

**Study of Trust as an Organizational Contingency, Part II:
Examining Four Dimensions of Trust in ELICIT Experimentation**

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Abstract

Extending the concept of trust as a contingency of organizational design based on ELICIT experimentation, we seek to explain further why certain configurations of trust and organizational type perform better than others. That is, we are interested in the factors that explain why an Edge organization with high levels of trust performs better than a Hierarchy organization with high levels of trust or an Edge organization with low levels of trust. We examine survey results from a questionnaire with four dimensions of trust—reliability, openness, ability, and concern—administered following the ELICIT computer simulation. The aim is to identify which dimension(s) may be primary or secondary determinants of performance, and recommend how managers and team leaders might better create and sustain trust by focusing on particular dimensions of trust within a manager's given organizational context. This research further establishes trust as a contingency factor in organizations. We discuss the implications for both scholars of trust in organizations and practitioners and managers (particularly in the Defense arena) as a means to address trust issues and improve performance outcomes.

Keywords: organizational design, dimensions of trust, contingency theory, ELICIT

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Introduction

Research on trust has received significant attention from organizational scholars (Schoorman, Mayer, & Davis, 2007; Kramer, 1999; Bigley & Pearce, 1998; Lewicki, McAllister, & Bies, 1998; Creed & Miles, 1996; Kramer & Tyler, 1996; Bromiley & Cummings, 1995; Mayer, Davis, & Schoorman, 1995). As Kramer and Cook (2004) state, “Trust often constitutes an important resource within social systems” (p. 1). Within the Defense arena, trust is a critical ingredient of successfully acquiring products and services from industry. In 1995, as part of the DoD’s Integrated Product and Process Development (IPPD) managerial concept, the Secretary of Defense directed the use of Integrated Product Teams (IPTs) as a means of promoting “flexible, tailored approaches to oversight and review [of acquisition programs] based on mutual trust” (OIPT-WIPT Information Guide, 1996, p. 26; Valdez & Kleiner, 1996). The Undersecretary of Defense for Acquisition, Technology, and Logistics (USD [AT&L]) underscored the importance of trust in Defense acquisition: “The two most important characteristics of IPTs are empowerment and cooperation —trust n’ teamwork by another name. The teams must have full and open discussions with no secrets. Team members must be empowered to speak for their superiors in the decision-making process” (OIPT-WIPT Information Guide, 1996, p. 50).

Despite its importance, trust is “a desired but elusive and fragile resource” (Kramer & Cook, 2004, p. 1). For example, recent corporate scandals (e.g., Enron, WorldCom, Arthur Anderson, AIG Insurance, Madoff Investment Securities, etc.) have challenged the trustworthiness of social organizations in general. The level of trust or distrust is connected to managerial influence. Creed and Miles (1996) argue that managers are responsible for trust levels within their organizations: “Managers are the primary designers of the total organizational form employed—the combination of strategy, structure, and internal mechanisms that provide the overall operating logic and resource allocation and governance mechanisms of the organization” (p. 19). Conversely, an organization’s level of trust can also affect its processes and structure (Grey & Garsten, 2001; Creed & Miles, 1996; Bromiley & Cummings, 1995; Ruekert, 1985; see also Donaldson, 2001; Bigley & Pearce, 1998) such that disenchantment with “command and control”

managerial philosophies found in traditional organizations has brought trust to the center of scholarly research in organizations.

Environmental factors such as globalization, competition, technology, customer expectations, and workforce dynamics increasingly compel firms and other groups worldwide to structure their organizations in ways that emphasize flexibility, participation, and agility (Liu, Magjuka, & Lee, 2008; Alberts & Hayes, 2005; Grey & Garsten, 2001; Porter & Lilly, 1996; Adams & Webb, 2002). Structures in stable environments tend to be hierarchical and rules-oriented. Mintzberg (1980) acknowledges that organizations tend to adapt to some suitable configuration in order to become and remain effective, even if they have to adopt a hybrid structure in reacting to contradicting pressures. Such increasing pressures, especially external competitive elements (such as globalization and technological advances), have forced organizations to adopt a more organic structure since the 1980's and into the 21st century. This "post-bureaucratic organization" trend includes organizations moving away from hierarchical design and rule-following toward flatter structures whose members garner trust and authority by their expertise (Alberts & Hayes, 2005; Grey & Garsten, 2001; Chandler, 2000).

Whereas the hierarchy (formal, mechanistic) structure has been the typical bureaucratic structure (Grey & Garsten, 2001), emerging organizational forms primarily adopt a network or "edge" structure. "The edge proposes to capitalize upon fully connected, geographically distributed, organizational participants by moving knowledge and power to the edges of organizations" (Leweling & Nissen, 2007, p. 1). Edge organizations are agile, flexible, and robust entities, like organic, flat, networked structures where managers do not rely upon formal authority to accomplish goals. Instead, individuals working in edge organizations must negotiate with key players, work across boundaries of assigned roles, and build trust (Leweling & Nissen, 2007; Alberts & Hayes, 2005; Grey & Garsten, 2001).

Despite emerging organizational designs, according to Kramer (1996), the hierarchy remains one of the most prevalent structures found in contemporary organizations. Hierarchies consist of relationships that are unequal in power or status, presenting an interesting arena in which to examine trust among organizational members (Kramer & Cook, 2004).

The present research examines the factors of trust in the context of two basic organizational structures: the hierarchy and the edge. Whether or not an optimal combination between high trust or low trust levels and these two structures is ascertained by the organization's overall performance. The paper is organized as follows: 1) literature review of trust as contingency factor as related to varying organizational structures; 2) description of the study which builds on previous research using ELICIT; 3) analysis of the trust factors in different organizational structures; 4) discussion of the results and findings; and 5) discussion of scholarly and practical implications.

Literature Review

In studying trust factors leading to performance outcomes of an organization, scholars cite a variety of environmental factors to (or in) which organizations have had to adapt in order to survive and succeed. Structure may be the contingency factor affecting, at least, the perception of trust. Kramer and Tyler (1996) provide empirical evidence that "cognitive and structural features of hierarchical relations influence individuals' judgments about trust" (p. 218). This finding is consistent with the research of Mayer et al. (1995), who suggest that selecting an organizational structure determines which controls are to be utilized, which together creates the context in which trust operates. "A strong organizational control system could inhibit the development of trust" (Mayer et al., 1995, p. 727) since an individual may be responding to the control system rather than to the trustworthiness of the other person. Additionally, trust may be construed through performance of a particular task and the individual's ability to act—both aspects dependent on the local work environment (Zolin & Hinds, 2004; Gambetta, 1988).

Determining "whether a factor is a contingency of organization depends on whether aligning the structure and the contingency produces higher performance" (Donaldson, 2001, p. 89). Dirks and Ferrin (2001) pursued a model that helps establish trust as a conditional factor under which desirable organizational outcomes, such as high performance and cooperation among members, are likely to occur. Bromiley and Cummings (1995) argue that trust may not be a significant determinant in choosing one form over the other. Like Dirks and Ferrin (2001), however, other researchers have determined trust to be a likely contingency factor or moderator having some definitive effect on business controls and processes (Creed & Miles, 1996; Grey & Garsten, 2001) when considering, for example, such routines as a

“mechanistic form of trust” found in bureaucratic organizations (Grey & Garsten, 2001, p. 234). Powley & Nissen (2009) found that the level of trust among a group of individuals can positively or negatively impact speed and accuracy as performance outcomes in either hierarchical or edge structured groups. The present research seeks to identify and determine what trust factors are responsible for high or low trust in either a hierarchy or edge organization.

Organizational Structure

In spite of innovations in organizational design, organizations have not fully automatically abandoned the hierarchy. In fact, hierarchy appears to remain relatively common and resilient (Grey & Garsten, 2001; Kramer & Tyler, 1996). Hierarchy does offer predictability, control, and fairness. Organizational structure enables employees to accomplish work tasks (Adler & Borys, 1996). Leavitt and Bahrami (1989) studied four types of communication patterns and found that the typologies revealed an organization’s true structure and characteristics, and further found that problem-solving occurred fastest in hierarchies. This finding is consistent with two prevailing concepts: (1) that direct control of information comes by centralized decision making and indirect control through formalized rules/processes and specialized job descriptions; and (2) that such controls (i.e., a bureaucracy) can expedite decisions and actions of the organization in a relatively stable environment by coordinating and integrating activities of specialists and specialized departments (Alberts & Hayes, 2005; Grey & Garsten, 2001; Bromiley & Cummings, 1992; Burns & Stalker, 1961).

