Why Gender Matters in CMC:
Gender Differences in Remote Trust and Performance with Initial Social Activities

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# Table of Contents

LIST OF TABLES .............................................................................................................................. vi

LIST OF FIGURES .......................................................................................................................... vii

ABSTRACT ........................................................................................................................................ viii

CHAPTER 1: INTRODUCTION ........................................................................................................ 1

1.1 Research Problem ................................................................................................................. 2

1.2 The Importance of this Study .............................................................................................. 4

CHAPTER 2: LITERATURE REVIEW .......................................................................................... 7

2.1 Why Study Gender in Online Environments? ................................................................. 7

2.2 Why Study Instant Messaging? ......................................................................................... 11

2.3 Why Study Trust? ................................................................................................................ 15

2.4 Why A Social Dilemma Game? ........................................................................................ 18

CHAPTER 3: HYPOTHESES .................................................................................................... 23

3.1 Gender Difference in Trust with and without Pre-task Treatment ......................... 23

3.2 Gender Difference in Performance and Behaviors with and without Pre-task Treatments ........................................................................................................................................ 25

3.3 Gender Differences in Communication Processes ....................................................... 28

CHAPTER 4: RESULTS FROM PILOT STUDY ...................................................................... 32

CHAPTER 5: METHODOLOGY ................................................................................................. 34

5.1 Experiment Design ............................................................................................................. 34

5.2 Participants ......................................................................................................................... 34

5.3 Task .................................................................................................................................... 35
List of Tables

1. Experimental Design and Number of gender pairs in two conditions .................... 35
2. Coding Scheme for Communication Process .......................................................... 43
3. Outline of Measurements, Hypotheses and Statistical Methods ............................. 45
4. Means (SD) of Gender Pair Trust Perception in Two Pre-task Interaction Conditions ................................................................................................................... 47
5. Means (SD) of Gender Pair Performance Time in Two Pre-task Interaction Conditions ................................................................................................................... 49
6. Means (SD) of Pair Total Investment Payoff in Two Pre-task Interaction Conditions ................................................................................................................... 50
7. Means (SD) of Pair Cooperation in Two Pre-task Interaction Conditions .............. 53
8. Mean (SD) and p-value (from ANOVA) of codes among two gender pairings ....... 56
9. Mean and p value (from ANOVA) of Percentage of codes among two gender pairings ........................................................................................................................ 59
List of Figures

1. Classic Prisoner’s Dilemma.................................................................................... 19
2. Investment interface of the task .............................................................................. 38
3. Discussion interface of the task after a simulated week ........................................ 39
4. Pair Trust Perception By Gender In Two Pre-Task Interaction Conditions .......... 47
5. Pair performance time by gender in two pre-task interaction conditions .......... 49
6. Pair investment payoff by gender in two pre-task interaction conditions .......... 51
7. Pair payoff for each trial in two pre-task interaction conditions ....................... 52
8. Pair cooperation by gender across two pre-task treatments.............................. 53
Abstract

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Gender effects in face-to-face and virtual communications are well known in the discipline of communication studies. However, less attention has been paid to the effects of gender on carrying out complex, collaborative tasks in virtual environments, mediated by modern communication media. The primary objective of this research is to explore gender differences in synchronous computer-mediated communication (CMC) with and without initial social activities. In particular, it aims to investigate whether exposure to pre-task social activities before doing a task can help males, who tend to be less trusting, overcome the trust barrier.

This research combines theories and empirical findings from a wide range of disciplines, including CMC, gender, trust and communication. One hundred and twenty four participants who did not previously know each other were recruited to form homogeneous pairs, male-male and female-female. Each pair carried out a competitive task via Instant Messaging (IM), either with or without pre-task social chat. The results from both quantitative and qualitative analyses indicate that female pairs had high levels of trust and more collaborative behaviors than male pairs in doing the task. In addition, females’ collaborative conversational style focusing on harmonious relationships put them in a position to achieve trust in the communication. The results also suggest that initial social chat prior to beginning work helps remote
team members build trust in the communication. But that initial social chat is more effective in female dominated groups.

The results have implications for research and practice of establishing higher levels of trust among remote workers who have to communicate via low-end media. In addition, this research will add to the small, but growing body of literature on the effects of group gender composition on performance outcomes. It will also benefit designers understanding emoticon usage patterns and developing design criteria for creating usable and useful interactive chat systems that support trust of both genders.
CHAPTER 1: INTRODUCTION

In recent years HCI researchers have made significant progress in understanding how different communication media influence people’s trust perceptions and task performance in virtual environments (Bos, Olson, Gergle, Olson and Wight, 2002; Rocco, 1998; Zhang, Olson and Olson, 2004). In this research little attention has been paid to the effects of gender differences in communication in virtual environments. However, there is good reason to investigate the role of gender, given research in the discipline of communication studies that has shown gender effects in face-to-face and virtual communications (Herring, 2000). In communication studies, gender analyses have focused on patterns of communication involving status, power, and influence (Spears and Lee, 1994). By contrast, bringing the gender factor into computer-mediated communication (CMC) from an HCI perspective responds to central concerns of efficiency, effectiveness, and user perceptions.

The primary objective of this research is to explore gender differences in synchronous computer-mediated communication with and without initial social activities. In particular, we ask whether initial social activities affect trust development and performance of male pairs and female pairs in a social dilemma game.

The contribution of this research is to provide an understanding of the interaction of gender and social chat in computer-mediated communication environments. Ultimately, the results of this study may provide insights into ways of improving performance of teams made up of diverse individuals in real world virtual collaborations.
1.1 Research Problem

The importance of trust in social, economic, political, legal, and organizational relations has been increasingly recognized (Bianco, 1994; Handy, 1995). While there is extensive research on trust from various perspectives (Gambetta, 1988; Lewicki and Bunker, 1996; Worchel, 1979), trust development is not yet well understood for communications occurring in groups of different gender composition using text chat technologies, such as Instant Messaging (IM). Since IM was introduced in 1996, the majority of IM users have been teenagers (Schiano, Chen, Isaacs, Ginsberg, Gretarsdottir and Huddleston, 2002). As the young IM users gradually enter the workforce, it is likely that their familiarity with IM will increase its acceptance as a business application. Consequently, the potential impact of IM in the workplace has become an important organizational issue.

The Social Identity Deindividuation (SIDE) model (Spears and Lea, 1994) and the Hyperpersonal Effects (Walther, 1996) theory argue that gender information becomes salient when little information about a person is available via CMC. According to the SIDE theory, media effects are produced via the interaction of the characteristics of a communication medium, the social context, and the social definition of self. In terms of self-definition, an individual may categorize him or herself as a unique person or as a member of a social group (Spears and Lea, 1994). The SIDE model predicts which categorization will be most salient in a particular context. In the context of collaborating with a partner in a task, an individual might categorize him or herself as a member of a group. If the partner is an anonymous stranger, the individual seeks evidence that he or she has common ground with the
partner. However, if communication occurs through a lean medium (e.g., text-only), there is limited information. Consequently, the individual is likely to give high value to any sparse information cues available, for example, educational background, age, or gender, and to use these cues to identify the partner as a member of the group based on their similarities. Such common ground allows a person to establish attitudes and behaviors toward the other individual in order to collaborate.

On the one hand, several previous studies found gender differences in problem solving and trust perception. Females tend to be socialized to interpret information and solve problems in a structured and collaborative fashion, whereas males prefer competition and tend to be encouraged from an early age to use an unstructured and individualistic approach to information processing and problem solving (Eagly, 1987; O’Donnell and Johnson, 2001). A previous study showed gender differences on initial trust perception in various gender composition pairs (Sun, Zhang, Wiedenbeck and Chintakovid, 2006); in particular, female pairs perceived higher levels of trust than male pairs when gender information about the partner was either seen via the video channel or mutually revealed via the IM channel. However, previous studies on trust have not progressed to looking at trust development in a longitudinal setting influenced by gender information.

On the other hand, it has also been shown that pre-task social activities can make a difference in trust development (Zheng, Veinott, Bos, Olson, and Olson, 2002). Trust can be established by various getting-acquainted activities such as text-chat or seeing a picture of a remote collaborator without a face-to-face meeting. Zheng et al.’s study found that using text social chat is nearly as good as a prior face-
to-face meeting. But it is still not clear how gender information plays a role in trust development and whether social chats also effectively help males (who typically have lower levels of initial trust) build trust. With the recent popularity of online chat groups, the issue of how gender information interacts with technologies to influence the process of trust development becomes more and more important.

To that end, the overall research questions for this study will be:

- How do gender differences affect trust and performance in computer-mediated communication (CMC)?

Specifically, I ask the following questions:

- How does gender information influence people’s trust development over multi-trials of a competitive task via the IM System?

- How effectively does pre-task activity, i.e., social chat, help male and female pairs achieve higher levels of trust and better performance over multi-trials of a competitive task?

- Is there a larger benefit of pre-task activity for males than for females in doing a task which involves conflicts of interest? If the answer is YES, to what levels do males achieve trust?

- How do male and female pairs construct and use language to communicate via the IM System?

1.2 The Importance of this Study

This study covers four areas of research: CMC, gender, trust and communication. This study is important not only for scholars who are interested in gender communication studies via computer-mediated technologies, but also to
industry practitioners whose work heavily depends on effective remote communication. These include geographically dispersed virtual teams doing software development, business marketing, or customer service. This research may impact society in several ways.

First, in CMC, gender information influences expectations and perceptions of communicators. Males tend to be more aggressive, decisive and competitive than females, and they perceive lower levels of initial interpersonal trust (Sun, et al, 2006). The low trust of males may interfere with their ability to collaborate effectively on work tasks. The results from this study will provide possible ways of establishing higher levels of trust among remote workers who have to communicate via low-end media, i.e., IM, especially for teams made up of solo males. When companies do not have the luxury of using expensive technology for remote communication, simple getting-acquainted social chat prior to beginning work is expected to be a good solution for increasing trust perception and improving performance.

Second, IM has become a very popular communication tool; however, it is still uncertain whether males and females use language differently in IM. Since IM does not contain the visual and aural cues that people get in face-to-face or phone contacts, it gives people a greater freedom to craft arguments carefully or to word an unpleasant message delicately, but it also leads to misunderstandings. Communication studies on various media have shown that the linguistic styles of males and females are relatively different (Herring, 2000; Savicki, Kelley and Lingenfelter, 1996). Today, a critical skill for managers is to become aware of the power of linguistic style and to make sure they understand the voices of all their
employees. Indeed, as the work place becomes more diverse in terms of gender and business becomes more global, team leaders will need to become even better at interacting with diverse team members and more flexible in adjusting their own styles to different group compositions.

Third, this research will contribute to the literature of the effects of group gender composition on performance outcomes. To date, there is only a small body of literature that deals with this issue. This research will carefully investigate how female and male gender pairs behave in the trust game, using multiple measures of cooperative behaviors. We expect that the results will bring practical implications to the work place, including ways of improving performance of teams made up of diverse individuals in real world virtual collaborations.

In the following chapters, we first review the related literature on CMC, gender and trust issues. Then we introduce the hypotheses based on the literature review. This is followed by the pilot data we collected in the past as well as some primary findings from that study. Next, in the methodology chapter we describe the experimental design, which compares male and female gender pairs carrying out a social dilemma game via IM with and without initial social chat. Next, the results of various data analyses are presented in the result chapter, which is followed by the discussion. Finally, implications and future research are addressed.
CHAPTER 2: LITERATURE REVIEW

This chapter details the background of the dissertation topic. Mainly, we will clarify two questions. The first issue is why we need to study effects of gender differences on trust development and performance in virtual environments. The second issue is what we can do to improve the performance of virtual teams made up of diverse individuals in the real world.

2.1 Why Study Gender in Online Environments?

Previous research shows that females and males show different strategies and preferences in computer games (Gorriz and Medina, 2000). Females typically are interested in a game when given the chance to interact socially in cooperation with others. By contrast, males prefer games that incorporate scoring and fighting with a high level of competition. They welcome mental challenge more than social interaction (Gorriz and Medina, 2000). For instance, in Kafai’s studies (1996, 1998), the overriding theme of most of the boys’ games was a contest between good and evil when they were asked to design their own games. By contrast, the girls tended to favor storylines and character development. Mattel Inc. research indicated that girls are more interested in collaborative play with other girls than they are in playing games alone, whereas boys are more interested in playing alone (Heyman and Berstein, 1996). This evidence was also shown in Inkpen et al. (1994) study, in which the girls preferred playing in pairs or small groups.

Similar behavioral patterns among children were found in the study of mouse control in a computer-based problem solving task (Barbieri and Light, 1992). In this study, mouse control switches between partners were most frequent in female pairs,
with their short and frequent turns suggesting collaborative behavior. In male pairs the number of switches were fewer and the turns longer. This may suggest two things: a higher initial competence level of males and/or less collaborative behavior.

Gender differences are also shown in learning styles. In general, females tend to prefer learning through collaboration; whereas, males generally prefer learning through competition (Brunner, Bennett and Honey, 1998; Martin, 1998). An empirical study involving a learning task (Jones, Brader-Araje, Carboni, Carter, Rua, Banilower and Hatch, 2000) showed that male pairs were more competitive than female pairs and appeared to have a high need for control and attention. Males were less likely than females to facilitate mutual participation in the task. Such gender differences in group activities have been explained from a psychosocial perspective. That is, females tend to be socialized to interpret information and solve problems in a structured and collaborative fashion, whereas males tend to be encouraged from an early age to use an unstructured and individualistic approach to information processing and problem solving (Eagly, 1987; O’Donnell and Johnson, 2001).

