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# Is Trust Always Better than Distrust? The Potential Value of Distrust in Newer Virtual Teams Engaged in Short-term Decision-Making

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## Abstract

The debate on the benefits of trust or distrust in groups has generated a substantial amount of research that points to the positive aspects of trust in groups, and generally characterizes distrust as a negative group phenomenon. Therefore, many researchers and practitioners assume that trust is inherently good and distrust is inherently bad. However, recent counterintuitive evidence obtained from face-to-face (FtF) groups indicates that the opposite might be true; trust can prove detrimental, and distrust instrumental, to decision-making in groups. By extending this argument to virtual teams (VTs), we examined the value of distrust for VTs completing routine and non-routine decision tasks, and showed that the benefits of distrust can extend to short-term VTs. Specifically, VTs seeded with distrust significantly outperformed all control groups in a non-routine decision-making task. In addition, we present quantitative evidence to show that the decision task itself can significantly affect the overall levels of trust/distrust within VTs. In addition to its practical and research implications, the theoretical contribution of our study is that it extends to a group level, and then to a VT setting, a theory of distrust previously tested in the psychology literature in the context of completing non-routine and routine decision tasks at an individual level.



*Keywords*: Trust, distrust, groups, virtual teams, tasks, team performance, decision making, decision quality, collaboration

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## Introduction

Virtual teams (VTs) exist in a wide range of settings from hedonic virtual worlds (Davis et al., 2009) to utilitarian tasks focused on products and services (Martins, Gilson, & Maynard, 2004; Zigurs, 2003). In 2002, over half of professional workers worked in VTs (Kanawattanachai & Yoo, 2002), and we can expect that this number has only grown. VTs are "groups of people who are geographically and/or organizationally dispersed and who rely on collaboration technologies to carry out tasks" (Davis et al., 2009, p. 91). Computer-mediated communication (CMC) is the primary method of communication for VTs (Jarvenpaa & Leidner, 1999). Geographical distance and the lack of nonverbal cues are among the reasons why trust/distrust in VTs differs from that in face-to-face (FtF) teams (Jarvenpaa & Leidner, 1999).

Both the group and CMC literature dealing with trust and distrust has tended to focus on the positive aspects of trust, and the negative aspects of distrust (Ashleigh & Nandhakumar, 2007; Hill et al., 2009; Jehn & Mannix, 1999; Klimoski & Karol, 1976; Zand, 1972). As a result, some practitioners and researchers have come to the simplistic conclusion that, in groups, trust is universally good and distrust is universally bad. Although there is increasing evidence to suggest that trust within groups can prove detrimental in certain contexts (Langfred, 2004), no research has examined the benefit of some level of distrust in a team environment. However, a promising study by Schul, Mayo, and Burnstein (2008) examined the relationship between distrust and reasoning at the individual level, and found that distrust helped people arrive at more optimal solutions when the problem was *non-routine* (i.e., an unfamiliar problem, which led to greater

difficulty because the solution set was unknown) versus *routine* (i.e., a familiar problem, which led to less difficulty because similar solutions had been applied previously).

An examination of the effects of trust and distrust on VTs represents an important opportunity. Although the effects of trust on temporary VTs has been studied extensively (e.g., DeRosa et al., 2004; Lowry et al., 2010; Panteli & Duncan, 2004; Robert, Dennis, & Hung, 2009) within the context of technology literature, most such studies have focused on trust as a dependent, rather than independent, variable (Sarker et al., 2011). In addition, the extant literature has not examined the effects of explicit distrust on team performance; yet, as noted, distrust operates differently in VTs than in FtF teams. Further, Schul et al. (2008) suggested that if distrust can be beneficial to individual problem-solving, then these benefits might also extend to VTs. If so, it would change research and practice regarding how to improve decisions in temporary VTs. This possibility lead us to research how increasing distrust in temporary VTs affects decision accuracy and, hence, performance when faced with either routine or non-routine problem-solving tasks.

We challenge the long-held assumption that distrust is entirely negative. Our results largely validate our expanded theory for decision-making in VTs using CMC. Accordingly, we contribute to the improvement of research and practice in VT CMC use by demonstrating two theory-based outcomes: (1) increases in distrust significantly affect the problem-solving performance of VTs using CMC technologies when faced with non-routine tasks, and (2) the context of the problem-solving task itself (routine or non-routine) can significantly affect the overall levels of trust/distrust within VTs using CMC technologies.

## Background on Trust and Distrust

### Defining Trust

Trust has been defined as one's perception that the actions of another person or thing will benefit oneself (Robinson, 1996; Schul et al., 2008). However, in our context, a more refined definition involves expectations and vulnerability. We conceptualize *trust* as the willingness of a truster to depend upon a trustee, and thus be vulnerable to that party, in the expectation that the trustee will do something considered important or valuable to the truster (Mayer, Davis, & Schoorman, 1995; McKnight, Cummings, & Chervany, 1998). According to McKnight et al. (1998), who developed a comprehensive model of trust that built on the seminal work of Mayer et al. (1995), this *willingness to depend* can be separated into two different types: trusting intention and trusting beliefs. *Trusting intention* is the willingness to depend on another person in a given situation (Currall & Judge, 1995; McKnight et al., 1998). A *trusting belief* is "a generalized expectancy… that the word, promise, or statement of another individual can be relied on" (Rotter, 1980, p.1), because that person is competent and benevolent in a given situation (Mayer et al., 1995; McKnight et al., 1998).

One important factor that influences trust is *disposition to trust.* According to Gefen (2000, p. 728), "disposition to trust is a general, … not situation specific, inclination to display faith in humanity and to adopt a trusting stance toward others." Thus, a person with a high disposition to trust is more likely to trust others than a person with a low disposition to trust. Likewise, the initial levels of trust in an interaction do not begin at zero (i.e., no trust), but at a starting point that varies from person to person (Kramer, 1999). Several studies have empirically demonstrated the effects of disposition to trust (Gefen & Straub, 2004; Lowry et al., 2008; Pavlou & Gefen, 2004; Vance, 2009).

As with individual trust, trust in a group setting can involve one or multiple targets for a given truster. Researchers have typically referred to trust in this group setting as *group trust* or *intra-team trust*. According to Cummings and Bromiley (1996), *group trust* in a group environment is a 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" (p. 303). This definition of group trust closely mirrors the definition of individual trust. Therefore, the level of overall trust in a VT closely follows the overall levels of trustworthiness felt among the individual team members (Jarvenpaa, Knoll, & Leidner, 1998; Piccoli & Ives, 2003). In a similar manner to De Jong and Elfring's (2010) concept of intra-team trust, our view of group trust refers to the group members' general feelings of trust toward other members of their group.

**Defining Distrust**

Lewicki et al. (1998, p. 439) defined *distrust* as "confident negative expectations regarding another's conduct, [signaling] a fear of, a propensity to attribute sinister intentions to, and a desire to buffer oneself from the effects of another's conduct". Substantial research has asserted that trust and distrust are characterized by different emotions and thought patterns (Dimoka, 2010; Luhmann, 1979; McKnight & Chervany, 2002). That is, trust is characterized by calm, assurance, and security (Eayrs, 1993; Holmes, 1991; McKnight & Chervany, 2002), whereas distrust is generally characterized by strong emotions, such as fear, anger, paranoia, worry, fear of loss, suspicion, wariness, and doubt, which often invoke a human survival instinct (Deutsch, 1958; Dimoka, 2010; McKnight & Chervany, 2002; McKnight, Kacmar, & Choudhury, 2004).

