Investigating Factors influencing Trust in Video-Mediated Communication

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ABSTRACT
Videoconferencing systems are increasingly used for a variety of tasks. Many of these tasks demand reliable, high quality communication support. Trust plays an important role in interpersonal communication, sometimes even as an enabler for effective communication. We present findings of an experimental study with 64 participants investigating the influence of task type and the amount of visual information available to the participants on trust and related factors. Significant effects were found for task type, view restrictions, satisfaction, social presence, and gender.

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Videoconferencing, desktop teleconferencing, collaboration

ACM Classification Keywords
H5.3. Information interfaces and presentation: Group and Organization Interfaces; H.4.3 [Information Systems Applications]: Communications Applications - Computer Conferencing, Teleconferencing, and Videoconferencing.

INTRODUCTION
For decades we have been promised to be able to communicate over virtually any distance in a way almost indistinguishable from face-to-face communication by means of videoconferencing. Many different forms of systems have been developed, ranging from early picture phones to installations with theatre dimensions. Thanks to the very fast developments in computer and internet technology, we also have videoconferencing on our desktops utilizing systems like Skype or MSN Messenger.

The advantages of using videoconferencing are obvious and convincing: it is green and clean, it saves time, it saves money, it allows for faster decision making, it allows for even more communication, it allows for an actual convergence of information and communication technology, to name the main arguments. But, do we actually use it to its full extent? Why isn't there the widespread use promised decades ago?

It is generally argued that to date teleconferencing is of bad technical quality, done over slow and unreliable lines (bandwidth), hard to use for non-experts, not generally available at the work place, requires too much effort to be used, and does not integrate digital and physical workplaces.

However, it is expected that the teleconferencing of tomorrow will be of high video and audio quality (e.g. HDTV quality), reliably fast (over advanced networks), really usable (as easy to use as the telephone), will be present in your office, and will allow for an actual convergence of information and communication. But, will these promises be the solutions to our problem of not using videoconferencing in a way it should or could be used?

While there is a substantial body of research work on private and casual use of videoconferencing, there is still much to be explored regarding the use of videoconferencing in the business side of things. About 20 years ago, Egido (1988) reviewed the hurdles to using videoconferencing as a collaborative tool. She pointed out that "it is difficult to predict the future of videoconferencing. What emerges clearly is the need for further research that explores how this technology can allow users to do business in creative and innovative ways." (p.22). Still, over two decades later, some of her findings and conclusions are still valid, even if the technology has significantly improved since then and uptake of videoconferencing technology has gained ground. While technology apparently overcame some hurdles in the private sector, e.g. bringing this technology to the desk, the business sector is still dominated by traditional, centralised, technology-driven systems, even if the technical quality improved a lot. As Egido pointed out, the difference might be the way one is using videoconferencing: either as a collaborative tool in business settings or for casual conversation alone.

As a starting point to investigate factors influencing the use and the current communication quality of videoconferencing we conducted structured interviews with subjects who would use the technology in a managerial/business context. Our main dimension of interests were (a) current travel and communication behaviour, (b) the current availability and actual use of videoconferencing technology and (c) communication and collaboration activities, regardless of the technology used. In addition we were interested in the participants' ideas on how videoconferencing technology could and should be used in the future. The interviews yielded leads in several directions that we then followed up in the

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videoconferencing literature. Specifically, we looked to explore the effect of varying the amount of visual information videoconferencing partners receive about each other on several factors: trust, performance, social presence, and satisfaction with performance and task process. The primary variable of interest in this study is trust. The importance of this factor is strongly supported by earlier work in the field (e.g. Bekkering & Shim, 2006).

Trust in Videoconferencing

What is trust? Trust can be thought of in different ways, and there are different kinds of trust. For example, we might trust a colleague not to be malicious and underhanded, but perhaps not to produce a competent report. Schoorman, Meyer, and Davies (2007) define the dimensions of trustworthiness as perceptions about an individual's ability, benevolence, and integrity. But what actually influences trust in video-mediated communication in dyadic and group situations?

