscript differ from each other at the $p < .05$ level. If no subscript is shown, mean comparisons did not differ among modality conditions.

*** $p < .001$
** $p < .01$
* $p < .05$
† $p < .10$

Computer-supported interaction can be characterized as relatively large numbers of brief "turns."

But the technology did not change the effect of status. High status members participated more in both face-to-face and electronic groups. Our central measure of group participation is the average proportion of remarks individuals mentioned in their group discussions. High status members talked more ($\bar{x}$ = .35) than low status members did ($\bar{x}$ = .30), $F_{1,73} = 7.9$, $p < .01$. The significant interaction effect is due to the increased participation in the mislabeled condition. Group members who were labeled as "low status" (but who were unaware of being relegated that status) actually participated more ($\bar{x}$ = .37) than the other two members ($\bar{x}$ = .31), $F_{3,73} = 3.7$, $p < .05$. This evidence seems to rule out the hypothesis that low status members are intimidated into not participating in the group discussion (Hypothesis 4).

These participation differences are reflected in influence measures. High status members shifted less from their initial pregroup opinions ($\bar{x}$ = 1.5) than did low status members ($\bar{x}$ = 2.4), $F_{1,77} = 9.0$, $p < .01$, and were perceived by their peers as contributing more to the final group decision ($\bar{x}$ = .33) than low status members ($\bar{x}$ = .28), $F_{1,81} = 12.2$, $p < .001$. The Gini coefficients of inequality at the group level mimic earlier patterns. Participation was substantially unequal, though not differentially so for electronic (G = .16) and for face-to-face (G = .19) groups. And computer-supported groups were significantly *less* egalitarian in their evaluation of their peers (G = .16) than were face-to-face groups (G = .10), $F_{1,45} = 6.4$, $p < .05$.

Results from the two modified electronic conditions are suggestive of possible underlying mechanisms. First, the anonymous (C-A) conditions showed no substantial difference on any measures from the identified (C-I) and face-to-face (F) conditions, leading us to reject Hypothesis 1. Whatever maintains the disproportionate participation and influence of the high status members, it clearly is not the identity of the other members. The finding also appears to weaken any account based on evaluation apprehension on the part of the low status member (e.g., Connolly et al., 1991; Diehl and Stroebe, 1991). It is conceivable that low status members participate less in both face-to-face and identified computer groups because they are dominated by fast talking MBA students (Hypothesis 2), or that the status label confirmed initial expectations of how low status group members should, in fact, behave. We thus have not ruled out support for Hypothesis 4.

The interactions in the mislabeled (C-M) groups proved especially intriguing. The mislabelled individual actually contributed a larger fraction (.37) of the total remarks than did the two (correctly-labelled) high status members (.31). The choice shift measure of influence indicates that this combination of high interaction

share and low status label left the mislabeled member as influential as the other group members (see Table I). Peer ratings, however, support Hypothesis 4 and strongly suggest stereotyping: the mislabeled member, though yielding only as much as other MBAs, and contributing proportionately more to the discussion, is rated by the other members as having little influence. He or she is, after all, only an undergraduate!

Discussion

Numerous previous studies examining participation and communication modality effects have found an equalization effect for computer mediation (see Rice, 1984; Culnan and Markus, 1987; Huber, 1990; Sproull and Kiesler, 1991 for reviews). Members have participated in group discussion, and influenced the final result, more equally in computer-based than in face-to-face groups. Our findings are in sharp contrast: High status members dominated the discussions, and exercised disproportionate influence on the final result. These results were replicated for groups whose members knew one another's names as well as for anonymous groups. The progression from face-to-face interaction (presumably rich in social context cues) through identified computer-mediated and finally to anonymous computer-mediated interaction (presumably much less rich in these cues) left untouched the basic inequalities: MBA students participated more than undergraduates, and had greater influence on the group decision.