Hierarchy does have limitations. As military, government, and other corporate or private organizations have grown into unprecedented sizes with more and more layers of management, the communication flow of information up and down the “chain of command” takes longer to travel and increases the probability for distortion and error (Alberts & Hayes, 2005). Miles and Snow (1992) explain that misapplication or over-extension of the hierarchy structure by managers and decision makers can result in organizational failures, whether internal or external. Leavitt and Bahrami (1989) found that more organic structures were best suited for complex, dynamic situations where learning is involved.

Moving decision making to the point where information is exchanged and processed is the primary operating logic and distinguishing feature of the edge structure (Leweling & Nissen, 2007; Alberts

& Hayes, 2005). In an era characterized by a constantly changing and widening environment (Leweling & Nissen, 2007; Edison, 2007; Grey & Garsten, 2001; Ruekert, 1985; Pitts, 1980), dynamic organizations requires structures that are adaptable and flexible to a volatile environment (Grey & Garsten, 2001), and are more agile than its competitors (Leweling & Nissen, 2007) in order to achieve its objectives. The network structure can somewhat satisfy these basic requirements resulting from such conditions. However, maximizing the potential to achieve objectives under these conditions means making the organization even “more powerful,” enabling it “to accomplish more, in less time, under more adverse conditions, and at lower cost” (Alberts & Hayes, 2005, pp. 213-214).

The edge capitalizes on two key factors to increase the power of the network: agility and empowerment. Agility is a premium characteristic that allows an organization to quickly and accurately respond to an environment with “increased uncertainty, volatility, and complexity [as] part of the transition from the Industrial Age to the Information Age” (Alberts & Hayes, 2005, p. 6). The edge structure places decision making at the point where it needs to be most agile, the point at which it interacts with its environment. This structure inherently provides decision rights, information accessibility, and empowerment to virtually all organizational members (Leweling & Nissen, 2007; Alberts & Hayes, 2005).

By empowering those who operate on an organization’s edge—the place at which an organization interacts with its external environment—this structure optimizes information processing through its “greatly enhanced peer-to-peer interactions” (Alberts & Hayes, 2005, p.5). Empowerment is key to simultaneously handling large numbers of tasks in a dynamic environment. “Empowered individuals and organizations that constitute an edge organization,” state Alberts and Hayes (2005), “have a greater “bandwidth” for action than their unempowered counterparts in traditional hierarchies” (p. 185).

However, the hierarchy provides control of information at each level of management, enabling managers to mandate appropriate action throughout the organization (Alberts & Hayes, 2005; Burns & Stalker, 1961). Trust-based controls in the bureaucratic hierarchy include formalization and cultural norms; therefore, trust in this structure requires relatively less effort to maintain (Grey & Garsten, 2001). Using established routines, coordinated communications, rules, and consequences for rule violations, an “invisible” form of trust exists in the hierarchy (Grey & Garsten, 2001, p. 235).

Interestingly, this observation is similar to that of Kramer and Tyler's (1996) findings regarding trust in hierarchical relationships. In such relationships, trust tends to be viewed from the top as a strategic issue. Managers, for example, are concerned with the organization's success and realize this depends on organizational members' (subordinates') performance. Consequently, trust is introduced into the relationship as a question: will the workers do their tasks "competently and faithfully" (Kramer & Tyler, 1996, p. 226). On the other hand in the same hierarchical relationship, the subordinate's lack of information about his or her manager or supervisor prevents making an informed assessment about that superior's trustworthiness. The worker also depends upon the manager for resources and support, both organizational and personal. Thus, trust is more salient to those in a lower position because of their dependency and vulnerability in a hierarchical relationship (Kramer 1999).

The edge structure encourages interaction among any and all organization members, including individuals outside the organization, when appropriate. Alberts and Hayes (2005) argue that such interaction allows an organization to combine information in new ways, which leads to increased agility. The scholars assert: "Edge organizations are particularly well suited to deal with uncertainty and unfamiliarity because they make more of their relevant knowledge, experience, and expertise available" (Alberts & Hayes, 2005, p. 217). Yet the mechanism enabling the edge to "make more" of its information assets is trust.

Regardless of organizational structure, managers can establish a predisposition for trust or distrust in the organization through their managerial philosophies, which, too, have evolved throughout the Industrial Age and into the Information Age (Castells, 2002; Creed & Miles, 1996). The functional and divisionalized forms of hierarchy structure, for example, reflect the human relations philosophy of management by exception, where a manager must trust his or her employees to behave as desired if treated properly and that the employees "have adequate technical and business capabilities and share the same values and goals" (Creed & Miles, 1996, p. 25). The human resource philosophy, in which managers, supervisors, and other decision-makers must establish and maintain trust through joint planning or negotiation, arose with the formulation of the matrix structure. Trust within and among network (edge) organizations is based upon recognition of co-dependence and a foregoing of personal interests.

This basis helps to ensure that – at individual, team, and corporate network levels—appropriate actions that will be mutually beneficial will be taken in response to change. The distinguishing element of the human investment philosophy is that the trust investment occurs at all levels (Creed & Miles, 1996).

The conclusion drawn by Creed and Miles (1996) is that the connection between organizational structure and trust is “clear and compelling” (p. 24). Bromiley and Cummings (1995) also arrived at a similar conclusion, arguing that trust level can affect some organizational structures and processes. To what degree, then, does trust determine organizational structure, or vice versa? Potential answers are explored next.

Organizational Trust

Trust is highly beneficial to organizations and has been shown to have a positive effect on individual performance (Dirks & Skarlicki, 2004; Dirks & Ferrin, 2001; Creed & Miles, 1996; Barber, 1983) and attitudinal behavior outcomes (Liu et al., 2004). Additionally, trust among workers can lead to higher performance by the organization overall (Zolin & Hinds, 2004; Hughes, Rosenbach, & Clover, 1983; see also Kramer, 1999). Indeed, trust at the individual and organizational level is increasingly being considered essential for achieving objectives, being viewed by career promoters as a “competency” (Levit, 2009; Covey, 2006). Ironically, despite such reinforcement to foster trust, levels of trust across broad, global social organizations have fluctuated from year to year during the past decade. Trust levels dropped by 20 percentage points during 2008, indicating that we may be propelling further into “a trust crisis” (Covey, 2006, p. 7; Levit, 2009).

Dirks and Skarlicki (2004) offer a conceptual framework of trust particularly useful in observing hierarchical relationships and organizations. Relationship-based trust is established on how a follower construes his or her relationship to a leader. If the relationship is positive, the follower is more likely to trust the leader. On the other hand, a follower using (albeit unconsciously) character-based trust focuses on the leader’s characteristics. Upon this trust basis, a follower’s trust in his or her leader is influenced by the perception of that leader’s fairness, trustworthiness, and competence. The follower is likely to be willing to engage in behaviors that put them at risk when they attribute competence and benevolence to their leaders.

There is also some significant research supporting trust as an affective attribute (Bigley & Pearce, 1998; McAllister, 1995; Adams & Webb, 2002). But according to Kramer (1999), most scholars agree that “trust is fundamentally a psychological state” made up of “several interrelated cognitive processes and orientations” (p. 571). Zand (1972) is more emphatic, stating that trust “is not a global feeling of warmth and affection, but the conscious regulation of one’s dependence on another that will vary with the task, the situation, and the other person” (p. 230). Simply put, trust is a calculated decision, arrived at through a cognitive process, to cooperate with specific others (Bigley & Pearce, 1998; Gambetta, 1980). A concise definition of trust can thus be explained, and its antecedents determined.

