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Effects of Cultural Diversity on Trust and its Consequences for Team Processes and Outcomes in Ad Hoc Distributed Teams

Anne Lise Bjørnstad
Norwegian Defence Research Establishment and University of Oslo

Knut Inge Fostervold
University of Oslo

Pål Ulleberg
University of Oslo

Authors' note

Complete departmental affiliations. Anne Lise Bjørnstad, Information Management Department, Norwegian Defence Research Establishment (FFI), and Department of Psychology, University of Oslo; Knut Inge Fostervold, Department of Psychology, University of Oslo; Pål Ulleberg, Department of Psychology, University of Oslo.

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Contacting information. Correspondence concerning this article may be addressed to Anne Lise Bjørnstad, Norwegian Defence Research Establishment (FFI), P. O. Box 25, 2027 Kjeller, Norway; tel: +47 63807746; fax: +47 63807212; e-mail: anne-lise.bjornstad@ffi.no.

Abstract

This quasi-experimental study explores trust as a mediator, explaining how cultural diversity may affect team processes and outcomes in distributed ad hoc teams. Data were collected both through self-report and direct behavioral measures from a military sample. Our results demonstrate significantly lower trust in culturally heterogeneous distributed teams than in homogenous teams. In turn, trust was found to be positively related to team processes (i.e., communication). The results suggest trust will add explanatory value as a mediator in future team composition research. In terms of performance, outcome was not significantly predicted. Aiming to contribute to the future successful use of internationally composed teams, the implications of and the need for further research in these areas are discussed.

Keywords: team cultural diversity, heterogeneity, trust, team processes, outcome, ad hoc distributed teams.

Introduction

The globalization of modern organizations engenders international collaboration and transnational teamwork (e.g., Arnold, Cooper, & Robertson, 1998; Kozlowski & Ilgen, 2005; Shuter & Wiseman, 1994). The team processes and outcomes in internationally composed teams may be affected by cultural differences in values and behavior across the collaborating nationalities (e.g., Cox, Lobel, & McLeod, 1991; Hofstede, 2001; Oetzel, 1998; Schneider & Barsoux, 1997; Thomas, 1999). Research by Watson, Kumar, and Michaelsen (1993) suggested that any negative impact of cultural differences on team output may be the greatest when a team has just been formed. Because of an increased use of ad hoc organized teams (e.g., Handley & Lewis, 2001), the finding of Watson et al. indicates a need for further investigation of team cultural diversity in such contexts.

Theory on trust indicates that team composition (in terms of cultural diversity) also may play a central role in the building of trust (e.g., McAllister, 1995; Williams, 2001). In turn, research has suggested that trust facilitates key team processes and outcomes (e.g., Colquitt, Scott, & LePine, 2007; Dirks & Ferrin, 2002; Jarvenpaa & Leidner, 1999; Lauring & Selmer, 2010). Seen together, this theory and research suggest that trust may contribute to the unveiling of how team cultural diversity affects team processes and outcomes in ad hoc teams. However, because the building of trust has been found to be positively related to face-to-face interaction (e.g., Connaughton & Shuffler, 2007; Oertig & Buergi, 2006), the increase in geographically distributed collaboration (e.g., Connaughton & Shuffler, 2007; Handley & Lewis, 2001) adds new questions to the role of trust.

The main aim of the present research is to increase the understanding of team cultural diversity in ad hoc distributed teams by examining the role of trust, primarily as

a mediator between team composition, and team processes and outcome measures. This aim answers to the calls for research to focus more both on the link between national culture and trust (e.g., Branzei, Vertinsky & Camp, 2007) and on how the effects of diversity on team processes and outcomes are mediated (Mannix & Neale, 2005). The aim also contributes to the need for more knowledge of how cultural diversity affects trust in distributed teams and of the effects of distribution and cultural diversity on team processes and outcome variables in concert (Connaughton & Shuffler, 2007). Furthermore, team collaboration across borders has most often been researched in the context of business, but it is also extremely relevant for the operational work of international medical, military, police, and crisis relief teams. To meet this need for, and gap in research, the present research studies military teams. Corresponding to the above outlined focus, *cultural diversity* is defined as national cultural diversity.

Team Cultural Diversity and Team Processes

Although organizational research has often viewed team member heterogeneity to be at least potentially advantageous for organizational and team performance through an increased pool of knowledge, viewpoints and creativity (e.g., Arnold et al., 1998; Hackman, 2002; Schneider & Barsoux, 1997), meta-analyses and reviews have shown that results from research on team composition are mixed and often not easily interpreted (e.g., Horwitz & Horwitz, 2007; Mannix & Neale, 2005; Stahl, Maznevski, Voigt, & Jonsen, 2010). However, the pattern seems to be that demographic type diversity (e.g., ethnicity/nationality, gender, race, and age) mainly leads to process losses, in terms of cooperative problems, whereas competency based diversity mainly leads to increased problem solving abilities, due to an increased pool of knowledge (Mannix & Neale, 2005). Cultural diversity may have the potential to lead to process losses but also to increase problem solving abilities (Stahl et al., 2010). This two-sidedness arises from the

fact that cultural diversity includes the element of demographic differences (potentially leading to cooperative problems) and an increased pool of knowledge brought about by the differences in background (potentially leading to increased problem solving abilities and creativity). Watson et al. (1993) found in their research that newly formed culturally diverse teams experience more negative consequences of cultural diversity than longer-standing teams, suggesting that cultural diversity may tend to be more problematic in ad hoc teams.

