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Is Out of Sight, Out of Mind? An Empirical Study of Social Loafing in Technology-Supported Groups

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Research on group behavior has identified social loafing, i.e., the tendency of members to do less than their potential, as a particularly serious problem plaguing groups. Social Impact Theory (SIT) helps explain social loafing in terms of two theoretical dimensions—the dilution effect (where an individual feels submerged in the group) and the immediacy gap (where an individual feels isolated from the group). In this study, which employed a controlled experiment, we investigated these dimensions of social loafing in the context of group decision making, using collocated and distributed teams of varying sizes. Our results—in line with SIT—indicate that small groups, signifying a small dilution effect, had increased individual contributions and better group outcomes compared to their larger counterparts. However, support for SIT's arguments about the immediacy gap was mixed: Members contributed visibly more when they were collocated, but no significant differences in group outcomes were evident. Regardless of dimension, the quality of the input (ideas generated) determined the quality of the output (decisions made). Also, contrary to the literature on brainstorming, having more ideas to work with resulted in poorer-quality decisions. This apparent paradox is explained using the notion of integrative complexity, which challenges conventional wisdom regarding the relationship between individual inputs and group outputs. The implications of these results for practice and research are examined.

Key words: computer-supported group work; distributed group decision making; group size; social loafing; integrative complexity; collaborative technologies; virtual teams; group performance
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Introduction

Organizations increasingly rely on teams to transact a wide range of activities, from designing products to developing software (Griffith et al. 2003). Often, members of these teams are located in different places and are linked with each other by a variety of communication media (Powell 2000). Despite the growing organizational reliance on such teams and the increasing range of technologies to support them, some key questions remain unanswered. For instance, are group members as productive when they are dispersed as they are when they are collocated? Does group performance differ based on where members are located? Does the size of a team affect its performance? These questions, critical to organizational performance in the best of times, take on particular significance during lean economic times when managers are looking to improve efficiencies and increase productivity. We report on the results of a controlled lab experiment conducted to answer these questions.

Some analysts (e.g., Chesbrough and Teece 1996) and researchers (e.g., DeSanctis and Monge 1999) have suggested that managing members of distributed groups may be more difficult without the advantages of collocation. For instance, in collocated settings, managers can presumably determine rather easily whether or not team members are "pulling their weight." However, in dispersed settings, where members are less visible, their contributions are also likely to be less visible, and hence more difficult to evaluate (Bélanger et al. 2002). Such problems may be exacerbated as these teams grow in size. Under these conditions, some group members may do less than expected on group tasks. This propensity of individuals to withhold some of their contributions to the team effort is referred to as social loafing

(Harkins and Szymanski 1989). In practical terms, social loafing represents significant process losses for teams and reduced productivity gains for organizations. As Kidwell and Bennett (1993) note, "…social loafing…describes a person who provides less than maximum possible participation or effort due to *motivation* and *circumstance*" (p. 430). In other words, the motivational reason for reducing effort has been associated with individuals' perceptions that their contributions do not make a difference, while the circumstantial reason for this phenomenon has been linked to environmental difficulties in identifying individual contributions (Karau and Williams 1993).

Some information systems (IS) researchers (e.g., Shepherd et al. 1995–1996, Suleiman 1998) have argued that collaborative technologies (CTs) can mitigate the impact of social loafing in some ways (such as providing structures to maintain focus on task deliverables, for instance) and exacerbate it in others (such as pooling individuals' contributions so they are difficult to identify). However, despite the growing use of technology by many organizational teams (Griffith et al. 2003) and the long history of research on supporting these teams (Dennis et al. 2001), the issue of social loafing has not been studied systematically in the context of technology-supported teams. In fact, with the two exceptions cited at the start of this paragraph, the issue of social loafing—which has received considerable attention in the industrial psychology (e.g., Guerin 1999) and organizational behavior (e.g., Karau and Williams 1993) areas—has largely been ignored by IS researchers. As mentioned earlier, this paper reports on a controlled lab experiment aimed at studying how the two theoretical reasons of social loafing—motivational and circumstantial—affect members' contributions and group outcomes in the context of technology-enabled group decision making.

Theory Development

The question of whether individuals contribute to their full potential when working in a group (compared to when they are working alone) has intrigued researchers for decades (Kerr and Bruun 1981). The earliest reports of such work can be traced back to the late 1920s, when Walther Moede, an industrial psychologist, reported on the "Ringelmann Effect," a term used to describe the finding that collective group performance was inferior to the sum of individual contributions for some tasks (Kravitz and Martin 1986). In other words, group performance was not fully realized due to the fact that group members exhibited less effort when working collectively than when working individually. Following the findings of this early work, a variety of factors have been shown to influence social loafing, including task complexity (Harkins and Petty 1982, Jackson and Williams 1985), expectations of coworkers (Williams and Karau 1991), evaluation of members' performance (Brewer 1995, Harkins and Szymanski 1989), gender (Eagly 1987), and culture (Gabrenya et al. 1985).

Latané (1981), through his articulation of social impact theory, provided a theoretical explanation for the phenomenon of reduced individual effort in certain group settings. His theory, which viewed individuals as sources and targets of social impact, proposed that the greater the number of sources and targets, the lower would be an individual's input to group tasks. Further, the theory elaborated that the more immediate and stronger the sources, the greater the impact on targets, and hence the greater their participation in group tasks. Conversely, it suggested that the less immediate and weak the sources, the less the impact on targets, and hence the lower their participation in group tasks. Thus, social impact theory provides two theoretical explanations[1] critical to our understanding of social loafing in technology-supported groups; these are discussed below.

The Dilution Effect

The *first* explanation—consistent with Kidwell's and Bennett's (1993) articulation of the motivational forces behind social loafing—is based on the argument that the greater the sources and targets of social impact within a group, the less the motivation of individual members to contribute to the group effort. Larger groups intrinsically have more sources and targets of social impact than smaller groups, and hence are more prone to social loafing (Latané 1981). Members

[1] Where groups have inherent power differentials, such as those comprised of supervisors and employees, the strength of the source(s) will affect the extent of social impact on the targets. However, in this study, the sources and targets of social impact had no inherent differences in strength.

who belong to such groups are less motivated to perform because they either perceive their contributions as being marginal, or they perceive their rewards as being unrelated to their inputs (Kidwell and Bennett 1993). This argument suggests that the social impact an individual can have in a large group is lessened because of a perceived "dilution" effect. This effect manifests itself in a variety of dysfunctional ways—including free riding, getting lost in a crowd, and shirking group work—all of which increase with group size and serve as symptoms of social loafing (Karau and Williams 1993).

Further, Festinger et al. (1952) describe how increases in the sources and targets of social impact result in members behaving as if they are "submerged in the group." Such behavior may include increased indifference toward the group and its members and may even escalate to feelings of hostility (Slater 1958) and dissatisfaction (Robinson and O'Leary-Kelly 1998). In sociology, voter apathy in many democracies—demonstrated by low turnouts in elections—has been shown to be related to a form of the dilution effect (Teixeira 1992). To summarize, individuals view their effort as being too small to make a difference (given the large number of "others" who can contribute), withdraw from the group, and, at times, engage in dysfunctional processes (Frank and Anderson 1971).

