Situation Invisibility and Attribution in Distributed Collaborations†

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This article expands theoretical and empirical understanding of interpersonal relationships under distributed conditions by highlighting the importance and consequences of situation invisibility. In a laboratory study, the authors demonstrate that distributed teammates are significantly more likely than collocated teammates to make internal dispositional attributions rather than situational attributions concerning negative partner behavior because of situation invisibility. These dispositional attributions in turn affect relational outcomes such as satisfaction and cohesion. The authors also demonstrate the impact of situational explanation as an antidote to situation invisibility.

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Advances in telecommunication and information technologies are facilitating the collaboration of people who do not share the same physical location. Technology-enabled, geographically distributed collaboration has become commonplace, particularly among

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professionals performing knowledge-intensive tasks (Gibson & Cohen, 2003; Kanawattanachai & Yoo, 2002; McDonough, Kahn, & Barczak, 2001). Some 137 million workers worldwide are involved in distributed electronic work (Solomon, 2001).

This article explores an important challenge to distributed collaboration, situation invisibility, and its impact on the development of work relationships via the fundamental social psychological process of attribution. Attribution, the process by which people make inferences about the causes of events, is important because it influences team ability to learn (Corn, 2000; Cramton, 2001), willingness to collaborate (McDonald, 1995), group cohesion (Brawley, Carron, & Widmeyer, 1987; Turner, Hogg, Turner, & Smith, 1984), satisfaction (Dorfman & Stephan, 1984; Wang, 1994), and leader-member relations (Adams, Adams, Rice, & Instone, 1985).

The starting point for theory concerning interpersonal relations in distributed groups has been the literature concerning the effects of the use of technology-mediated communication on social information and relationships. A fundamental premise of these theories (e.g., Lea & Spears, 1992; Short, Williams, & Christie, 1976; Sproull & Kiesler, 1986; Walther, 1992) is that communication mediated by technology carries less social information than face-to-face communication, affecting the development of interpersonal relationships in various ways. For example, Sproull and Kiesler (1986) proposed that relative to face-to-face communication, technology-mediated communication conveys fewer "social context cues" for the interaction, such as demographic attributes, organizational status, and norms for behavior. Consequently, individuals feel anonymous and focus on themselves more than on others (Kiesler, Siegel, & McGuire, 1984). Interaction is depersonalized, and relationships lack cohesiveness and adherence to social convention (Kiesler, Zubrow, Moses, & Geller, 1985).

In this article, we examine two additional factors that we think affect interpersonal relationships in distributed collaborations, locational differences and situation invisibility. As studies of distributed work have moved out of the laboratory and into the field, it has become increasingly clear that the local situations of collaborators often differ in ways large and small that constrain their behavior with each other. According to Cramton, "Such differences can include the quality, accessibility, and features of equipment, measurement processes and standards, the distances people must travel to accomplish tasks, competing responsibilities, pressures from local supervisors and coworkers, and local holidays, customs, and emergencies" (2001: 358). The challenges posed by such locational differences are compounded by situation invisibility. Remote collaborators typically are unable to observe important locational differences firsthand and must rely on information sharing. Situational information sharing often falls short for a variety of reasons. Cramton (2001) described how remote collaborators fail to communicate critical information about their local situations and constraints, make inaccurate assumptions about remote situations, and forget situational information that has been communicated to them. For all these reasons, distributed collaborators often lack an understanding of each other's situations.

Cramton (2001, 2002) suggested a link between reduced situational understanding and the attribution process, arguing that dispositionalism—the tendency to rely excessively on dispositional rather than situational explanations for others' behavior (Gilbert & Jones, 1986; Gilbert & Malone, 1995; Gilbert, Pelham, & Krull, 1988; Jones & Nisbet, 1972; Kelley, 1972; Krull, 2001; Lupfer, Clark, & Hutcherson, 1990; Ross, 1977; Winter & Uleman, 1984,

1986)—will be more extreme when partners in a task work under distributed as opposed to collocated conditions. For example, she described how people conclude that a remote partner is uncommitted or unreliable while failing to recognize how events in the remote location or technology failures contribute to the observed behavior.