To explore how users utilised and felt about video conferencing, interviews were held with three men in managerial positions who travelled very frequently for business reasons and had some experience with videoconferencing technology. One of the key points of the interviews was that they were dissatisfied with videoconferencing because it did not provide enough visual information about the people they were conferencing with. That is, they felt that being able to see each others' body language was an essential aspect of face-to-face meetings that was absent in traditional videoconferencing programs. The interviewees said that the lack of visual information made it hard to 'read' the other party, and they felt uncomfortable because of this lack of information. They also said that this was especially important in negotiation meetings, because of the mixed-motive nature of negotiations. It was indicated that it was a trust issue; it was hard to trust the other party in a negotiation, and harder still because their non-verbal cues were unavailable to be 'read.'

Availability of cues and comfort with the mediated situation is also subject of a review of 18 studies on a comparison of Computer-Mediated Communication (CMC) and Face-To-Face (FTF) communication, Bordia (1997) concluded that "[i]n general, discussions on CMC take longer, produce more ideas, and have greater equality of participation. There is reduced normative pressure and poorer comprehension of the discussion in CMC." (p. 99).

Bos et al. (2002) empirically investigated trust in different communication media and found that perceptions of trust in video and audio conferencing groups were nearly as good as in FTF and significantly better than in text chat, even if there was some evidence for slower progress in co-operation and some opportunistic behavior.
Nguyen and Canny (2007) showed that in group conferencing situations, the spatial arrangement of the conferencing environment (camera placements and visualisations within the conferencing environment) affected trust in videoconferencing. With their research they report on gaze support and awareness as main influencing factors on trust. Bekkering and Shim (2006) reported that there is a significant effect of eye-to-eye contact on trust in comparison to standard videoconferencing (off-centre video).

According to the media naturalness theory (Kock, 2004) a medium would need a richness as close as possible to, but not (artificially) richer than face-to-face communication to be able to communicate efficiently. What degree of richness does the CMC medium have to provide to allow for the "naturalness" of communication and with this to allow for a trustworthy situation between the partners?

Based on this research, it was decided to investigate the effect of expanding the view that each party receives in a traditional videoconferencing program so that they would be able to see these non-verbal cues. In doing this other research in the field that has explored ways in which videoconferencing could be made to better approximate face-to-face interaction was extended. Most traditional desk-top videoconferencing programs (e.g., Skype, NetMeeting) provide only a static head-and-shoulders view of each person to all parties involved. Now, there are videoconferencing programs that, using different methods, attempt to approximate FTF conversation (e.g. Regenbrecht et al., 2004). In our setup, we allowed participants to view the other party from the head down to the waist, with a wide enough viewing angle that would allow hand movements to also be visible. This matches the view someone would receive of another at a normal business meeting, as everyone would be seated and would only be visible from the waist up. The intention for using this particular setup was to empirically examine the effect of increased visual information, and in doing so, the amount of non-verbal cues each participant receives of their own perception and performance in videoconferencing.

Social Presence

Social presence is one other factor that may be affected by the amount of visual information about each other's partners. Social presence is a quality of the medium relating to "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationship" (Short, Williams, & Christie, 1976, p. 65), or the extent to which people in a remote conversation feel they are not-remote or 'together'. We also expect that the medium that transmitted non-verbal cues would receive higher social presence ratings than the medium that did not transmit non-verbal cues, as real-life meetings/conversations would allow for various non-verbal cues or body language to be available.

Task Type

One other point the interviewees brought up was how the lack of visual information about the other videoconferencing parties may affect different types of meetings in different ways. They suggested that videoconferencing may be more useful when participants have already been acquainted with each other and have existing relationships; one explicitly noted the link between existing relationships and a reduced need to observe nonverbal cues.

This could indicate that when there is a higher level of trust and familiarity, the need for non-verbal cues is reduced. Thus, the current lack of support for these cues (in videoconferencing) is less important in situations where all participants are familiar with each other than in situations where there is little familiarity, and in situations where participants are performing a collaborative task than in situations where participants may be engaged in a more competitive task. Several studies have shown support for task type and performance interactions.