Van Knippenberg, De Dreu, and Homan (2004) proposed that team processes and outcomes, such as collaborative behaviors and performance, do not depend on the type of diversity, per se, but rather on how the diversity is interpreted. The interpretation of diversity is understood to depend on factors such as the salience of the social categorization, as well as on motivation and ability. This interpretation would in turn result in either processes of social categorization and intergroup bias or elaboration of task-related information. The model predicts that social categorization and group bias-type processes affect performance negatively, whereas elaboration-type processes affect performance positively. Cultural differences may often be salient in internationally composed teams, especially in geographically distributed ad hoc teams where other member information becomes more limited. This salience suggests a risk that cultural diversity may induce a social categorization and intergroup bias effect, consequently leading to lower output. Furthermore, an elaboration process may be obstructed by cultural differences in values and behavior because differences in cognitive schemas of team members from different cultures can make the interpretation and prediction of other members' behavior more difficult than if team members were from the same culture.

Trust as a Mediator between Team Cultural Diversity and Team Processes

Research on trust further adds an explanation of how social categorization and group bias may negatively affect team processes and outcomes. The current study focus on ad hoc distributed teams requires a definition of trust that reflects both the short time frame and the distributed setting. McAllister (1995) and Webber (2008) found reliability, dependability, and competence to be central elements of trust in a shorter time frame, labeling it cognitive trust. Expanding on this research, Kanawattanachai & Yoo (2005) found cognitive trust to be the predominantly important type of trust in distributed work teams. Complementing the research on cognitive trust, Jarvenpaa, Knoll, & Leidner, (1998) and Jarvenpaa & Leidner (1999) found that trust in ad hoc distributed teams was highly task- and action-related, interpreted as "swift" trust, confirming Meyerson, Weick, & Kramer's (1996) earlier proposition. Moreover, swift trust is recognized as a cognitive form of trust that is based on categorical assumptions and implicit theories more than on the actual trustee, as well as being focused on expectations of future behavior (Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998; Meyerson et al., 1996). In line with this research we define *trust* as swift trust.

It has been suggested that group bias has a negative impact on the level of trust of different others through influencing the causal attributions of those others' dispositions, motives and intentions (Kramer, Brewer, & Hanna, 1996; see also Van der Zee, Vos, & Luijters, 2009). Additionally, as indicated above, a lack of the appropriate cognitive schemas can obstruct the ability to understand and predict the actions of diverse team-members, consequently lowering the potential for trust. The group bias and lack of appropriate schemas in culturally diverse teams indicate a possible double negative effect of cultural diversity on trust. Concurring with this line of thought, McAllister (1995) argued that cultural similarity promotes trust. In turn, not trusting one's team members can lower the motivation to engage in collaborative-type behaviors. Indeed,

trust has been found vital for central team processes such as communication (e.g., Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998; Lauring & Selmer, 2010; Rico, Alcover, Sanchez-Manzanares, & Gil, 2009), and outcomes in terms of performance (e.g., Colquitt et al., 2007; Dirks & Ferrin, 2002). This research suggests trust may be understood as a mediator between cultural diversity and team processes. Consecutively, team processes may be understood to mediate the effects of trust on output (Lauring & Selmer, 2010). Because communication has been identified as a key team process in research on trust, swift trust, multinational distributed teams, and team diversity (e.g., Connaughton & Shuffler, 2007; Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998; Kozlowski & Ilgen, 2005; Lauring & Selmer, 2010; Mannix and Neale, 2005; Rico et al., 2009) and because communication is the mode of distributed cooperation, team processes were defined as communication in the present research.

The above suggested relationships can be summarized into three hypotheses:

Hypothesis 1: *Cultural diversity has a negative effect on trust in distributed ad hoc teams*

Hypothesis 2: *Cultural diversity influences communication mediated by trust*

Hypothesis 3: *Communication influences outcomes positively*

The theoretical background and cited research on which this article is built stem from both individual- and group-level research. As indicated by Serva, Fuller, and Mayer (2005), both antecedents and consequences of trust have cross-level relevance. This relevance suggests an advantage of studying the hypotheses at both levels, also making results more interpretable in comparison with past and future research conducted either at the individual or group level of analysis.

Method

Design

A quasi-experimental design was employed to study the hypotheses. The difference in team composition, in terms of cultural homogeneity/heterogeneity, represented the experimental manipulation. 32 teams, each consisting of four members, were formed. 24 of the teams were culturally homogenous (i.e., all team members from the same culture/nation), and 8 of the teams were culturally heterogeneous (i.e., all team members from different cultures/nations). Heterogeneity and diversity are understood to describe the same attribute and are employed interchangeably.