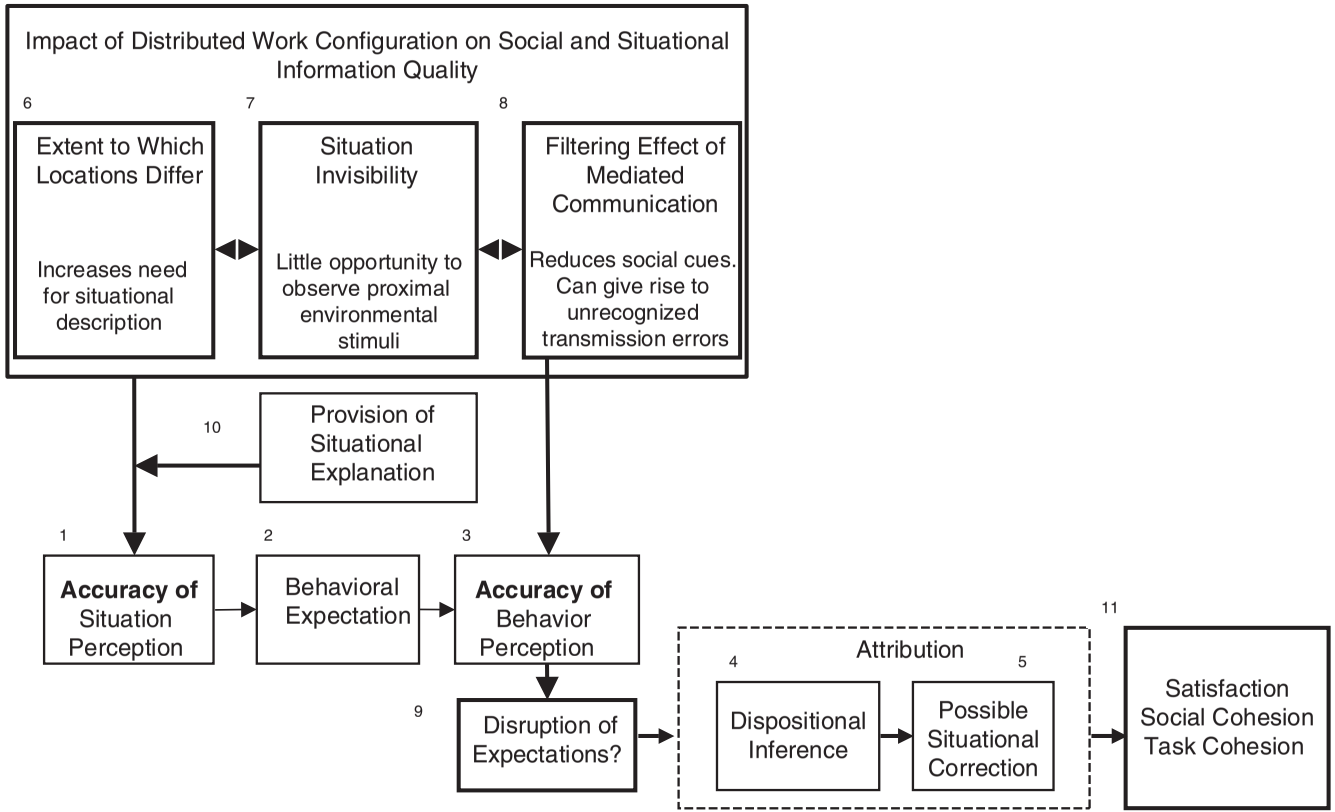
In this article, we develop this line of thinking further and test it empirically. We place locational differences and situation invisibility alongside reduced social cues as drivers of the development of work relationships under distributed conditions and demonstrate the importance of attribution as a mediating mechanism. We argue that a paucity of social *and local* information is likely to lead to disruptions of expectations in distributed collaborations. In a laboratory experiment, we compare the locus of attributions made about a colleague under distributed and collocated conditions when expectations are disrupted, highlighting the impact of situation invisibility under distributed conditions. We examine the extent to which locus of attribution in turn mediates the impact of distributed or collocated work conditions on relationship outcomes. Finally, we explore the impact of situational information sharing as a correcting factor for attribution under conditions of situation invisibility. Results support the following conclusions: Reliance on internal or dispositional attributions for disappointing partner behavior is greater when people work together under distributed conditions relative to collocated conditions because of situation invisibility, unless a situational explanation is provided. Locus of attribution affects relational outcomes such as satisfaction with the team experience and feelings of social cohesion. Thus, we conclude that situation invisibility and situational explanation have important impacts on relationships under distributed conditions through the mechanism of attribution.

Theoretical Framework

In recent years, scholars have developed and tested increasingly fine-grained models of the interpersonal attribution process and factors that affect it. We use Gilbert and Malone's (1995) authoritative model of the mechanism underlying dispositionalism (also known as correspondence bias and fundamental attribution error) as the starting point for our theoretical framework, which appears in Figure 1. Relative to the existing distributed work literature, it depicts our expanded view of key factors affecting interpersonal relations under distributed conditions. Our additions to the Gilbert and Malone (1995) model are highlighted in bold in the figure. In the following paragraphs, we describe the attribution mechanism and how distributed work conditions affect it.

According to Gilbert and Malone, the attributions that individuals make result from the fit between their perception of a situation (Box 1 in Figure 1), expectations for behavior in the situation (Box 2), and perception of the behavior that occurs (Box 3). If the observed behavior is consistent with the observer's expectations for the situation, the attribution that is made may ultimately be situational rather than dispositional. The behavior is seen as a typical response to the situation—how most anyone would respond—rather than a reflection of the disposition of the person whose behavior is being observed. However, the literature on dispositionalism and correspondence bias offers evidence that whether behavior fits the situation, the *first inference* drawn typically is dispositional (Box 4), not situational in samples

Figure 1
Impact of Work Configuration and Situational Explanation (in bold) on Gilbert and Malone's (1995) Model of Attribution Process



of people from Western cultures (e.g., Gilbert et al., 1988; Lupfer et al., 1990; Winter & Uleman, 1984, 1986). The observer then corrects the automatic inference and makes a situational attribution if the observed behavior is consistent with the perceived situation (Box 5). Gilbert and Malone wrote,

> When people attempt to understand others, they begin by inferring the presence of a corresponding disposition [to the observed behavior]. Only after having done so do they check to see whether the actor's behavior actually matched their own expectations [for behavior in that situation] . . . they correct [their spontaneous dispositional] inferences when the actor's behavior matches their expectations [for behavior in the situation]. (1995: 29)

When the observed behavior does *not* match the observer's expectations, given her perception of the situation, the initial dispositional inference is likely to stand without situational correction.

Clearly, the process described by Gilbert and Malone (1995) is affected in important ways by the accuracy of situation perception and the availability of situational information to correct initial dispositional inferences when appropriate. As early as 1972, Jones and Nisbett highlighted the importance of situational information in shaping the locus of attributions. People make situational attributions about an actor when they observe "proximal environmental stimuli" that seem to explain her behavior (Jones & Nisbett, 1972). For example, members of an audience may make situational attributions concerning a speaker's late arrival if they observe heavy snowfall and snarled traffic around the auditorium just before the event.

