

## TRUST AND THE UNINTENDED EFFECTS OF BEHAVIOR CONTROL IN VIRTUAL TEAMS<sup>1</sup>

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*Our analysis shows that the behavior control mechanisms typically used in traditional teams have a significant negative effect on trust in virtual teams. In-depth analysis of the communication logs of selected teams reveals that trust decline in virtual teams is rooted in instances of renegeing and incongruence. Behavior control mechanisms increase vigilance and make instances when individuals perceive team members to have failed to uphold their obligations (i.e., renegeing and incongruence) salient. Heightened vigilance and salience increase the likelihood that team members' failure to fulfill their obligations will be detected, thus contributing to trust decline.*

**Keywords:** Virtual teams, trust, behavior control, control theory, psychological contract, teamwork

### Abstract

*This article reports the findings of a longitudinal study of temporary virtual teams and explores the role of behavior control on trust decline. We conducted an experiment involving 51 temporary virtual teams. Half of the teams were required to comply with behavior control mechanisms traditionally used in colocated teams. Their counterparts were allowed to self-direct.*

### Introduction

Virtual teams are groups of geographically and/or temporally dispersed individuals brought together via information and telecommunication technologies (DeSanctis and Poole 1997; Jarvenpaa and Leidner 1999; Lipnack and Stamps 1997; Powell et al. 2004). Using available technology, individual contributions can be melded together without the expense and trouble of relocating members. Virtual teams can be temporary and focused on

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the completion of a specific project, or they can be long lasting, with stable membership over several months or years (Duarte and Snyder 1999; Lipnack and Stamps 1997; Townsend et al. 1998).

Virtual teams have the potential to deliver unique strategic flexibility by enabling the rapid formation and disbanding of teams comprised of the best talent available (Lipnack and Stamps 1997; Townsend et al. 1998). But these new organizational forms may also have a dark side (Victor and Stephens 1994). Some theorists have suggested that the dispersion of team members may engender low levels of trust and cooperation (Handy 1995; Nohria and Eccles 1992) that hamper a team's ability to perform adequately (Iacono and Weisband 1997). Recent research has sought to uncover the antecedents of team trust in the virtual context (Iacono and Weisband 1997; Jarvenpaa et al. 1998; Jarvenpaa and Leidner 1999). We extend this line of inquiry and concentrate on a specific managerial intervention, behavior control, and its effects on trust in temporary virtual teams.

Behavior control interventions are widely used in colocated teams (Henderson and Lee 1992; Kirsch 1997) and their use has been proposed for virtual teams as well (Townsend et al. 1998). Exploratory studies of virtual teams have shown that trust can indeed emerge in zero-history temporary teams with geographically and temporally dispersed members, while also showing that it can rapidly degrade and deteriorate (Jarvenpaa et al. 1998; Jarvenpaa and Leidner 1999). But early work has focused on self-directed virtual teams<sup>2</sup> and to date no attention has been devoted to the antecedents of trust decline and to the effects of managerial controls on trust in virtual teams (Powell et al. 2004). Our work provides a first attempt to fill this void. Our results indicate that behavior control mechanisms

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<sup>2</sup>Self-directed teams are defined as "groups of interdependent individuals that can self-regulate their behavior on relatively whole tasks" (Cohen and Ledford 1994, p. 13). Most notably, self-directed teams retain control over organization of work and are able to determine work assignment, work methods, and scheduling of activities.

increase vigilance and make more salient instances when individuals perceive that team members have failed to uphold their obligations (i.e., renegeing and incongruence). As a consequence they increase the odds that such incidents will be detected, and the likelihood of trust decline.

This article has four sections. The first section describes the theoretical underpinning of the study, followed by the second section describing the research methodology and data analysis procedures. The third section describes the quantitative and qualitative results of the study. The paper concludes with a discussion of the findings, limitations, and implications for future research and practice.

## Theoretical Framework

### *Dynamics of Trust Decline*

Team trust in the virtual environment is defined as the belief that an "individual or group (a) makes good-faith efforts to behave in accordance with any commitments both explicit and implicit, (b) is honest in whatever negotiations preceded such commitment and (c) does not take excessive advantage of another even when the opportunity is available" (Cummings and Bromley 1996, p. 303). Thus, individuals trust teammates who are perceived to be honestly and reliably attempting to fulfill their commitments to the team (Mayer et al. 1995). In virtual teams, trust is argued to be rooted in perceptions of teammates' ability, benevolence, and integrity (Jarvenpaa et al. 1998). Ability refers to the aptitude and skills that enable an individual to be perceived as competent by teammates (Jarvenpaa et al. 1998; Mayer et al. 1995). Benevolence refers to the extent to which an individual is believed to be willing to help teammates beyond personal motives or individual gain. Thus, a belief that teammates are concerned with the well-being and success of the team, and that they consciously avoid disrupting the project even when they may benefit directly, engenders perceptions of benevolence (Jarvenpaa et al.

1998; Mayer et al. 1995). Integrity refers to the extent to which an individual is believed to adhere to a set of principles thought to make her dependable and reliable. Thus, evidence that teammates have a solid work ethic, a strong sense of justice, and over time act in a manner consistent with these values fosters perceptions of integrity (Jarvenpaa et al. 1998; Mayer et al. 1995). Conversely, evidence that teammates behave inconsistently and that their actions contradict their own words hinders perceptions of integrity (Robinson 1996).

The literature on psychological contracts offers a useful starting point for the investigation of trust decline in virtual teams, since the breach of a psychological contract has been empirically linked to trust decline in colocated environments (Robinson 1996; Rousseau 1989). A psychological contract is defined as an "individual's beliefs about the terms and conditions of a reciprocal exchange agreement between the person and another party" (Robinson 1996, p. 575). Such contracts can be implicit and are defined in terms of individual perceptions (Morrison and Robinson 1997). When a virtual team is formed, teammates must communicate to evaluate the project requirements, make decisions regarding process and content, and provide feedback on one another's work. As the working relationship unfolds, team members develop expectations about individual workload, work processes, and individual contributions. As expectations arise about reciprocal obligations between teammates, a psychological contract is formed (Rousseau 2001).

Psychological contract breach, defined as an individual's belief that one's counterparts have failed to meet their obligations, is triggered by reneging or incongruence. Reneging occurs when others, recognizing that an obligation exists, "knowingly fail to follow through on that obligation" (Morrison and Robinson 1997, p. 233). Incongruence arises when the perception of obligations differ between some team members and the individual responsible for meeting them. Incongruence differs from reneging in that the individual who fails to follow through on her obligations does so unknowingly rather than deliberately. But

incongruence, like reneging, leads to observable behaviors that are inconsistent with teammates' expectations (Morrison and Robinson 1997).<sup>3</sup>

Contract breach has been found to damage two important antecedents of trust: judgments of integrity and beliefs about benevolence (Robinson 1996). Trust is predicated on the belief that others will make good-faith efforts to honor their commitments (Cummings and Bromley 1996) and have consideration for others' well-being (Gambetta 1988). Early work lends support to the notion that integrity and benevolence are important components of trust in virtual teams (Jarvenpaa et al. 1998). As virtual team members interact, individuals form beliefs about teammates' benevolence and integrity. If the interaction reveals that teammates have reneged on their obligations, judgments of integrity are revised and beliefs about teammate's benevolence are undermined (Robinson 1996). Incongruence-based incidents may also foster the perception that teammates have little interest in the success of the team and are not dependable, thus leading to a negative reassessment of beliefs about their benevolence and integrity. Furthermore, when reneging or incongruence occur, individuals tend to make attributions of malevolence, thus leading to the conclusion that teammates are not willing to respect their commitments and that trust has been misplaced (Robinson 1996). We, therefore, propose:

Hypothesis 1a: *Trust declines in virtual teams that experience reneging.*

Hypothesis 1b: *Trust declines in virtual teams that experience incongruence.*

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<sup>3</sup>Reneging and incongruence are qualitatively different, but they have the same effects. This is because to the perceiver, the behavior of others appears to be the same (i.e., teammates fail to fulfill their obligations), irrespective of whether it is due to their conscious decision (i.e., reneging) or a difference in perceived obligations (i.e., incongruence).

Because of the perceptual nature of breach of psychological contracts, it is not enough that renegeing or incongruence occur for trust to decline; failures to fulfill mutual obligations must also be detected and recognized (Morrison and Robinson 1997). Whether individuals actually perceive a discrepancy between teammates' obligations and actual behavior depends on their vigilance and the salience of that discrepancy. Vigilance represents how closely individuals monitor their counterparts' actions (Morrison and Robinson 1997). Thus, vigilance is an active behavior that team members engage in when they scrutinize whether or not teammates are fulfilling their obligations to the team. Theorists hypothesize that vigilance intensifies when the costs associated with an unfulfilled promise are significant (e.g., the team is penalized for failing to produce required deliverables) and when there is significant uncertainty about whether obligations will be fulfilled (e.g., as a deadline approaches teammates have yet to deliver expected work) (Morrison and Robinson 1997). When vigilance is high, any instance of renegeing or incongruence is more likely to be readily detected (Morrison and Robinson 1997).

