

Potential Antecedents to Trust in Ad Hoc Emergency Response Virtual Teams

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ABSTRACT

This research explores the potential determinants of trust in newly formed virtual teams to better inform the choice of communication media for virtual emergency response groups for which interpersonal trust is crucial. Results of a laboratory experiment indicate that the way that communicants view their teammates and themselves as part of that team is significantly correlated with the level of trust that they experience. Impression formation, public self-awareness, perceived social presence, and self-disclosure are all found to have significant correlations with trust among ad hoc teammates. It is therefore recommended that the design of emergency response communication systems include features to foster these feelings thereby promoting trust among teammates. Our results are applicable to ad hoc emergency teams who interact for a period of time to address relief and recovery efforts after a major disaster or emergency.

Keywords

Trust, ad hoc virtual teams, emergency response, impression formation, self-disclosure, social presence, self-awareness.

INTRODUCTION

When disaster strikes, responsible parties must convene on short notice from wherever they happen to be or develop the capacity to operate from remote locations. Most often, this results in electronic communication being the primary mode of interaction. Given the frequently ad hoc nature of the computer-mediated groups who collaborate to make decisions after a major event, there have been calls to better understand the nature of those newly formed teams so that appropriate communication systems can be provided (Mendonca et al., 2007) and useful communication practices encouraged. Since development of trust in these ad hoc teams has been cited as one of the major challenges to communication in a post-disaster response effort (Manoj and Hubenko Baker, 2007) this study seeks to shed light on some of the potential underlying antecedents of trust in ad hoc virtual teams.

Specifically, the teams that we focus on in this study are the ones that come together after a disaster to make decisions on how to proceed in response to the emergent events. They are managers and/or experts who join together in an effort to recover from the disaster. Therefore, the object of the current research is teams of individuals who have not worked together before but who must interact continuously after a major event until circumstances return to normal. Due to the gravity of the possible situations and the typical expectations that things return to normal as quickly as possible, we expect people in the disaster recovery roles to be working with a significant level of stress and urgency. Therefore, trust among team members is a key factor in overcoming the challenging circumstances and achieving successful outcomes from their interaction. Furthermore, we focus on groups who are collaborating electronically, which has been said to impose an additional set of constraints on the interaction. Under their conditions of limited contextual information, trust could pose as an important moderator of members' behaviors and responses (Dirks and Ferrin, 2001).

Interpersonal trust has been defined as "the extent to which a person is confident in, and willing to act on the basis of, the words, actions, and decisions of another" (McAllister, 1995). In a team of dispersed individuals who are collaborating under stressful circumstances, this means that trust facilitates the motivation for individuals to join

efforts and work well together, thereby enhancing the effectiveness of the team (Dirks, 1999). Therefore, in emergency response virtual teams where time is often of the essence and good decisions are crucial, the importance of a communication system and communication practices that can foster high levels of trust is intensified. Furthermore, since ad hoc groups who come together to solve problems resulting from emergency situations are often composed of individuals who have not worked together before, it is important that the communication system and protocol in use be conducive to the development of trust among team members easily and quickly.

Much discussion has transpired regarding features of, and innovations in, emergency response systems such as those that afford optimum coordination (Yuan and Detlor, 2005), flexibility (Turoff, 2002), effective and efficient information dissemination (Jaeger et al., 2007, Aldunate et al., 2006), and information quality (Turoff et al., 2004). However, few researchers have delved into the human aspect of emergency response teams and systems. As an exception, Carver & Turoff (2007) present the role of humans as collaborators with the emergency response system. Still, what has not been addressed is the role of the computer as a facilitator of collaborative communication among humans. Thus, it is instrumental to examine the nature of emergency response groups of people in their interactions with one another via computer-mediation to better inform their development of trust.

RESEARCH QUESTION

The principal purpose of this research study is to examine the factors that are correlated with trust development within ad hoc virtual teams. The underlying research question of this study is which interaction experiences and perceptions of self and others in ad hoc virtual teams are potentially beneficial toward trust development? Insight in this area will be instructive in the design of emergency response communication systems and in the development of communication protocols in ad hoc emergency response virtual teams.

