

GDW STRATEGY

COMMUNICATING AT A DISTANCE: THE EFFECTIVE USE OF GLOBAL VIRTUAL TEAMS

Anne Stringfellow
Thunderbird School of Global Management
15249 N. 59th Avenue
Glendale, AZ 85306
USA
+ 602-978-7452
anne.stringfellow@thunderbird.edu

Firms must integrate the diverse knowledge of multiple specialists to maintain their competitive advantage. The increasing use of multinational organizations means that all the expertise needed for this knowledge integration process is seldom in the same physical location. Virtual teams, with members in different geographical locations, are becoming the norm. However, the performance of virtual teams has been mixed: some quickly produce successful outcomes, while others perform very poorly. What are the crucial success factors? How can dispersed teams use the lean media available to them to connect despite their geographic separation? This project addresses these issues by synthesizing theory from multiple areas to provide a model of the challenges faced by virtual teams. The theoretical model is tested with data from members of real-world virtual teams. Findings underscore the importance of frequent communication and trust in virtual teams but, in contrast with popular belief, find no relationship between early face-to-face meetings and the perceived level of trust in global virtual teams. The results also suggest that early-stage meetings may be associated with lower team performance.

Keywords:

Global, virtual teams, communication.

1. INTRODUCTION

As competitive pressures and travel costs rise, virtual teams with members in different geographical locations are becoming more frequent. A recent study by the Gartner Group, estimates that more than 60 percent of professional employees perform at least some of their work at a distance (Kanawattanachai and Yoo 2002). The reasons for this trend include a desire to be closer to the customer, a need to bring diverse expertise together without relocating people, and the enabling effect of technological developments that support virtual work (Henry and Hartzler 1998). However, the performance of virtual teams has been mixed: some quickly produce successful outcomes, while others perform very poorly. Despite the prevalence of “how to” books on the subject, a comprehensive theoretical treatment of virtual teams is still lacking, as is empirical support for much of the advice. This gap is particularly noteworthy with respect to *global* virtual teams.

Research on global virtual teams has focused on experimental studies of academic samples, e.g., Jarvenpaa, Knoll and Leidner 1998, Jarvenpaa and Leidner 1999, Montoya-Weiss, Massey and Song, or in-depth qualitative studies of small real-world samples, e.g., Maznevskian and Chudoba 2000. A number of important findings emerged from this research. First, trust is strongly associated with the performance of global virtual teams composed of students (Jarvenpaa, Knoll and Leidner 1998, Jarvenpaa and Leidner 1999). Second, imposing structure on the team process, by providing interaction guidelines, moderates the effect of conflict management behavior on the performance of global virtual student teams (Montoya-Weiss, Massey, and /Song 2001). Third, the use of face-to-face communication, supplemented by leaner communication media for less-complex decisions, is positively associated with real-world global virtual team performance (Maznevski and Chudoba 2000).

Despite the research done to date, there remains a need for further research on larger samples of global virtual teams operating in a business context. This research addresses the need for well-grounded research on virtual teams by integrating findings on communication media with findings from previous research on teams into a new conceptual model and then testing the model with data obtained from a sample of members of virtual teams. The results provide suggestions for improving the effectiveness of virtual teams.