A few studies on social-emotional aspects of conversation also suggest gender differences similar to the studies mentioned above. For example, in one study of a collaborative task, females took turns speaking and avoided interrupting others. They tended to smile and laugh as a means of social support. Males showed more task-oriented concerns and fewer social concerns than females. They smiled and laughed less often than females and only in response to specific incidents, not as a means of social support (Frances, 1979; Mulac, Studley, Wiemann and Bradac, 1987).
The SIDE model (Spears and Lea, 1994) argues that media effects are produced via the interaction of the characteristics of a communication medium, the social context, and the social definition of self. Self-categorization theory (Turner, Hogg, Oakes, Reicher and Wetherell, 1987) claims that the conceptualization of the self comprises a range of personal identities. The individual may define him or herself as a unique person or as a member of a social group. Derived from self-categorization theory, the SIDE model predicts which self-category becomes salient in a particular context.

As discussed previously, in the case of communicating with an anonymous stranger, if the medium provides rich social information about the partner (e.g., face-to-face), then the person is likely to identify as an individual and also to treat the partner as a unique individual based on his or her characteristics. However, if the person has little information about the partner (e.g., text-only), the person is likely to give high value to any sparse information cues available (for example, educational background, age, or gender), as well as to use the cues to identify as a member of a group based on similarities between the two individuals. This common ground allows a person to establish attitudes and behaviors toward the other individual in order to collaborate. In other words, when a particular social cue, i.e., gender information, is available and group members are anonymous, group members tend to perceive themselves and each other more in terms of their gender group and less as individuals. This, in turn, influences their interactions. Such phenomena in CMC environments are called “hyperpersonal effects” by Walther (Walther, 1996).
Applying these ideas to gender information, Matheson (1991) carried out a study in which she either informed participants in a computer-mediated negotiation task about the gender of their partner or gave them no information about their partner. The results showed that when a female was explicitly told that the other negotiator was female, she expected the other negotiator to be fair and cooperative, i.e., to conform to a social norm. However, when no gender information was provided, she expected the other negotiator to be as uncooperative as did a male who was paired with another male.

Similarly, Sun et al. (2007) investigated whether providing collaborators’ gender information can help people achieve a level of trust in IM that is similar to trust seen in the video medium. IM is considered a cheap, lightweight technology, whereas video is considered a rich but expensive medium for supporting collaboration in virtual teams. The study compared male, female, and male/female gender pairs carrying out two different tasks via three communication media: video conferencing, IM_Known (in which the gender of the communication partners was mutually revealed), and IM_unknown (in which the individuals working together did not know the gender of their partner). The results showed that both female pairs and male/female pairs perceived higher levels of trust than male pairs when gender information about the partner was seen via the video channel. In addition, female pairs perceived higher levels of trust than male pairs when gender information about the partner was mutually revealed via the IM channel. The results imply that providing collaborators’ gender information did help females achieve a level of trust in IM that is similar to the trust seen in the much more expensive video medium.
The present study also focuses on trust and performance in virtual communications with different gender pairings. Specifically, it aims to answer the question: how can male pairs improve their low initial interpersonal trust when using low-end technologies, such as IM?

2.2 Why Study Instant Messaging?

Personal communication and work-related communication are the most important features of the Internet for the majority of today’s users (Cummings, Butler and Kraut, 2002; Kraut, Patterson, Lundmark, Kiesler, Mukophadhyay and Scherlis, 1998). After several decades of development, numerous Internet-based communication applications have become available to users, such as e-mail, voice mail, chat, bulletin boards, and Instant Messaging. Meanwhile, researchers have studied the potential impact of these CMC tools on individual behavior, organizational behavior, and society as a whole (Kraut et al, 1998; Whittaker, Frohlick and Daly-Jones, 1994). One research area has focused on the impact of CMC on social activities and relationship development. Previous studies have shown that Internet-based communication, such as online chat groups, allows people to develop meaningful relationships online, although people often still have a higher regard for offline, face-to-face friendships (Parks and Floyd, 1996, Parks and Roberts, 1998). However, due to the shorter history, CMC studies have not focused strongly on IM, especially in controlled laboratory studies.

Since it was introduced to the public in 1996, IM has spread quickly, especially among young people (Schiano, et al., 2002) – a generation called the “Millennial Generation” who were born between 1979 and 1994 and who have never
known a world without pervasive informational technologies (Sweeney, 2006). In
geneneral, Millennials have quite different technology use patterns and preferences
from previous generation, e.g., they make more friends and have communications
more frequently through IM and text messaging (Oblinger, Boomers, and Millennials,
2003; Sweeney, 2006). Millennials comprise the majority of today’s undergraduates
and will continue to do so for the next decade.

Consistent with the trend of wider acceptance and usage, especially among the
Millennial Generation, the IM market reached $4.2 billion in 2006 up from just $1.1
billion in 2001 (IDC research group, 2005). In addition, the Enterprise Instant
Messaging (EIM) market, which includes IM server software and products to secure
and manage information exchange, is expected to grow from $315 million in 2005 to
$736 million in 2009 (IDC research group, 2005). Like e-mail, IM is an application
that takes advantage of the unique capabilities of the Internet, allowing users to stay
connected with their friends and colleagues anywhere, anytime, on almost any
computing platform, at very low cost. In recent years, as IM and similar systems have
been adopted and used at the corporate level, many IT departments have become
convinced of the value of IM as a business-to-customer communications tool. For
instance, customers can click an icon to begin a live online chat with a customer
service representative for any questions they have.

Although IM is not as popular as e-mail and sometimes has difficulty gaining
acceptance in business organizations (Herbsleb, Atkins, Boyer, Handel and Finholt,
2002), it is certainly a promising tool for work-related communications because it
supports spontaneous and opportunistic communication (Isaacs, et al., 2002). Such
capabilities should make IM a valuable work tool, especially as the connection of a home base to geographically dispersed teams becomes more important in the global economy (Isaacs, et al, 2002). In addition, the sense of presence, awareness, and immediacy of IM are useful in filling some of the gaps in traditional business communication systems for connecting distance workers, telecommuters, and business partners (Tang, Bonte, Raven and Isaacs, 2000). For example, multinational team software development has become a significant movement in recent years (Nicholson and Sahay, 2001). Teams located at different places desperately need a coordination tool that will allow them to conduct formal meetings and transfer documents, and will allow them to respond to unanticipated events quickly. Research shows that IM not only effectively supports informal, lightweight communication in distributed teams (Nardi, Whittaker and Bradner, 2000), but also appears to be a suitable medium for negotiation in decision-making tasks via synchronous text-based feedback in lab settings (Setlock, Fussell and Neuwirth, 2004). Informal communication refers to impromptu, brief, context-rich and dyadic interactions, such as brief questions, clarifications, coordination, scheduling, and other tasks that require the rapid exchange of information. Such interactions are essential for effective collaboration (Kraut et al, 1998, Sproull and Kiesler, 1986). However, it is not clear how informal interaction through IM influences users’ trust perceptions.

Social presence theory (Short, Williams and Christie, 1976) is concerned with the degree to which individuals perceive others as being physically present during the communication process. The term “social presence” refers to psychological and social closeness, the subjective awareness of another communicator “to be nearby” or
“socially present.” The theory regards social presence as a subjective quality of the communication medium.

Social presence theory classifies tasks into four types: information exchange, problem solving, conflict resolution, and person perception. They differ by the degree to which the tasks depend on social presence, that is, how much the task outcome reflects personal or relationship qualities. Information exchange is the transmission of objective data among people. Problem solving according to Short et al. (1976) is collaborative activity among people who work to find a single, correct solution to a well-structured problem. Conflict resolution is adversarial activity among people engaged in a zero-sum game, such as union-management wage bargaining. It also includes activities of negotiation and coalition formation. Person perception is usually a one-way activity of attributing affect to another person, such as assessing the sincerity of a partner.

Regarding the effect of group gender composition on social presence, one study revealed that groups including females perceived higher social presence than male-only groups. There was also a positive relationship between groups’ perceived degree of social presence and their decision process satisfaction as well as their group performance (Wong, Shi and Wilson, 2004). Thus, the theory implies that the perceived social presence of a medium is decided not only by the medium itself but also by the people who use the medium and by the task that people carry out via the medium. In the current research a complex social dilemma game is used which requires conflict resolutions, and we expect that the perceived social presence is
higher for female pairings who care about interpersonal relationships other than just winning the game itself.

2.3 Why Study Trust?

The term trust is frequently used in our daily lives, but everyone has a slightly different understanding of what it actually is. We use the word trust not only for trusting an individual, but also for team trust, organizational trust, and trust in society. In their model of organizational trust, Mayer, Davis, and Schoorman (1995) argue that trust develops based on the trustor’s propensity to trust, the extent to which the trustee perceives the trustor as trustworthy, and the trustor’s perception of situational risk. The risk will moderate the relationship between the trustor’s attitude and his or her willingness to act in a trusting way, such that higher levels of trust will be required when higher levels of risk are present. In a broader organizational context, trust is a feeling of confidence and support in an employer. It has been suggested that trust will hold people together and give them a feeling of security in the organization (Mishra and Morrissey, 1990).

In contrast to organizational trust, trust between individuals within or outside an organization concerns personal interactions and relationships. In this research, we are interested in trust at the interpersonal level, rather than at the organizational level. We study trust between individuals in a simulated organizational setting.

The importance of trust has been increasingly recognized in many fields. In most research in the domains of communication studies and CMC, the definition of trust is agreed on as follows:
Trust is the willingness to be vulnerable based on positive expectations about the actions of others (Mayer, et al, 1995).

The definition of Bacharach and Gambetta (2001) is more specific about the structure of situations requiring trust:

In general, we say that a person ‘trusts someone to do X’ if she acts on the expectation that he will do X when both know that two conditions obtain: if he fails to do X she would have done better to act otherwise, and her acting in the way she does gives him a selfish reason not to do X (Bacharach and Gambetta, 2001).

It is important to study trust in CMC environment due to several reasons. First, Computer-Mediated interactions carry an increased risk. As limited cues are available to users compared to fact-to-face interaction, misunderstandings become more likely and enforcement of agreements and regulations becomes more difficult. As risks increase and become more difficult to evaluate, users of computer-mediated technologies face more complex decisions. Trust helps to reduce this complexity. For example, it has been shown that compared to face-to-face groups those using computer-mediated media exhibit both delayed trust by taking longer to reach cooperation, and fragile trust by taking repeated cycles to recover trust when one player violates an agreement and others retaliate (Bos, et al., 2002). Second, many users of advanced communication technologies state that they find it difficult to develop trust with someone they cannot see face-to-face. This problem is commonly attributed to the fact that these technologies do not convey the full richness of face-to-
face encounters. They omit cues that are thought to be crucial for trust building (Whittaker and O’Connaill, 1997; Mitra, 2002).

As stated above, the initial face-to-face interaction is critical for trust development to remote communicators (Rocco, 1998; Jensen, Farnham, Drucker, and Kollock, 2000). Face-to-face interaction may become expensive or impossible for remote virtual teams. However, one study (Rocco, 1998) showed that, if strangers who normally communicate only through email gather for a team-building exercise prior to collaborative work, they outperform strangers who have no prior meeting. Furthermore, they do as well as groups who meet face-to-face throughout the work. This finding corresponds to the widely held business opinion that people who meet before working together form better, more solid team relationships. Another study (Zheng et al, 2002) showed that trust between remote partners can be established by various getting-acquainted activities such as a face-to-face meeting, text-chat, seeing a picture of a remote collaborator or exchanging resumes of each collaborator. Not surprising, a face-to-face meeting beforehand was the best way to build trust; however, engaging in a text chat beforehand about social topics, a “getting acquainted” session, is nearly as good in establishing trust.

While there is extensive research on trust from various perspectives (Gambetta, 1988; Lewicki and Bunker, 1996; Worche, 1979), trust development is not yet well understood in communications occurring in diverse gender groups in virtual environments. In terms of the effect of gender on trust development, a recent study (Sun, et al., 2007) has shown that male pairs perceived lower levels of trust than both female pairs and mixed gender pairs. This leads to the question of what can we
do to help males perceive higher trust? Social chat might be a solution as in Zheng’s study. This is also one of the research questions we are interested in exploring.

As the above studies used Social Dilemma and Prisoner’s Dilemma as the task (Sun, et al., 2007; Bos, et al., 2002; Zheng, et al., 2002), the present study will use a day trader social dilemma game which involves both collaboration and competition, and will recruit participants to form different gender pairings to explore whether and how trust is developed via IM.

The study will address the issue of how IM technology influences interpersonal trust development in different gender pairing by employing a social dilemma game with different pre-task treatments. Negotiation between strangers is a vulnerable situation where trusting each other can lead to mutual benefits. We expect that getting acquainted through social chat sessions will help to develop trust in the task between remote partners, especially for male pairs who focus highly on competition. The results should have implications for the use of IM technologies in facilitating trust development of global virtual teams with diverse individuals.

2.4 Why A Social Dilemma Game?

To evaluate the trust building capability of different technologies, HCI researchers need valid and reliable measures of the interpersonal trust that users develop in virtual teams. Most CMC studies investigating trust use social dilemma games based on the Prisoner’s Dilemma (PD) as a means of measuring trust within dyads or groups. These studies measure players’ rates of cooperation and defection (‘cheating’) while they play these games over different CMC channels, such as text chat, audio and video.
The Prisoner’s Dilemma (Tucker, 1950; Flood, 1952) is the most prominent social dilemma, and most experimental research based on social dilemmas uses an incentive structure that is based on the PD. In the prisoner’s dilemma, each player gains when both cooperate, but if only one of them cooperates, the other one, who defects, will gain more. If both defect, both lose or gain very little. An example is shown in Figure 1.

For each player, there are two possible moves, “cooperate” or “defect.” “Cooperate” means each player has mutual agreement to cooperate with each other. “Defect” means promises made to take certain actions, but are not actually followed up later on. For each possible pair of moves, the payoffs to player 1 and player 2 (in that order) are listed in the appropriate cell. If both players choose to cooperate, each gains a payoff of “2.” If one player alone cooperates, that player gains nothing, or payoff of “0.” Vice versa, if one player alone defects, the player gains the highest payoff of “3.” If both players choose to defect, then each of them only gets a low payoff of “1.”