Systematic studies of group size were conducted by Hare (1976), who developed a theoretical model that helps explain the significance of the dilution effect. This model suggests that as group size increases linearly, the number of potential relationships—based on pairs of members and larger subgroups—within a group increases exponentially, as indicated by the following formula:

$$x = (3^n - 2^{n+1} + 1)/2,$$

where x is the number of potential relationships and n represents the number of members. Thus, if a group has four members, for example, then the potential number of relationships that exist in that group is 25. However, even modest increases in group size—such as doubling the membership to eight—increases the potential number of relationships considerably (to 3,025 in this case). Thus, based on Hare's (1976) arguments above, dilution effects can be more pronounced than would be suggested by simple increases in group size—a view that is consistent with Latané (1981).

The Immediacy Gap

The *second* theoretical explanation about social loafing that can be derived from SIT—consistent with Kidwell and Bennett's (1993) articulation of the circumstantial factors underlying social loafing—relates to the immediacy of sources and targets of social impact and is based on the environmental conditions in which group members interact. As members of a group (i.e., the sources and targets of social impact) become more isolated (and hence less immediate) their participation in and contributions to group activities decrease (Williams et al. 1981). We term this aspect of social loafing the immediacy gap to denote increased distance between group members and their work on the one hand, and between the members themselves on the other.

Researchers (e.g., Monge et al. 1985, Valacich et al. 1994) have argued that distance—a characteristic of the *circumstances of interaction* referred to by Kidwell and Bennett (1993)—is a multidimensional construct that is influenced by both physical (actual) and psychological (perceived) distances between communicating individuals. For instance, the circumstances of interaction in virtual teams include a combination of physical aspects (including increased geographical distance between members) and perceptual aspects (such as the difficulty in identifying members' identities) that contribute to a wider immediacy gap compared to collocated teams.

Previous research has shown that the immediacy gap exists most perceptibly in those settings where individuals' contributions to the group are not easily identifiable (Brewer 1995, Suleiman 1998) and where social comparisons are difficult to make (Shepherd et al. 1995–1996, Williams and Karau 1991). When members' contributions to the group cannot be identified readily, they respond by identifying less with, and contributing less to, the group. The most visible aspect of such behavior is reduced individual participation in group activities (Kerr and Bruun 1981), which cumulatively can decrease group performance (Jones 1984). In addition to task impacts, the immediacy gap also affects relational interactions by reducing the ability of members to engage in social comparison,

Figure 1 Theoretical Model—A General Model of Social Loafing in Group Interaction

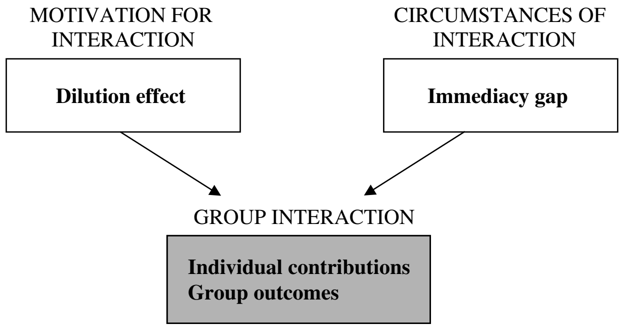
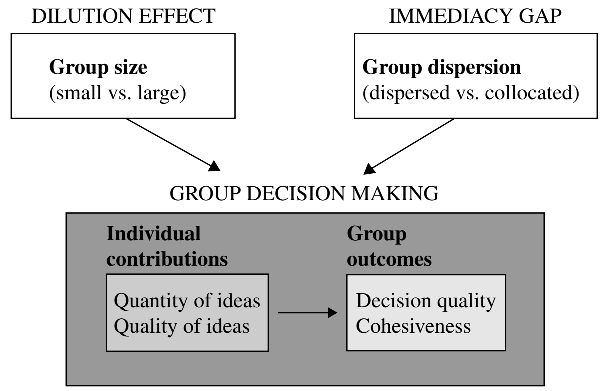


Figure 2 Research Model—A Specific Model of Social Loafing in Technology-Supported Group Decision Making



which, in turn, decreases the salience of other members and their actions (Weisband 2002). This reduced salience concomitantly increases members' difficulties affiliating with the group, which can lower group cohesiveness (Williams et al. 1981).

To summarize, the two theoretical dimensions of social loafing include the *dilution effect* and the *immediacy gap*. The dilution effect refers to motivational reasons and occurs when the sources and targets of social impact increase to such levels that individuals perceive their contributions to the group as being marginal, while the immediacy gap refers to circumstantial reasons and results when the sources and targets of social impact become distant. In line with these arguments, and consistent with Kidwell's and Bennett's (1993) view, our theoretical model (depicted graphically in Figure 1) suggests that both motivational and circumstantial elements affect various aspects of group interaction, including individual contributions and group outcomes.

Research Model and Hypotheses

Our research model (depicted in Figure 2) builds on the theoretical model outlined above and posits that the motivational and circumstantial factors of interaction—represented by the dilution effect and the immediacy gap—affect various aspects of group work. Details of how these two theoretical constructs and their impacts are operationalized in the research model follow.

First, as argued earlier, from a theoretical perspective, large groups (compared to smaller ones) have greater sources and targets of social impact. The increase in targets and sources of social impact concomitantly increases the opportunities for the dilution of individual contributions (Latané 1981). Empirical evidence (e.g., Kidwell and Bennett 1993) also supports the view that individuals tend to experience greater dilution of their efforts with increasing group size. Though other factors may contribute to the dilution effect, both theoretical arguments and empirical evidence are consistent in showing that group size is an integral part of this effect. Thus, it is used as a tangible proxy for this effect in our study.

Second, SIT indicates that the immediacy gap occurs in groups where the targets and sources of social impact are distant. While distance between members may be a multidimensional construct (Monge et al. 1985), greater geographic distance among members has been shown to alter a group's circumstances of interaction in many ways, including the time needed to develop relational ties (Chidambaram 1996), the nature of communication exchanged among members (Walther 1995), the speed with which trust develops (Jarvenpaa and Leidner 1999), and the relative foci of groups (Hollingshead et al. 1993). Thus, physical collocation—where the sources and targets of social impact are in visible proximity—constrains and enables members' interactions in ways that are different than if members were dispersed. Similarly, physical dispersion also constrains and enables interactions among group members, albeit in different ways, and thereby defines their circumstances of interaction. Thus, geographic dispersion, which helps define the circumstances of interaction for team members, is an important determinant of the immediacy gap and is used to operationalize this theoretical construct.

Third, our research model focuses on two aspects of group work impacted by social loafing—individual contributions and group outcomes. In the context of group decision making, individual contributions refer to ideas generated by members regarding a problem or issue facing the group, while group outcomes refer to the final decisions made by the group (Hirokawa 1983). The former represents a divergence of ideas based on individual input, while the latter represents a convergence of thought based on collective judgment (Hirokawa and Pace 1983). In tightly integrated decision-making tasks (such as the one used in this study), the final decision reflects initial inputs to a greater extent compared to less-integrated settings (Driver and Streufert 1969). Thus, the two phases—divergence and convergence—are linked inextricably in that the final decisions made by the group will directly reflect the ideas generated and examined by its members. These arguments are consistent with the idea of integrative complexity (Streufert and Streufert 1978) and the brainstorming literature (e.g., Osborn 1957), which also suggest a direct link between individual inputs and group outputs.