Both trust and distrust can exist in a given situation (Luhmann, 1979), as further demonstrated in the next section. Like levels of trust, levels of distrust can vary among individuals within a VT, because some people are naturally more distrusting. Accordingly, *disposition to distrust* is the tendency of an individual to distrust others (McKnight et al., 2004).

**Relationship between Trust and Distrust**

An important debate in the trust/distrust literature centers on the treatment of trust and distrust as either single constructs or two distinct phenomena. Early research on trust considered trust and distrust to be opposites on a continuum (e.g., Rotter, 1971; Stack, 1988), a perspective called the *dichotomous view,* and that perspective continues to be adhered to in some research (e.g., Lewicki et al., 1998; Schul et al., 2008). The traditional, dichotomous view assuming that trust and distrust can be accurately measured as opposite ends of the same has led to the widespread interpretation that high levels of trust represent low levels of distrust, and *vice versa* (Tardy, 1988; Torkzadeh & Dhillon, 2002; Walczuch & Lundgren, 2004). This view thus requires that the antecedents of distrust and trust be treated as being the same (e.g., Torkzadeh & Dhillon, 2002; Walczuch & Lundgren, 2004). However, a new view of trust and distrust has emerged that considers them to be separate constructs (Komiak & Benbasat, 2008; Lewicki et al., 1998; McKnight et al., 2004). In particular, a brain imaging study demonstrated that trust and distrust activate different regions of the brain (Dimoka, 2010), giving further credence to the argument that they are distinct constructs..

Many scholars have maintained that distrust is qualitatively different from trust, and should be treated as such (Benamati, Serva, & Fuller, 2006; Komiak & Benbasat, 2008; Lewicki et al., 1998; McKnight et al., 2004). That is, although the constructs of trust and distrust typically correlate negatively, they are also likely affected by other antecedents. For example, one study

identified neural correlates of trust and distrust when participants were given various treatments (Dimoka, 2010), and showed that "trust and distrust activate different brain areas and have different effects, helping explain why trust and distrust are distinct constructs associated with different neurological processes" (p. 373). Such studies affirm that an absence of distrust does not necessarily imply the presence of trust, and that low levels of trust do not necessarily imply high levels of distrust. Instead, distrust and trust are separate constructs with distinct emotional states, and researchers must measure these constructs separately (Dimoka, 2010; Komiak & Benbasat, 2008; Lewicki et al., 1998; McKnight et al., 2004).

**Trust in Temporary VTs**

With the rise of the Internet and its ever-increasing use in business applications has come the spread of VTs. VTs are often geographically dispersed, and are characterized by the use of CMC to collaborate on a common goal or set of goals (Saunders & Ahuja, 2006). These teams can take several different forms, with one of the most commonly studied being the temporary VT (e.g., Lowry et al., 2010; Panteli & Duncan, 2004). These temporary VTs are frequently brought together for a single purpose or goal, such as to brainstorm solutions to departmental or organizational issues, or to complete short-term projects, and thus differ from ongoing VTs in both structure and orientation (Saunders & Ahuja, 2006).

The importance and benefits of trust in temporary VTs have been widely studied. Since temporary teams are limited in time and scope, the development of trust in these teams must necessarily take a different form than in ongoing teams. Meyerson et al. (1995) described the formation of *swift trust*, which is a trust between team members that forms very quickly at the beginning of a relationship. Temporary VTs do not have time to build trust in a traditional manner, so they often move forward with their task with an assumption of trust (Jarvenpaa &

Leidner, 1999; Powell, Piccoli, & Ives, 2004).

**Trust and Conflict**

Previous research has addressed how conflict affects team performance within the context of team and group work. Three key meta-analyses have sought to identify the effect of both task and relationship conflict on performance (i.e., De Dreu, 2003; de Wit, Greer, & Jehn, 2012; DeChurch, Mesmer-Magnus, & Doty, 2013). *Task conflict* is defined as disagreements among team members with regard to the task at hand, while *relationship conflict* refers to personal disagreements unrelated to the team's task. De Dreu and Weingart's (2003) meta-analysis indicated that both task and relationship conflict negatively affect team performance, in conflict with the prevailing wisdom that some task conflict is beneficial to performance. The addition of moderators led to the opposite findings in some cases in de Wit et al.'s (2012) analysis. Specifically, when the relationship between task and relationship conflict is weak, task conflict has a greater likelihood of improving team performance. DeChurch et al. (2013) observed similar results, but found conflict within the teams accounted for only minor variability in performance.

Trust is one moderator of the task-relationship conflict correlation that improves the chance that task conflict can benefit team performance (Simons & Peterson, 2000). The presence of trust in a problem-solving team weakens the relationship between task and relationship conflict, thus allowing the team to benefit from task conflict, without descending into petty infighting. It follows, then, that distrust in a group may have the inverse effect, resulting in poorer outcomes when task conflict is present. This conjecture is consistent with the supposition that trust improves, while distrust degrades, team performance.

## Theoretical Model and Hypotheses

We propose a theoretical model to explain and predict how trust and distrust influence problem-solving outcomes in VTs performing routine and non-routine tasks. We extend Schul et al.'s (2008) theory of distrust to a short-term VT in a problem-solving context, and by integrating this extension with models of trust that are common in organizational research (McKnight & Choudhury, 2006; McKnight, Choudhury, & Kacmar, 2002a; McKnight et al., 2004).

Distrust creates an increased awareness and need to question, which is manifested through a reduced willingness to rely on the responses of others, and an increased need to check their work (Fein, 1996; Geng & Whinston, 2005). Schul et al. (2004, p. 676) stated that "in preparing to cope with a potentially invalid message, receivers increase the complexity of their processing." Compared to those in a state of trust, those in a state of distrust should perform better when solving problems that require a non-routine method and solution. However, in a situation in which the task requires little thought, those who are distrusting will perform worse than their trusting counterparts.

We propose that VTs will react in a similar manner to individuals when completing routine and non-routine problem-solving tasks. In addition, we propose that the nature of the task (routine or non-routine) will also similarly affect the trust/distrust of a VT. These extensions apply naturally to VTs, because the same substantive theories used to explain and show individuals' disposition to trust also "enable explanation of trust dynamics at the dyadic and group levels" (Brown, Poole, & Rodgers, 2004, p. 115). Another study found that a group's mental actions are the culmination of the thinking of that group (Davis, 1973). Thus, we propose that the alignment of VT normality, trust, and distrust with the nature of a VT's task, routine or non-routine, will affect VT decision-making similar to those seen in individual decision-making.

**Theoretical Overview**

Our proposed model extends the Schul et al. (2008) theory of distrust at an individual level, as depicted in Figure 1. Schul et al. (2008) proposed that normality positively affects trusting beliefs and negatively affects distrusting beliefs (see Figure 1). *Normality*, also known as *situational normality* (Li, Hess, & Valacich, 2008), is the perception that an environment is both safe and usual; it denotes familiarity, predictability, and the absence of unusual levels of risk (Schul et al., 2008). Schul et al. posited that in an environment with high levels of normality, an individual naturally accepts perceived messages about, and from, the environment as valid. Consequently, the individual experiences increased trusting beliefs. This means that when there is no perception of unfamiliarity or unusual risk, an individual has little reason to further investigate the environment for what is unfamiliar, unusual, or unknown.

