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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

**Responding to Counterterrorism Threats: Effects of Coalition
Trust and Mistrust on Organizational Design**

by

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1 February 2009

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ABSTRACT

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I. INTRODUCTION

Trust is important in organizations. Interpersonal trust among coworkers and between workers and managers can enhance efficiency by reducing the need for governance (Van de Ven, 2004), improve organizational performance (Zand, 1972), affect psychological contracts (Robinson, 1996), and may be important for organizations facing threats or crisis situations (Powley & Piderit, 2008; Powley, in press). Also, interpersonal trust is viewed widely as essential for knowledge sharing within organizations (Bazerman & Neale, 1992), and the concept *organizational trust* is viewed likewise as important for knowledge sharing between organizations (Zand, 1972; Mayer, Davis, & Schoorman, 1995; Nootboom, 1996). Due to its importance in the organization, substantial research on trust has been conducted and published (e.g., see Mayer, Davis, & Schoorman, 1995; Kramer & Tyler, 1996; Kramer & Cook, 2004; Kramer, 2006; Bachmann & Zaheer, 2006). The majority of such research either assumes or argues that organizational managers should always seek to establish and foster trust in their organizations.

However, research also indicates that trust levels have been declining over the past half-century (Bruhn, 2001) and that breaches in the psychological contract lead to loss of trust (Robinson, 1996). This raises an important issue for managers of organizations that do not enjoy high levels of trust and calls into some question whether management should strive universally to increase trust levels within organizations. Far less research has been conducted and published on how mistrust can be managed with equal organizational effectiveness; notable exceptions include work highlighting factors

of suspicion, cynicism and distrust (Fein & Hilton, 1994; Kramer, 1998; Omodei & McLennan, 2000). If high levels of trust in the organization cannot be guaranteed, then trust level becomes an organizational contingency factor, and a half-century of research on Contingency Theory (see Donaldson, 2001) suggests that different organizational designs may be comparatively more or less appropriate for different trust levels. Unfortunately, only a few examples of research are available to guide organizational design on the basis of trust-mistrust (see Creed & Miles, 1996).

In this article, we address the level of trust as a contingency factor in organizational design and examine comparative performance in conditions exhibiting mistrust as well as trust. Using the ELICIT multiplayer intelligence game in a laboratory setting (see Leweling and Nissen, 2007), we conduct a series of experiments to examine how trust level and organizational design affect—directly and via interactions—performance in the context of a counterterrorism problem solving task environment. Results suggest that trust and organizational design have strong interactions and reveal a complex design space in which high levels of trust are not always necessary for good performance. Results reveal also a substantial penalty for organizations with rigid, hierarchical designs that impede the benefits of high trust levels. We close with key conclusions and an agenda for future research along the lines of this investigation.

II. LITERATURE REVIEW

In this section we summarize a core set of literature on trust and organizational design to build upon through the experimentation discussed below.

A. TRUST IN ORGANIZATIONS

Trust in organizational decision-making is critical for successful outcomes. It has been widely viewed as the primary lubricant of interpersonal relations in organizations (Gambetta, 1988). Higher levels of trust are associated with cooperation and higher effectiveness (Butler, 1995). Zand (1972) showed that a high level of trust is related to positive performance, satisfaction, timely and accurate information, and overall confidence in others. In particular Zand (1972) and others (Driscoll, 1978) demonstrated that organizational trust is positively associated with greater satisfaction of decision-making quality. Like successful negotiations, effective decision-making requires parties to establish relationships of trust and share information (Bazerman & Neale, 1992). Trust is critical for leaders (Mishra & Mishra, 2008), particularly in crisis or other extreme events (Powley & Taylor, 2006). Corporate governance boards and senior management of any corporation is beholden to the trust afforded them by outside stakeholders and shareholders. Such public trust is granted as organizations respond to environmental, social, or economic problems proactively and responsibly with the good of the stakeholder ahead of its own motives. Agency theory is instructive for such situations (Eisenhardt, 1989). In particular, trust is garnered when cooperative agents and

principals act in accordance with approved, transparent practices, and share risks associated with the decisions being made.

Trust has been conceptualized primarily in terms of social exchange theory (Blau, 1964) with the net result of interpersonal relationships as either positive or negative (Pratt & Dirks, 2007). Pratt and Dirks argue that social exchange is implied in definitions of trust as “a psychological state comprising the intention to accept vulnerability based on positive expectations of the intentions or behavior of another” (Rousseau, Sitkin, Burt, & Camerer, 1998). Trust therefore requires risk and vulnerability in an exchange relationship. The widely accepted view of trust follows Mayer, Davis and Schoorman’s (1995) review of the trust literature: “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party.”

Established through various relational mechanisms trust involves concern for others and benevolence (Zand, 1972; Fisher & Brown, 1988). The trust literature identifies three basic components of trust in organizations: ability, benevolence and integrity (Mayer, et al., 1995). We use these three components of trust to induce an attitude and climate of trust and mistrust in our experiment, and summarize their effects in the research design below.