First, for a definition of trust itself, it is helpful to understand that “cognition-based approaches focus on actors’ cognitions and expectations about themselves and others” (Grey & Garsten, 2001, p. 232). Rotter (1980) suggests that trust is based on the expectancy that an individual or group can rely upon the statement (oral or otherwise) of another person or group. Dirks and Skarlicki (2004) add that an individual’s expectations are “based on perception of the integrity or capability of another party” (p. 28). As with their research on trust in hierarchical relationships mentioned earlier, Dirks and Skarlicki (2004) describe trust in terms of what they believe to be its components: integrity, fairness and benevolence, competence and capability, and trustworthiness. They base their working definition of trust on the model established by Mayer et al. (1995), which, in turn, parallels Gambetta’s (1988) definition and adds the component of vulnerability (Zand, 1972). For general understanding, this research will therefore use the Mayer et al. (1995) definition of trust: “Trust is 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” (p. 712).

Through their model of trust, Mayer et al. (1995), and likewise Schoorman et al. (2007), explain that trust is based on several cognitive inputs by the “trustor” (individual “doing” the trusting), including perceived trustworthiness described by three factors—ability, benevolence, and integrity—and the trustor’s propensity to trust the “trustee” (individual being trusted). Propensity to trust is the innate tendency of an individual or group to trust another individual or group; it is the trustworthiness ascribed by the trustor to the trustee (Dirks & Skarlicki, 2004; Mayer et al., 1995; Rotter, 1967). Because trust is an

individual's expectation of another's trustworthiness, Grey and Garsten (2001) argue that trustworthiness is the relative predictability that the other will exercise their autonomy with a reasonable degree of responsibility. Mayer et al. (1995) and Deutsch (1958) believe that to explain trust, one must go beyond the trustee's predictability. However, the propensity of the trustor is not enough to explain the observed variance of trust from one trustee to the next, nor does propensity account for situational conditions affecting trust outcomes (see also Schoorman et al., 2007). Propensity to trust, then, is affected by the three antecedent factors of ability, benevolence, and integrity, which describe the trustor's perception of the trustee's trustworthiness.

Schoorman et al. (2007) point out that "Trust [is] an aspect of relationships" (p. 344) rather than a character trait *per se*. It is "a willingness to be vulnerable to another party" (Mayer, 1995, p. 712). The scholars make a distinction between trust and trusting behavior: trust includes the willingness of an individual to assume perceived risk (vulnerability); trust behavior is the assuming of risk – the latter is captured by Mayer et al. (1995) as the Risk Taking in Relationship (RTR) component of the trust model. Risk exists because another's actions are unpredictable; there is uncertainty because of incomplete knowledge; vulnerability is present because of the possibility of loss. Trust mitigates risk, uncertainty, and vulnerability (Adams & Webb, 2002). But trust is more sensitive to perceived risk (Zolin & Hinds, 2004), and the higher the uncertainty, the more significant the role trust plays in an individual's behavior (Dirks & Ferrin, 2001). Consistent with the Mayer et al. (1995) trust model, Dirks and Skarlicki (2004) explain that risk and vulnerability are affected by a follower's (trustor's) perceptions of his or her leader's (trustee's) character in a hierarchical relationship. When a follower believes their leader has some degree of integrity, fairness and benevolence, competence and capability, and trustworthiness, they are likely to be more comfortable engaging in behaviors that put them at risk.

Understanding the "opposite" of trust is necessary since the "lack of trust would in general reduce cooperative efforts of all kinds" (Bromiley & Cummings, 1995, p. 232). A lack of trust has been found to be problematic for organizations, particularly federal government agencies (Jansen, Hocevar, Rendon, & Thomas, 2009; GAO, 2005). Zand (1972) explains that when individuals in a group or organization "encounter low-trust behavior, initially they will hesitate to reveal information, reject influence, and evade

control” (p. 230). Such situations increase the likelihood for misunderstandings among members and between workers and managers and can lead to lower performance, as lack of trust—like trust—is embedded in managers’ philosophies (Creed & Miles, 1996; Zand, 1972).

Two general perspectives exist in trying to determine the relationship between trust and its opposite. One perspective argues that since relationships are multiplex, trust and distrust can exist simultaneously in the same relationship (Lewicki, McAllister, & Bies, 1998), although the authors acknowledge this to be a significant departure from traditional views on trust. A stronger argument remains for the perspective of trust and distrust—or “not trust”—on a continuum, upon which a relationship can exist at only one point at a given time and in a particular context (Schoorman et al., 2007; Bromiley & Cummings, 1998; Mishra, 1996; Mayer et al., 1995). Thus, this research will describe levels of trust on a continuum by placing, like Adams and Webb (2002), “high trust” on one end and “low trust” on the other. Similarly, this research will use “high” and “low” to analyze and describe the relative levels of each trust factor described next (Mishra, 1996; Mayer et al., 1995).

Factors of Trust

Our primary question in this paper concerns the factors of trust: Which factor or factors of trust explain high or low levels of performance? Previously, Powley and Nissen (2009) analyzed performance associated with trust levels and organizational structure, where performance was defined by speed and accuracy. Powley and Nissen (2009) used ELICIT, a simulation exercise where participants must solve an imminent terrorist threat. In the high trust - edge condition, participants accomplished the task more quickly than the hierarchy. Similarly, their accuracy was high in the high - trust edge condition, but their accuracy was lower in the hierarchy. In conditions of low trust, however, speed in decision making was high in the hierarchy structure and low in the edge structure. Their accuracy in both structures was relatively low when trust was low. While analyzing trust levels associated with performance may indicate which structure we want to know further which factors of trust explain the performance outcomes. Based on literature and qualitative interviews with managers from more than 12 firms, Mishra (1996) identified four antecedent dimensions related to the Mayer et al. (1995) factors in his definition of trust: “Trust is one party's willingness to be vulnerable to another party based on the belief that the latter party

is 1) competent, 2) open, 3) concerned, and 4) reliable” (p. 5). These factors are the basis for our hypotheses.

Competence is defined by Webster’s dictionary (1983) as “requisite or adequate ability.” Although Mayer et al. (1995) prefer to use the term “ability,” their own review of terminology used by other scholars suggests a significant use of the terms competence, perceived expertise, and expertness. Kramer (1999) highlights the significance of individual expertise to help formulate trust within a group, as well as that of trust in the system of expertise in a given organization. Competence is described by Mishra (1996) as a factor in trust between a manager or leader and a subordinate. Fast (2009) observes that competence, or lack thereof, drastically affects execution of defense acquisition programs. He suggests that “outsiders” may not have requisite experience unique to the defense industry, and “because of the importance of teamwork and trust,” leaders should be careful when giving such individuals consideration for hire (Fast, 2009, p. 12). McGrath & Zell (2009) asserts that competence is needed for high information complexity in order to achieve corporate objectives.

Openness refers to the degree that an individual is honest with another individual. For example, a manager may be “open” with a peer or an employee in expressing a critique of their performance. Openness is only meaningful, however, if the employee trusts his or her manager. The converse in such a relationship works similarly; the manager is more likely to be open with an employee whom he or she trusts. In contrast, extreme honesty can actually damage the trust between individuals in an organization. (Mishra, 1996). Dirks and Ferrin (2001) provide empirical evidence that suggests a relationship among trust, openness, communication, and information sharing. The acquisition field in the Department of Defense recognizes this relationship, stating “Direct communication...is expected as a means of exchanging information and building trust” (p.7 DAG). Such communication of information is essential for any organization, but is generally limited to the confines of interaction vertically up or down one level in a hierarchy; it is also most often processed and redistributed by those few members near or at the top of the hierarchy (Alberts & Hayes, 2005; Burns & Stalker, 1961). In an edge structure, however, openness among members is vital to achieving objectives successfully (Alberts & Hayes, 2005; Grey & Garsten, 2001; Donaldson, 2001).

Hypothesis 1. *Under conditions of high trust, members of an edge structure exhibit high levels of competence and openness, and perform with high speed and accuracy.*

Concern is influenced by the extent that the trustor's behavior toward the trustee is relevant to the trustee's needs and desires (Mayer et al., 1995). Benevolence has a similar meaning as concern, but suggests an attachment between two individuals and a complete forgoing of self-interest. Concern, on the other hand, means "such self-interest is balanced by interest in the welfare of others" (Mishra, 1996, p. 7). Concern suggests that "interdependence is a critical antecedent to trust, because there would be no need to trust without one's own outcomes being in some way dependent on another person" (Adams and Webb, 2002, p. 3).