A net-based computer game, adapted for our research purposes through the Situation Authorable Behavior Research Environment (SABRE) (Warren et al., 2006), provided a controlled environment that ensured the same conditions for all teams, leaving only the team composition to vary. Each team participated in only one experimental game session, and each session was run with one team only, making a total of 32 game sessions. In both conditions, participants did not see each other during the game sessions, and the game itself also provided anonymity. The data collection was an international collaborative effort by Bulgaria, the Netherlands, Norway, Sweden, and the USA, within the context of a NATO research group (see Authors' note).

Participants

All participants were volunteers recruited from the same population of military officers in the two experimental conditions. Participants were assigned to either the culturally homogenous or the culturally heterogeneous teams.

Participants in the homogenous teams were from the Netherlands (n = 12), Norway (n = 56), and the USA (n = 28). Participants in the heterogeneous teams were from the Netherlands (n = 8), Norway (n = 6), the USA (n = 6), Bulgaria (n = 6), and Sweden (n =

6).[1] Each heterogeneous team of four was randomly composed of participants from the five nations. Nationalities included were understood to be culturally different on several dimensions, as indicated by cross-cultural research (e.g., Hofstede, 2001; House et al., 2004; Soeters, 1997). The sample size in all analyses was $N = 128$ at the individual level and $N = 32$ at the group level. 124 participants were male, and four were female, aged from 20 to 57. The mean age was 30.6 years, with a standard deviation of 7.8.

Procedure

Participants came into a lab and received a short briefing including information about the nationalities of their team-players. Participants in the homogenous team situation were able to see each other upon arrival (but did not interact), whereas this was not possible in the heterogeneous team situation. They were subsequently assigned to a computer and then started the game learning sessions (tutorial). One player in each team was randomly assigned to be the team leader. The experimental game session was timed to exactly one hour. Computerized survey questions followed after the game sessions, after which a quick debriefing was given.

In the game scenario, the participants were in a team whose task was to find caches of weapons in a modern urban environment. Team points were accrued by finding the hidden weapons. To execute their mission, the participants had access to a set of tools in the game. These tools were scarce, to promote cooperative behaviors between the players. Communication between the players was accomplished via a chat function in the game. The choice of a written mode of communication reflects that geographically distributed teams rely heavily on written computer-mediated communication. One

[1] To ensure that this slight difference in nationalities represented in the homogenous and the heterogeneous team conditions did not affect results (in line with demands for matched samples in cross-cultural research, e.g., Van de Vijver & Leung, 1997), appropriate measures were taken. Additional analyses were conducted to both control for the unequal numbers of participants from the different countries and to rerun all analyses with the Bulgarian and Swedish participants excluded from the heterogeneous team condition. The results persisted through these measures (details in results and footnotes 2-4).

common language, English, was used for all communication, also in the culturally homogenous team situation.

Task Type and Game Relevance

Following the typology for multinational group tasks by Hambrick, Davison, Snell, & Snow (1998), the current computer game group tasks would best fit the definition of a hybrid of coordinative, creative, and computational task types. First and foremost, the group tasks were coordinative in that the team members had to coordinate their behaviors and cooperate to reach the game goal (i.e., find crates with weapons and collect them using the different tools they had divided amongst themselves, which in turn gave the team points). Second, the group tasks were computational in that the team members needed to assemble, share, and analyze information to solve problems and make decisions about how to find the weapon crates, as well as lose as few points as possible in the process. Third, the tasks were creative because there was no predetermined way in which the participants should solve their tasks. The coordinative and computational task components made the game well-suited for studying cooperative team processes such as communication. The creative component also aptly simulated the type of contexts in which ad hoc distributed teams often operate (i.e., no structured tasks or predetermined solutions).

Variables and Measurements

Trust. The measure of trust focuses on the expectations of fellow team members' reliability, dependability, and competency in central task-related team behaviors, hence building on research on cognitive (McAllister, 1995; Webber, 2008) and swift trust (Meyerson et al., 1996; Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998). The adaptations made in the current measure aim to both ensure ecological validity and meet the need for a measure that focuses on elements of relevance to trust in a shorter time

frame. This means that elements in the measure employed by Jarvenpaa and colleagues that were found to be less relevant in a short time frame, such as benevolence, were replaced by items on reliability, dependability, and competency, and relating directly to the current team tasks. The task focus directly mirrors Jarvenpaa et al.'s finding this to be a defining feature of swift trust.

The measure included three items rated on a 5-point scale with answer categories from "very doubtful" (1) to "very confident" (5). Items focus on the positive expectancy of future task-related team-type behaviors (i.e., information sharing, assistance, and fulfillment of responsibilities). A sample item is: "How confident were you that team members would fulfill their responsibilities?"

Cronbach's alpha demonstrated satisfactory reliability of the measure ($\alpha = .76$). For the group-level analysis, an aggregated mean score of trust was computed based on the three items, in line with the procedure used in the work of Jarvenpaa and Leidner (1999), Jarvenpaa et al. (1998), and Rico et al. (2009). Aggregating the scores to the group level then allowed for an investigation of how the average trust in fellow team members affects collective outcomes at the team level.