In terms of trust, the literature is overwhelming in support for high trust levels enhancing performance, albeit with comparatively little attention to conditions of mistrust. The first hypothesis addresses this.

Hypothesis 1. Organizational performance under conditions of high trust will be greater than under conditions of low trust, regardless of organizational design.

B. ORGANIZATIONAL DESIGN

In this section we summarize a core set of literature on organizational design as it pertains to trust. Through our review of the organizational design literature, linkages between organizational contingencies and designs are central. Beginning with seminal works by Burns and Stalker (1961), Woodward (1965), and Lawrence and Lorsch (1967), organization and management theory has been guided by the understanding that no single approach to organizing is best in all circumstances. Moreover, myriad empirical studies (e.g., Argote, 1982; Donaldson, 1987; Hamilton & Shergill, 1992; Keller, 1994; cf. Mohr, 1971; Pennings, 1975) have confirmed and reconfirmed that poor organizational fit degrades performance. Indeed, organization and management scholars have come to understand well how various organizational forms are and should be designed and changed to fit specific contingency contexts (Creed & Miles, 1996).

For instance, scholars have identified an array of multiple contingency factors (e.g., age, environment, size, strategy, technology) that organizations must address and articulated how they must be addressed as a multicontingency set (e.g., see Gresov & Drazin, 1997) along with other dimensions of organizational life. Indeed, building recently upon such research, Burton et al. (2006) identify 14 contingency factors (e.g., goal, strategy, environment) that an organization must address simultaneously, and they explain how the set of factors can change through time, circumstance and management action. Trust is not included in this set, however, even though the literature above

suggests that it may represent an important contingency factor in terms of organizational design.

Moreover, since most organizations require considerable time to change structure (Pant, 1998)—or to raise low levels of trust within an existing structure—managers need to anticipate future changes across the whole set of contingency factors, including events that may impact trust levels negatively. In response, numerous researchers have been examining less rigid and bureaucratic, flexible and adaptable organizational structures that are designed more for frequent and/or abrupt change than for control and stable performance. For several instances: Tushman and O'Reilly (1999) discuss ambidextrous organizations, which are able to operate simultaneously in multiple modes; Lengnick-Hall and Beck (2005) discuss robust transformation, through which an organization seeks to develop responsiveness, flexibility and an expanded action repertoire as opposed to seeking high levels of fit; Alberts & Hayes, 2003 discuss Edge organizations, which emphasize agility across multiple, unpredictable environments, as opposed to current or adaptive performance in any specific contingency context; and Brown and Eisenhardt (1997) suggest that organizational semistuctures, capable of balancing order and flexibility, provide a superior approach to highly dynamic environments. As above, however, such research directs little attention to trust as a contingency factor, even though one might expect for trust to be important in flexible organizations.

In terms of organizational design, substantial current research exhorts managers to emphasize agile, adaptable, flexible organizational structures, albeit with comparatively little attention to organizational trust. The second hypothesis addresses this:

Hypothesis 2. Organizational performance under conditions of Edge organizational designs will be greater than under conditions of Hierarchical designs, regardless of trust levels.

Trust has received some attention as a contingency of organizational design (Miles & Creed, 1995; Miles & Snow, 1992; Powell, 1990; Bromiley & Cumminings, 1992), and it has been viewed as an important aspect of organizational design and as a general control mechanism (Bradach & Eccles, 1989) primarily because the emergence of less bureaucratic organizational forms has made trust a more central issue in organizational theory (Grey & Garsten, 2000). Moreover, a shift in organizational design, toward a more networked, team-based environment and away from a traditional top-down Hierarchical form results in higher quality and productivity (Banker et al., 1996). Indeed networked, Edge-like arrangements are dependent on high levels of trust (Creed & Miles, 1996), and Bromiley and Cummings (1992) suggest that trustworthiness affects structures and processes such that high trust environments have lower transaction costs.

Nonetheless, as noted above, we are left without specific guidance regarding how to design organizations—even flexible ones—that do not enjoy high levels of trust or the extent to which rigid (e.g., bureaucratic) organizations benefit and suffer from high and low trust levels, respectively. Moreover, the potentially most interesting hypotheses relate to interactions between trust and organizational design. The following four hypotheses address this.

Hypothesis 3. Organizational performance under conditions of high trust and Edge organizational designs will be greater than with low trust and Edge designs.

Hypothesis 4. *Organizational performance under conditions of high trust and Hierarchical organizational designs will be greater than with low trust and Hierarchical designs.*

Hypothesis 5. *Organizational performance under conditions of high trust and Edge organizational designs will be greater than with high trust and Hierarchical designs.*

Hypothesis 6. *Organizational performance under conditions of low trust and Edge organizational designs will be greater than with low trust and Hierarchical designs.*

III. RESEARCH DESIGN

In this section, we draw heavily from Leweling and Nissen (2007) and Moonier, Baker and Greene (2008) to summarize the research design. Building upon prior experimentation, we employ the ELICIT multiplayer intelligence game in a laboratory setting to conduct a series of experiments and examine how trust level and organizational design affect—directly and via interactions—performance in the context of a counterterrorism problem solving task environment, in which both trust and organizational design are expected to play a role. We begin by describing this ELICIT environment and then outline the subjects, groups, protocols, controls, manipulations and measurements used for experimentation.

