DO YOU READ ME?
THE DEVELOPMENT AND MAINTENANCE OF TRUST
IN GLOBAL VIRTUAL TEAMS

by

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Abstract

This paper explores the question of how trust is built and maintained in global virtual teams where the virtual form is built on electronic networks alone; no face-to-face meetings are possible between culturally diverse members. The existing literature on trust suggests that there are three forms of trust: deterrence-based, knowledge-based, and identification-based trust and that one form of trust enables another form; namely, deterrence-based trust is followed by knowledge-based trust, which is followed by identification-based trust. The research on computer-based communication suggests that the traditional forms of trust might be difficult to attain and sustain in the virtual context. Others have also suggested another from of trust, swift trust, for virtual contexts. Our study involving a sample of 29 global virtual teams, consisting of 4 to 6 members residing in different countries, and interacting and working together for 6 to 7 weeks suggests that global virtual teams can exhibit high levels of trust, including identification-based trust. Yet, teams in a virtual context did not seem to follow necessarily a path of deterrence- to knowledge- to identification-based trust. Also, the identification-based trust tended to revolve around a common task rather than based on the individuating cues from the members. The study also found partial support for swift trust. Pragmatically, this study suggests that under certain circumstances, a global virtual team can build and maintain trust without face to face contact. Theoretically, the study extends the developmental model of trust and the theory of swift trust to the global virtual team context.

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Introduction

"...you cannot build network organizations on electronic networks alone...If so,... we will probably need an entirely new sociology of organizations."

<div align="right">Nohria and Eccles, 1992, pp. 304-305.</div>

Virtual organizations are an emerging boundaryless network organization form that cuts across various intra-and interorganizational boundaries and are mediated and enabled by advanced information communication and technology architectures (Grenier and Metes, 1995; Stewart, 1994). The basic building block of virtual organizations is a virtual team to allow the organization to be fluid and flexible (Jarvenpaa and Ives, 1994). Virtual teams are temporary teams that are assembled on an as-needed basis for the duration of a task and staffed by members who are physically dispersed and who interact primarily through the use of computer-mediated communication technologies (Knoll and Jarvenpaa, 1995). The team members are unlikely to have worked together before and do not expect to work together again in the future. When a virtual organization expands its operations internationally, virtual teams become global virtual teams with members who represent diversity in cultures and countries and where virtual interaction replaces all or much of the face-to-face interaction (see Figure 1).

First Virtual is heralded as an exemplary Internet based virtual organization. The employees are geographically dispersed and much of the work is accomplished via virtual teams. Two-day monthly staff meetings serve as the only in-person meeting for many of the employees. Despite exponential revenue growth over the last two years, the firm reports problems with team coordination, efficiency, and performance (Borenstein, 1996). The employees do not feel they know each other well enough to predict each others' behavior resulting in miscommunication, missed meetings, and ultimately near misses of key work milestones. These problems point to difficulties in communication and, we argue, to the lack of trust in the virtual teams.

Trust plays a key role in creating and maintaining productive nonauthority based work relationships (Kramer and Tyler, 1996). In virtual forms of organizing such as that in First Virtual, trust is the primary means of social control and coordination (Miles and Snow, 1986; 1992). Trust is the only means by which members can be assured of others' willingness and ability to deliver on their obligations. Davidow and Malone (1992), in their book of The Virtual Corporation, state, "trust, as we will show, is the defining feature of a virtual corporation" (p. 9). Trust refers to the "willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer, Davis, and

Schoorman, 1995, p. 712). Put simply, trust is the willingness of an individual to behave in a manner that assumes another party will behave in accordance with expectations in a risky situation (Deutch, 1958).

Yet, the global virtual context eliminates the situational factors known to contribute to trust such as common history or familiarity with each other, geographical proximity, and similarity in backgrounds and experience (Mayer et al, 1995). The global virtual context also eliminates the developmental factors. Trust is most readily developed in the face-to-face interaction, the very interaction that the virtual form reduces or eliminates (Nohria and Eccles, 1992). According to Handy (1995) , "The more virtual the organization, the more its people need to meet in person" (p. 46). If trust needs physical face-to-face touch, how can global virtual team members who will never meet each other trust each other and on what basis? This paper will address the question of how trust is built in virtual forms that are built on electronic networks alone. The objectives of this paper are to explore (1) whether trust is possible in a global virtual context, (2) if trust exists, what its nature is, and (3) what factors appear to impede or facilitate the development of trust.

The next section of the paper will review literature on the development of trust that suggest that the traditional forms of trust might be difficult to attain and sustain in the virtual context. The third section presents the methodology of the empirical study. The fourth section reports on survey results and within-case and cross-case analyses. The fifth section presents discussion of results. The sixth section concludes the paper.

Conceptual Background

Trust is a complex, multifaceted, and changing concept (Lewicki and Bunker, 1996; Butler, 1991). Trust has been conceptualized in terms of the type of relationship such as romantic relationship (e.g., Larzelere and Huston, 1980; Wheeless and Grotz, 1977), professional superior-subordinate relationship (e.g., Roberts and O'Reilly, 1977; Korsgaard et al, 1995; Earley, 1986), organizational relationship (e.g., Cummings and Bromiley, 1996; Sitkin and Roth, 1993), and so on. Trust can have cognitive, affective, or behavioral facets with the strength of the particular facet being dependent upon the type of relationship involved between the trustor and trustee (Scott, 1980; Butler, 1991; Cummings and Bromiley, 1996). Furthermore, because few relationships are completely static, the dynamics of trust may change over time within the same relationship (Lewicki and Bunker, 1996; Sheppard and Tuchinsky, 1996).

Developmental Model of Trust

Shapiro, Sheppard, and Cheraskin (1992) proposed a developmental model of trust for two parties in a business context who have not had any prior history. The model identifies three forms of trust: (1) deterrence-based trust, (2) knowledge-based trust, and (3) identification-based trust. Deterrence-based trust means that individuals do what they say they will do

because of a fear of punishment if they do not perform consistently. Knowledge-based trust is grounded on the knowledge of the other person (i.e., trustee) that allows the trustor to understand and predict the behavior of the trustee. Identification-based trust is based on empathy and common values with the other person's desires and intentions to the point that one person is able to act as an agent for the other. Lewicki and Bunker (1995, 1996, 1997) extended the work of Shapiro et al (1992). They argued that the development of trust occurs in stages with deterrence-based being the first stage and identity-based the final, highest, stage. They suggested that the development of trust is fundamentally the same for different types of relationships (romantic, manager-employee, peer to peer work relationship, etc). They did not, however, specify the boundaries of the model and, of interest to our study, whether the developmental model applies to virtual contexts where the parties have no face to face contact.

Developmental Trust Model in a Virtual Context

In a virtual environment, deterrence-based trust appears to be particularly fragile and weak. Deterrence-based trust assumes that the fear of punishment is a greater motivator than the potential benefits from distrustful acts (Lewicki and Bunker, 1996). In non hierarchical or lateral relationships, penalties are often imposed by the greater network of associates and peers (Lewicki and Bunker, 1996; Sheppard and Tuchinsky, 1996). But in the virtual context, it will be difficult to plan a concerted punishment and there are not clear means to punish the nonobeying member. Because virtual team members do not share a past nor a future, it will be a challenge to identify and contact the appropriate network of friends and associates. Also, it takes more time to reach consensus on norms, rules, and punishment (Kiesler and Sproull, 1991). Because the threat of penalty from untrustworthy acts appears to be limited, frequent violations of the norms and rules are reported (Sproull and Kiesler, 1991. Siegel et al, 1986; Kiesler, 1986).

Likewise, an entirely electronic environment might prohibit the socialization and courtship necessary for knowledge-based trust. Regular and rich exchange of social information as well as explicit courtship where one party attempts to learn about the other party are necessary for knowledge based trust (Lewicki and Bunker, 1996; Sheppard and Tuchinsky, 1996). In the context of the current study, teams were limited to the asynchronous electronic mail communication and to occasional use of text-based synchronous "chat" facilities. Such communication media has been labeled as lean because the media is perceived to be incapable of handling rich information with ambiguity and uncertainty (e.g., Daft, Lengel, and Trevino, 1987). Recent research has challenged this media richness theory and concluded that in situations where parties know each other well (i.e., have a shared interpretive context), a lean electronic mail can convey a rich message (Zack, 1993; Markus, 1994). Still, if the parties are confined to electronic communication for long periods of time, their relationships are expected to turn to "cold and impersonal" (Markus, 1994). De Meyer (1991) found that in international R&D teams, initial face-to-face meetings were necessary to build a relationship and confidence

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so that subsequent electronic communications were meaningful. Periodic face-to-face meetings were additionally needed to counteract the decay in the teams' communication confidence that occurred when the communication was limited to electronic means.

Many others have reported that the computer-supported communication inhibits social information exchange and courtship because of impersonalization, extreme task orientation, and flaming (Lea and Spears, 1992; Steinfeld, 1986; Parks and Floyd, 1996, Siegel et al, 1996; Lea et al, 1991). Nohria and Eccles (1992) suggest that only via copresence, broad bandwidth that handles multiple senses, and via interactive communication that allows interruptability and instant feedback can individuals receive rich enough information allowing them to begin building trust in each other. Face-to-face encounters meet these requirements and thus may be irreplaceable for building trust as well as repairing eroding trust (Nohria and Eccles, 1992; O'Hara-Devereaux and Johansen, 1994).