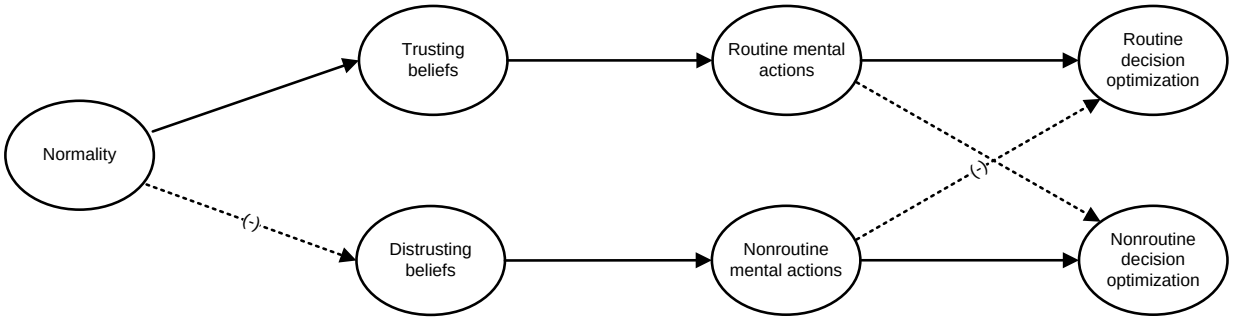


*Figure 1. Summary of the Schul et al. (2008) Distrust Theory*

Conversely, when an environment has low levels of normality, an individual suspiciously searches for falsehoods in the environment, because he or she doubts the validity of the perceived messages. Thus, someone who perceives low levels of normality is aware of the potential for unfamiliar or unknown environmental elements; this awareness increases the individual's distrusting beliefs. These distrusting beliefs compel a person to investigate the environment or situation for what is unsafe, unusual, or unknown (Komiak & Benbasat, 2008).

More important than how normality helps trigger trusting or distrusting beliefs are the effects of these beliefs on mental actions (i.e., conscious thought processes) (Proust, 2001). Schul et al. (2008) proposed that an increase in trusting beliefs increases routine mental actions, and that an increase in distrusting beliefs increases non-routine mental actions. *Routine mental actions* result in responses congruent with a perceived message, whereas *non-routine mental actions* result in responses incongruent with a perceived message (Schul, Mayo, & Burnstein, 2004). Routine mental actions are familiar and predictable, because a person has previous experience of similar messages. A routine mental action, for example, might cause a person to associate a word like *light* with a congruent word, such as *bright*, and a non-routine mental action might lead a person to associate *light* with an incongruent word, such as *dark*.

In the Schul et al. (2008) distrust theory (see Figure 1), trusting beliefs affect routine mental actions because high levels of normality (e.g., familiarity, predictability) evoke natural mental responses. Under trusting circumstances, one does not doubt the intentions or motives of the trustee, and this lack of scrutiny leads one to accept the situation as it appears. In turn, this acceptance encourages behavior and thinking that is congruent with the way the individual perceives the environment.

Conversely, a lack of normality increases distrusting beliefs, thereby increasing non-routine mental actions that in turn (1) work to protect an individual from perceived vulnerability, and (2) trigger a search for the unknown. When an individual is in an unfamiliar context (i.e., one lacking normality), cues that would remain unscrutinized in a trusting environment are examined more closely. For instance, if an individual perceives potential deception (e.g., anticipates a violation of normality that exploits a perceived vulnerability), routine mental actions are often discarded and non-routine mental actions are employed to defend against the

deception (Schul et al., 2008).

Because mental actions precede a person's physical actions, they can influence an individual's decision-making optimization by increasing speed and accuracy. A *routine task* is one in which "the problem is already defined, causal linkages are evident, the nature of the decision needing to be made is known, [and] disagreements over preferences are less prominent (Weick & Meader, 1993)" (Majchrzak, Malhotra, & John, 2005, p. 12). Hence, a routine decision task involves either a task that has been previously encountered, or a task that is highly similar to such a task. Thus, as the Schul et al. (2008) distrust theory suggests, the optimal way to enhance the speed and accuracy of a routine decision task is for the individual to employ routine mental strategies (i.e., familiar methods of accomplishing the task). If non-routine strategies come to mind instead, decision-making can be slowed, and the accuracy of the routine decision task can be impaired.

The inverse is true of non-routine decision tasks. A *non-routine task* is a task that "require[s] a wider spectrum of abilities like analytical skills [and] adaptability to new environments" (Egger & Grossmann, 2005, p. 199). Non-routine decision tasks are unfamiliar and can be difficult, and thus require non-routine thinking. Therefore, the optimal way to succeed at a non-routine decision task is to employ non-routine mental actions (Schul et al., 2008). If routine mental strategies are employed, decision-making can be slowed and the accuracy of the non-routine decision task can be impaired (Schul et al., 2008).

**Theoretical Extension of Distrust Model to Virtual Teams**

No study (empirical or theoretical) has yet examined the value of distrust within VTs in any context. Although several studies have investigated the benefits of dissent in certain contexts within FtF groups (Dooley & Fryxell, 1999; Schulz-Hardt et al., 2006; Schweiger, Sandberg, &

Ragan, 1986), whether or not the value of distrust may be extended from an individual level to VTs remains unexplored.

In addition to addressing this knowledge gap, we propose three major extensions of the Schul et al. (2008) distrust theory. First, we extend the theory from individuals to VTs. Second, we propose that increases in trust/distrust within VTs will significantly affect VT members' levels of non-routine or routine mental actions, which will then affect the accuracy and speed of the VT in completing a decision task. Third, we propose that the nature of the decision task (i.e., routine or non-routine) will significantly affect the perceived normality, and thus influence the trusting or distrusting beliefs of a VT.

**Extension 1: Performance from Individuals to Virtual Teams**

Our first theoretical extension of the Schul et al. (2008) distrust theory is from individuals to online VTs. Although this might appear at first glance to be a natural extension, extensive research on groups versus individuals indicates that it requires a theoretical justification grounded in the chosen context. A key assumption of our model is that the aggregation to the group level is not just for decision performance, but also for trust/distrust.

Groups and individuals can perform many of the same tasks, but with varying degrees of effectiveness (Morgan & Tindale, 2002). In typical conditions, group performance is a function of the ability of individual members. Social-decision scheme theory (Davis, 1973) maintains that group interaction is a combinatorial process that can be represented as aggregate individual performance (e.g., Maciejovsky & Budescu, 2007; Tindale, Kameda, & Hinsz, 2003). Day et al. (2004) demonstrated that the mean of group member cognitive ability was the best predictor of group performance for all types of tasks (Steiner, 1966, 1972). That is, VT performance can be successfully estimated as a function of each team member's cognitive ability. This is a key

assumption of our model for both trust/distrust, and decision speed and accuracy.

**Extension 2: Trust/Distrust from Individuals to VTs**

VT trust is not just the sum of the individuals' personal levels of trust. That is, "the meaning of trust as a team-level construct comes from the shared quality of these individual-level perceptions" (De Jong & Elfring, 2010, p. 536), as well as from each individual's disposition to trust and trusting beliefs. Members of a group depend on each other, and on the team (Ashleigh & Nandhakumar, 2007). This dependence adds factors to group trust, such as cohesiveness, cooperation, coordination, and communication (Ashleigh & Nandhakumar, 2007), which contribute to VT members' sense of normality and aggregate trust.

Normality's effects on group trust and group performance is very similar to its effects at the individual level. Increases in group trust are often connected to improvements in group performance; reasons for performance improvement include higher levels of engagement and motivation by team members, as well as increases in team members' willingness to endure hardships and sacrifice (Gonzalez & Tyler, 2008). Trust has also been shown to increase knowledge coordination, which can in turn improve task performance over time (Kanawattanachal & Yoo, 2007).

