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# VIRTUAL TRANSFER PRICE NEGOTIATIONS: UNINTENDED INTERACTIONS WITH INCENTIVE SYSTEMS

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## ABSTRACT

Despite decades of research concerning the impact of computer-mediated communication (CMC) on decision-making, the potential interaction with the organization's management control system has just recently received attention. Media naturalness theory is used to develop hypotheses concerning the interactions of communication medium with the incentive pay scheme, a ubiquitous aspect of management control systems. A laboratory experiment was used to examine the interactions between two treatments: face-to-face negotiations versus virtual (computer-mediated) negotiations and cooperative versus competitive incentive pay schemes. Buyer-seller dyads negotiated the price and quantity of the transferred goods. Results indicate that while virtual negotiations are more efficient in terms of time than face-to-face negotiations, there is not a significant interaction with the incentive pay scheme for efficiency. However, results also indicate that virtual negotiations are less effective in terms of optimal quantity (organizational profit) than face-to-face, and that there is a significant interaction with the incentive pay scheme. Virtual negotiations have the unintended consequence of reducing the effectiveness (organizational profitability) of the negotiations.

**Keywords:** Computer-mediated communication, virtual negotiations, transfer pricing, media naturalness theory.

## INTRODUCTION

Because organizations rely heavily on virtual communication, it is important to understand the interactions between virtual communication and the management control system and the effect of interactions on organizational performance. Early computer-mediated communication (CMC) research focused on design and contextual factors that could potentially impact the success of virtual communication [10, 11]. Design factors included medium, anonymity, and process structure. Contextual factors included task, group size, and member proximity. With few exceptions, the organizational environment was not included in the early research.

More recently, incentives, an omni-present element of the organizational environment, have been examined in CMC research [2, 21]. However, both theoretical and empirical researchers have focused on cooperative tasks. It is widely accepted that the type of task influences the success of CMC [10]. Here we focus on a negotiation task. Negotiation tasks are different from consensus tasks in that they have an innate motivation for self-interest and can have both competitive and cooperative aspects. Negotiations are also pervasive in organizations [20, 25].

The purpose of this study is to examine the interaction of communication medium and incentive scheme in an intra-organizational transfer price negotiation scenario. The

communication mediums examined are face-to-face and computer-mediated (virtual) and the incentive schemes are cooperative and competitive. The impacts on time to complete the negotiations (efficiency) and profit maximization (effectiveness) were examined. The results indicate that communication medium does not interact with incentive scheme for time, but does for firm profit. Virtual negotiations are more efficient in terms of the main effect of time than face-to-face negotiations, however, there is not a significant interaction with the incentive pay scheme on time. Results also indicate that virtual negotiations are less effective in terms of quantity transferred (profit) than face-to-face, and that there is a significant interaction with the incentive pay scheme. Virtual negotiations have the unintended consequence of reducing the profitability (effectiveness) of the negotiations. It is critical that organizations become aware of this interaction before they encourage the use of computer-mediated communication for negotiations.

The remainder of the paper proceeds as follows. The next section reviews the literature. The third section describes the dependent variables and presents the hypotheses. The fourth section describes the experiment. The fifth section gives the statistical results. The final section presents conclusions.

## LITERATURE REVIEW

### Communication-mediated Communication

The CMC literature draws on theories that are primarily concerned with social aspects of communication (e.g., social presence, social influence), on theories that are primarily concerned with technological aspects of communication (e.g., media richness, task-technology fit), and on theories that integrate both aspects (e.g., media naturalness). A common aspect in most of these theories is that they are concerned with the interaction between the communication medium and the task.

Social presence theory, which pre-dates CMC capability, has had a significant influence on CMC research [15]. Under social presence theory, communication is more effective when the medium used has the appropriate level of social presence for the level of interpersonal involvement necessary for the task. Social influence theory emphasizes the importance of social influence on attitudes toward the use of different communication media. However, under social influence theory, influences like peer pressure, cultural background, and mental schema may have a stronger effect on attitudes towards a medium and the actual use of a medium than characteristics of the medium itself.