In summary, our research model, based on SIT, suggests that as group size and member dispersion increase, group work will be affected in two ways: Members will contribute less (in the form of fewer ideas or lower-quality ideas, Latané 1981) and group outcomes will suffer (including lower levels of cohesion and poorer-quality decisions, Hirokawa and Pace 1983). Also, because the final phase of group decision making represents a convergence of ideas and opinions, group outcomes will be affected by *both* individual inputs (Hirokawa and Pace 1983) such as idea quantity and quality *and* contextual factors (Latané et al. 1979) such as group size and dispersion. Thus, as seen in Figure 2, both sets of effects on group outcomes are included in our model.

Below we present the hypotheses related to our research model and describe the theoretical and empirical bases for our expectations.

Group Size

Group size, the focus of group behavioral researchers for over half a century (Steiner 1972), has reemerged as a topic of interest for MIS researchers (Dennis and Valacich 1999, Pinsonneault et al. 1999a). The interest in technology support for groups of various sizes has spurred a spirited debate about the extent to which such support can enhance group productivity. While some researchers (e.g., Dennis and Valacich 1999) view the empirical evidence available as supporting the efficacy of technology support with idea generation in particular, others (e.g., Pinsonneault et al. 1999) are more equivocal. They suggest that technology support has little effect on small groups, while its impact on large groups is inconclusive given the relatively small body of evidence. This study hopes to add to this body of evidence.

The focus on small groups, ranging in size from three to six members, can be traced to the earliest studies of technology-supported groups (see Dennis et al. 1988 for a complete description). In these studies, minor differences in group size—such as between technology-supported groups of three and four—did not translate into differences in group outcomes (e.g., Watson 1987, Zigurs et al. 1988). However, in the few instances where differences in the sizes of technology-supported groups were more pronounced—such as between groups of 4 and 10 (Fellers 1989), 6 and 12 (Gallupe et al. 1992), or 3 and 9 (Valacich et al. 1992)—differences in outcomes, while not consistent, were observed. In particular, where sizes of the treatment groups were at least double that of the control groups, dilution effects were quite pronounced. Thus, consistent with these studies and Hare's (1976) arguments (discussed earlier), a similar approach—employing groups of four and eight—was used in this study.

Impact on Individual Contributions. Steiner (1966, 1972) found that in certain settings—such as when performing additive tasks—individual productivity increased exponentially as group size increased linearly. However, he found that productivity quickly peaked (which, incidentally, occurred with groups of four in his study), and then began to decline—again exponentially—due to process losses such as social loafing. Thus, Steiner suggested a nonlinear relationship between group size and individual productivity, illustrating the diminishing marginal utility of adding additional members to a team. In line with this view, Latané and colleagues (Latané et al. 1979, Latané 1981) argued that the actual contributions of members in large groups would be less than their potential contributions, a gap that they saw as increasing with group size. As depicted in our research model, individual contributions refer to ideas generated by group members and include measures of both quantity and quality. Thus, we propose the following hypotheses.

Hypothesis 1a. *The number of ideas generated by an individual member will be inversely related to the size of the group.*

Hypothesis 1b. *The quality of ideas generated by an individual member will be inversely related to the size of the group.*

Impact on Group Outcomes. The inverse power function implicit in Steiner's model (discussed earlier) suggests that, beyond a certain threshold, an increase in group size will result in a decrease in performance—a manifestation of the dilution effect. Consistent with these theoretical arguments, Shaw (1981) describes how small groups (of five members or fewer), while working on a cooperative task, produced better outcomes and were more satisfied than larger groups. These findings have been replicated in other settings, including among some technology-supported groups (e.g., Suleiman 1998). Our research model focuses on the quality of the group's final decision as an indicator of task performance. Hence, we propose the following.

Hypothesis 2a. *The quality of the final group decision will be inversely related to group size.*

In addition to task performance, group outcomes also include indicators of social performance or group well-being. Research has shown that members of large groups are less attracted to the group (Shaw 1981), tend to be less satisfied (Frank and Anderson 1971), and experience greater difficulty reaching consensus (Hare 1952) than members of smaller groups. Later research on technology-supported groups (e.g., Dennis et al. 1990) also found differences in relational outcomes between small and large groups. Thus, we expect cohesiveness, a key indicator of group well-being, to differ based on the number and sources of social impact in a group and present the following.

Hypothesis 2b. *A group's degree of cohesiveness will be inversely related to its size.*

Group Dispersion

As discussed earlier, the physics of dispersion constrain and enable group interactions in ways that epitomize the immediacy gap. Empirical evidence and theoretical arguments suggest two important observations in this regard. *One*, the "mere presence" concept advocated by Guerin (1986) suggests that the physical presence of others fundamentally changes how people behave. Thus, from the perspective of SIT, watching people work has a different social impact on a group member as opposed to reading their electronic messages. Similarly, for members seeking targets of social impact, the dispersed setting offers a predominantly text-based medium, which offers certain advantages (e.g., not worrying about the recipients' reactions, Sussman and Sproull 1999) and disadvantages (e.g., the inability of conveying status differentials, Weisband et al. 1995) compared to collocated settings. *Two*, the inability to see and be seen also affects relational group outcomes such as cohesion. Typically, in dispersed settings the reliance on electronic media results in groups taking longer to develop these indicators of social performance (Chidambaram 1996, Walther 1995).

Given that members of dispersed groups typically communicate in ways that differ from those in collocated groups (Weisband 2002, Chidambaram and Jones 1993, Dennis et al. 1988)—with increased anonymity, reduced identifiability of inputs, decreased member visibility, difficulty of making social comparisons, and challenges in evaluating contributions, to name a few—our model suggests that individual contributions and group outcomes will differ between such groups. Specific hypotheses for both sets of impacts and the underlying rationale for each are presented below.

Impact on Individual Contributions. The first aspect of geographic dispersion refers to the extent to which an individual's contributions to the group task can be identified. Among collocated groups, the link between reduced identifiability and increased social loafing was first demonstrated in an experiment conducted by Williams et al. (1981). They compared levels of effort exerted by individuals who were asked to engage in a shouting contest under various conditions. Results indicated that individuals exhibited greater effort when they believed that their contributions were identifiable, both while working in groups and individually. Jones (1984) argued that given equal rewards and unidentifiable input, rational behavior would dictate that individuals reduce their effort on group tasks to prevent free riding by others. Thus, where individuals' contributions are identifiable, they are likely to expend more effort on the task and focus on performing better because their behavior will have consequences attributable directly to them. In the case of dispersed groups, the extensive use of electronic media—being associated with increased anonymity of interactions (Valacich et al. 1994) and decreased ability to monitor performance (Weisband 2002)—can impair the identifiability of individual contributions (first recognized among collocated groups). Moreover, the "mere presence" argument would suggest that without peers to see and be seen by (especially in the absence of a reward/penalty structure based on individual performance) the social impact to work is lessened in dispersed settings. Thus, we hypothesize the following.

Hypothesis 3a. *The number of ideas generated by an individual member will be inversely related to the extent of group dispersion.*

Hypothesis 3b. *The quality of ideas generated by an individual member will be inversely related to the extent of group dispersion.*

Impact on Group Outcomes. The second aspect of the immediacy gap refers to the difficulty of making social comparisons in dispersed group settings. The relative anonymity of interaction inherent in such settings has been shown to reduce evaluation apprehension (Valacich et al. 1994), but in enabling this outcome (ironically) it also limits members' ability to evaluate others' contributions, and thus inhibits social comparison. Shepherd et al. (1995–1996) conducted two experiments to study the role of social comparison mechanisms in reducing the effects of social loafing in virtual teams. In both experiments, groups with greater ability to exercise social comparison—enabled through process facilitation—engaged in less social loafing and performed better than the control groups. Without the benefits of social comparison, SIT suggests that members will become isolated from their group and ultimately withdraw from its activities. Such withdrawal will impact task outcomes adversely (Prince 1970) and result in lower overall performance (Jones 1984), especially where convergence of opinion is vital (Driver and Streufert 1969). Based on these arguments, we present the following.