A. ELICIT ENVIRONMENT

ELICIT requires a team of subjects performing the roles of intelligence analysts to collaborate—in a networked, information-processing environment—and identify a fictitious and stylized terrorist plot. One would expect trust to play a role in terms of organizational performance in this domain (e.g., lower trust levels would likely impede subjects’ willingness to collaborate through information sharing and processing). One would also expect organizational design to play a role (e.g., for more rigid organizational structures would likely stifle subjects’ opportunities to collaborate through information sharing and processing).

The fictitious terrorist plot is described through a set of informational clues called “factoids” that have been developed systematically. ELICIT’s design is similar to the

Parker Brothers' board game "Clue" in that it requires each player to analyze clues and combine assessments with other players to identify key aspects of the fictitious plot. Each factoid describes some aspect of the plot, but none is sufficient to answer all of the pertinent questions (i.e., Who will execute the attack? What is the target to be attacked? Where will the attack take place? When will the attack take place?).

The factoids are distributed among the players in a series of steps: each player receives two clues initially, followed by one after five minutes of play and another after ten minutes have elapsed. The factoid distribution is designed so that no single player can solve the problem individually and that the team of players cannot solve the problem until after the final distribution. In other words, the players must collaborate to solve the problem, and they are required to do so for a minimum of ten minutes. Evidence from previous experiments (e.g., Parity, 2006) suggests that play requires substantially more time (e.g., an hour or more).

Subjects play the game via client applications on separate, networked computer workstations. Each subject has access to a set of five functions supported by the client application: 1) List, 2) Post, 3) Pull, 4) Share, and 5) Identify. After the game has completed, the administrator ends the simulation from the server application. The ELICIT application captures time-stamped interactions (e.g., Post, Pull, Identify, List functions) including, for instance, when and which factoids are distributed to each player, when and which factoids are posted to which common screens, when and which common screens are viewed by each player, when and which factoids are shared between each player, and the time stamped results of each player's Identify attempt (i.e., to identify the

who, what, where and when). The game requires considerable cognitive and collaborative effort to play well (i.e., identify the pertinent details of a terrorist plot), but experience indicates that such effort is within the capabilities of many people and groups.

B. SUBJECTS

Subjects for this study comprise 136 graduate students enrolled in a core organizational behavior course at a major university. Such students consist of military officers and government employees in the United States and other allied countries. All subjects have undergraduate college degrees as well as direct military service, and some of the subjects have worked professionally in military or government intelligence organizations. Hence the subjects are representative in part of the kinds of relatively well-educated and experienced people who serve as professional intelligence analysts, particularly in national intelligence agencies.

C. TREATMENT GROUPS

Subjects are assigned to one of four groups of 17 members each (see Table 1). To ensure that groups were comparable, we equally distributed subjects based on age and experience among the eight groups. Each group also contains an equally distributed representation of military service branch, organizations, officer subspecialties, genders, and country of service to mimic conditions associated with the kinds of international, coalition organizations working counterterrorism problems today. The most senior officers in each experimental group hold a simulation-defined leadership/managerial role.

Organizational Design		
Trust Level	Hierarchical	Edge
High	Hi-Hierarchical	Hi-Edge
Low	Low-Hierarchical	Low-Edge

Table 1. Treatment Groups.

Subjects report to a networked classroom on their assigned day for the experiment. Once seated, subjects are allotted ten minutes to read a set of instructions pertaining to both the experiment and the ELICIT environment; they are encouraged to ask questions about the experimental settings and ELICIT environment. Once subjects read the instructions they have ten minutes to discuss their approach to the problem-solving scenario with others in their group and take a short break before beginning. Subjects communicate with one another during game play using only the computer-network capabilities supported by ELICIT (esp. Post, Pull and Share), and they do not reveal their simulation-defined pseudonyms. The simulation ends after approximately 45 minutes and all players are given the option to identify the plot details.

D. MANIPULATIONS

The four unique treatment conditions (i.e., edge-trust, edge mis-trust, hierarchical-trust, or hierarchical-mistrust) are embedded in the instructions subjects read before beginning the simulation. We summarize the trust and mistrust treatments first and then follow with those pertaining to the Hierarchical and Edge organizations.

Trust. As noted above, the trust manipulation is based on the three trust components (i.e., ability, benevolence, integrity; see Mayer et al., 1995). Trust as a treatment is accomplished through verbal and written communications with the subjects. For instance, ability as a trust component is enhanced with the verbal suggestion that, “your intellect, varying skills, and past experience lead us to believe that you are well qualified to solve the terrorist threat problem.” As another instance, benevolence as a trust component is increased with the statement, “members of your community share information freely with a general orientation toward doing good to others. We are impressed with this orientation and are encouraged by the positive interactions among your fellow cohort members.” As a third instance, integrity as a trust component is bolstered by confirming that, “your actions will be consistent, congruent, and credible with established protocols and guidelines.”