Communication. Communication was operationalized as communication quantity and communication quality. To avoid the problem with common method variance, direct observations of communicational behavior were employed. The game-log of the written team communication (i.e., chat messages) formed the basis for the communication measures.

Communication quantity was measured in terms of the number of communicative utterances made by each participant within the teams, similar to Jarvenpaa, Shaw, and Staples (2004) who measured the number of e-mails in their research on global virtual

teams and trust. For the group-level analyses, scores were aggregated to provide a mean score for each team.

Communication quality was defined as the observed team collaborative effort toward a common goal, in terms of team members' willingness to support and aid each other in their task completion and the level of friendly atmosphere within the team. This focus reflects previous research on correlates of trust (e.g., Jarvenpaa et al., 1998; Colquitt et al., 2007). Communication quality was estimated (mean score) from two measures of communicated helpfulness and communication climate at the group level. Both helpfulness and communication climate were calculated from observer ratings on 5-point scales, completed on the basis of print-outs of each team's chat messages retrieved from the game-log. Helpfulness was rated from "not at all" (1) to "all the time" (5), and communication climate was rated from "very unfriendly" (1) to "very friendly" (5). The ratings were completed by two researchers (one unfamiliar with the hypotheses), and averaged scores from the raters were used in the analyses. The inter-rater reliability, estimated through the intra-class correlation coefficient, was .71 for helpfulness and .75 for communication climate. Reliability of the composite communication quality measure was satisfactory (α = .82).

Outcomes. Outcomes were operationalized as performance and measured by the points achieved in the computer game (further described under "Procedure"). This performance measure corresponded with participants' information about their game mission, and constituted an accurate measure of whether the participants reached their official team goals, hence providing good face validity. Game points were automatically logged in the game and measured at the individual and group levels, giving a direct performance measure. The team score equaled the aggregated mean individual score.

Covariates. English language ability was included as a covariate in the analyses to control for the possibility of differences in language ability affecting results. It was estimated by four items ($\alpha = .91$) (Bjørnstad, 2008).

Nationality and any familiarity with other team members were also controlled for in the analyses, as were team member heterogeneity other than culture (i.e., age, gender, rank, and educational level). Familiarity with other team members was measured by a questionnaire item rating familiarity from "not at all familiar" to "very familiar" (7-point scale). Heterogeneity in age, rank, and educational level of members within each team was measured by the standard deviation (*SD*) of these variables within each team. Teachman's (1980) formula for calculating group heterogeneity [$- \sum P_i \, (ln \, P_i)$] was applied to construct a heterogeneity index in gender for each team (where P_i is the proportion of members of a category within the group).

Levels of Analysis

Both individual and group level analyses were included to explore the cross-level validity of the proposed hypotheses, because both levels play an important role in the issues analyzed. Individual-level analyses were performed to study the relationships between heterogeneity, trust, communication quantity, and performance, and group level analyses were performed to study the relationships between heterogeneity, trust, communication quantity, communication quality, and performance.

Statistical Analyses

Because the 128 participants were nested within 32 teams, multilevel modeling (MLM) was found to be most appropriate to analyze data at the individual level in order to make the tests of statistical significance reliable. In all the MLM analyses conducted, individuals and teams were estimated as random effects (i.e., random intercepts), because we wanted to assess variability among individuals within teams as well as

variability in average scores between teams. All predictors were estimated as fixed effects, because the number of individuals within each team (i.e., four) was regarded as too low for estimating random effects (slopes) for the predictors. The SPSS mixed models procedure was employed to conduct the MLM analyses. However, MLM can only be applied for analyses where the dependent variables are at the individual (i.e., first) level. Because the communication quality variable was at the group (i.e., second) level, a separate analysis at the group level was indicated to include this.

Structural equation modeling (SEM) using the statistical program AMOS was applied to analyze the data at the group level of analysis. This method was chosen because the proposed relationships between the variables in the current study can be represented as a path model (i.e., trust is expected to mediate the influence of cultural heterogeneity on both communication quality and quantity, which in turn are expected to have effects upon performance). Although a sample size of $N = 32$ may seem low for conducting an SEM-analysis, Herzog & Boomsma (2009) found that a ratio of sample size to estimated parameters of ~2:1 can provide accurate estimates of model fit in small samples if Swain-corrected estimators are applied. The model presented in the results section has 13 estimated parameters, giving a ratio of 2.5:1. This correction is applied because traditional model fit measures tend to reject acceptable models too often as sample size decreases. Tanguma (2001) has, however, demonstrated fit measures, such as the comparative fit index (CFI), to be reliable even in samples as small as $N = 20$. To test the robustness of the statistical significance of the parameter estimates in the model, a bootstrapping procedure (bias-corrected percentile method) was applied.

Results

Individual Level Analyses

Descriptive analyses. Descriptive statistics for the variables of interest measured at the individual level are presented in Table 1.

[Insert Table 1 about here]

Differences between culturally homogenous and heterogeneous teams in trust. A two-level hierarchical model assessed differences between culturally homogenous and culturally heterogeneous teams in mean trust scores (Table 2). First-level units were the 128 participants, whereas the 32 teams were the second level units. The results showed that culturally heterogeneous teams had significantly lower mean trust scores than culturally homogenous teams, a difference of 0.43 points on a 5-point scale. This corresponds to a Cohen's *d*-value of 0.50, indicating a moderate difference in trust scores.

