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**MBA PROFESSIONAL REPORT**

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**Analysis of Trust in Integrated Product Teams (IPTs) in the Marine  
Corp Advanced Amphibious Assault Vehicle (AAAV) Program**

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June 2004**

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**ANALYSIS OF TRUST IN INTEGRATED PRODUCT TEAMS (IPT) IN THE  
MARINE CORP ADVANCED AMPHIBIOUS ASSAULT VEHICLE (AAAV)  
PROGRAM**

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INTEGRATED PRODUCT TEAMS (IPT) IN THE MARINE CORP ADVANCED  
AMPHIBIOUS ASSAULT VEHICLE (AAAV) PROGRAM**

**ABSTRACT**

Few studies have focused on the analysis of trust within an IPT team where military and civilian subcultures coexist. The purpose of this MBA Project was to provide an analysis of trust in the Advanced Amphibious Assault Vehicle (AAAV) Program. The primary objectives of this project were to identify significant relationships between trust of military and civilian personnel and to identify relationship between geographic workplace setting and trust of military and civilian personnel. The ultimate goal for the study was to provide recommendation for increasing the trust level among team members and in this way to enhance the acquisition process. Data were processed and analyzed using descriptive statistics, t-tests for differences in means before and after collocation and military versus civilian personnel, Pearson correlation coefficients, linear regression, and Chow's test.

Our analysis revealed significant differences between trust of military personnel and civilian personnel before collocation. We did not find and significant differences in trust between military and civilian personnel after collocation.

Also we found that there is a difference between trust of military team members before and after collocation of the working teams.

The study results showed that formal policies and procedures were a significant predictor of trust for military personnel before collocation, but not after collocation. Further research could focus on inspecting the relationships between trust of military personnel, formalism and geographic workplace settings.

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# I. INTRODUCTION

## A. BACKGROUND

Acquisition of investments, supplies, and services is one of the crucial processes for armed forces to achieve high readiness levels. Each year the U.S. federal government appropriates millions of dollars for the DOD to acquire necessary supplies and services. Each year, despite studies and reforms, DOD managers face the same problem: weapons cost too much, take too long to deploy, and do not perform as expected (Holland, 1988). Why do the problems persist despite the efforts to reform the acquisition process? What is needed to increase the efficiency and the effectiveness of acquisition process?

### 1. Cooperation

Cooperation between government and contractors plays a decisive part in the success of the acquisition process. Experience tells us that many times achieving good working relationships among acquisition partners is difficult. The difficulties stem from the differences between involved partners. Those differences can impede the development of good working relationships.

### 2. Difficulties

The military and civilian cultural backgrounds of partners on acquisition teams represent the main differences between the involved parties. These differences can be a source of diverse problem-solving approaches, a different depth of involvement in the project, contradictions in overall goals, and different stakes in the project.

Many times working teams are distributed over wide geographical locations. That is another source of difficulties because such a distribution hinders creating team values, team culture, and communication channels.

### 3. Leverages

For decades, many measures have been adopted to enhance the acquisition process. The reforms have focused on streamlining the acquisition process, improving cost-estimating processes, changing contracting procedures and legal regulations, establishing clear lines of authority, simplifying the selection process, and many other measures (Holland, 1998).

Less attention has been paid to the interpersonal relationships among the members of acquisition teams. We believe that trust is as important for the success of acquisition project as regulations, procedures, and organizational structure.

## **B. PROJECT OBJECTIVES**

A development of a new advanced amphibious assault vehicle (AAAV) is one of the Marine Corps' acquisition programs. In the beginning of the project the AAAV development team was situated in two locations. Later the team was collocated to one place. Two surveys were conducted among the members of the development team before and after the collocation.

The objectives of our project are

- To analyze gathered data and identify significant relationships (if they exist) between trust and various factors like the geographical location of the team and the military or cultural background of the team members.
- To provide recommendations, based on the results of our analysis, that increase the trust level among team members and in this way to enhance the acquisition process.

## **C. RESEARCH QUESTION**

In her research, Zolin (2003) inspected differences between trust in distributed and collocated working teams. She found no statistically significant relationship between trust and the geographical organization of the working teams.

The historical, cultural, working and managerial differences between military and civilian culture represent a challenge to trust for teams comprised of military and civilian members.

### **1. Main Research Question**

In our project, we closely examine the challenge represented by the military/civilian culture of trustors to the trust. At the same time we examine whether Zolin's finding about trust and the geographical organization of working teams is also valid for military or civilian team members. The focus of the project is expressed in the main research question:

*Does the trust of military trustors differ from the trust of civilian trustors?*

### **2. Secondary Research Question**

The secondary research question is as follows:

*Does geographical team organization (a distributed or collocated setting) impact the interpersonal trust of military and civilian team members?*

#### **D. SCOPE**

The study was accomplished in IPT teams, not outside of them. The survey was conducted only in one IPT team.

#### **E. METHODOLOGY**

The survey studies a target population consisted of approximately 200 government employees and 300 contractor employees. The participation rate was six percent from the government employees (12 persons) and nine percent from the contractor employees (26 persons).

The focus of the data analysis is to analyze the potential influence of a geographical setting and a military or civilian culture on the level of trust in teams. Thus the analyses is computed for various combinations of data split into groups according to the time of collection (before and after collocation) or according to the military or civilian background of the trustor. Data are processed and analyzed in four steps:

- We checked the data for complete responses. Respondents with partial entries were deleted. Also, multiple coding for the same respondent was eliminated. Then we computed the descriptive statistics.
- For the 150 directional dyads, t-tests for differences in means before versus after collocation and military versus civilian personnel are conducted. The tests were computed for both, equal variances assumption and unequal variances assumptions. When equal variances are assumed, Levene's test for equality of variances was conducted.
- To test for interrelationships between the variables, we computed Pearson's correlation coefficients with respective p-values.
- The linear regression was used for modeling the relationship between the trust – dependent variable and independent variables. The regression models were compared by Chow's test of equality of coefficients in two linear regressions.

## **F. ORGANIZATION OF THE STUDY**

Chapter I comprises the introduction and the background of the study, states the objectives of the study, the research questions, the scope and the methodology.

Chapter II consists of a literature review of trust, trust modeling and trustworthiness in cross-functional work, geographically distributed work, and collocated dyads work. This provides a background for a subsequent discussion of the influence of trust in dyads.

Chapter III describes the methodology of the survey and the statistical data analysis.

Chapter IV provides the results of the analysis of the data.

Chapter V discusses how the results could apply to military IPTs, shows the limitations of the study, and recommends further research.

## **II. LITRATURE REVIEW**

This chapter will present basic facts about “Alpha Contracting,” trust, and military and civilian culture. We also provide a brief overview of the new advanced amphibious assault vehicle acquisition project for which data for this study was gathered.

### **A. ALPHA CONTRACTING**

One of the approaches that the DOD uses to enhance the acquisition is incorporating more cooperation in the acquisition process. The U.S. Navy and Marine Corps has employed a procedure known as “Alpha Contracting,” which focused on implementing more collaboration into acquisitions. But the results of implementing the new procedure by government agencies are worse than the results given by the same procedure in commercial firms (GAO, 2001). Why do commercial firms achieve better results than DOD teams?

GAO report (GAO, 2001) lists low trust between government and contractor team members as one of the reasons for the ineffectiveness of DOD teams. This indicates that trust between team members may increase the efficiency of the DOD acquisition process.

Siemsen (2002) defines “Alpha Contracting” as a process by which confrontational negotiations between government and contractors are replaced by a collaborative process.

Under Alpha Contracting process “Integrated Product Teams” (IPT) are established comprised of all the participants in the acquisition (technical, supply, procurement teams, users, and contractor).

#### **1. Integrated Product Teams**

DOD defines an IPT as follows: “A cross-functional team formed for the specific purpose of delivering a product for an external or internal customer” (DoD, 2004).

Two surveys measuring the changes in trust level among IPT team members were conducted. The IPT teams (see Figure 1) were engaged in the “Advanced Amphibious Assault Vehicle” (AAAV) project.

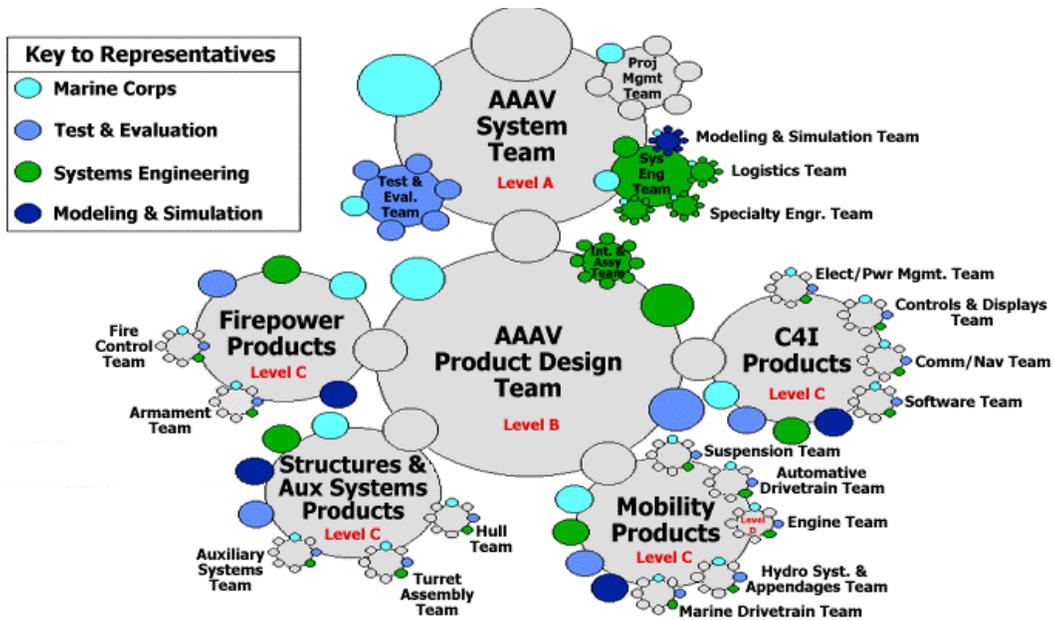


Figure 1. IPT Teams in Advanced Amphibious Assault Vehicle Program (From <http://www.acq-ref.navy.mil>)

## 2. Advanced Amphibious Assault Vehicle Project

New Advanced Amphibious Assault Vehicle is Marine Corps acquisition program managed under Alfa Contracting approach. The AAV is shown in Figure 2.

Figure 2. Advanced Amphibious Assault Vehicle (From [www.kitsune.addr.com](http://www.kitsune.addr.com))



AAV should replace the 30 year-old and less capable AAV7s (see comparison of AAV-AAV7 in Table 1). The Marine Corps has a requirement to procure 1,013 AAVs, and the program's total cost should be \$7.6 billion (Johnson, 1998).

Table 1. Comparison of Selected AAV Requirements with AAV's Current Capabilities

Function	AAAV requirement	AAV capability
Water speed	23 to 29 miles per hour	6 to 8 miles per hour
Cross-country land speed	Keep up with main battle tank, which travels at about 30 miles per hour	15 to 20 miles per hour
Range on water	65 miles	45 miles
Range on land	300 miles	300 miles
Troop-carrying capacity	18 combat-equipped troops	18 combat- equipped troops
Survivability (armor protection)	Survive 14.5mm bullets without attaching enhanced armor plating to vehicle's hull	Can only survive 14.5mm bullets if enhanced armor plating has been attached to vehicle's hull
Lethality (main armament)	Defeat light armored combat vehicles of 2005-2025 time-frame during day and night when moving	40mm and .50 caliber machine guns, which cannot defeat light armored combat vehicles of today

IPT teams engaged in the AAV development program initially operated in two locations. Now they are collocated in one location. Two surveys measuring the trust level and related variables among the team members were conducted before and after collocation, respectively.