Barriers to the development of identification-based trust might be expected to be an extension of barriers of knowledge based trust. The electronic communication cannot provide the context for communication and courtship that would allow individuals to develop kinship and intimacy and feel like that the others "think alike" and "feel alike." Identification-based trust assumes that there is a strong and salient group membership between trustor and trustee (Lewicki and Bunker, 1996). Nohria and Eccles (1992) argue that for people to identify with a group, members have to be able to establish roles for themselves and others in the group because only via roles can the members orient themselves toward one another and feel part of the group in the uncertain and ambiguous virtual context. The virtual context presumably eliminates critical team dynamics that would promote identification with a group.

Others, however, disagree that groups built on electronic networks cannot build group identity. Rheingold (1993) describes highly intimate even romantic relationships among electronically interacting individuals. Walther (1992, 1994, 1995, 1996, 1997) has developed a hyperpersonalization theory for groups limited to computer-supported communication. The theory argues that because individuating information (e.g., cues that help others understand if they are similar or different, for example, physically) is so scarce in the virtual context, members form a group identity on the basis of very limited interpersonal information that inherently emphasizes similarity among the members. Individuals in the virtual context tend to only reveal factors that provide favorable and similar cues of themselves to others. The group identity in turn increases the likelihood of further overattribution of similarities, which results in members' idealizing the other members and feeling that a member knows his or her teammates very well. And finally, the idealized perceptions tend to promote expected behavior or at least the perception that the other is behaving as expected. Ironically then, identity-based trust may be easier to form in an electronic than face-to-face environment because only selected cues are present that in turn promote stereotyping and overattribution. In fact, recent research has shown that geographically dispersed culturally diverse partners who relied totally on computer-mediated communication and were never able to meet each other physically, communicated

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more affection, reported higher levels of intimacy, social and physical attraction than did partners that were local (Walther, 1997). Moreover, Walther (1995) did not find the computer-mediated communication groups to be any more task oriented than the face to face teams. In short, while some authors' positions would question whether traditional forms of trust can be attained in a virtual context, other researchers' work, particularly that of Walther, supports the notion that trust, even identification based trust, can be built in an entirely electronic context.

Swift Trust

Beyond the different forms of trust, there is a question whether trust accumulatively changes from deterrence-, knowledge-, and identity-based trust in a virtual context. Meyerson, Weick, and Kramer (1996) suggest that the time and task requirements and constraints of the temporary team work preclude the development of trust in a gradual and accumulative fashion. Rather, they argue that a different form of trust, swift trust, is essential in such teams. Swift trust depends less on psychologically relating to others and more on doing in pursuit of the common goal. "There is less emphasis on feeling, commitment, and exchange and more on action, cognition, the nature of the network... , and avoidance of personal disclosure... modest dependency, and heavy absorption in the task" (Meyerson, 1996, p. 191). In temporary teams, members have to behave as if trust existed rather than spending time developing it or waiting to see who is or is not trustworthy. Hence, trust is not based on deterrence, knowledge, nor identification. Rather it is based on self-fulling prophecy; that is, if one acts toward another in a trusting matter, this trusting behavior creates trust that was presumed to be there in the first place. In order to maintain trust, members have to keep engaging in these trusting behaviors. In summary, swift trust is characterized as less of an affective or cognitive interpersonal form and more of a depersonalized action form directed toward the whole team (Meyerson et al, 1996). This characterization was based largely on anecdotal evidence on face-to-face temporary teams involving film production crews. Iacono and Weisband (1997) applied the concepts of swift trust to U.S. based virtual teams and found that high performing teams exhibited higher levels of initiations over the life of the project than did low-performing teams. Unfortunately, the study did not measure trust and therefore, we do not know whether the teams with more initiations indeed had higher levels of trust. Next, we report on the the study that attempted to shed light to the development and maintenance of trust in virtual teams.

Methodology

Three hundred and fifty masters' students from 28 universities around the world (every continent was involved except the Antarctica) participated in global virtual collaboration organized over a period of six weeks during the spring semester of 1996. The students' learning objectives were to learn how to collaborate with others in a virtual setting and to obtain international exposure by working with people from different countries. Participants were recruited through contacts with professors who had participated in previous collaborations (see

Knoll and Jarvenpaa, 1995). Although the letter soliciting participation explicitly stated that one of the conditions for participation included having the exercise comprise 20-40% of the students' course grade, the context of the students' participation varied. Most professors folded the exercise into one of their regularly scheduled courses where it counted for 20% to 75% of their course grade. To further motivate the students' participation, the professors were provided reports on their students' inactivity after the first two and four weeks. Additionally, monetary reward ($600) and industry publicity were promised for the winning team. All team members were also asked to rate each other's contribution to the final project.

The students were assigned to teams of four to six people each using the following criteria: (1) Each member on a team resided in a different continent or subcontinent of the world. (2) Each team should have a mix of students from low and high context cultures (Hall, 1976). (3) The students from a given university were assigned to teams based on the order their name appeared on their professor's list. The students were not assigned based on their skill sets.

The teams were charged with completing three tasks: two voluntary assignments and a final project (see Table 1 for the timing of the exercises). The students' course grade as well as the $600 reward was solely based on the successful completion of the final project.

March 11[1]	Collaboration began
March 24	Voluntary Assignment I completed
March 31	Voluntary Assignment II completed
April 2	First survey administered
April 29	Final project completed
April 30	Second survey administered

Table 1: Collaboration Schedule

Assignments

The first two voluntary assignments were designed to encourage the participants to exchange information about themselves and gain experience with the World Wide Web (WWW) technology platform. The first exercise asked the participants to send a description of themselves to their team members. The second exercise required each team member to locate one web site that they felt was relevant to business persons with information systems (IS) responsibilities and provide a paragraph explaining the relevance of the site.

The third assignment, the final project, asked the teams to propose and develop a WWW site and a 3-page justification of the proposal providing a new service or offering to ISWorld Net. (IS World Net is an electronic community comprised of IS practitioners and academicians around the world that communicate and disseminate information via the Internet

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[1] Between March 11 and 24, most students were on one week spring break. Hence, for all practical purposes, the teams only had one full week to complete the first assignment.

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and newsgroups.) The students had four weeks to complete this project. The students were told that each team member was to submit the same final deliverable to their professor and the team deliverable was to represent the collective efforts of the group. The assignment was expected to take about 20 hours of each student over a four week period.

Technology

The host institution established a WWW site on the Internet (http: //uts.cc.utexas.edu/~bgac313/index.html). The purpose of this central repository of information was to ensure that all students had access to the same information at the same time. Students communicated solely through electronic means. Electronic mail reached the individual team members via a "team address." Sometimes students used the reply function to respond to messages sent by individuals, thereby communicating with that individual alone.

Data Collection

All students' mail messages sent to the "team address" were archived. Students were notified at the start of the exercise that messages were being collected.

Team members were also sent an electronic survey to complete immediately following the deadline for the second voluntary exercise (Time 1). The survey was designed to assess the level of trust in the team. Measures of both trust and trustworthiness were included because past research has used these concepts interchangeably (e.g., Roberts and O"Reilly, 1977; Korsgaard et al, 1995). A second survey identical to the first with the addition of questions relating to team processes and outcomes (satisfaction, cohesiveness, and perceived group effectiveness) was sent to the team members a day following the deadline for the completed final project (Time 2). The first survey had a response rate of 47% and the other a response rate of 61%. The response rates are reasonable given that most teams had several inactive members. Inactive members were not expelled from participation as it was felt that coping with them was a part of being on a virtual team.

Since the unit of analysis was a team, we collapsed the responses of the team members on each team in a single team score for trustworthiness, trust, satisfaction, cohesiveness, and perceived group effectiveness. Before so doing, teams with responses from less than two members were eliminated from the dates as it was not felt that a single respondent would be a justifiable representation of the team.

Trustworthiness was measured via the Pearce et al (1992). The 5 point scales were modified to reflect the team rather than an organization as the unit of analysis. A modified 5 point scale version of Schoorman et al instrument (1996) based on Mayer et al (1995) was used to measure trust. The instrument was modified to reflect the team as a unit rather than the original dyad as a unit of analysis. Satisfaction was measured using items from Valacich et al

(1992). To measure perceived effectiveness, items were taken from Connolly et al (1990). To measure cohesiveness, items were taken from Chidambaram (1996), who modified Seashore's (1954) instrument. In general the factor analyses supported the proposed scales (see Appendix B for Factor analysis results and reliability). All variables exceeded .85 on the reliability score except the trust construct that had the score of .66. Trust and trustworthiness were highly correlated at Time 1 (P=.019) and Time 2 (.003). Since trustworthiness proved to be a more robust measure, we used that variable to represent trust. (See Appendix A for measures).

Selection of Teams for Case Analysis

Of the 75 teams, only 29 teams had two or more members who completed both the first and the second surveys. We assigned the 29 teams to one of the following categories: (1) lower than the mean trust of the sample at Time 1 and Time 2 (LoLo), (2) lower than the mean trust at Time 1, but higher than the mean trust at Time 2 (LoHi), (3) higher than the mean trust at Time 1, but lower at Time 2 (HiLo), and (4) higher than the mean at Time 1 and Time 2 (HiHi). Of the 29 teams, ten teams fell into the LoLo category, four into the LoHi category, five into the HiLo category, and ten into the HiHi category (see Figure 2). Following the advice of Eisenhardt (1989), we selected three teams for case analysis from each category that were the most extreme representatives of that category. Extreme cases make the process of interest "transparently observable" (Eisenhardt, 1989). In summary, the selection of cases for analysis was based on theoretical sampling of high and low trust teams at different points in time.