![Figure 1. Classic Prisoner’s Dilemma](image)

<table>
<thead>
<tr>
<th>Player 1</th>
<th>Cooperate</th>
<th>Defect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cooperate</strong></td>
<td>2, 2</td>
<td>0, 3</td>
</tr>
<tr>
<td><strong>Defect</strong></td>
<td>3, 0</td>
<td>1, 1</td>
</tr>
</tbody>
</table>
In PD games, the joint payoff is interpreted as an indicator of the trust the participants hold in each other. Previous studies have commonly used social dilemma games with dyads (Jensen et al., 2000; Zheng et al., 2002; Davis, Farnham and Jensen, 2002; Zhang et al, 2004) or groups (Rocco, 1998; Bos et al., 2002). Participants in these studies either played only one round of the game with each other (Jensen et al., 2000), or played multiple rounds of the game, in which communication between participants was allowed every five rounds of the game (Rocco, 1998; Bos et al., 2002; Zheng et al., 2002).

The interpretation of cooperation as trust in situations with a PD structure is based on the definition of trust as *willingness to be vulnerable based on positive expectations about the actions of others* (Mayer, et al, 1995). Indeed, the decision to cooperate carries more risk: a player will regret having chosen to cooperate if the other player chooses to defect. For an individual, the payoff for mutual cooperation in the prisoner's dilemma is smaller than the payoff for one-sided defection, so that there would always be a "temptation" to defect. However, the problem is that if both players are rational, both will decide to defect, and none of them will gain anything. Thus, the best strategy for a group is for both players to choose to cooperate, especially in the cases that long term interaction or collaboration is needed.

In terms of gender effects, a number of studies has investigated the relationship between gender and bargaining competitiveness over the past several decades (Walters, Stuhlmacher and Meyer, 1998). In this research, the PD game is frequently used due to stereotypic gender differences that tend to appear in the PD game. As discussed above (Eagly, 1987; O’Donnell and Johnson, 2001), psychosocial
studies indicate that socialization leads females to process information and solve problems in a structured and collaborative fashion, while males’ socialization encourages them to use an individualistic and less structured approach. Furthermore, other psychological research suggests that females are more sensitive to social cues in determining appropriate behavior than are males (Kahn, Hottes, and Davis, 1971). For example, in games females have been found to focus more than males on harmonious group relations, and to be less nervous or upset at the end of the task (Stockard, Kraft and Dodge, 1988). The focus on group harmony is consistent with the observation that females’ behaviors are sensitive to the social context in ways that males’ are not. In Sun et al.’s study (2006), a negotiation task was used which was similar to the PD game. In this task, participants were asked to play the roles of marketing managers of two competitive companies in which they had to agree on prices for their three common drugs. The task involved the conflicts between cooperative and competitive behaviors. As hypothesized, females’ collaborative fashion led to a higher level of trust than males.

More interpretations of gender differences in the PD game can be found in Kahn et al’s study (Kahn et al, 1971), in which they argued that males appear to be motivated by a desire to win as much as they can. Consequently, they altered their behavior depending on strategic considerations, i.e., when it was optimal to cooperate, males cooperated; when it was optimal to compete, males competed. The choices of male subjects were relatively uninfluenced by the gender of their partner. However, females appeared to be influenced more by the interpersonal nature of the PD game situation than by strategic considerations. Females showed changes in performance
with variations in the gender of the partner. In sum, males played to win, while females altered their behavior as the interpersonal situation changed.

Among these studies, the social dilemma game used in Zheng’s (2002) study fits our needs very well. In the game, the participants played the roles of day traders during a multi-day investment period. Each participant received a certain amount of money per day to invest, in which they had to either invest in a common pool whose payoff was dependent on how much the other partner invested in it, or keep it in an individual account. According to this payoff structure, the best strategy for an individual was to invest less in the common pool, but to convince his or her partner to invest the full money he or she had in the common pool. By contrast, the best strategy for the group was for both partners to invest full money in the common pool.

The role-playing setting and complicated payoff information is intended to encourage participants to communicate with their partners in order to reach an agreement. In addition, this game involves both cooperation and competition. In this setting, the question raised is whether establishing higher trust with each other leads to more cooperative behaviors and therefore to higher payoff. Trust should play a role here, and gender information should have an effect on establishing this trust.
CHAPTER 3: HYPOTHESES

This research compares male and female gender pairs in doing a social dilemma game via IM with and without a pre-task treatment to build initial trust. We are interested in finding out how gender information and technology affect trust development and performance when strangers collaborate. We also want to investigate whether different levels of the pre-task treatment can help males achieve higher levels of trust.

In order to get answers for these questions, we measure three dependent variables: participants’ post-task trust, participants’ performance and behaviors during the task, and the pairs’ communication processes.

3.1 Gender Difference in Trust with and without Pre-task Treatment

In the context of this research, trust is defined as a “willingness to be vulnerable, based on positive expectations about the actions of others” (Mayer, et al, 1995). Trust can be based upon the rational appraisal of a partner’s reliability and competence and upon feelings of concern, cooperation, and mutual support. In terms of measurement, trust has been measured by group performance and subjective ratings (Greenspan, Goldberg, Weimer and Basso, 2000; Bos et al. 2002). Trust has also been inferred from measured increases in collaborative behaviors (Bradner and Mark, 2002). In this work, trust is measured by participants’ subjective ratings in a questionnaire.

In accordance with SIDE theory and the above studies, given the situation that people are strangers to each other, the communication is influenced by people’s initial perception based on limited information, in our case, gender information. We expect
that the mutual knowledge that both collaborators’ are female will increase their willingness to cooperate and trust, due to females’ preferences for collaborative activities. Availability of such gender information will ease females’ uncertainty about carrying out a joint task in a virtual environment. By contrast, given males’ preference for competition and individualistic activities, the mutual knowledge that both partners are male will not influence their trust.

In addition, several studies examined the effect of prior acquaintance and personal information on cooperation (Rocco, 1998; Zheng et al., 2002). The motivation for this approach is to investigate Handy’s (1995, p. 46) claim that “trust needs touch,” i.e., that trust is established through direct communication. Rocco (1998) did indeed find a positive effect of prior face-to-face acquaintance on cooperation. Zheng et al. (2002) studied whether this effect could be reached by other means. They isolated three aspects of face-to-face interaction: synchronous interaction, visual identification, and exchange of personal information. They compared the effect of four pre-task treatments: face-to-face interaction, social text-chat, a photograph of the partner, and a personal information sheet. Davis et al. (2002) also included a personal information sheet in their study. The results from these studies draw a picture similar to other studies: the richer the channel by which participants got to know each other, the higher the cooperation rate in the subsequent social dilemma game. The social text-chat was the most effective way to build trust between remote participants. Both studies report a very limited effect of the personal information sheet on establishing trust. Furthermore, the results from some studies showed that the effect of the pre-task treatments became less important over time, as
collaborators had repeated interactions in the task (Zheng et al., 2002; Brader and Mark, 2002). In other words, as people interacted more with each other over time, the effect of pre-task treatment became less important. The direct interaction in the task becomes more important leading to more cooperative behaviors.

Building on the above literatures, we present the hypotheses with brief explanations below:

**H1a: All pairs will achieve higher levels of trust in the pre-task interaction condition than in the condition with no pre-task interaction.**

Rationale: as shown in the literature, the pre-task interaction helps to build trust between remote participants.

**H1b: In the pre-task interaction condition, all gender pairs will achieve similar levels of trust.**

Rationale: it has been shown that pre-task interactions improve trust; however, there is little guidance on how gender information plays a role in this setting. Based on the current literature, we tentatively predict that all gender pairs will benefit from the pre-task intervention.

**H1c: In the condition with no pre-task interaction, female pairs will achieve higher levels of trust than male pairs.**

Rationale: as explained earlier, females’ collaborative fashion leads to higher levels of trust than males.

3.2 Gender Difference in Performance and Behaviors with and without Pre-task Treatments

The overall performance time is measured to assess the gender difference in performance. Performance time refers to the total time overall starting from the first
trial of the game until the last trial. In addition, several behaviors that occur in the PD game are useful for assessing the nature of pairs’ collaboration. The measurements of behaviors include: investment payoff (the pair’s final total payoff and the payoff for each trial), cooperation (the total number of trials during which the pairs invest fully); number of defections (promises to invest fully made in a discussion that are violated in the later investment).

**Performance time**

The selectivity model (Meyers-Levy, 1989) proposes that, under certain task-related circumstances, females and males will follow different information processing strategies. The model predicts that females are more likely to employ detailed (elaborative) information processing strategies in both simple and complex decision tasks. On the contrary, males are more likely to select simplified (heuristic) processing strategies that minimize cognitive effort and reduce information load for simple tasks, switching to an elaborative strategy only when increasing task complexity will not accommodate a heuristic approach to information processing.

The selectivity model is supported by empirical results of O’Donnell and Johnson (2001). They found that female auditors spent significantly less time than males in a complex, analytical procedures task because females had more practice in selecting and using the appropriate elaborative strategies. In doing the same complex task, males needed more time to process information since they were less familiar with elaborative strategies that require more effort to integrate and retrieve information (O’Donnell and Johnson, 2001). In this study, the task time was
quantified as the number of minutes participants spent on the overall task. Given this literature and the complex nature of the Day Trader game in the study, we predict that:

**H2a: Female pairs will take less time in doing the task than male pairs.**

Rationale: females use elaborative processing while males use simple heuristics which are not appropriate for complex tasks. Thus, males will take more time to complete the task.

**H2b: Male pairs in the pre-task interaction condition will take less time than those in the condition with no pre-task interaction.**

Rationale: the pre-task interaction is expected to help male pairs achieve higher levels of trust which leads to better collaboration and less time in completing the task.

**Behaviors (Investment Payoff, Cooperation, Defection)**

**H3a: All pairs will have greater investment payoff in the pre-task interaction condition than in the condition with no pre-task interaction.**

Rationale: the pre-task interaction increases the level of trust and leads to better investment payoff than in the condition with no pre-task interaction.

**H3b: All pairs will have greater investment payoff at the end of 30 trials of the task than at the beginning of the task in both the pre-task and the no pre-task interaction condition.**

Rationale: investment payoff improves over time for pairs because of the increasing history of interaction, as they realize that collaboration is to their mutual benefit.

**H3c: In the condition with no pre-task interaction, female pairs will have greater investment payoff than male pairs during the first half of the trials. All pairs will have similar investment payoff at the end of the task.**
Rationale: without pre-task interaction, we know from the literature that females are more collaborative and such behaviors lead to greater mutual payoff for the first half of the trials. Then in the latter half of the trials, all pairs have similar investment payoff because they learn that collaboration is to their mutual advantage.

\textit{H3d: In the pre-task interaction condition, all pairs will have similar investment payoff during the task.}

Rationale: pairs become familiar with each other before the task, and it smooths their interaction through the whole task.

As stated above, trust has also been inferred from measured increases in collaborative behaviors (Bradner and Mark, 2002). In this research, trust is also measured in the amount of cooperative behaviors and the number of defections in the task. Occasions of cooperative and defective behaviors will be counted based on the pairs’ communication transcripts. Given the unpredictable results, we do not state hypotheses comparing female pairs and male pairs on cooperative behavior or numbers of defections. We would like to investigate it in a more exploratory way.

\subsection*{3.3 Gender Differences in Communication Processes}

Research in the discipline of communication studies has shown important gender effects in face-to-face and virtual communications (Herring, 2000). Gender analyses in communication studies have focused largely on patterns of communication involving status, power, and influence (Spears and Lea, 1994). However, there has been little qualitative research on the nature of the interactions of different gender composition groups in laboratory settings that underpin these results.
A contribution of our work is to use qualitative methods to take a closer look at the social mechanisms employed by different gender pairings.

A well-known phenomenon to linguists and socio-psychologists is that the linguistic styles are relatively different for men and women, and these differences are rooted in different ways of learning speech from childhood (Tannen, 1995). Girls and boys find different ways of creating rapport and negotiating status; girls tend to learn conversational rituals that focus on harmonious relationships, whereas boys tend to learn rituals that focus on status (Tannen, 1995). As a result, men tend to be sensitive to the power dynamics of interaction, speaking in direct ways that position themselves as one up; women tend to react more strongly to the rapport dynamic, speaking in indirect ways that save face for others and avoid putting others in a one-down position (Tannen, 1995).

Sociolinguists (e.g., Cameron, 1998; Coates, 1993; Eckert and McConnell-Ginet, 2003; Holmes, 1993; Romaine, 2003; Tannen, 1994) have commented on the tendency of females (largely, though not exclusively in the west) to use conversation predominantly as a tool for facilitating social interaction, while their male counterparts are more prone to use conversation for conveying information. In Holmes’ words (1995, p. 2), while females “use language to establish, nurture and develop personal relationships,” males’ use of conversation is more typically “a means to an end.” These two social constructs (social versus informative) derive from observations of concrete linguistic features, in which the speech of females diverges from that of males. For example, females tend to use more affective markers (e.g., “I know how you feel”), more diminutives (e.g., “little bitty insect”), more hedge words
(e.g., perhaps, sort of), more politeness markers (e.g., “I hate to bother you”), and more tag questions (e.g., “We’re leaving at 8:00 pm, aren’t we?”) than do males. Males, on the other hand, are likely to use more referential language (e.g., “The stock market took a nosedive today”), more profanity, and fewer first person pronouns than females. These patterns are also reflected in the ways males and females interact with computers.

Sociologist Sherry Turkle showed that males and females approach the computer with different attitudes (Turkle, 1988). According to her research, males see computers as a challenge, something to be mastered and overcome. They are risk takers, and they demonstrate this by eagerly trying new techniques and approaches. According to Turkle, this is an attempt to dominate the machine, and is actually an extension of their desire for personal physical power. Turkle describes the females’ approach to computers as ‘soft,’ meaning a female user’s attitude toward the machine is tactile, artistic, and communicative. Females approach the machine as a tool, and attempt to work with it in a cooperative manner. So, rather than dominate the machine, they attempt to work with it to achieve their goals. For them, the machine is a collaborative partner and an extension of their power of communication (Turkle, 1988).