## **B. TRUST**

The study of trust in an organization is a challenge for several reasons: (Mayer et al., 1995)

- Defining “trust” is problematic.
- The relationship between risk and trust lacks clarity.
- Trust is evaluated only from the trustor’s perspective.

The importance of trust is likely to increase during the coming years due to current trends in both the composition of the workforce and the organization of the workplace (Rousseau et al., 1998). Companies can benefit from high trust levels in a number of ways. Trust enables cooperative behavior (Gambetta, 1988), promotes adaptive organizational forms, such as network relations (Miles & Snow, 1992), reduces harmful conflict, facilitates rapid formulation of ad hoc groups (Meyerson, Weick, & Kramer, 1996) and promotes effective responses to crisis (Rousseau et al., 1998). Such benefits could be key factors for increasing organizational effectiveness.

Despite increasing interest in the study of trust, there is still no universally accepted definition of trust. Regardless of these divergences in trust studies, most trust theorists agree that trust is fundamentally a psychological state (Kramer, 1999). Rousseau et al. (1998) defined trust as “a psychological state comprising the intention to accept vulnerability based on positive expectations of the intentions or behavior of another.”

A lot of research has focused on identifying the bases of trust within organizations. Some of these divisions are as follows:

- “Deterrence-based trust” assumes that one party believes another because breaching the trust would be more costly than the expected benefits from keeping the trust (Shapiro et al., 1992).
- “Trust as a rational choice” is based on the incentives of the person who is trusted to honor or fulfill that trust (Hardin, 2002).
- “Calculus-based trust” emerges from reciprocal consequences according to Rousseau et al. (1998).
- “Relational trust” derives from repeated interactions over time between trustor and trustee (Rousseau et al., 1998) or more generally, it stems from the orientation toward other people and toward society as a whole (Kramer, 1999).
- “History-based trust” emerges from the cumulative interaction between people. It is a basis for initially calibrating and updating the trust-related expectations (Kramer, 1999).

Many times there is not enough direct information to make reasonable conclusions about trust. In these cases, substitution information is taken as a bases of trust. There are four primary forms of substitutional information.

- The first is “gossip” (Burt & Knez, 1995). This is the least reliable source of information because it is highly subjective.
- A more reliable trust substitution is “category-based trust,” which refers to trust predicated on information regarding a trustee’s membership in a social or organizational category (Kramer, 1999).
- “Role-based trust” constitutes another form of substitutional trust. It is based on the knowledge that a particular person occupies a specific role in the organization. This knowledge can serve as a proxy for personalized information about the person (Kramer, 1999).
- The fourth type of substitutional information is “rule-based trust,” which is based on shared understanding of the system of rules regarding appropriate behavior (Kramer, 1999).

### 1. Model of Trust

Various rational choices and relational perspectives would yield a different basis of trust and different images of trust. Hardin (2002) provides a way of moving beyond this difference. He proposed a three-part trust theory involving properties of a trustor, attributes of a trustee, and a specific context or domain over which trust is conferred.

Figure 3 shows the main blocks of the three-part trust model.

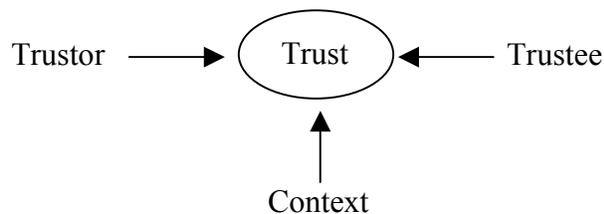


Figure 3. Three-part Trust Model

The properties and attributes of each of the blocks are discussed in the following text.

## **2. Characteristics of the Trustor**

### *Propensity to trust*

Propensity to trust might be thought of as the general willingness to trust others (Mayer et al., 1995). A propensity to trust influences how much trust one has for a trustee prior to acquiring data on that particular person.

## **3. Characteristics of the Trustee**

### *Trustworthiness*

Some people are more trusted than others. They have different characteristics determining their level of trustworthiness. Three characteristics that appear to explain the major portion of trustworthiness are “ability,” “benevolence” and “integrity” (Mayer et al., 1995). “Ability” refers to a group of skills, competencies, and characteristics that enable a party to have influence within some specific domain. “Benevolence” is the extent to which a trustee is believed to want to do good for the trustor. The relationship between “integrity” and “trust” involves the trustor’s perception that the trustee adheres to a set of principles that the trustor finds acceptable (Mayer et al., 1995).

### *Work Process*

The work process is a measure of the trustee’s flexibility, timeliness, creativity and ability to find practical solution to problems.

### *Perceived Follow-through*

Perceived follow-through is a measure of the trustor’s perception of the extent to which the trustee follows-through on commitments and delivers work on schedule (Zolin, 2003).

## **4. Characteristics of the Context Over Which Trust Is Conferred**

### *Risk*

Risk expresses what is at stake for a team member if another team member does not do his or her job (Zolin, 2003).

### *Reward*

Reward represents how important it is for a team member to achieve the goals of the project (Zolin, 2003).

### *Formalization*

Formalization refers to the degree to which communications and procedures in an organization are written. Hanks and Chandler (1995) proposed to measure three dimensions of formalization: formalization of documentation and policies, formalization of structure and reporting relationships, and formalization of planning and control systems.

### *Task Interdependence*

Task interdependence is the extent to which a team member must rely upon another team member to accomplish his task (Zolin, 2004).

## **C. MILITARY AND CIVILIAN CULTURE**

Military life differs from civilian life. The defense of the country is an around-the-clock obligation. Military service demands a high degree of commitment and subordination. It restricts some of the military personnel's freedoms and in deployment it often exposes them to life-threatening situations. Hence, military and civilian cultures obviously differ greatly and the difference determine how the military and the private sector do business.

At the general level, the different values can be seen as the primary difference between civilian and military cultures. The following civilian values were formed over the past 200 years of American history (Herson, 1984):

### **American Cultural Values**

- Liberty – Freedom to pursue one's own goals and freedom from inference
- Equality – Of opportunities and rewards
- Achievement – To strive to do one's best
- Justice – A system of law dedicated to moral ends
- Precedent – Past decisions should be followed in present circumstances
- Rule of law – Rulers and ruled alike are answerable to the law
- Private Property – Desire to be secure in one's own material comfort
- Localism – Government built on the foundation of federalism
- Democracy – Consent of the governed

Table 2 . Factors That Influence the Military-civilian Interface ( From Tweeddale, 2000)

Factor		Military		Civilian
1. Input	a.	Entry at basic pay grade	a.	Entry at varying pay grade levels
	b.	Grow managers from within	b.	No common academic experience/heritage
2. Continuing Education	a.	Subsidized	a.	Some subsidized programs available
	b.	Encouraged	b.	Sabbaticals not openly encouraged
3. Impact of Cultural Process	a.	Prepare for big picture	a.	Turnover likelihood enhanced with education
	b.	Skill retention high within Navy military force	b.	Identity tied to specific activity or own career field
	c.	Cultivate institutional identity	c.	No overarching profession
	d.	The military professional transcends job occupied		
4. Experience	a.	Broad experience in many jobs	a.	Experience accrual more focused
	b.	More “operations” experience	b.	Industry/government experience mix
	c.	Develops military management generalists	c.	Develops specialized expertise
5. Promotion	a.	Centralized promotion system	a.	Decentralized promotion system
	b.	Centralized fitness reports	b.	Promotion freezes not uncommon
	c.	Rank in person	c.	Rank in job
	d.	Performance appraisal system has withstood test of time	d.	Performance appraisal system historically ineffective
	e.	Predictable promotion patterns	e.	Unpredictable promotion patterns
6. Affiliative Network	a.	Peers (military)	a.	Peers (civilian) – less cohesive
	b.	Ties to Navy	b.	Ties to local community
7. Tour length	a.	Two to three years in the job	a.	Indefinite experience in the job
8. Retirement	a.	Forced retirement intrinsic system	a.	Forced retirement not practical
	b.	“Up and out” mobility	b.	“Up and stagnate” common late in the career
	c.	Institutionalized room at the top	c.	Late career anomie
9. Pay	a.	Early retirement allows for a second career	a.	Pay cap discriminates against most senior people

The general military values differ substantially from the general civilian values because military values revolve around the basic principle of obedience (Trainor, 2000). A common thread running through military values is the acceptance of being subordinate and assuming an unselfish role in service to the state. Bahr (1990) in his paper provides the following list of military values:

**Military Values**

- Obedience
- Loyalty
- Integrity
- Duty
- Selflessness
- Hierarchy
- Subordination
- Discipline

Clearly, vast differences exist between the cultures of the private sector and the military. Yet differences also exist on a more specific working level, as the Table 2 illustrates (Tweeddale, 2000).

For example, military members enter the system at the basic grade level and advance within the system to higher positions. Civilian members can enter the system at varying levels with no common academic or work experience.

Military members stay in one job two or three years, and then they are rotated to another job at the same or higher level. Civilian members can stay on the job for an indefinite time. The detailed list of factors influencing the military-civilian interface is in Table 2.

Military-civilian differences can also be found at the managerial level. A military manager has a strong orientation to the chain of command whereas the civilian has a strong orientation to the local activity or career field. The military manager's goals are constrained by tour length, mobility is centrally directed, and motivation is directed at achieving promotion through a good fitness report. The civilian manager's goals coincide with personal interests, mobility is self-directed, and growth opportunities may be seen as an effort to keep at least the current position and to take opportunities as they surface. The profile of those two managerial groups is in Table 3 (Tweeddale, 2000).

Table 3. A Profile of Career Civilian and Military Managers (From Tweeddale, 2000)

Characteristic		Military Manager		Career Civilian Manager
1. Orientation and Loyalties	a.	Fleet operations	a.	Local activity
	b.	Chain of command	b.	Career field
2. Goals	a.	Coincide with tour length	a.	Coincide with personal interests
3. Mobility	a.	Institutional	a.	Varies with individual
	b.	Centrally directed	b.	Self directed
4. Motivation	a.	Fitness report	a.	Keep what you have
	b.	Promotion potential	b.	Pursue growth opportunities as they surface
5. Decision Processes	a.	Military decision often perceived by civilians to be dysfunctional and incremental	a.	Civilian decisions perceived by military to be slow and parochial
6. Perception of Self	a.	Having ownership of command decision responsibility	a.	A staff resource
	b.	Controlling official	b.	Part of a caste system

#### D. IMPLICATIONS FOR RESEARCH

The literature as well as our experience tell us that military and civilian lives differ. The differences can be found in culture, values, career path, managerial styles, and in many other attributes of service and personal lives. Those differences let us assume that there is a significant difference in the trust level between military personnel and civilian personnel. For example, in the military environment, the prevailing trust perception is based on rules, history and deterrence whereas in the civilian environment, trust is perceived from the view of rational choice, roles, and third-party conduit.