Mistrust. The mistrust manipulation is based on undermining the three trust components from above. As with trust, mistrust as a treatment is accomplished through verbal and written communications with the subjects. For instance, ability as a trust component is undermined with the verbal suggestion that, “we have yet to assess your intellect and skills, and wonder whether past experience qualifies you to solve the terrorist threat problem as a group.” As another instance, benevolence as a trust component is undermined with the statements: “members of your community normally work well together but frequently withhold information from each other. We are unsure about how you interact among your fellow cohort members and question whether negative interactions have affected your relationships” and “previous sessions reveal that

some individuals take pride in undermining team cohesion and effectiveness by generating and releasing false information or by non-participation in the exercise.” As a third instance, integrity as a trust component is undermined by confirming that, “we are discouraged that when it comes to solving critical problems in group settings such as this that your actions may not be consistent, congruent, and credible with established protocols and guidelines. Simply put, be wary of moles and free-riders.”

Hierarchy. To operationalize the Hierarchical organization we draw from Mintzberg (1979) and look to the Machine Bureaucracy archetype. For ease of presentation we refer to such archetype simply as “Hierarchy” here.

As depicted in Figure 1 the Hierarchy group is stratified into three functional levels. The Senior Leader is responsible for the intelligence organization as a whole and has four Team Leaders (middle managers) reporting directly (the most senior subject is assigned to play this role). The most senior subject is assigned to play the role of the Senior Leader in the Hierarchy. Each team leader in turn has three Team Members (Operators) reporting directly and is responsible for one set of details associated with the terrorist plot. For instance, Team Leader (Who) and his or her team are responsible for the “who” details (e.g., which terrorist organization is involved) of the plot, Team Leader (What) and his or her team are responsible for the “what” details (e.g., what the likely target is), and so forth for “where” and “when.”

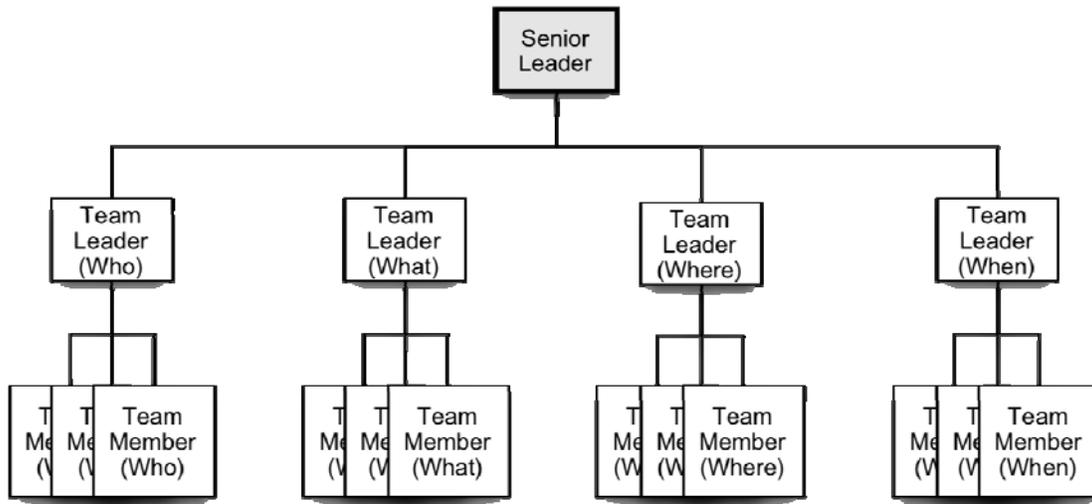


Figure 1. Hierarchy Organization.

Additionally, the ELICIT software limits subjects' Post (i.e., sharing factoids with others) and Pull (accessing factoids posted by others) access to specific common screens within this manipulation. Specifically, those players in the "who" group, for instance, are allowed to Post to and Pull from only one of the four common screens (i.e., the "who" screen) noted above. Comparable restrictions apply to players in the other three functional groups. The only exception applies to the Senior Leader, who has post-pull access to all four common screens."

Hence Team Leaders may share factoids only with the Senior Leader, other Team Leaders or their subordinate Team Members. Team Members may share factoids only with others in their team and with the Team Leaders. No one but the Senior Leader may post globally (which would share factoids with all individuals), and each solution group in the Hierarchy may only Pull factoids pertaining to their specific group's task (i.e., who, what, where, or when). Subjects are shown this organization chart, told of their

responsibilities within the organization, and provided with a short description of the Hierarchy.