One such study that found a significant task type and performance interaction was done by Straus and McGrath (1994). They examined performance on three different types of tasks (idea generation, intellective, and judgment) over two different communication media (FTF, and text chat remote communication). Their results showed that performance did not differ over the two types of communication media for idea generation and intellective tasks, but in the judgment task performance was better for face-to-face than for the computer-mediated medium.

In a longitudinal study of the differences in performance between FTF communication and CMC, Hollingshead, McGrath, and O'Connor (1993) also found an advantage for -to-face over computer-mediated communication for some tasks but not others. Performance was better for negotiation and intellective tasks using face-to-face communication, but did not differ between communication medium types in idea generation and decision tasks.

Lam (2001) also found a task type and performance interaction in his study, using a different task scheme than Straus and McGrath (1994), and Hollingshead et al. (1993), who both used McGrath's (1984) Group Task Circumplex, described in further detail below. Lam (2001) examined decision quality for additive, conjunctive, and disjunctive tasks in face-to-face communication and in a group decision support system (GDSS) that was developed in part by Lam himself. Additive tasks refer to those where every group member's role is similar, and results depend on the cumulative effort of the each group member. Disjunctive tasks are those that have objectively optimal solutions, and results depend on the strongest member of the group. Finally, conjunctive tasks are those where group members each have information that other group members do not, and in which group members must collaborate fully to obtain optimal results. The GDSS system allowed the participants to communicate through text messages and audio. His study found no difference in decision quality between the face-to-face mode and the GDSS mode for the additive task, but performance was significantly improved in the GDSS medium for the conjunctive and disjunctive tasks. Once again, this indicates that task type is an important factor to consider when studying GDSS and CMC, and designing the technology to support them. Knowing how different tasks may be more productive using different media would be beneficial, not least to manage and dedicate company resources so that the most appropriate venues or methods are used.

METHOD

Study Framework and Hypotheses

Based on the past research into trust, performance, and task type in videoconferencing, two different tasks were used in this study to see if task type would interact with availability of body language on perceptions and performance. This study differs from Straus and McGrath (1994), Hollingshead et al. (1993), and Lam (2001) in that we compare two different computer-mediated conditions rather than comparing a computer-mediated condition with a face-to-face condition. The reason for this is that we wanted to remove the confounding factor of experience. FTF is a communication mode that everyone inevitably has extensive experience and practice in using, whereas experience with videoconferencing or even video-enabled chat is much more limited. Furthermore, our foremost interest was in examining the effect of varying the availability of visual information of each participant in computer-mediated communication, and to see if task types would interact with these variations.

The task schema used is McGrath's (1984, cited in Straus, 1999) Group Task Circumplex. The circumplex has 4 quadrants (Generate, Execute, Negotiate, and Choose), which vary on the vertical axis in terms of how collaborative tasks are versus tasks where motives and goals may be more conflicting, and on the horizontal axis in terms of how cognitive versus how behavioural the tasks are. The vertical axis of this circumplex (addressing coordination) was empirically tested and supported by Straus (1999).

Because one end of the vertical axis is collaborative and the opposite end negotiation, motives may be more mixed in negotiation tasks than in collaborative tasks. In collaborative tasks such as idea generating tasks or intellective tasks, all meeting participants' goals are in agreement; they want the best possible answer for the group. In a judgment task, because the "right" answer cannot be decided by factual points, participants need to persuade others that their opinions are the right ones. There is even more persuasion in negotiation tasks, as there may be different 'sides' or different parties in the meeting, who may want to achieve the best or most favourable result they can obtain. As motives become more mixed, the need to accurately (or even satisfactorily) gauge other participants' reactions by observing things like body language may increase. And as this need increases, we may expect that mediums that facilitate observation of the full range of feedback, nonverbal cues, and body language will be preferred over mediums that hinder observations of this nature (such as traditional videoconferencing programs that only show the head and shoulders of each party.)