HYPOTHESES DEVELOPMENT

Our review of the literature on newly formed virtual teams and trust produced a set of four factors that are theoretically related to trust and could potentially influence its development among team members. The factors are divided into two major categories: self-reports of interaction experiences and perceptions of self and other team members. Each of these factors is in turn conceptualized in two main factors: self-disclosure and impression formation in interaction experiences and self-awareness and perceived social presence in perceptions of self and others. If these interaction experiences (self-disclosure and impression formation) are proven to be related to trust they can be monitored and encouraged, as this could potentially be an indication that they contribute to trust. Similarly, the perceptions of self and others (self-awareness and perceived social presence) can be embedded within the communication system if shown to be correlated with, or perhaps ultimately instrumental in trust development.

Self-Disclosure

Closely linked with trust (Wheless and Grotz, 1977), disclosure of personal information (self-disclosure) is one of the interaction experiences that we examine within ad hoc virtual teams. In the psychology literature, self-disclosure has been shown to promote reciprocal trust (Miller, 2002, Turner et al., 2007). Because people feel trusted when they are disclosed to, they trust and disclose in kind, causing an escalation in mutual trust. This phenomenon has been studied within computer-mediated relationships with similar results. In online relationships, self-disclosure has proven to display a positive association with trust among Americans (Yum and Hara, 2006) and has been described as one of the foundations of trust in online friendships (Henderson and Gilding, 2004).

In fact, computer-mediation seems to be an ideal forum for self-disclosure. Foreshadowed by studies that indicate people disclosing personal information more readily in a computer-based medium (Kiesler and Sproull, 1986, Sussman and Sproull, 1999, Weisband and Kiesler, 1996) and the suggestion that users are more likely to feel the freedom to self-disclose to one another using computers (Weisband and Reinig, 1995), particularly those that hide identities (Matheson and Zanna, 1992), some studies attest to the fact that the use of computer-mediated communication fosters an increased level of self-disclosure over telephone and face-to-face communication (Tidwell and Walther, 2002, Joinson, 2001). This phenomenon is attributed to “reduced evaluation anxiety, feelings of safety or invulnerability, and less concern with looking good,” (Weisband and Kiesler, 1996, p. 4).

In this light, we expect to find a sizeable amount of self-disclosure occurring within ad hoc virtual teams which in turn will positively contribute to trust development among the teams. We therefore predict that,

H1. Self-disclosure will be significantly positively correlated with the level of trust within ad hoc virtual teams.

Impression Formation

Another interaction experience that is common in ad hoc teams is impression formation, where the impressions formed by the appearances and communication behaviors of team members during the course of a project prove to be crucial to the development of trust. In fact, impression formation has been acknowledged as a cornerstone of social cognitive processes (Walther, 1993, Tidwell and Walther, 2002, Jacobson, 1999) – “thought focused on human interaction” (Rolloff and Berger, 1982), such as developing trust.

In teams that communicate electronically, impression formation plays an especially important role. Given the amount and type of information that is often absent in virtual communications (i.e. appearance, age, gender, voice, intonations, hesitations, etc.) (Sproull and Kiesler, 1986), communicants are forced to make assumptions based on the limited information that they have (Walther, 1997). Therefore, in computer-mediated communication, reduced non-verbal cues have caused virtual communicants’ impressions of one another to become exaggerated. Categorical information processing, overattributions on minimal social cues, and idealization of the communication partners in computer-mediated communication groups are common (Walther, 1997) because of the impressions that people build in the absence of individuating cues about others (Lea and Spears, 1992).

Lea and Spears’ (1992) SIDE (Social Identification/Deindividuation Effect) Theory posits that people tend to categorize themselves as either similar or dissimilar to the team based on these impressions. In fact, according to Walther’s hyperpersonal model (Walther, 1997), as described by (Jarvenpaa et al., 1998), idealization of communication partners is a common occurrence because group members tend to “assume similarity and tend to reveal factors and cues about themselves that only reinforce this similarity,” (pg. 32-33). These feelings of similarity with others then contribute to their willingness to cooperate and trust (Jarvenpaa and Leidner, 1999). Given this background it is appropriate to expect that:

H2. Impression formation will be significantly positively correlated with the level of trust within ad hoc virtual teams.

In addition to the above interaction experiences, members of ad hoc virtual teams are subject to certain perceptions of themselves and their teammates due to the nature of the communication medium and the transient history of the team. Following, we explore some of the perceptions that are common when ad hoc teams communicate electronically.