Edge organization. To operationalize the Edge organization we draw from Alberts and Hayes (2003) and look to the Edge archetype (see Nissen, 2005). For ease of presentation we refer to such archetype simply as “Edge” here. As depicted in Figure 2, the Edge Organization is very different than the Hierarchy. There are no Hierarchical levels or functional areas; rather, the organization is flat, and all participants are free to work on any aspects (i.e., who, what, where and when) of the problem. There is no defined Senior Leader who has more or less responsibility than any of the other participants. To be consistent with the assignment of roles, however, the most senior subject in the treatment group is assigned to play the same simulation-defined role as the in the Hierarchy conditions.



Figure 2. Edge Organization.

Further and more specifically, at any time, any subject assigned to the Edge group can: a) share factoids with any other member; b) post factoids to, c) pull factoids from any common screen (i.e., Who, What, Where and When); or d) Identify with partial or complete answers to in the terrorist plot; that is, unlike the Hierarchy manipulation, here the ELICIT software does not limit subjects' information access or communication patterns. As above, subjects are shown this organization chart, told of their responsibilities within the organization, and provided with a short description of the Edge.

E. MEASUREMENTS

Following Leweling and Nissen (2007), we operationalize performance as a two-dimensional dependent variable comprised of: 1) *speed* (i.e., time to identify plot details correctly) and 2) *accuracy* (i.e., correct identification of plot details). These dependent measures are informed by literature in the psychological and organizational domains that suggest a trade-off exists between time and accuracy in tasks requiring high cognition and/or advanced motor skills (e.g., see Meyer et al., 1998; Beersma et al., 2003; Elliott et al., 2001; Plamondon & Alimi, 1997; Guzzo & Dickson, 1996; Rogers & Monsell, 1995) at both the individual and team/group levels of analysis.

In the first component, speed pertains to how long it takes a subject to submit his or her identification of the terrorist plot details. For ease of comparison, the scale for this speed measurement is normalized to a 0-1 scale, with 1 being more desirable (i.e., faster). Measuring and normalizing time is straightforward, as the time for each subject's identification is logged to the nearest second by the software. Specifically, each subject's

elapsed time is recorded when he or she uses ELICIT to Identify the plot. To construct a scale in which faster speeds (i.e., shorter times to Identify) result in larger values, a baseline time is established as the maximum time required for the slowest of all subjects (i.e., 2872 seconds in this experiment). Each subject's time to identify is related to this baseline and normalized to produce a scaled score according to the formula: speed = $(2872 - \text{time}) / 2872$; that is, an individual subject's time (say, for example, 2385 seconds) would be converted to a speed score as: speed = $(2872 - 2385) / 2872 = 0.1695$. All subjects' times are converted to speed scores in this same manner and using this same baseline.

The second component of performance, accuracy, refers to the quality of the identification of the impending terrorist attack (i.e., Who, What, Where, and When). Each subject's Identify action is scored with a value of 1 for each correct answer to the Who, What and Where aspect of the solution. Note, however, that the When aspect of the solution includes three components (i.e., Month, Day, and Time). In order to avoid weighting this aspect more heavily than the other three, each subject's Identify action is scored with a value of 1/3 for each correct answer. The resulting sum is divided by four to construct a [0-1] scale; that is, an individual subject's Identify (say, for example, identifies the Who, What and Where aspects correctly but is correct only on the day and not the month or time components of the When aspect) would be converted to an accuracy score as: accuracy = $(1 + 1 + 1 + 1/3) / 4 = 0.83$.

IV. RESULTS

In this section we draw from Moonier et al. (2008) to summarize the statistical results of the laboratory experimentation in terms of multivariate and univariate analysis of variance (i.e., MANOVA and ANOVA). We then summarize key findings stemming from the results.

A. STATISTICAL RESULTS

Table 2 summarizes results in terms of the hypotheses. Each hypothesis is listed in the first column, and the corresponding statistical support in terms of multivariate and univariate analyses is noted across the other columns.

Hypotheses	Statistical Support			Effect
	MANOVA	ANOVA Speed	ANOVA Accuracy	
1. Trust outperforms Mistrust regardless of organization type	Supported	Not supported	Supported	Main effect
2. Edge Organization Type outperforms Hierarchy Organization Type regardless of trust condition	Supported	Not supported	Supported	Main effect
3. Trust Edge Organization Type outperforms Mistrust Edge Organization Type		Supported	Supported	Interaction effect
4. Trust Hierarchy Organization Type outperforms Mistrust Hierarchy Organization Type		Not supported	Not supported	Interaction effect
5. Edge Trust Condition outperforms Hierarchy Trust Condition		Supported	Supported	Interaction effect
6. Edge Mistrust Condition Outperforms Hierarchy Mistrust Condition		Not supported	Not supported	Interaction effect

Table 2. Statistical Support for Hypotheses.

Table 3 shows the summary results of a multivariate analysis of variance (MANOVA). The main effect of our Organization Type manipulation is significant at the 0.05 level, and the main effect of our Trust manipulation is significant at the 0.1 level. The interaction effect of our combined Organization Type and Trust manipulation is highly significant. The interaction between organization type and trust appears to be powerful.