Many different approaches to case research have been advocating, some recommending researchers to go to the field without prior preconceived notions of research questions, concepts, variables, etc. (Glaser and Strauss, 1967). Others take a drastically different view and recommend predetermined research questions, themes, and data collection plans (Eisenhardt, 1989; Miles and Huberman, 1984). Our case research falls between the two. We began our case analysis with a predefined research question, but did not have a set of a priori constructs and data coding themes (see below). Rather, we allowed constructs to emerge. We used the following process: Each team's mail archives were analyzed message by message noting the date, time, who initiated the message, and the content summary of each message. Next, a five to ten page case write-up was prepared for each team (the write-ups as well as the team archives are available from the authors). Next, cases were compared and contrasted with other cases in their category, followed by comparison with cases in other categories. The techniques of Miles and Huberman (1984) were used in within-case and cross-case analyses.

Results

We will first report on the survey results followed by case study analyses.

Survey Results on Trust

At Time 1, team trust on average was 3.86 on a five point scale (1=no trust; 5=high trust) (N=48 teams) (see Table 2). This suggests that after a brief period of initial two weeks (Time 1), teams on average reported to have relatively high level of trust. At time 2, team trust on average was only slightly higher of 4.06 (N=60 teams). Hence, relatively high levels of trust were associated with at least a subset of global virtual teams at Time 1 and Time 2.

Because of significant correlation among the outcome variables of cohesiveness, satisfaction and perceived effectiveness, we conducted Manovas with cohesiveness, satisfaction, and perceived effectiveness as dependent variables and trust at Time 1 as independent variable in the first Manova and trust at Time 2 as independent variable in the second Manova. Trust at Time 1 was a significant and positive predictor of team cohesiveness at Time 2 (b=.48344; p<.04), but not of satisfaction and perceived effectiveness at Time 2. Trust at Time 2 was a significant and positive predictor of team cohesiveness (b=.781, p>.000), satisfaction (b=.730; p>.000), and perceived effectiveness (b=.740; p>000) at Time 2. Hence, the results suggest that the higher the level of team trust, the greater the team cohesiveness, satisfaction, and perceived effectiveness. Research on face-to-face groups has similarly found trust to be a strong predictor of team outcomes of cohesiveness (Shaw, 1991; Budman et al, 1993; McIntyre and Salas, 1995), satisfaction (Cook and Wall, 1980; Driscoll, 1978), and effectiveness in meeting the team's task goals (Thompson and Pearse, 1992).

Within-Case Analyses

Table 3 reports background information on each case study team: the number and home country of team members, the total number of messages in the first two weeks and the following four weeks, and who sent the messages. Next we illustrate some of the interactions, work processes and work outcomes from each team to in order to shed light to the level and nature of social and professional "interrelating" and the level and nature of task focus or "doing" in each team.

Category 1: Low Initial Trust and Low Final Trust (LoLo)

Team LoLo1. Team LoLo1, composed of 5 members, was characterized by infrequent and unpredictable flow of messages. The team members did little to get to know each other although all contributed to the first assignment. Only one member took any initiative. This member sent 41 of the 81 total messages. Even this member's first message began with the question "Hi! Anybody there?" Six days later a response arrived from another member who questioned whether his message would be received by anyone. In preparation for the second assignment, the active member assigned roles and even volunteered herself as the coordinator. But after a four day lapse in communication and the deadline for the second assignment approaching, this active member asked the other members "are you not in the assignment anymore?" Three of the five people contributed to the second assignment before the deadline. After the first two weeks, the team had exchanged 20 messages.

After the initial assignments, the active member developed a schedule of tasks and deadlines. She asked for feedback from the other members. The only response received was one day later where a member provided an excuse for inactivity and encouraged the team to continue "on the next step." The active member then proposed an idea for the final project and reasserted "seriously and eagerly looking forward to communicate with you." A single response was received emphasizing the fact that the active member had addressed him as she, given that he was "100% of male..." The active member again referred to him as "she" and the response followed "AGAIN I'M CLARIFYING MY GENDER — I'MALE... A man..." After another lapse in communication one member reasserted his desire to "be part of the team." A third member also reemerged, "Don't worry I am still alive." These three members divided the work for the final project with the active member of the team carrying the largest portion of the work. At one point, the active member cried, I "hope that [member x] is working out something for the page," feeling ill-informed. Later, she explicitly asked feedback on her work, without any response. Although the other two members contributed to the final project, their contributions were not included in the deliverable as they were irrelevant. The team disbanded without goodbye messages.

Team LoLo2. Team LoLo2 consisted of 5 members, all of whom communicated although with significant lapses in communication. One member was responsible for 47 of the 109 total messages. This team was initially characterized by technical uncertainties and later by the lack of initiative. The first few messages were not received until a week after they were sent. One member expressed uncertainty about the server and asked for confirmation of her messages. One member asked the other members to "make sure everything is working." Her following message asked again "are you getting my messages, if so please let me know." The members did all complete their first and second assignments on time although the contributions were brief and with little social content. A total of 34 messages had been exchanged in the first two weeks.

Technical problems diminished after the first two assignments, but were replaced by feelings of skepticism and uncertainty over the final project. One member explicitly communicated her feelings of insecurity and would maintain a posture of confusion thereafter and would contribute little to the project: "kind of confused, still, about all that I am not sure I can be very helpful." Another member complained about the difficulty of getting started, "the subject hard to find." The team would assign roles for each member; however, the members did not consistently follow through. And the members never voluntarily gave others feedback. After aggregating her work with others, one member asked for feedback. The response was only "looks great." The member replied, "This is OUR PRODUCT." She continued—"We need to hurry as deadline is approaching." The feedback was again "Great job". She again prodded for feedback, but this time from a specific member who merely replied, that she did not "really understand." The member prodding for feedback erupted "What's going on!!! First, we had decided on a schedule, nobody follows it. Second, we decided on who would

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do what, nobody cares.....Is this a team project or what?". The team completed the assignment on time but no pleasantries were exchanged at the end.

Team LoLo3. Team LoLo3 had 5 members all of whom were active and three of whom took initiative. Compared to the previous two teams, this team exchanged lots of messages - 169 - and engaged in chat sessions as well. This team appointed a leader who would not have confidence in his team members. The leader expressed concern from the start over "the lack of control that a group project entails" as well as the uncertainty associated with the project-- "what should I do when there is no communication." Communication there would be, but often of a sharp tone. The first exercise was submitted without the introduction from one member. The leader scolded the team for not being able to manage such a simple task on time. Technical problems also delayed contributions to the second assignment. Again the leader communicated his frustration to the team "so far we have only had really easy things to do, and we still have failed to meet the deadline properly. "

Although this team began to work on the final project much earlier than the high trust teams, there were complaints on the lack of progress, "what is happening to the rest of the team... "Time is running!!!" Interestingly, on April 16, the leader announced that he had heard, their team was "actually going rather well." Yet, he asserted it was "very hard when there is no communication...I don't know if it is because of technology failing, or people not coming in to work or what..." Interestingly, there were only two communication lapses exceeding 24 hours in six weeks so it was unclear how much more communication the leader wanted. The members in this team also volunteered for tasks and appeared to complete their tasks with their best abilities. However, the leader continued to complain about the quality of other's work and about him not getting enough feedback on his work. With one week left, the leader created a new problem accusing the other members' having plans to submit their own write-ups rather than a collective one. Days after, the leader became preoccupied that the members would submit an incorrect version of the common document. The common project was completed on time, but the members only politely thanked each other.

Summary of LoLo Teams. Besides having technical problems, LoLo teams lacked optimism, excitement, and initiative. LoLo3 had members with initiative and willingness to complete their role assignments, but the negative or distrustful leader suppressed excitement over the project. The teams also suffered from major lapses in communication or as in case of LoLo3, from a fear of communication lapses. The leader of LoLo3 tried to establish rules and apply deterrence to motivate the team members. Team 3 appeared to be more inhibited by these threats than by being helped by them. None of the teams had messages with much social content.

Category 2: Low Initial Trust and High Final Trust (LoHi)

Team LoHi1. Team LoHi1 consisted of 6 members, 3 of whom were active. This team began their exchange by concern over who would do what. Upon volunteering for a role, one

member expressed hurt early on that "not everyone had responded to my 'vote' for me collecting" the information. Another member responded "just do it " and proposed a rule that "silence indicates consent". This was followed by a series of messages on establishing rules and norms such as respect others' ideas, no flaming of other members, and participation by all. The team was also distracted by technical problems and uncertainty about the whereabouts of some members. Ultimately, a late member contributed and noted, " I was away for a few days and everybody thinks I died or something". This team's trust appeared to be low because of uncertainty about the technology and roles, about what to do about nonparticipating members, and what rules and norms should govern the team.

After the initial exercises, the team continued to struggle. But once the idea for the final project was agreed upon by the active members, the messages were succinct and to the point and only dealt with the final project. There were no more references to rules of any kind and the nonparticipating members were simply ignored. The two inactive members were not even assigned any tasks. Later, one of the inactive members reemerged from what he said was an illness. The team welcome him and his extensive comments on the work accomplished so far. The team disbanded with upbeat social messages and a hope that the team would stay in touch. The emergence of trust in the team seemed to coincide with the shift in focus from establishing procedures to a focus on the task.