Although researchers do not always agree on whether trust has a direct effect on performance, its effects can be strongly correlated, even when indirect. For example, the findings of Jarvenpaa, Shaw, and Staples (2004) supported earlier research that found a strong indirect connection between trust and performance under certain conditions (Dirks, 1999; Dirks, 2001). They argued that trust has a greater effect on less structured tasks. Other studies have shown that trust increases when member behavior is consistent with expected roles (Brown et al., 2004). Therefore, the definition of normality is consistent in a VT setting.

The influence of trust can be modified by group dynamics, such as *task conflicts* (Jehn, 2008). "Task conflicts are disagreements among group members, concerning ideas and opinions about the task being performed" (Jehn, 2008, p. 467). Generally, conflict within a group is shown to weaken performance, but under some circumstances task conflict can benefit non-routine or innovative tasks (De Dreu, 2006; Jehn, 1995, 2008).

Group distrust usually coincides with lower task performance. One reason for this is that distrusted members are monitored more often, which detracts from task performance (Felps, Mitchell, & Byington, 2006), although team monitoring may improve such performance in some contexts (De Jong & Elfring, 2010; Langfred, 2004; Marks & Panzer, 2004). Distrusting group members are also less motivated to cooperate (Bommer, 2003; Felps et al., 2006). These and other factors contribute to group members' sense of normality. Changes in the environment (e.g., new members) can affect the distrust of the individuals in a community (Geng & Whinston, 2005). Introducing new members lessens normality, which increases distrust. In our context, as trust in teams increases, routine mental actions become more frequent than non-routine mental actions; thus, performance suffers in non-routine tasks.

These arguments help to establish the relationship between individual and group behavior (introducing suspicion into a certain tasks can enhance group, as well as individual, performance) and support the application of the Schul et al. (2008) distrust theory to groups. We assert that if distrust can help an individual in non-routine decision-making tasks, then it can also help groups in these same tasks. If individuals experiencing distrust perform better in non-routine decision tasks, then a VT whose members experience distrust is likely to perform similarly.

A previously unexamined implication of the theoretical model is that routine problems, will increase trust and decrease distrust, compared to non-routine problems. This change in trust

and distrust is introduced into the task (decision-making), and not the group itself. The effect is primarily due to the effects of normality on trust and distrust. Normality increases trust and decreases distrust (Komiak & Benbasat, 2008; Schul et al., 2008). When faced with a routine task, the problem-solver will feel comfortable because the problem is clearly defined, and the decision to be made is familiar (Weick & Meader, 1993). This comfort increases the sense of normality, which in turn increases trust and decreases distrust (Schul et al., 2008). Likewise, non-routine problems engender lower trust and higher distrust by negatively affecting normality. When confronted with an unfamiliar question, problem-solvers must seek unfamiliar answers. This search decreases normality and increases distrust.[i]

**Hypotheses**

There are four possible scenarios that are relevant to the theory we have developed up to now. These four scenarios involve trust and distrust, and routine tasks and non-routine tasks. The scenarios can be represented in a 2 x 2 matrix, involving routine or non-routine decision tasks, and the presence or absence, or not, of a distrust scenario (see Table 1). We state our hypotheses by comparing the groups presented in Table 1. In Quadrant 1 (Q1), VTs perform a routine task with no distrust manipulation. In Quadrant 2 (Q2), VTs perform a routine task after a distrust manipulation. In Quadrant 3 (Q3), VTs perform a non-routine task with no distrust manipulation. In Quadrant 4 (Q4), VTs perform a non-routine task after a distrust manipulation.

*Table 1*
*2 x 2 Hypothetical Quadrants*

| Nature of the Task | No Distrust | Distrust |
|---|---|---|
| Routine decision task | Q1 | Q2 |
| Non-routine decision task | Q3 | Q4 |

In a CMC-based VT environment we predict the following, as depicted in Figures 2 and 3:

H1a. **Trust** during **routine** decision tasks should be **higher** than **trust** during **non-routine** decision tasks (Trust Q1 > Trust Q3).

H1b. **Distrust** during **routine** decision tasks should be **lower** than **distrust** during **non-routine** decision tasks (Distrust Q1 < Distrust Q3).

H2a. **Trust** during **routine** decision tasks should be **higher** than **trust** during **routine** decision tasks that follow an additional **distrust** treatment (Trust Q1 > Trust Q2).

H2b. D**istrust** during **routine** decision tasks should be **lower** than **distrust** during **routine** decision tasks that follow an additional **distrust** treatment (Distrust Q1 < Distrust Q2).

H3a. **Trust** during **routine** decision tasks should be **higher** than **trust** during **non-routine** decision tasks that follow an additional **distrust** treatment (Trust Q3 > Trust Q4).

H3b. **Distrust** during **non-routine** decision tasks should be **lower** than distrust during **non-routine** decision tasks that follow an additional **distrust** treatment (Distrust Q3 < Distrust Q4).

H4a. **Trust** during **routine** decision tasks should be **higher** than **trust** during **non-routine** decision tasks that follow an additional **distrust** treatment (Trust Q1 > Trust Q4).

H4b. **Distrust** during **routine** decision tasks should be **lower** than **distrust** during **non-routine** decision tasks that follow an additional **distrust** treatment (Distrust Q1 < Distrust Q4).