Interdependence is characteristic of relationships between various post bureaucratic organizations, such as organic networks of teams, companies, and industries (Grey & Garsten, 2001; Chandler, 2000). Miles and Snow (1992) explain that the growth of an organization is achieved in part through interdependent alliances with suppliers and distributors clarified by contracts and exchange agreements. The authors describe concern as being necessary to establish and foster trust among team members and among network organizations. A member of one organization is concerned for a member of another organization when he or she realizes that the relationship is mutually beneficial in a continuously changing and increasingly competitive environment (Miles & Snow, 1992).

An individual's or an organization's outlook for another may reach a limit at self-preservation, however. Concern is not demonstrated by an individual at the expense of his or her self-interest, such as achieving personal goals or the objectives of his or her organization (Miles & Snow, 1992). Similarly, the concern (or benevolence) displayed by a company for another likely originates from its own financial interests (Schoorman et al., 2007). Because the trustor reaches a limit at the preservation of his or her own self-interests when trusting another individual (or organization), the trustor's concern for that other, as an antecedent factor, does not significantly contribute to high trust. The hypothesis follows:

Hypothesis 2. *Under conditions of high trust, members of an edge structure exhibit moderate or low levels of concern, and perform with high speed and accuracy.*

Reliability refers to the “consistency between words and action” (Mishra, 1996, p. 9). The reliability antecedent factor stems from the expectancy aspect of trust that the trustor has of the trustee to behave in a way important to the trustor and that the trustor can rely upon statements by the trustee (Mishra, 1996; Mayer et al., 1995; Rotter, 1980). Mayer et al. (1995) describe reliability—which they label integrity—as the consistency of acts based upon an acceptable set of principles.

Given the dynamic and fluid nature of the environment in which an organization operates, members of an edge organization—an organic structure—might regard trust in each other in terms of reliability as a “skill” or personal, professional “quality” in and of itself (Grey & Garsten, 2001). However, the concept of such a skill or quality, and its antecedent role to trusting behavior, is captured in the competence factor described above. In the same research, Grey and Garsten (2001) also state “Action in PBOs is determined by reference to those with appropriate expertise...” (p. 236). Additionally, throughout a bureaucratic hierarchy, each member is expected to behave consistently according to a set of prescribed controls, routines, and norms (Mintzberg, 1980; Burns & Stalker, 1961). By comparison then, reliability rather than competence, openness, or concern likely plays a determinant role of performance level in the hierarchy, a mechanistic structure or bureaucracy. In other words, as long as hierarchy members continue to perceive one another as reliable, then it is possible that the organization can perform as well, and even better than, the edge organization under conditions of low trust brought about by a lack of competence, openness, and concern. Thus, the final hypothesis for this research is:

Hypothesis 3. *Under conditions of low trust, members of a hierarchy structure exhibit high levels of reliability and perform with high speed and low accuracy.*

Organizational Performance

Research shows that trust level, organizational structure, and performance/effectiveness are interactive (Levit, 2009; Covey, 2006; Bromiley & Cummings, 1995; Moonier, Baker, & Greene, 2008). Schoorman et al. (2007) note that the poor organizational performance of several corporations and some government agencies during the late 1990s and early 2000s, as indicated by publicized scandals, has increased research regarding trust and organizational performance. For example, researchers have found that performance indicators such as sales, profits, and employee turnover are related to trust levels of an

organization (Dirks & Skarlicki, 2004). Liu et al. (2008) assert that “successful organizations that are able to utilize advanced information technology to establish a dynamic form to adapt to the ever-changing landscape and customer requirements always gain a competitive advantage in global competition” (p.1). In terms of structure, organic forms are more suitable for higher performance in a rapidly changing environment, whereas hierarchical (or bureaucratic) structures perform well in stable environments (Alberts & Hayes, 2005; Donaldson, 2001; Grey & Garsten, 2001; Mintzberg, 1980). Higher performance may be determined by trust among managers of an organization, since trust at this level in the firm is what will ultimately govern the overarching strategic actions of the organization (Schoorman et al., 2007; Creed & Miles, 1996). Trust among co-workers can positively affect organizational performance because trusting and being trusted leads to better performance (Zolin & Hinds, 2004; Hughes, Rosenbach, & Clover, 1983).

Methodology

The present study draws on the same data set from Moonier et al. (2008) and Powley & Nissen (2009). This study incorporates survey data about perceptions of trust collected after the ELICIT simulation. The participants were active duty military personnel enrolled in an MBA program. A small percentage of each individual's course grade was based on his or her participation and performance in the experiment, thus serving as an incentive for the individual to do well. These men and women included active and reserve officers in all four branches of the U.S. Armed Services, a small number of DoD employees, and foreign military officers (as students of NPS). The military participants held ranks ranging from O1 (lieutenant/ensign) to O5 (lieutenant colonel/commander), possessed 1 to 18 years of military experience, and hold undergraduate degrees. As subjects of the experiment, these individuals represented a diverse sample of the broader Defense population.

Each subject was assigned to one of four groups so that each group consisted of approximately 17 members. We used a stratified assignment process so that the groups contained an equally distributed representation of age, experience, military service branch, officer subspecialty, gender, and country of service. We did this to approximate conditions present in joint or coalition military organizations. Groups

participated in different ELICIT game scenarios over a two-day period resulting in a total of eight experimental groups.

A post simulation questionnaire was given to participants to measure each individual's perception of trust. Whereas as a previous study examined the relationships between the four experimental groups, the post simulation survey data was used to test the hypotheses this study. The post-survey results are believed to be most relevant, since interactive relationships are an integral part of trust, and vice versa (Schoorman, 2007; Dirks & Skarlicki, 2004; Kramer, 1999; Hughes et al., 1983; Zand, 1972). Such interactions during the game occur after the pre-survey is completed. Therefore, in this instance, a post-survey best captures each subject's perception of trust during the simulation.

While the questionnaire as a whole served the initial purpose of measuring perceived trust level (high or low), each statement scored by a respondent corresponds to one of the four antecedent factors of trust identified by Mishra (1996) and congruent with the Mayer et al. (1995) trust model.

ELICIT Simulation

The ELICIT intelligence game is an experiment in which participants are required to interact and collaborate via computer terminal client interfaces in order to collectively disrupt (solve) a simulated terrorist plot. At the beginning of the experiment, participants were first given a written scenario briefly describing the fictitious terrorist situation, nature of their organization's structure, and type of trust environment in which they were required to interact with other members. Instructions about playing the game were also included in the writing. After this introduction and a 10-minute break, participants completed a pre-survey before beginning the computer-based portion of the experiment. Once the group "solved" the terrorist plot, the computer-based portion ended, and participants were asked to complete a post-survey consisting of the same questions as the pre-survey. The total time for each of the eight experiments was approximately one hour.

The object of the ELICIT game is to solve the terrorist plot, and thereby prevent the terrorist action from occurring, by answering the following questions: Who planned/led the effort to attack and who will execute the attack? In what country (where) will the attack take place? What is the specific target or event to be attacked? When (month, day and time) will the attack occur? During the initial 10 minutes of

the game, each participant is given a pseudonym and eventually receives four “factoids” that provide clues to answering the questions above. A total of 68 factoids are distributed throughout the group, but not all factoids are needed to solve the plot, and some of the factoids are irrelevant to the solution. The simulation is designed such that no single individual can solve the game independently. Members must collaborate and interact through their computer terminal using one of five simulation software functions (e.g., list information, post information, pull information, and identify the different aspects: who, what, where, when). The game ends when one or more participants receive/obtain enough information (factoids) to answer all four questions accurately, or when a pre-designated amount of time has elapsed.

Two organizational structures were designated in the simulation: a strict hierarchy and an edge configuration. For the hierarchy structure we assigned each of the group members to one of three tiers consisting of 12 operators divided into four teams with a middle manager reporting to a senior supervisor. In contrast, in the edge structure design we did not assign any functional or leadership role to specific participants. As with a “real” edge-structured organization, participants determined who should focus on which aspect of the simulated terrorist plot, as well as who will post, pull, and share what information with whom. At the game’s end, each participant entered an answer for each question to the best of their current “simulated” knowledge (Moonier et al., 2008; Leweling & Nissen, 2007).