Media richness theory [4, 9, 15] extends social presence theory and classifies communication media according to its ability to convey natural language, nonverbal cues, personality traits, and immediate feedback. Under media richness theory, the criterion for choosing the appropriate media for the task is based on the



need to reduce uncertainty in the communication. Face-to-face communication is the richest medium. The telephone is less rich because visual cues are not available. Most intranet- and internet-based media are near the other end of the spectrum, which is often denoted as media leanness, as opposed to richness. Task-technology fit theory [27] proposes a set of profiles composed of an internally consistent set of task contingencies and communication elements that affect performance. Like social presence theory, media richness and task-technology fit theories emphasize using the appropriate medium for the designated task [17].

The media naturalness theory, also known as the psychobiological theory [15, 16] proposes that there is a negative causal association between the "naturalness" of a computer-mediated communication medium, which is based on the similarities to face-to-face communication, and the cognitive effort required for the person using the medium. The less similar the medium is to face-to-face, the more cognitive effort that is required. This theory is integrative in that it encompasses previous theories, instead of attempting to negate them, and because it examines the *reasons* why face-to-face and CMC can lead to different outcomes. The task is an aspect of this theory, but the focus is on the cognitive effort required by the difference between 'natural' medium (face to face) and lean CMC mediums.

Empirical CMC research, as classified by Fjermestad (2004), has typically modeled communication mode (face to face versus CMC) as the primary independent variable. Other independent variables include context, group, method, process structure, task, and task support. Moderating (adaptation) and intervening variables include communication dimensions (media richness, social presence), group member perceptions of task, adaptation process (rules, resources), process gains and losses, group role. Dependent variable categories include consensus, effectiveness, efficiency, satisfaction and usability.

Thus, the CMC literature has been concerned with the interaction of the task and the medium on the performance of the task itself. A wide variety of tasks (e.g., idea generation, problem solving and consensus) and myriad aspects of the medium (e.g., synchronous, asynchronous, structured interactions, support available) have been examined. While empirical results have been somewhat mixed on the relative benefits of CMC versus face-to-face [1, 9, 12], it is widely accepted that communication medium and task characteristics do interact to impact outcome measures of the task.

Further, this body of research, with the above noted exceptions, has examined the impacts of CMC on decision making without considering the organizational factors that could influence or interact with the implementation of CMC. The organizational factor considered here is whether the communication takes place in a cooperative or a competitive situation.

### Competitive versus Cooperative Incentives

Deutsch (1980) proposed a theory that identified potential outcomes of cooperation and competition and the processes that underlie those outcomes. Cooperation and competition can refer to the interdependence between goals [22]. In cooperative situations, the achievement of one person's goal is positively related to the achievement of another person's goal (one person's movement toward their goal facilitates the other person's movement towards their goal). In competitive situations, the achievement of one person's goal is negatively related to the achievement of another person's goal (one person's movement toward their goal interferes

with the other person's movement towards their goal). Rewards or outcomes in both cooperative and competitive situations may be either be (i) pre-determined (called zero-sum game) or (ii) relative to the combined actions of the parties. Perceived interdependence of goals can affect group productivity and problem solving ability [24]. One way to create cooperative or competitive situations is through the incentive scheme [3].

Although the impact of cooperative and competitive incentives have been extensively examined for individual decisions [22], the research on the effects of incentives on multi-person decision making processes is limited. A primary focus of this research is the effect of incentives on information sharing. Ferrin and Dirks (2003) found that cooperative incentive schemes led to higher trust and information sharing. Incentives have also been found to interact with communication medium. In a production planning task, Barkhi, Jacob, and Pirkul (2004) found that cooperative incentives led to higher performance in face-to-face communication than in virtual communication and that individual incentives led to more similar performance in both mediums. They also found that a significant interaction between medium and incentive scheme on truthful information sharing.

Thus, cooperative versus competitive goals affect behavior. Incentives can be used to foster these goals. Incentives have been shown to interact with some aspects of information systems. But, to our knowledge, the impact of cooperative versus competitive situations on negotiation behavior when utilizing virtual negotiations has not been previously examined.

### Transfer Pricing Negotiations

Negotiation situations are of special interest here because they can vary in the same manner as incentive schemes, from cooperative (win-win, also called integrative) to competitive (win-lose). Transfer pricing negotiations for the price and quantity of an intermediate good are a particularly interesting form of negotiation because they contain aspects from both ends of this spectrum. The larger the **quantity** of goods transferred, the larger the profit to be divided between divisions (cooperative). But the transfer **price** determines the portion of the profit that goes to each division (competitive). Negotiators have a stake in both the quantity and the price. Therefore, negotiated transfer pricing is usually considered to be a mixed-motive situation [23].