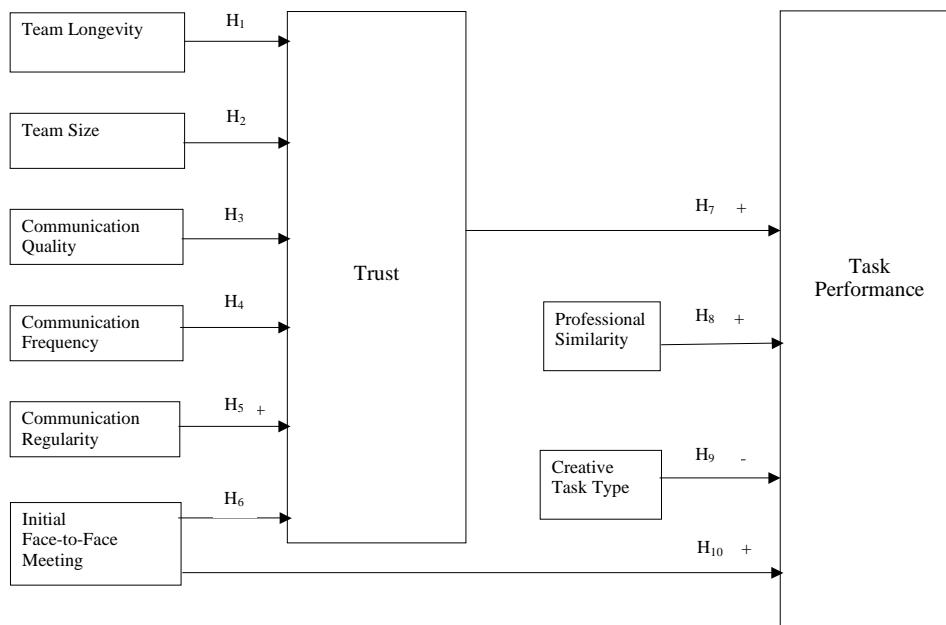
In the next section of the paper, a conceptual model and research hypotheses are developed. Immediately following the hypotheses, the empirical research methodology is described. The results of the analysis are presented next and the paper concludes with a discussion of the results, their managerial implications, research limitations, and suggestions for future work.

2. PROPOSED MODEL AND HYPOTHESES

In this research, a virtual team is defined as a group of twenty or fewer people who work together toward a common goal, while being located for the majority of their time at geographically dispersed work sites. Such teams include internationally-dispersed teams as well as teams with multicultural members who happen to be all located at different locations within the same country. They include intact work groups as well as *ad hoc* teams brought together for a limited time to tackle special projects. Since one of the motivating factors for virtual teams is the integration of specialized expertise, team members are often from different functional areas. Communication among team members typically occurs by means of communication technologies such as phone and e-mail.

The conceptual framework on which this research is based is presented in Figure 1. The framework proposes that team longevity, team size, communication quality, communication frequency, and communication regularity and initial face-to-face meetings affect trust amongst the members of virtual teams. Trust, in turn, affects team performance. Other antecedents of virtual team performance are the direct effect of initial face-to-face meetings, as well as team member professional diversity and the type of task being undertaken by the team. The major constructs on which the research is based, communication media richness and trust, are discussed below. This discussion leads into the development of the specific relationships comprising the conceptual model.

Figure 1: Conceptual Model



2.1 Communication media richness

The communication media used by virtual teams differ from the face-to-face communication possible in co-located teams in that the majority of communication between team members is less rich. Media richness is a measure of the amount of information that can be conveyed through a communication medium (Daft and Lengel 1984). The richness of a medium is determined by its ability to handle multiple information cues simultaneously, and its ability to allow immediate feedback (Daft and Lengel 1986). Face-to-face communication is the richest form of communication,

since it allows for the transmission of non-verbal cues, such as gestures and tone of voice in addition to the pure content of the message. Those communicating face-to-face also receive immediate feedback, allowing them to adapt the remainder of the message to better suit the recipients. For example, in response to a puzzled expression on someone's face, a communicator might provide further explanation. This richness is missing from the many communications amongst virtual team members that take via conference call, e-mail and other less rich communication media. In virtual teams composed of members with different cultural backgrounds, this lack of richness is expected to be particularly challenging.

2.2 Trust in virtual teams

The literature on trust cites perceptions of competence, benevolence, and integrity (Butler 1991, Mayer, Davis and Schoorman 1995) as important antecedents of trust. Trust has been viewed as a belief, sentiment, or expectation about another's trustworthiness that results from their expertise, reliability, or intentions. Trust has also been viewed as a behavioral intention or behavior that reflects a reliance on another and involves vulnerability and uncertainty on the part of the trustor. Trust is defined as a willingness to rely on another in whom one has confidence (Moorman, Zaltman and Deshpande 1992). As Moorman points out, this definition spans the two general approaches to trust in the literature.

Virtual teams represent a context in which there may be fewer opportunities to obtain the information needed to judge the expertise, reliability and intentions of one's fellow team members as a basis for trust. Without this information, it is difficult for virtual team members to rely on their counterparts. What then determines whether the members of global virtual teams trust one another?