For this experiment, participants were assigned to one partner for the duration of two sessions. In each session, they performed two tasks (one idea generation task and one negotiation task) over a video/audio link in adjacent

rooms. The idea generation task required them to discuss a proposed problem and work together to generate as many solutions to the problem as possible. For the negotiation task, each participant received a list of 8 items with set payoffs (or priorities), and the partners received lists that had the opposite payoff or priority order; their task was to agree with each other on which 3 items to discard, and to achieve the highest payoff possible for themselves. In one session, they received the traditional videoconferencing view of each other (a head-and-shoulders shot/Restricted), and in another, they received a wider view that showed that partner from the head to waist (Unrestricted). After each task, they were asked to fill in a set of questionnaires: the Individualised Trust Scale, the Performance Perception Questionnaire, and the Presence Scale. The hypotheses for the experiment were as follows:

1. Participants would trust their partners more in the Creative tasks than in the Negotiation tasks.
2. In the Negotiation tasks, participants would trust each other more in the Unrestricted view than in the Restricted View.
3. The Unrestricted view would receive higher ratings of Social Presence than the Restricted view.
4. Participant satisfaction with the task process and performance would be higher in the Creative tasks than in the Negotiation tasks.
5. Participant satisfaction with the task process and performance would be higher in the Unrestricted view than in the Restricted view.
6. Performance in the Creative tasks would not significantly differ between the Unrestricted view and the Restricted view.
7. Session length in the Negotiation tasks would differ between the Unrestricted view and the Restricted view.
8. Payoff difference in the Negotiation tasks would differ between the Unrestricted view and the Restricted view.

Participants

Sixty-four students at the University of Otago were recruited for this experiment. There were 28 males and 36 females, ranging in age from 18 to 28 years old (M=19.78, SD=1.79.) 42 participated in exchange for course credit, and 22 participated in exchange for monetary payment. Those who participated for course credit were 1st and 2nd year students recruited through the department's online experimental sign-up website, and those who participated for money were students recruited through the university's Student Job Search company. It was not possible to control for participant familiarity with their partners for those who participated for course credit. However, since only 4 pairs of students who participated for course credit knew each other, those who were recruited through Student Job Search were required to be unfamiliar with their partner. The data of the 4 pairs that were previously acquainted prior to the experiment were not excluded, as the results were not significantly different from the data of the rest of the participants.

Apparatus and Materials

Two Apple e-Mac Power PC G4s were used to run the experiment. Both computers were using G4 700Mhz processors, and 1GB RAM. They were running the Mac OSX 10.4.5 platform, had display resolutions of 1152 X 864 pixels, and had screen refresh rates of 80Hz. Both computers were networked to each other. The experiment was run in two adjacent, similar rooms; each room was set up so that both rooms' monitors, desks, and chairs were at the same height. The experiment also utilised a HandyCam (handheld video camera, mounted on tripod) in each room, set up with the e-Macs in both rooms to be situated directly to the top left of the computer monitors. The cameras were directed at the participants, and set at the widest angle as to capture the participant from the waist up. The cameras were similarly positioned in both rooms; this was meant to give both participants similar views of each other. The cameras were used to transmit video and audio to the participant in the adjacent room.

The videoconference between participants was facilitated through the iChat 3.1.1 V429 software. This is a standard audio/video chat program on Apple computers. The program was set to full-screen mode on both computers, and both iChat windows had their picture-in-picture window removed through the Ecamm Conference Recorder 2.0.2 add-on for iChat (www.ecamm.com/mac/).

Tasks

Task selection was based on McGrath's (1984, as cited in Straus, 1999) Group Task Circumplex, and were selected to compare performance between tasks from different quadrants in this circumplex. One task (idea generation) was used to represent the Generate quadrant and the other (negotiation) was used to represent the Negotiate quadrant. These tasks were selected to represent opposite types of tasks in the Group Task Circumplex. Idea generation is a collaborative task in which participants all aim for the same goal, whereas negotiation is mixed-motive and one where participants are more likely to want the best for themselves. The idea generation task was based on McGrath (1993), and Straus and McGrath (1994). In this task, participants were presented with a simple scenario for which they needed to suggest and list as many solutions as possible for the scenario (for example, suggesting solutions for reducing littering around the campus area.) The negotiation task was based on Short (1967) and Suh (1999); in this task, participants were presented with a list of 8 items, and were asked to agree with each other on selecting 3 out of the 8 items to be discarded. For example, participants were told that the Psychology Department was planning a new building, but that as a result of budget cuts, 3 of the 8 planned facilities would have to be slashed considerably; their task was to agree on which 3 facilities should suffer the burden of the budget cuts. Each item had a numerical payoff indicating its value to the participant, and each participant's payoff lists were in the opposite order to that of their conversation partner's. The values of the items ranged

from 30 to 100, and this was a constant-sum task; the total loss of points from the two participants always added up to 390 points.