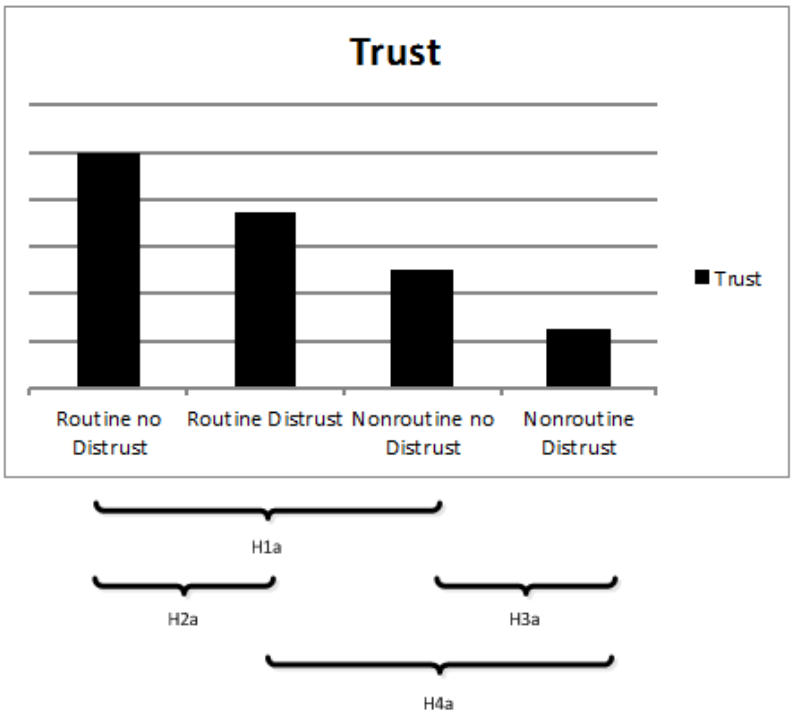


*Figure 2. Trust Hypotheses*

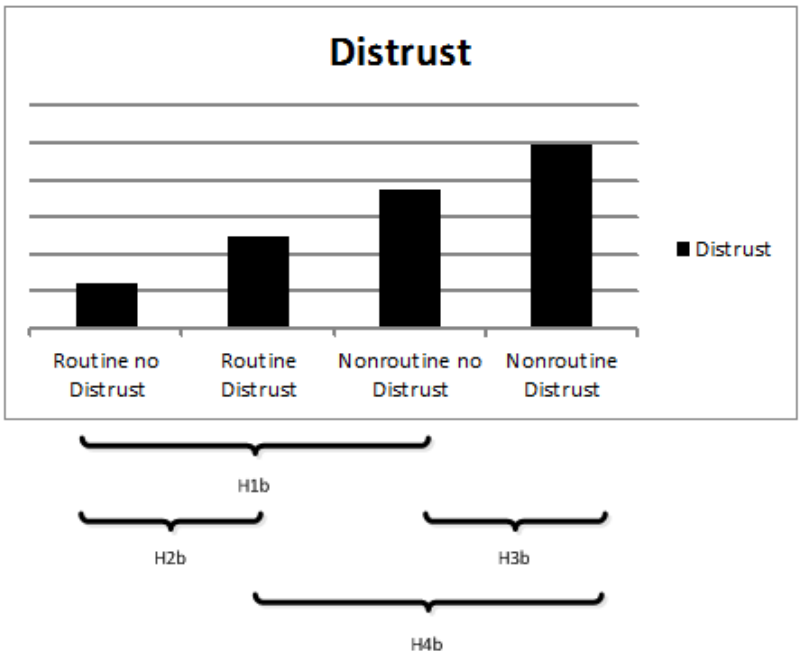


*Figure 3. Distrust Hypotheses*

VTs that are highly trusting and working on routine decision tasks should experience greater decision accuracy than VTs that are distrusting and working on the same tasks. In other words, the VT's routine mental actions will be optimal for routine tasks. Conversely, distrusting VTs should experience more decision accuracy performing non-routine decision tasks than trusting VTs performing the same task, because the former will engage in non-routine mental actions that are more helpful to decision-making in non-routine decision tasks. We assume homogeneity within groups (Klein, Dansereau, & Hall, 1994), and conceptualize distrust as the average of the measures of distrust for individual team members.

We conceptualize decision optimization as the degree of correctness of decisions in a VT. All predictions for decision optimization are on an individual level (recorded) and on a VT level (also recorded) for the final converged team decision. In summary, we predict the following:

> H5a. Individuals in VTs who complete **routine** decision tasks should have higher decision accuracy than individuals in VTs who complete **routine** decision tasks and receive an additional **distrust** treatment (Decision accuracy Q1 > Decision accuracy Q2).
>
> H5b. VTs that complete **routine** decision tasks should have higher converged decision accuracy than VTs that complete **routine** decision tasks and receive an additional **distrust** treatment (Convergence Q1 > Convergence Q2).
>
> H6a. Individuals in VTs who complete **non-routine** decision tasks should have lower decision accuracy than individuals in VTs who complete **non-routine** decision tasks and whose members receive an additional **distrust** treatment (Decision accuracy Q3 < Decision accuracy Q4).
>
> H6b. VTs that complete **non-routine** decision tasks should have lower converged decision accuracy than VTs that complete **non-routine** decision tasks, and whose members receive an additional **distrust** treatment (Convergence Q3 < Convergence Q4).

## Methods

### Participants

Participants volunteered from an information systems course required of business

students and open to all university students at a large private university in the Western US. The institutional review board gave human-subjects approval, and we followed all standard protocols carefully. Of all 212 participants, 75.7% were male and 24.3% were female, and the mean of total years of education was 14.39, with a standard deviation of 1.27. Students were highly appropriate as participants, given the desire for control and the nature of the decision task.[ii]

**Design**

We assigned VTs randomly to one of four conditions: (1) non-routine spreadsheet VT-decision tasks with distrust intervention; (2) routine spreadsheet VT-decision tasks with distrust intervention; (3) non-routine spreadsheet VT-decision tasks without distrust intervention; and (4) routine spreadsheet virtual-decision tasks without distrust intervention. This random assignment mitigates many threats to validity, such as participant history and skill level.

In total, there were 70 groups. Most groups were composed of three participants. In cases where the number of participants in a session was not divisible by three, we created groups of four. We found no statistical differences between three- and four-person groups. As we randomized groups to treatments after they arrived for a laboratory session, we used an unbalanced design: 76 participants received condition 1; 62 received condition 2; 77 received condition 3; and 65 received condition 4.

We created routine tasks by adapting questions participants had previously encountered in both lectures and homework. All participants were members of the same introductory information systems course, and had solved problems that were very similar to the routine tasks, which involved a spreadsheet of 41 shipment records, consisting of a shipment number, weight, price, and destination. We asked participants to determine the total number of shipments, as well the total cost of shipments, to each destination. We then asked participants to calculate the

average cost of a package sent to a particular destination.

The non-routine tasks required adapting the same set of skills to complex problems that had not previously been encountered in participants' coursework. Using the skill set acquired throughout the course, the students could solve the non-routine problem, but the solution would require a new application of their skills. Participants received training to solve the non-routine problem, but had not seen an in-class problem such as this, which involved a spreadsheet of 3,007 records consisting of order volume and customer name. We informed participants that (1) the company was required to contact customers who had placed exactly three orders, and (2) management had requested a list of the customers who had made exactly three orders. We asked them to provide the names of customers appearing exactly three times in the list, list the sum of the order volumes for each person appearing in that list, and provide the total order volume of all customers who made exactly three orders.

**Measures**

We directly measured six constructs: disposition to trust, disposition to distrust, trusting beliefs, distrusting beliefs, routine decision optimization, and non-routine decision optimization. We measured the four trust- and distrust-related constructs using established scales (McKnight & Choudhury, 2006; McKnight et al., 2002a; McKnight et al., 2004), and we operationalized routine and non-routine problem-solving performance, using a measure of accuracy of the multipart spreadsheet problems.

**Procedures**

The volunteer participants provided consent, completed a pre-experiment survey, and signed up for an experimental session via an online form. The pre-experiment survey gathered demographic information and measured participants' disposition to trust and disposition to

distrust. Participants took the survey several days prior to the experiment to minimize potential selection-testing threats to validity. This trust/distrust information served as a baseline to determine the effects of the experiment.

Each participant selected a seat at a computer workstation and then logged in to the experiment session Web site that we custom-designed for this experiment. Each workstation had Microsoft Excel™ and Google Talk: Labs Edition™ preinstalled. To prevent cheating and restrict communication to only the assigned team through the online chat interface, we assigned computers with alternating problem treatments so that, for example, if we assigned a computer the routine task, we assigned the adjacent computers with the non-routine task. After determining the problem assignment associated with the workstations and after all participants logged in, we randomly organized workstations into teams under the condition that no group member sat next to another member of his or her VT. All collaboration between team members took place virtually. After the VT assignment, participants received scripted training on the team chat tool. The experiment website displayed some of this training information, including each participant's unique chat account and password.

We then assigned each participant a role: A, B, C, or D (D was used only if the VT had four members). Member A invited the other participants to join a team chat. The other team members accepted the chat invitation. A powerful point of control was that participants were never able to identify their team members visually, or to communicate with them orally; all VT communication occurred via the chat tool. Team members were required to communicate using Google Talk and to use their assigned chat names (A, B, C, or D) (i.e., they were instructed not to divulge their real identities). The purpose of the anonymization was to simulate, to as great an extent as possible, a temporary VT. As our participants may have had previous associations with

one another either inside or outside of class, the use of assigned names mimicked a temporary team, wherein members have had no prior association. Using the assigned name also had the advantage that anonymity is beneficial to groups, as it allows members to focus on the problem, and not on personalities (Nunamaker et al., 1991). We reviewed all chat logs to verify that participants did not divulge their real names.