*Hypothesis 2a: Vigilance intensifies the negative effect of renegeing and/or incongruence on trust.*

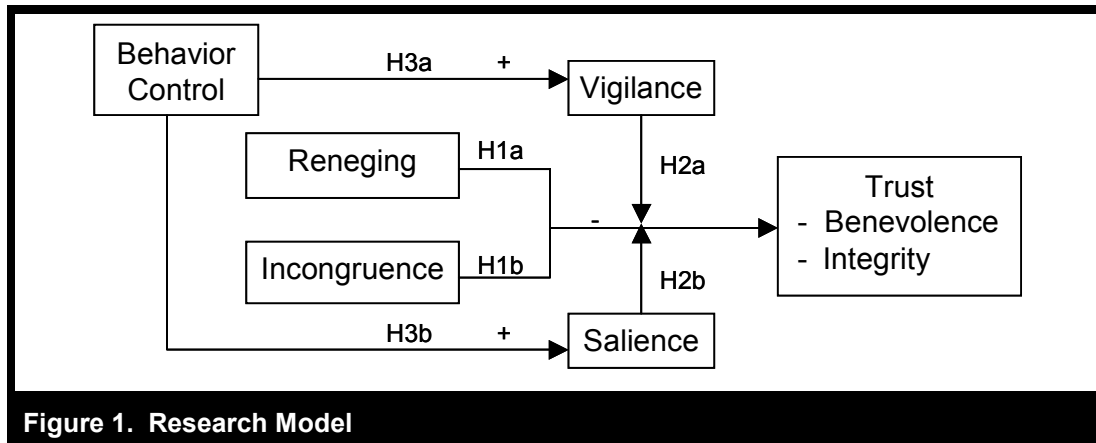
Salience is defined as the degree to which a stimulus stands out from its context (Fiske and Taylor 1984). Thus, salience is defined as a characteristic (e.g., strength) of an instance of renegeing or incongruence—not as a behavior in which the individual engages (i.e., vigilance). The degree of salience is affected by the magnitude of the discrepancy between perceived obligations and actual teammates' behavior (e.g., repeated calls for contributions go unanswered), by how vivid mutual obligations are for one or more team members (e.g., the obligation was recently or unequivocally set), or by the importance an individual ascribes to the obligation (Morrison and Robinson 1997). When any instance of renegeing or incongruence is highly salient, the incident is more likely to be readily detected (Morrison and Robinson 1997).

*Hypothesis 2b: The salience of mutual obligations intensifies the negative effect of renegeing and/or incongruence on trust.*

### **Behavior Control and Trust Decline**

Control theory, as originally conceptualized, focused on the organization as the unit of analysis and addressed broad-based organizational control structures (Eisenhardt 1985; Ouchi 1979). More recently, it has been adopted to study smaller work units, such as project teams (Guinan et al. 1998; Henderson and Lee 1992; Kirsch 1997). Following Kirsch (1997), we conceptualize control as attempts to ensure that individuals working on organizational projects act in conformity with pre-defined strategies. Thus, control is exercised via mechanisms that, when successfully implemented, lead to the regulation of behavior (Kirsch 1997). Formal control mechanisms are classified into behavior and outcome controls. Behavior control mechanisms—the focus of this study—are designed to structure the transformation process of work, whereas outcome controls tie incentives directly to the outcomes of work activities (Ouchi 1977; Snell 1992). "In behavior control, specific rules and procedures are articulated, which, if followed, will lead to desired outcomes" (Kirsch 1997, p. 217). In colocated teams, behavior control mechanisms are used to stimulate team performance, foster cooperation, and improve individual psychosocial outcomes (Henderson and Lee 1992; Pinto et al. 1993). Typical behavior control mechanisms include the definition of explicit work assignments, the specification of rules and procedures, and the filing of project plans and project reports (Henderson and Lee 1992; Kirsch 1997; Pinto et al. 1993).

By their very nature, behavior control mechanisms reward compliance with the given rules and procedures (Snell 1992). As a consequence, teams are likely to pay significant attention to the requirements and the associated deadlines. For example, when asked to periodically provide reports, teammates are likely to structure their work around



the reporting schedule (e.g., agree on due dates for individual contributions before reporting dates). As the deadlines for the delivery of individual contributions approach, individuals are likely to closely monitor teammates' fulfillment of their obligations. Moreover, in cases when a deadline approaches and some team members fail to contribute as expected, the ensuing increasing uncertainty may further stimulate vigilance. Thus, behavior controls act as a catalyst for heightened vigilance and create incentives to closely monitor whether teammates are fulfilling their obligations to the team.

*Hypothesis 3a: Behavior control increases team members' vigilance in virtual teams.*

When a team is required to comply with behavior controls (e.g., regularly report on team progress, future plans, or individual work assignments), mutual obligations are periodically documented. Team members' attention is also periodically drawn to these obligations (i.e., mutual obligations become vivid). Moreover, because explicit rewards are associated with compliance with behavior controls, team members may be more likely to regard mutual obligations as important. Imagine for example that a team is required to report periodically on project plans and individual responsibilities. As team members assume responsibility for various components of the team

project, mutual obligations are crystallized. When the team is asked to report on its behavior and progress, failure by teammates to fulfill their obligations (i.e., any instances of reneging or incongruence that may have occurred) is likely to be highly salient.

*Hypothesis 3b: Behavior control increases the salience of reneging and incongruence in virtual teams.*

Behavior control mechanisms increase team members' vigilance and make perceived evidence that team members have failed to uphold their obligations (i.e., reneging and incongruence) salient.<sup>4</sup> Saliency and vigilance moderate the relationship between these incidents and trust decline. Thus, when reneging or incongruence occur in virtual teams complying with behavior control, they are more likely to be detected. As a consequence, virtual teams in which behavior control is used experience significant trust decline.

*Hypothesis 4: Virtual teams under behavior control experience significant trust decline.*

The research model is depicted in Figure 1.

<sup>4</sup>The failure by teammates to fulfill their obligation may be real (reneging) or perceived by some team members (incongruence).

## Research Methods

We tested the research hypotheses through an experiment employing a two-group pretest-posttest design with 51 virtual teams of three and four members.<sup>5</sup>

## Subjects

A total of 201 graduate (89 percent) and undergraduate (11 percent) students from six schools in the United States, Europe, and New Zealand were involved in the research. On average, they were 28.1 years old and had 5.1 years of work experience. About 10 percent of respondents reported having been a member of a virtual team in the past. Subjects were randomly assigned to teams, with the only restriction being that no two members could be geographically colocated. Teams were then randomly assigned to treatments.

## Procedures

Following a preliminary survey in which background, experience, and demographic information were collected, the teams completed a three-week long preliminary exercise. This was designed to familiarize participants with the communication and collaboration infrastructure, and with the nature of virtual teamwork. All teams were required to produce a four-page report outlining their analysis of an online case study. Upon completion of the preliminary exercise, the teams completed the pretest questionnaire and immediately began working on the main project: the development of a business plan for a new Internet-enabled venture (Figure 2).<sup>6</sup> This project, a research and planning task used in previous

virtual team research (Jarvenpaa and Leidner 1999), is well suited for our investigation because it requires considerable interaction among teammates and the extensive communication and coordination of effort typical of virtual teams (Furst et al. 1999). A substantial portion of each student's final course grade (20 to 25 percent) was assigned to the project and a prize of U.S. \$750 was offered to each of the two teams that produced the best business plan.

Communication took place in each team's private communication hub. Each hub, accessible through password authentication, provided a private distribution list that broadcast e-mail messages to all team members, an asynchronous threaded discussion board, a synchronous chat room, and a shared document repository. Each team could freely select its own communication media portfolio.

The behavior control mechanisms applied in this study mirror those often used in colocated teams. The teams in the treatment group were required to file weekly reports documenting their long-term and short-term plans, identifying members responsible for completion of specific tasks, and reporting on the progress made during the previous week. The teams' compliance with the above procedures accounted for 20 percent of each team's final project grade. Members of teams in the control group were required to file an individual report upon completion of the exercise so as to ensure a balanced workload between the treatment and control groups (e.g., all teams had to write reports), and to maintain a consistent grading structure (e.g., all teams were rewarded for writing required reports).

## Manipulation Check

The members of teams in the treatment group recognized the reporting requirement ( $t = 52.44$ ;  $p = .000$ ) and all treatment teams submitted all the required weekly reports except for two teams that skipped one report each. Participants were asked to report the extent to which they engaged in planning, task assignment, and progress revision.

<sup>5</sup>Forty-eight teams started the study with four members. The remaining three teams began with three members.

<sup>6</sup>The preliminary survey provided demographic and attitudinal data, the pretest questionnaire provided trust data, and the posttest questionnaire provided trust and manipulation check data.

	Opening Exercise		Business Plan Writing Project	
<b>Preliminary Survey</b>		<b>Pretest Questionnaire</b>	<b>Treatment</b>	<b>Posttest Questionnaire</b>
<b>Preliminary Survey</b>		<b>Pretest Questionnaire</b>		<b>Posttest Questionnaire</b>

**Figure 2. Projects and Data Collection Timeline**

The members of the behavior control group reported engaging in these activities significantly more than the self-directed group: all three behaviors were successfully increased ( $F = 8.764, p = .003$ ;  $F = 3.941, p = .049$ ;  $F = 6.455, p = .012$  respectively).

## Analysis

This study uses a multi-method approach: Through case analyses, we evaluate the effects of renegeing and incongruence on trust (H1a; H1b), the moderating effect of vigilance and salience (H2a; H2b), and the effect of behavior control on vigilance and salience (H3a; H3b). Through statistical analysis of team trust at pre- and posttest we evaluate the effect of behavior control on trust in the virtual environment (H4). The advantages of blending qualitative and quantitative analysis approaches are now widely recognized (Kaplan and Duchon 1988; Mingers 2001). In this study, the multi-method approach minimizes the threat of mono-method variance, enables us to evaluate overt behaviors rather than relying on self-reports, and allows us to chart the effects of interactions among teammates over time.