More recently, Gilbert and Malone described what they call the "invisibility problem": The stimuli that constrain behavior may not be proximal. "In everyday life, many situational forces are temporally or spatially removed from the behavioral episodes they constrain," they observed (1995: 25). For example, the speaker might be late to the event because he or she was given incorrect directions by the event organizer. In this case, the audience did not give the directions or witness the conversation two weeks prior in which directions were given and consequently may make an uncorrected dispositional inference concerning the speaker's lateness. "If (the person making an attribution) cannot see the situation, (he or she) will fail to take that situation into account," wrote Gilbert and Malone (1995: 25). The result is that automatic dispositional inferences stand uncorrected by situational information.

We argue that three aspects of distributed work configurations—the extent to which locations differ (Box 6), situation invisibility (Box 7), and use of mediated communication (Box 8)—tend to result in inaccurate situation perception (Box 1) and disruption of expectations (Box 9) among remote collaborators. These factors interact with and reinforce one another. When work locations differ from one another in important characteristics, constraints, and practices, collaborators require situational information to understand their remote partners' behaviors and preferences. Relative to face-to-face collaborators, however, they experience situation invisibility. Their opportunities to observe the proximal environmental stimuli that affect each other are limited. Both Bellotti and Bly (1996) and Cramton (2001) have observed that members of distributed work groups lack awareness of their remote partners' context and activities. Moreover, when the distributed partners Cramton (2001) studied lacked such information, they often assumed, incorrectly, that the remote situation was similar to the local situation. For example, they tended to assume that partners in different countries celebrated the same holidays as

themselves, which typically was not the case. People often also were unaware of differences between themselves and their remote colleagues in work responsibilities, time allocations to a project, and supervisor backing for the project. This can be thought of as a variant of the false consensus effect in that people make inaccurate assumptions about others because they do not recognize the selective nature of their own experience (Ross, 1977; Ross, Greene, & House, 1977). Finally, use of technology-mediated communication (Box 8) can contribute to inaccurate situation perception when it filters transmission of social cues such as organizational status or demographic attributes. For example, it may be unclear via e-mail, audioconference, or even videoconference how much informal power a remote partner has to get things done. In summary, given inaccurate situation perception (Box 1)—resulting from locational differences, situation invisibility, and use of mediated communication—the likelihood increases that there will be a mismatch between expected behavior for the situation (Box 2) and observed behavior (Box 3), that is, a disruption of expectations (Box 9).

In addition, we propose that use of technology-mediated communication affects not only situation perception (Box 1) through reduced social cues but also behavior perception (Box 3) when it allows undetected errors in message transmission to occur. Cramton (2001) has described how undetected human errors and technical failures of mediated communication such as equipment and network failures, erroneous phone numbers and e-mail addresses, firewall problems, flawed distribution lists, and transmission time lags lead distributed collaborators to draw inaccurate perceptions of each other's behavior. For example, they sometimes assumed that remote collaborators failed to act when, in fact, transmissions were lost or failed. Overall, then, we argue that there is a high likelihood that distributed collaborators will have inaccurate perceptions of both each other's situations and behaviors, increasing the probability of disruptions of expectations (Box 9) under these conditions, which leads to the making of automatic dispositional inferences (Box 4).

The next key question is whether, in lieu of direct observation of proximal environmental stimuli and social context, a situational explanation for behavior is offered (Box 10). Both Jones and Harris (1967) and, more recently, Lupfer et al. (1990) have shown how providing an observer with such an explanation reduces dispositional inferences. Thus, observers may correct their initial dispositional inferences by observing proximal environmental stimuli (Box 7) or by drawing on an explanation of the actor's situation if provided (Box 10). As part of the current research, we explore the impact of situational explanation on attribution in distributed teams in lieu of the opportunity to observe proximal environmental stimuli.

Finally, we anticipate that the locus of the resulting attribution for disrupted expectations will affect key team outcomes (Box 11). Research has shown that dispositional attribution affects team ability to learn (Corn, 2000; Cramton, 2001), willingness to collaborate (McDonald, 1995), group cohesion (Brawley et al., 1987; Turner et al., 1984), satisfaction (Dorfman & Stephan, 1984; Wang, 1994), and leader-member relations (Adams et al., 1985).

We note that attributions differ on dimensions above and beyond locus, such as stability and controllability (Weiner, 1986); however, our theoretical argument and empirical examination in this article focuses on locus. It is this particular aspect of attribution that we think is most systematically affected by distributed work conditions. We also note that factors other than situation invisibility can affect locus of attribution through the mechanism portrayed here. For example, behavioral expectations (Box 2) may be heightened by strong

personal efficacy, increasing the likelihood of a disruption of expectations and attribution as to its cause (Silver, Mitchell, & Gist, 1995; Stajkovic & Sommer, 2000). Interpersonal familiarity also can be expected to affect behavioral expectations. Shared identity might affect the likelihood of a forgiving situational correction (Box 5) for dispositional inferences (Hewstone, 1990; Pettigrew, 1979). Although this article focuses on the impact of situation invisibility stemming from distributed work conditions on locus of interpersonal attribution, our theoretical framework invites extension.

In summary, this study examines whether collocated partners will make significantly more situational attributions than distributed partners because they can observe proximal environmental stimuli that suggest causes for behavior, whereas distributed partners cannot. We also explore a possible antidote to this problem: in lieu of direct observation of situations, provision of a situational explanation for behavior. We predict the following interaction effect:

Hypothesis 1: Collocated collaborators who are not provided an explanation of their partner's situation are significantly more likely to make situational attributions than distributed partners who are not provided an explanation of their partner's situation because of their ability to observe proximal environmental stimuli affecting their partner. However, there will be no difference in attributions across team configurations when an explanation of the partner's situation is provided.