Effect		Value	F	Hypothesis df	Error df	Sig.
Organization Type	Pilia's Trace	0.045	3.082	2	130	0.049
	Wilk's Lambda	0.955	3.082	2	130	0.049
	Hotelling's Trace	0.047	3.082	2	130	0.049
	Roy's Largest Root	0.047	3.082	2	130	0.049
Trust Condition	Pilia's Trace	0.036	2.407	2	130	0.094
	Wilk's Lambda	0.964	2.407	2	130	0.094
	Hotelling's Trace	0.037	2.407	2	130	0.094
	Roy's Largest Root	0.037	2.407	2	130	0.094
Organization Type *	Pilia's Trace	0.202	16.457	2	130	0.000
	Wilk's Lambda	0.798	16.457	2	130	0.000
Trust Condition	Hotelling's Trace	0.253	16.457	2	130	0.000
	Roy's Largest Root	0.253	16.457	2	130	0.000

Design: Intercept+Organization Type+Trust Condition + Organization Type * TrustType

Table 3. Multivariate Results.

Next we examine how speed and accuracy vary separately across our manipulations through a series of Factorial ANOVA calculations. Table 4 shows the results of the ANOVA using speed scores as the dependent variable. The ANOVA reveals that taken independently the main effects (i.e., organization type and trust condition) are not significant; however, the interaction between the two main effects is highly significant, ($p < 0.001$).

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.586(a)	3	0.195	10.681	0
Organization Type	0.022	1	0.022	1.22	0.271
Trust Condition	0.001	1	0.001	0.051	0.821
Organization Type * Trust Condition	0.561	1	0.561	30.661	0.000
Error	2.397	131	0.018		

R Squared = .197 (Adjusted R Square = .178)
 Dependent Variable: Speed

Table 4. Univariate Results with Speed as the Dependent Variable.

Figure 3 delineates the results of the mean speed scores. As summarized in the table above, for a given level of trust (i.e., trust or mistrust condition), speed performance across the organization manipulation does not appear to vary much. The same is apparent for speed across the trust manipulation for a given organization type (i.e., Hierarchy or Edge). However, the interaction is highly significant. When the level of trust is low, the Hierarchy outperforms the Edge in terms of speed. It appears as though the Hierarchical organization structure enables participants in a mistrust environment to work comparatively more quickly than in the Edge. Alternatively, when the level of trust is high, the Edge outperforms the Hierarchy. It appears as though the Edge organization structure enables participants to work much more quickly than in the Hierarchy when trust is high. Notice that the Edge organization in the trust condition produces the highest overall performance in terms of speed.

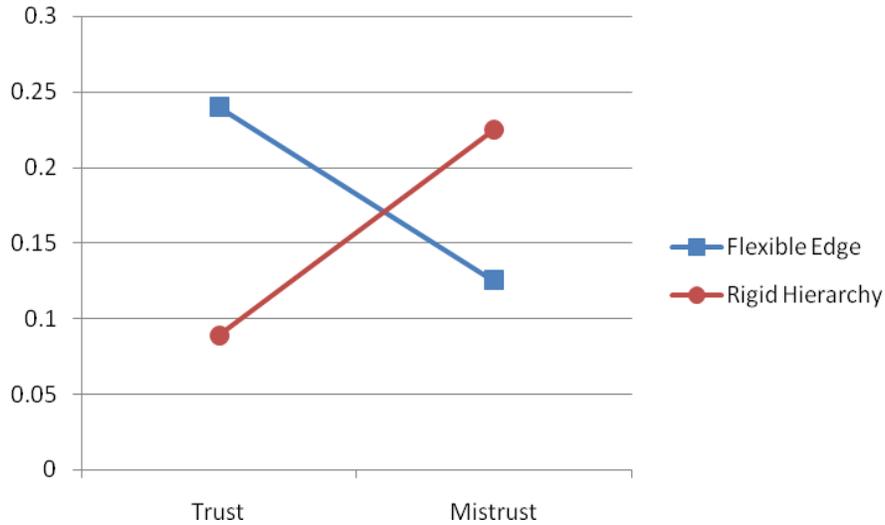


Figure 3. Interaction of Edge and Hierarchy for Speed.

Table 5 shows accuracy as the dependent variable. In this case both main effects are significant at the 0.05 level, and the interaction effect is significant at the 0.01 level. Unlike the analysis above, in which neither main effect is significant, both the organization type and trust condition have strong influences on performance in terms of accuracy. Like the analysis above, the interaction of organization type and trust is strong.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.287(a)	3	0.429	5.825	0.001
Organization Type	0.429	1	0.429	5.818	0.017
Trust Condition	0.325	1	0.325	4.406	0.038
Organization Type * Trust Condition	0.528	1	0.528	7.161	0.000
Error	9.652	131	0.074		

R Squared = .197 (Adjusted R Square = .178)

Dependent Variable: Accuracy

Table 5. Univariate Results with Accuracy at the Dependent Variable.