## Data Display and Measures

We measured trust using a previously validated scale (Jarvenpaa and Leidner 1999). The scale loaded satisfactorily on one factor and demon-

strated adequate reliability on both the pretest ( $\alpha = .85$ ) and posttest ( $\alpha = .89$ ). The data show strong perceptual agreement at pretest and posttest measurement ( $r_{wg(i)} = .92$  and  $.90$  respectively) and were aggregated at the team level. We made inferences about individual judgments of benevolence and integrity from participants' explicit behavior and statements. A statement that captures an individual's perception that teammates are disrupting the project, or that they are putting personal interests before those of the team, was construed to be evidence of lowered benevolence assessment. A statement that captures an individual's perception that teammates are unreliable was construed to be evidence of lowered integrity assessment.

After coding the team transcripts of selected cases, we created time-ordered matrices in order to reveal the sequence and flow of events in each team (Miles and Huberman 1994). The coding and data reduction process, as well as a description of the data displays used in the analysis, are reported in Appendix A. Renegeing, incongruence, vigilance, and salience were measured by analyzing the communication logs of selected teams. An instance of renegeing was recorded when one or more team members knew about their obligations (e.g., had explicitly taken responsibility for specific contributions or had acknowledged their responsibility) and failed to deliver on them. Evidence of incongruence was found in a pattern of codes indicating that a misunderstanding of obligations between one or more of the team members had occurred. The time stamp

associated with the incident was the day in the life of the team when the incident became apparent (e.g., contributions due for a specific date are not produced on that day). A pattern of codes indicating that one or more team members were actively monitoring teammates' behavior (e.g., a team member inquires with others about the status of the latter's missing contributions) provided evidence of team members' vigilance. A pattern of codes indicating that an unfulfilled contribution was significant (e.g., because of its cost to the team), vivid (e.g., because repeated calls drew attention to it), or personally relevant to one or more team members provided evidence of the salience of incidents.

## Selection of Cases

Ten cases were extracted from the population of 51 teams. In the case selection stage, we followed the logic of theoretical replication whereby cases are not chosen at random or through statistical sampling, but based on expectations grounded in theory (Eisenhardt 1989; Yin 1994). Cases that are expected to produce contrary results but for predictable reasons are chosen in order to rule out competing explanations of the observed phenomenon (Yin 1994). Support for the research hypotheses is claimed if the case evidence is consistent with the hypothesized pattern.

The four cases that exhibit the highest negative trust differential between pre- and posttest measurements (Teams 41T<sub>td</sub>, 40T<sub>td</sub>, 4C<sub>td</sub> and 26C<sub>td</sub><sup>7</sup>) provide the basis for testing H1 and H2. While these four cases were selected without regard to team control structure, two cases in each treatment qualified for selection. Cases that were expected to produce contrary results, but for predictable reasons, were then selected: the teams with the highest posttest trust in each group were used (teams 15C<sub>ht</sub> and 50T<sub>ht</sub>).

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<sup>7</sup>We use the suffix T to refer to treatment group teams and C to refer to control group teams. We also use the subscript td to refer to trust decline teams, ht to refer to high-trust teams, and bc to refer to teams used to study the effects of behavior control.

Theoretical replication was also used to guide the selection of four cases addressing H3. H3a and H3b propose an explanation of how and why behavior control mechanisms are responsible for trust decline—a result established through statistical analysis (H4). Four teams that experienced maximally different (Eisenhardt 1989) trust change between pre- and posttest measurements (teams 44T<sub>bc</sub>, 33T<sub>bc</sub>, 19T<sub>bc</sub> and 24T<sub>bc</sub>) were extracted in pairs so that the two teams in each pair had similar pretest trust but divergent posttest trust (see Table 2). H3 focuses on the role of behavior control in trust decline; therefore, only cases from the treatment group were selected.

The selection process and the number of cases selected in this research are consistent with earlier work in virtual teams (Jarvenpaa and Leidner 1999) and colocated teams (Gersick 1989).

## Results

### *Challenges to Trust Maintenance in Virtual Teams*

We hypothesize that instances of renegeing (H1a) and incongruence (H1b) lead to trust decline when vigilance (H2a) or salience (H2b) are high. The four teams that experienced the most significant trust decline during the completion of the business plan provide substantial evidence of both renegeing and incongruence (see Table 1). Each of these incidents is associated with high vigilance and/or salience. We report some exemplars in the remainder of this section.

### *Evidence of Renegeing*

**Team 4C<sub>td</sub>** experiences early renegeing and incongruence incidents but, after settling on one project idea and dividing responsibility for its completion, all team members engage in research and provide feedback to each other over a nine-day period. Suddenly, Sam stops participating and



**Table 1. Trust, Incongruence, and Reneging: Trust Decline and Validation Cases**

Team	Pretest Trust	Posttest Trust	Trust Change	Incongruence	Reneging	Total	% Last 12 Days
Trust Decline Cases							
Team 41T <sub>td</sub>	1.500	3.500	-2.000	7	10	17	30%
Team 40T <sub>td</sub>	2.250	4.563	-2.313	6	3	9	67%
Team 4C <sub>td</sub>	2.223	3.917	-1.694	6	4	10	75%
Team 26C <sub>td</sub>	1.417	3.750	-2.333	2	2	4	50%
Validation Cases							
Team 15C <sub>ht</sub>	1.438	1.250	0.188	0	0	0	0%
Team 50T <sub>ht</sub>	1.875	1.438	0.437	0	6	6	0%

Note: The last column represents the percentage of instances of reneging and incongruence that occurred during the last 12 days of the project (i.e., the last third of the project duration).

Lower numbers indicate higher trust.

**Table 2. Trust, Incongruence, and Reneging: Behavior Control Cases**

Team	Pretest Trust	Posttest Trust	Trust Change	Incongruence	Reneging	Total	% Last 12 Days
Team 44T <sub>bc</sub>	1.688	3.250	-1.562	7	2	9	33%
Team 33T <sub>bc</sub>	1.750	1.500	0.250	1	0	1	0%
Team 19T <sub>bc</sub>	2.625	3.500	-0.875	6	1	7	86%
Team 24T <sub>bc</sub>	2.688	1.688	1.000	5	2	7	14%

Note: The last column represents the percentage of instances of reneging and incongruence that occurred during the last 12 days of the project (i.e., the last third of the project duration).

Lower numbers indicate higher trust.

answering e-mails for a period of six days. His teammates call repeatedly for his contributions.

By	#	Day	Excerpt
Sam	368	27	Last e-mail in which he provides an exhaustive point-by-point response to an earlier request. This e-mail provides no warning of his upcoming prolonged absence.
Mia	369	27	"Sam, I like your explanation of...Where will this description go in our business plan?"
Mia	374	30	"Hi Lee and Sam, Where are your sections? We have only 4 days remaining until the due date!!!! Please, send whatever you have completed so far."
Lee	378	31	"Sam - I'd like you to go through my section with a fine comb and make sure I covered all the technical angles in an adequate fashion. Please let me know ASAP (TOMORROW)...4 DAYS TO GO"
Mia	379	31	"Sam????? Are you there???? Please respond to our messages."
Lee	382	32	"Sam - What are your opinions regarding my piece." Once again he asks for his feedback and suggestions for improvement.
Mia	385	32	"Sam, PLEASE respond to our e-mails!!!! We have not heard from you in 5 days."
Lee	388	33	"Sam -...CONTACT MIA AND MYSELF TODAY. If you are having difficulties with your part, please let us know....It's all about Teamwork!!!"
Mia	390	33	"I am concerned that we have not heard from Sam....we could just leave those sections blank with a note that says 'no input received from Sam'."

Sam	391	33	"Sorry I wasn't able to reply....I had to catch up with a few things....I will try and get my other sections ASAP."
Lee	392	33	"We all have deadlines and you should have planned to have your piece finished last week. I am disappointed that you haven't reviewed Mia's work and my work....I hope you'll produce the goods."

As his teammates produce the contributions expected of them, Sam fails to fulfill his obligations. Upon his return, Sam provides no excuse for his behavior. He shows little concern for his teammates and disregard for the interests of his team. As a consequence, teammates' perception of his benevolence (e.g., "Sam, PLEASE respond to our e-mails!!!! We have not heard from you in 5 days" [Mia, 385]) and integrity (e.g., "We all have deadlines you should have planned to have your piece finished last week" [Lee, 392]) are lowered.

The above excerpt not only presents an example of renegeing, but also shows the role of salience and vigilance in its detection. Sam's renegeing is not immediately apparent, but when he fails to respond to repeated calls for contribution, his renegeing becomes obvious (e.g., "CONTACT MIA AND MYSELF TODAY" [Lee, 388]). As his absence continues, teammates monitor his behavior more and more closely (each teammate calls on him on each of the last three days of his absence).

**Team 40T<sub>td</sub>** also provides multiple examples of renegeing. The team faces early confusion and encounters difficulties in choosing one idea from two competing proposals. After finally making a decision, individual members take responsibility for different sections and the team makes substantial progress. As the project conclusion approaches, Dan abruptly announces that he has completed his part and he will no longer be available.

By	#	Day	Excerpt
Dan	87	28	"Here is my part on [my section]. Our school's term ends on [day 30], so if you have any minor revisions, let me know sometime tomorrow afternoon and I can address them tomorrow night."
Mel	88	30	"Good work done there on [your section], Ned and Dan. It needs to be put together. Dan, if your term is ending does that mean that you won't be in touch again??"
Don	89	30	"I was wondering the same thing Dan."
Dan	90	30	"I believe my piece stands alone well. Thus, I see no reason it can't be simply cut and pasted...once the rest of you have completed your sections....Best of luck to each of you..."