In terms of the empirical results in laboratory environments, one study (Savicki et al., 1996) found that male groups had larger percentages (6%) of messages containing tension than mixed groups (2%) and females groups (0%). According to the authors, tension refers to arguments in a discussion. In their study, participants were scheduled in different gender composition groups of 4-6 members to work on
two different decision making tasks, using an asynchronous email system for a period of four weeks. They found that groups with a larger proportion of males used more fact-oriented language and more calls for action. The groups with higher proportions of women were more conductive to group members’ self-disclosing and seeking prevention and reduction of tension.

Because of the lack of direct research knowledge on gender and use of language in IM, we tentatively hypothesize that:

\( H4a: \text{Female pairs will use more emoticons, and use more acknowledgement words during their interaction than male pairs.} \)

Rationale: caring about interpersonal relationships leads females to use more cooperative communication language, such as emoticons and acknowledgement words.

\( H4b: \text{Male pairs will use more acknowledgement words and their conversation will contain less tension in the pre-task interaction condition than in the condition with no pre-task interaction.} \)

Rationale: the pre-task interaction is expected to help male pairs achieve higher levels of trust and lead to more cooperative communication language. Thus, their conversation is expected to contain less argumentative words and more acknowledgement words.
CHAPTER 4: RESULTS FROM PILOT STUDY

From fall 2005 to spring 2006, we conducted an empirical study to investigate the effect of gender information on trust perception and performance in computer-mediated virtual environments. The motivation behind this work was the little studied, yet important question, of how gender information affects trust building and performance when strangers collaborate in virtual settings. In this study, we investigated whether providing collaborators’ gender information can help people achieve a level of trust in IM that is similar to trust seen in the much more expensive video medium. We compared male, female, and male/female gender pairs carrying out two different tasks via three communication media: VC (gender information was known by passively seeing the partner in a video), IM_Known (the gender of the partners was revealed by the experimenter immediately before the pair performed the task), and IM_Uknow (gender information was not revealed). This study used a 3x3x2 between subjects design: gender pairing (male/male vs. male/female vs. female/female), media condition (VC vs. IM_Known vs. IM_Uknown), and task (brainstorming vs. negotiation).

A total of 186 individuals, recruited from a university in the United States, took part in the study. The participants were undergraduate students majoring in business, sociology and psychology. Pairs of participants did not know each other before the experiment. Participants received a small amount of extra credit in a course for their participation. Pairs were run one at a time. The members of a pair were scheduled to arrive at an interval of ten minutes, so that they would not meet or see each other before the study. The first participant to arrive was put in one room; the
second was put in another room on a different floor. This procedure worked effectively—the members of a pair never accidentally met.

The primary results indicate that: (1) both female pairs and male/female pairs perceive higher levels of trust than male pairs when gender information about the partner is seen via the video channel, (2) female pairs perceive higher levels of trust than male pairs when gender information about the partner is mutually revealed via the IM channel, and (3) male/female pairs have better performance outcomes than the other two pairings. The results imply that knowing gender information may enable females to achieve high levels of trust leading to cooperation and information sharing in virtual settings. In addition, the results suggest that gender diversity, as represented by the male-female pairs, may be important to quality outcomes in collaborative work groups.

Following up on this pilot study, using many of the same procedures, the present study still focuses on trust and performance with different gender pairings, but from a simulated longitudinal perspective. Specifically, it aims to answer the question: How can males improve their low initial trust in low-end technologies, such as IM?
CHAPTER 5: METHODOLOGY

We did the quantitative analysis on trust and performance based on the post-questionnaire and the various measures of cooperation (investment payoff, cooperative behavior, number of defections). Also, we performed qualitative analysis based on the communications from pairs’ discussion during the task.

5.1 Experiment Design

A 2x2 between subjects design was used: gender pairing (male/male vs. female/female), and pre-task interaction (interaction vs. no interaction). All participants used the AOL IM System to do the task. The gender of the partners was revealed by the experimenter immediately before pairs performed their task.

5.2 Participants

A total of 124 individuals participated in the experiment. They were undergraduate or graduate students from Drexel University. Participants were paired with individuals of the same gender, forming two possible pairings: male/male (MM) and female/female (FF). Each pairing was randomly assigned in equal numbers to the following conditions: 1) pairs directly did the trust game via IM without any pre-task interaction; 2) pairs had pre-task interaction via IM for 10 minutes before they did the trust game. Pairs of participants did not know each other before the experiment. Major and age were counter-balanced across gender and task conditions. Table 1 shows the experimental design and number of gender pairings in each condition.
Table 1

Experimental Design and Number of gender pairs in two conditions

<table>
<thead>
<tr>
<th></th>
<th>No Interaction</th>
<th>Pre-task Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female Pairs</td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td>Male Pairs</td>
<td>15</td>
<td>14</td>
</tr>
</tbody>
</table>

A power analysis was run to determine the effective number of participants (Cohen, 1988; Cohen, 1992). In power analysis, one uses the relationships between power, effect size, and number of participants in designing experiments and interpreting results. Cohen (1988, 1992) recommends that experiments be designed to achieve a power of about .80 with alpha value of $p = .05$. According to the table of sample size measures for eight common statistical tests (Cohen, 1988), given multiple correlation analysis and two independent variables used in this research, the required sample case is 45, i.e., 45 pairs or 90 participants. Therefore, the number of participants used in the study meets the requirement of the power analysis.

5.3 Task

The task used in the study was based on the social dilemma game used in Zheng’s study (2002). Pairs of participants played a multi-trial variant of a day trader trust game. For this task, each participant was to imagine being a day-trader during a simulated multi-day (one month) investment period. In a single one hour session, the task simulated 30 “days” of investment with a large number of opportunities to assess the partner’s behavior. A simulated task was used because it is not feasible to have a
true longitudinal study of 30 days in a controlled laboratory setting. This is an accepted way to investigate trust development from a longitudinal perspective (Bos, et al., 2002; Zheng, et al., 2002). Each participant received $40 a day to invest; they could invest all or some of the $40. Each day-trader had two choices for investing the money: invest in a common pool whose payoff was dependent on how much the other partner invested in it, or keep it in an individual account. In order to conceal what each partner contributed exactly, a random factor (between -10 and +10) representing stock market fluctuations was added to any group contributions. The random factor differed across days, but summed to zero over the 30 day trials. After including the random factor, the money that each person invested with the group was doubled and split evenly between the two participants. The money that was not invested, the person kept.

One more element that encouraged self-serving behavior was added to the task. The participants were told that at the end of the each week (after five trials) a $200 bonus might be given to the person who made the most money in that block. The term “block” is used here to represent a simulated week. In actuality, the bonus was given in every block. If there was a tie, the bonus was split evenly.

After every five trials the participants were allowed to communicate via IM for up to five minutes, giving the participants the opportunity to communicate with the other trader in the game. During the discussion time, participants could talk about any aspect of the game with the other trader; for instance, pairs used this time to make agreements about how much they would contribute to the group investment. Pairs utilized the discussion time to interact with each other, which may lead to higher trust
establishment and cooperative behaviors. Because this task was played over multiple trials and in the context of a volatile stock market, it provided ample opportunity for a variety of strategies.

In terms of the pre-task interaction, pairs in this condition had a 10-minute getting acquainted session using IM to talk about any personal things they would like before they did the trust game. Participants got to know each other through this session. They were not allowed to talk about anything related to the game. Participants were informed to start interaction by a signal in the IM chat window sent by the experimenter and to stop interaction by a corresponding signal. The interaction and exchanging personal information allows the opportunity of finding similarities between each other, and might lead to trust because this disclosure makes one appear vulnerable in some cases.

In order to give some sense of how this game works, we show two interfaces of the task programmed with FileMaker Pro. Figure 2 shows the investment interface, and Figure 3 shows the discussion interface after one block – a simulated week. Please refer to Appendix C for the complete task instruction.

As shown in Figure 2, players know the game has started when the group status bar says “Investing.” While deciding how much to invest, the players can look at what they gave and what their payoffs were in previous rounds. Once players decide how much they want to contribute to the group investment, they need to enter a number (0-40) in the box on the lower left. Whatever they do not contribute is automatically put into their individual investment fund ('Keep' field on the lower right). Their investments are recorded when they click the ‘Make Investments’ button.
They have up to three minutes to decide on an investment in the first round, and up to two minutes to decide each round after that.

*Figure 2. Investment interface of the task*

Every five rounds there is a five minute pause for discussion, where the players have the opportunities to communicate with each other in the game. *Figure 3 shows the interface for the discussion. The interface lists the results of the last round of play, and also shows whether the player earned a share of the weekly bonus. Each player only sees his or her own results of the last five rounds. Discussions end whenever the pairs decide they are ready to go on by clicking ‘Play Practice Round Again.’*
The bonus box tells whether players earned a good payoff over the last five rounds. Two hundred means they get the entire bonus, because they are the top money-earners for that week. One hundred means the bonus is split between two players. Zero means either the other player gets a bonus or neither of them gets the bonus.

Figure 3. Discussion interface of the task after a simulated week

5.4 Procedure

Pairs were run one at a time. The members of a pair were scheduled to arrive at an interval of ten minutes, so that they did not meet or see each other before the study. The first participant to arrive was put in one room; the second was put in another room on a different floor. Participants started with a general background questionnaire (see Appendix A). Then, they were assigned to do the trust game either without the pre-task treatment or with the pre-task treatment. After the game, they completed a post-questionnaire that assessed trust and their experiences with their partner. The post-questionnaire includes eight questions regarding cognitive and
affective trust adapted from McAllister (1995). Examples of cognitive and affective questions include “S/He was a contributor to our final outcome” and “I felt comfortable sharing my feelings and ideas about the task with him/her.” The questionnaire uses a 1-7 Likert-type scale, with 1 corresponding to strongly disagree and 7 corresponding to strongly agree. Please refer to Appendix B for the complete questionnaire instrument. The same post-questionnaire was used in Sun et al.’s (2006) study to measure trust in different gender pairings. The Cronbach’s Alpha for reliability on the eight trust questions was .79. After completing the post-questionnaire, participants were debriefed.

5.5 Measurements and Analyses

The quantitative measures include: the summed results of the questions in the post-task trust instrument, time spent on performing the task, the pair’s payoff for each trial, the pair’s final total investment payoff, the total number of trials during which the pairs cooperate (invest fully), and the total number of defections (promises made in a discussion that are violated in the next block). The analyses were carried out by Analyses of Variance and t-tests.

The qualitative data of the pairs’ communication processes were measured by the frequency of the various codes. A coding scheme was developed to reveal the way participants negotiate in terms of their communication styles.

The transcripts of the negotiations were coded to determine how participants communicate in pair activities. Initial codes were developed based on the literature of pair negotiation, content analysis in CMC, and gender communication (Fisher and Ertel, 1995; Rafaeli and Sudweeks, 1993; Meyers-Levy, 1989). These categories
reflect key aspects of the communication process. The unit of coding is a meaningful statement, either as a word or a sentence, expressing particular negotiation activities. In the next step four sample transcripts from each of the four conditions were randomly chosen. Two of the researchers coded these four transcripts independently, and then went through several iterations of discussion and recoding to determine whether the initial codes were relevant and if other elements in the transcripts should be coded. A set of rules were developed to determine how to apply each code to transcripts. Examples of those rules include the following. First, any clarification was coded as an inherited code of the one it was clarified. For example, clarification of option was coded as option, and clarification of meeting management was coded as meeting management. Second, if an utterance, such as okay and aha, had no clear meaning, or only showed acknowledgement of listening, it was not coded as any code. Third, in some cases, when participants made statements related to the task strategy for performing the investments, the statements included the investment number (option). To avoid the double codes, these statements were coded as strategy.

In the final coding scheme, there were ten codes representing the primary activities of the participants: greeting, option, criterion, relationship, appreciation, schema-driven, strategy, meeting management, digression, and emoticon. The detailed interpretation of each code is described below.

**Greeting** is a statement expressing good wishes to each other, especially at the beginning or the end of the task, e.g., “how are you?” **Option** is a statement or question of possible solutions to the agreement, which can be either a simple investment number or an investment range, for instance, “how about we put 15 as...
investment?” “I think we should stay around 30-35.” Criterion refers to any evaluative statement, e.g., “10 is fine for me”, “last round went well for me.”

Relationship is any evaluative statement on fairness with a consideration of group payoff or another party in the negotiation, for instance, “I am going to bump mine [my investment] up then so our group payoff is higher,” “how about you invest 39 each time and I will invest 40…, this way we will have higher payoff and you will get the bonus.” Appreciation refers to any statement of appreciating others’ work, e.g., “nice working with you,” “pleasure playing this game with you.” Schema-driven is any statement or judgment connecting to the facts in the real world, for instance, “I don’t think it’s a very stable economy…, lots of fluctuations I guess,” “bad economy I think, that’s how the market works, and it fluctuates daily.” Strategy refers to any statement of how to approach the task or any proposal of how to perform the investments, for instance, “I think we’ll make the most money if we both invest the same amount,” “I was investing up and down based on the return [from the group payoff],” “it [the investment] is all about whether you want to help the person or deceive them.” Meeting management refers to any statement that provides simple facts to move the discussion ahead, either at the beginning of the conversation or the discussion during the task, e.g., “let’s go to the next round,” “you got the bonus for the first 2 rounds, right?” “I am not really sure; I’ll keep a closer eye on it [the payoff] in the next couple rounds.” Digression refers to any statement irrelevant to the experiment task, including jokes or facetious ideas often followed by laughter, and extended discussion about friends’ weddings, faculty members, plans for the evening, gross behaviors, etc., for instance, “I suggest you taking the same psychology class I
have taken, because the instructor from that class is great.” *Emoticon* is a unique way of expressing emotional feelings by using symbols provided in Instant Messaging system, such as 😊.

Table 2 lists the coding scheme with all above codes and their definitions.