Self-Awareness

It has been shown that when using computer-mediation, communicants focus more on themselves than on others (Sproull and Kiesler, 1986) and overestimate their own contribution to decision tasks (Weisband and Atwater, 1999). Kiesler et al. (1984) have noted that computer-mediated communication seems to comprise among its conditions “reduced self-awareness”. Still, others have observed that computer-mediated communication made users much more self-aware (Matheson and Zanna, 1988, Pinsonneault and Heppel, 1998). Actually, two types of self-awareness have been identified, defined, and said to be impacted by computer-mediation.

Private self-awareness is “a focus on personal aspects of oneself, like perceptions, thoughts, and feelings” (Pinsonneault and Heppel, 1998). Often electronic communication takes place anonymously. Even when it doesn’t, communicants commonly work under physical isolation (Spears and Lea, 1994). Both of these conditions contribute to an increased focus on one’s own thoughts and feelings – heightening private self-awareness. On the other hand, in computer-mediated communication, the inability to identify the originator of the messages, and the corresponding freedom to create messages that can be posted without personal identification, has been linked to lower *public self-awareness* (attention to oneself as a social object) (Pinsonneault and Heppel, 1998). Even when communicants are not anonymous, the nature of computer mediation is such that social and context cues are attenuated, causing an inherent distance among communicants. Thus, they are not focused on their outward appearance and consequently don’t seek to build a relationship with their teammates.

Given this background it follows that due to increased private self-awareness and decreased public self-awareness, computer-mediated virtual team members are likely more inwardly directed than focused on building a relationship with their teammates. Consequently, levels of public and private self-awareness that exist among emergency response virtual teams will impact the team’s ability to successfully address the decisions at hand albeit in opposite directions. Hence it is appropriate to predict the following:

H3a. Public self-awareness will be significantly positively correlated with the level of trust within ad hoc virtual teams.

H3b. Private self-awareness will be significantly negatively correlated with the level of trust within ad hoc virtual teams.

Perceived Social Presence

The outcomes of electronic ad hoc team collaboration will also be affected by means of a related perception, the feeling of social presence that is felt by the users of the system – or perceived social presence. Perceived social presence is the feeling that the people communicating are psychologically perceived to be physically collocated (Daft and Lengel, 1986, Rice, 1987, Short et al., 1976). Traditionally, systems that have more communication cues are said to encourage more perceived social presence. For example, when a system imposes greater delays between messages and their responses, it is considered to have less immediacy of feedback which contributes to the perception of low social presence (Burke and Chidambaram, 1999).

Most research that has been done regarding the impact of social presence on trust is in the context of human-computer interaction. Specifically, researchers seek to decrease uncertainty in online transactions where there is very little interpersonal interaction (Gefen and Straub, 2004). Therefore, increasing the levels of social presence on Web sites and other online interactions has been a major focus (de Vries, 2006). More so in collaborative contexts, where there is interpersonal interaction, increased perceived social presence changes the way virtual communicants view themselves in relation to their teammates thereby affecting the level of trust between them. In fact, social presence has been investigated as a vehicle to enhance trust between individuals, finding some positive correlations (Bente et al., 2004).

As a result, we expect that,

H4. Perceived social presence will be significantly positively correlated with the level of trust within ad hoc virtual teams.

Figure 1 provides a summary of the above hypotheses. The following empirical investigation of these hypotheses will inform us as to the desirability of the above behaviors and perceptions among ad hoc virtual teammates who make crucial decisions in emergency situations.

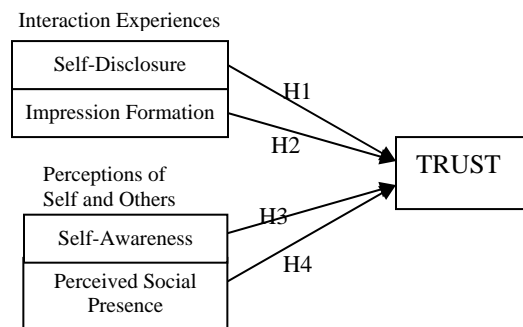


Figure 1. Summary of Hypotheses

METHODOLOGY

To achieve the goals set forth for this paper we conducted an experiment to test for a correlation between each of the proposed variables and trust in ad hoc virtual teams. Participants were recruited from the population of students at the researchers' institution using fliers and classroom announcements to elicit volunteers. All participants were offered a ten-dollar incentive for their time of about an hour. Participants were randomly organized in groups of

three members. Each group of participants worked together to solve a short case. The case presents the situation of a fictional character facing an ethical dilemma.