The historical, cultural, working and managerial differences between military and civilian culture represent a challenge to trust for teams comprised of military and civilian members like IPT teams in AAV program. In our project, we closely examine this challenge. The focus of the project is expressed in the main research question:

*Does the trust of military trustors differ from the trust of civilian trustors?*

In our further analysis we focus on the relationship of geographical work place setting and trust. Zolin (2003) found that there is no significant relationship between those two

variables. We examine this relationship in the context of military and civilian background of the team members. We ask in our secondary research question

*Does geographical team organization (a distributed or collocated setting) impact the interpersonal trust of military and civilian team members?*

The answers to our research questions could indicate how DOD acquisition managers can increase the trust level in IPT teams composed of military and civilian team members. It also creates a basis for further research in the area of trust between military and civilian team members.

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### III. METHODOLOGY

This chapter describes the organization of research, the structure of data gathered in the survey, the methods of statistical analysis used, and the limitations for the research.

#### A. RESEARCH DESIGN

The research was executed in two surveys. The first survey was accomplished when the IPT teams were geographically distributed and the latter was administered three months after the IPT teams' collocation.

The surveys studied a target population composed of all twenty-eight IPT teams using the Alpha Contracting in the AA AV development program. Those IPT teams contained over 500 members consisting of approximately 200 government employees and 300 contractor employees.

A nonprobability convenience sampling method was used. All team members were invited to respond on a voluntary basis. The response rate was six percent from the government employees (12 persons) and nine percent from the contractor employees (26 persons). Consequently, caution must be exercised in interpreting the results of our analysis since we may not have a representative sample.

Our database comprises responses only of those respondents who participated in both surveys, as shown in Figure 4.

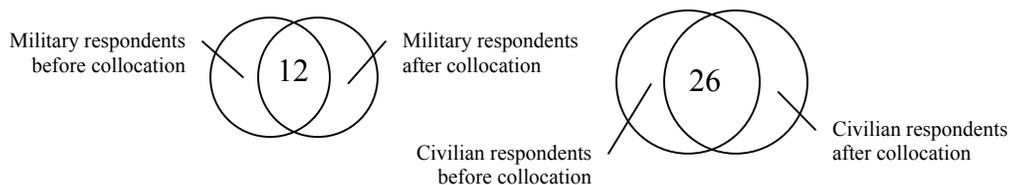


Figure 4. Respondents' Participation in Surveys

The respondents were asked to provide information on their work relationship with four other employees chosen at random. This design created pairs of trustor (respondent) – trustee called “directional dyads.” The directional dyad is the unit of analysis. Thirty eight trustors reported on a total of 150 trustees, resulting in 150 directional dyads. The theoretical number of directional dyads by the participation of 38 respondents is 152 ( $38 \times 4 = 152$ ). Our

number of directional dyads (150) tells us that some respondents provided information on less than four coworkers. Figure 5 shows in detail the database design based on the surveys results.

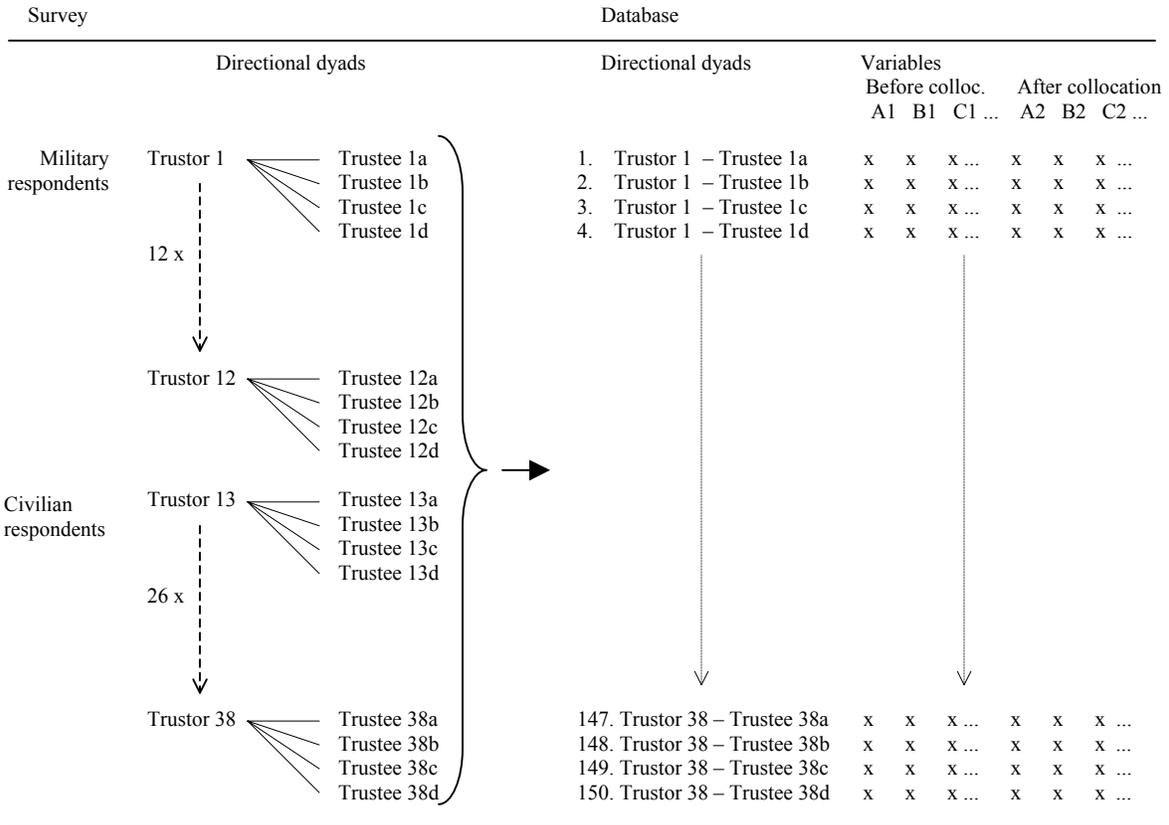


Figure 5. Survey Design and Database Structure

In the first part of the survey, the respondents were asked to answer questions about their demographics. In the second part, they provided information about the trust items between them and the trustees. The survey questions are presented the Appendix 1.

**B. DATA COLLECTION**

Team members were asked to complete an online survey. The gathered data were about the members’ own demographics and about facts related to the trust of the other team members in the directional dyads. Data was collected in a form to provide potential metrics for dependent and independent variables as shown in Table 4.

Table 4. Constructed Dependent and Independent Variables

Independent Variables (# of primary questions)	Dependent Variables (# of primary questions)
Checking behavior (3)	Trust (4)
Trust to other teams (4)	
Trust to one's own team (4)	
Formal policies and procedures (8)	
Risk (1)	
Reward (1)	
Perceived trustworthiness (15)	
Perceived follow-through (4)	
Work Process (4)	
Task interdependence (5)	
Propensity to trust (7)	
Project communication (1)	
Coordination communication (1)	
Personal communication (1)	
Initiation of communication (1)	

All variables, except for the communication variables (project communication, coordination communication, personal communication, initiation of communication) were measured using a 7-point Likert scale. For example, one of four questions about trust was “I would be willing to let this person have complete control over my future on this project.” The respondent could answer the question on a 7-point scale starting from “Strongly disagree” (1 point) and ending at “Strongly agree” (7 points).

The variables trust, trust to one's own team, and trust to other teams were measured using a scale developed by Mayer and Davis (1999). Another scale by the same author was used to measure perceived trustworthiness. Zolin (2001) proposed the scales for checking behavior, risk, reward, and perceived follow-through variables. Formalism was measured on a scale by Hanks and Chandler (1995). The scale for task interdependence was developed by Sims et al. (1976) and for the work process variable by Zaheer et al. (1998).

The variable measuring who initiated interaction was measured using the ratio scale. For example, the following question asks about the percentage of communication started by

the trustor: “Of all the times you have interacted with this team member in the last month, what percentage of those interactions were initiated by you?”

The communication variables were measured by question about the number of hours the trustor and trustee spent in face-to-face communication: “On average, how many hours per week do you talk face-to-face with each team member?”

Communication variables were not used further in the analysis because the relationship of those types of communication measures to trust was not the focus of our particular research.

Each variable in Table 4 except for the communication variables, the risk variable, and the reward variable were constructed from an aggregation of the subset of questions in that area. Subsets of primary questions could be as small as three individual questions or as large as 15 individual questions. The value of a constructed variable is computed as an average value of the answers to the respective primary questions in that area. For example, a subset of questions for the “CHECKING” variable was comprised of three primary questions:

- To what extent do you check to see if this team member is working on his/her commitments?
- To what extent do you compare the work of this team member to others to evaluate his/her contribution to the group?
- To what extent do you verify this team’s progress on the deliverables she/he promised?

For an illustration, a set of answers on those questions for one directional dyad (trustor-trustee) were 5, 6, 6 before collocation and 1, 2, 4 after collocation. This gives us a value of the checking variable for that specific dyad before collocation equal to  $(5+6+6) \div 3 = 5.67$  and after collocation  $(1+2+4) \div 3 = 2.67$ .

Where the question was reversed in the meaning from the overall direction of other questions in the scale, answers from the 7-point Likert scale were reversed.

This data construction process yielded the 12 variables for the 150 trustor-trustee dyads both before and after collocation illustrated in the last column of Figure 5.

### **C. DATA ANALYSIS**

The focus of the data analysis is to analyze the potential influence of a geographical setting and a military or civilian culture on the level of trust in IPTs. Thus the analyses were

computed for various combinations of data split into groups according to the time of collection (before and after collocation) or according to the military or civilian background of the trustor. The data was processed and analyzed in four steps:

- We checked the data for complete responses. Respondents with partial entries will be deleted. Also, multiple coding for the same respondent will be eliminated. Then we computed the descriptive statistics.
- For the 150 directional dyads, t-tests for differences in means before versus after collocation and military versus civilian personnel were conducted. The tests were computed for both equal variances assumption and unequal variances assumptions. When equal variances are assumed, Levene's test for equality of variances was conducted.
- To test for interrelationships between the variables in Table 4, we computed Pearson correlation coefficients with respective p-values.
- The linear regression was used to model the relationship between the trust – dependent variable and independent variables. Chow's test for equality between sets of coefficients in two linear regressions was used for hypotheses testing.

#### **D. LIMITATIONS**

The statistical analysis was limited by the small number of respondents. Only 38 persons out of about 500 participated in the survey. Thus the small number of respondents did not lend itself to assessing the influence of the military or civilian culture on the trust level in detail. We divided the available dyads into military or civilian only by the trustor's background. Further division by the trustee's background would yield a sample too small for reliable statistical analysis.

The influence of the geographical setting was measured from the data collected before the collocation and three months after the collocation of the teams took place. But, of course, the affects of collocation on the working team may ensue after three months. A longitudinal study could analyze this problem in more detail and provide more reliable conclusions.

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## IV. RESULTS

In this chapter we will present the results of statistical analysis of trust and other trust-related variables of 150 directional dyads trustor-trustee. The data were gathered in two surveys among IPT teams working on the AAV project during 2003. The first survey was conducted before collocation and the other after collocation. The teams were formed of military and civilian team members.

In our analysis we focused on the following research questions:

**Q1:** Does the trust of military trustors differ from the trust of civilian trustors?

**Q2:** Does geographical team organization (distributed or collocated setting) impact interpersonal trust of military and civilian team members?