We have argued that dispositional attribution disrupts key team processes and states. Consistent with Figure 1, this study investigates the consequences of the attributions that are made on team members' feelings of cohesion with their partners and their satisfaction with the team experience. On the basis of work by Dorfman and Stephan (1984), LePine and Van Dyne (2001), and Wang (1994), we expect that dispositional attribution for a partner's failure at the task will be negatively related to feelings of cohesion and satisfaction with the team experience. Following Zaccaro and Lowe (1988) and Zaccaro and McCoy (1988), we treated cohesion as a multidimensional construct. Social cohesion is defined as members' attraction to, or liking of, the group (Evans & Jarvis, 1980). Task cohesion is defined as a group's shared commitment to the group task or goal (Hackman, 1976). Dispositional attributions about a teammate's behavior, then, are likely to influence attraction to and liking of the teammate. Furthermore, there is interdependency between task cohesion and social cohesion (Zaccaro & Lowe, 1988). When liking of a teammate in a task is reduced, this affects perceived similarity and closeness in the team around task accomplishment. Therefore, we expect that attributions will affect both task cohesion and social cohesion. Given the interaction proposed above, we expect relationships of mediated moderation, specifically:

Hypothesis 2a: The relationship between team configuration and feelings of task cohesion is one of mediated moderation such that locus of attribution mediates the interaction of team configuration and provision of situational explanation on task cohesion.

Hypothesis 2b: The relationship between team configuration and feelings of social cohesion is one of mediated moderation such that locus of attribution mediates the interaction of team configuration and provision of situational explanation on social cohesion.

Hypothesis 2c: The relationship between team configuration and satisfaction with the team experience is one of mediated moderation such that locus of attribution mediates the interaction of team configuration and provision of situational explanation on satisfaction with the team experience.

Method

Participants

Forty-five female students and 21 male students at an East Coast university participated in this study. Fifty-four percent of the participants were Caucasian, 6% were Black, 25% were Asian, 9% were Hispanic, and 6% identified themselves in an "other" category. They received partial credit toward fulfillment of an undergraduate psychology course requirement. Participants were required to speak English, to be age 18 or older, and to be familiar with using a computer mouse. They were told that they would be working with a partner to attain a team goal. Each participant's partner was a confederate in the study, enabling control of teammate behavior and team outcomes. There were two male and two female confederates. Because of schedule constraints, it was not possible to perfectly counterbalance confederates across sessions such that each confederate participated in each condition an equal number of times. However, manipulations were randomly chosen for each data session for each confederate, resulting in dispersion of confederates across conditions. For example, Confederate 2 participated in each condition twice, whereas Confederate 4 participated in each condition four times. In total, 66 dyads consisting of one participant and one confederate participated in the study.

Simulation

In all conditions, the dyads performed their task through the use of a computer simulation. Researchers have concluded that low-fidelity off-the-shelf simulations are an effective vehicle through which to investigate team processes and performance (Weaver, Bowers, Salas, & Cannon-Bowers, 1995). They provide the opportunity to employ novice participants with minimum training, rather than depending on limited expert subject populations. This research, therefore, used a low-fidelity networked computer-based task, a version of the popular game, Jeopardy. The commercially available software shows participants a board with six categories of potential questions. Within categories, questions vary in difficulty and in points awarded for a correct response. For the purpose of this study, a single computer was split so that it fed into two monitors, two keyboards, and two "mouses." Participants at two different workstations were able to see and control the same images. Rather than competing to answer the questions, dyads pooled their points from correct answers to be eligible to win a prize.

Research Design

The study used a 2×2 factorial design with two manipulations:

Team configuration. Participants were put into either a collocated or distributed team configuration. In the collocated configuration, dyads sat at two networked workstations within the same space. Their workstations were located along the same wall, approximately 10 feet apart. Subjects could see their partner sitting at his or her computer and the surrounding environment, but they were not allowed to talk with their partner. In the distributed configuration,

partners were seated at identical workstations in separate rooms and were unable to see each other or communicate.

Provision of situational explanation. The second manipulation concerned whether or not participants were given an explanation of their partner's situation. In the situational explanation condition, the participant was told that his or her partner would have to answer the Jeopardy questions on the basis of personal knowledge, whereas the participant would be given a booklet of questions and answers as an aid. Participants were told that most people found the questions difficult to answer without help. The explanation was constructed on the basis of Kelley's (1967, 1972) principle of consensus to produce a situational attribution.

Procedure

All participants were introduced briefly to their partner (a confederate) before they were seated in a room by themselves, provided an introduction to the study, and asked to read and sign the informed consent form. They were told that they would be responsible for answering questions in three of six Jeopardy categories, whereas their partner would be responsible for the remaining three. Categories were randomly selected by the computer. They were told that the team's goal was to accumulate at least 6,000 points out of a possible 9,000 to get their names entered into a drawing for $100 at the end of the semester. It was not possible for individuals to accumulate 6,000 points on their own; they were dependent on their partner's contributions. Partners were not permitted to help each other answer the questions.

All participants were given a booklet of Jeopardy questions and answers to aid them. At this point, participants in the situational explanation condition were told that their partner would not have a booklet. Following training and completion of premeasures, those participants in the collocated condition were seated at workstations in the same room.

The performance phase lasted approximately 25 minutes. Participants answered their questions first, and all scored at least 3,000 points. Confederate partners then performed the task, limiting themselves to 600 to 800 points toward the team score. This ensured that no team received the 6,000-point minimum, and that failure to perform was obviously due to the confederate partner's performance. Throughout the performance phase, participants could view the team's running score on their own monitor, including instances when their partners answered questions correctly or incorrectly. Thus, participants in both collocated and distributed configurations were aware of the contrast between their own good performance and their partner's poor performance. The performance difference was intended to trigger a disruption of expectations and the making of attributions, either internal or external, about the performance outcome. Following performance, participants were asked to complete postperformance measures and debriefed.