Figure 4 depicts the results of the mean accuracy scores. When the level of trust is low (i.e., the mistrust manipulation), there is negligible performance differential between organizational types in terms of accuracy. When mistrust pervades, the organization type does not appear to make much difference. Alternatively, when the level of trust is high, The Edge organization outperforms the Hierarchy. Interestingly, in the Hierarchy it does not appear to matter whether trust is present or not in terms of accuracy; performance is roughly the same across both trust and mistrust conditions. Notice too how the combination of Edge organization type and trust condition produces the highest overall performance in terms of accuracy. This parallels the result in terms of speed noted above.

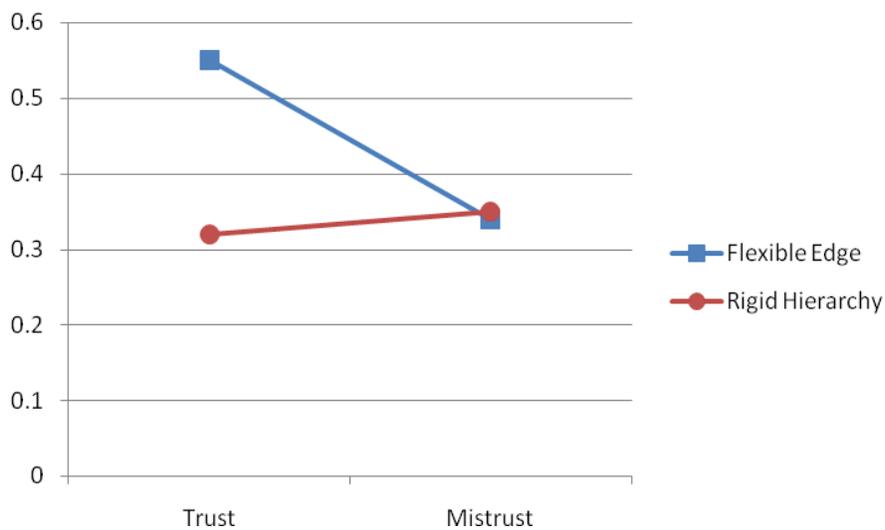


Figure 4. Interaction of Edge and Hierarchy for Accuracy.

B. KEY FINDINGS

The results summarized above provide four important insights for organizational designers and managers. First, performance in the Edge Organization is very sensitive to

trust. If trust is present or can be developed in an organization, then the Edge form is superior to the Hierarchy in terms of both speed and accuracy. Indeed, the Edge organization with trust performs better than any other configuration examined through this experimentation. It appears as though the free information exchange and limited structure combine to produce high performance when organizational members trust one another. Alternatively, performance of the Edge organization in conditions of mistrust is much worse. It appears as though mistrust negates the performance advantages available through the Edge form. Where organizational designers and managers have the benefit of high trust levels in the organization, they should strive to create or maintain Edge forms, for they produce the best organizational performance. Likewise, where organizational designers and managers have created Edge forms, they must work diligently to establish and maintain those high trust levels.

In contrast, performance in the Hierarchy Organization is comparatively insensitive to trust, particularly where accuracy is measured. If mistrust is present, possible or cannot be overcome in an organization, then the Hierarchy form is superior to the Edge in terms of both speed and accuracy. Indeed, Hierarchy performance in terms of accuracy is nearly identical in trust vs. mistrust conditions. The situation is even more pronounced when speed is the dependent outcome. Hierarchy performance in terms of speed is greater in mistrust than in trust conditions. It appears as though the rules and constraints imposed by the Hierarchy are sufficiently effective to overcome negative performance impacts associated with conditions of mistrust. It appears also as though such rules and constraints are at inherent odds with high trust environments. Where

organizational designers and managers do not have the benefit of high trust levels in the organization, they should strive to create or maintain Hierarchy forms, for they offer the greatest level of safety.

Second, a design and managerial tradeoff exists between organizational performance and safety. As summarized above, where trust is present or can be developed, the Edge delivers the highest performance, but where mistrust is present, possible or cannot be overcome, the Hierarchy is exposed to the least risk in terms of performance degradation. Organizational designers and managers must assess the relative advantages and disadvantages of Edge and Hierarchy forms within the contingency context of whether trust or mistrust prevails. Consistent with Contingency Theory, neither organizational form is superior across all trust-mistrust levels.

Third, quite distinct from the Edge Organization described above, in which developing and maintaining high trust levels is vital, efforts to promote high trust levels in the Hierarchy may be futile. In terms of speed, the Hierarchy performs worse in conditions of trust than with mistrust, and in terms of accuracy, trust has negligible influence over performance. This implication is likely to be very controversial: it suggests that organizational managers in the Hierarchy should not concern themselves with promoting trust. Such implication requires additional investigation, as there are likely to be other, important factors affecting the results.