Table 5 shows descriptive statistics for all the collected variables. The upper part of the table encompasses the data collected before collocation (month 1), and the lower part contains data collected after collocation (month 3). The first column of the table is a list of explanatory variables. Columns 2 to 4 show descriptive statistics for variables related to military personnel. Descriptive statistics for civilian personnel are in columns 5 to 7.

In approximately one-third of the dyads, the trustors were military team members and in the remaining two-thirds of the dyads, the trustors were civilian team members.

For all team-members (military and civilian) and at both times (before and after collocation) the value of the trust level was above the middle of the measurement scale ( $\bar{x} > 4.77$  out of 7), indicating that IPT team members tend to report high trust for each other.

The variables like reward, perceived trustworthiness, perceived follow-through, work process, and task interdependence also had high values ( $\bar{x} > 5.00$  out of 7).

Table 5  
Descriptive statistics for month one (1) - before collocation and month three (3) - after collocation

	Military personnel			Civilian personnel		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Trust (1)	40	5.33	1.52	97	4.78	1.54
Checking behavior (1)	42	3.37	1.87	97	2.68	1.77
Trust to the other teams (1)	39	5.15	0.93	41	4.66	0.40
Trust to one's own team (1)	46	5.07	0.90	104	4.56	0.76
Formal policies and procedures (1)	46	4.60	0.96	104	4.26	1.11
Risk (1)	46	4.07	1.05	104	4.21	1.08
Reward (1)	42	5.19	0.74	104	6.08	0.92
Perceived trustworthiness (1)	40	5.76	1.20	91	5.55	1.20
Perceived follow-through (1)	40	5.97	1.25	94	5.35	1.24
Work process (1)	42	5.72	1.06	93	5.22	1.50
Task interdependence (1)	41	6.57	2.10	95	4.93	2.57
Propensity to trust (1)	46	3.85	0.55	104	4.23	0.64
Trust (3)	46	4.90	1.70	104	4.92	1.61
Checking behavior (3)	46	3.01	1.61	92	2.36	1.64
Trust to the other teams (3)	34	3.93	0.61	72	3.88	0.67
Trust to one's team (3)	38	4.24	0.68	92	4.35	0.83
Formal policies and procedures (3)	38	4.53	0.89	92	4.19	1.11
Risk (3)	38	3.76	1.10	92	4.15	1.34
Reward (3)	38	5.08	1.34	92	5.78	0.98
Perceived trustworthiness (3)	46	5.58	1.25	101	5.33	1.31
Perceived follow-through (3)	45	5.49	1.51	104	5.00	1.58
Work process (3)	46	5.20	1.32	99	5.03	1.49
Taks interdependence (3)	46	5.83	2.19	95	4.72	2.50
Propensity to trust (3)	38	4.00	0.52	92	4.21	0.55

For military team members the highest value for any variable was task interdependence. The mean value of the task interdependence variable for the military team members before collocation was  $\bar{x}=6.57$  ( $s=2.10$ ) on a scale from 1 to 7. Therefore military team members relied upon other team members to accomplish their tasks to a large extent.

For civilian team members, the highest value for any variable was reward. The mean of the reward variable for the civilian team members before collocation was  $\bar{x}=6.08$  ( $s=0.92$ ) on a scale from 1 to 7.

Checking behavior had the lowest value among measured variables. The means for checking was in a range from  $\bar{x}=2.36$  for the civilian personnel before collocation to  $\bar{x}=3.37$  for the military personnel before collocation. This result agrees with the theory that the

checking behavior is a reversed measure of trust (Zolin and Hinds, 2003). When the mean of the trust variable is high, then the mean of the checking variable should be low. This is exactly what we observed in our data.

Task interdependence had the widest dispersion of the values. On a scale of 1 to 7, the standard deviation of task interdependence for all personnel was approximately  $s=2.50$ . This aligns with our expectations because trustors reported on team members selected at random. Therefore a wide range of interdependence would be expected.

In the next section, we analyze the results of the t-test for equality of means of variables for

- military personnel compared to civilian personnel (last three columns on Table 6),
- all personnel before collocation compared to all personnel after collocation (Table 8).

## **A. T-TEST FOR EQUALITY OF MEANS**

Our goal was to identify the differences in trust between military and civilian personnel and before and after collocation by comparing the means of the trust variable and other trust-related variables. We started by identifying the differences in trust between military and civilian team members.

### **1. Trust Differences Between Military and Civilian Team Members**

In the first step we compared trust and other variables between military team members and civilian team members, which were collected before collocation.

#### ***a. Trust Level Before Collocation***

The trust level of military team members was  $\bar{x}=5.33$  ( $s=1.52$ ) while the trust level of civilian team members was  $\bar{x}=4.78$  ( $s=1.54$ ) (see Table 6). The difference of trust was  $\Delta\bar{x}=0.55$  (see Table 6). However, according to the  $p$ -value = 0.06 the difference between the means was not statistically significant at the level of significance  $\alpha = 0.05$ .

This is a very sensitive statistical result. The working hypothesis for the t-test was: “The mean of trust of military personnel equals the mean of trust of the civilian

personnel". The p-value for the working hypothesis is 0.06. This is very close to our test significance of 0.05. A larger sample may very well result in a rejection of this hypothesis. Likewise, a larger test significance ( $\alpha = 0.10$ ) would result in the rejection of this working hypothesis.

Table 6.  
T-test for equality of means of trust variables of military versus civilian personnel

	Military personnel		Civilian personnel		T-test for Equality of Means		
	N	Mean	N	Mean	Mean Difference	t	Sig. (2-tailed)
<i>Before collocation</i>							
Trust	40	5.33	97	4.78	0.55	1.91	0.06
Checking behavior	42	3.37	97	2.68	0.69	2.07	0.04
Trust to the other teams	39	5.15	41	4.66	0.50	3.05	0.00
Trust to one's own team	46	5.07	104	4.56	0.50	3.52	0.00
Formal policies and procedures	46	4.60	104	4.26	0.33	1.77	0.08
Risk	46	4.07	104	4.21	- 0.15	- 0.77	0.44
Reward	42	5.19	104	6.08	- 0.89	- 5.55	0.00
Perceived trustworthiness	40	5.76	91	5.55	0.20	0.90	0.37
Perceived follow-through	40	5.97	94	5.35	0.62	2.64	0.01
Work process	42	5.72	93	5.22	0.51	2.24	0.03
Task interdependence	41	6.57	95	4.93	1.64	3.89	0.00
Propensity to trust	46	3.85	104	4.23	- 0.38	- 3.51	0.00
<i>After collocation</i>							
Trust	46	4.90	104	4.92	- 0.02	- 0.07	0.95
Checking behavior	46	3.01	92	2.36	0.65	2.22	0.03
Trust to the other teams	34	3.93	72	3.88	0.05	0.38	0.70
Trust to one's own team	38	4.24	92	4.35	- 0.10	- 0.69	0.49
Formal policies and procedures	38	4.53	92	4.19	0.33	1.64	0.10
Risk	38	3.76	92	4.15	- 0.39	- 1.59	0.12
Reward	38	5.08	92	5.78	- 0.70	- 3.32	0.00
Perceived trustworthiness	46	5.58	101	5.33	0.25	1.09	0.28
Perceived follow-through	45	5.49	104	5.00	0.29	1.22	0.22
Work process	46	5.20	99	5.03	0.17	0.66	0.51
Task interdependence	46	5.83	95	4.72	1.11	2.57	0.01
Propensity to trust	38	4.00	92	4.21	- 0.21	- 1.96	0.05

Further we analyzed the differences among other variables related to trust.

The checking behavior of military personnel was represented by the mean  $\bar{x} = 3.37$  ( $s = 1.87$ ), whereas the mean of checking behavior for civilian personnel was  $\bar{x} = 2.68$  ( $s = 1.77$ ). The difference in checking behavior  $\Delta\bar{x} = 0.69$  was statistically significant (p-

value=0.04). Military team members check on their partners more than civilian team members.

The level of the military personnel's reward expectation from the project was  $\bar{x}=5.19$  ( $s=0.74$ ), which was by 0.89 ( $p\text{-value}=0.00$ ) less than the civilian personnel's reward expectation ( $\bar{x}=6.08$ ,  $s=0.92$ ). The difference in the reward variable implies that rewards from the project are more important for civilian personnel than for military personnel.

The perceived follow-through difference between military team members ( $\bar{x}=5.97$ ,  $s=1.25$ ) and civilian team members ( $\bar{x}=5.35$ ,  $s=1.24$ ) was  $\Delta\bar{x}=0.62$  ( $p\text{-value}=0.01$ ). Military team members tend to perceive trustee's follow-through on commitments and work deliveries on schedule higher than civilian members do.

Military team members see their working partners as more competent ( $\bar{x}=5.72$ ,  $s=1.06$ ) on average by  $\Delta\bar{x}=0.51$  ( $p\text{-value}=0.03$ ) than civilian personnel see their working partners ( $\bar{x}=5.22$ ,  $s=1.50$ ).

The level of task interdependence for military personnel was  $\bar{x}=6.57$  ( $s=2.10$ ) and for civilian personnel it was  $\bar{x}=4.93$  ( $s=2.57$ ). Based on the task interdependence difference  $\Delta\bar{x}=1.64$  ( $p\text{-value}=0.00$ ), we imply that military personnel rely upon other team members much more than civilian team members do.

Military team members reported lower propensity to trust ( $\bar{x}=3.85$ ,  $s=0.55$ ) than civilian personnel ( $\bar{x}=4.23$ ,  $s=0.64$ ). The negative difference  $\Delta\bar{x}=-0.38$  ( $p\text{-value}=0.00$ ) tells us that civilian team members are more likely to trust unknown people than military team members.

In our analysis we found that before collocation there was no significant difference in the trust level between the military team members and civilian team members at the significance level  $\alpha = 0.05$ . Nevertheless, we found significant differences in other factors related to trust. They are summarized in Table 7.

Table 7.

Variables with Statistically Significant Differences between Military Personnel compared to Civilian Personnel

<i>Variable</i>	<i>Before Colocation</i>		<i>After colocation</i>	
		p-value		p-value
Trust		0.06		0.95
Higher perceived follow-through		0.01 **		0.22
Higher checking on their partners		0.04 *		0.03 *
Higher work process		0.03 *		0.51
Higher task interdependence		0.00 ***		0.01 **
Lower perception of rewards		0.00 ***		0.00 ***
Lower propensity to trust		0.00 ***		0.05 *

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001

#### ***b. Trust Level After Collocation***

The results of the t-test for equality of means after collocation did not show any significant differences in trust between military and civilian personnel.

After collocation most of the differences in other variables (perceived follow-through, work process, and propensity to trust) between military and civilian team members ceased. However, four significant differences remained. They are presented in Table 7.

Military personnel still wanted to check on their partners more than civilian members after collocation. The level of checking behavior was  $\bar{x} = 3.01$  ( $s = 1.61$ ) for military personnel and  $\bar{x} = 2.36$  ( $s = 1.64$ ) for civilian personnel. The difference was  $\Delta\bar{x} = 0.65$  ( $p\text{-value} = 0.03$ ).

Civilian personnel still expected more reward from the project ( $\bar{x} = 5.78$ ,  $s = 0.98$ ) than military personnel ( $\bar{x} = 5.08$ ,  $s = 1.34$ ) after collocation.