Since valid judgments on all three aspects of trust (competence, benevolence, and integrity) are usually made only after repeated dealings with others, familiarity and shared experience are important determinants of trust formation. Members of virtual teams that have a history of working together, even at a distance; have the advantage of being at least somewhat familiar with their remote counterparts. Although this familiarity may be limited to knowledge such as fellow team members work practices, this serves to reduce some uncertainty, and may increase trust.

This argument suggests the following hypothesis:

H1: The longer a global virtual team has worked together, the greater its members' trust of one another.

Since the development of trust requires familiarity with one's fellow team members, it seems reasonable that more effort is required to gather the information necessary to decide whether to trust the members of a large team than a team consisting of only a few members. Thus an inverse relationship is proposed between trust and team size.

H2: The greater the number of members in a global virtual team, the lower the level of trust amongst team members.

If trust is based on perceptions of knowledge of one's fellow virtual team members, then team members' perceptions of their ability to communicate with those team members should influence the extent to which they are trusted. Thus we hypothesize a positive relationship between trust and perceived communication quality.

H3: The greater the perceived communication quality amongst members of a multicultural virtual team, the greater the level of trust amongst team members.

Despite the fact that members of virtual teams are limited in the depth and richness of their interactions by geographic constraints, it is nevertheless possible for them to communicate to some extent. Frequent communication allows team members to share ideas and helps to ensure that members are all "on the same page". Frequent communication also affirms that other team members are working on the project, and suggests that they may be trusted to play their part in completing the task. This argues for a positive relationship between frequent communication and trust amongst team members.

H4: The greater the frequency of communication amongst members of a multicultural virtual team, the greater its members trust of one another.

In addition to frequent communication, regular communication at specified intervals helps the team stay on track. Regular communication differs from frequent communication in that it represents pre-planned epoch-driven communication, as opposed to event-driven communication. In the project management literature, researchers have

found that regular meetings improve adherence to schedule (Cleland 1990). In virtual team situations, many team members have a variety of responsibilities, many of which may be locally-based and/or short-term in nature. In such situations, it is very easy for the local or short-term responsibilities to take precedence over virtual team responsibilities. Anecdotal evidence suggests that frequent contact among global team members improves performance (DiStefano and Maznevski 2000). Regular communication between members at a distance may also serve the purpose of assuring team members that their counterparts in other locations are devoting at least some time to the virtual team project and thus can be trusted to be making progress.

H5: Regular communication amongst members of a multicultural virtual team is associated with greater trust of one another.

As mentioned previously, valid judgments of trust are usually made only after repeated interactions with others. To the extent that initial interactions among team members take place face-to-face, richer information about one's team mates is available as a basis for this judgment. Supporting this, research in psychology has found the majority of people's intent to be conveyed by their facial expression (Mehrabian 1971). People are more likely to be favorably disposed to others whom they meet in person, rather than electronically (Sproull and Kiesler 1991). Anecdotal evidence suggests face-to-face meetings during the early stages of virtual projects facilitate the development of trust (Grundy 1998). This belief is also consistent with Handy's (1995) contention that trust needs physical touch. This argument leads to the following hypothesis:

H6: Face-to-face meetings at the start of a project increase trust in global virtual teams.

2.3 Drivers of team performance

Working well together requires some level of trust (Bromiley and Cummings 1995). Trust is positively associated with the performance of co-located work teams (Erdem and Ozen 2003) and research with temporary global virtual teams in a student context shows trust to be an important predictor of task effectiveness (Jarvenpaa and Leidner 1999). This finding is expected to extend to virtual teams in the business world, leading to the hypothesis below:

H7: The greater the trust amongst members of a global virtual team, the greater the team's task performance.

Another factor that may affect team performance is interpretive differences. Members of *cross-functional* virtual teams are subject to the language barriers imposed by their specialized training, which includes the unique technical jargon of their field. (Burns and Stalker 1961, Tushman 1978). These differences have been found to be associated with communication difficulties. For example, in new product development, "...dissimilar jargons can lead to misunderstandings and communication failures" (Souder 1987, p. 195).