Subjects were also placed into one of two trust conditions: high trust or low trust. Participants in the high trust condition were told that others’ “actions will be consistent, congruent, and credible with established protocols and guidelines.” Participants in the low trust condition were told that “Members of your community normally work well together, but frequently withhold information from each other,” along with references to negative interactions affecting relationships seek to negate openness and concern.

Measuring Trust Factors

We used a trust instrument developed by Mishra and Mishra (1994) to measure each subject’s perception of the levels of overall trust and trust antecedents. Mishra and Mishra (1994) used the survey as part of an overall assessment of mutual trust. In doing so, the researchers were able to capture indications of the four trust antecedents among managers, employees, and customers experiencing the effects of corporate downsizing.

Several other studies have incorporated adaptations of the same instrument. Spreitzer and Mishra (1999) used the questionnaire to collect perceived trust and trust factor (competence, openness, concern, reliability) data from personnel working in the American and Canadian automotive industries. Spreitzer and Mishra (2002) used the instrument to analyze survivor reactions and retention after corporate downsizing has occurred, followed by Brockner, Spreitzer, Mishra, Hochwarter, Pepper, and Weinberg (2004), who used the same tool to further study the negative effects of downsizing. Leweling and Nissen (2007) used the questionnaire in conjunction with an ELICIT simulation experiment comparing performance levels between edge and hierarchy structures as part of broader “command and control” research.

The post-survey questionnaire used in the ELICIT experiment asked subjects to evaluate the simulated organization of their test group and the trust level they perceived during the game by indicating how much they agreed or disagreed with 16 different statements using a 7-point Likert scale with endpoints. Similar to the methods used by Brockner et al. (2004, pp. 82-83), the present research averages each set of four related numerical responses into a single index corresponding to each trust antecedent. Additionally, the average of these indices provides a trust index. Hence, each of the 135 subject responses consists of a total of 5 indices: “openness, competence, reliability, concern,” and an overall measure for trust.

Performance outcomes of speed and accuracy were used to measure the effects of the trust and structure manipulations. “Speed” refers to the time required by the subject to identify the simulation plot details correctly. During the experiment conducted by Moonier et al. (2008), the simulation software logged the time lapse in seconds of each subject, which was then normalized (based on a maximum time of 2,872 seconds) to a scale from 0 to 1 where 1 indicates a faster time. “Accuracy” is whether or not a subject answers each of the four plot questions of “who, where, what, when” correctly. A score is given for each component question correctly answered and is then normalized to a scale from 0 to 1. A normalized score of 1 indicates the subject solved each component of the simulated terrorist plot correctly; blank or “non” answers received a zero.

Data Analysis

The data analysis examines observable effects each trust antecedent has on performance within a given organizational structure. We present an overview and provide a comparison of the trust antecedents across the four experiment groups. Next, descriptive statistics and correlations are identified across the entire sample of 135 respondents, followed by regression analysis of the same sample in order to establish basic relationships among trust antecedents, organization structure type, and performance outcomes. Hypothesis testing and a summary of key findings conclude the analysis.

Descriptive Statistics

We took the mean of four trust factors to create a trust index, a single numerical value representing a participant's overall level of trust during the experiment. Table 1 shows the index means and the standard deviations for each antecedent and the trust index across the four experiment groups.

The openness index for each group falls below that of the other trust antecedents; its standard deviation, however, is the smallest in each group, indicating that the index may be more robust in its effect on performance than the other antecedents. As an example, the concern index for the edge (low trust) group falls below 5.0; however, its relatively high standard deviation implies it would be well above this level approximately 68 percent of the time. Interestingly, the trust omnibus for the hierarchy (high trust) condition is the second highest and has two antecedents whose levels surpass those of the edge (high trust) condition. However, openness in the hierarchy (high trust) group is the lowest value in the entire table.

The edge (high trust) condition has the greatest level of trust as measured in the post-simulation survey (mean = 5.23). This is consistent with previous findings (Powley & Nissen, 2009). Competence appears to be the primary input, but reliability, not openness (as hypothesized), is the secondary factor explaining the high values of trust in this experimental condition. Finally, in the hierarchy (low trust) condition reliability and competence account for the trust index.

Descriptive Statistics and Correlations

Descriptive statistics of the entire sample of 135 questionnaires are consistent with those found across experimental groups. In particular, the openness index level (mean) and standard deviation are again the lowest of the trust antecedents. Openness appears approximately equally correlated to each of

the other three antecedents and is weakly correlated with speed and accuracy. However, openness and structure are negatively correlated: As the openness index increases, the value for structure type “decreases” to 0, which represents the edge structure in this analysis.

Table 1. Descriptive Statistics by Group

| Group | | Openness | Competence | Reliability | Concern | Trust Index |
|----------------------------------|-------|----------|------------|-------------|---------|-------------|
| Hierarchy (high trust) (n=34) | Mean | 4.26 | 5.40 | 5.38 | 5.43 | 5.12 |
| | s. d. | 0.8140 | 1.1516 | 1.1336 | 1.1169 | 0.9796 |
| Edge (high trust) (n=35) | Mean | 4.93 | 5.45 | 5.32 | 5.24 | 5.23 |
| | s. d. | 0.7240 | 1.3996 | 1.3606 | 1.3352 | 1.1516 |
| Hierarchy (low trust) (n=33) | Mean | 4.56 | 5.24 | 5.23 | 5.09 | 5.03 |
| | s. d. | 0.8029 | 1.2303 | 1.1574 | 1.2132 | 1.0306 |
| Edge (low trust) (n=33) | Mean | 4.86 | 5.17 | 5.14 | 4.96 | 5.03 |
| | s. d. | 0.7182 | 1.0707 | 1.0479 | 1.1526 | 0.9301 |

A similar correlation occurs between structure type and performance indicators. As structure type “increases” toward the value representing the hierarchy (1), both speed and accuracy scores decrease. Focusing on the two highest (absolute value) correlation coefficients of the performance indicators also reveals a negative correlation between speed and reliability. Additionally, competence, concern, and the trust index are each negatively correlated to speed.

These relationships in Table 2 are counterintuitive, seem to go against the literature reviewed in Section II. The high correlation coefficients between the trust antecedents i.e., competence, reliability, concern, and the overall trust score (each $r > 0.90$) suggest multicollinearity. Several reasons may exist for this occurrence, including the possibility that the construct development for the survey items was not as robust as previously thought, that is, there may not be four empirically derived factors. A second possibility may be the improper administration of the questionnaire. Individuals participating in the experiment may have interpreted the questionnaire statements differently, unintentionally skewing the results. Alternatively, the need to feel trusted, to think of him or herself as exhibiting trusting behavior, or

to be perceived by others as trustworthy may create strong social desirability bias (that is, it is undesirable to be perceived as untrustworthy, particularly in military or intelligence contexts) further skewing responses to the questionnaire. In any case, these results make it difficult to clearly identify relationships among trust antecedents, organization structure types, and performance outcomes.

Table 2. Descriptive Statistics and Correlations (n=135)

| Variables | Mean | s. d. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-------------------------------|-------------|--------------|----------|----------|----------|----------|----------|----------|----------|
| <i>Trust Antecedents</i> | | | | | | | | | |
| 1. Openness | 4.65 | 0.802 | | | | | | | |
| 2. Competence | 5.32 | 1.213 | 0.667 | | | | | | |
| 3. Reliability | 5.27 | 1.173 | 0.666 | 0.943 | | | | | |
| 4. Concern | 5.18 | 1.208 | 0.617 | 0.901 | 0.923 | | | | |
| 5. Trust Index | 5.11 | 1.020 | 0.769 | 0.967 | 0.972 | 0.951 | | | |
| <i>Organization Type</i> | | | | | | | | | |
| 6. Structure (Hierarchy=1) | 0.50 | 0.502 | -0.302 | 0.002 | 0.033 | 0.067 | -0.029 | | |
| <i>Performance Indicators</i> | | | | | | | | | |
| 7. Speed Score | 0.17 | 0.149 | 0.073 | -0.122 | -0.166 | -0.105 | -0.101 | -0.082 | |
| 8. Accuracy Score | 0.39 | 0.286 | 0.083 | 0.061 | 0.029 | 0.009 | 0.045 | -0.181 | 0.281 |

Multivariate Analysis

In light of the multicollinearity among antecedents, we analyze some general regression models to determine any relationships among the variables. Table 3 summarizes the findings. Of the eight regression models, four include the dependent variable speed score (a) and four have accuracy score (b) as the dependent variable. The independent variables for models 1 and 2 include the trust antecedents; the trust index represents “trust” as the independent variable for models 3 and 4. Additionally, models 2 and 4 also include structure type as an independent variable.