Military personnel still relied upon their partners more than civilian team members after collocation. The task interdependence level for military personnel was  $\bar{x} = 5.83$  ( $s = 2.19$ ) and  $\bar{x} = 4.72$  ( $s = 2.50$ ) for civilian personnel. Military personnel rely more upon other team members.

Civilian team members were still more likely to trust unknown people than military team members.

*c. Summary of Analysis of Trust Differences Between Military and Civilian Team Members*

The trust level of military team members did not significantly differ from the trust level of civilian team members ( $\alpha = 0.05$ ).

There were significant differences in other trust related factors. Before collocation, military team members perceived trustee's follow-through on commitments to be higher than civilian team members. Moreover, military team members checked more on their partners, considered them more competent, and more relied upon them. Civilian team members saw the rewards from the project as more important, and they were more likely to trust unknown people.

After collocation, significant differences remained in checking behavior, task interdependence, and reward. Military personnel checked more on their partners and relied more upon other team members. Civilian team members perceived the rewards from the project as more important.

In the following analysis, we identified the differences in trust level before and after collocation.

**2. Trust Differences Between Team Members Before and After Collocation**

In the first part of our analysis we focused on the differences in trust and other variables reported by military personnel before and after collocation.

*a. Trust Level of Military Personnel*

The trust level of military personnel changed from  $\bar{x} = 5.33$  ( $s = 1.52$ ) before collocation to  $\bar{x} = 4.90$  ( $s = 1.70$ ) after collocation (column 3 in Table 5). The difference  $\Delta\bar{x} = 0.43$  (see Table 8) was not significant ( $p\text{-value} = 0.23$ ).

Table 8.

T-test for equality of means of trust variables before versus after collocation

	Before collocation		After collocation		T-test for Equality of Means		
	N	Mean	N	Mean	Mean Difference	t	Sig. (2-tailed)
<i>Military personnel</i>							
Trust	40	5.33	46	4.90	0.43	1.22	0.23
Checking behavior	42	3.37	46	3.01	0.35	0.94	0.35
Trust to the other teams	39	5.15	34	3.93	1.22	6.50	0.00
Trust to one's own team	46	5.07	38	4.24	0.82	4.64	0.00
Formal policies and procedures	46	4.60	38	4.53	0.07	0.34	0.73
Risk	46	4.07	38	3.76	0.30	1.29	0.20
Reward	42	5.19	38	5.08	0.11	0.47	0.64
Perceived trustworthiness	40	5.76	46	5.58	0.18	0.66	0.51
Perceived follow-through	40	5.97	45	5.49	0.48	1.59	0.12
Work process	42	5.72	46	5.20	0.52	2.05	0.04
Task interdependence	41	6.57	46	5.83	0.74	1.59	0.12
Propensity to trust	46	3.85	38	4.00	- 0.15	- 1.29	0.20
<i>Civilian personnel</i>							
Trust	97	4.78	104	4.92	- 0.14	- 0.63	0.53
Checking behavior	97	2.68	92	2.36	0.31	1.27	0.21
Trust to the other teams	41	4.66	72	3.88	0.78	7.65	0.00
Trust to one's own team	104	4.56	92	4.35	0.22	1.91	0.06
Formal policies and procedures	104	4.26	92	4.19	0.07	0.45	0.65
Risk	104	4.21	92	4.15	0.06	0.34	0.73
Reward	104	6.08	92	5.78	0.29	2.17	0.03
Perceived trustworthiness	91	5.55	101	5.33	0.22	1.22	0.23
Perceived follow-through	94	5.35	104	5.00	0.15	0.85	0.40
Work process	93	5.22	99	5.03	0.18	0.84	0.40
Task interdependence	95	4.93	95	4.72	0.21	0.56	0.58
Propensity to trust	104	4.23	92	4.21	0.03	0.30	0.76

The trust of military team members did not change significantly after the teams were collocated. The trust variable of the military team members before collocation was strongly related to the trust variable of the military team members after collocation. Table 9 shows correlation matrices for the explanatory variables for military personnel before and after collocation. The last row in the upper part of the table shows the correlation coefficient for the trust of military team members before (month 1) and after collocation (month 3)  $r = 0.85$ , significant at 0.01 level.

Table 9.

Correlation matrix for **military personnel** for month one (1) – before collocation and trust in month three (3) – after collocation

	1	2	3	4	5	6	7	8	9	10	11	12
1 Trust (1)												
2 Checking behavior (1)	0.02											
3 Trust to other teams (1)	0.08	- 0.20										
4 Trust to one's own team (1)	0.16	- 0.16	0.98**									
5 Formal policies and procedures (1)	0.09	- 0.43**	0.22	0.14								
6 Risk (1)	- 0.07	- 0.12	0.26	0.12	0.54**							
7 Reward (1)	0.18	0.28	0.47**	0.42**	0.24	0.50**						
8 Perceived trustworthiness (1)	0.90**	- 0.08	0.21	0.27	- 0.09	- 0.18	0.01					
9 Perceived follow-through (1)	0.63**	- 0.22	- 0.06	- 0.05	- 0.06	- 0.06	- 0.08	0.73**				
10 Work process (1)	0.76**	- 0.14	0.14	0.20	0.03	- 0.04	- 0.07	0.89**	0.73**			
11 Task interdependence (1)	0.32*	0.56**	- 0.15	- 0.10	- 0.17	0.06	- 0.03	0.18	0.11	0.18		
12 Propensity to trust (1)	0.08	- 0.44**	0.29	0.32	0.62**	- 0.09	0.04	0.14	0.13	0.25	- 0.36*	
13 Trust (3)	0.85**	0.09	0.17	0.24	0.00	0.02	0.35*	0.78**	0.57**	0.72**	0.19	0.17

\*\*p &lt; 0.01, \*p &lt; 0.05.

Correlation matrix for **military personnel** for month three (3) – after collocation and trust in month one (1) – before collocation

	1	2	3	4	5	6	7	8	9	10	11	12
1 Trust (3)												
2 Checking behavior (3)	- 0.22											
3 Trust to other teams (3)	0.33	0.23										
4 Trust to one's own team (3)	0.53**	0.23	0.38*									
5 Formal policies and procedures (3)	0.05	0.32	0.85**	0.11								
6 Risk (3)	- 0.11	0.58**	0.14	0.20	0.26							
7 Reward (3)	0.23	0.06	0.26	0.16	- 0.06	0.17						
8 Perceived trustworthiness (3)	0.90**	- 0.09	0.29	0.47**	0.16	0.15	0.27					
9 Perceived follow-through (3)	0.73**	- 0.23	0.24	0.38*	0.10	0.18	0.16	0.85**				
10 Work process (3)	0.77**	0.06	0.55**	0.52**	0.42**	0.18	0.21	0.85**	0.70**			
11 Task interdependence (3)	0.06	0.66**	0.22	0.11	0.28	- 0.60**	0.09	0.18	- 0.03	0.33*		
12 Propensity to trust (3)	0.02	0.40	0.39*	0.26	0.44**	0.80**	0.40*	0.24	0.23	0.40*	0.50**	
13 Trust (1)	0.85**	0.16	0.33	0.57**	0.12	- 0.10	- 0.10	0.84**	0.78**	0.79**	0.05	0.05

\*\*p &lt; 0.01, \*p &lt; 0.05.

From the descriptive statistics we see that military team member's level of trust for other teams was  $\bar{x} = 5.15$  ( $s=0.93$ ) before collocation and changed to  $\bar{x} = 3.93$  ( $s=0.61$ ) after collocation. The difference  $\Delta\bar{x} = 1.22$  ( $p\text{-value}=0.00$ ) shows that collocation significantly lowered the trust of military team members of other teams.

Similarly, the trust of military team members for their own team was lowered after collocation. Military personnel reported a value of  $\bar{x} = 5.07$  ( $s=0.90$ ) for trust for their own team before collocation. After collocation, the value of that variable sank by  $\Delta\bar{x} = 0.82$  ( $p\text{-value}=0.00$ ) to a new level of  $\bar{x} = 4.24$  ( $s=0.68$ ).

The military personnel's perception of their partner's work process reduced from  $\bar{x} = 5.72$  ( $s=1.06$ ) before collocation to  $\bar{x} = 5.20$  ( $s=1.32$ ) after collocation. Collocation lowered the military personnel's perception of their partner's work process by  $\Delta\bar{x} = 0.52$  ( $p\text{-value}=0.04$ ).

#### ***b. Trust level of Civilian Personnel***

The trust level reported by civilian personnel before collocation was  $\bar{x} = 4.78$  (see Table 8). After collocation it increased by a value of  $\Delta\bar{x} = 0.14$  ( $p\text{-value}=0.53$ ) to a level of  $\bar{x} = 4.92$  ( $s=1.61$ ). The reported change was not significant at the level of significance  $\alpha = 0.05$ .

The correlation between the trust of civilian personnel before collocation and after collocation was nearly as strong as in the case of military personnel. The correlation coefficient was  $r = 0.78$  significant at 0.01 level (see Table 10). The trust variables before and after collocation of civilian personnel were closely related regardless of collocation.

Collocation significantly reduced the trust of civilian team members for other teams. Before collocation, the value of the trust to other teams was  $\bar{x} = 4.66$ , and it sank by  $\Delta\bar{x} = 0.78$  ( $p\text{-value}=0.00$ ) to  $\bar{x} = 3.88$  after collocation (see Table 8). Collocation lowered the trust of civilian personnel for other teams.

Another significant change in trust factors of civilian personnel due to collocation was that the perception of rewards from the project decreased. Before collocation, the importance of the rewards from the project for civilian personnel was

Table 10.

Correlation matrix for **civilian personnel** for month one (1) – **before collocation** and trust in month three (3) – after collocation

	1	2	3	4	5	6	7	8	9	10	11	12
1 Trust (1)												
2 Checking behavior (1)	0.06											
3 Trust to other teams (1)	0.38*	0.14										
4 Trust to one's own team (1)	0.14	0.10	0.37**									
5 Formal policies and procedures (1)	0.16	- 0.19	0.03	- 0.03								
6 Risk (1)	- 0.11	- 0.18	- 0.07	- 0.19*	- 0.09							
7 Reward (1)	0.06	- 0.10	- 0.15	- 0.08	0.02	0.00						
8 Perceived trustworthiness (1)	0.84**	0.18	0.43**	0.27*	0.24*	- 0.14	0.04					
9 Perceived follow-through (1)	0.59**	0.07	0.55**	0.09	0.10	0.12	- 0.19	0.67**				
10 Work process (1)	0.73**	0.14	0.46**	0.02	0.38**	0.01	0.01	0.77**	0.67**			
11 Task interdependence (1)	0.47**	0.51**	0.37*	0.02	0.03	- 0.08	- 0.21*	0.61**	0.63**	0.63**		
12 Propensity to trust (1)	0.10	- 0.08	- 0.07	- 0.49**	- 0.10	0.15	0.47**	- 0.08	0.04	0.12	0.08	
13 Trust (3)	0.78**	0.08	0.18	0.09	0.46**	- 0.10	- 0.08	0.71**	0.46**	0.62**	0.42**	- 0.01

\*\*p &lt; 0.01, \*p &lt; 0.05.