Measures

Preperformance measures. Participants filled out a demographic questionnaire before being trained on the task. Measured demographics include sex, age, and ethnicity.

Postperformance measures. Attributions were measured through an open-ended question: "Please provide three reasons why you think your team performed successfully/unsuccessfully, in order of importance." Two raters coded each of these attributions as either dispositional or situational. To establish interrater reliability, the two raters first coded a randomly selected 20% ($n = 40$) of the attributions gathered from the participants. Their level of agreement was measured by Kappa at .90. Given the level of interrater reliability, the remaining attributions were coded by a single rater. In three cases, the participants had made an attribution concerning themselves rather than their partner. These were coded into a third category. Values of the dependent variable ranged from zero to three, depending on whether the participant listed three situational attributions (0), a combination of situational and dispositional attributions, or three dispositional attributions [Box 3].

Cohesion was assessed via a 10-item scale adapted from Craig and Kelly (1999). Five questions measured social cohesion, and five questions measured task cohesion. Sample items for social cohesion are "To what extent was it important that you and your teammate got along with one another?" and "To what extent did you like your teammate?" Sample items for task cohesion are "To what extent did you and your teammate treat this exercise as meaningful and important?" and "To what extent were you and your teammate engaged or 'into' the exercise?" Possible responses ranged from 1 (*not at all*) to 7 (*great extent*). The coefficient alphas for the Social Cohesion and Task Cohesion scales were .71 and .76, respectively, both showing an acceptable level of reliability.

Satisfaction with the team experience was assessed using a three-item scale. Items were "I am satisfied with how things went," "I am satisfied with how my partner performed during this task", and "I am satisfied with how my teammate and I worked together to perform this task." Possible responses ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). The coefficient alpha for this scale was .74, showing an acceptable level of reliability.

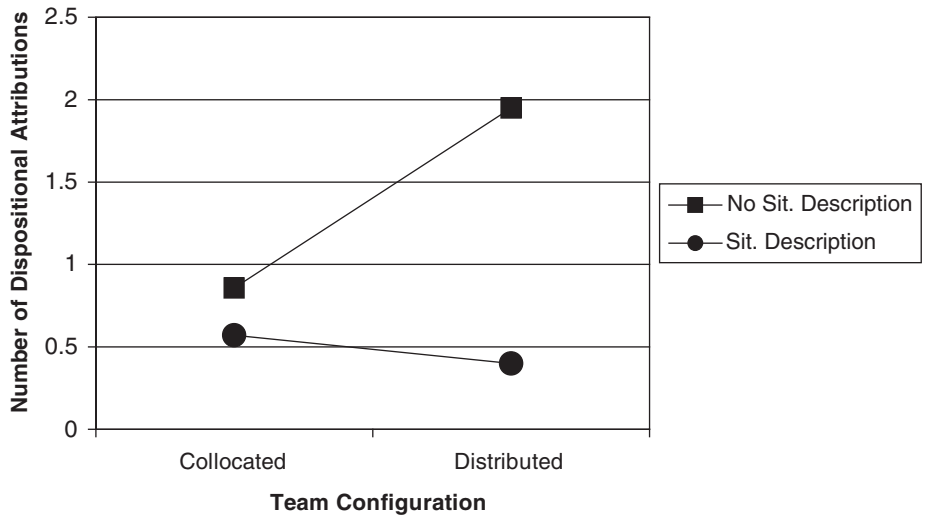
Results

Analyses were conducted to ensure that the confederates did not influence the variables of interest. Four separate regression analyses indicated that confederates (dummy coded) did not predict any of the major variables of interest: number of dispositional attributions ($F = 1.41$, $p > .05$), social cohesion ($F = 1.95$, $p > .05$), task cohesion ($F = .24$, $p > .05$), or satisfaction ($F = .51$, $p > .05$). Accordingly, there was no need to control for the effects of confederates.

Attribution in Distributed and Collocated Teams

We used hierarchical multiple regression analysis to test the interaction of team configuration and situational description on locus of attribution. The dependent variable was the number of internal dispositional attributions on the subject's list, ranging from 0 to 3. This quantifies the extent to which only dispositional attributions concerning a partner occurred to participants when asked to list three reasons for their team's outcome. Data from two participants who provided fewer than three attributions were not included,

Figure 2
Interaction of Team Configuration and Provision of a Situational Explanation on the Number of Dispositional Attributions Offered



Note: Sit. = situational.

resulting in 64 cases for the analysis. The three participants who provided attributions internal to themselves were included because our interest was in predicting dispositional attribution concerning a partner. Because these cases were not within that category of prediction, they did not compromise the dependent variable. In support of our hypothesis, the analyses revealed a significant interaction effect, $R^2\Delta = .06$, $F(1, 60) = 5.48$, $p < .05$. As shown in Figure 2, there were significantly more dispositional attributions in distributed dyads than in collocated dyads when no situational explanation was provided (distributed $M = 1.95$, collocated $M = .86$), but that difference disappeared in cases in which participants were provided with a situational explanation (distributed $M = .56$, collocated $M = .57$). Hierarchical regression results are shown in Table 1. As the table notes, there also were significant main effects for both of the manipulated variables, $R^s = .25$, $F(2, 61) = 10.19$, $p < .05$, accounting for 25% of the variance. Participants who were not provided a situational explanation were more likely to make dispositional attributions than those who were provided an explanation for their partner's situation. Participants in the distributed condition were more likely to account for team outcomes in terms of their partner's nature, effort, or ability than participants in the collocated condition. These results, however, depend on the hypothesized interaction.