Previous research on the relationship between professional or functional diversity and the performance of co-located teams has obtained mixed results. For example, despite the fact that the involvement of multiple functions in new product development was shown to have positive effects on performance at the firm level (Dougherty 1992, Souder 1987), functional diversity in specific project teams was negatively related to management ratings of technical innovation and team-rated performance (Ancona and Caldwell 1992). This suggests that professional diversity in global virtual teams will negatively impact performance.

H8: In virtual teams, greater professional diversity among team members is associated with reduced task performance.

Understanding the virtual team's task type is vital since the task type is an important determinant of team members' communication needs. A number of taxonomies of group tasks have been applied to diverse teams. One taxonomy divides team tasks into task execution, problem-solving, and creative categories (Jackson 1992). A slight modification, based on the observation of multicultural teams, is to use the categories of coordinative, computational, and creative tasks (Hambrick, et al. 1998).

According to these authors, a coordinative task is one that requires interaction and information exchange among team members. By contrast, a computational task is a bounded, well-defined, task that requires the exchange and processing of information in order to arrive at an objectively correct solution. Tasks that fall into the creative category are those that may be approached in many different ways and for which no one verifiably correct solution exists (Jackson 1992). Such tasks may require the successful integration of specialized knowledge from a variety of fields. Product development tasks represent an example of this latter category.

In the past, the product development process involved a sequential interdependence relationship (Thompson 1967). The process might be either a linear R&D-driven relationship, in which new products were driven by research and development capabilities, or a linear marketing-driven relationship, in which marketing decided what customers wanted, R&D developed the product, and manufacturing determined how to make it. Instead of a linear process, Galbraith (1984) recommended a reciprocal triangular relationship between the manufacturing, R&D, and marketing functions in an innovating firm, noting that creative tasks, such as product innovation, require the use of reciprocal interdependence.

Competitive pressures now require a reciprocal relationship, in which members of different organizational functions work in parallel, but communicate constantly and update their criteria often in response to other departments' changes. This complex interdependence is challenging for participants, because of the need to keep others informed. However, it has the potential to reduce time-to-market, since activities occur in parallel. Cost savings are also likely, since the product represents a joint optimization of marketing, R&D, and manufacturing criteria, without the need for rework in response to changes.

Reciprocal interdependence is strongly reliant on strong communication links. Creative tasks are highly equivocal, that is, there are no correct answers and a preferred alternative must be chosen by interaction between group members. In contrast, an uncertain task is one where a correct answer exists, but must be found. As group tasks pose greater requirements for member interdependence, communication media that transmit more social context cues improve group performance (Straus and McGrath 1994).

Although comprehension is greater when information is transmitted in written form, opinion change tends to be greater with interpersonal communication (Porter and Roberts 1983). In addition, resolution of complex issues requires the back-and-forth discussion that is possible only with synchronous channels. Even if the technology for a synchronous channel is available, time zone differences may make its use very inconvenient (Armstrong and Cole 1996). The communication limitations inherent in virtual operation are expected to be particularly problematical for teams involved in creative tasks. This reasoning supports the following hypothesis.

H9: Virtual teams engaged in creative tasks tend to exhibit lower levels of performance than those engaged in coordinative or computational tasks.

Because of the need to adapt to differences in demeanor, attitudes to time, and other differences in cultural norms, face-to-face encounters are proposed to be particularly important in multicultural virtual teams. According to Daft and Lengel (1984), richer communication methods, such as face-to-face communication, are needed to reduce equivocality than to reduce uncertainty. This suggests that rich communication may be more important at the beginning of a project, referred to as the "fuzzy front end" (Moenaert, et al. 1995), when equivocality is at its greatest.

Anecdotal evidence (De Meyer 1991; Duarte and Snyder 1999; Grundy 1998; Lipnack and Stamps 1997) suggests that face-to-face meetings early in a virtual team's existence may improve team performance. The perceived importance of early face-to-face meetings to team success suggests that the opportunity afforded for rich communication between team members may not only foster team trust, but may have an additional direct effect on team performance. This argues for the following hypothesis:

H10: Early-stage face-to-face meetings among members of global virtual teams are associated with high task performance.

3. RESEARCH METHODS

The conceptual model was tested empirically by means of a cross-sectional descriptive study using data collected from the members of global virtual teams.