Team LoHi2. Team LoHi2 had four active members and one inactive member. This team exchanged only 16 messages in the first two weeks. The members, three of whom were older students in their 30s and 40s, engaged in little social dialog, but reflected honestly on the virtual environment, "Quickly establishing a mutual understanding is not an easy task", "Everyone makes an introduction, but the impression you get is like via a letter". The third member echoed a paradox of virtual work: the "virtual environment can either allow a person to be more honest than they may be face to face or the exact opposite, they can hide behind a facade so you may not be getting truth."

Team LoHi2 became focused on the final task very early and exhibited a consciousness of time management throughout the remainder of the project. One member developed a home page and listed the days and hours he would be available to work on the project. He encouraged the other members to send him their schedules and he would post them on his page. The other three active members complied. This team quickly reached consensus on the idea for the final project. From this point on, the team functioned with clear, though undefined, roles. Each member volunteered to do certain parts of the project and followed through religiously. The members neither hesitated to commit nor softened commitments with such statements as "I will try."; rather, they were straightforward and firm: "I promise to do a paragraph or two as ... suggested." One member consistently summarized in a message all changes made to the team's web page. The team disbanded with warm good-bye messages. Although Team LoHi2 sent few messages overall, they were able to develop trust by a focus on task, by following through with their tasks, and by accepting that messaging would be

infrequent although predictable.

Team LoHi3. Team LoHi3 sent relatively few messages--60, 28 of which occurred in the first two weeks. This team began with technical problems which created uncertainty and delays in submitting the first two assignments. This team also had a cantankerous member. A member also emerged early on who would take the initiator (i.e., leader) role on the team. This member compared a virtual team to "playing chess with one move made every 24 hours." This member was the only one who would provide a long personal description and expressed a desire to get to know the others. The initial low trust seemed to result from uncertainty about the technology, the lack of social content in early messages, and the sour tone of one member.

Trust developed gradually as a result of the task-related efforts of three members, the leadership efforts of one member, and the refusal of the members to yield to the negative sentiments of one member. The initiator (leader) remained patient throughout and held the team together despite flaming and sour comments. Once the topic for the final project was agreed, the team made progress. The active members took care in acknowledging each other's efforts, showing enthusiasm, and providing feedback. The team could have erupted at one point because of repeated scarcacism of one member, but the leader responded to the messages very rationally and the rest of the team ignored them. No social pleasantries were exchanged at the end.

Summary of LoHi Teams. The LoHi trust teams appeared to differ from the LoLo trust teams from having infrequent, but predictable communication, more equal participation by members, and the focus on the task after the initial assignments. Like LoLo teams, LoHi team members did not exert effort to getting to know each other and hence the members relationships were purely professional or task focused. These teams seemed to be initially preoccupied with the establishment of rules to manage the uncertainty they felt. The teams appeared to have increased their trust by successfully overcoming (or simply learning to ignore) the initial uncertainties they felt and members' focus on the task and the unwillingness to be distracted by anything that did not contribute to the task.

Category 3: High Initial Trust and Low Final Trust (HiLo)

Team HiLo1. Team HiLo1 exchanged a total of 99 messages, nearly half of which were exchanged in the first two weeks. This team began with great optimism, enthusiasm, and awareness of their communication, "If my style, mood, or anything else is not good, please let me know", "What are you thinking of our interaction up to now?..." The group exchanged many social messages and praised each other for completing the initial exercises on time. The team initially viewed the virtual environment very optimistically: "How hard is it to carry out an entire project without having those boring professional meetings. It's got to be great." The members also took initiative and volunteered for roles; however they did not follow through unless an initiator received confirmation and encouragement from everyone.

The initial high level of trust proved ephemeral and highly vulnerable. Shortly after the

second exercise was completed, a member announced that he "would love to just do it [the final project] and get it over." Another person replied with a hope that they could still try to win the prize. Another member began complaining of technical problems. A fourth member failed to communicate for over a week and there were concerns over his absence: "I hope he gets back in soon, because the things are going to get worse from now on." The work on the final project moved slowly. A member proposed a schedule with deadlines for the final project but this was never again referred to. The members failed to provide any substantive feedback on work accomplishments beyond comments such as "Great Hurray ..., Excellent initiative my friend."

The members exhibited a pattern of followers without a leader: "If you send me a topic that I can research, I'll be happy to do so," said one member. Said another, "But plz plz plz mail me in what way I can contribute. I want to do my share." "So where do I go from here? I still am a little confused. Just tell me what I need to contribute". The commitments also became vague, " "I think (not a promise) I'll be able to have the page (at least the skeleton of it) done early next week." Messages then followed that communicated the disappointment and frustration, "I thought we were all supposed to send this stuff by Wednesday. I don't know what day it is there but it is Thursday evening here. Don't bail on us now!!" A member describes his very busy schedule in response.

In contrast to the optimism and enthusiasm exhibited during the first two weeks, Team HiLo1 exhibited hesitancy, lack of leadership, slow progress on the task, and technical problems during the last four weeks. Hence, the initial trust of the team proved transitory and highly fragile.

Team HiLo2. Team HiLo2 had 73 messages in total, 21 in the first two weeks. The members began the project hesitantly - checking to see if the email messages were getting through, but after satisfied that the system worked, all members contributed their first exercise on time, except for one member, who later explained of having had technical problems. At the start of the second assignment, a member asked another member to take "the role of a team coordinator" because of his "technical experience and ambitions to go into management." The appointed leader did not acknowledge the appointment in writing, but did take initiative in helping the team complete the second assignment with all members contributing.

Although the team began at a high level of trust, it soon declined as the leader became negative and ultimately abandoned the team. A major communication lapse occurred immediately after the second assignment. After this lapse, the leader sent a negative message, "I've just spent a very dull few hours looking through the ISWorld site in preparation for Part III." He then stated, "The next and final assignment is due on 4/29 and, as is the custom of most students, we're leaving it rather late." He offered an idea for the project and received no replies. After sending the message again, a member replied blaming failing technology and promised to respond shortly as he did, but gave no idea of his own for the project. Days later the leader announced he was leaving for two separate trips and would only have one day to

work on the project between the two trips. Soon after, one member, assumed by the others to be the team leader, sent a message to the project coordinator complaining that none of the other members were doing anything. The message was forwarded to the professors of each student on the team. One of the students responded, "that sort of behavior does nothing for the spirit of the team." Another member tried to console the team but also agreed that "In my humble opinion, things are somewhat out of order in this exercise." The leader would send just three more messages in a 10 day period, one terse message with his contribution to the project, one thanking a member for coding the page, and a third stating that he was unavailable to do any more work on the project. Two members stepped on the leadership role for the remainder of the project although the members contributed very little and received no feedback from the other members until after the project was turned in.

Team HiLo3. Team HiLo3 was unique of HiLo teams in that almost half of the messages, 46, were sent by a single member who was appointed as the leader. The team began optimistically and exchanged 36 messages in the first two weeks. However, much of this discussion was almost exclusively focused on procedures. Even on such seemingly minor aspects such as how to refer to past messages, several rounds of messages were sent. A few members experienced problems in receiving email, but the first and second assignment were completed by all and on time except for one individual. The team appeared to be pleased with itself after the first two weeks because it had developed protocol for participation.

After the second exercise, the appointed leader struggled to get the other members to follow his schedule of tasks and deadlines, and the leader grew increasingly pessimistic. April 10, the leader wrote "judging from the pace we have demonstrated so far, we should be done by Christmas." Even though the team had exchanged 53 messages at this point, he stated that "they need to start interacting more often as a team." Soon after, an active member withdrew herself from the project on April 15 and stated that "the actual teamwork could have anyhow been more intensive." The leader grew even more disappointed and asked each member to identify a role for themselves and how much time they planned to devote to the task. Ten hours later, the leader sent another message and stated that "this will continue to be a frustrating experience for many unless everyone participates fully..." and that if "anyone is in for a free ride, get out." He counted the number of task related messages in the past week and described the situation as "extremely frustrating". Although two members responded constructively, the leader expressed lack of confidence that the members would actually do their task. The leader again asked if they actually planned to do their tasks. The leader referred the team to a web site developed by a classmate's team and told them that this was "the kind of site we could build with sustained effort". He continued to express discontent and reminded members of their promises by resending messages containing their promises. The leader did not calm down: "I would have expected this exercise to be a real collaborative effort which, unfortunately, it has not really been" He implored them to "please show me that I can still have faith in the human spirit". Team HiLo3 completed the project but with a great deal of frustration

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and, despite a large number of overall messages, with few messages actually contributing productively to the task.

Summary of HiLo Teams. The teams that shifted from high trust to low trust exhibited initial enthusiasm and excitement. Ironically, their optimism coincided with a lack of serious reflection on the challenges of working in a virtual environment. This optimism and excitement waned gradually in one case, but rather abruptly in two cases. In one case, the trust seemed to fall as the members exhibited a pattern of desultory followers looking for a leader who did not emerge. The other two teams explicitly chose a leader only to be abandoned by them. The very choice of a single leader seemed to be a hedge. The existence of a stated leader seemed to lessen the felt need to contribute among the other members. Since the members had betrayed their leaders, it was no surprise that the leaders betrayed their teams.