Table 2

**Coding Scheme for Communication Process**

<table>
<thead>
<tr>
<th>Code Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greeting</td>
<td>Statement expressing good wishes to each other</td>
</tr>
<tr>
<td>Option</td>
<td>Statement or question of possible solutions to the agreement, which can be either a simple investment number or an investment range</td>
</tr>
<tr>
<td>Criterion</td>
<td>Any evaluative statement</td>
</tr>
<tr>
<td>Relationship</td>
<td>Evaluative statement on fairness with a consideration of group payoff or another party in the negotiation</td>
</tr>
<tr>
<td>Appreciation</td>
<td>Statement appreciating the other’s work</td>
</tr>
<tr>
<td>Schema-driven</td>
<td>Making statement or judgment by connecting to the facts in the real world</td>
</tr>
<tr>
<td>Strategy</td>
<td>Statement of how to approach the task or any proposals of how to perform the investments</td>
</tr>
<tr>
<td>Meeting management</td>
<td>Statement that provides simple facts to move the discussion ahead, either at the beginning of the conversation or the discussion during the task</td>
</tr>
<tr>
<td>Digression</td>
<td>Statement irrelevant to the experiment task, including jokes and extended discussion about friends’ weddings, faculty, plans for the evening, gross behaviors, etc.</td>
</tr>
<tr>
<td>Emoticon</td>
<td>A way of expressing emotional feelings by using symbols provided in the IM system</td>
</tr>
</tbody>
</table>
CHAPTER 6: RESULTS

This chapter reports the results of data analyses. They are organized in the three categories: gender difference in trust with and without pre-task treatment (measured by questionnaire), gender difference in performance and behaviors with and without pre-task treatments (measured by time, investment payoff of the task, cooperation behaviors, and defection behaviors), as well as gender differences in communication processes. Table 3 shows all the dependent variables, Hypotheses and the analytic methods used in SPSS.
Table 3

Outline of Measurements, Hypotheses and Statistical Methods

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Hypotheses</th>
<th>Statistical Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust Perception</td>
<td><em>H1a:</em> All pairs will achieve higher levels of trust in the pre-task interaction condition than in the condition with no pre-task interaction.</td>
<td>ANOVA</td>
</tr>
<tr>
<td></td>
<td><em>H1b:</em> In the pre-task interaction condition, all gender pairs will achieve similar levels of trust.</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td><em>H1c:</em> In the condition with no pre-task interaction, female pairs will achieve higher levels of trust than male pairs.</td>
<td>N/A</td>
</tr>
<tr>
<td>Performance Time</td>
<td><em>H2a:</em> Female pairs will take less time in doing the task than male pairs.</td>
<td>ANOVA</td>
</tr>
<tr>
<td></td>
<td><em>H2b:</em> Male pairs in the pre-task interaction condition will take less time than those in the condition with no pre-task interaction.</td>
<td>N/A</td>
</tr>
<tr>
<td>Behaviors (total final payoff, investment payoff per trial)</td>
<td><em>H3a:</em> All pairs will have greater investment payoff in the pre-task interaction condition than in the condition with no pre-task interaction.</td>
<td>ANOVA</td>
</tr>
<tr>
<td></td>
<td><em>H3b:</em> All pairs will have greater investment payoff at the end of 30 trials of the task than at the beginning of the task in both the pre-task and the no pre-task interaction condition.</td>
<td>ANOVA with Repeated Measures</td>
</tr>
<tr>
<td></td>
<td><em>H3c:</em> In the condition with no pre-task interaction, female pairs will have greater investment payoff than male pairs during the first half of the trials.</td>
<td>ANOVA with Repeated Measures</td>
</tr>
</tbody>
</table>
| Communication Process | All pairs will have similar investment payoff at the end of the task.  
H3d: In the pre-task interaction condition, all pairs will have similar investment payoff during the task. | ANOVA with Repeated Measures |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H4a: Female pairs will use more emoticons, and use more acknowledgement words during their interaction than male pairs.</td>
<td>ANOVA</td>
</tr>
<tr>
<td></td>
<td>H4b: Male pairs will use more acknowledgement words and their conversation will contain less tension in the pre-task interaction condition than in the condition with no pre-task interaction.</td>
<td>ANOVA</td>
</tr>
</tbody>
</table>
6.1 Gender Difference in Trust with and without Pre-task Treatment

As mentioned earlier, the post-questionnaire included eight questions regarding cognitive and affective trust adapted from McAllister (1995). The Cronbach’s Alpha for reliability on the eight trust questions was .79. The overall between-subjects 2x2 (gender x pre-task treatment) ANOVA for trust perception showed main effects of pre-task treatment (F (1, 58) = 5.56, \(p < .02\)) and gender (F (1, 58) = 2.32, \(p < .04\)). There was no interaction effect of gender x pre-task treatment. Table 4 shows the means and standard deviations of pair trust perception. Figure 4 shows pair trust perception by gender across the two pre-task treatments.

Table 4

<table>
<thead>
<tr>
<th></th>
<th>No Interaction</th>
<th>Pre-task Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female Pairs</td>
<td>4.79 (.83)</td>
<td>5.40 (.74)</td>
</tr>
<tr>
<td>Male Pairs</td>
<td>4.58 (.69)</td>
<td>4.84 (.60)</td>
</tr>
</tbody>
</table>

*Figure 4. Pair Trust Perception By Gender In Two Pre-Task Interaction Conditions*
H1a was supported by the results in that all pairs achieved higher levels of trust in the pre-task interaction condition than in the condition with no pre-task interaction. In addition, the results also indicated that female pairs achieved higher levels of trust than male pairs in both the pre-task interaction condition and the no interaction condition. Furthermore, there appears to be a trend toward female pairs having higher trust than male pairs in the pre-task interaction condition.

Regarding our hypotheses of H1b and H1c on trust perception in the two pre-task interaction conditions, we were not able to perform further analyses since there was no interaction effect of gender x pre-task treatment.

6.2 Gender Difference in Performance and Behaviors with and without Pre-task Treatment

Performance measures included performance time and behaviors during the task. The measurements of behaviors include: investment payoff (the final total payoff as a pair and the pair’s payoff for each trial), cooperation (the total number of trials during which the pairs invest fully), and number of defections (promises to invest a certain amount made in a discussion that are violated in the later investment). The analyses of these measures are provided below.

6.2.1 Performance Time

The overall between-subjects 2x2 (gender x pre-task treatment) ANOVA for performance time showed a main effect of gender ($F (1, 58) = 8.95, p = .00$), and a marginal effect of pre-task treatment ($F (1, 58) = 3.71, p < .06$). There were no interaction effects of gender x pre-task treatment. Table 5 shows the means and
standard deviations of pair performance time. Figure 5 shows pair performance time by gender across the two pre-task treatments.

Table 5

Means (SD) of Gender Pair Performance Time in Two Pre-task Interaction Conditions

<table>
<thead>
<tr>
<th></th>
<th>No Interaction</th>
<th>Pre-task Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Female Pairs</strong></td>
<td>20.35 (4.91)</td>
<td>18.64 (7.68)</td>
</tr>
<tr>
<td><strong>Male Pairs</strong></td>
<td>28.26 (10.20)</td>
<td>22.47 (9.15)</td>
</tr>
</tbody>
</table>

Figure 5. Pair performance time by gender in two pre-task interaction conditions

H2a was supported by the results in that female pairs took less time than male pairs in doing the task. In addition, the results also indicated that all pairs spent less time on doing the task in the pre-task interaction condition than in the condition with no pre-task interaction. Once again, we were not able to perform further analyses
since there was no interaction effect of gender x pre-task treatment.

6.2.2 Behaviors (investment payoff, cooperation, defection)

Investment payoff

Investment payoff was measured in two ways, either by the final total payoff as a pair (where the maximum possible final total payoff was 6000) or by the pair’s payoff for each trial (where the maximum possible payoff was 160). Since the bonus and random factor were the same for all pairs, they were removed from all calculations. The overall between subjects 2x2 (gender x pre-task treatment) ANOVA for final total payoff as pairs showed a main effect of pre-task treatment ($F (1, 58) = 7.43, p < .01$). Neither a main effect of gender nor an interaction effect of gender x pre-task treatment was found. Table 6 shows the means and standard deviations of pair final investment payoff. Figure 6 shows pair final total investment payoff by gender across the two pre-task treatments.

Table 6

Means (SD) of Pair Total Investment Payoff in Two Pre-task Interaction Conditions

<table>
<thead>
<tr>
<th></th>
<th>No Interaction</th>
<th>Pre-task Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Female Pairs</strong></td>
<td>4999.07 (496.26)</td>
<td>5222.88 (587.70)</td>
</tr>
<tr>
<td><strong>Male Pairs</strong></td>
<td>4934.47 (485.33)</td>
<td>5382.09 (625.35)</td>
</tr>
</tbody>
</table>
H3a was supported by the results in that all pairs had better total investment payoff in the pre-task interaction condition than in the condition with no pre-task interaction. To test H3b, H3c and H3d, ANOVA with repeated measures were performed to investigate the pairs’ investment payoff for each trial over time and the gender differences in the pre-task interaction conditions.

Figure 7 shows the trial-by-trial payoffs for the two pre-task interaction conditions. The data shown in Figure 7 was analyzed using a 5 (trials within one “week”) X 6 (blocks or “weeks”) repeated measures ANOVA with pre-task treatments as the between-subjects variable. This test was performed to investigate whether pairs had greater payoff overtime (H3b); thus all gender pairs were combined. There was a main effect of block on payoff, $F(5, 290) = 13.44, p < .00$, indicating that pairs received higher payoffs over time (H3b). In addition, the main effect of trial within block on payoff was significant as well, $F(4, 232) = 2.94, p < .02$, indicating that pairs contributed less the further they were from the intermittent communication
To further test the gender differences on pair payoff trial-by-trial in the condition with no pre-task interaction (H3c) and in pre-task interaction condition (H3d), another set of analyses with ANOVA with repeated measures were performed. However, there were no significant gender differences found in either condition. Thus, only H3d was supported by the results, in that all gender pairs had similar investment payoff during the task in the pre-task interaction condition.

**Cooperation**

Pairs’ cooperation was measured by the total number of trials during the task in which the pairs invested fully. By investing the full $40 for both players, the pair’s payoff per trial therefore would be maximized, presumably because of trust. The
overall between subjects 2x2 (gender x pre-task treatment) ANOVA for cooperation showed a main effect of gender (F (1, 58) = 10.00, p < .00). Neither a main effect of pre-task treatment nor an interaction effect of gender x pre-task treatment was found. Figure 8 shows means of pair cooperation by gender across the two pre-task treatments.

Table 7

*Means (SD) of Pair Cooperation in Two Pre-task Interaction Conditions*

<table>
<thead>
<tr>
<th></th>
<th>No Interaction</th>
<th>Pre-task Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Female Pairs</strong></td>
<td>4.20 (8.66)</td>
<td>9.50 (9.47)</td>
</tr>
<tr>
<td><strong>Male Pairs</strong></td>
<td>1.81 (3.04)</td>
<td>1.42 (2.61)</td>
</tr>
</tbody>
</table>

*Figure 8.* Pair cooperation by gender across two pre-task treatments
As shown in Figure 8, female pairs had a higher number of trials than male pairs during the task which they invested fully. However, there was no significant difference in pairs’ cooperation whether or not pairs from different pre-task interaction conditions ever invested the entire $40.

**Defection**

Occasions of defection behaviors were counted and analyzed. Pairs were deemed defecting when they did not invest what they promised to in the discussion. For female pairs, on average there were 4.29 trials in which at least one of the two players defected, and for male pairs, the average number was 5.21 trials. There were neither main effects of gender or pre-task treatments, nor an interaction effect of gender x pre-task treatment.

### 6.3 Gender Differences in Communication Processes

For communication process data, all the pairs’ transcripts were originally saved as log files and subsequently were coded using a coding scheme based on the previous literature. Please see Table 2, Chapter 5.

In the following sections, the coders’ reliability and the communication process analysis are reported in detail.

**Coders’ Reliability**

All coding was completed by two coders, including the author and another researcher in the same college at Drexel University. Both coders have similar educational and professional background and had some coding experience in actual research projects. Each one coded half of the transcripts in each condition. In the training stage, four sample transcripts were randomly picked from each of the four
conditions. Two coders coded these four transcripts with several iterations of discussion and recoding to come to an agreement of the application of the codes, until a satisfactory level of interrater reliability was reached. The consistency of the two coders on the four sample transcripts was 84 percent, 89 percent, 80 percent and 81 percent respectively, with an average of 83.5 percent. The Cohen’s Kappa reliability statistic for all the transcripts was .80, which is within the acceptable range (Cohen, 1988).

**Communication Process Analyses**

The communication process analysis revealed the language styles participants engaged in doing the negotiation. It provided more detailed data to better understand the results from the quantitative analyses of pairs’ performance and behaviors during the task, as well as their trust perception. We conducted analyses on each code as listed in Table 2. The number of instances of each code was counted. For detailed definition of each code, please see Table 2 in Chapter 5. Table 7 shows the mean (SD) of each code frequency, and p-values from ANOVA analyses. It is an accepted way to conduct quantitative analysis on qualitative results (Creswell, 2002).
Table 8

*Mean (SD) and p-value (from ANOVA) of codes among two gender pairings*

<table>
<thead>
<tr>
<th></th>
<th>Female Pairs N=33</th>
<th>Male Pairs N=29</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Interaction</td>
<td>Pre-task</td>
<td>No Interaction</td>
</tr>
<tr>
<td>Greeting</td>
<td>3.00 (2.50)</td>
<td>.50 (1.01)</td>
<td>4.22 (4.30)</td>
</tr>
<tr>
<td>Option</td>
<td>3.24 (2.68)</td>
<td>3.64 (4.43)</td>
<td>2.11 (1.97)</td>
</tr>
<tr>
<td>Criterion</td>
<td>10.24 (6.75)</td>
<td>8.00 (7.02)</td>
<td>8.56 (6.86)</td>
</tr>
<tr>
<td>Relationship</td>
<td>3.47 (2.98)</td>
<td>3.64 (2.59)</td>
<td>2.00 (1.87)</td>
</tr>
<tr>
<td>Appreciation</td>
<td>2.12 (1.65)</td>
<td>1.00 (1.04)</td>
<td>1.11 (1.69)</td>
</tr>
<tr>
<td>Schema</td>
<td>1.18 (1.38)</td>
<td>0.57 (.76)</td>
<td>1.00 (1.12)</td>
</tr>
<tr>
<td>Driven</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategy</td>
<td>16.24 (7.40)</td>
<td>11.00 (9.01)</td>
<td>20.22 (13.03)</td>
</tr>
<tr>
<td>Meeting</td>
<td>35.41 (10.70)</td>
<td>23.57 (12.93)</td>
<td>55.89 (20.75)</td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digression</td>
<td>0.65 (2.03)</td>
<td>0.00 (0.00)</td>
<td>5.00 (12.12)</td>
</tr>
<tr>
<td>Emoticon</td>
<td>1.53 (1.94)</td>
<td>1.71 (2.13)</td>
<td>0.44 (0.73)</td>
</tr>
</tbody>
</table>
There are pre-task treatment effects on greeting (F (1, 58) = 17.16, p < .00), appreciation (F (1, 58) = 9.11, p < .00) and meeting management (F (1, 58) = 7.14, p < .01). In the condition with no pre-task interaction, all pairs tended to use polite and warm statements. In addition, exchanging simply facts were frequently used in pairs’ communication in order for them to keep each other posted and move the discussion ahead.