Questionnaires

At the beginning of the experiment, participants were asked to fill in a demographic questionnaire involving general questions about the participants (such as age and gender), and their attitudes towards and experience with computers. Examples of questionnaire items were "Have you used video communication programs, such as Skype, Netmeeting, or webcams?", "How do you feel about computers in general?", and "How do you feel about computer-mediated communication?" A set of questionnaires were administered after the completion of each task: a performance and process satisfaction questionnaire from Suh (1999) called the Performance Perception Questionnaire, a Presence Questionnaire measuring social presence and co-presence as described in Hauber et al. (2006), and a trustworthiness questionnaire (rating the trustworthiness of their conversation partner) as described in Wheeless and Grotz (1997) called the Individualised Trust Scale. For each item on these 3 questionnaires, a 7-point Likert scale ("1" represented "disagree" and "7" represented "agree") was used to record responses. Participants placed a mark on the scale corresponding with how much they agreed or disagreed with the item.

Experimental Design

There were two manipulated variables: task type and amount of visual information. Task type was a within-subject variable and had two levels: an idea generation task, and a negotiation task. Amount of visual information was also a within-subject variable and had two levels: minimum visual information about one's partner (head-and-shoulders view or Restricted View), and maximum visual information about one's partner (Unrestricted View from head to waist). This experiment had a 2x2-design.

Both variables were counterbalanced, so that some participants received the idea generation task first and the negotiation task second, and some would receive the tasks in the opposite order, in each session. Participants also received the Unrestricted and Restricted views of their partner a counterbalanced session order.

Procedure

At the beginning of the experiment, both participants signed consent forms and filled in the demographic questionnaire. They were then informed of their first task (either negotiation or idea generation) and were given instructions verbally as well as on a sheet of paper that had the full details of the scenario and instructions, and told that they had a time limit of 15 minutes to complete the task. For the idea generation task, they were told that the task was like a brainstorming session, where they were to generate as many solutions as possible for the scenario presented. For the negotiation task, they were told that they had two goals: to agree with each other on which 3 of the 8 items to discard, and to maximise their own payoff. They were each provided with a printed list of the 8 items, and a pencil to write with and to check off items. Each participant's list had the opposite order of priorities as their partner's (i.e., they had opposite payoff scales and priorities.)

Participants were each moved into an experimental booth and the task began once the cameras were started and both booths were shut. After participants had completed the task, they exited the booths and completed the satisfaction, social presence, and trust questionnaires. They were informed that they should complete the questionnaire in relation to the task they had just completed.

Once they had completed all the questionnaires, they were given instructions for their second task (either negotiation or idea generation), and informed that they again had 15 minutes to complete the task.

After participants had completed the second task and completed the questionnaires a second time (again told that they should complete the questionnaires in relation to the task they had just completed), both participants selected a time and date for their second session together.

In the second session, the procedure was repeated with these changes: they did not have to fill in the consent forms and demographic questionnaire, they experienced a different view of their conversation partner than they did in the first session (i.e., if they had experienced the Unrestricted view in the first session, they experienced the Restricted view in the second session), and the experiment ended after the completion of the second set of questionnaires for that session. Participants were then debriefed about the purpose of the experiment, and dismissed.

RESULTS

Participant responses on the Likert scales were recorded for the Individualised Trust Scale, the Presence Questionnaire, and the Performance Perception Questionnaire. Some items (#2 on the Presence Questionnaire, and #6, #8, and #9 on the Performance Perception Questionnaire) were reverse-scored to make the direction of the ratings consistent. On the Individualised Trust Scale, a higher number response would indicate more distrust of the participant's partner, and a lower response would indicate less distrust of the participant's partner. For the Presence Questionnaire and the Performance Perception Questionnaire, higher responses would indicate better social presence and better performance satisfaction respectively. Means of each participant's scores on the Individualised Trust Scale were averaged across all participants, for each of the 4 conditions: Creative Restricted, Creative Unrestricted, Negotiation Restricted, and Negotiation Unrestricted. This was repeated for the Presence Questionnaire and Performance Perception Questionnaire after reverse-scoring.