For teams receiving the distrust treatment, the experimental instructions for each team member included an additional paragraph stating the following:

"A team member in your group has been assigned to purposely slow you down and lead the group to the wrong answer. This team member has been instructed not to admit this role. You will be asked later to identify who in your group filled this role." We used this statement to seed distrust among team members.

We then gave each team a multipart spreadsheet problem to solve. We encouraged members to agree as a team, before submitting a final answer. However, team members were responsible for individually submitting their own answers through the experiment website and had the opportunity to submit a dissenting answer. After submitting an answer, participants completed their trust and distrust measures in a post survey (see Appendix 1). Although team trust and distrust were not measured until the post survey, we can infer causality by the timing of the distrust manipulation. The only difference between the distrust and control conditions was the presence of the distrust manipulation described above. It can be reasonably inferred that any variations in team trust or distrust were caused by the manipulation.

To minimize the risk of threats to validity, we used multiple control groups and randomized both VT and treatment assignments. Random assignment prevents confounds, including participant skill or disposition through statistical controls. The experiment occurred

after the course had fully covered spreadsheets, to ensure that all participants had the same spreadsheet experience and similar knowledge. As a result, we minimized possible s*election-maturation* validity threats. Random assignment also mitigated this and other selection threats.

## Data Analysis

A key step before assessing factorial validity is to determine which constructs are formative, and which are reflective (Diamantopoulos & Winklhofer, 2001; Petter, Straub, & Rai, 2007). We used the approach advocated by Diamantopoulos and Winklhofer (2001), as a guide to determining that all of our constructs are reflective. We therefore followed the latest procedures for establishing factorial validity for reflective indicators.

Prior to testing our hypotheses we conducted standard tests on factorial validity and common-method bias. We analyzed factorial validity using partial least squares (PLS); specifically PLS-Graph version 3.0 (Ringle, Wende, & Will, 2005). PLS is especially suited to early theory development, as opposed to situations where prior theory is highly developed with strong nomological relationships. In the latter, further testing and extension are the primary objectives, and other methods, such as maximum likelihood or generalized least squares, are often preferred (Chin, Marcolin, & Newsted, 2003; Gefen & Straub, 2005).

We also conducted within-analysis between-analysis (WABA) to ensure that we analyzed our data at the right level of analysis (see Appendix 2 for more details). Running the WABA allowed us to choose the best level of analysis (group, individual, or both). No significant induction occurred, indicating no practical or statistically significant group-level correlations between the trust and distrust variables. These results indicate that the team-level results are due only to individual variation, and thus should be analyzed on the individual level.

We conducted all analyses using MANCOVA with disposition to trust, disposition to

distrust, and education as covariates. We also calculated the effect size of all our results using Cohen's *d.* The relative sizes of Cohen's *d* are as follows: *negligible effect* (> = -0.15 and < 0.15), *small effect* (> = 0.15 and < 0.40), *medium effect* (> = 0.40 and < 0.75), *large effect* (> = 0.75 and < 1.10), *very large effect* (> = 1.10 and < 1.45), and *huge effect* (> 1.45). Table 3 summarizes our measurement model statistics.

*Table 3*
*Measurement Model Statistics (n = 280)*

| Second-Order Construct | X | SD | (1) | (2) | (3) |
|---|---|---|---|---|---|
| Disposition to trust (1) | 5.00 | 0.65 | | | |
| Disposition to distrust (2) | 4.08 | 0.77 | -.446** | | |
| Trust (3) | 5.11 | 1.21 | .161** | -.033 | |
| Distrust (4) | 6.55 | 1.18 | -.089 | .079 | -.804** |

**Correlation is significant at the 0.01 level (two-tailed).

H1a indicates that VTs with the non-routine decision task (without the additional distrust treatment) should have higher trust (μ = 5.98, SD = 0.72) than the trust found in VTs with the non-routine decision task (without the additional distrust treatment) (μ = 4.81, SD = 1.00). H1a was supported at $F_{(1,126)} = 60.94$, $p < 0.000$ with a very large effect ($d = 1.4$). H1b indicates that VTs with the routine decision task (without the additional distrust treatment) should have lower distrust (μ = 2.39, SD = 0.92) than the distrust found in VTs with the non-routine decision task (without the additional distrust treatment) (μ = 3.12, SD = 0.80). H1b was supported at $F_{(1,126)} = 25.62$, $p < 0.000$ with a large effect ($d = 0.91$). The disposition to distrust covariate was partially significant at $F_{(1,126)} = 7.22$, $p = 0.008$, with a medium effect ($d = 0.48$).

H2a indicates that VTs with the routine decision task should have higher trust (μ = 5.99, SD = 1.15) than the trust found in VTs with the routine decision task, with an additional distrust treatment (μ = 5.38, SD = 0.72). H2a was supported at $F_{(1,118)} = 13.95$, $p < 0.000$, with a medium effect ($d = 0.69$). H2b indicates that VTs with the routine decision task should have lower

distrust (μ = 2.39, SD = 0.92) than the distrust found in VTs with the routine decision task, with an additional distrust treatment (μ = 3.03, SD = 1.25). H2b was supported at $F_{(1,118)} = 10.30$, $p = 0.002$ with a medium effect ($d = 0.60$). No covariates were significant, except for disposition to trust, which predicted trust at $F_{(1,118)} = 7.10$, $p = 0.009$ with a medium effect ($d = 0.49$).

H3a indicates that VTs with the non-routine decision task should have higher trust (μ = 4.81, SD = 1.00) than the trust found in VTs with the non-routine decision task with an additional distrust treatment (μ = 4.42, SD = 1.27). H3a was partially supported at $F_{(1,139)} = 3.24$, $p = 0.074$, with a small effect ($d = 0.31$). H3b indicates that VTs with the non-routine decision task should have lower distrust (μ = 3.12, SD = 0.80) than the distrust found in VTs with the non-routine decision task with an additional distrust treatment (μ = 3.68, SD = 1.29). H3b was supported at $F_{(1,139)} = 8.25$, $p = 0.005$, with a medium effect ($d = 0.49$). The disposition to trust covariate was partially significant at $F_{(1,139)} = 3\ .72$, $p = 0.056$, with a small effect ($d = 0.33$). Support for H2 and H3 indicates that our distrust treatment successfully seeded distrust according to our previously validated measures.

H4a indicates that VTs with the routine decision task and without the additional distrust treatment should have higher trust (μ = 5.98, SD = 0.72) than the trust exhibited in VTs with the non-routine decision task with the additional distrust treatment (μ = 4.42, SD = 1.27). H4a was supported at $F_{(1,131)} = 70.92$, $p < 0.000$, with a huge effect ($d = 1.48$). H4b indicates that VTs with the routine decision task without the additional distrust treatment should have lower distrust (μ = 2.39, SD = 0.92) than the distrust found in VTs with the routine decision task with the additional distrust treatment (μ = 3.68, SD = 1.29). H4b was supported at $F_{(1,131)} = 40.60$, $p < 0.000$, with a very large effect ($d = 1.12$). No covariates were significant. This result supports the conclusion that the nature of the task (i.e., routine or non-routine) had a significant and

meaningful effect on group trust and distrust.