Since it has been noted that, “Efforts in crisis management are fundamentally ethical in nature,” (Pauchant and Mitroff, 1992) because, “their aim is to manage our organizations for their financial health, as well as for the viable health of people, communities and the natural world,” (Simon and Pauchant, 2000, p. 11), an ethical decision making task is a good vehicle for drawing conclusions applicable to emergency ad hoc virtual teams. In addition, because the chosen task was a decision making scenario for which there is no demonstrably correct solution, it is reliant upon the level of intragroup trust which is crucial in achieving ethical crisis teams (King, 2002).

Participants were asked, as a group, to use a given synchronous communication system to discuss the assigned case and produce a written recommendation for the character in the case. The software employed for this task was ICQ Pro 2003b, which allows same time textual communication (i.e. chat). After completing the task, participants were directed to an online questionnaire where they answered questions about their experience during the task. Outcomes of group work were measured in terms of trust among team members and individual perceptions of the process. Control variables captured in a pre-task questionnaire include demographics, usage of and comfort with synchronous communication, and propensity to trust. All survey items are based on 7-point Likert or semantic differential scales adapted from the literature.

DATA ANALYSIS AND RESULTS

We successfully collected 251 usable individual observations (from among 87 groups) for testing the hypotheses about the antecedent of trust. The sample has a demographic distribution similar to that of the college population that it was taken from, with 50% of each gender and a large percentage of undergraduates ages 18-24. For detailed demographic information, see the table in Appendix A.

Even though the survey items for all the variables are adapted from previously validated surveys, we conducted a principal components analysis (PCA) and calculated Cronbach’s alpha to ensure the validity and reliability of each scale for this context. In PCA, an item is considered to load onto the factor for which it has the highest factor loading value, assuming that the value is above the cutoff of .5. Our PCA resulted in usable scales for five out of the six constructs that we set out to measure. (Since private self-awareness had only one item, we used that one to measure private self-awareness in the analysis.) Each of the scales was then tested for internal consistency using Cronbach’s alpha. Only disclosure had an alpha value that was less than .7. (See Table 1.) Since the scale for disclosure was not reliable, the remainder of the analysis will include only one item as a measure of disclosure.

Factor Number	Scale Name	No. of Items	Cronbach's Alpha	Reliability
1	Impression formation	10	0.91	R
2	Trust	8	0.90	R
3	Public Self-Awareness	7	0.88	R
5	Perceived Social Presence	4	0.75	R
7	Disclosure	2	0.64	NR
Factors 8-10 included only one item. R=Reliable; NR=Not Reliable				

Table 1. Scale Reliability

Appendix B lists the items that loaded together for each of the other scales. The eight non-reversed items of the trust survey scales (trust and trustworthiness), which were adapted from Jarvenpaa et al. (1998), loaded on one factor. The scale for impression formation was composed of the ten items adapted from “Messaging-Based Stereotyping” in Sarker et al. (2003). The scale for public self-awareness consisted of all the items from the scale used by Pinsonneault and Heppel (1998). Finally, the positively worded perceived social presence items from Champness (1973), in Short et al. (1976) that loaded together comprised the scale for perceived social presence. The average of the items in each of the above scales was used as an index to measure the construct in the analysis that follows. The index means are shown in Table 2.

Index/Variable	Mean	Std Dev
Impression formation	4.37	1.05
Trust	4.69	1.11
Public Self-Awareness	3.88	1.30
Perceived Social Presence	4.20	1.19
Private Self-Awareness	5.07	1.35
Disclosure	5.46	1.27

Table 2. Index/Variable Means

Having calculated an index for each item, we then conducted a regression analysis to determine the effects of each of the identified perceptions and behaviors on trust within the experimental teams. The regression model tests the effect of all of the projected variables on trust, and uses propensity to trust and gender as controls. As summarized in Table 3 below, the results of the regression analysis indicate that the model is indeed significant at $p < .0001$. The R^2 value indicates that 22% of the variance in trust is attributed to the tested variables. In fact, as predicted, all of the variables included in the model are found to have significant impacts on the level of trust. Perceived social presence and private self-awareness contribute to the trust model at $p < .05$ while impression formation and public self-awareness are significant at $p < .001$. Disclosure is the most significant contributor to the trust model at the .1% level ($p < .0001$). Also as expected, while all of the variables indicate a positive relationship with trust, the exception is private self-awareness whose coefficient in the model is negative indicating a negative correlation with trust.