Dan's behavior represents an example of reneging (i.e., leaving the team before completion of the project). By leaving the team early, Dan is violating accepted principles of teamwork and demonstrates himself to be an unreliable team member (i.e., lacking integrity). He also displays disregard for the team's success by disrupting the project so close to the final deadline (i.e., not giving teammates the opportunity to comment on his contribution and leaving others with the task of integrating his work in the final deliverable). A message that Mel addresses to the exercise coordinator summarizes team members' reactions to Dan's reneging: "I think that this is extremely unfair to the rest of the team....My term is also drawing to a close...I don't see that as a worthwhile reason to turn one's back on the team."

Dan's reneging appears to be highly salient to his teammates because of its magnitude (e.g., "this is extremely unfair to the rest of the team"). Dan leaves the team four days before the final deadline, at a time when attention to the project and contributions to the final deliverable are at a peak

(see Figure 4), and offloads his responsibility to others. His behavior is very noticeable and likely personally relevant for the teammates who are left to pick up the slack.

**Team 41T<sub>td</sub>**, a team relying mostly on synchronous meetings, presents an example of reneging following a meeting where all teammates agree to engage in research and post their findings to the discussion board before the next meeting. This agreement is summarized in a weekly report: "The group has agreed to post all business ideas on the [discussion board by day 13]. This will enable everyone to read through the business topics and post any supporting ideas or conflicting thoughts. The group will finalize a topic on [day 13] during the chat session." Only Tim and Deb fulfill their commitment by the deadline, and Deb, who has been monitoring the discussion board, comments [541]: "Tim and I posted our ideas to the [discussion board] but no one went out to expand on the ideas or add any new ones." Her perception of reneging by teammates becomes more apparent when the team is unable to finalize a topic on day 13 and has to engage in further research.

By	#	Day	Excerpt
Tim	652	13	"Instead of meeting for an on-line chat session, we could use the [discussion board] and e-mail."
Deb	654	13	"The only problem is that we say we're going to use the discussion board and e-mail and no one ever does. I think it's more flexible as long as everyone would participate."
Ken	655	13	Proposes to post contributions to the discussion board and meet in the chat room to discuss them.
Deb	656	13	"Oh well, I guess it's your evaluation if you don't [post your contributions on the discussion board]. Let's give it another try."

Deb's skepticism is evident from her reaction [656] and suggests that she does not believe others are dependable or committed to the success of the team (an attribution of low integrity and benevolence). Before leaving the meeting all team members explicitly agree to be present for the next electronic discussion (day 18). But when others fail to attend the scheduled meeting on day 18 and Deb finds herself alone in the chat room, teammates' renegeing is glaring (e.g., nobody else made the meeting and she "wasted 2 hours" [697]), and she asks, visibly frustrated [698]: "Where is everyone?????"

A very similar dynamic is evident in **Team 26C<sub>td</sub>**, a dysfunctional team that has very low communication throughout the project and three very inactive members. The team member most active during the preliminary project, who volunteered to aggregate teammates' contributions during the preliminary exercise, contributes only one message during the main project and stops participating without any notice. The remaining two members seem unable to cope with his absence. Larry asks: "I don't know what to do about Bernard. We haven't heard from him and are getting close to the deadline. Do you want to split the rest up or what?" But Larry receives no answer and turns in the project without Bernard's section.

**Evidence of Incongruence**

**Team 40T<sub>td</sub>** experiences its first instance of incongruence as the deadline for the first project report approaches.

By	#	Day	Excerpt
Don	41	6	Outlines two ideas through e-mail as the team is unable to find a suitable meeting time.
Ned	42	6	"Don, that sounds like some really good ideas for a business," he endorses the first one and states: "I went over the articles and inspiration has still not struck me...I will keep brainstorming."

Dan	43	6	"I particularly like the [first] idea as well. I think we should give it another day or 2 to see if we can come up with anything else." He then calls attention to the weekly report, due in three days.
Mel	44	8	Dissents with the group: "I don't really think that the [first] idea is a very good one." He then explains his reasons, endorses the second idea, and expands on it.
Dan	45	8	Endorses Mel's position and calls attention to the report (due next day) "I think we could do a good job with this idea as well....If the rest of you guys agree, it may be time to start pursuing this objective.... let me know how you want to approach our first [weekly report]."
Ned	46	9	Challenges Mel's position "I like the [first] idea" explains his view and calls for comments to file the report "Send me some comments....The report needs to be filed today..."
	47-49	9	While both Mel and Don have posted messages since Ned's original call for input on the report, their comments focus on debating the idea and there is no mention of the report itself or what to write.
Ned	50	9	"You have convinced me its not that great an idea...Do you want to write up the report on the communication hub for the [second idea]..."
Ned	51	9	"The progress report is due in 4 hours...I want to [do the first idea]...e-mail any additional comments."

Ned	52	9	Calls for Don's help, still a proponent of the first idea, "so we can quickly come up with something to put on the progress report. We have till 12 midnight CDT."
Mel	53	10	Receiving no answers Ned files the report focusing on the first idea. Mel comments: "I still think that the [first] idea is not a very good one. Ned and Mike want to go ahead with it, what do you think Dan??"
Ned	54	10	"I don't think anything is set in stone, Mel, if you can come up with something on the [second] idea, I think there is still an opportunity in doing this."
Dan	55	11	"I personally think that the [second] idea is a better one. Here are a few reasons why:" Dan details why he believes the second idea is superior.
Ned	56	11	"I am on the [second idea] bandwagon....Give me a complete idea of what it is" Even though he changes his position, Ned is still deeply confused about the specifics of the second idea.
Don	57	13	"I too am on the bandwagon. I know that initially this was my idea, but I think that Mel has a better vision."
Ned	58	13	As the deadline for the second weekly report nears (due in two days), Ned, who has received no answer to his inquiry [56], confuses matters further: "Someone needs to take charge and produce a new [weekly report] for all of us if they want to do [the second idea]. Until then I am going to keep working on the [first idea]."

Dan	59	13	Even though on day 11 all team members had pledged support for the second idea, apparently confused by Ned's last statement Dan states: "Though I championed [the second idea] before, let's just get going on the [first one]. All in? (Besides you, Ned. I know you are...)."
Ned	61	15	Due to its state of confusion the team misses the second report and receives a reminder. Ned immediately files the report and e-mails the team: "I understand that everyone has a busy schedule but more attention needs to given to this project. At this point, I feel like I have done the majority of the work....I expect some help.... look at the second report submitted. I am getting extremely upset. My grade depends on this project...I want some deliverables by the next report."
Don	62	15	Ned's report focuses on the first idea and provides a breakdown of responsibilities. This report represents a turning point in the life of this team. Summing up the confusion Don states: "I am sorry but I was unsure as to what idea we were pursuing??? ... Now that that is settled I know what to look into, so I will."

Ned's disappointment appears to stem from his perceptions that teammates are not contributing to the project and are unconcerned with the success of the team (i.e., perception of low benevolence). Note, however, that during this incident teammates are contributing, with each member discussing his view on the alternative proposals. The significant confusion with respect to individual responsibilities and what to do, partly fueled by Ned's own sense of urgency (e.g., "Send me

some comments...the report needs to be filed today" [46]; "Do you want to write up the report" [50]), seem to be the cause of the incident. Ned, who has continuous access to e-mail, monitors teammates closely (his last three calls for contribution coming in a span of six hours [50-52]), but Mel, who relies on school laboratories, and Dan, who holds a full time job, both have limited access to the Internet. They did send comments to Ned following his request [46], but can't respond to Ned's suggestion that one of the champions of the "second idea" file the report [50]. When the confusion persists and the team misses the second report deadline, Ned verbalizes his perceptions and states his disappointment with teammates [61].

**Team 41T<sub>td</sub>** uses synchronous meetings to brainstorm, make decisions, and divide the work among team members—much like a traditional team. Between meetings team members work independently on their tasks. This model is successful during the preliminary exercise and the team reports very high trust. But when the team encounters significant difficulties coordinating a meeting, a significant incongruence-based incident occurs.

By	#	Day	Excerpt
Deb	709	19	"Wonder what's happened to Pam? The biggest question that needs to be answered at this point is do we want [option A] or do we want [option B]."
Pam	713	19	"In my rush to [attend to an emergency out of town] I composed a note but forgot to send it....Sorry I missed both the online conferences we had this weekend....Would someone update me?"
Deb	714	20	She explains that they were unable to meet and calls for a new meeting. "ALL, Let me know when you guys want to meet again?....Also, what position do we take on [option A vs. option B]?"

Deb	715	20	"Anyone have a preference/ conflict with [meeting] tonight vs. tomorrow? Who is turning in the progress report? Thanks."
Tim	716	20	"Can anyone meet tomorrow during the day" Details his constraints and schedule extensively.
Pam	717	20	"I am an hour behind you guys and could meet anytime [in the afternoon]."
Deb	718	21	Deb details a change that happened in her schedule and suggests: "I think squeezing a lunch meeting in today would work best....Ken and Pam, would this work for you guys?"
Ken	719	21	"I am in class until [gives time in his time zone]. I could meet around [late afternoon in Deb's time zone]. The time difference is difficult with all our different schedules!....We need to make some progress."
Deb	720	21	"Anyone able to make a [late night chat meeting]???? Who is turning in the progress report? What's our [decision between option A and B]? Can someone please offer some feedback?"
Tim	721	21	"My meeting that I had this evening was cancelled and I will be able to chat tonight."