Finally, organizational designers and managers should understand the strong interaction effects identified through this study. It is insufficient to design an organization as either an Edge or Hierarchy, for performance is dependent upon the trust-mistrust

conditions. Likewise, it is insufficient to promote either trust or mistrust, for performance is dependent upon the organizational design. Hence the combination of organizational design and trust level is key. Edge-trust organizations produce the best overall performance but exhibit greater risk in terms of performance degradation where high trust cannot be assured. Hierarchy organizations produce better performance where mistrust exists and represent safer forms where trust cannot be assured. Organizational designers and managers are called to pursue both design and trust changes in organizations to enhance and maintain performance while limiting risk. This provides a potentially important contribution to Contingency Theory: explicit and directional linkages between organizational form and trust-mistrust conditions.

V. CONCLUSION

Due to its importance in the organization, substantial research on trust has been conducted and published, the majority of which either assumes or argues that organizational managers should always establish trust. However, research also indicates that trust levels have been declining, which raises an important issue for designers and managers of organizations that do not enjoy high levels of trust. If high levels of trust in the organization cannot be guaranteed, then trust level becomes an organizational contingency factor, and Contingency Theory suggests that different organizational designs may be comparatively more or less appropriate for different trust levels. Unfortunately, negligible research is available to guide organizational design on the basis of trust-mistrust.

In this article, we address the level of trust as a contingency factor in organizational design and examine comparative performance in conditions exhibiting mistrust as well as trust. Using the ELICIT multiplayer intelligence game in a laboratory setting, we conduct a series of experiments to examine how trust level and organizational design affect performance in the context of a counterterrorism problem solving task environment. Specifically, we set up an experiment that controls the task environment and manipulates two variables in a full-factorial design: 1) organizational design (i.e., Hierarchy vs. Edge) and 2) trust condition (i.e., trust vs. mistrust).

Results suggest that trust and organizational design have strong interactions and reveal a complex design space in which high levels of trust are not always necessary for good performance. Consistent with Contingency Theory, neither organizational form is

superior across all trust-mistrust levels. Results reveal also a substantial penalty for organizations with rigid, Hierarchical designs that impede the benefits of high trust levels. Indeed, controversial results suggest that efforts to promote high trust levels in the Hierarchy may be futile. In either case, results indicate that both organizational design and trust are important to performance and that neither is sufficient alone: in a contingency theoretic manner, they show how trust is an important factor in organizational design.

These results also suggest an agenda for future research along the lines of this investigation. First, the controversial results reported above (esp. that high trust in the Hierarchy degrades performance) require deeper examination. The experiment should be replicated, and manipulation checks should be conducted with particular thoroughness, to ensure that the kinds of effects expected through trust and organizational design manipulations manifest themselves through the experiment.

Second, the experiment can be modified to examine the different components of trust—perceived integrity, benevolence and competence—independently as well as in combination. The current design examines all three components as a single manipulation, but the comparative effects of each component may differ. Aside from the blanket hypothesis, “more trust is better,” it’s unclear how ability, benevolence and integrity would contribute separately to organizational performance in this task environment. Further, trust could be viewed as a dependent variable as well as an independent one. An additional experimental design could examine the effect of different organizational designs, leadership styles, communication protocols and other factors on the emergence

and development of trust over time (e.g., with pretest-posttest measures), and social network analysis of dyadic trust patterns may elucidate relationships that remain opaque at present. Qualitative analysis may prove insightful as well. For instance, ascertaining why various subjects trust or mistrust different participants—in terms of ability, benevolence and integrity—may reveal insightful patterns and trends.

Third, the literature suggests several additional factors that may interact with trust and organizational design to affect performance in the kind of information sharing and problem solving task environment examined through this study. For instance, whether subjects are collocated or physically distributed may affect trust and performance—and require different organizational designs—as may the degree of homogeneity (e.g., in terms of nationality, culture, military service) of subjects assigned to teams. As another instance, the time allotted for trust and organizational performance is relatively short in this experimentation setting. Additional research that permits subjects to participate on the same teams through multiple sessions may uncover important longitudinal learning patterns.

Additionally, both psychological and neural factors may influence the kinds of results identified through this study. For instance, a personality inventory (e.g., NEO-FFI) could be administered to subjects and correlated with information sharing behaviors, problem solving performance, and reported trust levels, in addition to the trust and organizational design manipulations accomplished in the present study. The same can be said for cognitive matching between different subjects and the kinds of rapport mechanisms that they use in trust-relevant circumstances. Understandable patterns

between personality traits, cognitive styles, trust, organizational design and performance could provide useful staffing knowledge to organizational designers and managers as they confront different trust levels and organizational designs.

As another instance, advances in neural science suggest that different regions of the brain are responsible for the kinds of information sharing behaviors and trust perceptions seen to be important in this study. Advanced imaging techniques (e.g., fMRI) may reveal connections between neurological factors and personality traits, trust, organizational design and performance, which may provide useful staffing knowledge also to organizational designers and managers as they confront different trust levels and organizational designs.

Finally, organizational designers and managers have potential to learn much through research along these lines. We trust that our continued work with ELICIT experimentation will continue to produce useful knowledge and controversial results. This highlights additional opportunities for collaborative research.

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