Because the relationship between cultural heterogeneity and trust may be confounded by other factors such as team heterogeneity in age, gender, rank, and education level, team heterogeneity indices for these four factors were included as level-2 predictors in the next model. The effects of these four team heterogeneity indices on trust scores were all non-significant and did not influence the effect of team cultural heterogeneity on trust scores (the difference in trust scores actually increased). Next, we controlled for any familiarity each participant may have had with his or her teammates by adding this as a level-1 predictor. Familiarity with teammates showed no relationship to trust scores and did not affect the relationship between team cultural heterogeneity and trust.

Based on the unequal numbers of participants from the different countries in the homogenous team situation, the effect of nationality was controlled for by adding nationality and interaction terms between nationality and cultural homogeneity as predictors in the MLM analysis. Including nationality did not affect the difference in

trust found between homogeneous and heterogeneous groups, and the unequal numbers referred to should therefore not pose a problem.[2]

In sum, cultural heterogeneity in teams was the only heterogeneity factor related to individual ratings of trust in other team members. Based on this finding, the covariates mentioned above were excluded from further analyses.

[Insert Table 2 about here]

Trust and communication quantity. A two-level hierarchical model was used to explore whether trust was positively related to communication quantity (Table 3). Due to a substantial positive skewness in the communication quantity variable, a logarithmic transformation was conducted. The transformed communication quantity variable was used as the dependent variable in a 2-level hierarchical model, where cultural heterogeneity was entered as a level-2 predictor and individual trust scores as a level-1 predictor (Table 3). Both predictors were grand mean centered before being entered in the model. Neither of the two predictors was found to have significant main effects on communication quantity. It was suspected that the problem with the group biasing effect and differing cognitive schemas in heterogeneous teams, as described in the theory chapter, may not only lead to lowered trust but also increase the importance of trust in heterogeneous teams relative to that in homogeneous teams. This is because trust may motivate continued communication despite the hurdles caused by the differences. To test for this possibility, a 2-level interaction term between team composition and trust was included in the model. This model was significantly better than that without the interaction term, $\Delta\chi^2(1, 128) = 7.1$, $p < .01$. The significant effect of the interaction term

[2] Additionally, to control for any possible difference caused by not having any Bulgarian or Swedish homogenous teams, all of the above analyses were repeated with these nationalities excluded from the heterogeneous teams (i.e., $N = 116$). This measure actually resulted in a larger difference in trust scores between the two conditions, a difference of 0.7 points ($p < .01$), Cohen's $d = 0.80$.

of $b = 0.33$ ($\beta = .20$) showed that trust was positively related to communication quantity only within culturally heterogeneous teams. An additional analysis controlling for English language ability by including this variable as a level-1 predictor neither improved the model nor altered the results presented above.

[Insert Table 3 about here]

Communication quantity and performance. A final 2-level hierarchical model was used to assess the effect of communication quantity on performance. The results showed no significant relationship between communication quantity and performance ($b = -8.2$, $p = .88$). Team cultural heterogeneity, trust, and the interaction term between cultural heterogeneity and trust were also included as predictors in the model. The results showed no significant effects of these predictors on performance.

Group Level Analyses

Group level t-tests of differences in trust, communication quantity, communication quality, and performance were conducted to check for differences in mean scores between teams with culturally homogenous and heterogeneous compositions. The results presented in Table 4 indicate (in line with the MLM analyses) that the mean scores on trust were significantly higher in the homogeneous teams.[3]

[Insert Table 4 about here]

A SEM analysis was performed at the group level ($N = 32$) to explore the hypothesized relationships between heterogeneity, trust, communication quantity, communication quality, and performance in one common analysis. Based on the interaction effect found at the individual level between cultural heterogeneity and trust

[3] Excluding the Bulgarian and Swedish participants from the heterogeneous teams in the analyses only strengthened results. The significant difference in trust scores between homogenous and heterogeneous teams increased (0.7 difference, $p < .01$).

upon communication quantity, this interaction term was also included in the group-level model. The hypothesized relationships between the variables with estimates are presented in the form of a path model (Figure 1). The model demonstrated a very close fit to the data according to conventional criteria (Hu & Bentler, 1999): the chi-square degrees of freedom ratio (X^2/df) = 0.95, CFI = 1.00, and the root mean square error of approximation (RMSEA) = .00. Due to the close fit of the model, there was no need to apply Swain-corrected estimators of model fit (see Herzog & Boomsma, 2009).

Because it seemed probable that the interaction term could also have an effect on communication quality, a post hoc modification was performed adding this path to the model. The path was found to be weak and far from significant (β = .09, p = .59) and did not improve the model's χ^2 significantly ($\chi^2_{diff}(1) = 0.30$, p = .59). Hence, there were no indications for adding this path to the model.