Hypothesis 4a. *The quality of the final group decision will be inversely related to the extent of its group dispersion.*

Because social comparison involves a mutual process of observing others' participation and having one's own participation be observed, members of dispersed groups—depending on the technology used—may be constrained in their ability to fully engage in this process (Jessup and Tansik 1991), and are likely to experience deindividuation effects whereby "others cannot single [members] out for their behavior" (Jessup et al. 1990). This contention is supported by empirical results (e.g., Chidambaram and Jones 1993, Gallupe and McKeen 1990, Griffith et al. 2003), which are quite consistent: Collocated groups (with greater ability to engage in social comparisons) generally report higher levels of satisfaction (e.g., Cass et al. 1992), greater cohesiveness (e.g., Chidambaram 1996), and less difficulty in reaching consensus (Gallupe and McKeen 1990) compared to their distributed counterparts. In summary, the deindividuation effects of geographic dispersion will be evident in the way members relate to each other and the group. Hence, we propose the following.

Hypothesis 4b. *A group's degree of cohesiveness will be inversely related to the extent of its dispersion.*

Integrative Complexity

As mentioned earlier, our research model focuses on two aspects of group work impacted by social loafing—individual contributions and group outcomes. Each of these aspects represents the initial and final phases of group decision making, referred to by theorists as divergence and convergence (Driver and Streufert 1969). Divergence is considered a characteristic of brainstorming where no evaluative filters are placed on ideas, and results in disparate views being expressed by members about problems and issues facing a group (Osborn 1957). Convergence represents the coming together of differing opinions and often involves resolving conflict and reaching consensus (Kelly and Karau 1999).

While theorists are consistent in proposing that the initial and final stages of group decision making are linked, they are divided in their views about the nature of this relationship. Some theorists (e.g., Hall 1971) suggest that the greater the solution space (exemplified by a large number of ideas) and the better the proposed solutions (exemplified by high-quality ideas), the better will be the final decision of the group. However, others (e.g., Streufert and Streufert 1978) view group decision making as a combination of two contrasting processes—differentiation (representing divergence) and integration (representing convergence)—that when combined results in "integrative complexity." In other words, differentiation involves looking for solutions characterized by differing perspectives and not limited by unifying themes. Integration, however, involves arriving at a solution, and is characterized by resolving differences and limiting outcomes to a consistent framework (Scheidel 1986).

Because these two processes have opposing goals, a group that does well in the differentiation phase by generating many ideas may experience considerable difficulties arriving at a decision in the integration phase—a visible symptom of information overload. Grisé and Gallupe (1999–2000) examined this proposition empirically by studying the relationship between idea generation and idea organization among technology-supported groups. Their results confirmed the existence of an inverse relationship between the differentiation and integration phases, i.e., the more ideas a group generated, the more difficult was the ensuing process of organizing these ideas. Thus, based on the arguments of integrative complexity and the available empirical evidence, we propose the following.

Hypothesis 5a. *The quality of the final group decision will be inversely related to idea quantity.*

Hypothesis 5b. *The quality of the final group decision will be positively related to idea quality.*

Research Design and Methods

Two hundred and forty undergraduate business students participated in this study. Forty teams—half comprised of four members and the other half of eight members—were formed using random assignment. As posited by SIT and argued earlier, the dilution effect manifests itself when the sources and targets of social impact, i.e., group size, increase. Thus, a doubling in group size from four to eight suggests an exponential increase in the number of potential relationships within the group and a concomitant increase in the dilution effect (Steiner 1972, Hare 1976). Further, the second dimension of SIT—the immediacy gap, which refers to the distance between the group and its members—was operationalized by randomly assigning the various groups to either a collocated or a distributed setting. Thus, the research design employed two levels of randomization: random assignment of individuals to groups and random assignment of groups to treatments.

Course credit, consisting of 5% of the course grade, was offered for participating in the study. In addition, each member of the best-performing team (based on the quality of the final decision) in each of the four treatments received a cash prize of $20. Previous research (e.g., Jones 1984) has shown that the fact that everyone in a team gets the same reward despite different levels of effort (either perceived or actual) can influence individual contributions and subsequent interactions. Thus, in this study, everyone who participated in the study received the same amount of course credit and everyone in a winning team received the same amount of money, regardless of how much effort they put into the group task.

Training

Participants were trained on using three tools—for generating, organizing, and evaluating ideas—embedded in a commercially available collaborative system, *GroupSystems*®. (A complete description of these tools and how they were used is provided below.) Based on a pilot study, a script was developed for the training exercise; the same exercise was used for all teams. However, given the differences in the communication mode—only electronic for the virtual teams and a combination of electronic, verbal, and paraverbal for the collocated teams—training for each treatment was done separately (and "cheat sheets" were used to supplement the training). After the formal training exercise (which lasted about an hour) was completed, subjects were encouraged to clarify their doubts in a question-and-answer session. The participants were informed only in general terms about the purpose of the study; they were not aware of the specific research questions or the experimental task. Finally, they were asked not to discuss the study or the training with others.

Task

The task used in this study—validated in a variety of contexts (e.g., Wei 1997, Chidambaram 1996, Miranda and Bostrom 1993)—can be classified as a decision-making task with no right or wrong answers. It required the groups to simulate a board of directors of a winery dealing with the problems of global expansion. Specifically, the task required the board to solve a serious image problem faced by the company. Subjects were required to generate alternatives, discuss them, and narrow the list before voting to select the one they would recommend to the management of the company. After completing a presession questionnaire (which collected demographic and experiential information), subjects read the case and completed the task.

Experimental Setting

The collocated groups met in the networked conference room of a large university. Members of these groups, whether small or large, were seated around a horseshoe-shaped table, facing each other. At the open end of the horseshoe, visible to all participants, was a drop-down screen that displayed the output from the various group activities. The task used in this study, as discussed earlier, included the three phases of decision making proposed by Simon (1955)—intelligence, design, and choice. Collocated groups used electronic tools in all three phases (as described in detail below). Additionally, they used verbal, nonverbal and paraverbal communication during the design phase (referred to in our study as the discussion phase). Members of the distributed groups did not meet face to face, but reported to their assigned rooms, located in a building that contained networked computers and had research associates present who delivered the task and instructions for its completion. All communication was electronic and the resulting output was archived by the system. Other than location and the communication channel, procedures were identical for the distributed and the collocated groups. Upon completion of the task, each group turned in a form that included their final decision and the rationale for the decision. After this form was turned in, subjects were asked to complete a post-session survey, debriefed, thanked for their participation, asked not to discuss the study with others, and dismissed.

Technology

To complete the task, all groups used the same three electronic tools—Electronic Brainstorming (EBS), Topic Commenter, and Electronic Voting—that were part of the *GroupSystems*® groupware suite. Additionally, members of dispersed groups used a "meta communication" window to exchange messages about the task and a pop-up messaging tool to communicate with the facilitator. The facilitator provided technical support by launching the collaborative tools used during each activity. To ensure equity across the groups and the treatments, the first tool, which was an idea-generation tool, was enabled at the outset of each session. Each tool and how it was used in the collocated and dispersed conditions is described below and summarized in Table 1.