Deb attempts to obtain a response to two substantive issues (i.e., selecting between two options and deciding who will file the progress report). While all team members are active as they attempt to find a suitable time to meet, none of them responds to her repeated calls regarding what option to choose. As they had done before, Deb's teammates appear to defer the discussion of substantive matter to the synchronous meeting. Deb is disappointed with what she perceives as a lack of help and teammates' failure becomes

increasingly salient with each of her calls for a response (e.g., “Can someone please offer some feedback?” [720]). As confusion reigns, only Tim and Deb are able to make the meeting. Deb’s perception of teammates’ failure is evident as she retracts an earlier statement about the quality of the team: “I think I spoke too soon the other day about how great [our team is]” [760].

**Team 4C<sub>td</sub>** presents evidence of incongruence as well. After all team members have outlined their idea, Mia attempts to structure the work going forward.

By	#	Day	Excerpt
Mia	320	10	After trying and failing to schedule a chat meeting for 10 days over a total of 10 messages, Mia suggests: “It looks like the virtual chat just will not happen due to our conflict in schedules. I do not think that it is required at this point, we can communicate via e-mail.”
Mia	322	12	“I recommend that we go with a combination of Sam’s and my ideas” and details the idea in depth. “What are your comments? Here is the business plan template that we MUST follow.” Mia details the structure of the plan and asks, “Please respond to this e-mail as soon as possible so that we can start working on the research for this project. I think the easiest way to respond would be to add inline comments.”
Mia	323	14	Reiterates her call for contributions: “Please respond to my earlier e-mail. This is supposed to be a GROUP project and it would be nice if we can all share in the work equally this time.”

Sam	324	14	Indicates that he has found, in his research, a company implementing an idea similar to his proposal.
Lee	325	15	Even though the team has had difficult time coordinating a chat meeting, and Mia already suggested to work with inline comments, Lee states: “Let’s organize a time to meet [in the chat room] and we can decide on a strategic plan of action. I think it is the best starting point.”
Mia	326	15	“Let’s give up on [chat room meetings], OK? We have wasted much time on trying to find a time convenient for all. Would you two please try to respond to my earlier e-mail... which means add comments where I have requested comments.”
Lee	328	15	“Good idea Mia. Maybe we could plan some time to discuss ideas this week in the virtual chat. There we could start organizing the logistics of the project. What do you both think?”
Mia	329	15	She resends her earlier message [326] as if it had not been delivered.
Mia	332	17	Having still received no feedback in the format requested, she resends the original message prefaced by some comments: “I sent the following message almost 1 week ago and still neither of you have responded directly to any of my specific questions and comments....We need a response from each group member in order to proceed with the research and business plan development....Please respond today!!”

Like Deb's teammates (Team 41T<sub>td</sub>), Lee has a hard time breaking away from the traditional colocated teamwork model entailing regular synchronous team meetings. Mia prefers a model based on consensus building and sequential progress in which all members must participate. She is unable to move forward before all team members have contributed their ideas [321; 322] or have commented directly on her specific questions and comments [332]. Indeed she states [332]: "We need a response from each group member in order to proceed." This incongruence regarding the manner in which contributions should be provided leads to considerable frustration for Mia, who perceives that she is receiving no help from teammates. In this instance, Mia's teammates do not appear to be consciously renegeing on their commitments, but instead seem confused as to how to proceed; however, Mia makes a negative attribution with respect to their benevolence (e.g., "This is supposed to be a GROUP project" [323]) and integrity (e.g., "I sent this message almost 1 week ago and still neither of you have responded" [332]).

### High Trust Teams

In the previous two sections we have shown how renegeing and incongruence are prevalent in teams that suffered trust decline (H1a and H1b) and how these incidents are either highly salient (H2b) and/or detected by vigilant team members (H2a). Our explanation for the causes of trust decline in virtual teams suggests that high trust can be maintained under two circumstances: Either the team experiences no renegeing and incongruence, or the incidents go undetected due to their low salience and low vigilance by team members. An examination of the logs of the high trust teams lends support to these expectations.

**Team 15C<sub>ht</sub>**, achieving the highest level of post-test trust, experiences no renegeing or incongruence, even though it faces junctures similar to those that generate incidents in other teams. Like Team 40T<sub>td</sub>, after three members pledge support for one idea and call for the team to move forward, the fourth member supports a different idea.

Unlike Team 40T<sub>td</sub>, however, Team 15C<sub>ht</sub> rapidly resolves the disagreement without incidents.

By	#	Day	Excerpt
Leo	87	14	"I would really like to get moving on the business plan. Are there any new ideas or are we going to go with Ann's idea? Hope to hear from you all soon."
Roy	89	14	"I agree with Leo about getting this thing done quickly. I also like Ann's idea. I'm ready to begin.... Looking forward to hearing from you."
Bob	90	15	"I have another idea." He then details his idea and adds: "I also like Ann's [idea]. It is up to you. Whatever you think is best. Please reply to me quickly so that we can finalize quickly and get started."
Roy	93	15	"I guess we should vote and see which idea has the most votes so we can get started. I vote for [Bob's idea], although all of the ideas are good ones."
Ann	94	16	"I vote for [Bob's idea] as well."
Bob	95	16	While there is no record of Leo's vote, he appears to have communicated his preference privately. "So we all agree to [use Bob's idea for the] business plan." He then expands further on the idea.

**Team 50T<sub>ht</sub>** does experience renegeing and incongruence early on, but reports the highest level of posttest trust in the treatment group. Throughout the project, team members show little evidence of vigilance (e.g., they rarely inquire about each others' contributions), often seemingly forgetting that mutual obligations have been set. Failure to



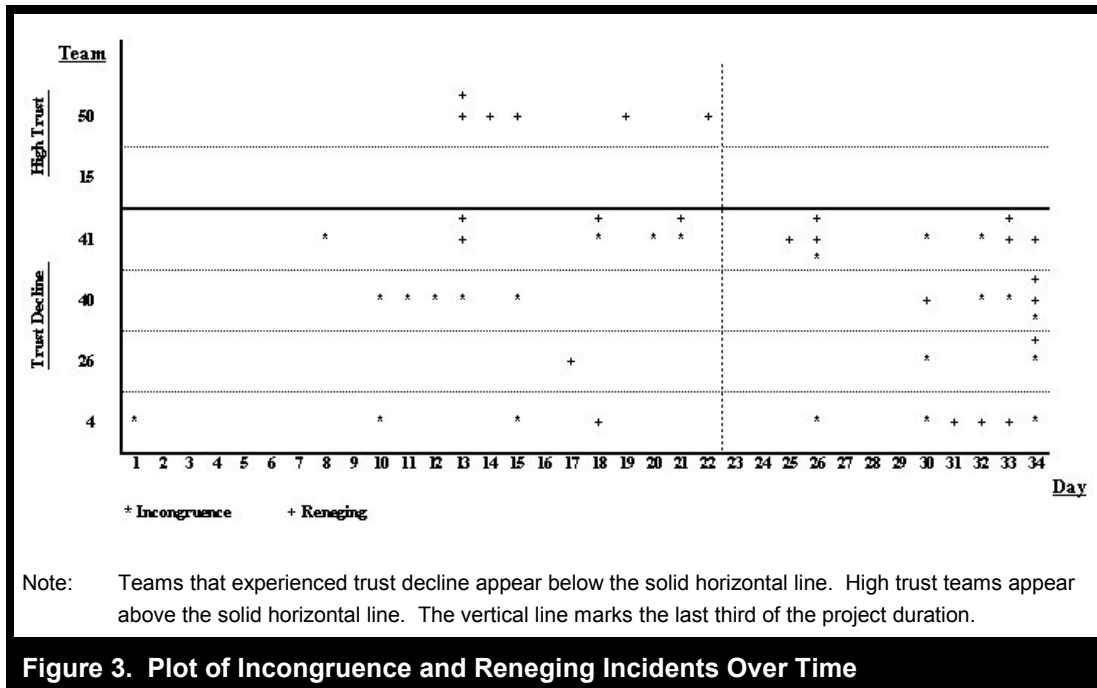
fulfill obligations by team members generally does not appear to be significant (e.g., “I was supposed to send you an e-mail yesterday ... and have not been able to do it until now”), and teammates seem generally unconcerned (e.g., “It’s okay, we all get busy”)—both indications of low salience.

By	#	Day	Excerpt
Len	544	9	“How about we post our results by the weekend, and get together next week?”
Len	581	13	“I’m sorry to be doing this at such sort notice....Unfortunately, the time I have had to do my assignment for our project up till today has been next to nil...I will be on line at 4, but expect to be sort of empty handed....Sorry about this, I’ve just been swamped with work.....”
Len	593	13	“Have you had a chance yet to look into anything for the paper?”
Rob	594	13	“Sorry but I didn’t have time.”
Sue	605	13	“Hi guys, sorry I am late”
Rob	609	13	“Is it okay if I leave now and turn in the ideas on [day 18]?”
Len	610	13	“Sounds good to me...and then we’ll talk on [day 19].”
Sue	611	13	Sue, forgetting they had agreed to provide some contributions by this date, states: “So, we are just going to post ideas to the [discussion] board by [day 18] and talk on [day 19].”
Ted	624	13	Ted, who missed the meeting, apologizes later: “I apologize whole heartedly for my absence this weekend at our chat session....To make matters even worse I am exceedingly busy with other class work for the next three days.”