Negotiated transfer pricing is also an important form of negotiation because the outcomes are of interest not only to the negotiators (divisions), as described above, but also to organization as a whole. The quantity transferred determines the organization's total profit from the transfer. The price determines the divisions' profits, which can be used for performance evaluation. Thus, the organization also has a stake in both the quantity and the price. Incentives have been recognized as a factor in the success of a transfer pricing system [13].

Thus, this study differs from most previous CMC studies because it examines the differential impacts of moving to CMC under different organizational situations (different incentive schemes) in a negotiation task. This examination is important because, despite the widely recognized importance of organizational factors in systems design, there is a paucity of empirical evidence on the interaction of communication medium with organizational factors. Transfer pricing negotiations are used as the experiment task because they provide an opportunity to examine a structured task with both competitive and cooperative aspects. Further, the process and the outcomes of the negotiations



are of interest both to the negotiator and to the firm deploying the CMC system.

## DEPENDENT VARIABLES AND HYPOTHESES

### Effectiveness

Effectiveness was measured by the quantity transferred. This is an appropriate measure because the quantity of the good transferred determines the firm profit from the transfer. From the firm's perspective, an effective outcome of the negotiation process is the transfer of the optimal quantity (the quantity which maximizes total firm profit). This assumes that revenue from the final sale of the good to the external customer and the cost function for the production of the good are exogenous (given) to the transfer pricing negotiations. From the divisional perspective, since the optimal quantity maximizes the firm profit, it also maximizes the potential profit to be divided between the divisions.

Empirical results have shown that, in the absence of incentives, face-to-face communication is more effective than CMC [1]. In a meta-analysis of a broad range of CMC studies, Baltes et al. (2002) found that for negotiation and mixed-motive tasks, CMC led to decreased effectiveness from face-to-face. These results are consistent with media-naturalness theory. Media naturalness theory [15, 16] predicts that a decrease in media naturalness (moving from face-to-face negotiations to virtual negotiations) leads to increased cognitive effort and increased communication ambiguity.

Empirical results have also shown that cooperative incentives lead to higher effectiveness than competitive incentives [5, 8]. In mixed motive situations like transfer pricing, cooperative incentives can lead negotiators to focus on jointly increasing the total profit to be divided. Competitive incentives can lead negotiators to focus on maximizing their share of the total profit. Competitive situations can also lead to have increased cognitive effort to process the implications of both their own actions and the other person's actions and reactions.

While communication medium and incentives have each been shown to impact firm profit (effectiveness), the issue for this study is how communication medium and incentives *interact* to impact firm profit in a transfer pricing situation. The increased cognitive effort required for the combined competitive situation and virtual communication leads us to predict a significant interaction. The specific form of the interaction is the differential impact of CMC in different incentive (organizational) situations, leading to the following:

H1: The impact on effectiveness (quantity transferred) of moving from face-to-face to computer-mediated communication will be significantly greater in the cooperative situation than in the competitive situation.

### Efficiency

One measure of the efficiency of a process is the amount of time spent on the process [46]. Efficiency was measured by the number of minutes taken to reach agreement or impasse.

Media naturalness theory [15, 16] predicts that a decrease in media naturalness (moving from face-to-face negotiations to virtual negotiations) leads to increased cognitive effort and increased communication ambiguity. Virtual negotiations would

take longer than face-to-face because negotiators would need more time to think through offers and to assess the other negotiator's stance. There is also increased communication ambiguity because less information is available under CMC. This would imply decreased efficiency under CMC.

In cooperative situations, negotiators would be motivated to work toward a common goal, to maximize firm profit. In competitive situations negotiators would be motivated to work toward increasing their own share of the profit. Individuals have to have increased cognitive effort to process the implications of both their own actions and the other person's actions and reactions. This would also imply decreased efficiency under CMC.

The issue for this study is how communication medium and incentives *interact* to impact efficiency. The increased cognitive effort required for the combined competitive situation and virtual communication again leads us to predict a significant interaction. The specific form of the interaction is the differential impact of CMC in different incentive (organizational) situations, leading to the following:

H2: The difference in efficiency (number of minutes) between face-to-face and computer communication will be significantly greater in the cooperative situation than in the competitive situation.