3.1 Sample

The population of interest consists of members of global virtual teams. To reach members of virtual teams working in an international context, the sampling frame used in the research consisted of the alumni of a large international business school who had signed up to join an alumni networking Web site. A request for participation was posted in the research area of the alumni Web site. A total of 67 alumni responded to the survey, yielding 57 usable responses.

The response rate is unknown, since it is impossible to determine how many alumni viewed the request for participation.

3.2 Measures

As far as possible, published multiple item scales were used in this research. Where suitable scales did not exist, scales were developed prior to data collection. The items comprising the measures, and their Cronbach alpha reliabilities, where applicable, are shown in Appendix A.

Team longevity: Team longevity was defined as the elapsed time since the team was formed. This variable was measured by asking respondents to state the number of months since team inception.

Team size: Team size measured the number of members on the team.

Communication quality: Communication quality was defined as team member perceptions of their ability to understand one another. This variable was measured by means of a two-item Likert scale. The five-point item response scales were anchored by “Strongly Disagree” and “Strongly Agree”

Communication frequency: Communication frequency was defined as the average rate at which team members communicated with one another. Since it is an average rate, it taps the total quantity of communication, without obtaining any information on whether the communication occurred at regular intervals. This variable was measured on a 5-point scale, with responses ranging from “Once every few months” to “At least daily”.

Communication regularity: Distinct from communication frequency, communication regularity was defined as the extent to which team members engaged in *regularly scheduled* communications with one another. An example of a regularly scheduled communication might be a weekly Monday morning meeting. This variable was measured on a 3-point scale.

Early-stage face-to-face meeting: This was measured by asking respondents to indicate whether or not the entire team met in person at the beginning of the project. The responses were coded 0 or 1 and entered as a dummy variable in the regression analysis.

Trust: Trust measured the extent to which respondents believed that they could rely on their teammates. This variable was measured by means of a six-item Likert scale. The five-point item response scales were anchored by “Strongly Disagree” and “Strongly Agree”.

Professional similarity: Professional similarity measured the extent to which team members had similar organizational functional backgrounds and training. This variable was measured by means of a two-item Likert scale. The five-point item response scales were anchored by “Strongly Disagree” and “Strongly Agree”.

Task type: Task type measured the type of task undertaken by the team. A categorical scale based on Hambrick, et al. 1998, was used to measure this variable. The three possible responses were “Coordinative”, “Computational”, and “Creative”.

Task performance: Task performance measured the respondents’ perception of the team’s performance. A six-item Likert scale, anchored by “Strongly Disagree” and “Strongly Agree” was used to measure this construct.

3.3 Data collection and analysis

Data were collected by means of a Web-based survey. The survey was designed using a commercially-available survey site. Alumni of an international business school who were currently members of multicultural virtual teams, or who had worked on a multicultural virtual team in the past year, were invited to fill out the survey. A reminder invitation was posted one month after the original invitation.

Data entered by the respondents were automatically written to an Excel file that was imported into SPSS for statistical analysis. The hypotheses were tested by means of ordinary least squares regression. Hypotheses H_1 to H_6 were tested by regressing Trust on Team Longevity, Team Size, Communication Quality, Communication Frequency, Communication Regularity, and Initial Face-to-Face Meeting. Hypotheses H_7 to H_{10} were estimated by regressing Team Performance on Trust, Professional Diversity, Creative Task Type, and Initial Face-to-Face Meeting.

4. RESULTS

Table 1 provides demographic information about the teams to which the respondents belonged. Table 2 shows the means and standard deviations of the scaled variables used in the analysis, as well as their bivariate correlations. The teams studied consisted of an average of about 8 members and had worked together an average of just under 10 months. On average, each team had members from three to four nationalities, and members were located in two to three countries. The average team had representatives from three to four functional areas.