H5a indicates that individuals in VTs with the routine decision task should have higher decision accuracy (μ = 98% correct, SD = 18%) than individuals in VTs in the routine decision task with the additional distrust treatment (μ = 97% correct, SD = 12%). H5a was not supported at $F_{(1,125)} = 0.22$, $p = 0.641$. H5b indicates that VTs with the routine decision task should converge to a higher decision accuracy for the final VT answer (μ = 99% correct, SD = 6%) than VTs in the routine decision task with the additional distrust treatment (μ = 97% correct, SD = 9%). H5b was not supported at $F_{(1,39)} = 0.555$, $p = 0.461$.

H6a indicates that individuals in VTs with the non-routine decision task should have lower decision accuracy (μ = 8% correct, SD = 27%) than individuals in VTs with the non-routine decision task and the additional distrust treatment (μ = 32% correct, SD = 47%). H6a was supported at $F_{(1,149)} = 14.75$, $p = 0.000$, with a medium effect ($d = 0.63$). No covariates were significant. H6b indicates that VTs with the non-routine decision task should converge to a lower decision accuracy for the final VT answer (μ = 8% correct, SD = 22%) than VTs in the non-routine decision task with the additional distrust treatment (μ = 32% correct, SD = 39%). H6b was supported at $F_{(1,48)} = 6.73$, $p = 0.013$, with a large effect ($d = 0.76$). Although we predicted that team performance for routine decision tasks would improve with trust, no such effect manifested itself. However, we did observe support for the prediction that performance on non-routine decision tasks would improve in the presence of distrust.

We conducted a final exploratory analysis to see if there were any time completion differences, because additional distrust might have slowed VTs down. Time to completion for the routine decision task (μ = 18.22 minutes, SD = 6.15) versus the routine decision task with the distrust treatment (μ = 19.68 minutes, SD = 6.33) was insignificant at $F_{(1,127)} = 1.76$, $p = 0.187$.

Time to completion for the non-routine decision task (μ = 43.35 minutes, SD = 10.51) versus the non-routine decision task with the distrust treatment (μ = 40.74 minutes, SD = 9.77) was insignificant at $F_{(1,153)} = 2.54$, $p = 0.113$.

## Discussion

Table 4 summarizes the results, most of which exhibited medium-to-huge effect sizes. Here, we present these results in terms of the research questions proposed in the introduction.

Table 4
*Summary of Hypothesis Testing*

| Hyp. | Supported? | Effect Size | Finding |
|---|---|---|---|
| H1a | Yes*** | Very large | Routine decision tasks invoke *more trust* than non-routine tasks. |
| H1b | Yes*** | Large | Routine decision tasks invoke *less distrust* than non-routine tasks. |
| H2a | Yes*** | Medium | Routine decision tasks invoke *more trust* than routine tasks with the added distrust treatment. |
| H2b | Yes*** | Medium | Routine decision tasks invoke *less distrust* than routine tasks with the added distrust treatment. |
| H3a | Partially$^{+}$ | Small | Non-routine decision tasks invoke *more trust* than non-routine tasks with the added distrust treatment. |
| H3b | Yes** | Medium | Non-routine decision tasks invoke *less distrust* than non-routine tasks with the added distrust treatment. |
| H4a | Yes*** | Huge | Routine decision tasks invoke *more trust* than non-routine tasks with the added distrust treatment. |
| H4b | Yes*** | Very large | Routine decision tasks invoke *less distrust* than non-routine tasks with the added distrust treatment. |
| H5a | No | n/a | There was no difference in individual decision accuracy between routine decision tasks and routine tasks with the added distrust treatment. |
| H5b | No | n/a | There was no difference in VT-decision accuracy between routine decision tasks and routine tasks with the added distrust treatment. |
| H6a | Yes*** | Medium | Individual decision accuracy was *higher* in non-routine decision tasks that had an added distrust treatment than in non-routine tasks. |
| H6b | Yes* | Large | VT-decision accuracy was *higher* in non-routine decision tasks that had an added distrust treatment than in decision tasks. |

+ p < .1 * p < .05; ** p < .01; ** p < .001

Our underlying theoretical model predicts that the benefits of distrust apply only to non-routine decision tasks in which non-routine approaches to problem-solving are advantageous. We tested this proposition and found no individual-level (H5a) or group-level (H5b) decision accuracy differences in comparing routine decision tasks to routine decision tasks that had the additional distrust treatment (and thus had higher distrust and lower trust). Thus, true to the theory, additional distrust in this situation neither helped nor hindered. However, also consistent with the theory, we found that individual-level (H6a) and group-level (H6b) decision accuracy was higher in non-routine decision tasks that had an additional distrust treatment than in non-routine decision tasks without the treatment. We thus supported the underlying theory that greater distrust heightens the use of non-routine mental actions that are valuable in solving non-routine problems.

We found that short-term VTs working on routine decision tasks had greater trust (H1a) and less distrust (H1b) than similar VTs working on non-routine decision tasks. These results support the underlying theory that non-routine decision tasks invoke non-routine mental actions that increase distrust and decrease trust; moreover, routine decision tasks invoke routine mental actions that increase trust and decrease distrust. Thus, VTs seeking to increase group trust would likely benefit from starting with routine decision tasks before turning to non-routine tasks.

We introduced an environmental abnormality by telling some teams that a person in their group might be trying to undermine the decision results. We found that a routine decision task in a VT setting produced more trust (H2a) and less distrust (H2b) than it did for VTs in the same setting with the additional distrust treatment. Likewise, we found that VTs with non-routine decision tasks had greater trust (H3a) and less distrust (H3b) than the same VTs with the additional distrust treatment. Moreover, VTs with routine decision tasks had more trust (H4a)

and less distrust (H4b) than VTs with non-routine decision tasks and the additional distrust treatment.

These results provide strong evidence that environmental abnormalities can invoke higher levels of distrust (and lowered trust) than would normally be obtained by differences in only the routineness of a decision task. Thus, distrust can be increased and trust can be decreased through two methods: (1) using a less routine decision task and (2) introducing an environmental abnormality. Combining these approaches is the most effective strategy for inducing distrust.

Although trust and distrust showed a negative correlation in this context, supporting the notion that they lie at opposite ends of the same continuum, it does not necessarily follow that this is true in all contexts. Thus, we recommend continuing to treat trust and distrust as separate constructs, as is supported by current research (Komiak & Benbasat, 2008; Lewicki et al., 1998; McKnight et al., 2004).

**Contributions**

Building on the answers to the research questions, our study makes several important contributions. First, we introduced technology and VTs to the research on distrust occurring in social psychology, and extended Schul et al.'s (2008) distrust theory from individual-level to group-level analysis. Our findings show that the effects of distrust on decision-making extend effectively to groups.

Second, we modeled, tested, and measured distrust and trust. In the original Schul et al. (2008) paper, the states of distrust or trust were assumed to be present on the basis of an introduced stimulus, but because trust and distrust were never measured, it was not determined whether, and to what extent, distrust was actually induced, or, if it was induced, to what extent. Our measures provide important validation of the underlying mechanisms.

Third, our study tested and validated the trust and distrust measures in their nomological network. McKnight et al.'s (2004) new distrust measures effectively measured participants' post-test distrust state. We revalidated McKnight et al.'s (2002b) trust measures and disposition to trust measures and McKnight et al.'s (2006) new disposition to distrust measures. Together, these tests help validate the nomological network of distrust and trust measures.

Fourth, we demonstrated how simple contextual normality, such as decision-task routineness, can easily increase trust in decision-making VTs. Such manipulation can be useful for VTs wishing to increase their level of trust. In a similar manner, contextual abnormalities can easily increase distrust in decision-making VTs. We tested and validated these effects using the aforementioned measures.