## THE EXPERIMENT

### Negotiation Task

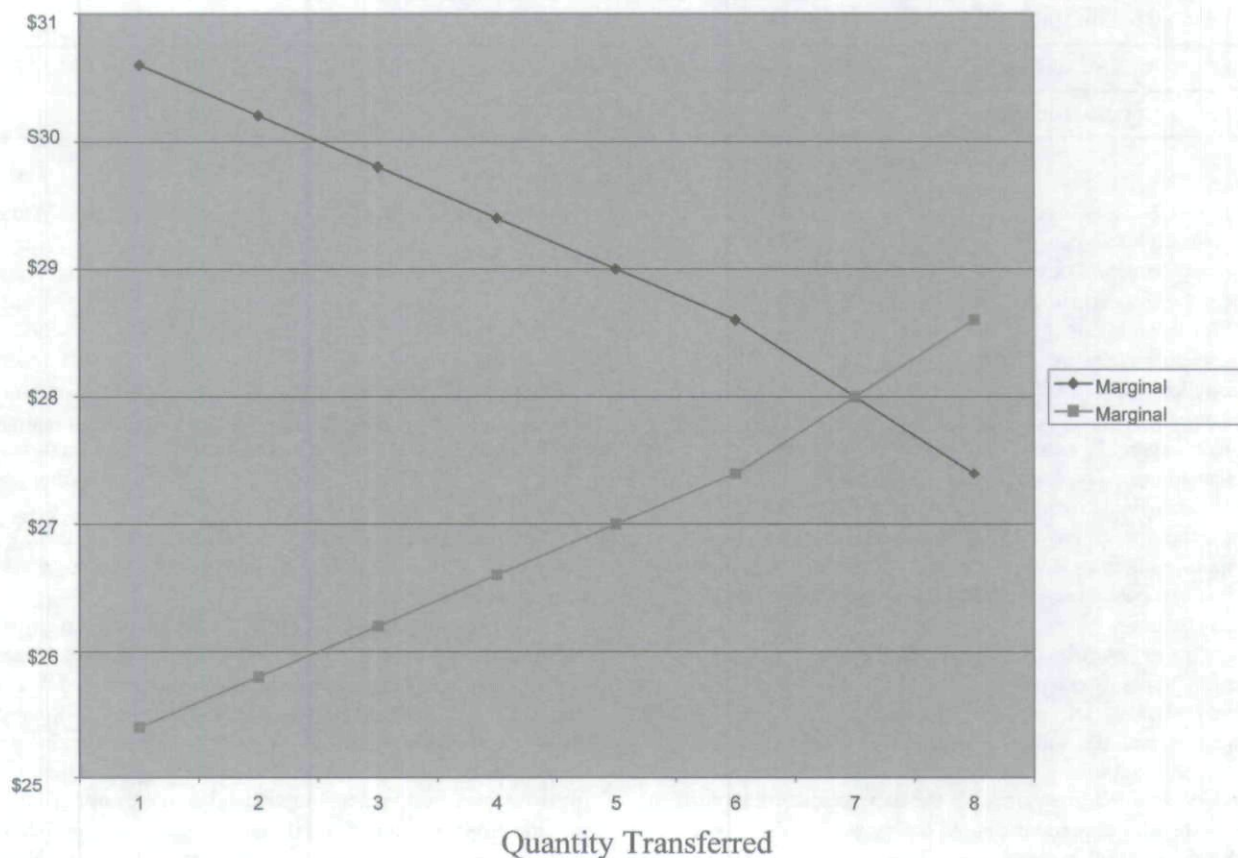
The experimental scenario had the manager of a buying unit and the manager of a selling unit involved in intrafirm bilateral negotiations for the transfer price and quantity of an intermediate good. Bilateral negotiations are common in vertically integrated firms where one division produces an input used by the second division. Therefore, the use of negotiating dyads is appropriate for an investigation of intrafirm communication and incentives. While multi-party negotiations are interesting, dyads provide greater simplicity for analyzing the effects of communication and incentives by eliminating issues such as coalition formation which are not the primary topic of this paper.