Table 1: Virtual Team Demographics

	<u>Mean</u>	<u>Std. Dev.</u>
Team Size	7.82	3.63
Team Longevity(months)	9.56	11.46
Number of Nationalities on Team	3.55	2.02
Number of Mother Tongues on Team	2.79	1.37
Number of Countries in which Team Members were Located	2.55	1.81
Number of Functional Areas Represented on Team	3.55	1.70

Table 2: Means, Standard Deviations, and Correlation Matrix

	<u>Mean</u>	<u>Std. Dev.</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
1 Professional Similarity	3.41	.96							
2 Communication Frequency	3.61	1.06	-.343**						
3 Communication Quality	3.62	.78	.159	-.038					
4 Communication Regularity	2.59	.63	-.230	.109	.116				
5 Team Longevity (months)	9.56	11.46	-.215	-.116	.101	.105			
6 Team Performance	3.83	.79	.036	.069	.683**	.123	.205		
7 Team Size	7.82	3.63	-.166	-.002	-.072	.076	.232	-.118	
8 Trust	4.06	.72	.050	.166	.716**	.022	.181	.581**	-.107

** $p < .01$ (two-tailed)

* $p < .05$

4.1 Drivers of trust in virtual teams

Table 3 shows the results of regressing trust against the hypothesized independent variables. The regression model fit the data well with an R^2 of .543 and an adjusted R^2 of .483. Hypothesis H1 proposed that teams with greater longevity would exhibit greater trust. This hypothesis was supported ($p < .01$). Hypothesis H2 proposed that larger teams would exhibit lower levels of trust than teams with fewer members. No support was found for this hypothesis ($p > .10$).

Hypotheses H3 through H6 concerned the effects of various aspects of communication on trust. Hypothesis H3 proposed that greater communication quality amongst team members would be associated with higher levels of trust. This hypothesis was supported ($p < .01$). Hypothesis H4 proposed that higher communication frequency would be associated with higher levels of trust. This hypothesis was supported ($p < .05$). H5 proposed that communication regularity would be associated with higher trust. This hypothesis was not supported ($p > .10$). Finally, H6 proposed that virtual teams that came together for an early-stage face-to-face meeting would exhibit higher levels of trust. This hypothesis was not supported ($p > .10$).

Table 3: Antecedents of Trust in Virtual Teams

	<u>Standardized Coefficients</u>
Initial Face-to-Face Meeting	.059
Team Longevity	.242**
Team Size	-.128
Communication Quality	.679***
Communication Frequency	.229**
Communication Regularity	-.094
R ²	.543
Adjusted R ²	.483
Significance of F for Model	.000

* $p < .1$ (two-tailed)

** $p < .05$

*** $p < .01$

4.2 Drivers of virtual team performance

The results of regressing team performance against a number of proposed antecedents are shown in Table 4. The regression model fit the data fairly well with an R² of .333 and an adjusted R² of .276. Hypothesis H7 proposed a positive relationship between trust and task performance. This relationship was supported ($p < .01$). In addition, it was hypothesized (H8) that professional differences would be negatively related to team performance. This hypothesis was not supported ($p > .10$). Hypothesis H9 proposed that creative tasks would exhibit lower levels of team performance than those associated with coordinative or computational tasks. This hypothesis received marginal support ($p < .10$). Finally, Hypothesis H10 proposed a positive relationship between the occurrence of an early-stage face-to-face meeting and virtual team performance. Not only was this hypothesis not supported, the results indicated a significant negative relationship between these variables, suggesting that meeting face-to-face at an early stage detracted from team performance.

5. DISCUSSION

The key objectives of this research were to examine how communication factors influence the formation of trust and task performance in real-world global virtual teams. This section reviews the key findings of the study and suggests managerial implications, limitations, and some directions for future research in this area.

5.1 Managerial implications

Two team factors, longevity and size were proposed as antecedents of trust. As hypothesized, team longevity was shown to be positively related to trust. Team size, hypothesized as being negatively related to trust, showed no significant relationship. Taken together, these results suggest that trust tends to develop slowly and, in general, not strongly dependent on team size. This may indicate that trust in virtual teams is less a function of personal knowledge of one's team mates and more strongly related to experience of their actions. The importance of joint team member experience argues for the significance of what may be termed "team capital", since it suggests that people who have worked together on virtual teams in the past are likely to have developed trusting relationships that represents a valuable source of future competitive advantage for a firm.