[Insert Figure 1 about here]

The effect of heterogeneity on trust was also significant at the group level of analysis, explaining 15% of the variance in trust. Consecutively, trust was significantly related to the composite measure communication quality (i.e., the higher the trust, the higher the communication quality score). The relationship between trust and communication quantity was in the expected direction but rather weak and not significant (p = .54). The effect of the interaction term between cultural heterogeneity and trust on communication quantity was of the same size and direction as in the individual level analysis, though not significant at the group level (p = .29). Both the relationship between communication quality and performance and between communication quantity and performance were in the expected direction, though these effects were non-significant (β = .19, p = .28, and β = .15, p = .39, respectively).

Some additional analyses were conducted to test the robustness of the model.[4] A bootstrapping procedure, drawing 500 random samples of $n = 32$ (with replacement) from the entire sample, was employed to test for possible biases in the standard errors of the parameter estimates. This procedure resulted in the same conclusion as described above, i.e., the effect of cultural heterogeneity on trust and the effect of trust on communication quality were both significant at the 5% level. The effect of English language ability on communication quantity was controlled for in the model. Because there was no relationship between language and communication quantity ($\beta = .14$, $p = .41$), there was no reason to include language ability in the model.

Discussion

The analyses demonstrated support for Hypothesis 1 in terms of finding significantly lower trust in culturally diverse than in culturally homogenous ad hoc teams in a distributed setting. This finding was observed at both the individual and group levels of analysis. In turn, trust was expected to mediate the effect of cultural diversity on team communication (quality and quantity) (Hypothesis 2). There was also found support for this second hypothesis: a significant relationship was found between trust and communication quality at the group level, in terms of high trust predicting a cooperative type of communication (i.e., communication quality). Moreover, the SEM analysis indicated that cultural diversity influenced communication quality mediated by trust. The hypothesized relationship between trust and the amount of communication (i.e., communication quantity), was found within the culturally diverse teams only. Although this finding was only significant at the individual level of analysis, the tendency was the same at the group level. Hypothesis 3, predicting that the communication (quality and

[4] This included re-estimating the model excluding the Bulgarian and Swedish participants. This analysis resulted in only trivial changes in parameter estimates and *p*-values.

quantity) influences outcomes positively, in terms of higher performance, was not found to be significant at either level of analysis.

Implications and Future Research

The current results support research on trust in general, which has indicated that it is more difficult to build trust between people who are dissimilar than between people who are similar (e.g., Ibarra, 1993). Moreover, the results support the proposition set forth by McAllister (1995) of cultural similarity promoting trust. Being from the same culture may provide a positive effect of group bias and increase the interpretation and predictability of behavior. Mannix and Neale (2005) proposed the use of elements such as common goals, identity, and team culture to bring heterogeneous team members closer together. The current results rather suggest that a common goal, organizational culture (NATO military), and identity (military) are not enough to override national cultural differences, at least not in ad hoc distributed teams. Though a superordinate common identity may reduce group bias (e.g., Stone & Crisp, 2007), research by Laurent (1983) and Van der Zee et al. (2009) indicates that introducing a common identity may also backfire, i.e., if the common identity is perceived as a threat to the individuals' existing identity.

The presented results further suggest that trust may add interpretative value to team diversity research, providing a clarification as to how team heterogeneity affects team processes such as communication. Moreover, trust may explain the often mixed results from both demographic and competency types of diversity (e.g., Horwitz, 2005; Mannix & Neale, 2005). Indeed, unless trust is established in heterogeneous teams, the potential advantages contained in the collective capacity of the team (e.g., increased knowledge, viewpoints, and creativity) may not be realized. This also adds to Van Knippenberg et al.'s (2004) model; introducing trust explains the psychological processes by which

group bias can affect group processes such as communication, as well as by which elaboration can be made difficult and likewise affect group processes.

Previously, several moderators have been suggested in team research (Bowers, Pharmer, & Salas, 2000; Horwitz, 2005; Mannix & Neale, 2005). However, trust has not been proposed as a moderator or as a mediator in this research. Based on the current results, it is suggested that trust be added as a mediator in future team composition research.

Based on the work of Jarvenpaa et al. (1998), and Serva et al. (2005), there is good reason to believe that the relationship between trust and team communication may be reciprocal in nature. Trust may form the basis for good communication, but good communication may also foster the building of trust. To eliminate the competing interpretation in the current research that communication may have caused the differences found in trust between the culturally heterogeneous and homogeneous teams, additional analyses at both the individual and group levels were performed.[5] The results showed that the significant difference found in trust between homogeneous and heterogeneous teams could not be accounted for by differences in communication. A proposition for future research, however, is to test for a feed-back loop from communication to trust by collecting time-series data.