Len	625	13	“I also apologize - I was supposed to send you an e-mail yesterday after we got together on the web and have not been able to do it until now”
Rob	757	19	“So, how is the researching?”
Sue	758	19	“I don’t know anything about technology...I was hoping to get some feedback from you guys”
Ted	759	19	“My research is coming along very slowly...but I have found some competitors of sorts.”
Len	859	22	“Like I said in the e-mail, sorry about missing the last meeting”
Rob	862	22	“It’s okay, we all get busy sometimes or maybe a lot of times for others.”
Len	863	22	“Thanks, Rob”

While the team meets biweekly in the chat room throughout the project, teammates spend more than half the allocated time simply debating the merits of preliminary ideas and making little progress. But after selecting an idea and subdividing the work (on day 22), Team 50T<sub>nt</sub> progressively picks up the pace and experiences no further renegeing or incongruence (see Figure 3). A sense of urgency never pervades this team, but as the final deadline approaches all teammates contribute significantly to the project, debating inconsistencies and other unresolved issues before separating until the next meeting. For example, between two scheduled chat meetings, Ted sends an e-mail titled “URGENT!!!” in which he explains why the advertising plan they have developed will not work. He details an alternative and asks for input. By the end of his working day, he receives an answer from each teammate.

These results lend support to H1 and H2. The teams where trust declined experience substantial renegeing and incongruence. These incidents are detected because of their salience and/or high vigilance by team members at the time. When



**Figure 3. Plot of Incongruence and Renegeing Incidents Over Time**

individuals witness renegeing or incongruence, they lower their assessment of teammates' benevolence and integrity, and trust declines as a consequence. Conversely, the high trust teams either do not experience renegeing and incongruence or, when they do, the failure to fulfill obligations has little effect on trust due to its low salience and teammates' low vigilance. As shown in Figure 3, the timing of incidents, not just their occurrence, may help explain our results. Teams where trust declined experience a substantial portion of their incidents during the latter third of the project, a time when high trust teams experience no incidents (see Table 1). Late in the project, as the deadline for completion approaches, team members are likely to become highly vigilant due to the increasing cost of unfulfilled obligations. At this time, any renegeing and incongruence is also more likely salient because mutual obligations are increasingly vivid and relevant to team members. Thus, incidents that occur later in the project, when team members are generally more active (see Figure 4), may have a disproportionate effect on trust decline.

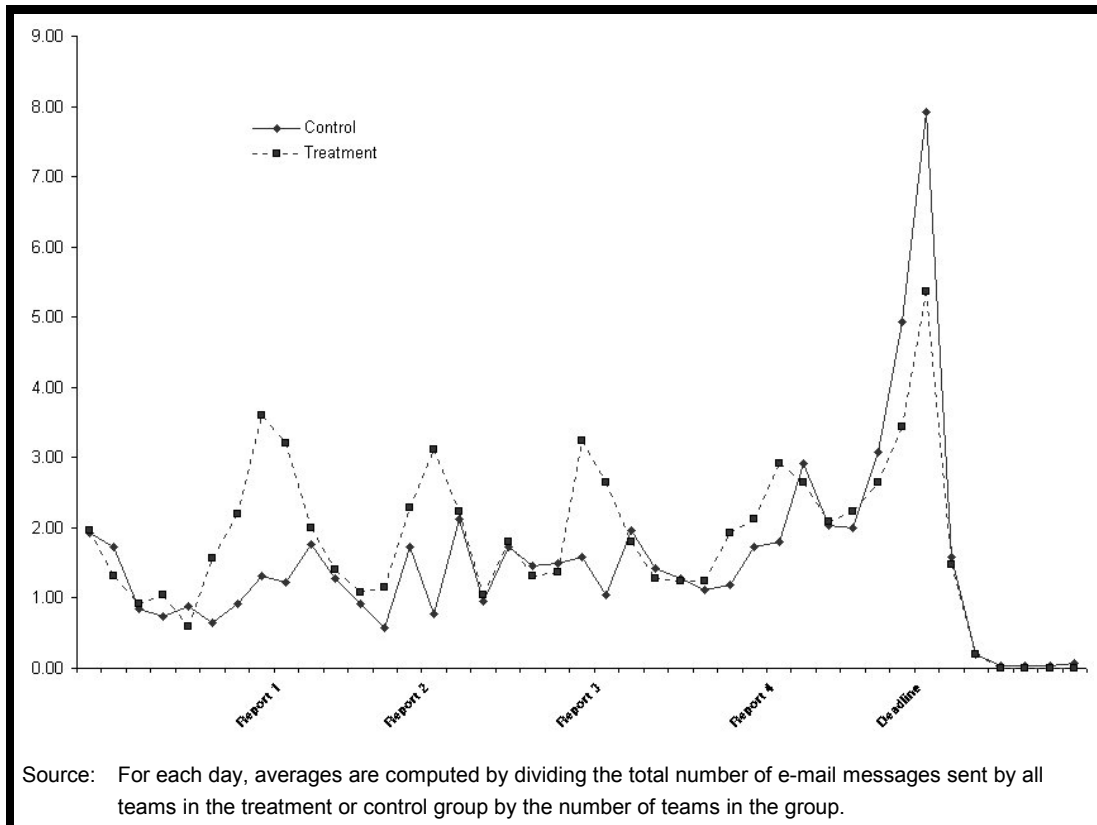
### **Behavior Control and Trust Decline**

The analysis of trust scores at pre- and posttest provides support for H4 and the proposition that, on average, behavior control negatively affects trust in virtual teams. No significant pretest trust difference was detected ( $p = 0.449$ ). After controlling for pretest trust, teams under behavior control report significantly lower posttest trust than their self-directed counterparts (Table 3).

Within each group (i.e., behavior control and self-directed teams), trust evolved differently during the main project. On average, individuals in self-directed teams did not revise their assessment of trust. Conversely, teams under behavior control experienced a significant decline in trust (Table 4).

### **Behavior Control's Impact on Vigilance and Salience**

We hypothesized that behavior control would increase team members' vigilance (H3a) and the



**Figure 4. Average Daily Messages per Team During Completion of Main Team Project**

<b>Table 3. Posttest Trust ANCOVA Results</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>p</b>
<b>Corrected Model</b>	17.602	2	8.801	12.651	.000
<b>Intercept</b>	2.675	1	2.675	3.845	.056
<b>Trust (pretest)</b>	12.705	1	12.705	18.262	.000
<b>Treatment</b>	3.277	1	4.897	4.711	.035
<b>Error</b>	33.393	48	.696		
<b>Total</b>	433.878	51			

Note: Pretest trust is used as a covariate.

	Pre-Treatment Trust			Post-Treatment Trust			t	Sig.
	Mean	St. Dev.	N	Mean	St. Dev.	N		
<b>Treatment</b>	2.35	0.581	25	3.06	1.080	25	-4.14	.000
<b>Control</b>	2.22	0.666	26	2.44	0.851	26	-1.34	.192

Source: For each day, averages are computed by dividing the total number of e-mail messages sent by all teams in the treatment or control group, by the number of teams in the group.

salience of incidents (H3b). Behavior controls periodically drew team members' attention to their work progress and most teams paced their work around the requirement to file four weekly reports. While the magnitude of communication in the treatment group is generally in line with that of the control group, it increased substantially in the vicinity of the report deadline (Figure 4). This pattern of communication suggests that behavior control acted as a catalyst, drawing attention to the project and spurring team members to take action. Such heightened attention appears to engender more vigilance by team members and increase the salience of incidents.

Analyses of the communication logs of teams that experienced trust decline during the main project provides evidence of behavior control-induced vigilance.<sup>8</sup>

**Team 19T<sub>bc</sub>** paces its work around the reporting deadlines and the first message following an eight-day collective absence is spurred by the first report:

By	#	Day	Excerpt
Pat	30	7	"the deadline is drawing dangerously close for the submission of our first report."
Al	36	11	After the team selects one idea, Al states: "I will have a draft business description and marketing plan out to you by [day 13]." He then assigns sections to the team-mates and concludes: "Please get this out to the team by [day 14], so that we can prepare our next weekly report and have it in on time."
Al	37	13	After sending his promised contribution, he adds: "Remember we have another deadline to meet this week - we need to send the report in tomorrow night ideally, so get your stuff to me asap."
Sid	39	13	"Here is a rough draft of [my part]. Please, feel free to make any changes."
Al	42	14	After only receiving Sid's contribution, and being unable to read it due to a virus, he files the second report: "I have submitted the report. Go to the web site to have a look. Some feedback and discussion on this assignment would facilitate a better end result. Look forward to hearing from you all and receiving some input."

<sup>8</sup>In this section, we focus our attention on critical incidents that stem from the implementation of behavior control. This narrow focus could convey the false impression that these teams were mostly focused on, and communicating about, the reporting requirement. To the contrary, these teams discussed topics and issues similar to those reported above, but we only report excerpts relating to the reporting requirements.

Pat	43	14	"I apologize for the delay with my contribution." He then provides it in the form of an e-mail message.
Al	46	18	"Pat, thanks. Can you shape these to fit the appropriate section of the report format? ...Sid, still hoping to receive your work [virus free]. As usual, we are running short on time, so can you also shape your work to fit the appropriate heading in the report format?...Max, anything to add?"

As each report deadline nears, it is apparent that Al is vigilant and monitors his teammates. He repeatedly calls on them to produce their contributions (e.g., "get your stuff to me asap" [37]; "Sid, still hoping to receive your work...Max, anything to add?" [46]). When Al is preparing to file the reports, he actively looks for expected teammates contributions.

In **Team 44T<sub>bc</sub>** the reporting schedule influences the pace of work activities as well. Some team members are very aware of the cost of missing a report (e.g., Art, asking for clarification to the coordinator, states: "I just want to make sure we do not miss any deadlines").

By	#	Day	Excerpt
Art	68	9	"Read over what I [wrote in the report] We need to stick to the deadlines in this report." The report details the team's idea and individual work assignments.
Vic	69	10	Thanks Art but provides no substantive feedback.
Art	70	11	"I have not received any feedback from anyone regarding the document I sent to you....We need everyone's input to every part....Who is doing progress report #2?"