Dependent Variable: Trust				
	Coefficient	t-value	p-value	
Intercept	1.59	3.29	0.001	**
Impression formation	0.21	2.72	0.007	**
Public Self-Awareness	0.14	2.67	0.008	**
Perceived Social Presence	0.16	2.36	0.019	*
Disclosure	0.20	4.01	<.0001	***
Private Self-Awareness	-0.12	-2.35	0.019	*
Gender	0.16	1.27	0.206	
Propensity to Trust	0.06	.81	0.417	

F-Value	9.93***
Model Significance	<.0001
R^2	22%

* Significant at the 5% level; ** Significant at the 1% level; ***Significant at the .1% level

Table 3. Regression Model for Mediators on Trust

DISCUSSION

These experimental results serve to confirm that this set of interaction experiences and perceptions of self and others exists among members of newly formed virtual teams. Further, it has been empirically shown how these experiences and perceptions have a significant correlation with trust within virtual teams.

Specifically, this experiment has corroborated that the common phenomenon of forming impressions based on limited context and social cues, as well as the tendency to disclose personal information during computer-mediated communication, might have significant positive impacts on the development of trust within virtual teams. Results indicate that in the context of emergency response this knowledge could be key to the training of emergency response individuals who can benefit from the development of trust to ease the decision making process that occurs

under stressful circumstances. If so, these parties should be encouraged to engage in behaviors and use communication techniques during their virtual interactions that will encourage these experiences and perhaps increase the likelihood that a trusting interaction can ensue, fostering a smooth decision making process.

Additionally, emergency response personnel should be made aware of the fact that the perceptions of self-awareness and social presence also have significant correlations with trust formation within virtual teams. Perhaps during emergency preparedness planning, executives should choose the virtual communication methods that will capitalize on higher levels of social presence and public self-awareness, while minimizing the levels of private self-awareness so that participants in the response efforts will experience an outwardly focused meeting where they can more easily work together as a trusting whole toward rapid, high quality decisions post-emergency.

It is possible that our teams exhibited some form of “swift trust” at the beginning of the exercise. As discussed by (Jarvenpaa et al., 1998), sometimes members of temporary teams that have never worked together before and will never work together again, act as if trust is present from the start, exhibiting swift trust. This kind of trust enables team members to “deal with uncertainty, ambiguity and vulnerability while working on complex interdependent tasks with strangers in a situation of high time pressure,” (p. 56). Swift trust is a depersonalized action. In contrast, our measure of trust is the result of an initial team interaction and, as our results show, it is influenced by perceptions of others and the nature of the interaction itself. Therefore, it is neither swift nor depersonalized. Adjusting initial levels of trust as more information about team members is gathered, is important when emergency teams need to meet repeatedly after an emergency or a crisis (e.g. post Katrina relief efforts).

These findings have implications for the design of computer-mediated communication systems to support emergency response teams. For instance, the system could include features to allow members of newly formed teams to identify themselves (with pictures or avatars) and to quickly introduce themselves to the rest of the team, thus removing any layer of anonymity that may affect trust. Likewise, system features showing how members formulate their messages may reduce the level of focus on editing one’s own messages, shifting it to the salience of others in the communication. In addition, such features could influence the image that participants project onto others.

The results of this experiment are also instructive for the development of communication protocols during post-emergency response efforts. For example, based on the above results, it would be worthwhile to encourage desirable interaction experiences, by incorporating a short introduction exercise in the initial meeting of the post-emergency response team, thereby giving each team member the opportunity for self-disclosure and form the basis for impression formation.

CONCLUSION

In the event of a disaster, the ability of a newly formed team of people to operate together quickly, capably and ethically (as discussed above) from remote locations is crucial. Larkin and Arnold (2004) point out that in emergency situations, while the full spectrum of ethical dilemmas cannot be anticipated, advance moral preparation will make emergency response personnel work more effectively and efficiently. Yet even as the response team converges and begins to collaborate, “we can assume individual behaviors such as trust, respect, and honesty might encourage an ethical environment within a crisis team,” (King, 2002, p. 243). In emergency situations, time is of the essence and therefore any mechanism conducive to the development of trust would improve team outcomes.