The relationship found between trust and amount of communication in the culturally heterogeneous teams only, may indicate a double challenge; not only is there lower trust in ad hoc international teams than in national teams, but the effect of lower trust may have greater consequences for collaborative-type behaviors such as

[5] A two-level hierarchical model showed that the difference between culturally homogenous teams and culturally heterogeneous teams in trust scores at the individual level was largely unaffected by controlling for differences in communication quantity.

communication in international teams. The question put forth by Jarvenpaa and Leidner (1999) as to whether technology might obliterate the negative effects of cultural diversity on communicative behaviors when in completely virtual settings was not supported in our research. The implication of the present results is that more attention must be paid to developing trust in international ad hoc teams than in national ad hoc teams. Prichard & Ashleigh (2007) and Jarvenpaa et al. (1998) demonstrated a positive effect on trust from team training, the latter research from global virtual teams. Face-to-face training, which is considered advantageous for building trust (e.g., Connaughton & Shuffler, 2007; Oertig & Buergi, 2006), was not found to be required in Jarvenpaa et al.'s research. Based on current and previous research (e.g., Ibarra, 1993; Webber, 2008), the logic seems to be that the more culturally diverse the team is at the outset, the more time and effort may be needed to build trust. Increasingly, both civilian and military organizations collaborate across borders, making this an important insight to consider to avoid the pitfalls and reap the benefits of cultural diversity in teams. If trust is not given the time and opportunity to be established in culturally diverse teams, the current results suggest negative effects on key team work processes such as communication. It is suggested that future research continue to examine how trust can best be built in international teams in general, as well as in internationally composed ad hoc teams in particular.

Contrary to expectations, the amount and quality of communication was not found to promote higher performance. Because the game was quite intense (1 h), it could be that using an extensive time on communication during the game also had some negative effects, such as less time to directly engage in point-collecting activities. This finding could arguably be an effect of a poorly chosen performance measure lacking in external validity. However, similar time conflicts between exchanging information through communication and acting is just as relevant in real life situations as in a game

scenario. Although this latter point suggests a lack of a relationship between communication and performance, research has found performance to be a particularly difficult measure, because it is influenced by a wide range of confounding variables (e.g., Kozlowski & Ilgen, 2005). Consequently, Kozlowski and Ilgen suggested rather using key team processes such as communication as team outcome measures.

Limitations and Methodological Issues

Results in this research were obtained with teams that differed in composition, in terms of being composed of either culturally homogeneous or culturally heterogeneous team members. Because all participants were military officers, the samples were well matched so that other sources of heterogeneity were largely controlled for. Nevertheless, any national differences in trust, any familiarity with team members, and other demographic heterogeneity indices were controlled for in an MLM analysis, showing no significant influences on trust. As indicated above, face-to-face collaboration is considered advantageous for building trust (e.g., Connaughton & Shuffler, 2007; Oertig & Buergi, 2006), suggesting that participants in the homogenous team situation seeing each other upon arrival (see the method section) could be interpreted as a confounder. However, previous research has studied face-to-face *collaboration* as a builder of trust, not mere exposure. Jarvenpaa et al. (1998) also found that trust could be built in a distributed collaborative situation with no face-to-face contact. In the present experiments, collaboration was completely anonymized, thus making mere exposure a less plausible explanation of the differences found in trust between the heterogeneous and homogeneous situations. Furthermore, any familiarity with other participants was controlled for, so any remaining effect would have to be related to mere exposure. The exposure-attraction research tradition (e.g., Zajonc, 1968) also rests on recognition. In the current research, this was not possible because collaboration was anonymized

through the game interface. However, whether or how much influence a short, one-time exposure could have for the building of trust in distributed teams remains an empirical question that should be examined in future research.

Our analyses explored most of the relationships at both the individual and group levels. The results indicate good cross-level validity, which is consistent with what has been suggested in previous research (e.g., Serva et al., 2005). The relatively small sample size at the group level of analysis did, however, result in low power to detect statistically significant effects at this level.

Some may question whether using a computer-based game is the best way to study trust and collaborative behavior in teams. However, such games have previously been successfully employed in research on human behavior, though not in the same context as in this study (e.g., Aidman & Shmelyov, 2002; Devine, Martin, Bott, & Grayson, 2004). Additionally, because collaboration, and especially international collaboration, is increasingly computer-mediated and distributed, the current research method is growing in relevance.

The military sample in the current research makes the results primarily applicable to military and other operational-type organizations (e.g., medical, police, or crisis relief) – typically less researched environments than the traditional business organization. However, the experimental setting in which this study was conducted (focusing on trust and communicational behaviors), was a context that could be transferrable also to distributed collaboration in for instance business contexts. This interpretation is corroborated by the fact that the present results largely support previous research conducted in such contexts.

Conclusion

In line with expectations, there was observed lower trust in international than in national ad hoc distributed teams, which in turn was found to influence communication quality negatively. Low trust was found also to interact with team diversity, in terms of influencing communication quantity negatively. These findings suggest a double challenge; in international compared to national ad hoc distributed teams, trust may both become lower and have more consequences for some collaborative-type behaviors. Correspondingly, trust could be understood as a catalyst for communication in culturally diverse teams. No conclusions could be drawn pertaining to performance.

The implications of the current findings include that trust may add explanatory value as a mediator in future team composition research, that internationally composed distributed teams may be less than optimal if ad hoc organized, and that taking the time to build trust in such teams thus may be worthwhile. Suggestions for future team composition research include adding trust as a mediator and exploring how to best build trust in international distributed teams.

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Table 1.