Art	72	11	"Ron, are you going to write the next progress reports?"
Art	74	13	While Ron is active and is communicating with the team about substantive issues throughout this exchange, he never acknowledges Art's request for confirmation about his responsibility to file the report. Art issues a third call: "Ron, you are writing the next progress report due on [day 14] right?"
Ron	76	13	"I will write the progress report tomorrow."
Art	86	20	"Ron, great job on your part! ...Vic and Bill?"
Ron	90	22	"I checked the communication hub and there was no report so far submitted.... We need to stick to the deadlines. Vic, can you let us have the draft of your part by the end of this week?...Bill, can you let us know if you are going to write your part?"

As in Team 19T<sub>bc</sub>, this concern with deadlines leads to heightened vigilance and active monitoring of teammates contributions by some members (e.g., "I have not received any feedback from anyone regarding the document I sent to you" [Art, 70]; "Ron, are you going to write the next progress reports?" [Art, 72; 74]; "I checked the communication hub and there was no report so far submitted" [Ron, 90]).

In our study, behavior control was also responsible for increased salience of incidents because renegeing and incongruence became more vivid and relevant with the approaching of report deadlines. For example, as the deadline for the first report approaches in Team 19T<sub>bc</sub>, Al closely monitors his teammates (see excerpt reported above). The day before the deadline he reminds

teammates to send him their contributions [37]. Only one teammate honors his request, with unusable input, and other teammates' failure to fulfill their obligations is very salient. This incident is very obvious to Al due to his recent, and ignored, call for contributions. Moreover, Al has to scramble to complete the report in time and his teammates' failure is likely important to him. Similar incidents occur in conjunction with two of the three remaining reports. Al's reaction to perceived teammates' failures becomes clear in an e-mail he sends to the team after submitting the fourth report [61]: "I have become so frustrated with the lack of input that I have pressed on by myself - I can't wait until the last moment each time reports and assignments are due....I don't want to finish up with a disappointing grade." His statement suggests that he has been closely monitoring teammates as deadlines approach and that their repeated failure to adequately contribute is personally relevant to him.

**Team 44T<sub>bc</sub>** begins working on the project early on, spurred by a member who exhibits an uncommon sense of urgency.

By	#	Day	Excerpt
Art	50	2	"Since we have time constraints...I think that we should decide on our business by [day 3]. Let's talk about it! I already gave my idea [reiterates his idea]."
Ron	56	4	"It seems we are already late ...I propose that for the first report we should have accomplished the following tasks:" Details a series of research and discussion tasks.
Art	57	6	After identifying similarities between his and Ron's ideas, states: "Bill [and] Vic, what do you think? We need to start on this immediately. Our first progress report is due on [day 9]"

Art	58	7	"I do not think that we are responding fast enough to this project. There is no more time to wait....We have a project update to send to [the coordinator] on [day 9]. We need to talk about this."
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As the deadline for the first weekly report approaches, only Ron answers Art's repeated calls for contributions. The pressure created by the need to resolve issues before the first report deadline is instrumental in making teammates' failure very apparent to Art and Ron, who are waiting on teammates' input to finalize the report. Moreover, as the deadline approaches, the magnitude and importance of teammates' renegeing increases. The reporting requirement appears to be instrumental in making mutual obligations more vivid and important for some team members and teammates' failure to contribute salient. This incident, and others in this team, is reminiscent of those experienced by Team 4C<sub>td</sub> where the deadlines imposed by Mia create similar pressure.

### **Behavior Control in High Trust Teams**

In our study, teams that successfully maintained or improved trust while complying with behavior control represent the exception. In these teams, the control mechanisms did increase vigilance. But like the other high trust teams, they either experienced minimal renegeing or incongruence (Team 33T<sub>bc</sub>) or experienced few incidents, most concentrated early on in the team's life (Team 24T<sub>bc</sub>).

In summary, behavior control mechanisms do appear to increase team members' vigilance and the salience of renegeing and incongruence incidents the team experiences during the project. In so doing, they increase the likelihood that these incidents will be detected and lead to trust decline. Conversely, in teams that experience no incidents, or that only experience some early incidents, behavior control has no detectable effect on trust.

## Discussion

Previous research suggests that virtual teams are able to rapidly achieve a relatively high level of trust (Iacono and Weisband 1997; Jarvenpaa et al. 1998; Jarvenpaa and Leidner 1999). As early trust can be established, the challenge then is to maintain it while the team moves toward completion of the project (Meyerson et al. 1996). Our results provide important clues about the determinants of trust decline in the virtual environment and, in particular, about the effect of behavior controls on trust.

Reneging and incongruence plagued all virtual teams where trust declined. In these teams, high vigilance by some team members and/or the salience of the incidents made them easily detectable. When identified, these incidents prompted a revision of team members' assessments of their teammates' benevolence and integrity that was reflected in declining team trust. Teams that experienced a minimal number of incidents (Teams 15C<sub>nt</sub> and 33T<sub>bc</sub>) reported high trust. Other high trust teams did experience some reneging and incongruence (24T<sub>bc</sub> and 50T<sub>nt</sub>). These teams started their work with a ramp-up period during which all teammates contributed sporadically to the project. Incidents were concentrated during this time, a time when the project appeared to be a low priority for all team members. However, after this initial period, the teams transitioned to a second phase characterized by high involvement by all team members when incidents did not occur. As a consequence, the few instances of reneging and incongruence that happened early on appeared to go largely undetected, or were regarded as minor, and had no negative impact on trust.

An important insight emerging from this study pertains to the timing of reneging and incongruence-based incidents. On average, the four high trust teams experienced 7 percent of their total incidents during the latter third of the project duration.<sup>9</sup> During the same time, the six teams in

which trust declined experienced, on average, 50 percent of their total incidents. We conclude that, as the final deadline nears, when attention to the project is at a peak and incidents are most likely to be detected, reneging and incongruence may have the strongest impact on trust decline. Future research should explicitly test this proposition.

Behavior control had, on average, a negative effect on trust in the temporary virtual teams in this study because it tended to increase the salience of incidents caused by reneging and incongruence and made some individuals more vigilant. By stimulating a discussion of progress to date, individual contributions, and future plans, the weekly reporting requirement periodically drew individuals' attention to individual performance relative to mutual obligations and highlighted differential contribution and failure to fulfill these obligations by some team members.

Specific behavior control mechanisms were the focus of this study, but other mechanisms may contribute to heighten team members' vigilance and increase the salience of reneging and incongruence. Self-directed teams chose varied approaches to self-regulation. For example, in one team (Team 4C<sub>id</sub>), one member attempted to heavily structure the team's interaction process by proposing deadlines and individual work assignments. As with the behavior control teams, these requirements appear to have stimulated increased salience and vigilance, and to have contributed to trust decline.

## Limitations

The study's limitations must be recognized before results are interpreted. This study focuses on temporary virtual teams in an experimental setting. Generalization to other contexts, such as ongoing or longer-term virtual teams, should be done with caution. Teammates in this study had no expectation of long-term affiliation with the organization and they were likely unconcerned with their long-term reputation with teammates and others involved in the project. Replication of this study in environments where members of

<sup>9</sup>Of the four teams, three experienced no incidents and one experienced only one incident during this time

temporary virtual teams have a permanent affiliation with an organization is needed.

We adopted behavior control mechanisms commonly used in traditional teams. Nonetheless, we only implemented a subset of the possible behavior controls available to management. While any control mechanism that increases salience and vigilance may have a negative effect on trust, our results may not be readily generalized to forms of control we did not explicitly investigate. More importantly, we did not provide explicit training as to how to manage the behavior control mechanisms and enforced strict deadlines. These choices maximized the impact of the control mechanisms, but may not be representative of real work environments where reporting deadlines are generally more fluid. Finally, we inferred individual and private judgments of benevolence and integrity from participants' explicit behavior and statements. We believe that pursuing the chain of causality and investigating the components of trust, despite imperfect measures, provides a significant addition to the current literature. Future research should seek to corroborate our results with different measures (e.g., self-reported perceptual data) in an effort to provide more precision.

## Implications and Conclusions

Our work brings a new theoretical perspective to the study of trust in virtual teams and describes processes by which trust deteriorates in virtual environments. Our results show that incongruence and renegeing play an important role in trust decline. In the virtual environment, the obstacles to effective communication, the failure to recognize the coexistence of different communication habits and constraints, the inability to overcome preconceived frameworks about how teamwork should be accomplished, and the inability to simultaneously attend to both local obligations and requests from distant teammates, all may provide fertile ground for incongruence. Recent research demonstrates that the lack of

face-to-face communication in virtual teams tends to hinder orderly and efficient information exchange (Galegher and Kraut 1994; Hightower et al. 1997). Thus, as virtual team members communicate about mutual responsibilities and obligations, incongruent perceptions of their commitments may develop, creating the potential for trust decline.

Early work on leadership (Kayworth et al. 2001) and individual roles in the virtual environment (Vogel et al. 2001), suggests that virtual teams benefit from the designation of a team member responsible for ensuring regular, detailed, and prompt communication, as well as communicating individual role relationships and responsibilities. Arguably, the designation of a team member who is exclusively focused on minimizing the threat of incongruence by being responsible for creating shared understanding and for circulating accurate information to all team members will contribute to sustaining a high level of trust among teammates. Future research aimed at investigating the determinants of incongruence in the virtual environment is needed.