Correlation matrix for **civilian personnel** for month three (3) – **after collocation** and for trust in month one (1) – before collocation

	1	2	3	4	5	6	7	8	9	10	11	12
1 Trust (3)												
2 Checking behavior (3)	0.02											
3 Trust to other teams (3)	0.55**	0.19										
4 Trust to one's own team (3)	0.42**	0.10	0.63**									
5 Formal policies and procedures (3)	0.56**	- 0.19	0.25*	0.37**								
6 Risk (3)	- 0.07	- 0.20	- 0.28*	- 0.09	- 0.02							
7 Reward (3)	- 0.04	- 0.21	0.02	0.08	0.09	0.28**						
8 Perceived trustworthiness (3)	0.85**	0.11	0.49**	0.42**	0.51**	- 0.08	- 0.07					
9 Perceived follow-through (3)	0.52**	0.15	0.55**	0.45**	0.51**	- 0.01	- 0.15	0.60**				
10 Work process (3)	0.78**	0.22	0.55**	0.49**	0.42**	- 0.03	0.00	0.85**	0.80			
11 Task interdependence (3)	0.39**	0.52**	0.27*	0.35**	0.13	- 0.15	- 0.27*	0.62**	0.54**	0.59**		
12 Propensity to trust (3)	0.25*	0.12	0.25*	0.08	0.35**	0.11	- 0.24*	0.30**	0.21*	0.35**	0.23*	
13 Trust (1)	0.78**	0.10	0.55**	0.34**	0.34**	- 0.20	- 0.04	0.74**	0.51**	0.67**	0.40**	0.08

\*\*p &lt; 0.01, \*p &lt; 0.05.

reported at level  $\bar{x}=6.08$  ( $s=0.92$ ). It decreased by  $\Delta\bar{x}=0.29$  ( $p\text{-value}=0.03$ ) to a value  $\bar{x}=5.78$  ( $s=0.98$ ) after collocation. Collocation lowered the civilian personnel's perception of rewards from the project.

**c. Summary of Analysis of the Relationship Between Trust of Military and Civilian Team Members and the Geographical Team Organization**

Collocation of working teams had no significant impact on the trust level of working members regardless of their civilian or military background.

Collocation lowered the level of military team members' trust for other teams and for their own team. It also lowered the military personnel's perception of their partner's work process.

Collocation also lowered the trust of civilian personnel to other teams. Another significant impact of collocation on civilian personnel was that of their perception of the significance of rewards from the project decreased.

The statistically significant changes of trust factors of military and civilian personnel due to collocation are summarized in Table 11.

Table 11.  
Statistically Significant Changes in Trust Related Variables of Military and Civilian Personnel due to Collocation

---

<i>Military personnel</i>	
•	trust their team and other teams less
•	perceive the trustee's follow-through on commitments and work deliveries on schedule more negatively
<i>Civilian personnel</i>	
•	trust other teams less
•	perceive the rewards from the project as less important

---

**3. Summary of Results of T-test for Equality of Means**

The t-tests for equality of means showed no difference between the trust level of military and civilian personnel both before and after collocation at the significance level  $\alpha = 0.05$ . The t-tests also did not reveal any significant influence of collocation on the trust level of military personnel and civilian personnel. This finding was also supported by the strong correlation of trust variables of civilian or military personnel both before and after collocation.

We found significant differences in other trust factors between military versus civilian personnel.

Before collocation – military personnel perceived trustee’s follow-through on commitments to be higher than civilian team members did. Military team members checked more on their partners, saw them as more competent, and relied upon them more. Civilian team members saw the rewards from the project as more important and they were more likely to trust unknown people.

After collocation – military personnel checked on their partners more and relied upon other team members more than civilian personnel. Compared to military personnel civilian team members perceived the rewards from the project as more important.

Due to collocation military team members lowered their level of trust for other teams and for their own team. Their perception of their partner’s work process also decreased.

Civilian personnel after collocation reported lower trust of other teams. Another significant impact of collocation on civilian personnel was that their perception of the significance of rewards from the project decreased.

In the following analysis we built multivariate linear regression models of trust and identified how the differences influenced trust related variables on trust.

## **B. MULTIVARIATE LINEAR REGRESSION**

We conducted multi-variate linear regressions with trust as the dependent variable.

We computed five linear regression models of trust based on data collected both before collocation and after collocation. The values of standardized coefficients  $\beta$  for those models are presented in Table 12.

Table 12.

## Comparison of linear regression models of trust

Independent variables	Standardized coefficient $\beta$ values for regression models before and after collocation									
	Model 1		Model 2		Model 3		Model 4		Model 5	
	before	after	before	after	before	after	(Military)		(Civilian)	
	before	after	before	after	before	after	before	after	before	after
<i>Coefficient values for explanatory variables</i>										
Intercept	**	*			*					
Geographically distributed <sup>1</sup>	- 0.01	0.09	0.04	0.14	- 0.08	- 0.02	0.00	0.03	- 0.08	- 0.05
Military <sup>2</sup>	0.23+	0.09	0.16	- 0.05	0.18*	- 0.09				
Propensity to trust	0.06	0.19+	0.14	0.04	- 0.07	- 0.03	- 0.61***	0.01	0.01	0.00
Task interdependence			0.52***	0.29**	0.10	0.17*	0.09	0.09	- 0.10	0.20*
Risk			- 0.24*	- 0.26*	- 0.07	- 0.14*	- 0.50**	- 0.35+	- 0.24	- 0.13+
Reward			0.22+	0.17	0.19**	0.04	0.27**	0.06	0.19	0.03
Formal policies and procedures			0.17	0.42***	- 0.13+	0.08	0.80***	0.03	- 0.02	0.11
Perceived trustworthiness					0.73***	0.92***	0.86***	0.98***	0.63***	0.82***
Perceived follow-through					0.10	0.02	0.10	0.09	0.39	0.11
<i>Model Fit</i>										
Adj. R-squared	0.01	0.02	0.29	0.24	0.78	0.75	0.91	0.79	0.72	0.75
Model F	1.22	1.56	5.1***	5.51***	28.27***	33.26***	39.88***	16.08***	12.82***	25.71***
Degrees of freedom	3,67	3,96	7,63	7,92	9,61	9,90	8,24	8,24	8,29	8,58

+p&lt;0.10, \*p&lt;0.05, \*\*p&lt;0.01, \*\*\*p&lt;0.001.

<sup>1</sup> Geographically distributed = 1, Collocated = 0<sup>2</sup> Military = 1, Civilian = 0

In Model 1, we examined the relationship between trust and geographic distribution, military or civilian trustor, and his or her propensity to trust. In Model 2, we extended Model 1 by including variables like task interdependence, risk, reward, and formal policies and procedures. Lastly, in Model 3, we added two more variables to the linear regression model – perceived trustworthiness and perceived follow-through. Model 4 and Model 5 are computed with the same explanatory variables as in Model 3, but are computed separately for military and for civilian personnel.

## 1. Results

Geographic distribution was not statistically significant in any of the models.

The military or civilian background of a trustor was barely significant in Model 1 before collocation ( $\beta = -0.23$ ,  $p < 0.10$ ) and significant at 0.05 level in Model 3 before collocation ( $\beta = -0.18$ ,  $p < 0.05$ ). This indicates a statistical difference between trust of military personnel compared to trust of civilian personnel before collocation.

Propensity to trust was slightly significant in Model 1 after collocation ( $\beta = 0.19$ ,  $p < 0.10$ ). It was highly significant at 0.001 level in Model 4 before collocation ( $\beta = -0.61$ ,  $p < 0.001$ ). In Model 4 we can observe a strong propensity of military personnel to trust before collocation.

Model 2 revealed a strong relationship between task interdependence and trust before ( $\beta = 0.52$ ,  $p < 0.001$ ) and after ( $\beta = 0.29$ ,  $p < 0.01$ ) collocation. Task interdependence was also significant in Model 3 after collocation ( $\beta = 0.17$ ,  $p < 0.05$ ) and in Model 5 (civilian) after collocation ( $\beta = 0.20$ ,  $p < 0.05$ ). In Models 3, 4, and 5 task interdependence was less significance when compared to Model 2 because perceived trustworthiness was added to these models. Perceived trustworthiness had a stronger relationship to trust. Observed changes in  $\beta$  values and in their significances indicate the following pattern for the relationship between task interdependence, perceived trustworthiness and trust:

task interdependence  $\rightarrow$  perceived trustworthiness  $\rightarrow$  trust.

Risk was significant at both times, before ( $\beta = -0.24$ ,  $p < 0.05$ ) and after collocation ( $\beta = -0.26$ ,  $p < 0.01$ ) in Model 2 and in Model 4 (military) ( $\beta = -0.50$ ,  $p < 0.01$  before;  $\beta = -0.35$ ,  $p < 0.10$  after). In Model 3 ( $\beta = -0.14$ ,  $p < 0.05$ ) and Model 5 (civilian) ( $\beta = -0.13$ ,

$p < 0.10$ ) risk was significant after collocation. Risk shows the strongest influence on trust of military personnel before collocation.

Rewards from the project were significant before collocation in Model 2 ( $\beta = 0.22$ ,  $p < 0.10$ ), Model 3 ( $\beta = 0.19$ ,  $p < 0.01$ ), and Model 4 (military) ( $\beta = 0.27$ ,  $p < 0.01$ ). The fact that the reward variable was significant in Model 4 (military) before collocation but was not significant in Model 5 (civilian) before collocation indicates that before collocation the reward from the project influenced the trust of military personnel more than trust of civilian personnel.

The formal policies variable was strongly significant in Model 2 after collocation ( $\beta = 0.42$ ,  $p < 0.001$ ), slightly significant in Model 3 before collocation ( $\beta = -0.13$ ,  $p < 0.10$ ) and strongly significant in Model 4 (military) before collocation ( $\beta = 0.80$ ,  $p < 0.001$ ). This result corresponds with the expectation that formal policies and procedures strongly impact the trust of military personnel.

Perceived trustworthiness was highly significant in all models (Models 3, 4, 5) ( $p < 0.001$ ). This indicates a very close relationship between trust and perceived trustworthiness regardless of the military or civilian background of the trustor or the geographical workplace setting (before or after collocation).

Perceived follow-through was not significant in any of the models.

Adjusted R-squared was close to 0 in Model 1. Adding four more variables to the regression models increased the R-squared value of Model 2 to 0.29 and 0.24 for trust before collocation and after collocation, respectively. Adding the perceived trustworthiness variable to the Model 3 substantially increased the explanatory power of the model and the R-squared value rose to 0.78 and 0.75 before and after collocation. In Model 4 (military) and Model 5 (civilian) the R-squared value is on a similar level as in Model 3 except for Model 4 (military) before collocation with the R-squared equal to 0.91. This indicates that the explanatory value of the variables that influence trust are different for military personnel compared to civilian personnel before and after collocation.

## 2. Summary of Results of Multivariate Linear Regression

Substantial differences can be observed between the models computed for all personnel compared to models computed for military or civilian personnel. Separating the team members into groups based on the military or civilian background made the models different. That indicates that military and civilian personnel trust differently.

In Models 1, 2, 3 and 5 we observed similar results for both times, before and after collocation. In Model 4 (military), R-squared before collocation was equal to 0.91 and after collocation it was equal to 0.79. Moreover, before collocation, five explanatory variables were significant at the levels 0.01 or 0.001 and after collocation only one variable remained significant at the level 0.001. Collocation changed the variables that influence trust for military personnel.