Table 1
Regression Results Predicting Number of Dispositional Attributions

Step	Predictor Variable	$F_{b/w}$	$R^2\Delta_{b/w}$	*B*	*t*	*df*
1	Team configuration[a]	10.19	.25	.57	2.34*	2, 61
	Situational explanation[b]			–.90	–3.73**	
2	Team Configuration × Situational Explanation	5.48	.06	–1.10	–2.34*	1, 60
	Total model $R^2 = .31$					

a. 0 = collocated; 1 = distributed.
b. 0 = no situational explanation; 1 = situational explanation.
*$p \leq .05$
**$p \leq .01$

Table 2
Means, Standard Deviations, and Correlations of Attribution and Outcomes Variables

Variable	*M*	*SD*	1	2	3	4
1. Dispositional attribution	1.03	1.08	—			
2. Task cohesion	4.62	1.18	.04	—		
3. Social cohesion	3.41	1.26	–.30*	.23†	—	
4. Satisfaction	2.63	0.78	–.47**	.18	.26*	—

†$p < .10$
*$p < .05$
**$p < .01$ (two-tailed)

Relationships With Cohesion and Satisfaction

The second set of analyses examined the hypothesized relationships of mediated moderation. We predicted that locus of attribution would mediate the relationship between the interaction of team configuration and situational explanation on team outcome variables. Correlations, means, and standard deviations of the relevant variables are displayed in Table 2. Because there was no correlation between locus of attribution and task cohesion, that is, the mediator and one of the dependent variables, we eliminated this outcome variable from further analyses for mediation effects.

We tested moderation for each path of the mediated models using the procedures for moderated regression analysis and path analysis recommended by Edwards and Lambert (2007) to integrate moderation and mediation. We centered the continuous variables to reduce multicollinearity (Aiken & West, 1991). Expressions involving products of coefficients (indirect effects, total effects, and differences across levels of the moderator variable) were tested with confidence intervals using coefficients estimated from 1,000 bootstrap samples (Shrout & Bolger, 2002). In this approach, mediation is framed as a path model, and relationships

Table 3
Results for the Moderated Path Analysis Approach

	X Team Configuration	*M* Attribution	*Z* Situational Explanation	*XZ*	*MZ*	R^2
Attribution	1.09**		.20	–1.09**		.52**
Satisfaction	0.06	–.27*	.14	–0.09	.15	.25**
Social cohesion	0.56	–.40*	.52	–1.55**	–.27	.20**
Task cohesion	0.66	.04	.58	–0.40	–.01	.07

Note: $N = 65$. Entries in columns *X*, *M*, *Z*, *XZ*, and *MZ* are unstandardized regression coefficients.
*$p < .05$
**$p < .01$

among variables are expressed using regression equations. Moderation is incorporated by supplementing these equations with the moderator variable, its product with the independent variable, and its product with the mediator variable (Baron & Kenny, 1986). The equations are integrated through reduced-form equations by substituting the regression equation for the mediator variable into the equation for the dependent variable. This approach produces tests for direct, indirect, and total effects for different values of the moderator variable. It offers the advantage of pinpointing which paths of a mediated model are moderated and provides statistical tests of moderation for each path (Edwards & Lambert, 2007). Regression results are reported in Table 3. Simple effects for each path of the mediated model, as well as the indirect and total effects, are shown in Table 4.

For satisfaction, regression analyses in Table 3 indicate that situational explanation moderated the path from team configuration to attribution. Expressed as simple effects in Table 4, situational explanations "corrected" attributions only when teams were distributed. When teams were collocated, the situational explanations were superfluous because team members observed proximal environmental stimuli directly. Thus, attribution mediated the relationship between team configuration and satisfaction only under conditions of no situational explanation (an indirect effect, $P_{MX}\ P_{YM} = –.28$, $p < .05$). This pattern of results indicates first-stage moderation or mediated moderation for satisfaction.

For social cohesion, regression analyses in Table 3 show that situational explanation moderated the path from team configuration to attribution and the direct effect of team configuration on social cohesion. Simple effects reported in Table 4 indicate that situational explanations affected attributions when teams were distributed but lost their effect when teams were collocated. As with satisfaction, then, attribution mediated the relationship between team configuration and social cohesion under conditions of no situational explanation (an indirect effect, $P_{MX}\ P_{YM} = –.32$, $p < .05$).

In addition, the direct relationship between team configuration and social cohesion depended on situational explanations. Reported feelings of social cohesion were highest when participants were collocated with their partners and had received an explanation of their partner's situation, namely, that the partner did not have a booklet to help them answer the Jeopardy questions. Reported feelings of social cohesion were lowest when participants

Table 4
Analysis of Simple Effects Moderation by Situational Explanation

	Simple Effects for Situational Explanation					Simple Effects for No Situational Explanation				
	1st Stage	2nd Stage	Direct Effect	Indirect Effect	Total Effect	1st Stage	2nd Stage	Direct Effect	Indirect Effect	Total Effect
Satisfaction	*–.01*	–.37*	.20	*.004*	.204	*1.09***	*– .26***	*–.25*	*–.28**	–.53
Social cohesion	*–.01*	–.67*	*–.88**	*.01*	–.87	*1.09***	*–.29*†*	*.18*	*–.32**	.14
Task cohesion	*–.01*	.03	.22	.00	.22	*1.09***	.16	*.73*†	.17	.90