Category 4: High Initial Trust and High Final Trust (HiHi)

Team HiHi1. Team HiHi1 began with a mixture of excitement ("this project is really exciting to me") and caution ("can we trust the things we see, read, or hear? How can we be sure we get the right information?"). This team exerted extra effort to get to know each other. Several members faced difficulty receiving or sending messages and they failed to complete the first exercise on time. Early on, a member suggested they "rotate the leading part". She volunteered to coordinate the first exercise and suggested another coordinate the second. The last coordinator was one whose time zone allowed for the most time to complete the project. This team did not establish firm rules nor spent much time setting schedules nor deciding upon procedures. Yet, all team members took initiative and provided feedback on others ideas. The second exercise was completed on time with no problems. After the first two weeks, the team had exchanged 40 messages and one member referred to the team as a "virtual party."

The team would continue to operate with a natural flow. The roles would rotate. Different individuals took initiative for ideas, for developing them, and suggesting work processes. The team braced --"We work apart, but decide together!". A member proposed a schedule with 4 milestones, each with a deadline which was modified by another member to take into account the known pending absences of the members. One member proposed a list of tasks and each member volunteered for tasks.This team had social exchanges in almost all messages up to the final week. Upon return from Easter Break, the first round of messages were purely social --describing their weekends, what they ate, and what they drank. A member began to refer to the team as a "virtual family."

Things were going too well; crises were imminent. A member found a link that she felt had already accomplished what they were planning to do. The team was divided over what they should do and a sense of urgency developed as they "are running out of time!". The one who had insisted that they need to change their idea proposed later that they stuck to the original idea, which resulted in further confusion, with several members asking which topic they were doing. The project was due in four days. The members were well behind their own

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"schedule" but seemed to maintain a confidence--"Don't worry I am sure we will get it done with a little concentration some hard work and keeping in touch." At this point in the project, with four days left, 91 messages had been exchanged. In the remaining four days, 111 more messages would be exchanged!

So intense was the work that the members became accustomed not just to receiving quick responses, but to having at least one other member working at the same time that they began their messages by asking "Are you there??????", meaning at that moment. They posted each other which hours they would be working and conducted the final two days virtually real-time with the exception of one member who was assigned a more independent activity.

Another crisis developed over the division of labor. A member thought she had an understanding with another member on their division of labor, yet they ended up doing precisely the same thing. The initial response was negative: "I really don't know what is going on?...I feel like I am wasting my time working this way..." Another sent a positive message and began working on the part assigned to him and suggested that she had not wasted her time, but had "gained a lot of experience." This team ended up circulating and refining the final deliverable much more than the other teams although they had a late start. The team disbanded by thanking each other for their great work and exchanged personal email addresses. In summary, Team HiHi1 was characterized by enthusiasm, by a strong group identity, by a very relaxed attitude toward procedures, by extreme intensity at the critical moment of the project, by a floating leadership, and, perhaps most importantly, by the ability to overcome two crises.

Team HiHi2. The first two weeks of Team HiHi2's work was dominated by a life loving and eccentric 50-year old former nurse who had such enthusiasm and excitement that the other members immediately took to her upbeat tone. Another member proclaimed to be as "equally enthusiastic", but refused to follow the structure of the first exercise as he felt that structure "limits one's creativity." Two of the remaining members experienced initial technical and language problems. And the team failed to submit the first two exercises on time. The team eventually received all of the exercises for each member and the nurse proclaimed even before end of the first two weeks that "We are beginning to feel like friends, not just team mates." Like Team HiHi1, four of the five members were female.

Compared to HiHi1, this team had permanent roles. The nurse was appointed to be the leader and she took initially on mostly a social role. A third member took the role of structurer. She suggested the numbering system of messages and how to identify what parts were social rather than task oriented. Another also proposed a timetable and schedule. A fourth female took the role of task master.

After the Easter break, the team exchanged many social messages. Only two ideas for the final project were received at this point and there was little task progress. One member expressed confusion over the topic, "not quite sure what to do, and what to write" and asked the others to describe to her "in short clear terms." The male member felt "that we are

stagnating and I just want to know your thoughts. He stated that "if you feel that you can not work for this project, then just say so." He also felt that they were "apparently lagging behind" other teams. Finally one member made substantive progress, another joined her and they developed a draft of the paper. The leader also emerged from a 7 day delay. However, just as the team thought they had turned a corner, a crisis occurred over how each had interpreted the topic. The crisis triggered negative messages, "It is very depressing" but the two optimists cheered the team up by their "calming emails."

Seventy-two messages were sent during the final week of the project and several chat sessions were conducted. This period saw the morale and coordination increase. Three of the five members did the majority of the work with minor contributions from the two others, though with very positive encouragement from them and a desire to participate even if they "were not as adept as the others." The excitement and enthusiasm of the first two weeks reemerged, only this time it was based on task outcome rather than on social dialog. At the end, members were thrilled by their success and hoped to stay in touch.

Team HiHi3. Team HiHi3 exchanged 131 messages throughout the project, 45 of which were exchanged in the first two weeks. Compared to Team HiHi1 and HiHi2, Team HiHi3 was stable and efficient throughout the project with only one minor tension. Like Team HiHi2, Team HiHi3 had a member who was older and more experienced than the others (a 39 year old former doctor) who approached the project with a great deal of realism and calmness. He stated in an early message, "the first couple of weeks...will be largely about sorting out what the project even is, and only then will we be able to have well mapped out aims, objectives, and time frames." This team experienced few initial technical problems. The group agreed upon some procedures as early as the start of the second week--they would read all messages before responding to any, used meaningful subject headings, coded their messages for easy references, and divided into roles. The doctor was nominated as leader and everyone else was also given a "permanent" role on the basis on what they had done so far or appeared to be interested in. The second exercise was also completed by all members on time with little fanfare or social discussion. One member's exercise had problems and the leader sent that member a private message asking her about the project rather than singling her out in front of the team.

Team HiHi3 began focusing on procedures immediately after the second exercise and spent a week in doing so. The leader developed a list of tips on how to chat properly--with upwards of 15 tips included. The members also discussed the proper way to exchange versions of the paper well before anything had been written.

The team has a small crisis as it tried to orient from procedures to tasks. The leader responding to an idea from a second member suggested that he and a third member had a different approach. The third member named by the leader erupted from this remark and suggested a new rule--that no one "speak on behalf of anyone else." She proceeded to support the idea that the leader initially criticized. The leader remained phlegmatic and volunteered

himself for a portion of the work and made suggestions on which members would do the other tasks. The leader exhorted the team to "get moving on the production of the best ISPage ever."

The project proceeded very smoothly from this point on. The doctor continued to play the leadership role and encouraged the team by comparing the team to the teams of his classmates who were well behind. The team's pace intensified well before the deadline and the members wrote portions of the paper during chat sessions. The biggest spurt of messages occurred the week before the project deadline. The members were excited "This is great!" with the way they were working together and finished the project several days early. In fact, this team finished the project at just about the time HiHi1 and HiHi2 were beginning to engage in their most intense work. The members congratulated each other on their contributions and exchanged personal addresses.

Summary of HiHi Teams. The HiHi teams engaged in social introduction that allowed the teams to get to know each other. Periods of intense on-line communication further strengthened the group identify. The HiHi teams experienced difficulties, but were able to overcome them. For example, two of the HiHi teams failed to fully complete the first two exercises on time, but this was not viewed as a setback by the members; rather, they kept prodding the members who did not complete the exercises to complete them after the deadline, not because the completion was needed but because they were generally interested in the other members. The team members all or nearly all showed initiative and roles emerged for all. These roles were temporary or permanent depending on how fluid the team was. In the HiHi teams, the members engaged in frequent communication, gave substantive feedback on fellow members' work, and notified each other of forthcoming absences. Figure 3 summarizes the key observations by the four categories of cases.

Analysis Across the Categories of Cases
The previous section reveals how the low levels of trust were tied to uncertainty over the technology, lack of social introduction, enthusiasm, and initiative as well as unpredictability of communication. The teams that overcame this low trust did so by managing the shift from a social to procedural and then to a task focus and by remaining calm in the face of difficulties. Teams that were unable to manage a successful shift failed to develop capabilities to deal with the unreliable technology, appointed a leader who had no followers, or there were followers with no leader. Teams that began with high trust did so largely on the basis of enthusiasm, initiative, and social introductions of their members. The teams that were unable to maintain this high level of trust appeared to suffer from a lack of serious reflections on their environment, a lack of follow-through on ideas, and negative posturing on the part of key team members. The teams that remained at a high level of trust did so largely by remaining calm in the face of difficult periods, by providing thorough explanations of content contributions, and by engaging in intense work during critical periods of the project.

Figure 4 captures the factors that appeared to be necessary for the teams to either stay or move from one category to another during their 6 week period. We will first discuss the factors that appeared to reduce trust or inhibit the development of trust (Box 1 and 2) followed by discussion of factors that appeared to maintain and/or facilitate the development of trust (Box 3 and 4). If the numbers of teams in our sample that remained at low levels of trust throughout (10) as compared to those which moved to high levels (4) is significant, it suggests that beginning at low levels of trust proved difficult to overcome.

1. Technical uncertainty. The teams with low initial trust were unable to develop a system of coping with the technical uncertainty. In LoLo3, the demanding leader gave his work and home telephone numbers for the other members if they were experiencing prolonged difficulties beyond their control. This was, however, not a realistic coping mechanisms because of time zone differences and the expense of telephone calls. The HiHi trust teams developed schemes to deal with the technological uncertainty.