While further investigation is necessary to determine the extent of causality, through the strong positive correlations, this study has shown that the interaction experiences and team members’ perceptions of self and others are relevant in the quest for methods of establishing initial levels of trust.

Although the generalization of the results of this study to other settings and populations should be made with caution, this analysis of the dynamics of ad hoc virtual teams engaged in decision making has the potential to bring emergency preparedness one step closer to confidence in virtual trust and cooperation in the aftermath of an emergency.

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APPENDIX A: DEMOGRAPHIC INFORMATION

Table 3. Demographic Information					
Characteristic	Percentages			Mean	Std. Dev.
Age	18-24: 86%	25-34:15%	35-44:<1%	----	----
Gender	male: 50%	female: 50%		----	----
Level	undergrad: 95%	grad: 5%		----	----
IM Comfort Level	Very comfortable: 59%	comfortable: 34%		1.51	0.69
	slightly uncomfortable: 6%	very uncomfortable: 2%			
Typing Skill	hunt and peck: 2%	rough or casual: 27%			
	good: 50%	excellent:22%			
IM Frequency	at least every day: 45%	few times/week: 29%			
	few times/month: 10%	few times/year: 5%			
	rarely: 9%	never: 1%			
Propensity to Trust (7 pt. scale)	----			4.09	0.94
IM with whom*	Friends: 96%	Family: 53%	Colleagues: 28%	----	----
	Businesses: 9%	Classmates: 65%			
* Does not add up to 100% because respondents could choose more than one response					

APPENDIX B: SURVEY ITEMSScale Items:

Based on what you experienced, please indicate the extent to which you agree or disagree with each statement. (1=Strongly Disagree; 7=Strongly Agree)

Table 5. Scale Items	
Index/Variable Name	Survey Items
Trust	<p>We had confidence in one another in this group.</p> <p>We were considerate of one another's feelings in this work group.</p> <p>Members of my workgroup showed a great deal of integrity.</p> <p>The people in my group are friendly.</p> <p>Overall, the people in my group are very trustworthy.</p> <p>I can rely on those with whom I worked in this group.</p> <p>I would be comfortable giving the other team members a task that was critical to this decision even if I could not monitor them.</p> <p>I would be comfortable giving the other team members complete responsibility for making this decision.</p>
Impression formation	<p>From the contents of posted messages, I can get an impression of my remote team members' enthusiasm about the task.</p> <p>From the contents of posted messages, I can get an impression of my remote team members' trustworthiness.</p> <p>From the tone of posted messages, I can get an impression of my remote team members' enthusiasm about the task.</p> <p>From the tone of posted messages, I can get an impression of my remote team members' trustworthiness.</p> <p>From the frequency of posted messages, I can get an impression of my remote team members' enthusiasm about the task.</p> <p>From the frequency of posted messages, I can get an impression of my remote team members' trustworthiness.</p> <p>From the speed of posted messages, I can get an impression of my remote team members' enthusiasm about the task.</p> <p>From the speed of posted messages, I can get an impression of my remote team members' trustworthiness.</p> <p>From the typing quality of posted messages, I can get an impression of my remote team members' enthusiasm about the task.</p> <p>From the typing quality of posted messages, I can get an impression of my remote team members' trustworthiness.</p>
Public Self-awareness	<p>In this experiment I have wondered about the way I've responded and presented myself in comparison to others.</p> <p>In this experiment, I have been thoughtful of how well I may get along with my discussion partner if we meet in the future.</p> <p>I was concerned about my style of doing things</p> <p>I was concerned about the way I presented myself</p> <p>I was self-conscious about the way I was identified</p> <p>I was worried about making a good impression</p> <p>I was concerned about what other people thought of me</p>
Perceived Social Presence	<p>I would be happy to use the system for a meeting in which I intended to persuade other people.</p> <p>One can easily assess the other people's reactions to what has been said.</p> <p>It provides a great sense of realism.</p> <p>It was just as though we were all in the same room.</p>
Private Self-Awareness	In this experiment I've generally been very aware of myself, my own perspective and attitudes.
Disclosure	During the discussion, my teammates and I disclosed thoughts about ourselves