Collocated Groups. These groups used electronic tools in all phases of decision making, as described below. In addition, they communicated verbally and nonverbally during the discussion phase.

• *Idea Generation*. In this phase, which corresponds to the intelligence phase of decision making, members used a tool called Electronic Brainstorming (EBS) to electronically generate alternatives about the problem facing the firm. The facilitator started the tool, and each member worked privately and without interruption, but in full sight of each other, until all ideas were exhausted. Ideas appeared on the common screen and members could view these ideas as they were being generated, but could not discuss them. Each idea was "tagged" with the user ID derived from the client machine from which it originated, but it did not include any personal identification related to the author.

• *Discussion*. The ideas generated by the group were discussed verbally (along with nonverbal and paraverbal exchanges) during this phase. The objective of this phase was to develop a shared understanding of the alternatives available to the firm in dealing with its image crisis. Comments and questions were raised about the ideas generated, and clarifications were sought and provided. Based on

Table 1 Differences in Treatment/Technology Between Groups

Phase of group work	Collocated groups	Dispersed groups
Idea generation	• *Electronic brainstorming in a face-to-face setting* Each member works privately in sight of others All output appears on a common screen No discussion	• *Electronic brainstorming from dispersed locations* Each member works privately in separate offices All output appears on a split-screen window No discussion
Discussion	• *Verbal (plus nonverbal and paraverbal) discussion of ideas* Includes commenting on, clarifying, and questioning of ideas • *Electronic organization* Includes merging, editing, deleting, and grouping of ideas	• *Electronic discussion of ideas in a "metacommunication" window* Includes commenting on, clarifying, and questioning of ideas • *Electronic organization* Includes merging, editing, deleting, and grouping of ideas
Evaluation	• *Electronic voting* Rating each idea on a scale of 1 (low) to 10 (high) System consolidates scores No discussion	• *Electronic voting* Rating each idea on a scale of 1 (low) to 10 (high) System consolidates scores No discussion

the verbal discussion, members then electronically organized the ideas using a tool called Topic Commenter, and in the process edited, enhanced, deleted, or merged them into a coherent group of alternatives.

• *Evaluation*. After the discussion phase concluded, the facilitator started an electronic voting tool that allowed members to rate each alternative on a scale of 1 (low) to 10 (high). During this phase, there was no discussion—verbal or electronic. The system consolidated the ratings and presented the results, which were visible on the public screen. The alternative with the highest score was considered the decision of the group and was recorded on a form, which included the final decision of the group along with the rationale for its recommendation.

Dispersed Groups. These groups used the same electronic tools (described below) as their collocated counterparts, except from different offices in the same building. Moreover, communication was limited only to electronic exchanges: Members communicated with each other through a separate metacommunication window and with the facilitator by using pop-up messages.

• *Idea Generation*. In this phase, as with the collocated groups, members used the EBS tool to electronically generate alternatives about the problem facing the firm. However, members were dispersed, and thus relied on a split-screen display to see all the ideas generated by the group. As with the collocated groups, each idea was "tagged" with the user ID of the client machine from which it originated, but it did not include any personal identification of the author.

• *Discussion*. During this phase the ideas generated by the group were discussed electronically using the Topic Commenter tool. As with the collocated groups, the objective of this phase was to develop a shared understanding of the alternatives available to the firm in dealing with its image crisis. Comments and questions about specific ideas were listed under those ideas while general discussion was enabled through a metacommunication window, wherein comments were serialized and identified with client IDs. As with the collocated groups, based on the discussions, members electronically organized the ideas by moving, deleting, merging, and revising them into a coherent group of alternatives.

• *Evaluation*. After the discussion phase concluded, members could use a pop-up messaging tool to request that the facilitator start the electronic voting tool to enable them to rate each alternative available to the firm. As with the collocated groups, there was no discussion at this stage. The system consolidated the ratings and presented the results, which were visible on members' desktops.

Measures

Individual Contributions. In studies involving creativity (Osborn 1957) and group decision making (e.g., Hirokawa and Pace 1983), individual contributions have been measured using ideas generated by individuals. Similar to these approaches, and given the focus of this study, both the quantity and the quality of ideas generated by individuals were measured.

• *Idea Quantity*. In terms of quantity, the average number of ideas generated by members in a group was used to evaluate individual productivity. This measure had the advantages of normalizing the scores across groups of different sizes (thereby providing a comparable estimate of contributions) and being consistent with previous studies of the phenomenon (thereby allowing comparisons across studies). Consistent with previous research (e.g., Connolly et al. 1993) that eliminated redundancies in ideas before conducting statistical analysis, we eliminated ideas that were identical (e.g., "Use a celebrity to advertise on television" and "Have TV ads with a celebrity"). In such cases, only one idea was included in the analysis.

• *Idea Quality*. In terms of quality, the average quality of ideas generated by a group was assessed by having two instructors in marketing (blind to the treatments) evaluate each idea generated by a group in terms of its effectiveness in solving the firm's image problem. The least-effective ideas were rated 1 and the most effective ideas were rated 10. Given an acceptable level of interrater reliability (intraclass correlation coefficient of 0.68) over a relatively large set of ideas, the average of the two raters' scores was computed to get an overall measure of idea quality. As with idea quantity, this measure was not confounded by group size.

Group Outcomes. A direct measure of task performance (quality of the final decision) and a perceptual measure of group well-being (group cohesiveness) were used to assess group outcomes.

• *Quality of the Final Decision*. This measure has played an important role in the study of social loafing (e.g., Latané 1981, Karau and Williams 1993, Suleiman 1998) and serves as a key indicator of task performance. In this study, quality was evaluated by two expert judges—different from those who rated the individual ideas—who were faculty members in marketing and blind to the treatments. Every decision was rated from 1 (low) to 100 (high) based on the evaluator's perception of how effective it was in solving the firm's image problem. Interrater reliability was 0.83, and the average scores were used in the analysis.

• *Cohesiveness*. In this study, a validated version of Seashore's Index of Cohesiveness—used in other studies (e.g., Wei 1997)—was employed. The degree of cohesiveness in a group is the average score of members' perceptions about the relational ties that exist in the group (Keller 1986) and serves as a good indicator of a team's social performance (Cartwright and Zander 1968). This 5-item index had a scale that ranged from 1 (low) to 5 (high).

Results

An analysis of the presession surveys completed by the subjects in the collocated and dispersed treatments regarding their age ($t_{235} = 0.886$, $p = 0.376$), gender ($\chi^2_1 = 1.067$, $p = 0.302$), technical ability ($t_{238} = 0.860$, $p = 0.391$), and experience working in groups ($t_{238} = 0.051$, $p = 0.960$) revealed no significant differences between the groups. With the exception of gender (a categorical variable) which was expected to, and did, have more subjects of both genders in the large groups, there were no significant differences between the small and large groups as well, in terms of age ($t_{235} = 0.163$, $p = 0.871$), technical ability ($t_{238} = 0.702$, $p = 0.484$), and group experience ($t_{238} = 0.071$, $p = 0.943$). Descriptive statistics for the variables examined in this study are included in Table 2.