Note: Table entries are simple effects. Coefficients in italics are significantly different across levels of the moderator (situational explanation). Effects involving products of coefficients (indirect effect, total effect) were tested using confidence intervals derived from bootstrapping.
†$p < .10$
*$p < .05$
**$p < .01$

worked with their partners under distributed conditions and had received an explanation of their partner's situation. Close analysis of responses to individual items on the social cohesion scale and of all other observed relationships helped explain this interesting effect. Our conclusion is that participants in the situational explanation conditions may have felt a major responsibility for outcomes after being told that their partner would not have a booklet and that most people find it difficult to answer the questions correctly without a booklet. We think this personal responsibility for outcomes interacted with visual awareness of the partner in the collocated conditions and with the absence of the partner in the distributed condition. When collocated with situational explanation, we think participants experienced high social cohesion with their partners as a result of realizing that the partner who toiled at the task within their view was largely dependent on them to win the exercise. On the other hand, when participants in the distributed condition were told at the outset that, in effect, outcomes depended on them alone, we think a deindividuation process occurred with respect to the absent, disembodied, and largely useless partner, resulting in low feelings of social cohesion with them. This is consistent with the traditional literature concerning the impact of technology-mediated communication and lack of social cues on relationships (Kiesler et al., 1984; Kiesler et al., 1985; Lea & Spears, 1992; Sproull & Kiesler, 1986). As that literature suggests, under such circumstances, relationships are depersonalized and lack cohesiveness. We think deindividuation was held in check when partners were distributed but lacked situational explanation by the participant's expectation that the partner would assist in the effort to succeed on the task.

Discussion

As expected, dispositionalism was more extreme when dyads were distributed and not provided with a situational explanation for their partner's failure at the task. We had theorized that the tendency to make internal attributions under distributed conditions would be due to the limited ability to observe proximal environmental stimuli affecting partner performance. In lieu of either observing or being given information suggesting situational causes, we thought distributed partners would fall back on dispositional attributions, which they did.

Our rationale and findings are supported by the reasons participants listed for their team's performance. Table 5 provides the three most frequently listed reasons by condition. Collocated partners offered explanations such as "My partner did not have a booklet to help him," whereas distributed partners offered explanations such as "My partner had a hard time looking up the answers in the booklet quickly." Collocated participants observed proximal environmental stimuli and noted that the partner did not have a booklet. Distributed participants could not observe their partner's situation but assumed that it was similar to their own situation and then made dispositional attributions concerning the partner's performance. *They assumed that their partner had a booklet but was slow or confused in using it.* Our findings support Cramton's (2001) proposal that attribution under distributed conditions is affected by (a) limited situational information, (b) the assumption that remote situations are similar to the local situation, and (c) a tendency to lean toward dispositional attribution rather than situational attribution when situational information is lacking.

Table 5
Three Most Frequent Reasons Listed for Team Failure by Condition

Condition	Most Frequent Reason	Second Most Frequent Reason	Third Most Frequent Reason
Distributed/no situational description	Partner had hard time looking up answers in booklet (quickly)	Partner needed more time	Partner didn't have answer booklet
Collocated/no situational description	Partner didn't have answer booklet	We couldn't help each other	Hard questions
Collocated/ situational description	Partner didn't have answer booklet	Partner didn't know some answers or topics	Hard questions
Distributed/ situational description	Partner didn't have answer booklet	Hard questions	We couldn't help each other

As expected, we also found evidence that being given an explanation of a partner's situation affects attribution. Participants who were given a situational explanation for their partner's failure were significantly more likely to make situational attributions than participants who did not receive a situational explanation. This finding suggests a solution to the problem of exacerbated attribution error in distributed collaboration: Communication of situational explanations under distributed conditions can give partners much needed understanding of each other, resulting in more accurate and reasonable attributions.

As hypothesized, we found an interaction between team configuration and situational explanation. Having an explanation of a partner's situation affected the attributions made in the distributed dyads, but not the collocated dyads. Participants in the collocated condition were able to see that their partner did not have the same tools as themselves and therefore were less likely than participants in the distributed condition to make internal attributions for the partner's poor performance, even if they were not given an explanation of their partner's situation.

In our second set of analyses, we showed that locus of attribution mediates the relationship between the information that a partner has about a colleague's situation—either by virtue of merely observing proximal environmental stimuli when collocated or having received a situational explanation regardless of team configuration—and two important outcomes, feelings of social cohesion with the partner and satisfaction with the team experience. Locus of attribution did not mediate a relationship between the interaction of team configuration and situational explanation on feelings of task cohesion, that is, commitment to the team goal, because there was no relationship between attribution and feelings of task cohesion. To understand this result, we reexamined our task cohesion measure. Items in this standard measure ask participants to make team-level inferences (e.g., "To what extent did you and your teammate treat this exercise as meaningful and important?"). The wording is appropriate for measuring cohesion at the team level. Team interdependence in our study, however, was pooled not reciprocal, and we did not permit direct interaction between partners on the task. It is possible that these conditions made it difficult for participants to answer the questions concerning team task cohesion. Furthermore, Carless and De Paola (2000) found that

people tend to respond to task cohesion questions at the individual level, focusing on their own commitment to the task. Given the fact that our participants had limited data on which to make a team-level assessment, they may have relied on their own feelings of task commitment in responding to the questions. This reduces the likelihood that we would find a relationship between attributions about the partner and the task cohesion measure. More research will be needed to explore this relationship. Turning to social cohesion, we conclude that these feelings stemmed from two sources, (a) attraction to or withdrawal from the partner based on attributions about the partner's competence and (b) the experience of responsibility for the partner versus alienation from the partner, as affected by being able to see or not see the partner during task performance. The unexpected second finding suggests a refinement for the traditional literature concerning the occurrence of deindividuated behavior when people communicate through technology and cannot see each other: Deindividuation may be most likely to occur when interdependence is weak. Finally, we conclude that satisfaction with the team experience operates through attribution, the path of primary interest to us in this study, and results from a rational assessment of performance processes and outcomes within the participant's understanding of the situation.