Fifth, we contribute evidence that an increase in distrust can improve VT-decision accuracy for certain types of problems. Simple contextual abnormalities, such as seeding distrust about another team member, can have a significant effect on VT-decision accuracy. Although there was a positive relationship between distrust and VT-decision accuracy in non-routine problems, the results of our study do not show any significant influence of distrust on VT-decision accuracy in routine problems. This effect could also apply to practice if distrust is seeded by changes in the environment using ideas suggested by Geng et al. (2005).

**Limitations and Future Research**

One limitation of this study is that it may have shifted the baseline of distrust higher by using CMC. We used a chat interface that was unfamiliar to many participants, although the interface was not dramatically different from other popular chat or instant messaging tools. The use of unfamiliar technology might have inflated the level of distrust and/or negatively affected the level of trust. This baseline would be especially confounding if it interfered with the level of

trust for VTs that worked on completing a routine task. As participants were unfamiliar with the technology used, they might have been more likely to distrust team members, lowering the average level of trust for all participants. The between-groups differences found in our results maintain validity because of the random assignment, but without this potential baseline shift, our results might have been stronger. It is important to resolve this issue in future research because CMC with unfamiliar technologies is prevalent in industry.

Whereas Schul et al.'s (2008) theory distinguishes two types of distrust, focused and unfocused, we manipulated only focused distrust; the distrust manipulation was "focused" on a single team member (although the member was anonymous). It would be valuable to measure the effect of unfocused distrust, rather than distrust focused on specific team members. While unfocused distrust might prove more difficult to induce in participants during an experiment, this type of distrust is likely more common in real-world settings. Similarly, Dimoka (2010) conceptualized distrust as having two subconstructs: discredibility and malevolence. Isolating the consequences of these components as potential antecedents of performance is a task for future research.

Another limitation was the time frame of the study. We studied the effects of our experiment on a short-term decision-making VT; a VT designed to solve only a brief problem set. Our study left unexamined the long-term effects of trust and distrust in VTs. We seeded distrust by suggesting to members of selected VTs that one of their team members was instructed to mislead the rest of the team. Testing other methods of inducing distrust would be valuable, because our introduction of focused distrust might have a negative effect on the long-term effectiveness and cohesiveness of the VT. The time frame also limited our generalizability to these types of temporary teams. Further research could study the effects of distrust in ongoing

VTs, or in temporary teams convened for a longer-term project.

When juxtaposed against a long-term study performed by De Jong and Elfring (2010), our study suggests some interesting directions for future research. De Jong and Elfring proposed and validated a model whereby three team processes, including *team monitoring,* fully mediate the effects of trust on team performance. Interestingly, the theoretical basis of our model, and the underlying definition of distrust, suggests that distrust might also be an antecedent of team monitoring, which might further explain our findings that show the positive effects of distrust on performance in the presence of a non-routine decision problem.

Our study examined decision accuracy only in the context of small VTs (three or four participants). It would be inappropriate to extrapolate our results to larger VTs, where the quality of communication can change dramatically (Roberts, Lowry, & Sweeney, 2006). These limitations present an opportunity to determine whether CMC makes a significant difference regarding non-routine and routine tasks in VTs, and whether the size or complexity of the task affects outcomes involving VT-decision optimization.

Our model of distrust might also provide more accurate explanations of findings of other research on group distrust. For example, Phillips, Liljenquist, and Neale (2009) analyzed the impact of introducing a new out-group member to an existing team to increase diversity, versus introducing a new in-group member to an existing team. Homogenous teams (all in-group members) perceived their interactions to be more effective, and had more confidence in their performance than heterogeneous teams, yet they performed worse. They showed that these results were not due to newcomers' fresh ideas. However, the authors speculated that the results occurred because the existing group members had increased social concerns, which converted affective pain into cognitive gain. We believe we can enhance their explanation theoretically as

follows: out-group members disrupt the status of an existing group of in-group members, shifting both their decision-task context and their cognitive processes from routine to non-routine. This disruption further manifests itself in increased distrust. By focusing on non-routine cognitive processes, and thus aligning themselves with a non-routine task context, they are capable of achieving better results. Establishing this claim will require further research. Such research could be particularly promising to extend to cross-cultural group trust studies (e.g., Lowry et al., 2010).

In a similar manner to that of Phillips et al. (2009), our study was limited to groups without previous experience together. Thus, a gap remains in the literature with regard to the effect of a distrust stimulus on an experienced, existing group. It would be useful to examine whether the results of our experiment would be the same for groups in which members know each other and have worked together for some time. This scenario could introduce a baseline of trust that might affect the results in a different way from our study.

## Conclusion

This paper is the first major study to examine the value of distrust in a VT setting. We investigated the value of distrust in the context of VTs completing routine and non-routine decision tasks. We demonstrated that the benefits of distrust extend to short-term VTs in this context, because VTs seeded with distrust significantly outperformed all control groups on non-routine tasks. In addition, we showed quantitative evidence to suggest that the context of performing decision tasks can significantly affect the overall levels of trust/distrust within VTs. Previous distrust studies in non-virtual settings (i.e., FtF) have only inferred similar findings. We contributed to the theory by extending to a group level, and then to a VT setting, a model of distrust previously tested in the psychology literature in the context of completing non-routine and routine decision tasks at an individual level.

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## Endnotes to Support Article

[i] It is important to recognize that relative levels of trust and distrust might vary among individuals within a VT, as some people are naturally more trusting and some are naturally more distrusting, although this is mitigated by random assignment. To account for this variance, McKnight et al. (2002b) measured the difference between an individual's disposition to trust and his or her current level of trust. As a result, the difference between these two constructs more fully represents change in trust, due to an outside stimulus (in this study, from a routine or non-routine problem). McKnight et al. (2004) applied this same principle to disposition to distrust and current level of distrust. *Disposition to trust* is defined as the tendency of an individual to trust others; *disposition to distrust* is the tendency of an individual to distrust others (McKnight et al., 2004).

[ii] Previous research has demonstrated that students can be adequate subjects from which to generalize, as long as they are adequate for the research task used in a given study (Gordon, Slade, & Schmitt, 1986; Greenberg, 1987). As McKnight, et al. (2002b) argued, students are appropriate for these types of trust studies, because such studies do not require an organizational context. Our pilot studies indicated wide variance in the operationalized problem domain with a broader range of participants. We discovered that the baseline knowledge of students was easily controlled because we could use technology and topics they worked on directly in a course in which they were all enrolled. This allowed for much more control and reliability in constructing routine and non-routine decision problems. To do so for a broader audience, in which Excel skills would be far more varied, would have been unwieldy from an experimental viewpoint.

Although generalizability is always a concern for experiments, Lynch (1999) has observed: "Findings from single real-world settings and specific sets of 'real' people are no more likely to generalize than are findings from single laboratory settings with student subjects. Just as in the laboratory, the real world varies in background facets of subject characteristics, setting, context, relevant history, and time." That is, any sample would have its peculiarities, and complete generalizability is only possible following replication of multiple samples in multiple settings for similar reasons, students have been used effectively in trust-related team/group research in many studies appearing in top technology and behavioral science journals. A non-exhaustive list includes (Alnuaimi, Robert, & Maruping, 2010; Chidambaram & Jones, 1993; Hill et al., 2009; Jarvenpaa et al., 1998; Jarvenpaa et al., 2004; Kanawattanachal & Yoo, 2007; Lowry et al., 2010; Warkentin, Sayeed, & Hightower, 1997; Zhang et al., 2007).