Early virtual team theorists have suggested that high levels of trust are maintained in virtual teams that engage in continuous and frequent interaction. This research indicates that the members of high performing teams pressured each other to move quickly and "everyone submitted to that pressure," contributing their "most intense efforts several days before each deadline" (Iacono and Weisband 1997, p. 8). Our results confirm these early findings and indicate that teams where all members provide substantial contributions, particularly near deadlines when vigilance and salience are likely heightened, minimize the occurrence of renegeing and incongruence-based incidents and maintain high trust.

We have limited the scope of our work and have hypothesized a direct link between incidents rooted in renegeing and incongruence, and trust decline. Future research should build on our work and further explain the process by which detected incidents lead to individuals' revision of teammates' benevolence and integrity assessments.



Some unanswered questions raised by our research include the following: What is the effect of the timing of incidents on trust decline? It appears that incidents that occur near important deadlines are more likely to be detected and have a disproportionate effect on trust decline. What is the effect of past teammates' behavior on the detection and interpretation of incidents? It appears that team members will more closely monitor teammates that have proven unreliable in the past and, as a consequence, will be more likely to detect their renegeing. Prior witnessed behavior is used to make attributions about the intentions behind current witnessed behavior (Kelley 1973). Thus, if two team members, one that has actively contributed in the past and another that has proven unreliable, fail to answer a call for help, their respective behavior may be interpreted differently by the perceiver. This interpretation process may moderate the relationship between detected incidents and trust decline and may have been at play in our study. For example, when Mia does not receive a response to her two-day old call for volunteers, shortly after the team experienced a renegeing incident, she states [323]: "Are you two out there????????? Did you received my last message I sent several DAYS ago?????" These and other unanswered questions provide fertile ground for future research.

Finally, our results regarding the negative impact of behavior control suggest an important, and distressing, dynamic. Managerial interventions that focus individuals' attention on deadlines and work progress—the very intervention that is designed to mitigate communication and coordination problems—can promote trust decline. These findings indicate that managers charged with the task of ensuring the success of virtual teams sit on the horns of a dilemma. They may allow the team to self-direct, and accept whatever positive or negative outcomes the team will be able to achieve on its own; alternatively, they can intervene and risk creating the premises for trust decline. Note that this dilemma does not only pertain to the control mechanisms we studied; rather, any managerial intervention that increases salience and vigilance may contribute to weaken virtual team trust.

This potential outcome is important because it runs counter to expectations based on an extension of the traditional team literature. Others have warned against "the assumption that previous theory and practice on traditional group processes and outcomes easily generalize to the virtual environment" and call for empirical testing of this assumption (Furst et al. 1999, p. 251). Our research provides evidence that generally adopted managerial practices may not suit the idiosyncrasies of the virtual environment. Virtual teams, composed of dispersed members often in different time zones, experience communication and coordination difficulties with which traditional teams do not have to contend (Powell et al. 2004). For example, virtual team members never meet by chance and generally cannot quickly gather to discuss issues. As a consequence, control mechanisms that require considerable interaction and coordination may constrain the team's ability to fall into the rhythm of communication that best fits the team's structural and process elements (Maznevski and Chudoba 2000). Under these circumstances, control mechanisms may themselves become a source of renegeing and incongruence-based incidents and, because of their effect on salience and vigilance, make these incidents easily detectable. Thus, simply porting management practices and control tools used in traditional teams to the virtual environment may be ineffective, even counterproductive.

Our results provide empirical confirmation for concerns voiced by others (DeSanctis and Poole 1997; Malone and Laubacher 1998; Victor and Stephens 1994). Future research should focus on developing prescriptions for effective virtual team designs. Information systems researchers, with their understanding of new technology, adoption and appropriation processes, organizational structures, and social systems, are well positioned to explore novel approaches to virtual team design. For example, recent work posits that a virtual team will experience superior coordination and performance if members are decoupled—decreasing the need for synchronized efforts and extensive communication—rather than following the meeting patterns of traditional teams (Ramesh and Dennis 2002). Complementing recent contributions, our

research highlights the need for a richer understanding of managerial control in virtual teams and, we believe, provides both theoretical and methodological direction for future work.

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## Appendix A

### Data Reduction

Data reduction, the process of focusing and abstracting the research data (Miles and Huberman 1994), was first performed upon completion of the study in order to reduce the team communication databases of the selected 10 cases (1,148 individual e-mail messages and 2,912 chat room messages) to a manageable format. For each team, a communication transcript was developed. All messages were listed in chronological order, noting the date and time stamp, the sender, the message subject, the body of the message, and the elapsed time since project inception. When a team initiated a chat session, the session log was inserted in the communication database at the appropriate time to preserve the chronological flow of events. A sequential number was also assigned to each message for easy referencing.

E-mail messages were coded individually, while contributions in the chat room were coded only as multiple-message exchanges. This distinction was necessary because of the rapid and interrelated nature of synchronous messages, and for pragmatic reasons, because of the large number of messages exchanged in the chat rooms in a short period of time. For every e-mail message and chat posting, we noted on the side of the transcript the main themes of the communication, what posting, if any, the contribution referred to, whether an expectation, implicit or explicit, had been set, acknowledged, echoed, fulfilled, not fulfilled, and the reaction by the original individual who set it (see Appendix B). Throughout the analysis we focused both on individual communication messages as well as exchanges (i.e., sets of related messages). For example, when a team member asked for contributions, explicitly or implicitly, we coded the content of the message and cross-referenced it with teammates' responses, or noted lack thereof, and any following reaction by the original message sender. We also evaluated the communication process, noting communication breakdowns and coordination problems such as missed meetings because of technical difficulties, time zone mistakes, and scheduling challenges.<sup>10</sup> During this first stage of the analysis, memos, short conceptual write-ups about the codes and their relationships (Miles and Huberman 1994), were recorded in association with individual messages or multiple-message exchanges. The codes and memos were recorded in a spreadsheet. This allowed us to rapidly scan the data while still being able to drill down to the richness of the original transcript.

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<sup>10</sup> The primary researcher coded all transcripts and the second researcher independently coded the transcript of one team. Scott's index of intercoder agreement, 0.6635 (Craig 1981), indicates substantial agreement (Landis and Kock 1977).

Time order matrices, identifying the message number as column heading and the message sender as row heading, were used to reveal the sequence and flow of events in each team. The codes associated with each message were inserted at the intersections. This display allows for visual scanning of each team's overall pattern of codes over time (e.g., teammates' agreement on the need to produce individual contributions by a certain date, the actual contributions provided at the agreed upon date, and the reaction by various team members) and easy identification of potential trust threatening incidents. The first step in this identification process consisted of extracting instances when expected contributions were not delivered, or when individuals reacted to teammates' response (or lack thereof) to an earlier expectation. The identified instances were used to create critical incidents charts (Miles and Huberman 1994) with pointers to the related messages and memos.

Next, each critical incident was analyzed by reviewing all messages and memos related to the incident and evaluating how expectations came to form, how team members' responded to the expectations, and the outcome of the interaction. The analysis was designed to determine whether the interaction was indicative of renegeing (i.e., conscious failure to meet an obligation) or incongruence (i.e., different perceptions about mutual obligations) and to evaluate its impact on trust. Finally, we verified whether these patterns were unique to trust-decline cases and if, and how, they differed from those detected in the high-trust cases. This strategy allowed us to isolate trust-threatening incidents and evaluate the impact of these incidents across the theoretical sample of cases.

## Appendix B

### Transcript Coding Guide

Statement	Code	Description
<b>Expectations</b>		When the message sender is setting an expectation for action
	EXP-I() EXP-E()	The I and E qualifiers indicates whether the expectation is <i>implicitly</i> set or <i>explicitly</i> set (If the expectation is a repetition of an earlier one, the number in parenthesis represents the iteration number)
	m / c / r / a	This qualifier indicates whether the expectation is for new <i>material</i> to be submitted, for <i>comments</i> on previously submitted material, for a <i>response</i> to a question, or for <i>action</i> that is not subsumed under the ones above (e.g., when what is requested is to do something like submit a report or write a report).
<b>Response to expectation</b>		When the message sender is responding to an expectation set earlier.
	EXP-ACK	A response that acknowledges an expectation (the individual who is responsible for fulfilling the expectation acknowledges it).
	EXP-ECH	A response that endorses (echoes) an expectation (individuals not directly responsible for fulfilling the expectation endorse it).
	EXP-FLF()	The person responsible delivers on the expectation. No judgment of quality is made regarding how well the expectation was fulfilled.
	EXP-CHK()	A comment by an individual who is checking on the status of earlier set expectations.
	EXP-RCT()	An overt reaction by the individual who set the expectation to a response or lack thereof.
	EXP-MIS()	A team member fails to deliver on an explicit and clear expectation
<b>Process</b>		When the message pertains to a process such as to set communication policies, set working procedures, organize the activities, draw attention to deadlines.
	PROC-DL	Attention to deadlines. A message that draws attention to internal deadlines set by the team
	PROC-FDL	Attention to <u>formal</u> deadlines. A message that draws attention to a formal project deadline.
	PROC-PR	Work procedures. A message that establishes procedures for the completion of work.
<b>Process response</b>	RPROC-X	When the message contains a response to a process initiation. (X represents the type of process initiation)
Communication	COMM	These messages reveal communication issues and problem.
Coordination	COOR	These messages reveal coordination issues and problems.

# Appendix C

## Correlation Matrix Dependent and Independent Variables XXXXXXXXXX

	Mean	Std. Dev	Treatment	Trust Time 1	Trust Time 2
Treatment			1.000		
Trust Time 1	2.28	1.01	.072	1.000	
Trust Time 2	2.71	1.42	.224*	.422*	1.000

\*denotes significance at 0.01 level.