To measure performance in the Creative tasks, the number of ideas generated by each pair of participants was recorded and averaged across all pairs for the Full and Restricted views. Performance in the Negotiation tasks were measured in two ways: the session length (or time it took the participants to agree with their partners on

a resolution) and the difference in payoff between the participants of each pair. These were averaged across all pairs for the Unrestricted and Restricted views.

These data are presented in Figures 1, 2, and 3 below.

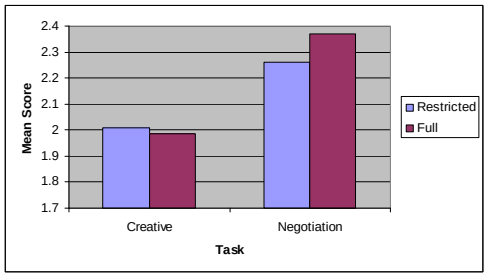

Figure 1. **Individualised Trust Scale scores for task type and amount of visual information.**

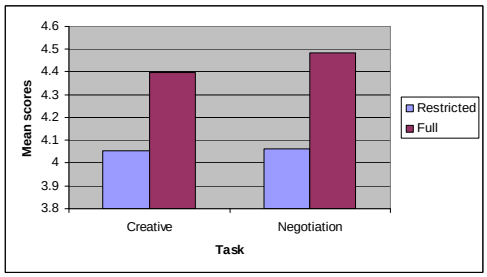

Figure 2. **Presence Scale scores for task type and amount of visual information.**

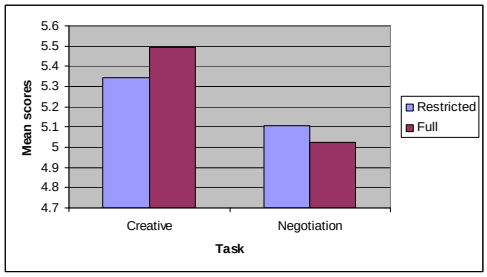

Figure 3. **Performance Perception Questionnaire scores for task type and amount of visual information.**

As shown in Figure 1, participants trusted their partners more in the Creative tasks (M=2.00, SD=0.81) than in the Negotiation tasks (M=2.32, SD=1.03), for both the Restricted and Unrestricted views. There was very little difference in trust ratings for the Creative tasks between the Restricted and Unrestricted views, but in the Negotiation tasks, participants trusted their partners slightly more in the Restricted View (M=2.26, SD=1.00) than in the Unrestricted view (M=2.37, SD=1.06). A 2x2 repeated-measures analysis of variance showed that there was a significant main effect of task, $F(1, 63) = 18.307$, $p < .001$. There was also a marginally significant interaction between the task and view factors, $F(1, 63) = 3.604$, $p = .06$. There was no significant main effect of view, $F(1, 63) = .567$, $p > .05$.

Figure 2 showed that in both the Creative and Negotiation tasks, participants gave higher social presence ratings in the Unrestricted view (M=4.44, SD=0.78) than in the Restricted View (M=4.06, SD=0.90). The ANOVA showed that there was a significant main effect of view, $F(1, 63) = 21.418$, $p < .001$. There was no significant main effect for task, $F(1, 63) = .768$, $p > .05$. There was also no significant interaction between the task and view factors, $F(1, 63) = .534$, $p > .05$.