Our mission in this article has been to expand theory concerning interpersonal relationships in distributed groups beyond media effects to incorporate the impact of locational differences and situation invisibility. Specifically, we have argued that locational differences and situation invisibility, as well as the use of technology-mediated communication, affect the development of distributed work relationships via the fundamental social psychological mechanism of attribution. Our results demonstrate that locus of attribution is directly affected by the conditions of distributed work. We show that reliance on internal attribution for disruptions of expectations is greater when people work together under distributed conditions relative to collocated conditions because of situation invisibility. We also show that under conditions of no situational explanation, locus of attribution mediates the relationship between work configuration and interpersonal outcomes in teams.

Overreliance on dispositional attribution for negative partner behavior under distributed conditions matters because of evidence that attribution in turn directly affects team cohesion, satisfaction, future willingness to collaborate, and learning (Brawley et al., 1987; Corn, 2000; Cramton, 2001; Dorfman & Stephan, 1984; McDonald, 1995; Turner et al., 1984; Wang, 1994). Recently, scholars have suggested that greater research attention be given to exploring possible mediators and moderators of the impact of distributedness on team functioning (Kraut, Fussell, Brennan, & Siegel, 2002; Martins, Gilson, & Maynard, 2004). Such extensions to the literature, said Martins et al., "would help develop a richer, more theoretically-grounded understanding of the underlying dynamics of (virtual teams)" (2004: 823). Hinds and Mortensen (2005), for example, have drawn on Cramton's (2001) rationale concerning attribution under distributed conditions to suggest an explanation for the incidence of conflict in such teams relative to collocated teams. Cramton (2001) has given examples of how excessive dispositional attribution for negative behavior can blunt distributed teams' ability to learn and improve by deflecting team member attention from structural analysis of problems. Our findings provide an empirical foundation for further exploration of these relationships.

The limitations of our work invite future research. We did not examine attributions under distributed and collocated conditions when expectations are met. In addition, factors beyond

distributed work configuration may affect the processes of interest. Familiarity might affect the likelihood of disruption of expectations, and shared identity or culture might affect the likelihood of situational correction of dispositional inferences. Future theorizing and research should explore such matters.

Future research should continue to examine the incidence of situational differences in distributed teams, situational information-sharing practices, and their consequences. It would be useful to know whether team members can be trained to anticipate and communicate about situational differences across distributed environments and what role leaders can play to further this practice. Research also should continue to explore the potential of information technology to provide distributed collaborators with effective situational context cues. For example, Majchrzak, Malhotra, and John (2005) examined the role of information technology in providing contextualization for task contributions.

It will be important to learn whether hastily drawn dispositional attributions in distributed teams are modified over time if situational information sharing increases. If so, this might help explain findings that lower levels of satisfaction and cohesion in distributed relative to collocated teams improve over time (Alge, Wietoff, & Klein, 2003; Walther & Burgoon, 1992; Wilson, Straus, & McEvily, 2006). This would be consistent with Walther's (1995) social information processing theory of communication in distributed groups. On the other hand, the literatures concerning anchoring (Block & Harper, 1991) and confirmation bias (Jonas, Schulz-Hardt, Frey, & Thelen, 2001) suggest that once made, dispositional attributions could be slow to change.

It would be useful to study attribution, situational information sharing, and outcomes in different types of distributed teams in organizations, comparing them with collocated teams. On the basis of Bell and Kozlowski's (2002) typology of virtual teams, we might expect that distributed teams that include multiple functions (e.g., engineering, marketing, and manufacturing) would be more susceptible to attribution biases than homogeneous teams because of their lack of familiarity with each other's situational constraints and roles.

Additional investigation of attribution processes in distributed teams would contribute more broadly to our understanding of impression formation in this context. Recent studies offer new twists to Allport's (1954) notion that people develop more accurate knowledge of each other through contact over time. Some studies have shown that individuals in technology-mediated relationships have more accurate perceptions of each other than those in unmediated relationships (Straus, Miles, & Levesque, 2001; Weisband & Atwater, 1999). Others have found that distributed group members develop less detailed impressions but that these impressions are more resistant to change (Tidwell & Walther, 2002). Attribution is likely to be a fundamental component of the as yet little understood process of impression formation at a distance.

Our work also has implications for practice. In distributed work environments, managers already have reason to be concerned about building trust (Handy, 1995) and monitoring effectively (Alge, Ballinger, & Green, 2004). Our study raises concern about evaluation of distant employees. If distant managers are likely to attribute employee performance problems to the person rather than the situation, this could result in systematic biases in the performance evaluations—and ultimately compensation—of remote workers.

Our work highlights the importance of information management and information sharing in the formative stages of work collaborations, particularly distributed ones, to facilitate the development of positive interpersonal relations and active collaboration. Ideally, people who will collaborate remotely should visit each other's locations at least once. This gives them the opportunity to see how the remote situation differs from their own situation and to absorb details that colleagues may take for granted or forget to mention. If this is not possible, an alternative might be to send influential team members or people in leadership positions to visit remote work locations. Should problems across locations arise, these more informed members may be able to guide colleagues toward more accurate interpretations of the behavior of partners in the remote locations.

In addition to making site visits, leaders and members of distributed teams should foster active situational information-sharing practices across locations. Members of distributed teams must keep in mind the need to offer situational explanations to remote partners who cannot observe the situation firsthand. From the converse vantage point, it is important for individuals to monitor the tendency to leap to dispositional attributions when remote partners fail to meet expectations. This may be quick and easy, but also could be inaccurate and destructive to collaboration. Instead, collaborators should discipline themselves to react with curiosity—to ask questions rather than assume. Situational causes should be considered routinely, even if information to support them is not immediately available. Giving remote partners the benefit of the doubt when questions or problems arise is a simple but powerful practice, particularly when modeled by team leaders.

As distributed work has become more common, it has generated considerable research interest. Our study contributes to the enterprise by demonstrating the relevance of the powerful theoretical and empirical literatures concerning attribution to understanding and improving the dynamics of interpersonal relationships under distributed collaborative conditions.

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