2. Lack of social introduction. The members with low initial trust engaged in little social exchanges early on. Their early messages were brief and failed to provide sufficient personal information to help reassure the other members and encourage a sense of liking and commitment to the team. All three HiHi teams exchanged many comments of a social nature during the first two weeks of the project and developed a strong rapport among themselves.

3. Lack of enthusiasm. In teams with low initial trust, the messages revealed markedly little enthusiasm or optimism. Several members would try to convince themselves that everything "would be just fine" but such statements revealed more hopeful-delusion than confident optimism. In HiHi teams there was a great deal of excitement about the project, but the teams also reflected quite seriously about potential problems one might encounter in a virtual environment.

4. Lack of Individual Initiative. The teams that had initial low trust had members who did not take any initiative. Also the teams that remained at a low trust level revealed a troubling lack of initiative. Several members on each low-low team revealed a desire to be told what to do and simply waited for others to make the important decisions. In HiHi teams although a leader emerged, at least the majority, if not all, of the members took initiative at different times.

5. Negative Leader. The HiLo1 and HiLo2 teams appointed leaders who engaged in negative rather than positive reinforcement--complaining about other members' lack of participation, complaining about too little communication, comparing the team unfavorably to other teams, or sending messages of complaint to the project coordinator. These actions were viewed as betrayals by the other team members and did little to build spirit or commitment among the team.

6. Unpredictability in communication. Unequitable, irregular, and unpredictable communication hindered the development of trust later on. It was not so much the overall level of communication (as seen with Team LoLo3, a great deal of messages were exchanged--169--

more than some high-high teams or in LoHi teams where relatively few messages were exchanged), but that one or two members were responsible for the majority of the communication and that the communication pattern was unpredictable. This, in conjunction with unexplained lapses in communication among most or all members, prolonged low trust.

7. Emergent roles rather than assigned. The leaders of HiLo and LoLo teams were appointed not based on their greater level of experience than the other members, but apparently based mostly on the fact that they were the individuals who submitted the largest number of messages during the first two weeks of the project. In the third HiLo team (HiLo2), the trust seemed to fall as the members exhibited a pattern of desultory followers looking for a leader who did not emerge because none was taking initiative and producing anything. In teams with high final trust, roles and leadership emerged after the individual had produced something or exhibited skills, ability, or interest critical for the role.

8. Substantive Response and Feedback. The key difference between HiLo and HiHi teams was that in the latter teams, members received concrete evidence that their messages and specifically their contributions to the assignments were READ and furthermore valued. Trust appeared to be critically reinforced by thorough feedback members received from the other members. Even though all three high-high teams divided the work, each member contributed to the work of the others. Even less adept members (either due to language difficulties or experience weaknesses) managed to contribute positively and exert a sincere effort to play a role on the team.

9. Successful transition from social or procedural focus to task focus. HiLo trust teams seemed to build their initial level of high trust largely on the basis of social exchanges. However, these teams were unable to manage a shift from a social to a task orientation. Instead, they engaged in prolonged periods of discussions of a procedural nature. All loHi teams demonstrated an ability to move from a social and/or procedural orientation to a task orientation. Once they began focusing on the task, they remained undisturbed by negative comments, by missing team members, or by failing to stick precisely to their schedule.. The HiHi teams also were able to make a successful, though difficult, transition from a social to procedural and then to task orientation.

10. Phlegmatic Reaction to Crisis. All three HiHi teams experienced some turbulence which could conceivably have permanently disrupted the teams. However, it was their ability to remain phlegmatic during crises that characterized the HiHi teams. All three teams experienced difficulties related to the choice of a topic for the final project--two teams discovered after they had chosen a topic that other web sites existed covering the same idea; one team had difficulty reaching an agreement over an idea. Another temporary source of turbulence for one team coincided with a sudden change in the communication regularity of the key member and disagreement over the division of work. In summary, a number of factors appeared to facilitate or impede trust in a global virtual context. It appears that through social engineering and team process redesign, inhibitors to team trust can be minimized and

facilitators can be strengthened.

Discussion

The objectives of this study were to (1) examine whether trust is possible in a virtual context given that the context eliminates many of the means used to develop trust in a traditional context, (2) if trust does exist, to explore the nature of trust, i.e. whether it appears to be deterrence-based, knowledge-based, identity-based, or swift trust, and (3) explore the factors that facilitate the development of trust. This section will discuss results as they pertain to the first two objectives. The third objective was discussed in the previous section.

Trust in Virtual Context

Whereas some might suggest that trust is not possible in a virtual context, our findings suggest that trust appeared to exist in virtual teams where members had no face-to-face contact. O'Hara-Devereaux and Johansen (1994) describe teams limited to electronic messaging as "working without context" (p. 150). Nohria and Eccles (1992) describe three barriers of electronic communication that prevent shared context-building: (1) the lack of copresence in time and space, (2) the lack of the entire human bandwidth (sight, hearing, smell, taste, and touch), and (3) the lack of capacity for interruption, feedback, and learning. They refute the substitution hypothesis of face-to-face interaction for electronic communication except in cases where relationships are hierarchical, context is certain and unambiguous, and tasks are standard and routine. In the current teams, relationships were lateral, context was highly uncertain, and final team project was challenging and unstructured. Yet, at least some of the teams in our study exhibited trust according to the quantitative survey results and qualitative case analysis.

The study also underscores the fact that trust in virtual teams appears to be dynamic. Even the teams classified as HiHi or LoLo evinced signs of shifting trust over time. The pattern exhibited by HiHi trust teams appeared to be high--low/medium--high rather than a consistent high level of trust. The two of the LoLo trust teams compared themselves favorably against other teams midway through the project and seemed to have somewhat increased their level of trust during the project but were unable to sustain the level to the end. Meyerson et al (1996) and Iacono and Weisband (1997) suggest that trust in temporary teams becomes either more thin or more think over time. Our study suggests more variance and unpredictability within a range. That is, trust fluctuates although teams are unlikely to experience large changes in trust. Only 9 of the 29 teams experienced a notable shift from Time 1 to Time 2 in our study

The adage, "you can never give a second first impression" seems to apply to electronic impressions as well. The first messages, if not the first message exchanged, on the team appeared to set the tone for how the team interrelated. Also, the teams that began with a high level of trust after the two weeks were able to overcome problems more effectively than the teams that began at a low level of trust. Moreover, only 4 out of 29 moved to high level of trust. This suggests that beginning at low levels of trust proves difficult to overcome.

<u>Nature of Trust</u>

In terms of the nature of trust in the virtual context, the cases suggest that there appears to be three forms of trust, but the forms do not build on each other as Lewicki and Bunker suggest (Lewicki and Bunker, 1995; 1996; 1997). According to Lewicki and Bunker, deterrence-based trust is the lowest stage, knowledge-based the next stage, and the identification-based trust the highest stage. The developmental model held in the sense that the LoLo teams seemed to base their trust on deterrence, which proved weaker than a knowledge-based or even identification-based trust experienced by the HiHi teams based upon their more extensive socialization.

The teams that began at low levels of trust attempted to implement rules, which can be seen as a way of building in deterrence mechanisms, or engaged in negative posturing, which can be seen as a means of punishing the disobeying members. Certain behaviors such as negative posturing on the part of the team leader, complaints to the team or against the team, and the lack of inclusion of some members' names on the final project can be considered as a type of punishment. Teams that experienced prolonged attempts at implementing deterrence had difficulty moving to other forms of trust. The emphasis on rules may seem to be a logical hedge, but in the absence of any mechanism to enforce the rules or even monitor the other members' compliance, the rules are ineffective. They are ineffective in the sense that any member could re-emerge and blame his absence on technological or personal problems. Or the complaints can be ignored. One member of a low-high trust team kept a log of visitors to the site he was developing for the team and made comments when only one team member had visited the site. However, the other members remained unbothered by this surveillance. When effective, deterrence can totally destroy trust like in the case of HiLo2 where the leader postured negative comments about the members to the network of associates. A study of self-managing teams (Barker, 1993) found that self-managing teams developed strong normative rules and applied them in a concerted fashion. The rules became more and more rigid over time and more behaviorally constraining than what had existed even before under hierarchical and bureaucratic control. Although in our study the HiHi trust teams generally established rules, they served more as guidelines than requirements for behavior.

Rather than beginning with deterrence-based trust and progressing to knowledge-based trust, the teams that began at a high level of trust did so by engaging in extensive socialization. In terms of knowledge-based trust, one can consider the focus on social exchanges to be an attempt at the "courtship" necessary for a knowledge of the other members to develop. On the one hand, one might view such an emphasis on social dialogue in temporary teams as superimposing a sense of artificial personalness to an otherwise professional relationship. However, if the professional side of the relationship is fostered with progress on the task, as in HiHi teams, then the trust remains at a high level, but if the professional relationship never

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develops because of inability to transition to task focus, as in the HiLo teams, then trust begins to decline. Thus, an initial non-task period of socialization appears to strengthen the trust of the team and assist in early development of knowledge-based trust which, as suggested above, can be crucial in helping the team coping with task and non-task related problems. These findings are consistent with other research on computer mediated communication that have found that to increase group performance, greater task orientation needs to be coupled with greater social discussion and that time spent in socialization does not necessarily diminish time spent on task (Walther, 1996; Chidambaram, 1996).