Regressing all 135 responses reveals models 1a, 2a, and 4b as significant at the 0.01, 0.05, and 0.10 levels, respectively (see the Significance of F values in Table 3). Model 4b shows structure type (p-value = 0.0377) as significant at the 0.05 level, suggesting the idea that structure, not trust level, may have more of an impact upon accuracy. Model 1a demonstrates that openness and reliability significantly contribute to speed score at the 0.01 and 0.05 levels, respectively. This holds true when structure type is

introduced as an independent but insignificant variable, shown by Model 2a. Openness remains highly significant, while structure is not significant when included in the speed model. On the other hand, structure becomes significant at the 0.10 level when included in the accuracy regression, as seen in Model 2b. The model overall, however, is not significant (Sig. F = 0.3163).

Table 3. Results of Regression Analysis for (a) Speed and (b) Accuracy: Trust and/or Structure Type (n=135).

| | Models | | | | | | | |
|--------------------------|---------------|--------|--------|--------|--------|--------|--------|--------|
| | 1a | 1b | 2a | 2b | 3a | 3b | 4a | 4b |
| <i>Trust Antecedents</i> | | | | | | | | |
| Openness | 0.0054 | 0.4355 | 0.0088 | 0.9692 | | | | |
| Competence | 0.6644 | 0.2310 | 0.6562 | 0.2637 | | | | |
| Reliability | 0.0108 | 0.5936 | 0.0106 | 0.7051 | | | | |
| Concern | 0.1879 | 0.4118 | 0.2034 | 0.5395 | | | | |
| Trust Index | | | | | 0.2441 | 0.6020 | 0.2330 | 0.6408 |
| <i>Organization Type</i> | | | | | | | | |
| Structure (Hierarchy=1) | | | 0.7910 | 0.0811 | | | 0.3278 | 0.0377 |
| R ² | 0.1038 | 0.0213 | 0.1042 | 0.0442 | 0.0102 | 0.0021 | 0.0174 | 0.0343 |
| F | 3.7622 | 0.7068 | 3.0024 | 1.1929 | 1.3689 | 0.2733 | 1.1667 | 2.3429 |
| Sig. F | 0.0063 | 0.5887 | 0.0135 | 0.3163 | 0.2441 | 0.6020 | 0.3146 | 0.1000 |

In sum, across the entire sample of 135 questionnaire responses, speed score appears to be consistently dependent upon openness and reliability index levels. The observed openness indices reinforce this finding, whereas the multicollinearity among the antecedents weakens it. In contrast, accuracy score appears to be significantly determined by structure type and is reinforced by the correlations explained previously. Hypothesis testing follows next to analyze these results from the perspective of the reviewed literature.

Key Findings

The hypotheses formed in the present research make claims regarding a relative level of each trust antecedent. The regression models in Table 4 are numbered according to their respective hypothesis. Additionally, an “alternative” model at the far right reflects an unanticipated finding through

analysis of the data. The table does not include structure type or trust omnibus as these variables are defined by the group sample and, hence, are held constant.

Of the proposed hypotheses, none are supported in the regression analysis. Variations of these models (not listed), such as including all three independent variables of Models 1 and 2 into a single model, do not change the significance level of either the variables or the model itself. Furthermore, the R-square values of each hypothesis regression model are very small. Although only two different “cell groups” are included in the hypotheses, which focus on trust antecedents, all four were tested for comparison. Like the edge (high trust) and hierarchy (low trust) conditions, the edge (low trust) group was not significant overall and did not reveal any significant variables. Interestingly, however, the alternative model “a” (“Alt. a”) produced a relatively large R-square value of 0.3266 that is significant at the 0.01 level. The model reveals two highly significant ($p > 0.001$) trust antecedents: competence and reliability. Speed score in this group was highly determined by competence (somewhat similar to Hypothesis 1) and reliability (somewhat similar to Hypothesis 3). In this sense, portions of Hypotheses 1 and 3 are supported by the data in Table 4. For the hierarchy (high trust) group (Model “Alt. b”), trust antecedents did not determine accuracy scores; this reinforces the idea that structure type, rather than trust level, affects accuracy. Model “Alt. b” lends some support to Hypothesis 3, as well.

Table 4. Results of Hypothesis Testing for (a) Speed or (b) Accuracy: Trust Antecedents

| | Models for Hypothesis Testing | | | | | | | |
|-------------------------------|--------------------------------------|---------|---------|---------|---------|---------|---------|---------|
| | 1a | 1b | 2a | 2b | 3a | 3b | Alt.a | Alt.b |
| Group (n) | HE (35) | HE (35) | HE (35) | HE (35) | LH (33) | LH (33) | HH (34) | HH (34) |
| <i>Trust Antecedents</i> | | | | | | | | |
| Openness | 0.1761 | 0.7332 | | | | | | |
| Competence | 0.1298 | 0.6992 | | | | | 0.0007 | 0.3564 |
| Reliability | | | | | 0.2170 | 0.9453 | 0.0005 | 0.4439 |
| Concern | | | 0.7563 | 0.9471 | | | | |
| R ² | 0.0743 | 0.0050 | 0.0030 | 0.0001 | 0.0487 | 0.0002 | 0.3266 | 0.0299 |
| F | 1.2845 | 0.0803 | 0.0980 | 0.0045 | 1.5881 | 0.0048 | 7.5163 | 0.4778 |
| Sig. F | 0.2907 | 0.9230 | 0.7563 | 0.9471 | 0.2170 | 0.9453 | 0.0022 | 0.6246 |
| <i>Support for Hypothesis</i> | No | No | No | No | No | No | Yes | No |

Our analyses lead to several key findings. The data generally support the claims made by Moonier et al. (2008) and Powley & Nissen (2009), who identified the edge (high trust) condition as having the highest speed and accuracy scores that reflected the highest trust level. Additionally, the present analysis adds some empirical credence to the general assertion that the edge structure may be the most effective organization given a high level of trust among its members and between its corporate partners (Powley & Nissen, 2009; Leweling & Nissen, 2007; Alberts & Hayes, 2005). The trust index for the edge (high trust) group, as well as the negative correlation between structure type and trust index, reinforce this assertion. However, the data does not support a significant model utilizing trust index as an independent variable.

Limitations

Several of the seemingly important results are confounding because of the small sample size for each group, where $n < 40$ in each case and for which it is commonly desirable to have $n > 30$ for each independent variable included in a given model. Nevertheless, the sample $n = 135$ was sufficient for models including all four antecedents. Somewhat surprisingly, the hierarchy (high trust) group model with a sample of only 34 produced the most significant results in the present study, leading to a third and fourth key findings.

Obviously, human error exists in the creation and implementation of any controlled experiment. As part of the experiment, explanation and administration of the questionnaire instrument to the subjects may have included human error that unintentionally appeared in the results when coupled with small sample sizes of each experimental group. Alternatively, human error entered the data and subsequent analysis based on subjects' interpretation of the questionnaire statements. Personal biases of each subject desiring to be perceived by others as trustworthy also possibly skewed the data results. Both reasons might explain why openness has a consistently lower index across groups, yet no group model reflected openness as a significant variable. Error and bias may also account for the relatively strong HH model.