Tests of Hypotheses

The paths depicted in the research model and representing the hypotheses of interest in this study were tested using the partial least-squares (PLS) technique, as described by Löhmuller (1989). Given the minimal assumptions of PLS about the distribution of data and its appropriateness in testing a path model such as the one presented in this study, this technique was chosen over other analytical techniques. The results of this analysis are depicted graphically in Figure 3 along with the corresponding t-statistics for the path coefficients and their levels of significance. To ensure that the Type I error rate was not inflated due to multiple comparisons, a familywise significance level of 0.05 was used in testing the paths. Given the 10 paths in the model, the level of significance chosen for each t-test was a very conservative rate of 0.005 (i.e., the familywise rate/number of paths = 0.05/10)

Given the similarity of PLS to multiple regression, the interpretation of the values in the model is

Table 2 Means, Standard Deviations, and Intercorrelations of Study Variables

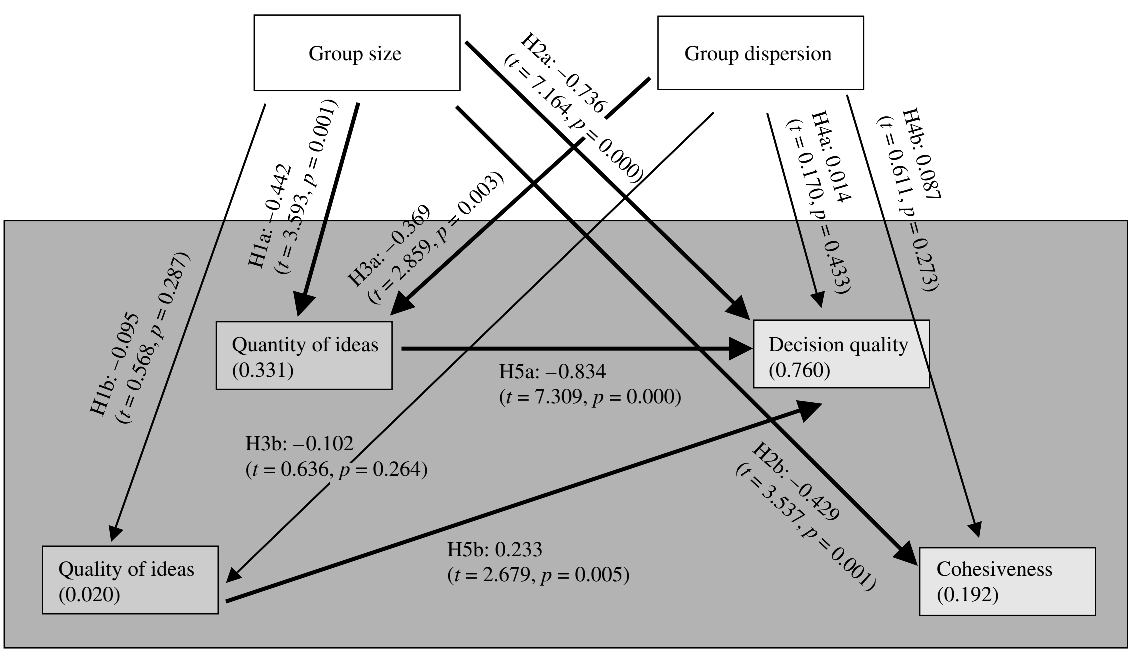
Variables (scales)	Means (std. devs.)	Group size	Group dispersion	Idea quantity	Idea quality	Decision quality	Cohesiveness
Group size	—	1.000					
Group dispersion	—	—	1.000				
Idea quantity (per person)	4.340 (0.935)	−0.443**	−0.370*	1.000			
Idea quality (out of 10)	5.185 (0.724)	−0.095	−0.103	0.077	1.000		
Decision quality (out of 100)	77.406 (7.814)	−0.390*	0.297	−0.495**	0.238	1.000	
Cohesiveness (1 to 5)	3.640 (0.204)	−0.435**	0.087	0.242	0.065	0.094	1.000

*Sig. at 0.05 level (2-tailed).
**Sig. at 0.01 level (2-tailed).

straightforward: R-squared values for each endogenous variable (included within each box) represent the proportion of variance explained by the exogenous variables impacting it while the path coefficients represent standardized regression coefficients, i.e., the beta weights (β). Below we present those results from the model that are related to our hypotheses. In the next section we discuss their implications for practice and research.

Of the two hypotheses relating group size to individual contributions, only H1a (about the quantity of ideas generated) was supported ($\beta = -0.442$; $t = 3.593$, $p < 0.005$); H1b related to idea quality was not supported. The negative beta weight above indicates that the results were in the expected direction, i.e., an increase in group size was related to a decrease in the average number of ideas generated by members. The second set of hypotheses (H2a and H2b) related

Figure 3 A Path Model of Social Loafing in Technology-Supported Groups



Notes. Arrows in boldface denote paths significant at $p < 0.005$.
Path coefficients, prefaced by their corresponding hypotheses, are listed along with their respective t-values and significance levels.
R-squared values of endogenous variables are included within their respective boxes in parentheses.

to group outcomes were both supported, indicating that increases in group size were related inversely to the quality of group decisions ($\beta = -0.736$; $t = 7.164$, $p < 0.005$) and the degree of cohesiveness ($\beta = -0.429$; $t = 3.537$, $p < 0.005$).

Regarding the impact of group dispersion on individual contributions, only Hypothesis H3a, which proposed an inverse relationship between group dispersion and the quantity of ideas generated, was supported ($\beta = -0.369$; $t = 2.859$, $p < 0.005$). The other hypotheses that proposed an inverse relationship between group dispersion and outcomes, including decision quality (H4a) and group cohesiveness (H4b), were not supported.

Finally, results related to the solution space explored and the integrative complexity of group decision making—articulated in Hypotheses H5a and H5b—were as expected: Idea quantity had a significantly negative impact on decision quality ($\beta = -0.834$; $t = 7.309$, $p < 0.005$), while idea quality had a significantly positive impact on it ($\beta = 0.233$; $t = 2.6788$, $p = 0.005$). In the next section, we discuss the significance of these and other results.

Post Hoc Tests

Post hoc analyses of variance (ANOVAs) were carried out to test any interaction effects between the two exogenous variables of interest in this study—group size and group dispersion (see Table 3 for results of these analyses). However, no significant interaction effects were evident on any of the endogenous variables—idea quantity ($F_{1,36} = 0.08$, NS), idea quality ($F_{1,36} = 0.01$, NS), decision quality ($F_{1,34} = 2.44$, NS) (which included idea quantity and idea quality as covariates), and the degree of cohesiveness ($F_{1,36} = 0.45$, NS).

Limitations

While our results offer some insights to social loafing in teams, this study was conducted in a controlled lab environment, and hence caution should be used in interpreting or extrapolating these results. A key dimension of this study was group size, which was used to operationalize the dilution effect. However, it is important to note that group size may include other aspects—such as the division of labor or the idea of strength in numbers—in addition to the dilution effect. In some cases, such as when a group is engaged in an intellective task, these aspects may in fact have a different impact than those seen in this study.

A related limitation deals with another aspect of group size. Despite doubling group size (which resulted in an exponential increase in the number of intragroup relationships), only two group sizes were examined in this study. Studying a range of group sizes or significantly larger groups (of, say, 20 or more members) may yield different results. Particularly noteworthy is the assertion by Dennis and Valacich (1999) that groups with more than eight members are likely to benefit considerably from using collaborative technologies, especially in the context of idea generation.