In addition, we found significant gender effects on relationship, appreciation, strategy, meeting management and emoticon.

1) Female pairs used more statements of appreciation and fairness. They were more concerned with their partners and group payoff in the negotiation, such as relationship (F (1, 58) = 9.03, p < .00) and appreciation (F (1, 58) = 7.38, p < .01).

2) Male pairs used more direct language and more calls for planning and action, such as strategy (F (1, 58) = 4.99, p < .03) and meeting management (F (1, 58) = 12.39, p < .00).

3) Female pairs used more emoticons to express their feelings or to avoid embarrassment during the conversation (F (1, 58) = 4.54, p < .04).

Note that there was a marginally significant gender difference on digression (p < .07). This was due to one instance, in which a male pair spent a long time chatting with each other about their school and hobbies. If this pair was removed from the statistical analysis, the p-value was not significant.

Overall, hypothesis H4a was supported by the results, in that female pairs used more emoticons and acknowledgement words during their interaction than did male pairs. In addition, male pairs did not use more cooperative communication.
language, i.e., using appreciation and relationship statements in our case, in the pre-task interaction condition. Therefore, hypothesis H4b was not supported.

In the next step, we calculated percentages of codes by dividing the frequency of each individual code by the sum of all codes. Table 8 lists the results of calculations. It confirmed the above analysis; females pairs had more statements of relationship and appreciation, and they cared about their partners and group payoff in the negotiation. Furthermore, they used more emoticons during their communication. Finally, all pairs used more greeting statements in the condition with no pre-task interaction than in the pre-task interaction condition. On one hand, the results show that pairs’ communication have a high percentage of strategy and meeting management; that is due to the nature of the task that pairs need to discuss and negotiate with each other in order to reach agreement on investment payoff. On the other hand, the results also indicate that the statements of relationship, appreciation and emoticon only count for small percentages of conversation. However, those statements have important social impacts on facilitating collaborative behaviors among remote communicators.
### Table 9

*Mean and p value (from ANOVA) of Percentage of codes among two gender pairings*

<table>
<thead>
<tr>
<th></th>
<th>FF N=33</th>
<th></th>
<th>MM N=29</th>
<th></th>
<th>P-value</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Interaction</td>
<td>Pre-task Interaction</td>
<td>No Interaction</td>
<td>Pre-task Interaction</td>
<td>Gender</td>
<td>Pre-task Treatments</td>
<td>Interaction</td>
</tr>
<tr>
<td>Greeting</td>
<td>0.04</td>
<td>0.01</td>
<td>0.04</td>
<td>0.01</td>
<td>.37</td>
<td>.00</td>
<td>.47</td>
</tr>
<tr>
<td>Option</td>
<td>0.04</td>
<td>0.07</td>
<td>0.02</td>
<td>0.03</td>
<td>.17</td>
<td>.42</td>
<td>.93</td>
</tr>
<tr>
<td>Criterion</td>
<td>0.13</td>
<td>0.15</td>
<td>0.09</td>
<td>0.11</td>
<td>.50</td>
<td>.37</td>
<td>.22</td>
</tr>
<tr>
<td>Relationship</td>
<td>0.05</td>
<td>0.07</td>
<td>0.02</td>
<td>0.01</td>
<td>.00</td>
<td>.30</td>
<td>.07</td>
</tr>
<tr>
<td>Appreciation</td>
<td>0.03</td>
<td>0.02</td>
<td>0.01</td>
<td>0.00</td>
<td>.04</td>
<td>.72</td>
<td>.40</td>
</tr>
<tr>
<td>Schema Driven</td>
<td>0.02</td>
<td><strong>0.01</strong></td>
<td><strong>0.01</strong></td>
<td><strong>0.03</strong></td>
<td><strong>.19</strong></td>
<td><strong>.35</strong></td>
<td><strong>.03</strong></td>
</tr>
<tr>
<td>Strategy</td>
<td>0.21</td>
<td>0.21</td>
<td>0.20</td>
<td>0.26</td>
<td>.14</td>
<td>.35</td>
<td>.09</td>
</tr>
<tr>
<td>Meeting Management</td>
<td>0.46</td>
<td>0.44</td>
<td>0.56</td>
<td>0.52</td>
<td>.27</td>
<td>.31</td>
<td>.29</td>
</tr>
<tr>
<td>Digression</td>
<td>0.01</td>
<td>0.00</td>
<td>0.05</td>
<td>0.02</td>
<td>.07</td>
<td>.40</td>
<td>.77</td>
</tr>
<tr>
<td>Emoticon</td>
<td>0.02</td>
<td>0.03</td>
<td>0.00</td>
<td>0.01</td>
<td><strong>.01</strong></td>
<td>.32</td>
<td>.57</td>
</tr>
</tbody>
</table>
CHAPTER 7: DISCUSSION

The primary objective of this research was to explore gender differences in synchronous computer-mediated communication (CMC) with and without initial social activities. In particular, we asked whether initial social activities affect trust development and performance of male and female gender pairs in a social dilemma game. A primary question was whether male pairs, who tended to be less trusting (Sun, et al., 2007), would be able to achieve the same level of trust and performance as female pairs via exposure to the pre-task social activities. This section will examine the results of this study in the context of previous studies. In many cases, the results of this study served to support what previous research indicated. However, there were several instances where that was not the case.

The following discussion is organized in the three categories: gender difference in trust with and without pre-task treatment, gender difference in performance and behaviors with and without pre-task treatments, as well as gender differences in communication processes. The examination of hypotheses and the detailed interpretation of the results will be addressed in this section.

7.1 Gender Difference in Trust with and without Pre-task Treatment

**Primary Conclusion**

Pairs achieved higher levels of trust in the pre-task interaction condition than in the condition with no pre-task interaction. In addition, female pairs achieved higher levels of trust than male pairs across both conditions.
Interpretation Regarding the Hypotheses

The result that all pairs achieved higher levels of trust in the pre-task interaction condition than in the condition with no pre-task interaction confirmed our hypothesis (H1a). Trust, once again, was measured by the post-questionnaire. Several previous studies examined the effect of prior acquaintance and sharing of personal information on trust and cooperation (Rocco, 1998; Zheng et al., 2002). Rocco (1998) did indeed find a positive effect of prior face-to-face acquaintance on cooperation. Zheng et al. (2002) questioned whether this effect could be reached by other means. They isolated three aspects of face-to-face interaction: synchronous interaction, visual identification and exchange of personal information. They compared the effect of pre-task treatments: face-to-face interaction, social text-chat, a photograph of the partner and a personal information sheet. Davis et al. (2002) also included a personal information sheet in their study. The results from these studies draw a picture similar to other studies: the richer the channel by which participants get to know each other, the higher the cooperation rate in the subsequent social dilemma game. The social text-chat turned out to be the most effective way to build trust between remote participants. Both studies report a very limited effect of the personal information sheet on establishing trust. Our result on trust building further confirmed the earlier work. Furthermore, with detailed quantitative and qualitative analyses, our results provided additional insights on the impacts of both gender and initial social chat on trust and cooperation in more complex ways.

Regarding our hypotheses of H1b and H1c on trust perception in the two pre-task interaction conditions, there was no interaction effect of gender x pre-task
treatment. However, our finding uncovered an interesting phenomenon, in which female pairs achieved higher levels of trust than male pairs across both conditions. A few previous studies have found that females focused more than males on social cues and harmonious group relations in playing games, and were less nervous or upset at the end of the game (Stockard et al., 1988; Kahn, et al., 1971). The focus on group harmony is consistent with the results from this study that females care more about their partner and behave more collaboratively, which lead to higher levels of trust than male pairs. In addition, as indicated by SIDE (Spears and Lea, 1994) theory, when females notice that their partner is also a female, they feel more comfortable sharing information and cooperating with each other and they tend to be more collaborative and more attentive to group harmony. By contrast, a male who knows that he is paired with another male is less likely to perceive trust, since a male’s relationship with his partner tends to be built on individualism or competition with lower sensitivity to harmonious group relations. Several previous studies have pointed out the impacts of providing gender information on cooperation and trust among collaborators (Matheson, 1991; Sun, et al., 2007). In Sun et al.’s study providing collaborators’ gender information did help females achieve a level of trust in IM that was similar to the trust seen in the much more expensive video medium.

7.2 Gender Difference in performance and behaviors with and without Pre-task Treatments

7.2.1 Performance Time

Primary Conclusion
Female pairs took less time than male pairs in doing the task. In addition, all pairs spent less time doing the task in the pre-task interaction condition than in the condition with no pre-task interaction.

**Interpretation Regarding the Hypotheses**

Hypothesis H2a was supported by the result that female pairs took less time than male pairs in doing the task. Initially, we based this hypothesis on the selectivity model (Meyers-Levy, 1989). This model predicts that females are more likely to employ detailed (elaborative) information processing strategies in both simple and complex decision tasks. On the contrary, males are more likely to select simplified (heuristic) processing strategies that minimize cognitive effort and reduce information load for simple tasks, switching to an elaborative strategy only when increasing task complexity will not accommodate a heuristic approach to information processing.

Given the complex nature of the Day Trader game in the study, females should take less time in doing the task by using elaborative information processing strategies they are good at. However, our analyses of the communication process, specifically the code “schema-driven” in the coding scheme, did not show differences between females and males on the information processing strategies they used. A *schema-driven* is any statements or judgments connecting to the facts in the real world. A specific example is: “bad economy I think, that’s how the market works, and it fluctuates daily.” It is interpreted as using less effortful recognition comparing to using more effortful recall, representing a simplified information processing strategy (Meyers-Levy, 1989). The different conversational styles and negotiation strategies
between female pairs and male pairs are the main reasons leading to the different performance time. This is further discussed in the communication process section.

Regarding our hypotheses of H2b on male pairs’ performance time in the two pre-task interaction conditions, there was no interaction effect of gender x pre-task treatment.

Regarding our finding that all pairs spent less time doing the task in the pre-task interaction condition than in the condition with no pre-task interaction, it is apparent that pairs became familiar with each other before the task in the pre-task interaction condition, and their familiarity smoothed their interaction through the whole task, leading to faster performance time than the pairs in the condition without pre-task interaction.

7.2.2 Behaviors (investment payoff, cooperation, defection)

**Primary Conclusion**

First, all pairs had better total investment payoff in the pre-task interaction condition than in the condition with no pre-task interaction. Second, pairs received higher payoffs over time. Third, pairs invested more money immediately after they finished a chat, but their investments fell as they did the remaining trials in the block. Fourth, female pairs invested fully in a higher number of trials than male pairs.

**Interpretation Regarding the Hypotheses**

First of all, our hypothesis H3a was supported by the results in that all pairs had better total investment payoff in the pre-task interaction condition than in the condition with no pre-task interaction. Consistent with other studies (Rocco, 1998; Zheng et al., 2002; Bos, et al., 2002), our result showed the power of prior
acquaintance before the task, in which the pre-task interaction increases the level of trust and leads to better performance behaviors than in the condition with no pre-task interaction. In this study, better performance behaviors refer to greater payoff and more cooperative behaviors.

Our finding that pairs received higher payoffs over time was consistent with our Hypothesis H3b. The results from several previous studies showed that the effect of the pre-task treatments became less important over time, as collaborations had repeated interactions in the task (Zheng et al, 2002; Brader and Mark, 2002). In other words, as people interacted more with each other over time, they became more familiar with each other, and then the effect of pre-task treatment became less important. The direct interaction becomes more important leading to more cooperative behaviors.

Another interesting finding is that pairs invested more money immediately after they finished the chat, but their investments fell as they did the remaining trials in the block. This reflects the effectiveness of social chats from another perspective, indicating the importance of the direct interaction among collaborators. This interesting phenomenon was called the “sawtooth pattern” in Bos’s study (Bos, et al., 2002).

The higher number of trials in which females invested fully during the task indicated their higher cooperative behaviors than males. Pairs’ cooperation was measured by the total number of trials during the task in which the pairs invested fully. By investing the full $40 for both players, the pair’s payoff per trial therefore would be maximized, presumably because of trust. Interestingly, we did not find a
difference in defection behaviors between female and male pairs. Recall that pairs were deemed defecting when they did not invest what they promised in the chat, i.e., making promises and not keeping them. This implies that when people do not trust each other, they tend to show it by withholding group investment, rather than by defecting.

In this task, participants played the game with a fictitious amount of money and they got a small amount of extra credit in a course as an incentive. Thus, there was no real risk of losing money. That might be a reason why pairs did not have many defections during the task. It would be very interesting to see what happens when pairs play with real money. Would pairs still tend to withhold group investment rather than defect when they mistrust with each other?