Descriptive statistics for variables measured at the individual level (N = 128)

	Mean	SD
Trust[a]	3.5	0.9
Communication quantity	44.0	27.8
Performance (game points)	220.5	424.0
Familiarty with teammates[b]	3.0	2.1
Language ability[a]	3.1	1.2
Education[c]	2.9	1.0
Military Rank[d]	1.9	1.2

[a] Range 1-5. [b] Range 1-7. [c] Range 1-5 (1 = High school, 5 = PhD/Doctor's degree). [d]Range 0-5 (0 = Other Ranks, 1-5 = NATO Officer, OF 1-5).

Table 2.

Multilevel analysis for trust regressed on cultural heterogeneity, additional group heterogeneity indices, and familiarity with teammates (N = 128 individual level, N = 32 group level).

	Intercept-only model[a] *b* (*s.e.*)	+ Cultural heterogeneity *b* (*s.e.*)	+ Additional heterogen. indices *b* (*s.e.*)	+ Familiarity rating *b* (*s.e.*)
Fixed effects				
Intercept	3.47 (0.09)**	3.57 (0.09)**	3.39 (0.18)**	3.45 (0.28)**
Cultural heterogeneity (0 = homogenous, 1 = heterogeneous)		-0.43 (0.18)*	-0.72 (0.25)**	-0.73 (0.25)**
Additional heterogeneity indices:				
Sex			-0.08 (0.41)	-0.04 (0.43)
Age (*SD*)			0.05 (0.03)	0.05 (0.03)
Education (*SD*)			0.01 (0.26)	-0.02 (0.27)
Rank (*SD*)			0.07 (0.15)	0.07 (0.15)
Familiarity with team mates				-0.01 (0.05)
Random effects				
Individual level	0.70**	0.70**	0.70**	0.70**
Team level	0.06	0.02	0.00	0.00
Log likelihood (χ^2)	326.8	321.6	317.9	317.8
$\Delta\ \chi^2$		5.2*	3.7	0.1

* $p < .05$, ** $p < .01$. [a]Intra-class correlation = .07.

Table 3.

Multilevel analysis for communication quantity (log transformed) regressed on cultural heterogeneity and trust (N = 128 individual level, N = 32 group level). Both predictors are grand mean centered.

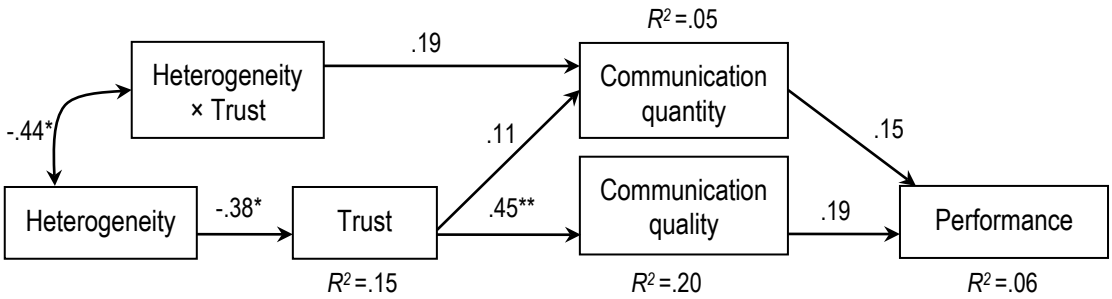
	Intercept-only model[a] *b* (*s.e.*)	+ Cultural heterogeneity and trust *b* (*s.e.*)	+ With cross-level interaction term *b* (*s.e.*)	Standardized coefficients β
Fixed effects				
Intercept	3.57 (0.10)**	3.57 (0.09)**	3.60 (0.09)**	
Cultural heterogeneity		-0.25 (0.22)	-0.20 (0.21)	-.12
Trust		0.02 (0.06)	-0.01 (0.06)	-.01
Cult. heterogeneity × Trust			0.33 (0.12)**	.20
Random effects				
Individual level	0.27**	0.27**	0.25**	
Team level	0.22**	0.21**	0.20**	
Log likelihood (χ^2)	241.4	239.8	232.7	
$\Delta\ \chi^2$		1.6	7.1**	

**$p < .01$. [a]Intra-class correlation = .45.

Table 4.

T-tests of differences in trust, communication quantity, communication quality, and performance in homogenous and heterogeneous teams at the group level of analysis (N = 32).

	Team composition	*N*	Mean	*SD*	Sig. diff. of means	*d*-value
Trust	Homogeneous	24	3.6	0.5	.030	0.97
	Heterogeneous	8	3.1	0.5		
Communication quantity	Homogeneous	24	46.0	20.0	.335	0.39
	Heterogeneous	8	37.9	21.3		
Communication quality	Homogeneous	24	3.9	0.9	.664	0.20
	Heterogeneous	8	3.7	0.9		
Performance	Homogeneous	24	205.5	112.6	.204	-0.52
	Heterogeneous	8	265.3	113.2		



* p < .05, **p < .01

Figure 1. Heterogeneity, trust, communication quantity, communication quality, and performance at the group level of analysis (standardized coefficients, $N = 32$).