Table 3 Results of Post Hoc ANOVAs

	Endogenous variables											
	Idea quantity			Idea quality			Decision quality*			Cohesiveness		
Sources of variance	*df*	*F*	Sig.	*df*	*F*	Sig.	*df*	*F*	Sig.	*df*	*F*	Sig.
Covariates*												
Idea quantity							**1**	**71.72**	**0.000**			
Idea quality							**1**	**8.31**	**0.007**			
Group size	**1**	**10.60**	**0.002**	1	0.33	0.569	**1**	**63.81**	**0.000**	**1**	**8.57**	**0.006**
Group dispersion	**1**	**7.34**	**0.010**	1	0.39	0.538	1	0.02	0.901	1	0.34	0.562
Size × Dispersion	1	0.08	0.786	1	0.01	0.918	1	2.44	0.128	1	0.45	0.508
Error	36			36			34			36		
Corrected total	39			39			39			39		
R-squared		0.334			0.020			0.776			0.206	

*As can be seen in the research model, decision quality was the only endogenous variable with covariates.

Similarly, as many researchers (e.g., DeSanctis et al. 2000, Hollingshead et al. 1993) have suggested, studying groups for longer periods may also reveal novel patterns of interactions and outcomes. In this study, ad hoc groups were studied for a short duration. However, groups with a history and a future working on an ongoing basis may be subject to very different kinds of social impact, which would be difficult to replicate and examine in a lab setting. As discussed earlier, the inverse relationship between idea quantity and decision quality may have been compounded by the tightly integrated nature of the task and the type of technology support provided. Other types of tasks and technologies may result in different outcomes.

Other than the number of ideas generated, there were no differences in outcomes between collocated and dispersed groups. This similarity in results mirrors the similarity in technological tools used by both groups. The one notable difference in how the tools were used by the two groups occurred in the discussion phase. During this phase, collocated teams discussed ideas in a face-to-face setting and used the online tool to organize them, while the dispersed groups used only the online tool to discuss *and* organize the ideas. However, the results suggest that this difference in the treatments did not result in outcome differences. A more pronounced difference between treatments—for instance, where collocated teams relied solely on face-to-face discussion without access to any online tools—may have yielded discernable differences in outcomes. However, given that the focus of this study was on social loafing, the difference between collocated and dispersed groups was operationalized primarily to capture the "mere presence" effect—an artifact that may have dampened differences in outcomes.

In this study, collocation and dispersion were operationalized as discrete states. However, in modern organizations, it is likely that groups have elements of both collocation and dispersion. Even among collocated groups, a range of options may exist from all members working together in a face-to-face setting to all members being in the same building and occasionally meeting face to face, to some members working in the same building and others working face to face. Similarly, among dispersed teams, a range of options may exist: from all members working apart all the time to some members meeting frequently, to all members meeting face to face occasionally (Griffith et al. 2003). Thus, it is likely that the results reported in this study may differ based on the "degree of virtualness" of groups.

Discussion and Implications

Despite the limitations discussed above, results from our study offer some interesting insights about social loafing in technology-supported groups. Group size affected both aspects of group decision making, including individual contributions and group outcomes. Thus, the lessons from the group behavior literature that "size matters" held true, even with the addition of technology support. Results related to member dispersion confirmed the "mere presence" argument of social loafing made by Guerin (1986). Specifically, individuals in the collocated teams, reacting to the mere presence of others, contributed significantly more than their distributed counterparts, who used the same technology but from dispersed locations. However, group performance did not differ between the collocated and distributed teams. Finally, the results also confirmed the concept of integrative complexity between members' ideas and a group's final decision: More ideas were negatively related to decision quality, but higher-quality ideas were positively related to decision quality. We discuss these results and their implications below.

Group Size: Is Less, More?

In previous studies of technology-supported groups, small groups experienced better relational interactions (e.g., Gallupe et al. 1992), but the impact of group size on individual contributions and group decisions was less clear. While larger groups—embodying greater dilution effects—typically generated more ideas overall than smaller ones (e.g., Valacich et al. 1992, Fellers 1989), the individual contributions of members were either not evaluated or displayed no significant improvements. Moreover, the impact of group size on the quality of group decisions was also mixed (Valacich et al. 1995). In comparison, results from studies of groups without technology support (e.g., Karau and Williams 1993, Thomas and Fink 1963) have been quite consistent: Large groups have generally elicited lower individual contributions and had poorer outcomes compared to small groups. These results from groups without technology support are in line with the findings from this study, where all groups *had* technology support for task completion.

Viewed differently, contrary to conventional wisdom, technology support did little to mitigate the impact of the dilution effect on large groups. Fellers (1989), who examined the effects of group size among technology-supported groups, found that members of larger groups had a greater tendency to indulge in "free riding" compared to those in smaller groups (akin to findings from the group behavior literature). He argued that some aspects of technology use, such as pooling individual inputs, in fact tend to exacerbate members' perceptions of marginal contributions inherent in large teams. Anonymously entering ideas, pooling them together on a common screen, and voting on them privately—as was done in this study—may well reinforce the perceptions prevailing in large groups that individual contributions are indistinguishable and are part of an amorphous whole. In other words, among such groups—with an inherently large dilution effect—the lower motivation to participate in group tasks resulted in reduced individual contributions (reflected in the number of ideas generated), poorer task performance (reflected in the quality of the final decision), and poorer social performance (reflected in the cohesiveness of the group). Thus, Kidwell and Bennett's (1993) arguments—that the perceived marginalization of effort is at the core of motivational losses, which affect both inputs to, and outputs from group interactions—were generally supported in this study.

These results add to recent debates on the role of group size in idea generation by technology-supported teams (Dennis and Valacich 1999, Pinsonneault et al. 1999a). Given that technology-supported groups of different sizes exhibited results similar to those found in groups without technology support, one may surmise that technology neither exacerbated the lack of synergy implicit in small groups nor did it mitigate the process losses of large groups (Steiner 1972). It is also possible that technology boosted the supposedly low synergy level of small groups (Dennis and Valacich 1999), thereby improving individual contributions, while it intensified the dilution effects of large groups (Pinsonneault et al. 1999a) and decreased individual contributions. Regardless of which explanation is more plausible, our results suggest that the impact of technology was not sufficient to reverse traditional patterns of individual behavior commonly attributed to small and large groups (Latané 1981).

Steiner's (1972, p. 103) assertion, "as groups become larger, process losses will ordinarily increase at an accelerating rate" has been substantiated quite strongly in studies of group behavior (e.g., Guerin 1999). However, some researchers of technology-supported groups (e.g., Gallupe et al. 1992) have argued that collaborative technologies are best suited to help large groups, in particular, by minimizing these process losses. Nevertheless, in this study, where all groups had technology support, we found that large groups did not outperform their smaller counterparts in individual contributions or group outcomes. As explained earlier, some aspects of the technology may have reinforced the feelings of "being submerged in the group" (endemic to large groups) and consequently exacerbated the process losses of these groups. Shepherd et al. (1995–1996) suggest that a catalyst, such as process facilitation (which was not provided in this study), may in fact be necessary to help large technology-supported groups reduce process losses and exploit the benefits of collaborative technologies more fully.

Member Dispersion: A Case of Keeping Up Appearances?