The buying unit manager had the marginal revenue schedule for the resale prices of the goods, but did not know the production costs. The selling unit manager had only the marginal cost schedule for the production costs of the goods. Thus, information asymmetry existed between the managers. The marginal revenue and cost schedules were adopted from DeJong, Forsythe, Kim & Uecker (1989), as shown in Figure 1. A major benefit of using marginal revenue and marginal costs is that an economic optimal (profit-maximizing) quantity can be determined, allowing results to be objective, as opposed to subjective measures of success. A pilot was conducted to ensure that subjects could understand the instructions and to determine that an adequate amount of time was allowed for the negotiations.

The negotiation support system provided structured interactions in face-to-face and computerized negotiations. Structured interaction has been shown to improve the processes and outcomes of negotiation [1]. Characteristics of CMC potentially include parallel communication, group memory, anonymity, and a structured pattern of discussion. Ours provides the last three. Because we wanted to look at the actual negotiations rather than the option generating portion of negotiation, we used sequential communication. Other forms of decision support, such as the



FIGURE 1. Marginal Revenue and Marginal Cost Curves



explicit identification of objectives, were not included because the issue of interest here is the communication medium, rather than the effectiveness of various support system options.

### Experimental Design

The experiment had a 2x2 design with communication medium and organizational situation treatments. The two mediums were face-to-face negotiations and computer-mediated negotiations. Communication in the face-to-face medium followed a similar structured format as in the computer mediated medium. The structure of the negotiations is described below in the Experimental Sequence section.

The organizational situation was operationalized through cooperative and competitive incentive schemes serving as the treatments. In both situations, the divisions earned a trading income from the profits earned from the transfer pricing negotiations and a fixed income. The fixed income served to keep the subjects' cash remuneration from becoming negative in the event of a trading loss. The trading profit was determined by the quantity and the transfer price.

For buying divisions (retailers), the trading profit was the difference between the resale value of the goods and the negotiated amount paid to the seller. For selling divisions (manufacturers or wholesalers), the trading profit was the difference between the negotiated amount received from the buyer and the cost incurred in producing or acquiring the goods.

In the cooperative situation, subjects earned 1% their own division's fixed income plus 1/2% of the organization's trading

profit, which was determined by the quantity transferred. In the cooperative situation, the buying and selling divisions equally shared the profits from the transfer. This experimental treatment is intended to induce cooperative behavior in both the buyer and the seller.

In the competitive situation, subjects received 1% of their own division's total profit, which included their fixed income and their division's trading profit from the transfer. This experimental treatment is intended to induce individualistic behavior that maximizes divisional profit, but which may take the focus away from maximizing total company profit.

### Experimental Sequence

Thirty-four undergraduate students enrolled in accounting information systems and cost accounting classes served as voluntary participants. Subjects were screened prior to the experimental session based on their responses to a utility preference elicitation question. The question required the probability assessment for a lottery that stated "If we were willing to give you \$5 for certain, or a gamble that pays \$10 with probability  $p$  or \$0 with probability  $(1-p)$ , what would  $p$  have to be so that you are indifferent between receiving the \$5 for certain and taking the gamble?" Subjects were assigned a time slot with other subjects who had approximately the same  $p$  value. This initial procedure attempted to ensure that dyads consisted of trading partners with similar risk preferences.

Subjects were randomly assigned to the buyer or the seller position. Each subject participated in only one of the four sets



FIGURE 2: Experimental Design

Medium\Incentive	Cooperative	Competitive
Face-to-face	n = 8 dyads	n = 9 dyads
Computer-mediated	n = 10 dyads	n = 7 dyads

of conditions (face-to-face and cooperative, face-to-face and competitive, CMC and cooperative, CMC and competitive) for the entire experiment. Because all subjects assigned to a cell did not appear for the experiment, the number of dyads in each cell varied. Please see Figure 2.

All subjects were given training to ensure that they understood the negotiation and reward process. Subjects in both mediums had to correctly complete the practice calculations before the experiment began. If practice calculations were not correct, oral explanations were given, and the subjects were required to rework the calculations. No subject was allowed to proceed with the experiment until they demonstrated an understanding of the appropriate marginal cost/revenue curve, the negotiation procedures, the business unit profit calculations, and the remuneration calculations. We used training rather than ex-post manipulation checks to ensure that subjects understood the experimental procedures and the incentive treatments. We did this because the experiment was costly in terms of money and time to both the experimenters and the subjects. Due to space and equipment limitations, the experiment could be administered to a maximum of six subjects at one time. Because the experiments took place outside the regular classroom time in the evenings, special trips to campus required for many subjects and a limited number were willing or able to do this. Gateway conditions based on training assure that subjects understand the experiment procedures.