As most of the previous research indicates, trust is a variable that has direct effects on group cooperation and performance (Dirks and Ferrin, 2001). In other words, when the level of trust is increased, a group is expected to experience superior group processes (e.g., higher levels of cooperation) and higher performance; when trust is decreased, a group is expected to experience inferior group processes and lower performance. The results from behavioral analysis are in line with previous studies in that all pairs had higher level of trust and better total investment payoff in the pre-task interaction condition than in the condition with no pre-task interaction. In addition, higher levels of trust achieved by female pairs lead to their more cooperative behaviors than male pairs. Once again, cooperation is frequently associated with trust – particularly when cooperation puts one at risk of being taken advantage of by a partner (Mayer et al., 1995). Regarding our hypotheses about gender differences on
pair payoff trial-by-trial in each pre-task interaction condition (H3c and H3d), our results showed that in the condition with no pre-task interaction, there were no gender differences on pair payoff for each trial. Thus, our H3c was not supported. This could be due to a couple of reasons. First, with respect to the effect of interval communication during the task, as mentioned earlier, the effects of direct interaction among collaborators might have been more important than gender differences. Second, relating to the nature of the task, in this game players would quickly realize that investing more money in the common pool would help them increase individual payoff. Furthermore, pairs had similar investment payoff trial-by-trial in the pre-task interaction condition. Therefore, our H3d was supported by the results. This was because pairs became familiar with each other before the task, and it smoothed their interaction through the whole task.

### 7.3 Gender Differences in Communication Processes

**Primary Conclusion**

There are strong gender effects on communication processes. First, female pairs used more statements of appreciation and fairness, and they were more concerned with their partners and group payoff in the negotiation. Second, male pairs used more direct language and more calls for planning and action, such as strategy and meeting management. Third, female pairs used more emoticons to express their feelings or to avoid embarrassment during the conversation. Finally, in the no pre-task interaction group, all pairs tended to use more polite and warm statements, i.e., greeting and appreciation, and used more statements of meeting management to move
the discussion ahead. This contrasted with the pre-task interaction condition, which used fewer such utterances.

The qualitative analysis provides more detailed data to explain the results from quantitative analyses, especially with respect to trust. The higher levels of trust perceived and more collaborative behaviors performed by female pairs may be partly due to the conversational styles they used. It appears that female pairs tried to create a smooth relationship by considering both parties’ benefit and reinforcing that with language expressing mutual respect and appreciation of others’ efforts. On the other hand, male pairs showed lower sensitivity to group harmony in the competitive negotiation context. This may have influenced male pairs’ lower levels of trust. In this study, we used qualitative methods to take a closer look at the social mechanisms employed by male and female pairs, and the results from qualitative analysis provide a clearer understanding of linguistic mechanisms that support collaborators in competitive CMC settings.

**Interpretation Regarding the Hypotheses**

Our hypothesis H4a was supported by the results. As discussed above, females tend to use a collaborative conversation style that focuses on harmonious relationships, whereas males tend to be sensitive to the power dynamics of interaction, speaking in direct ways and focusing on status (Tannen, 1995). Talbot (1998) also says, “women tend to focus on rapport and the affective, supportive function of conversation…men on the other hand tend to focus on report and the informational function of conversation” (p. 101).
In a recent case study, Sheridan (2007) uncovered that males and females use different communication skills in decision making and leadership in real work settings. Females use more supportiveness, attentiveness, and collaboration in their conversation to enhance morale and productivity, whereas males engage in more unilateral, directional communication to exercise leadership, which is consistent with their learned view of talk as a way to assert self and achieve status (Sheridan, 2007). In addition, another study has suggested that females’ conversational goals are far more about support and cooperation than are males’. Stereotypically, females are expected to have more listener responsiveness behaviors and are accepted generally as better listeners than men (Marche and Peterson, 1993). Listener responsiveness behaviors, or back channel, usually involve small verbal cues, such as repetitions of a speaker’s words, sentence completions, minimal responses such as mm hmm, uhuh, yeah, which convey the listener’s continuing attention to a conversation (Zimmerman and West, 1975; Maltz and Borker, 1982; Fishman, 1978; Coates, 1989; Jenkins and Cheshire, 1990; Case, 1994). Appropriately using the back channel has an impact on supporting conversation, such that the speaker truly feels that he or she is being listened to.

The different conversational styles between males and females are also reflected in the ways males and females interact with computers (Turkle, 1988). For example, meta-analysis has revealed gender-related stereotypical patterns in CMC environments, in which female communication, compared to male, is more socio-emotionally oriented (Li, 2005). Our communication process analysis supported these ideas, in which the female pairs used more language of fairness and appreciation in
their conversation; whereas the male pairs made more statements about meeting management and strategy when communicating with each other. Our hypothesis H4b was not supported by the results. Pre-task interaction did not help males use more cooperative communication language. It might be due to the fact that pairs felt no need to be so polite because they already were familiar with each other from the pre-task interaction.

Another interesting finding was that female pairs used more emoticons in their conversations than did male pairs. Females often used emoticons as visual cues to expand the meaning of textual electronic messages. For example, in one instance of a female pair’s conversation: Female 1: “Did you invest the number [amount of money] as we agreed?” Female 2: “😡, sorry. I accidentally put in the wrong number.” Inserting this emoticon with a red face immediately enhanced the message content and the message receiver was able to feel the embarrassment and apologies that the message sender tried to convey. Emoticons help female pairs express feelings and ideas. The conversations between females were more with emoticons and smileys and much more sympathetic in tone. Our finding that females were more likely to use emoticons than were males is consistent with Herring’s report (2003) that women are three times as likely to use representations of smiles or laughter than were males in one-to-many synchronous communication.

Emoticons are becoming more prevalent in online interactions, partly due to the fact that they are often built into CMC applications, such as instant messaging, chat rooms, message boards, and even blogs. Users can select an emoticon from a menu embedded in the application. Furthermore, research suggests that females use
emoticons more often than males in instant messaging applications and newsgroups (Lee, 2003; Witmer and Katzman, 1997; Wolf, 2000). One study (Yigit, 2005) examined the usage of emoticons when an emoticon menu was provided to communicators in a discussion board format; it showed that there is a significant difference in emoticon usage based on gender. Eighty-six percent of the emoticon users were females. As the increasing numbers of high school and college courses include a computer-mediated component, such as a discussion board, to enhance the class, it is important to make sure that online communication between students in a course context is similar to the richness of in-person class communication. Emoticons seem to be a good way to help communicators in the exchange of emotions and also enhance the message content, especially for female dominated groups. Research on emoticon usage is new in the education field, but the findings from this research and a few previous studies (Wolf, 2000; Yigit, 2005) suggest that emoticons may be perceived as a helpful tool in understanding other’s feelings.

As discussed above, although our hypothesis H2a was supported by the result that female pairs took less time than male pairs in doing the task, it was not due to different information processing strategies used by female and male pairs as indicated by selectivity model (Meyers-Levy, 1989). By comparison, the different conversational styles and negotiation strategies between female pairs and male pairs are the main reasons leading to the different performance time. First, females tended to post relatively short messages which saved time. This finding is consistent with Herring’s study (Herring, 2003), in which she found that men used longer messages
in asynchronous communication and more balanced numbers and length of messages in synchronous CMC.

Herring (2003) offers a thorough analysis of language and gender issues in one-to-many CMC forums such as listservs and newsgroups (both of which involve asynchronous communication) and Chat, MUDs, and MOOs (all of which involve synchronous communication). In both venues, Herring reports gender asymmetries. On asynchronous discussion lists and newsgroups, “males are more likely to post longer messages, begin and close discussions in mixed-sex groups, assert opinions strongly as ‘facts,’ use crude language (including insults and profanity), and in general manifest an adversarial orientation toward their interlocutors” while females “tend to post relatively short messages, and are more likely to qualify and justify their assertions, apologize, express support of others, and in general, manifest an ‘aligned’ orientation toward their interlocutors” (Herring, 2003 p. 207).

Another reason that female pairs took less time in doing the task is that different game playing behaviors tend to appear in male pairs and female pairs. Our communication process analysis showed that male pairs spent time discussing the investment strategies for this game. For instance, they explored various ways of playing the game even though they had already found an effective way of investing. An example from a male pair’s conversation: Male 1: “Do you want to keep going like this (an investment strategy they agreed for last round) or play around with other numbers?” Male 2: “Let’s try something else. We should try investing a stable $10 per day ... and then for the first 4 days ... and not invest anything on the 5th day.” Male 1: “let’s try that.” By contrast, as soon as female pairs reached mutual
agreement on how to play the game, they stuck to the investment plan until the end of
the game. Males appeared to be motivated by a desire to win as much as they could
by trying out every possibility. However, females appeared to be influenced more by
the interpersonal nature of this task than by strategic considerations. In sum, males
spent more time discussing the investment strategies for this game, while females
focused on harmonious group relations with less care of winning the game.

Our results also showed the significant pre-task treatment effects, in which
pairs had more statements of greeting, appreciation and meeting management in the
condition with no pre-task interaction than in the pre-task interaction condition. The
differences of conversation in the two pre-task treatments differed in how these
conversations began and ended. Pairs in the pre-task interaction condition
demonstrated a tendency to ignore greetings and goodbyes in their conversations,
starting and finishing their exchanges abruptly since they already knew each other
from the pre-task activity. Pairs in the condition without pre-task interaction, on the
other hand, generally opened a conversation with a greeting of some sort. For
example, one instance of a male pair’s conversation: Male 1: “Hi.” Male 2: “Hi,
lovely morning?” Male 1: “I am Matt. Beautiful morning.” When they needed to end
the conversation, they stated their appreciation to other’s contribution and said
goodbye before they leave the conversation. Another example in a female pair’s
conversation: Female 1: “Fun playing with you.” Female 2: “yeah, same here. Nice
working with you.” Female 1: “Have a great day.” This may relate to the differences
in tone between the two pre-task treatments; to formally open and close a
conversation is to be polite, a characteristic more likely to be found in real world
conversations. People like to express their politeness when they communicate with strangers in order to have a smooth conversation. It is also true that exchanging personal information or stating facts are often used as a relational strategy to initiate conversation and build personal relationships when communicators are strangers who have never met before.

Our analyses on the percentage of each code during the conversation indicated that the statements of relationship, appreciation and emoticon only counted for a small percentage of conversation. However, those statements had important social impacts on facilitating collaborative behaviors among remote communicators (Soller, 2001).
CHAPTER 8: CONCLUSION

This study highlights a number of primary findings that improve our understanding of the effects of gender and initial social activities on trust and performance in IM. First, gender influenced expectations and perceptions of communicators in CMC: female pairs had high levels of trust and more collaborative behaviors than male pairs in doing the negotiation task. Second, initial social chat prior to beginning work helped remote team members build trust in the communication. In particular, female pairs did better in both pre-task interaction conditions. Third, females’ collaborative conversational style focusing on harmonious relationships put them in a position to achieve trust in the communication.

Taken together, the results from this research provide insights to understand how gender information plays a role in trust development and whether social chats also effectively help males (who typically have lower levels of initial trust) build trust. Previous literature showed beneficial effects of pre-task social activities on trust development and group performance. The results from this study indicate that initial social chat is more effective in female dominated groups in the context of collaborating with a partner in a task when limited cues are available (gender information) through IM. The game used in this study involves a vulnerable situation where trusting each other can lead to mutual benefits. We believed that trust would play a factor and expected that female pairs would develop greater trust than male pairs.

We found that both gender and pre-task interaction affected trust development and performance, and trust as a variable had direct effects on group cooperation and
performance, in which that all pairs had higher level of trust and better total investment payoff in the pre-task interaction condition than in the condition with no pre-task interaction. The higher levels of trust achieved by female pairs lead to their more cooperative behaviors than male pairs. In addition, the communication process analyses revealed different communication styles for female and male pairs, and provided detailed information regarding their negotiation activities. Compared to male pairs, female pairs used more statements of appreciation and fairness, and they were more concerned with their partners and group payoff in the negotiation.

As stated earlier, CMC researchers have made significant efforts to understand how virtual group members develop trust in the context where they never see each other before and they do not share physical space and local context. Previous studies have explored trust behaviors that are associated with group productivity (Iacono and Weisband, 1997; Weisband and Atwater, 1999). However, these studies do not connect all the elements for a complete view of trust perceptions, behaviors and performance. In addition, fewer have investigated communication behaviors in virtual group settings in order to evaluate trust impact. This empirical research provides interconnections among remote trust development, performance outcomes in computer-mediated groups and group communication behaviors.

**Implications**

There are several important implications from this work. Theoretically, this research offers contributions to our understanding of the role of gender and initial social activities on trust, performance and behaviors, as well as communication processes. Although previous studies showed the importance of prior acquaintance
and personal information on trust and cooperation (Rocco, 1998; Zheng, et al., 2002), with detailed quantitative and qualitative analyses, our results provide additional insights on the impacts of both gender and initial social chat on trust and cooperation in more complex ways. It showed that female pairs build higher levels of trust and behave more collaboratively both with and without initial social chats conditions. In organizational settings, it is often the case that temporary teams are formed around a common task within a certain period. Such teams consist of members with diverse skills, with a limited history of working together, and with little prospect of working together again in the future. The tight deadlines leave little time for relationship building for remote team members. Because the time pressure hinders the ability for team members to develop expectations of others based on first hand information, members import expectations of trust from other settings with which they are familiar. The low trust and cooperation of males, as shown in this research, may interfere with their ability to collaborate effectively on work tasks, especially with limited time in temporary teams. How to improve males’ low levels of trust still remains a question. Future studies may focus on seeking other methods, such as increasing the pre-task interaction time frame or using other communication media.

Second, this research provides practical implications in understanding IM as a daily communication tool in work environments. The value of IM and similar systems has been recognized by more and more organizations, and IM is frequently used as an effective medium for remote communication among virtual teams. In such chat communications it is often the case that collaborators in the communication start the task immediately and tend to follow the rule “time is everything.” But to establish
trust among remote workers using the text chat medium, initial social chat prior to beginning work appears to help them build trust in the communication. In particular, female dominated work groups benefit more from initial social chat to build trust than do male groups.