During the brainstorming phase, collocated groups and dispersed groups used the same technological tool to generate ideas. The key difference between them was the ability of members in the collocated groups to see others and be seen by them. The following quote from Weisband (2002, p. 311) provides insights to the results from our study:

> In face-to-face groups, feedback about what others are doing is immediate and can be accomplished passively. Group members, for instance, can observe who attends meetings or . . . they can glance over at another person to see if they are working or they can hear the sound of a particular machine and know what work is being done . . . . In contrast, distributed groups can go long periods during which they have no information about their teammates' activities. They may have to rely entirely on the messages that appear on the

computer screen to figure out what other members of the work group are doing.

In other words, the collocated groups have a greater ability to engage in social comparison compared to distributed groups. Thus, seeing others work—and comparing one's level of effort with that of the others—fosters a desire to "keep up with the Joneses" and results in a cycle of social comparison leading to overt displays of work, such as entering more ideas on a workstation. One may be tempted to conclude that in such settings, which have high visibility, the appearance of progress may be viewed by participants as being just as important as actual progress.

However, SIT allows us to offer a somewhat less cynical explanation. This explanation is also consistent with the findings that while collocated groups generated more ideas, the average quality of these ideas was not significantly better than that of the dispersed teams. Individual performance in groups is influenced by a combination of social demands and task demands (Hirokawa 1983). Given the same set of task demands for both the dispersed and collocated groups, one can argue that the social demands were higher in the collocated setting, which meant that peer performance was a prime mover in members generating more ideas (to match what others were doing), but not necessarily better in quality. Among dispersed groups, where the discernable social pressure to *appear* productive was lower, group members generated ideas dictated primarily by task demands, not the combination of task *and* social demands (as in the collocated groups). Viewed differently, members of dispersed groups used their time more efficiently—a contention supported by Majchrzak et al. (2004)—by only generating ideas that needed to be generated (Walsh and Maloney 2002).

Interestingly, while social impact played an important role in determining one dimension of individual contributions—the number of ideas contributed by members—it did not affect other aspects of individual or group work. In particular, social performance measured using group cohesiveness did not differ between dispersed and collocated groups. Thus, having the ability to communicate freely (given the ease of talking compared to writing) and respond perceptibly to social stimuli (given the immediacy of sources and targets of social impact) did not translate to greater cohesion among members of collocated groups. Viewed differently, while collocated members responded to seeing and been seen by others by working visibly more (i.e., generating more ideas), when the task ended so did the social impact of the setting. There was no carryover effect when members were asked to assess the social performance of their groups. Thus, having a richer medium did not automatically translate to being more cohesive for these groups.

To sum up, collocation increased the social pressure on group members and provided them with a relatively unconstrained environment, to which they responded by appearing visibly more productive. However, when the task ended, the social pressure of the setting did not carry over; members of collocated groups did not rate their groups as being any more cohesive than their dispersed counterparts. Thus, the social impact of the setting is most likely a transitory phenomenon and, in this instance at least, was based on responding primarily to visual cues. Viewed differently, when others were not around, the need to *appear* productive seemed to diminish. Similarly, when the task ended, the need to respond favorably to social impact also seemed to diminish given that collocated members, despite being aware of others' presence more keenly and responding to it, did not rate their groups as being more cohesive than their dispersed counterparts.

Integrative Complexity: Is More, Less?

Not surprisingly, the final decision was based on the ideas generated by individuals in the first phase; thus, *where* a group started determined *where* it ended. In other words, the quality of the final decision—being a combinatorial subset of the ideas generated—should and did reflect the quality of the ingredients used to arrive at it (Hall 1971). However, what may appear less intuitive is the inverse relationship we found between idea quantity and decision quality. Stated simply, having more ideas to process—contrary to the literature on brainstorming (Osborn 1957)—resulted in poorer-quality decisions. Thus, the conventional wisdom that the "larger the solution space, the better the solution" was not confirmed in this study.

These results can be explained using the concept of "integrative complexity" as articulated by

Streufert and Streufert (1978), who, as mentioned earlier, viewed group decision making as a combination of two contrasting processes—differentiation and integration. Given the opposing goals of these phases, a group that excels in the differentiation phase (by generating many ideas) may inadvertently be stacking the deck against itself by creating numerous options to sift through, many of which may reflect differing points of view, in the next phase—integration (Scheidel 1986). While exploring a larger solution space may yield novel and interesting options (Hall 1971), it undoubtedly increases the difficulty of making a decision by concomitantly increasing information overload and interpersonal conflict (Streufert and Streufert 1978).

Our results are in line with those of Grisé and Gallupe (1999–2000), who confirmed the existence of an inverse relationship between the differentiation and integration phases, i.e., the more ideas a group generated, the more difficult was the ensuing process of organizing these ideas. They conclude by suggesting that technology support during the idea-generation phase in fact helped individuals to generate ideas very rapidly, exceeding the ability of groups to subsequently process them. Thus, the integrative complexity among technology-supported groups appears to be high, a finding that is consistent with the results of this study. Grisé and Gallupe (1999–2000) suggest that providing process facilitation and synchronizing differentiation and integration processes will improve group decision-making outcomes. Along similar prescriptive lines, Streufert and Streufert (1978) suggest that an appropriate level of integrative complexity—defined as a fit between the pace of idea generation and the ability to process the ideas generated—is necessary for making good decisions.

Conclusion

Social loafing is a costly phenomenon for organizations because it reduces task performance and hinders group well-being. SIT provides a theoretical framework for helping us to understand the underlying factors of social loafing. Results of this study offer mixed support for SIT—on the one hand, the arguments about group size, embodying the dilution effect, were strongly supported. However, on the other, the arguments about group dispersion, representing the immediacy gap, found only modest support. Specifically, the responses to the questions posed at the start of this paper can be summarized as follows: While members of dispersed groups were presumably less productive than their collocated counterparts when it came to generating ideas, the quality of their group decisions was comparable. In other words, group performance did not differ based on where members were located. Moreover, regardless of location, smaller groups fared better—in terms of individual input and group output.

Because most organizational teams utilize collaborative technologies to varying extents, the lessons from this study may provide some clues about staffing such teams. What may appear intuitive is also borne out by empirical evidence: The size of a team matters; even moderate increases in size will likely impact individual participation and group performance. In fact, as seen in this study, small groups supported by technology can be more productive and make better decisions than comparable larger groups. Thus, regardless of technology support, careful consideration should be paid when adding members to a team. Simply put, members should only be added to a team if they can contribute to it—a determination that admittedly may be difficult to make a priori. Our findings suggest that even the use of collaborative technologies by a group does not negate this lesson, but reconfirms it.

The findings from this study also provide some insights about collocating team members. Undoubtedly, as seen here, collocation has benefits such as increasing individual involvement in team activities. Thus, activities with a high social component—such as team building, for instance—are likely to benefit from collocating members. However, the benefits of collocation must be weighed against its costs, including the economic costs of getting group members together and the possibly minimal impact it is likely to have on some task outcomes. In line with the arguments of Majchrzak et al. (2004), results of this study suggest that team performance will not suffer merely because its members are dispersed. Arguably, the only impact of collocation seen in this study was the increased social pressure to *appear* productive. From a managerial perspective, this result suggests that some teams can perform effectively without the benefits (and costs) of collocation. Given the range of collaborative technologies available, organizations need to carefully consider when to bring people together and when they should work apart, because we found little evidence—at least as far as task performance goes—that out of sight was out of mind.

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