The high-trust hierarchy model above ("Alt. a") illustrates the most significant and consistent model contained in the present research. Considering the general design of the U.S. military organization,

and considering that the sampled members of the hierarchy (high trust) group come predominantly from the same organization, it is not entirely surprising that results in such an experiment may exhibit characteristics more in line with the nature of the organization and its members rather than those expected through a literature review encompassing a myriad of samples. The hierarchy (high trust) data are encouraging to this study, but further research is warranted to determine whether or not such results indicate a general relationship among trust antecedents, structure type, and performance indicators, or if the results more closely reflect a military culture in which high trust is valued as a means to achieve objectives rapidly (but not necessarily accurately) in a hierarchical structure.

The argument that trust is comprised of “trust antecedents” cannot be fully empirically supported based on our study. Mishra and Mishra (1994) created the instrument to help determine what characteristics of an individual come together into his or her trustworthiness as perceived by others. Mayer et al. (1995) and Schoorman et al. (2007) hold the same argument and call for empirical studies needed to corroborate their proposed trust model. Though somewhat limited in sample size and/or diversity, and requiring further experimentation and validation, the present data analysis suggests that trust antecedents may have an aggregate effect on speed and accuracy, rather than represent three separate trust factors. Of particular note, in some studies using the questionnaire, researchers opt not to report the trust factors separately, but instead consider the total items in the scale as an overall indicator of trust (see, for example, Brockner et al., 2004).

Implications

Managers and leaders can create conditions for a trusting environment (Levin et al., 2002). When trust is high, the more organic, flexible edge structure type offers the highest desirable results among the configurations tested in the present study and by Moonier et al. (2008) and Powley & Nissen (2009). In environments characterized by low trust, the rigid hierarchy structure provides more desirable results from the organization and team members than the edge structure (see also Dirks & Ferrin, 2001). The implication is that managers can achieve better performance outcomes under low trust conditions by structuring his or her team into a hierarchy, even if the outcomes are not as high as enabled by a edge (high trust) configuration. Additionally, the leader can establish a relative measure of trust level in his or

her organization in order to determine which structure type is most suitable. Another implication is that leaders and managers can distinguish the effects of trust level and structure type. For example, accuracy appears to be affected more by structure type, while trust level has a more noticeable impact on speed during problem solving. Alternatively, configuring a group into a hierarchy does not necessarily mean trust level will be low, nor does it mean performance outcomes will be poor. Such possibilities may be particularly useful to program managers operating in the dynamic, high-paced environment of DoD acquisition industry. Rather than feeling high trust is always required for success, the manager or team leader has an option through the hierarchy structure.

A low trust level is often due to factors beyond the manager's and group members' control: although they may trust each other personally, circumstances limit their trust professionally and functionally. The hierarchy characterized by bureaucracy serves as a trust substitute (Grey & Garsten, 2001). Bigley and Pearce (1998) explain: "The bureaucratic organizational form is an example of a trust-producing mechanism for situations where the scale and scope of economic activity overwhelm interpersonal trust relations" (p. 411). Schoorman et al. (2007) take a different view, asserting that the bureaucracy traditionally associated with a hierarchy only fosters a perception of trust; the cause for trust is actually found in trust antecedents. For example, the control systems in such an organization may be the perceived reason for "trusting" another. Yet, it is the trustor's benevolence and integrity that is "causing" the trustee to trust the trustor. Indeed, according to the findings of the present research, the hierarchy (high trust) configuration suggests that the trust antecedents of competence and reliability are responsible for the high trust level.

The implication for leaders and managers is that high levels of competence and reliability can produce a high level of trust in the organization and lead to better performance in a hierarchy structure. It seems reasonable, then, that the manager who fosters knowledge, skill sets, task completion, and a sense of loyalty in his or her employees/subordinates is inherently improving the performance (at least in terms of faster results) of the team. A challenge—also from the present study—that weakens this argument, however, is that only one of eight models tested reflected statistically significant antecedents. If

antecedents consistently produced unique trust levels, one would expect at least some of the other configuration models to show significant antecedent variables.

This report has introduced the application of the present research on trust, structure type, and performance outcomes to Integrated Product Teams in the DoD acquisition program. Currently, IPT structures typically are some hybrid of cross-functional matrices and/or network designs with a hierarchical structure. Like many other groups, IPTs are embedded in a larger social system (i.e., DoD and the Federal government) that largely defines the context in which these teams operate (Guzzo & Dickson, 1996). However, certain interventions can bring about improved team performance (Grey & Garsten, 2001), and further research considering the IPT as a more organic entity may lead to interventions that address trust antecedents and structure types. What if the IPT could—as a high-trust edge group, for example—self-organize around a pre-determined outcome in a way unique to that desired outcome? With additional research, prerequisite conditions and tools for program managers will be identified that help answer such questions. The world continues to become increasingly complex and the challenges facing DoD reflect this complexity (Jansen et al., 2009). As the GAO (2005) continues to identify trust as a key element for successful federal institutions, and scholars and practitioners alike recognize a need for greater understanding in such areas, this research is both relevant and timely.

Conclusion

Trust has gained increased recognition as an element vital to organizational survivability and success. The emergence of the post-bureaucratic trend at the turn of the 21st Century has lead researchers and practitioners to give much attention to the role of trust associated with an organization. As Kramer (1999) observes, “Trust has rightly moved from bit player to center stage in contemporary organizational theory and research” (p. 594). The present research has helped empirically validate this claim, especially as the DoD explores the future use of edge type groups and organizations, while continuing to refine its current traditional, robust hierarchy. This research empirically supports the argument that the edge organization in a high trust environment outperforms each of the other three trust-structure type configurations. Additionally, the hierarchy in a high trust environment studied here is found

to be robust, potentially reflecting a high regard for trusting behavior and rapid problem solving in a military culture.

References

- Adams, B. D. & Webb, R. D. G. (2002). "Trust in small military teams." Canada: Defence and Civil Institute of Environmental Medicine. Retrieved from http://www.dodccrp.org/events/7th_ICCRTS/Tracks/pdf/006.PDF
- Adler, P. S., & Borys, B. (1996). Two types of bureaucracy: Enabling and coercive. *Administrative Science Quarterly*, 41(1), 61-89.
- Alberts, D. S. & Hayes, R. E. (2005). *Power to the edge: Command and control in the information age*. Washington, DC: Command and Control Research Program.
- Barber, B. (1983). *The logic and limits of trust*. New Brunswick, NJ: Rutgers University Press.
- Bigley, G. A., & Pearce, J. L. (1998). Straining for shared meaning in organizational science: Problems of trust and distrust. *Academy of Management Review*, 23(3), 405-421.
- Brockner, J., Spreitzer, G., Mishra, A., Hochwarter, W., Pepper, L., & Weinberg, J. (2004). Perceived control as an antidote to the negative effects of layoffs on survivors' organizational commitment and job performance. *Administrative Science Quarterly*, 49(1), 76-100.
- Bromiley, P., & Cummings, L. L. (1995). Transactions costs in organizations with trust. *Research On Negotiation in Organizations*, (5), 219-247.
- Burns, T., & Stalker, G. M. (1961). *The management of innovation*. London: Tavistock Publications.
- Castells, M. (2002). An introduction to the information age. *City* 2(7): 6-16.
- Chandler, A. D. (2000). The information age in historical perspective: Introduction. In A. D. Chandler & J. W. Cortada (Eds.), *A Nation transformed by information: How information has shaped the United States from colonial times to the present*. New York: Oxford University Press.
- Covey, S. R. (2006). *The Speed of trust: The one thing that changes everything*. New York: Free Press.
- Creed, W. E. D., & Miles, R. E. (1996). Trust in organizations: A conceptual framework linking organizational forms, managerial philosophies, and the opportunity costs of controls. In R. M. Kramer & T. Tyler (Eds.), *Trust in organizations* (16-38). Newbury Park, CA: Sage.
- Defense Acquisition Guidebook (DAG) (2010). Defense Acquisition University, March 19, 2010.
- Deutsch, M. (1958). Trust and suspicion. *The Journal of Conflict Resolution (Pre-1986)*, 2(4), 265-279.
- Dirks, K. T., & Ferrin, D. L. (2001). The role of trust in organizational settings. *Organization Science*, 12(4), 450-467.
- Dirks, K. T., & Skarlicki, D. P. (2004). Trust in leaders: Existing research and emerging issues. In R. Kramer & K. Cook (Eds.), *Trust and distrust in organizations: Dilemmas and approaches*. (21-35). New York, NY: Russell Sage Foundation.
- Donaldson, L. (2001). *The contingency theory of organizations*. Thousand Oaks, CA: Sage Publications.
- Edison, T. R. (2007). *The Relationships between Work Team Strategic Intent and Work Team Performance*. 4th Annual Acquisition Research Symposium, May 2007. Monterey, CA: Naval Postgraduate School.