Today, there are many employees in companies and institutions whose work heavily depends on effective remote communication. These include geographically dispersed virtual teams doing software development, business marketing, or customer service. In computer-mediated virtual environments, gender influences expectations and perceptions of communicators. Male pairs tend to be more aggressive, decisive and competitive than female pairs, and they perceive lower levels of interpersonal trust and less cooperative behaviors. The results from this research imply that when managers assign groups to perform tasks, they need to consider the gender composition of the groups. Including females in remote work teams might help constrain the males' over-competitiveness and achieve higher levels of trust and better cooperation, ultimately leading to higher information sharing and collaboration. In addition, since the additional communication time needed by males in trust building is inefficient and deleterious to work productivity, including females in virtual teams might increase the work efficiency due to the facts that females tend to post short messages in an online setting and are more likely to apologize and express support of others.

Third, the qualitative analysis provides more detailed data to explain the results of our quantitative analyses, especially with respect to trust. The higher levels of trust perceived by female pairs in IM may be partly due to the conversational styles
they used. It appears that female pairs tried to create a smooth relationship by considering both parties’ benefit and reinforcing that with language expressing mutual respect and appreciation of others’ efforts. On the other hand, male pairs showed lower sensitivity to group harmony in the competitive negotiation context. This may have influenced male pairs’ lower levels of trust. Today, a critical skill for managers is to become aware of the power of linguistic style and to make sure they understand the voices of all their employees. Indeed, as the workplace becomes more diverse in terms of gender and culture, leaders of virtual teams will need to become even better at interacting with diverse team members and more flexible in adjusting their own styles to different group compositions.

Fourth, the results have implications for the design community regarding emoticon usage in system design. The existing mechanisms for representing affect in IM environments, such as smileys and emoticons, help in representing a feeling or a reaction to a given issue that occurred during the discussion. The findings from this research and a few previous studies suggest that the appropriate use of emoticons encourages exchange of emotions and facilitates ease of understanding of the message content. Previous research on affective IM has largely focused on conversations between pairs of users. Research on emoticon usage is new in the education field. The issues of supporting chat rooms or discussion boards with three or more users need further research attention. The emoticon usage patterns discussed in this study will benefit designers developing design criteria for creating usable and useful chat systems.
Future Work

Because of limited resources, we were unable to recruit enough participants to form mixed gender pairs. In the future, we will collect data from heterogeneous male/female gender pairs to determine whether females continue to maintain trust in collaboration in a mixed setting with and without pre-task social activity. In addition, it is also very interesting to examine the performance of mixed gender pairs. Several previous studies have shown the importance of gender diversity in achieving better group performance (Sun, et al., 2007; Wood, 1987). In those studies, mixed gender groups tended to perform better than same gender groups because of gender differences in group behavior–men tend to offer many opinions and suggestions during group tasks, whereas women tend to moderate excessive behaviors through friendly and agreeable social acts. Wood (1987) argued that it is the combination of these differences in interactive style that contribute to the superior performance of mixed-gender groups.

Group size is another important factor worth further research. Previous research has investigated the effects of gender composition on social presence, decision process satisfaction, and performance outcomes in a face-to-face setting (Wong, et al., 2004;; Rogelberg and Rumery, 1996). One study (Wong, et al, 2004) revealed that three-member groups including females perceived higher social presence than male-only groups. There was also a positive relationship between groups’ perceived degree of social presence and their decision process satisfaction as well as their group performance. In another empirical study, Rogelberg and Rumery (1996) examined the impact of five gender compositions of four-person teams (all-
male, all-female, balanced-gender, lone-male, and lone-female) on decision quality and interpersonal cohesion. They found that teams with a lone female outperformed the all-male teams on a decision task, due to the fact that individuals in lone-female teams were more sensitive to the need of coordinating and integrating different viewpoints. In addition, the lone female played a role of constraining the males' over-competitiveness, leading to more effective teamwork. Although those earlier studies suggest superior performance of mixed-gender groups, it still remains unknown how different gender composition groups behave and build trust in online settings. Might our results have been different with groups larger than two? What factors are critical to facilitate trust and cooperation in more complex settings?

Another topic for future research is to investigate different technologies that may foster trust. Previous studies showed that more interactive technologies (phone-based communication vs. email) engender higher trust perception (Rocco et al., 2001). There are many kinds of video, and many kinds of communication media that might be interesting and relevant. Given such a wide availability of communication technologies, future experiments should test hypotheses about the following issues. How does media richness interact with gender on trust development? How do different mixes of face-to-face and mediated communication support trust in different gender groups? How will technology capabilities and gender interplay to empower people’s trust perception and cooperation behavior? Addressing these questions will help in the management of diverse composition virtual teams as well as in the determination of technology requirements for supporting trust in such teams.
In addition, participants in this study generally did not have prior experience of doing investments in the real world. This raises the question whether experienced students, i.e., having an educational background in finance and business or having auction or investment experience, still behave and build trust in the ways that have been found in this study. For example, meta-analysis has revealed that the gender differences in investment behavior may be related to investment knowledge (Croson and Gneezy, 2005). When comparing decision-making characteristics of males and females in a “non-managerial” population with those of a “managerial” population, the managerial sub-population males and females display similar risk propensity and make decisions of equal quality. However, in the non-managerial sub-population females are more risk averse than males (Croson and Gneezy, 2005). Thus, it would be very interesting to investigate whether females in financial and business fields still maintain higher trust and better cooperation or whether they behave competitively and have low trust just like males.

Finally, gender differences in trust behavior may vary by culture. The way people think and behave is also governed by a set of values—culture, which is a significant social factor influencing interpersonal trust building in remote collaboration. Given the large differences between individualistic Western culture and high-context Eastern culture, it is very likely that a gender-culture interaction in different countries will emerge. Future research should consider culture and gender interaction issues on trust perception and task performance.
LIST OF REFERENCES


Appendix A

Participant Background Questionnaire

Please make checkmarks for the appropriate answer or fill in the blanks.

1. Are you?  ____Female  ____Male

2. Are you?  ____Caucasian  ____Black not Hispanic  ____Hispanic or Latino  
____Pacific Islander  ____Native American or Alaskan  
____Asian  ____Other

3. What is your age?  ____years

4. What is your status?  ____Undergraduate  ____Graduate

5. What is your current major (or department)?  ________________

6. What is your hometown (where you learned your first language)?

____________________

7. How frequently have you used Instant Messenger (check one)?
   (a)  ____Never
   (b)  ____Once or twice
   (c)  ____A few times
   (d)  ____Regular user
   (e)  ____Heavy user

8. For the following Instant Messenger applications, please give the order in terms of your use frequency
   ____AOL Messenger
   ____MSN Messenger
   ____YAHOO Messenger
   ____Other Applications, such as _____
Appendix B

Post Experiment Questionnaire

Part 1: We are interested in how your pair approached the task. Please indicate the degree to which each statement applies to you or your pair. Indicate your choice by circling the appropriate number: the larger the number, the more you agree with the statement. There are no right or wrong answers. Work quickly - just record your first impressions.

1. In the task, I suggested how we could work together.

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<td>Strongly Disagree</td>
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<td>Slightly Agree</td>
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2. When we disagreed, I tried to suggest things that we could agree on.

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<td>Strongly Disagree</td>
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3. How much are you satisfied with the group’s outcome to this task?

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<td>Strongly Unsatisfied</td>
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<td>Slightly Satisfied</td>
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4. How much are you satisfied with your own outcome of this task?

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<td>Strongly Unsatisfied</td>
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Part 2: Please evaluate the following statements for the other person in the experiment.

5. S/He kept information from me.

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6. S/He cared about my profit during the task.

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<td>Strongly Disagree</td>
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<td>Slightly Agree</td>
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7. I felt comfortable sharing my feelings and ideas about the task with him/her.

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<td>Agree</td>
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8. I was trying to establish a good relationship with him/her during the task.

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<td>Neutral</td>
<td>Slightly Agree</td>
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9. I could not rely on him/her to do what I expected.

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<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Slightly Disagree</td>
<td>Neutral</td>
<td>Slightly Agree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

10. S/He was a contributor to our final outcome.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Slightly Disagree</td>
<td>Neutral</td>
<td>Slightly Agree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

11. S/He was competent in performing the task.

<table>
<thead>
<tr>
<th>1</th>
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<th>5</th>
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<td>Slightly Agree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

12. S/He could not determine if there was a best solution to this task.

<table>
<thead>
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</tr>
</tbody>
</table>
Part 3: Following statements are to evaluate how useful the technology is to your pair’s task.

13. I felt that I could communicate with the other participant as naturally as I do in the daily life.

14. The Instant Messaging system got in the way of my being able to communicate.

15. What factors helped you establish the trust with the other person?

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

16. What factors made you feel closer to the other person?

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
Appendix C

Task Instruction

Instructions for playing DayTrader

In this game, you are a day trader at a small investment brokerage. You and another trader have recently found out about a great investment opportunity where you can sometimes double your investments overnight. Your payoff will be partly determined by whether you decide to cooperate with the other trader or compete with him/her for bonuses, and how honest you are with each other.

Investment options and payoffs
1. You can invest a maximum of $40 dollars each day, no matter how much you have made on previous days.
2. If you Keep your money, you can make a guaranteed payoff equal to your keep amount.
3. If you Contribute to a group investment with the other trader you might make 2x your investment, however, you also may be exploited by the other trader and make less money. This is how the group investment works:
   Every day the brokerage takes contributions from both traders and invests these contributions in a block. This investment pays on average 2 times of the contribution overnight, depending on the market. Because of the fluctuation of the market, your final group contribution will be different than the actual total group contribution, with a margin of +$10 to –$10. However, the brokerage does not record how much you contributed to the group fund; instead, the earnings are divided equally between both investors. This means that an investor who contributed only $1 would get the same return from the group as an investor who contributed $40 (plus, the first would get another $39 from individual investment). So, using the group investment usually requires some sort of agreement, plus a high degree of trust between investors. You should not put any money into the group investment unless you believe that the other trader in the game will also be putting some of his/her money into it.
   
   Note on figuring out how much the other player contributed. You will not be able to find out exactly how much the other player contributed for each round because of the market fluctuation. You can only see your contribution from each investment, and the total group payoff. (You will, however, be able to have a reasonable range of guess, since the market fluctuation is strictly between -$10 and +$10.) If you are paid less, it might be that the other trader has
taken advantage of your contribution, or it might simply be the result of a bad market. And there might be a good chance that the other trader has contributed less even though the group contribution is within the market fluctuation range.

**Weekly bonuses.** When the economy is good, the brokerage gives out a weekly bonus of $200 to whichever trader made the most on their investments that week (only the current week counts toward the bonus). This substantial bonus will be split two ways if there is a tie. However, if one trader is even slightly ahead of the others, say, by $1, they get the entire bonus. But if the economy is bad, neither of you will get any bonus. So if you don’t get any bonus at the end of 5 rounds, it might be either that the other trader has taken advantage of you or that the economy was bad for that 5 rounds. Note that the economy status for weekly bonuses is not related in any way with the market status for each week, which determines your group payoff.

**Discussions with the other trader.** You have the opportunity to communicate with the other trader at the end of the trading week (at the end of every 5 rounds), via Instant Messaging. Some groups use this time to make agreements about how much they will contribute to the group investment, but this is not required. Discussions will end whenever the group decides it is ready to go on.

**Your goal.** Your goal in this game is to earn as much money as you can during the course of the game, which is 30 rounds. Please note that all the dollars ($) showing in this document or in the game are fictitious.
How to play

You will start out on the investment screen, shown on the right. You will know the game has started when the group status bar says Investing. While you are deciding how much to invest, you can look at what you gave and what your payoffs were in previous rounds.

When you decide how much you want to contribute to the group investment, enter this number (0-40) in the box on the lower left. Whatever you do not contribute is automatically put into your individual investment fund ('Keep' field on the lower right.) Your investments are recorded when you click the 'Make Investments' button. You have four minutes to decide on an investment in the first round, and two minutes to decide each round after that.

The history table shows you how much you contributed, and how much your payoffs were from the previous round.

The weekly bonus will be added to the winner after that week (5 rounds). If you don’t get any bonus after 5 rounds, that means either that the other trader has better payoff in this week and has got the bonus, or the economy of that week is bad and neither of you got any bonus.
After you finish investing, you will either go to the next round, or, if the other trader is still deciding on his/her investment, you will be moved to a waiting screen. (Shown at the right.) At the waiting screen you can examine the game history and use the analysis tool.

The next round will start when both traders have invested. **You will NOT be automatically moved to the next investing screen** so make sure to watch the Group Status bar. When the Group Status changes from 'Investing' to 'Round Complete' then you can start the next round by pressing the 'Next round' button.
Every five rounds there is a discussion round, where you have the opportunity to communicate with the other trader in the game via IM system. You will know it is time for a discussion round when, after you make your investment, you see the screen on the right.

The Discussion screen shows the results of the last round of play, and also shows you whether you earned a share of the weekly bonus.

Your bonus pay also tells you how you did in comparison to the other trader over the last five rounds.

200 means you got the entire bonus, because you were the top money-earner for that week.

100 means you split the bonus with the other trader.

0 means either the other trader got a bonus, but you did not or neither of you got the bonus.

During discussion you can talk about any aspect of the game with the other trader. Some groups use this time to make agreements about how much they will contribute to the group investment, but this is not required. You have up to 5 minutes for each discussion session.
Analysis tool
You can use the analysis tool to see what your payoff would be based on hypothetical investments by yourself and the other trader. The numbers you put in this tool have no effect on the game, and cannot be seen by the other trader; it is only for your use. Enter a hypothetical contribution for yourself and of the other trader to calculate what your payoff would be. The analysis tool doesn’t involve the effect of the random factor.

The calculation tool tells you how much you would get back on a particular round, and also how you did in comparison with the other trader in competition for the bonus.

You can use the analysis tool at any time.