Consider the notions of undergraduate and MBA "status" we have been using thus far. Compared to undergraduates, MBAs are older, more experienced, quite probably more intelligent, ambitious, self-confident, self-assertive, vocal, affluent – that is, they surely differ from undergraduates on a host of task-relevant dimensions. One account, then, is simply that MBAs are highly verbal, take-charge people. They participate more than, and are at least as persuasive as, undergraduates, and their influence over the group decision reflects this, regardless of communication modality.

An alternative, more cognitive explanation is that participants categorized each other on the basis of their educational status, and subscribed to norms that were consistent with their expectations of how the two groups would differ. Even in anonymous conditions, 12 out of 19 (63%) high status participants were able to make reasonably successful guesses as to which of the others was the undergraduate (see Figure 1). The research in this area indicates that virtually any categorization process can lead to biased evaluations in favor of the in-group (high status majority) and against the out-group (low status minority) (e.g., Billig and Tajfel, 1972; Turner, 1975; Tajfel, 1978). Outgroup members who are relatively deindividuated are also more likely to be targets of negative evaluations than are

persons of whom we have greater knowledge.

The computer mediated, mislabeled condition helped to disentangle these accounts. The hint, clearly, is that the mislabeled participant is seen by the others as behaving in a status-inappropriate way and that they react by reducing their participation, unsure how to deal with the deviation. This apparent confusion of status categories in the mislabeled condition is also revealed in Figure 1: even when told who the undergraduate was, 18 out of 39 "high status" members (46%) were unable to figure out who the undergraduate was. Whether or not this conjecture is borne out in subsequent studies, the evidence from the mislabeled condition does suggest that the group interaction is shaped by social impressions beyond simple assertiveness or personality characteristics of MBA students.

Participant ratings of influence are more egalitarian in face-to-face groups, and are clearly stereotyped (to derogate undergraduates) in computer-interactive, mislabeled groups. The evidence suggests that the status cue in computer-mediated discussions was more salient because richer verbal and paralinguistic cues were missing. And with no additional, individuating information available to counter the effects of prior labeling, stereotypical impressions were confirmed on the basis of the social category alone.

The limitations of these studies, based as they are on volunteer student subjects discussing unfamiliar tasks for modest periods of time and for small stakes, are too familiar to need reiteration here. The remedy, too, is familiar: We need to replicate the findings in real-world settings where decisions of consequence are made by experienced, professionally involved participants. A central interest of these extensions, clearly, would be the effect of shared norms for or against equal participation. For example, there will be many decisions in which all participants agree to defer to the superior expertise, knowledge, or judgment of some participants (as perhaps happened here). In other cases, differential influence of, say, hierarchical superiors will be seen as unhelpful to good decision making, in which case the potential of computer mediation for equalizing influence would become more attractive. A full exploration of these issues is, clearly, a substantial undertaking. Perhaps the present demonstration, that a simple status-equalization hypothesis for computer-mediated groups is not tenable, will provide a useful point of departure.

This study has important social implications for the design of computer communication technologies. How communication systems are designed will affect their ability to act as status levelers. Most current electronic mail systems label messages with individuals' personal names, so our results suggest that these technologies will not reduce status inequalities appreciably. Most group decision support systems, however, have the capability for completely anonymous messag-

ing (i.e., without network locations like "Person A," "Person B," and "Person C") which might reduce status inequalities (DeSanctis and Gallupe, 1987, Connolly et al., 1990). As the use of graphic and video technologies becomes more pervasive, and as design features of computer communication systems increase their bandwidth (e.g., by attaching a picture of the sender to each electronic message), group members may find it easier to reveal personal information to each other, making it less likely that people will rely solely on their generalized knowledge of social status categories. Alternatively, it may be easier to transmit status cues in these richer communication environments (e.g., Daft and Lengel, 1986), which could magnify the inequality of participation. Future research will determine whether the availability of such social cues is beneficial to group decision making.

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