- Fast, W. R. (2009). What ever happened to certification? *Defense Acquisition Reform Journal*, 16(1), 2-17.
- Gambetta D. 1988. Can we trust trust? In *Trust: Making and Breaking Cooperative Relationships*, ed. D Gambetta, pp. 213–37. Cambridge: Blackwell.
- General Accounting Office. (1996). *Aviation acquisition: A comprehensive strategy is needed for cultural change at FAA* (GAO/RCED-96-159). Washington, DC: General Accounting Office. Retrieved from http://www.gao.gov/docsearch/locate?searched=1&o=0&order_by=rel&search_type=publications&keyword=RCED-96-159&Submit=Search
- Government Accountability Office. (2005). *Results-oriented government: Practices that can help enhance and sustain collaboration among federal agencies* (GAO-06-15). Washington, DC: Government Accountability Office. Retrieved from http://www.gao.gov/docsearch/locate?searched=1&o=0&order_by=rel&old_keyword=Results+oriented&ft=&rpp=25&order_by=rel&order_in=rel&search_type=publications&add_topic=&remove_topic=&add_type=&remove_type=&add_fed_type=&remove_fed_type=&add_fed_desc=&remove_fed_desc=&add_year=2000++2009&remove_type=&keyword=GAO-06-15
- Grey, C., & Garsten, C. (2001). Trust, control and post-bureaucracy. *Organization Studies*, 22(2), 229-250.
- Guzzo, R. A., & Dickson, M. W. (1996). Teams in organizations: Recent research on performance and effectiveness. *Annual Review of Psychology*, 47, 307-338.
- Hughes, R. L., Rosenbach, W. E., & Clover, W. H. (1983). Team development in an intact, ongoing work group: A quasi-field experiment. *Group & Organization Studies (Pre-1986)*, 8(2), 161-186.
- Jansen, E., Hocevar, S. P., Rendon, R. G., & Thomas, G. F. (2009). *The theory and measurement of interorganizational collaborative capacity in the acquisition and contracting context*. 6th Annual Acquisition Research Symposium, May 2009. Monterey, CA: Naval Postgraduate School.
- Kramer, R. M. & Tyler, T. (Eds.). (1996). *Trust in organizations*. Newbury Park, CA: Sage.
- Kramer, R. M. (1999). Trust and distrust in organizations: Emerging perspectives, enduring questions. *American Reviews Psychology*, 50, 569-598.
- Kramer, R. M. & Cook, K. S. (Eds.). (2004). *Trust and distrust in organizations: Dilemmas and approaches*. New York, NY: Russell Sage Foundation.
- Leavitt, H. J., & Bahrami, H. (1989). *Managerial Psychology: Managing behavior in organizations*. Chicago, IL: University of Chicago Press.
- Levin, D. Z., Cross, R., Abrams, L. C., & Lesser, E. L. (2002). Trust and knowledge sharing: A critical combination. IBM Global Services, Somers, NJ. Retrieved from <http://www-935.ibm.com/services/in/index.wss/ibvstudy/igs/x1022502?cntxt=x1022261>
- Levit, A. (2009, September 20). At work, are you trustworthy? The Wall Street Journal. Retrieved from <http://www.WSJ.com>

- Leweling, T. A., & Nissen, M. E. (2007). Hypothesis Testing of edge organizations: Laboratory experimentation using the ELICIT multiplayer intelligence game. *Proceedings from International Command & Control Research & Technology Symposium*. Newport, RI: Naval Postgraduate School.
- Lewicki, R. J., McAllister, D. J., & Bies, R. J. (1998). Trust and distrust: New relationships and realities. *Academy of Management Review*, 23(3), 438-458.
- Liu, X., Magjuka, R., & Lee, S. (2008). An examination of the relationship among structure, trust, and conflict management styles in virtual teams. *Performance Improvement Quarterly*, 21(1), 77-93.
- Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integration model of organizational trust. *Academy of Management Review*, 20(3), 709-740.
- McGrath, C., & Zell, D. (2009). Profiles of Trust: Exploring the Support Networks of Top Managers. *Sloan Management Review*, 50(2), 75-80.
- Miles, R. E., & Snow, C. C. (1992). Causes of failure in network organizations. *California Management Review*, 34(4), 53-72.
- Mintzberg, H. (1980). Structure in 5's: A synthesis of the research on organization design. *Management Science*, 26(3), 322-341.
- Mishra, A. K., & Mishra, K. E. (1994). The role of mutual trust in effective downsizing strategies. *Human Resource Management (1986-1998)*, 33(2), 261-279.
- Mishra, A. K. (1996). Organizational responses to crisis: The centrality of trust. In R. M. Kramer & T. Tyler (Eds.), *Trust in organizations* (pp. 261-287). Newbury Park, CA: Sage.
- Moonier III, J. E., Baker, S. L., & Greene, M. L. (2008). Trust, mistrust, and organizational design: Understanding the effects of social configurations (MBA Professional Report, Naval Postgraduate School, 2008). Monterey, CA: Naval Postgraduate School.
- Office of the Under Secretary of Defense for Acquisition Reform. (1996). *OIPT-WIPT Information Guide*. Washington, DC: Department of Defense. Retrieved from <https://acc.dau.mil/GetAttachment.aspx?id=24458&pname=file&aid=2867&lang=en-US>
- Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. (1999). Rules of the road: A guide for leading successful integrated product teams. Washington, DC: Department of Defense. Retrieved from <https://acc.dau.mil/GetAttachment.aspx?id=24458&pname=file&aid=2867&lang=en-US>
- Pitts, R. A. (1980). Toward a contingency theory of multibusiness organization design. *Academy of Management Review*, 5(2), 203-210.
- Porter, T. W., & Lilly, B. S. (1996). The effects of conflict, trust, and task commitment on project team performance. *International Journal of Conflict Management*, 7(4), 361-376.
- Powley, E. H., & Nissen, M. E. (2009). Trust-Mistrust as a Design Contingency: Laboratory Experimentation in a Counterterrorism Context. *Proceedings of the 14th International Command & Control Research and Technology Symposium, Washington, DC*. Manuscript intended for *Academy of Management Journal*.

- Rotter, J. B. (1967). A New Scale For The Measurement of Interpersonal Trust. *Journal of Personality*, 35 (4), 651-665.
- Rotter J. B. (1980). Interpersonal trust, trustworthiness, and gullibility. *American Psychology*, (35), 1-7.
- Ruekert, R. W. (1985). The organization of marketing activities: A contingency theory of structure and performance. *Journal of Marketing*, 49(1), 13-25.
- Schoorman, F. D., Mayer, R. C., & Davis, J. H. (2007). An integrative model of organizational trust: Past, present, and future. *Academy of Management Review*, 32(2), 344-354.
- Spreitzer, G. M., & Mishra, A. K. (1999). Giving up control without losing control: Trust and its substitutes' effects on managers' involving employees in decision making. *Group & Organization Management*, 24(2), 155-187.
- Spreitzer, G. M., & Mishra, A. K. (2002). To stay or to go: Voluntary survivor turnover following an organizational downsizing. *Journal of Organizational Behavior*, 23(6), 707-729.
- Valdez, R., & Kleiner, B. H. (1996). How to build teamwork in the defense industry. *Team Performance Management*, 2(2), 41-49.
- Webster's Collegiate Dictionary* (9th ed.). (1983). Merriam-Webster, Inc.
- Zand, D. E. (1972). Trust and managerial problem solving. *Administrative Science Quarterly*, 17(2), 229-239.
- Zolin, R., & Hinds, P. J. (2004). Trust in context: The development of interpersonal trust in geographically distributed work. In R. Kramer & K. Cook (Eds.), *Trust and distrust in organizations: Dilemmas and approaches* (pp. 214-235). New York, NY: Russell Sage Foundation.