Both, task interdependence and perceived trustworthiness were closely related to trust, but relationship of perceived trustworthiness was stronger. This indicates the following interaction between task interdependence, perceived trustworthiness and trust: task interdependence → perceived trustworthiness → trust.

Risk and reward seem to be significant factors in predicting trust. They are perceived more by military personnel.

Military personnel perceive formalism as a significant factor to increase their trust.

Trust is closely related to perceived trustworthiness. The significance of this relationship remains the same before or after collocation and among military or civilian personnel.

In the last part of our analysis, we further examined the differences in trust levels between military versus civilian personnel or before or after collocation using Chow's test of equality between the sets of coefficients in two linear regressions (Pindyck and Rubinfeld, 1991).

## C. CHOW'S TEST OF EQUALITY OF COEFFICIENTS IN TWO LINEAR REGRESSIONS

Chow's test compares the coefficients of two linear regressions and shows whether the dependent variable is affected by the independent variables in the same way in both of the regression models.

Chow's test of equality of coefficients in two linear regressions presents a more rigorous comparison test than the simple significance or R-square comparison. This test captures the difference between military and civilian personnel and also the different effects before and after collocation on the trust level.

We tested equality of coefficients of linear regression from Table 12 for Models 4 and 5.

### 1. Tests of Working Hypotheses

We tested the equality of coefficients of Models 4 and 5 with the help of two working hypotheses:

**H<sub>10</sub>:** *The explanatory variables affect the trust variable in the same fashion for military personnel as for civilian personnel.*

**H<sub>20</sub>:** *The explanatory variables affect the trust variable in the same fashion before collocation and after collocation.*

We rejected those hypotheses if p-value was less than 0.05.

For the testing of the H<sub>10</sub> hypothesis, we considered the coefficients of the pairs of regression models presented in Table 12. The first pair consists of Models 4 (military) and Model 5 (civilian) before collocation (test 1). The second pair is represented by the same models but after collocation (test 2).

We also tested Hypothesis H<sub>20</sub> on the regression Model 4 before and after collocation (test 3) and on Model 5 before and after collocation (test 4).

The results of Chow's test are presented in Table 13.

## 2. Results

In test 1 we rejected Hypothesis H1<sub>0</sub> because p-value=0.002 was less than the level of significance  $\alpha = 0.05$ . Before collocation the explanatory variables affected trust in a different fashion for military personnel than for civilian personnel. There was no significant difference between military and civilian trust models after collocation at the level of significance  $\alpha = 0.05$  (test2, p-value=0.091).

We rejected Hypothesis H2<sub>0</sub> for military personnel (test3, p-value=0.012). Before collocation the explanatory variables affected trust of military personnel in a different fashion than after collocation. We found no significant difference between the trust models of civilian personnel before and after collocation (test 4, p-value=0.137).

Table 13.

Chow test for Equality between Sets of Coefficients in Two Linear Regressions

Hypothesis	N	Models (see Table 8)	F-test	p-value
<b>I. H1<sub>0</sub>: The explanatory variables affect the trust variable in the same fashion for <i>military personnel</i> as for <i>civilian personnel</i></b>				
Test 1 Before collocation	71	M4 before - M5 before	3.34	0.002
Test 2 After collocation	100	M4 after - M5 after	1.75	0.091
<b>II. H2<sub>0</sub>: The explanatory variables affect the trust variable in the same fashion <i>before collocation</i> and <i>after collocation</i></b>				
Test 3 Military personnel	66	M4 before - M4 after	2.73	0.012
Test 4 Civilian personnel	105	M5 before - M5 after	1.57	0.137

## D. ANSWERS TO RESEARCH QUESTIONS

We conducted the statistical analysis focusing on the following research questions:

**Q1:** Does the trust of military trustors differ from the trust of civilian trustors?

**Q2:** Does geographical team organization (a distributed or collocated setting) impact interpersonal trust of military and civilian team members?

To answer the first research question Q1 we tested the following hypothesis

**H1:** *The trust of military trustors does not differ from the trust of civilian trustors.*

The results of t-test for equality of means show that there is barely a difference between the trust of military and civilian personnel before collocation and that there is no difference in trust between military and civilian team members after collocation at the level of significance  $\alpha = 0.05$ .

The linear regression models show significant differences between trust of military and civilian personnel before collocation. We did not find any significant differences between regression models for military and civilian personnel after collocation.

The comparison of linear regression models with Chow's test showed significant difference between regression models of military personnel and civilian personnel before collocation. After collocation Chow's test did not yield any significant difference between military and civilian regression models. We can answer the first research question Q1:

*Before collocation, the trust of trustors with military backgrounds differs from the trust of trustors with civilian backgrounds. After collocation there is no significant difference between the trust of trustors with military backgrounds compared to the trust of trustors with civilian backgrounds at the level of significance  $\alpha = 0.05$ .*

We formulated hypothesis H2 to answer the second research question Q2:

**H2:** *The geographical team organization has no impact on interpersonal trust of military and civilian team members.*

The results of t-test for equality of means did not show any significant difference in trust of military and civilian team members due to collocation. However, the regression models and their comparison by Chow's test revealed a significant impact of collocation on the trust of military personnel (p-value=0.012). Regression models and results of their comparison agreed with the t-test results for civilian personnel – collocation had no significant impact on the trust of civilian personnel at the level of significance  $\alpha = 0.05$  (p-value=0.137). In our conclusions we prefer the results of Chow's

test for equality of linear regression models because of it's a more rigorous comparison test. Our answer to the second research question Q2 is the following:

*The geographical team organization had significant impact on the trust of military personnel. It had no significant impact on the trust of civilian personnel at a significance level  $\alpha = 0.05$ .*

The results of our analysis are summarized in Table 14.

Table 14.  
Summary of hypotheses, tests and results

Research question and hypothesis		Test	Result
<b>Q1:</b> <i>Does the trust of military trustors differ from the trust of civilian trustors?</i>			
<b>H1:</b> The trust of military trustors does not differ from the trust of civilian trustors.	before collocation	Regression (Table 8), Chow's test (Table 9)	Not supported
	after collocation	T-test (Table 2), Regression (Table 8), Chow's test (Table 9)	Supported
<b>Q2:</b> <i>Does geographical team organization (distributed or collocated setting) impact interpersonal trust of military and civilian team members?</i>			
<b>H2:</b> The geographical team organization has no impact on interpersonal trust of military and civilian team members.	military personnel	T-test (Table 4), Regression (Table 8), Chow's test (Table 9)	Not supported
	civilian personnel	T-test (Table 4), Chow's test (Table 9)	Supported

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## V. CONCLUSIONS

The DOD established Integrated Product Teams (IPT) to increase the effectiveness of the DOD acquisition process. The members of IPT teams are representatives of all participants in the acquisition process, both military and civilian personnel.

The differences between military team members and civilian team members are substantial. For example they can be found in culture, values, working experience, and managerial styles. Those differences represent a challenge to trust for IPT teams. A low trust level can adversely affect the effectiveness of the whole team. In our project we examined that challenge. We answered the following question

***Q1:** Does the trust of military trustors differ from the trust of civilian trustors?*

Further we analyzed the impact of a geographical workplace setting on the trust in IPT teams. From the literature we suspect that there is a significant relationship between trust and geographical workplace setting. We analyzed this potential relationship in a new, military – civilian framework. We asked

***Q2:** Does geographical team organization (distributed or collocated setting) impact interpersonal trust of military and civilian team members?*

We conducted our analysis on the data gathered in two surveys among IPT teams working on AAV project. The first survey was conducted before collocation, and the second three months later, after collocation. The teams were composed of military and civilian team members.

The data were comprised of 150 directional dyads collected from thirty-eight trustors who reported on their relationships with four teammates.

### A. DISCUSSION OF RESULTS

We present the results of the statistical analysis in two parts. The first part comprises the test results for the differences in trust based on military versus civilian personnel. The second part provides the results of the analysis of the difference between

team members caused by different geographical workplace organization – before and after collocation.

### **1. Trust Differences Between Military and Civilian Team Members**

In our analysis we found that before collocation the trust level of military team members was higher than the trust level of civilian team members but after collocation there was no significant difference.

There are at least two explanations for these results. First, after collocation the understanding between the team members could have increased to such an extent that it positively influenced trust and eliminated the substantial trust differences between military and civilian team members. Second, after moving to a new location, the interpersonal relationships could have been disrupted, and they may have needed time to settle down. In the meantime, the trust level decreased and the difference in trust between military and civilian personnel vanished. In the regression Model 4 (see Table 8), for military team members we observed a significant drop in the explanatory power of the model after collocation (the R-squared value fell from 0.91 to 0.79). This finding supports the second explanation that after collocation relationships were disrupted and they had not settled down.

In our analysis we found significant differences in other trust related factors. Before collocation, military team members perceived a higher level of follow-through than civilian team members. Moreover, military team members checked more on their partners, saw them as being more competent, and demonstrated a higher task interdependence. Civilian team members considered the rewards from the project as more important and they were more likely to trust unknown people. Linear regression models showed significant impact of risk, reward and formalization on the trust of military personnel.

After collocation, significant differences between military and civilian team members remained in checking behavior, task interdependence, and reward. Military personnel checked more on their partners and relied more upon other team members. Civilian team members perceived the rewards from the project as more important. The

differences in other variables ceased possibly due to the disruption of interpersonal relationships after collocation.

## **2. Trust Differences Between Team Members Before and After Collocation**

The results of the statistical analysis show that collocation of working teams had significant impact on the trust level of military working members and had no significant impact on trust of civilian team members at the selected test significance  $\alpha = 0.05$ .

The change in trust of military personnel due to collocation could have been caused by significant changes in the relationships between trust and trust-related variables for military personnel. These changes were obvious in regression Model 4 for military personnel before and after collocation. Another possible reason for the change of trust of military personnel after collocation could be the fact that collocation moved mainly the military personnel to a new location while the majority of the civilian personnel were already at that location.

Our analysis revealed a significant impact of collocation on some trust related variables of military and civilian personnel.

Due to collocation, military team members lowered their level of trust for other teams and for their own team. They also decreased their perception of their partner's work process. Civilian personnel after collocation reported lower trust for other teams. Another significant impact of collocation on civilian personnel was that their perception of the significance of rewards from the project, decreased.

## **B. IMPLICATIONS FOR PRACTICE**

The results of our study show that in distributed working teams the trust level of military team members is higher than the trust level of civilian team members. After collocation, the trust of military team members decreased and the difference between military and civilian team members vanishes. This is an indication that collocation may disrupt interpersonal relationships among personnel who have moved, and that it could take some time for those relationships to settle down. Acquisition managers should be

aware of that impact and should anticipate a temporary decrease of trust after collocation. Acquisition managers could also use this disruption as an opportunity for changing interpersonal relationships. The period after collocation could be a good time for conducting team-building activities.

Further we found that military team members tend to have closer relationships to their coworkers than civilian team members. Military personnel check upon their partners more, rely upon them more and perceive higher follow-through. In contrast, trust of military personnel depends more on formal procedures and perceived risk. On the other hand, for civilian team members rewards are more important, but they are more likely to trust unknown people.