Figure 3 showed that in both the Restricted and Limited Views, participants had higher performance satisfaction in the Creative tasks (M=5.42, SD=0.79) than in the Negotiation tasks (M=5.06, SD=1.03). In the Creative task, participants were more satisfied when they were using the Unrestricted view (M=5.49, SD=0.76) than when they were using the Restricted View (M=5.34, SD=0.81). In the Negotiation task, this pattern was reversed; participants were more satisfied when they were using the Restricted View (M=5.10, SD=1.03) than when they were using the Unrestricted view (M=5.03, SD=1.04). The ANOVA showed that there was a significant main effect of task, $F(1, 63) = 11.640$, $p = .001$. There was no significant main effect of view, $F(1, 63) = .226$, $p > .05$. There was also no significant interaction between the task and view factors, $F(1, 63) = 1.796$, $p > .05$.

On average, participants came up with slightly more ideas in the Unrestricted view (M=7.56, SD=2.27) than in the Restricted View (M=7.47, SD=2.41). A t-test showed that this difference was not significant, $t(31) = -.220$, $p > .05$.

There was a slightly higher payoff difference between participants when using the Restricted View (M=32.50, SD=27.71) than when using the Unrestricted view (M=31.88, SD=29.78). This difference was not significant, $t(31)=.158$, $p > .05$. Comparisons of payoff differences between the first session and second session showed no significant order effect.

On average, participants took longer (in minutes) to reach a resolution to the Negotiation tasks in the Unrestricted view (M=6.82, SD=3.41) than in the Restricted View (M=6.13, SD=3.05). A t-test showed that the difference was not significant, $t(31) = -.831$, $p > .05$. However, when session times were compared between the participants' first Negotiation session and the second Negotiation session (regardless of view condition), an order effect emerged. Participants took significantly longer to reach a resolution to the Negotiation task in their first session (M=7.88, SD=3.00) than in their second session (M=5.08, SD=2.85), $t(31)=4.19$, $p < .01$.

DISCUSSION

Hypothesis 1 and 2: The findings showed that, consistent with Hypothesis 1, participants trusted their partners significantly more in the Creative tasks than in the Negotiation tasks, regardless of the view condition. However, in the Negotiation tasks, participants trusted their partners more in the Restricted View than in the Unrestricted View, which is the opposite of our prediction. There was a significant interaction for trust between the view and task factors, which suggests that task type does mediate the relationship between the amount of visual information available and trust.

Interestingly, in the Negotiation tasks, participants trusted each other significantly *less* when they had more visual information about their partners than when they had less visual information. As discussed earlier, the interviewees felt strongly about needing non-verbal cues in meetings; that the lack of such was a large drawback to conventional videoconferencing, and that this was particularly important for negotiation meetings because of their mixed-motive nature. It was reasoned that with few non-verbal cues, 'reading' one's partner would be difficult and their trustworthiness hard to ascertain; thus, being able to see their partner's non-verbal cues should make it easier and the negotiation more comfortable. However, the results were contrary to this expectation.

This desire for more cues about their meeting/conversation partners and the decrease in trust when they do get this information can be reconciled. Presumably, each party in a negotiation has the objective of securing a resolution that is most to their advantage. To that end, they may be behaving uncooperatively, and cues into this behaviour may be more obvious or perceivable when body language is available. This would be consistent with the undifferentiated trust scores for the Creative task in the Unrestricted View and Restricted view conditions; since the task is collaborative, neither participant has motive to persuade their partner to accept a less profitable end or to be combative.

Hypothesis 3 and 4: Participants' satisfaction with the task process and their performance was significantly higher in Creative tasks than in Negotiation tasks, regardless of view condition. This result supports Hypothesis 3. View had no effect on satisfaction, which is contrary to Hypothesis 4, which predicted that participants would be more satisfied with the Unrestricted view than with the Restricted view. There was no significant interaction for satisfaction between the view and task factors, but participants were more satisfied in the Creative tasks with the Unrestricted View than in the Restricted view, and this pattern was reversed for the Negotiation tasks.

This is consistent with the pattern in trust scores. So, participants trust their partners less and feel less satisfied about the Negotiation task process and outcome in the Unrestricted View, than in the Restricted view. This seems to indicate that the Unrestricted View is a poor fit for the Negotiation task, despite the apparent demand for that sort of body language/non-verbal cues to be available. Another possibility is that despite the decreased trust and satisfaction with task process and outcome, users regard having that information (to make those trust and satisfaction decisions) necessary for peace of mind.