Two aspects of communication, perceived level of communication quality and communication frequency, were significantly positively associated with trust. These results are consistent with theories of trust that propose that

familiarity between trustor and trustee tends to increase trust. Regular communication, however, did not significantly increase trust. This suggests that frequent communication, on an as-needed basis, may build trust more effectively than regularly scheduled meetings. Managers might do well to reduce the number of scheduled meetings while ensuring that team members are easily able to contact one another when an important issue arises.

The finding that early-stage face-to-face meetings were not associated with a higher level of trust within the team is intriguing. It suggests the possibility that meeting face-to-face may be a double-edged sword: On the one hand, the rich communication facilitated by this type of meeting may foster close interpersonal relationships and facilitate shared understanding (Duarte and Snyder 1999); on the other hand, it may make team members aware of displeasing characteristics of fellow team members that lead to lower levels of trust. Although face-to-face interaction provides rich information, it is questionable whether all the additional non-verbal cues, such as whether someone is a sharp dresser, are relevant to a judgment on whether to trust him or her. In some instances, some information of this kind may interfere with the development of trusting working relationships. Research has shown that people are more likely to trust others who they perceive as being similar to themselves (Tsui, Egan and O'Reilly 1992). For example, a team member with more traditional views on jewelry may decide not to trust someone merely because he or she wears a nose ring. This may also relate to the suggestion that cultural differences are less salient in computer-mediated environments (Jarvenpaa and Leidner 1999).

As hypothesized, trust was strongly related to perceived task performance, extending the result previously found for student teams (Jarvenpaa and Leidner 1999) to teams of real-world professionals. This underscores the importance of relationships between people, as opposed to the mere use of state-of-the-art technology, in facilitating cooperative working relationships, even at a distance. As DiStefano and Mazeveski (2000) have suggested, it is by integrating ideas from multiple team members in a trusting environment that global teams are best able to achieve creative solutions.

In contrast with this result, perceived professional diversity showed no significant effect on performance. One possible explanation is that members of global virtual teams are familiar with crossing cultural boundaries and that this comfort level with differences extends to differences in functional culture as well. The result may also reflect the characteristics of this particular sample, whose members would have gained experience in working in functionally and culturally diverse teams during their business school years.

The type of task the team was engaged in was significantly related to perceived task performance. As expected, members of virtual teams working on tasks categorized as creative tended to perceive their performance as lower than those working on coordinative or calculative tasks, providing support for extending the generally-held belief that creative tasks are more challenging to the virtual realm.

Not only was there no significant relationship between early-stage meetings and trust, a significant *negative* relationship emerged between early-stage meetings and perceptions of team performance. This is in direct contradiction with a number of published recommendations for virtual teams that espouse face-to-face meetings at the start of a project (e.g., De Meyer 1991, Duarte and /Snyder 1999). One possible reason for this result may be that virtual teams whose members are given the budget to meet in person early in the life of the project may be those teams with more challenging team assignments. In this case, the performance of the teams that engage in these meetings might well be viewed as being of lower quality.

Foremost among the findings from this research is the importance of trust in multicultural virtual teams. Despite the descriptive research design, the results strongly suggest that trust is a major determinant of the performance of these teams. The results suggest that trust is more likely in global virtual teams where members have worked together for some time, who understand one another well, and who are in frequent communication with one another.

One important antecedent of trust was team longevity. Another important determinant of trust, which may well reflect the multiculturalism of the sample, was the perceived quality of team member communication. Related to this need for accurate information was a perceived need for up-to-date information. The presence of an early-stage face-to-face team meeting did not affect perceptions of trust, suggesting that the meeting itself may be less important than previously believed. The picture that seems to be emerging from these results is that experience of one's team-mates as colleagues seems to be more important than mere social familiarity.

5.2 Limitations and directions for future research

One limitation of this research stems from the fact that it is based on a small convenience sample of virtual teams. Using the sampling frame of graduates from an international graduate business school allowed access to a very specialized population that would have been difficult to reach using conventional random sampling. This sample may differ from the general population of virtual teams in that the informants are all products of a common, culturally-diverse graduate school experience. However, these are precisely the sort of people who self-select into multinational corporations and are likely to be assigned to virtual teams. Follow-up studies might examine a larger spectrum of global virtual team members, and might tease out the effect of previous multicultural experience on trust and team performance.