While it is inappropriate to suggest that in such a relatively short period of time, true identification with others can be established, there were some signs of identity-based trust in the high trust teams. One strategy which appears to enhance identity-based trust is the establishment of roles. Teams from all of the four trust categories developed roles for the members. However, unlike LoLo teams where the roles were geared around non-task functions (such as leader, secretary, reviewer of rejected messages), the roles on the high trust teams revolved around task. More importantly, a factor which might enable the development of the identity-based trust in a virtual environment is the very absence of such typical group identifiers as gender, age, and appearance. With these factors rendered largely irrelevant by the technology, individuals are able to develop a group identity on the basis of a shared task rather than on the basis of similar characteristics. This has interesting implications for intercultural communication: the similarity-attraction-cooperation hypothesis suggests that people are more likely to react positively and cooperatively with individuals who appear similar to themselves because they find such individuals attractive (Francis, 1991; Turner, Sachdev, and Hogg, 1983). Others also suggest that the electronic environment eliminates the possibility of identifying with others on the basis of a shared individual difference factors (such as gender or age) (Walther, 1997). Hence, there seems to be less of a tendency to view individuals from different cultures as dissimilar because differences in verbal interpersonal communication styles and in appearance are less salient. Hence, ironically, it appears that identification-based trust can be developed quickly in global virtual teams, with the shared identity revolving around a common task.

Finally, all of the teams that finished the project at a high level of trust exhibited some of the characteristics of swift trust but did not exhibit these characteristics throughout the project. One of the basic tenets of the swift trust theory is that in temporary teams members have to act as if trust were in place rather than waiting to see who can be trusted (Meyerson et al,1996). The HiHi trust teams were very proactive, enthusiastic, and likely to take initiative from the start. Hence, the members in HiHi teams appeared to act as though trust existed from the beginning. The teams that finished the assignment at high levels of trust (low-high or high-high teams) also demonstrated an intense action orientation at critical project points and particularly toward the end of the project. Trustful acts hence appeared to help maintain or strengthen trust itself although the cases also gave the sense of rapidly decreasing trust in the

face of crises or new uncertainties and unpredictable events.

Meyerson et al (1996) also provide anecdotal evidence that in successful temporary teams, there are few purely social exchanges, but rather a "heavy absorption in the task" (p. 191). They argue that swift trust is less an interpersonal form than an action form. The trust observed in our virtual teams departs somewhat from this second tenet of swift trust. The departure was namely in the social focus observed at the beginning of the project with the task-orientation developing later. It may have been that the first exercise encouraged members to consciously engage in social interaction. However, the teams that began at low trust levels did engage in the first exercise but without a series of social exchanges as seen in the high-trust teams. Also, two of the HiHi teams continued to exchange social messages even in the middle of the project although the last couple of weeks were solely focused on "staying on task."

In summary, based on the survey results and case observations, one can suggest that trust is possible in the virtual context. Furthermore, behaviors associated with knowledge and identity-based trust, namely courtship and socialization, appear to lead to stronger levels of trust than behaviors associated with deterrence-based trust. The developmental models of trust suggest that trust takes time to develop, but our cases tentatively suggest that members in a virtual context had relatively high levels of trust relatively quickly, supporting the notion of swift trust. The observations also suggest that trust does not necessarily follow the sequence of deterrence-knowledge-identity. Sometimes, group identification appears to be formed first followed by knowledge and deterrence. The current findings reinforce the notions of Walther (1992; 1994; 1996; 1997) regarding hyperpersonalization and group identity formation in computer-mediated communication.

Future Research

This study was not designed to reveal insight as to one whether trust is actually built in a virtual team or whether the team members import trust to these new form from their past experiences with teams, and/or general beliefs and values about team work held prior to joining the team. Research on these questions is, however, encouraged. In our case studies, the types of problems (unreliable technology, agreeing on an idea, finding the idea had already been taken, dealing with non-participating members) were common in low and high trust teams. Hence, the LoLo teams and HiHi teams were not distinct in terms of the circumstances they faced, but rather in the individual members' reactions to these circumstances. A theory of anticipatory socialization would suggest that individuals are conditioned to work values, expectations and beliefs on the basis of their past experience and early adulthood experiences (Jablin, 1987). One might hence speculate that swift trust on the team is determined by the collective past team experiences of its members. That is, individual members have preconceived notions about trust in the team before they join the group and this will determine the extent to which they exhibit swift trust. These are all speculations waiting for empirical inquiry.

Future research should also explore the questions of to what extent trust is imported

from other contexts and how robust this imported trust is in the face of unpredictable team events that might be expected to lower trust on the team. Such investigations should also examine how situation dependent swift trust is; that is, to what extent situational factors versus the person's chronic disposition predicts the level of swift trust. Future research should also more rigorously examine the nature of trust by incorporating specific trust measures on deterrence-based, knowledge-based, identity-based, and swift trust.

Limitations

There are several limitations that warrant mention. One might argue that the current context that eliminates any face-to-face interaction is contrived. We argue that the current context provides a rare opportunity to examine pure virtual interaction free from any influences of face to face interaction. Such research will, in the long run afford us instruction not just to what extent a team can work virtually, but also to design technology and group processes to combine most effectively the virtual interaction with face-to-face meetings.

The study's methodology can be criticized in several ways. First, the final project was designed to be a collaborative task and the students were graded on their contributions to the task, but the project nevertheless could be theoretically completed by one person. Second, the notion of trust assumes that risk is at present (Deutch, 1958). Although professors whose students were invited to participate were informed that the collaboration should count between 20 to 40% toward a grade in a course a student was taking at a time, there were discrepancies in course credit and hence in participant's risk level. Third, the external validity of the results might be faulted on having used students' as participants. One should, however, note that the students were in masters' programs and that most had significant work experience. Fourth, the case analysis method provided insight into the nature of trust in the global virtual context but could not provide any definite answer as to the nature of trust at present. Fifth, since only teams with at least two respondents to the survey measuring trust were included in the pool of potential cases, it is possible that many of the least effective teams (and perhaps, least trusting) were not considered for analysis since the failure to receive at least two responses to the survey may have indicated a low level of participation on the team. Sixth, there was no objective measure of effectiveness taken rendering conjectures about the implications of trust on objective team effectiveness impossible.

Conclusion

Research in transnational teams - teams where managers come from different countries - have found trust to be a key requirement for success (Snow et al, 1996; Phillips, 1994). The prescriptions for transnational teams underscore the importance of meeting face to face early on to build trust (Snow et al, 1996; O'Hara-Devereaux and Johansen, 1994; Phillips, 1984). "Trust is the glue of the global workspace - and technology doesn't do much to create

relationships" (O'Hara-Devereaux and Johansen, 1994, p. 243). Yet, O' O'Hara-Devereaux and Johansen ask in their book "How do global team members build trust among team members scattered from Montreal to Tokyo to San Francisco to Paris who are never likely to meet face-to-face?" The authors leave the question open for others to answer.

Our exploratory study suggests that teams built purely on electronic networks can have trust. That is, teams that are separated by vast distances and diverse in culture can exhibit trust, even identification-based trust. Hence, pragmatically this study suggests that under right circumstances, there is no minimum requirement for face to face contact for a global virtual team, contrary to arguments of Nohria and Eccles (1992). It will be up to future research to isolate the necessary and sufficient member profile, group processes, task requirements, and other social circumstances that allow the face to face requirement to be lifted.

Our research does offer some limited insight into the development of trust in global virtual teams. The study suggests that members build trust in a similar manner to members in face-to-face teams: they socialize, they define roles, they develop schedules, and they take initiative in task-related work. The primary challenge associated with the virtual environment is the additional uncertainty it entails--are other individuals reading the messages?; if not, why not?--are they having technical problems or are they not committed?; are the other individuals working on their tasks?; if so, how can one be sure?. These uncertainties are greater in the virtual context than in the face-to-face context where information on others' activities is easier to obtain. Achieving a sense of predictability in terms of others' communication habits and work habits seemed to be the way that teams in a virtual context coped with these uncertainties.

In conclusion, relying exclusively on electronic communication, the teams in our study were able to develop high level of trust in a short period of time. It is quite possible that the absence of non-verbal cues made it easier to build a group identity based on task which then fostered trust. One might anticipate different patterns of trust development in teams that had first met face-to-face. Alternatively, interesting dynamics might arise for teams that engaged in electronic team socialization, free from the biases that can arise by virtue of the physical presence of other individuals, and then meet face-to-face periodically during the project. Although it is not possible to generalize the results of this study to non-virtual teams, the insights of the study can be useful for teams which engage in a significant amount of virtual teamwork.