Hypothesis 5, 6, and 7: For the Creative tasks performance was measured by the number of ideas each pair of participants generated for each task. No significant difference was found for the number of ideas generated in the Unrestricted and Restricted views. Removing all unfeasible ideas did not change the findings; this was because pairs that generated unfeasible ideas for one view were likely to generate unfeasible ideas for the other view as well. This finding supports Hypothesis 5, which predicted little difference in performance in the Creative tasks between the Unrestricted and Restricted views.

For the Negotiation tasks, performance was measured by the time it took for participants to reach a resolution (bargaining time) and by the difference in payoffs between participants and their partners (co-operation or joint profit.) There were no significant differences in session length and payoff points between the Unrestricted and Restricted views. These findings contradict Hypotheses 6 and 7, which predicted better performance for the Negotiation tasks in the Unrestricted view than in the Restricted view. However, there was a significant order effect for session length. Regardless of view condition and the order in which they received each view, participants took significantly less time to reach a resolution in their second session than in their first.

There could be several reasons for this: participants may have become more familiar and more comfortable with videoconferencing, their partners, or the tasks. It appears unlikely that increased familiarity and comfort with their partners accounted for the difference in session length, as an analysis for order effects showed no significant differences in trust scores between first session tasks and second session tasks. If the decrease in session length was due to increased familiarity with CMC/VMC or the task, the findings would be consistent with experiments that supported the theory that experience with/entrainment for CMC increased performance (Cornelius & Boos, 2003; Chidambaram, Bostrom, & Wynne, 1991; van der Kleij, Paashuis, Langefeld, & Schraagen, 2004; Hollingshead, McGrath, & O'Connor, 1993.)

Several studies have indicated that the effect of different media types on performance are mitigated by task types (Lam, 1997; Hollingshead, McGrath, & O'Connor, 1993; Rico & Cohen, 2005; Straus & McGrath, 1994.) The current study failed to support their findings; no difference in performance was found between the different task and view conditions. One possible reason for this is that despite the significant difference in the social presence of the media, they may not differ significantly in richness.

Hypothesis 8: For social presence, there was a significant increase in ratings for the Unrestricted View over the Restricted View. This is consistent with Hypothesis 3. The different tasks had no effect on social presence scores, and there was no interaction between the view and task factors. The significant increase in social presence ratings in the Unrestricted View compared to the Restricted view across both task types indicated that, as expected, social presence of media can be increased by facilitating transmission of non-verbal language and a more complete view of a person's partner. This may also help to simulate face-to-face conditions where participants in a conversation see much more of their partners than just their head and shoulders, as is common in traditional video-conferencing.

General Discussion and Future Research

The present experiment was designed to explore the effect of varying the amount of visual information

available about each user or participant on perception and performance in the videoconferencing mode of interaction. This work follows Hauber et al. (2006) in exploring not just the different media forms (face-to-face vs. videoconferencing) but also different forms of videoconferencing.

The experiment also looked at the mediating role of task type. Of the factors examined, only the performance measures did not yield significant results across either the screen view types or the task types. Social presence showed a view effect, satisfaction a task effect, and trust showed a task effect and a task-x-view interaction. For the trust measure in the creative task, as predicted, participants trusted their partners more when body language was available than when it was not. However, in the negotiation task, participants trusted their partners *less* when body language was available than when it was not, which was contrary to our predictions.

There are two possible reasons for this drop in trust. The first possibility is that, due to the competitive, mixed-motive nature of the negotiation task, people simply *expect* to see untrustworthy behaviour, and that the body language is additional information that further informs their judgments of trustworthiness. Thus they mistakenly interpret the body language they see to be cues of untrustworthiness due to their expectations. The second possibility is that again, due to the competitive, mixed-motive nature of the negotiation task, people *actually are* behaving in an untrustworthy manner. In this case, participants would accurately perceive their partners to be acting in an untrustworthy way, and the body language may actually be accurately informing their judgments. The second possibility seems more plausible at this time, as it has been shown that people are better at controlling their faces than their bodies when attempting to deceive others (Ekman & Friesen, 1974). We are currently investigating these hypotheses in an additional experiment.

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