Another limitation is the use of a single informant from each team. In future research, data collection from all team members would be ideal, but, as in this case, is often not feasible in field-based team research. This additional data would allow for the study of within-team perceptual differences.

A final limitation is the fact that a perceptual measure, rather than an independent external measure, was used for team performance. This raises the possibility of common-method bias, in that the independent and dependent variables were collected from the same respondents, using a single survey instrument. One test for this bias is the test of the hypothesis that all measures load on a single factor. In this test, the independent and dependent variables were factor analyzed together and were found to load on distinctly different factors, suggesting the absence of significant bias. Despite this presumed lack of bias, it would be advantageous if an independent measure of team performance could be obtained in future research.

Perhaps the most interesting question raised by this research is the apparent negative relationship between early-stage meetings and perceived team performance. It would be valuable to investigate whether this result extends to other contexts, and, if so, what the underlying mechanism is. One factor that might be studied is the effect of team members' having worked together in the past. In contrast with virtual student teams, members of real-world teams virtual are more likely to have prior knowledge of their fellow team members before the team starts work. Even if this knowledge is only by reputation, it may nevertheless lessen the need for early-stage face-to-face teambuilding, and may allow firms to avoid not only the costs incurred in bringing everyone together. In addition, it may improve performance by avoiding the negative stereotyping of team members.

It would be interesting to explore the joint effects of functional and cultural diversity in global virtual teams. In particular, the "faultline" theory that there are interaction effects between different types of diversity, as proposed by Lau and Murnighan (1998) is worthy of investigation in a global virtual team context.

Further study of the link between task type and perceived team performance is warranted in order to determine whether the lower performance on creative tasks is simply related to the inherent difficulty of unstructured tasks, or whether the leaner communication medium contributes to the result. This might provide guidelines to managers as to which tasks would be better reserved for teams with co-located members.

Finally, it would be interesting to study the membership of global virtual teams in more depth to investigate the effects of specific cultural dimensions on the performance of global virtual teams. For example, using Hofstede's (1980) cultural framework, what is the effect of having individualists and collectivists work together at a distance? Does the use of lean media accentuate some cultural differences, while minimizing others? The answers to this and other culturally-related questions will provide valuable guidance to managers working not only in an increasingly global context, but also one in which virtual collaboration is becoming increasingly crucial.

6. REFERENCES

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APPENDIX A: MEASURES

All Likert-scale items were scored on five-point scales. Except where otherwise stated, the scales were anchored by "Strongly Disagree" and "Strongly Agree".

Communication Quality (Cronbach Alpha = .79)

1. We communicate very well.
2. We understand each other very well

Professional Similarity (Cronbach Alpha =.76)

1. Most of us have similar training.
2. Team members' professional backgrounds are similar.

Trust (Cronbach Alpha =.94)

(Adapted from Jarvenpaa, Knoll, and Leidner 1998)

1. I can rely on those with whom I work in my team.
2. The members of my team are dependable.
3. Overall, the people in my team are very trustworthy.
4. I trust my team members.
5. I can rely on fellow team members to keep their promises.

Team Performance (Cronbach Alpha = .91)

(Adapted from Stringfellow 1998)

1. The team produces high quality output.
2. Our project is very successful.
3. Our results are above average.
4. Our final product is excellent.
5. We are effective at accomplishing our task.
6. I am satisfied with our progress on this task.

Communication Frequency

(Adapted from Maltz 2000)

On average, how often do you communicate with your fellow team members?

- Once every few months
- 1-3 times a month
- 1-3 times a week
- 4-5 times a week

- At least daily

Communication Regularity

Do team members communicate on a regularly scheduled basis, such as once a week?

- Yes
- Sometimes
- No

Task Type

(Adapted from Hambrick, et al. 1998.)

Please indicate the primary type of task undertaken by your team (select one only):

- Coordinative (a task with an objective measure of success that executes an agreed upon plan by means of well-coordinated interaction between team members, for example, executing an already-developed business strategy)
- Computational (a task with a relatively objective measure of success that requires the assembly and analysis of a bounded amount of fairly clear-cut information, for example, manufacturing site selection, global logistics planning)
- Creative (a task with no verifiably correct solution that can be approached in numerous different ways, for example, product development, global strategy development)