These findings imply that in distributed IPT teams military personnel need more interaction with their coworkers so that they can gather enough information and support for their reliance and perception of other team members' work. They also need firmly stated policies and procedures for their job activities. The higher importance of formalism for military personnel indicates that formal procedures could be perceived not as a limitation in the job execution but as a tool for trust building among military team members or between military and civilian team members. Because risk negatively affects the trust of military personnel, perceived risk must be minimized, especially by military personnel. Civilian team members must have clearly stated rewards related to the project goals. Civilian team members will probably cooperate more effectively with new team members than military personnel. Therefore, the new military team members may need a longer time to incorporate themselves into the team.

After collocation, in collocated IPT teams, our results show that military personnel lower their perception of their partner's work process. Military personnel had more positive impressions about their partner's work process before collocation than after collocation. That implies that military personnel may need more information about their coworkers before collocation so that they can create a more realistic image about their partners. Alternatively it could mean that military personnel may need time to readjust their evaluations after a collocation move. As in the above paragraph, we imply that military team members need more interaction with their working partners.

Civilian team members after collocation lower their perception of the significance of rewards from the project. That implies that in collocated IPT teams, in contrast to distributed IPT teams, there may be more need to pay close attention to formulating the goals and rewards from the project.

### **C. LIMITATIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH**

The main limitation of our study was the sample size. Due to the small number of respondents, we divided the available dyads into military or civilian only by the trustor's background. Further division by the trustee's background would yield a sample too small for reliable statistical analysis. For example our database comprises data on 46 dyads with military team member as a trustor. Let us assume that the ratio between military and civilian trustees is the same as between military and civilian trustors ( $\frac{1}{2}$ ). Under this assumption, there would be 15 military and 31 civilian trustees among 46 persons. We would have only 15 dyads with military trustor and trustee. A survey with a greater number of responses is needed for more detailed inspection of the influence of military or civilian background on trust.

The influence of the geographical setting was measured from the data collected before the collocation and three months after the collocation of the teams took place. But, of course, the affects of collocation on the working team may ensue after three months. A longer longitudinal study could analyze this problem in more detail and provide more reliable conclusions. We recommend a follow-up survey.

Our analysis yielded two partial results not fully consistent with the overall conclusions. According to the t-test for equality of means, the difference between the trust of military personnel compared to the trust of civilian personnel before collocation was barely significant. Further, t-test showed no significant difference in the trust of military personnel due to collocation. In both cases, Chow's test for equality of coefficients of linear regression models yielded results indicating significant differences. We recommend closer analysis of these relationships in further research.

In our research we found that formal policies and procedures were a significant predictor of trust for military personnel before collocation. After collocation that factor lost its significance for the trust of military personnel. Further research could focus on inspecting the relationships between trust of military personnel, formalism and geographical workplace setting and explain how formalism influences the trust of military personnel under different workplace settings.

# APPENDIX

## SURVEY QUESTIONS

### Demographic questions

1. What has been your primary work location during the last month?
2. What organization do you work for?
3. What is the primary discipline you use on this project?
4. What is your secondary discipline?
5. How many years of work experience do you have in your primary discipline?
  6. How many years of education and training do you have relating to your primary discipline?
7. How long have you been a member of this team?
8. Approximately how many members were on the team when you joined?
9. Approximately how many members are there on the team now?
10. How has the change in team size effected the operation of the team?
11. How long have you known this team member?

### Dyad questions

#### Trust

1. If I had my way, I wouldn't let this person have any influence over issues that are important to me. \*
2. I would be willing to let this person have complete control over my future on this project.
3. I really wish I had a good way to keep an eye on this person. \*
4. I would be comfortable giving this person a task or problem that was critical to me, even if I could not monitor their actions.

#### Checking

1. To what extent do you check to see if this team member is working on his/her commitments?
2. To what extent do you compare the work of this team member to others to evaluate his/her contribution to the group?
3. To what extent do you verify this team's progress on the deliverables she/he promised?

#### Formalization

1. Formal policies and procedures guide most decisions
2. Important communications between departments are documented by memo.
3. The top management team is comprised of specialists from each functional area
4. Reporting relationships are formally defined
5. Lines of authority are specified in a formal organizational chart
6. Capital expenditures are planned well in advance.
7. Plans tend to be formal and written
8. Formal operating budgets guide day to day decisions

#### Risk

1. How much is at stake for you if the project fails?

#### Reward

1. Please spend a moment to think about the personal and professional goals you hope to achieve with this project. How important are these goals?

#### Perceived Trustworthiness

##### *Benevolence*

1. This person is very concerned about my welfare.
2. My needs and desires are very important to this person.
3. This person would not knowingly do anything to hurt me.

4. This person will go out of his/her way to help me.

#### *Ability*

1. This person is very capable of performing his/her job.
2. This person is known to be successful at things he/she tries to do.
3. This person has much knowledge about the work that needs to be done.
4. I feel very confident about this person's skills.
5. This person is well qualified.

#### *Integrity*

1. This team member has a strong sense of justice.
2. I have never had to wonder whether this team member will stick to his/her word.
3. This team member tries hard to be fair in dealings with others.
4. This team member's actions and behaviors are not very inconsistent. \*
5. I like this team member's values.
6. Sound principles seem to guide this team member's behavior.

#### **Perceived Follow-through**

1. To what extent did this team member follow-through on work commitments?
2. To what extent did this team member fail to follow-through on work commitments? \*
3. To what extent did this team member complete work commitments on time?
4. To what extent did this team member fail to complete work commitments on time without good reason?\*

#### **Work Process**

1. To what extent is this person flexible and accommodates requests for changes?
2. To what extent does this person provide timely and relevant information?
3. To what extent does this person find practical solutions to problems?
4. To what extent does this person make creative suggestions?

#### **Task Interdependence**

1. How much of your job depends upon your ability to work with this team member?
2. To what extent is dealing with this team member a part of your job?
3. To what extent do you receive feedback from this team member?
4. To what extent do you use work that has been done by this team member?
5. To what extent does this person use work that has been done by you?

#### **Propensity to Trust**

1. One should be very cautious with strangers
2. Most experts tell the truth about the limits of their knowledge.
3. Most people can be counted on to do what they say they will do.
4. These days, you must be alert or someone is likely to take advantage of you.
5. Most salespeople are honest in describing their products.
6. Most people answer public opinion polls honestly.
7. Most adults are competent at their jobs.

#### **Frequency and Mode of Communication**

1. Of all the times you have interacted with this team member in the last month, what percentage of those interactions were initiated by you?
2. On average, how many hours per week do you talk face-to-face with each team member?
3. How many times in the average week do you communicate with each team member about these topics: project, coordination, non-work related, personal topics?

**Trust of Other Teams**

1. If my team had its way, we would not let team X have any influence over issues that were important to us.\*
2. My team would be comfortable giving team X a task or problem that was critical, even if we could not monitor team X's progress.
3. My team would be willing to let team X have complete control over our future in this project.\*
4. My team really wishes we had a good way to keep an eye on team X. \*

**Trust of One's own Team**

1. If I had my way I wouldn't let my team have any influence over issues that are important to me.\*
  2. I would be comfortable giving my team a task or problem that was critical, even if I could not monitor my team member's progress.
  3. I would be willing to let my team have complete control over my future in this project.\*
  4. I really wish that I had a good way to keep an eye on my team.\*
- 

Note: \* Indicates items were reverse coded.

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## LIST OF REFERENCES

Bahr J. J., *Societal Values and Their Effect Upon the Military*. ( pp. 8-10). Study Project. U.S. Army War College .Carlisle Barracks, PA. March 1990

Burt R., Knez M. “Kinds of third-party effects on trust.” *Rationality and Society*. V.7 pp.255–299. 1995

DoD IPPD, Office of the Under Secretary of Defense. “Integrated Product and Process Development Handbook”. [<http://www.acq.osd.mil/io/se/ippd/guide/ipt.html>]. May 2004.

GAO, General Accounting Office. *Report to the Chairman and Ranking Member, Subcommittee on Readiness and Management Support, Committee on Armed services, U.S. Senate*. April 2001.

Gambetta D. “Can we trust trust?” In *Trust: Making and Breaking Cooperative Relationships*, ed. D. Gambetta, pp.213 – 237. Cambridge: Blackwell. 1988

Hardin, R. *Trust and Trustworthiness*. New York: Russell Sage Foundation. 2002.

Hanks, S. J., Chandler, G. N. “Patterns of formalization in emerging business ventures.” [<http://www.babson.edu/entrep/fer/papers95/hanks.htm>]. April 2004

Herson, L. J. R. *The Politics of Ideas: Political Theory and American Public Policy*, pp. 13–26. Homewood, IL: Dorsey Press. 1984

Holland L. “The Weapons Acquisition Process: The Impediments to Radical Reform” *Acquisition Review Quarterly*, pp. 235-251, Spring, 1998.

Johnson J., Collie. “AAAV-At the Brink of Prototype.” *Program Manager magazine*, pp. 2-15. Nov.-Dec, 1998.

Kramer, R. M., “Trust and distrust in organizations: Emerging perspectives, enduring questions.” *Annual Review Psychology*, v.50, pp.569–598. 1999,

Mayer R. C., Davis H. J, and Schoorman F. D. “An integrative model of organizational trust.” *Academy of Management Review*. v 3, pp. 709–739. 1995.

Mayer R. C., Davis H. J. “The effect of performance appraisal system on trust for management: A field quasi-experiment”. *Journal of Applied Psychology*, 84(1), pp. 123 – 136. 1995.

Meyerson, D., Weick, K. E., Kramer, R. M. "Swift trust and temporary groups." In R. M. Kramer & T. R. Tyler (Eds.), *Trust in organizations: Frontiers of theory and research*: pp.166 – 195. Thousand Oaks, CA: Sage. 1996

Miles, R. E., Snow, C. C. "Causes of failure in network organizations." *California Management Review*. Summer: pp. 93– 72. 1992

Pindyk R. S. and Rubinfeld D. L. *Econometric Models and Economic Forecasts*, 3rd ed., McGraw-Hill, Inc.1991.

Rousseau, D. M., Sitkin, S. B., Burt, R. S., Camerer, C., "Not so different after all: A cross-discipline view of trust." *Academy of Management Review*, v23: pp. 393 – 404. 1998.

Siemsen I. Thomas. Just contracting parties or partners as well? *Acquisition Review Quarterly*, pp. 225-231, Summer, 2002.

Shapiro, D. L., Sheppard, B. H., Cheraskin, L. "Business on a handshake." *Negotiation Journal*. v8: pp. 365– 377. 1992

Trainor, S. C., Values, culture, and civil-military relations: implications for the postmodern military. USAWC strategy research project. Carlisle Barrack, Pennsylvania. 2000.

Tweeddale, J. W. "A perspective on research transitions". *Improving the Research Transition process: Proceedings from an NPRDC/ONR Workshop*. Navy Personnel Research and Development Center, San Diego, CA. 1986.

Zaheer A., McEvily B., and Perone V. Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. *Organization Science*, 9(2), pp. 141-159, 1998

Zolin, R., and others. "Trust in Cross-Functional, Global Teams". *Organization Science Special Issue: Trust in an organizational Context*. pp. 105-152. Milan, Italy, 2001.

Zolin, R., Hinds, J. P. "Trust in context: the development of interpersonal trust in geographically distributed work". In R. M. Kramer, & K. Cook (Editors), *Trust In Organizations*. Russel Sage Foundation. 2003.

Zolin, R., Hinds, P. J., Fruchter, R., Levitt, R.E. "Interpersonal trust in cross-functional, geographically distributed work: A longitudinal study". *Information and Organization*, 14, pp. 1-26, 2004

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