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Figure 1

Definition: Global Virtual Team

Type of Group

Interaction mode

Permanent
(Common History
Common Future)

Temporary
(No Common History
No Common Future)

Electronically mediated

Mix of face to face and electronically mediated

Face to Face

Similarity in
Culture
Geography

Context

Diversity in
Culture
Geography

**Global Virtual
Team**

Figure 2

The Change of Team Trust Over Time

Low (below mean); High (above the mean)

Trust at Time 1

	Low	High
Low	10 teams	5 teams
High	4 teams	10 teams

Trust at Time 2

	Mean	St Dev	Min	Max	N
Trust at Time1	3.86	0.45	2.93	4.60	48
Trust at Time2	4.06	0.52	2.20	4.90	60
Satisfaction	3.69	0.78	1.33	4.93	60
Cohesiveness	3.23	0.60	1.25	4.25	60
Perceived Effectivness	3.67	0.72	1.50	4.75	60

Teams with at least two respondents on the second survey

	Mean	St Dev	Min	Max	N
Trust at Time1	3.95	0.42	3.00	4.60	29
Trust at Time2	4.04	0.40	3.00	4.60	29
Satisfaction	3.57	0.74	1.33	4.67	29
Cohesiveness	3.16	0.52	1.50	3.85	29
Perceived Effectiveness	3.56	0.63	2.25	4.55	29

Teams with at least two respondents on both surveys

Table 2: Descriptive Statistics

Table 3: Communication Events of the Case Study Teams

Team	Total Messages Sent	Messages before Survey 1	Messages after Survey 1	Team Trust at Time 1	Team Trust at Time 2	Home Country	Number of Messages by Member Before Survey at Time 1	After Survey at Time 1
LoLo								
LoLo1	81	20	61	3	3	Australia	11	30
						Denmark	1	13
						France	2	0
						Philippines	2	9
LoLo2	34	74	108	3.33	3.48	Australia	9	38
						Canada	12	17
						Finland	4	3
						France	5	4
						Ireland	4	12
LoLo3	39	140	179	3.67	3.7	Australia	16	30
						Austria	4	27
						Denmark	6	39
						Finland	8	11
						Philippines	5	33
Lo-HI								
LoHi1	122	48	74	3.43	4.15	Australia	8	11
						Austria	22	36
						Brazil	2	2
						France	5	9
						Ireland	4	11
						Netherlands	6	6
								0
LoHi2	58	16	42	3.4	4.4	Australia	4	15
						Austria	3	7
						Canada	4	11
						Denmark	2	0
						Finland	3	8
LoHi3	60	28	32	3.87	4.1	Australia	8	9
						Austria	4	9
						Brazil	9	4
						USA	7	8

Table 3 continued

Hi-Lo								
HiLo1	99	41	58	4.07	3.67	Australia	8	16
						Brazil	10	11
						Denmark	3	3
						Netherlands	9	16
						USA	9	12
HiLo2	73	21	52	4.25	3.6	Australia	4	17
						Brazil	4	11
						Canada	7	8
						Denmark	2	7
						Ireland	4	7
HiLo3	107	36	71	4.3	3.93	Australia	6	12
						Austria	7	4
						Canada	13	33
						Denmark	2	1
						Finland	7	7
						Thailand	0	10
Hi-Hi								
HiHi1	222	40	222	4.44	4.6	Australia	5	22
						Denmakr	7	44
						Finland	10	35
						Ireland	11	51
						USA	7	24
HiHi2	131	45	131	4.56	4.6	Australia	5	19
						Canada	8	15
						Denmark	6	14
						Netherlands	11	12
						Philippines	5	19
HiHi3	172	46	172	4.47	4.6	Australia	1	31
						Canada	20	18
						France	4	14
						Netherlands	11	27
						Philippines	8	34
MEAN				3.95	4.04			
ST DEV				0.42	0.4			

Figure 3: Within Category Case Analysis

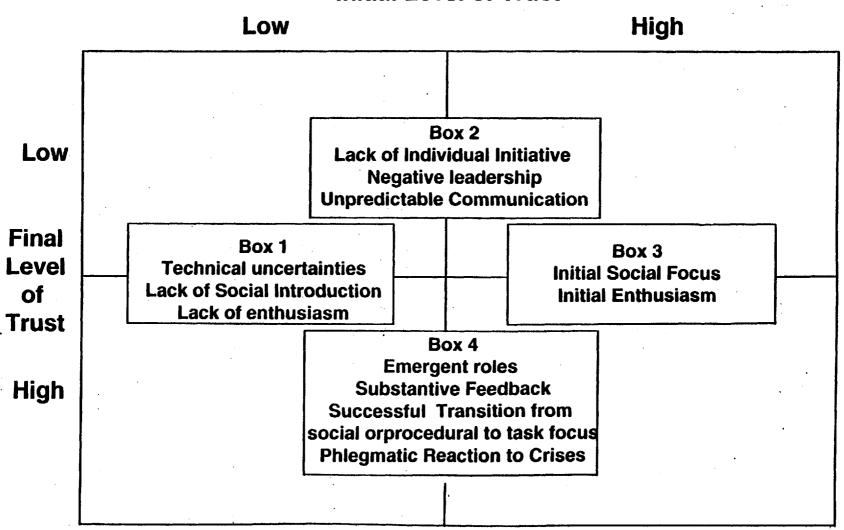## Initial Level of Trust

	Low	**High**
Low	Lack of Social Introduction Bothered by technical failures Lack of Task focus Unequally distributed communication Little enthusiasm Little initiative Shallow ideas and little or no feedback Negative leader	Initial excitement Unreflective expectations Lack of follow-through on ideas Departure/betrayal of leader or key member Negative leader Followers, but no leader Unable to manage transition to task focus
High	Little social introduction Initial preoccupation with procedures Later focus on task Emergent rather than assigned leadership Predictable communication Professional rather than social relationship among members	Extensive social dialog Initiative and enthusiasm Unbothered by initial failures Roles for all Realistic expectations Schedule as guide, not source of pressure Thorough explanation of ideas Intensity during crucial periods Substantial feedback on others' ideas

Final Level of Trust (row label)

Figure 4: Cross Category Case Analysis

Initial Level of Trust

Low   **High**

Final Level of Trust

Low

> **Box 2**
> **Lack of Individual Initiative**
> **Negative leadership**
> **Unpredictable Communication**

> **Box 1**
> **Technical uncertainties**
> **Lack of Social Introduction**
> **Lack of enthusiasm**

> **Box 3**
> **Initial Social Focus**
> **Initial Enthusiasm**

High

> **Box 4**
> **Emergent roles**
> **Substantive Feedback**
> **Successful Transition from**
> **social or procedural to task focus**
> **Phlegmatic Reaction to Crises**

Appendix A: Measures

Measures of Trust

Overall Trust
If I had my way, I wouldn't let the other team members have any influence over issues that are
important to the project.
I would be comfortable giving the other team members   complete responsibility for the
completion of this project.
I really wish I had a good way to oversee the work of the other team members on the project.
I would be comfortable giving the other team members a task or problem which was critical to
the project, even if I could not monitor them.

Trustworthiness
Members of my work group show a great deal of integrity
I can rely on those with whom I work in this group
Overall, the people in my group are very trsutworthy
We are usually considerate of one another's feelings in this work group
The people in my group are friendly
There is no "team spirit" in my group
There is a noticeable lack of confidence among those with whom I work
We have confidence in one another in this group.

These questions wre responded to on a five point scale of 1= strongly disagree, 2=disagree,
3=neither disagree nor agree, 4=agree, 5=strongly agree.

Measures of the Group Outcomes

Satisfaction
How satisfied were you with the group process?
How satisfied were you with the outcome of your team's project?
How satisfied were you with the other members of the group?
Overall, how satisfied were you with this project?

These questions were responded to on a five point scale of 1=very dissatisfied, 2=dissatisfied,
3=neutral, 4=satisfied, 5=very satisfied.

Perceived Effectiveness

How effective was your team in making use of the skills of the different team members?
How effective was your team at generating ideas for the project?
How effective was your team at coordinating?
How effective was your team in developing the final project?

The respondents answered on a five-point scale of 1=very ineffective, 2=ineffective, 3=neutral,
4=effective, 5=very effective.

Group Cohesiveness
Do you really feel that you were a part of the team?

1=I didn't feel I belonged at all
2=I didn't feel I really belonged too much
3=I felt included in some ways, but not in others
4=I felt included in most ways
5=I really felt a part of the team

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If you had a chance to do the same kind of work in another student work group, how would you feel about moving to a different team?

1=I would very much want to move to another team
2=I would rather move than stay in this team
3=It would make no difference to me
4=I would rather stay on this team
5=I would want very much to stay on this team

How does this group compare with other students groups on each of the following points:
a. the way people get along together
b. the way people work together
c. the way people help each other

1= very much worse than most
2=worse than most
3=about the same
4=better than most
5=very much better

Variable	Alpha	Items	Loading
Trust	0.66	If I had my way, I would not let other members have any influence over important issues	0.78
		(-) I really wish I had a good way to oversee the work of the other members	0.64
		I would have been comfortable giving the other members complete responsibility for completion of this project	0.72
Trustworthiness	0.92	Overall, the people in my group were very trustworthy	0.81
		We were usually considerate of one another's feelings on this team	0.76
		The people in my group were friendly	0.76
		I could rely on those with whom I worked in my group.	0.82
		Overall, the people in my group were very trustworthy	0.82
		(-)There was a noticeable lack of confidence among my team members	0.71
Satisfaction	0.92	How satisfied were you with your team's process	0.89
		How satisfied were you with the outcome of your team's project	0.82
		How satisfied were you with the other members on your team?	0.88
Perceived Effectiveness	0.88	How effective was your team in making use of the skills of the different team members	0.83
		How effective was your team at generating ideas for the ISWorld Net assignment	0.79
		How effective was your team at coordinating the ISWorld Net assignment	0.91
		How effective was your team at developing the final ISWorld Net deliverable	0.82
Cohesiveness	0.88	If you had a chance to do the same kind of work on another student team, how would you feel about moving to a different team	0.83
		How does the team compare to others in : The way people got along together	0.80
		: The way people worked together	0.87
		: The way people helped each other	0.81

Appendix B: Factor Analysis and Reliability