The negotiations took place over ten trading periods. Each period lasted for a maximum of twelve minutes. In the CMC condition the twelve minutes were divided into six rounds in which the buyer and the seller alternately had an opportunity to accept offers or reject the trading partner's offer and submit their own offers to the trading partner. Offers were made in the form of price and quantity schedules. The schedules contained the quantities available for transfer, i.e., 1 through 8 units. The negotiators listed the average price they were willing to accept for each quantity. The price and quantity offers were the only information communicated other than acceptance of an offer.

In the face-to-face condition the buyer and the seller exchanged written offer schedules before beginning their negotiations. They were then allowed to bargain verbally for the remainder of the period. However, to ensure that the difference between mediums was not due to differing levels of information, the subjects were instructed to only exchange information about their marginal revenues or marginal costs curves during their negotiations. The experimenters monitored the negotiations to ensure that subjects adhered to these instructions.

The first round of the first period began with the seller entering the prices for each quantity on offer schedule based on the marginal production cost schedule. A two-minute limit was imposed for preparing the schedules. Insufficient time to negotiate might lead to uniformly high impasse rates. The pilot had indicated that two minutes was sufficient for each round and that six rounds was sufficient for each period. Since our impasse rates were very low, we concluded that two minutes was sufficient time for each round.

The experimenter/computer then transmitted the schedule to the buyer. The buyer had two options: (i) accept a given price and quantity combination, and an exchange would take place and the trading period ended; or (ii) reject all price and quantity combinations proposed by the seller and submit a schedule of price and quantity counter-offers to the seller. The seller then had two options: (i) accept a given price and quantity combination, and an exchange would take place and the trading period ended; or (ii) reject the buyer's combinations and prepare a new counter offer schedule for the next round of negotiation. Trading periods ended either when an offer was accepted or at the end of six rounds of offers. If no agreement had been reached at the end of six rounds, the negotiators were considered to be at an impasse and no trade took place.

At the end of each period, buyers and sellers each calculated their division's trading profit, if any, for the period. Under the competitive incentive scheme, the subjects then added their fixed income to the trading profit and used the total divisional profit to calculate their actual cash earnings. Under the cooperative incentive scheme, the buyer and seller each reported their trading profit to the experimenter/computer, who equally divided the total trading profit between the divisions. The subjects then added their fixed income to their share of the trading profit and used that total to calculate their actual cash earnings.

The subsequent periods proceeded in the same sequence except that the initial submissions offer schedules alternated between the buyer and the seller. Multiple sessions were needed because the effect of incentives needs to incorporate time for feedback and learning (Sprinkle 2000). The subjects did not know the number of periods in advance, so there should not have been end of game strategies. At the end of the ten trading periods, subjects calculated their total remuneration based on their performance. (The calculations were later audited and subjects were sent a check by mail.) The experimental sessions took approximately 2 hours.

## RESULTS

The cell means and standard deviations are presented in Table 1. The data was analyzed using a MANOVA because there are multiple observations for each dyad. The statistical results are presented in Table 2 — Section i. A MANOVA was used because the effectiveness variable, transfer quantity, and the efficiency variable, minutes, could be correlated, thereby necessitating a joint analysis. A repeated measures MANOVA was first performed on each of the dependent variables in the study separately to see if there was an end-of-game effect. Since no end-of-game effect existed, we then proceeded to use the two dependent variable MANOVA to control for the potential interdependence of the variables, and to increase the power of the test. The lack of a time effect also indicates that there is no significant learning effect. The MANOVA analysis found the interaction of medium and incentive was significant at the .01 level.



**TABLE 1**  
Average Statistics by Independent Variables and Interaction (For Periods 1-10)

	<u>DYADS</u>	<u>TRANSFER QUANTITY*</u> Optimal = 6 or 7	<u>MINUTES*</u>
<u>MEDIUM:</u> FACE TO FACE (FTF)	17	5.59 (1.79)	7.88 (2.51)
COMPUTER	17	3.76 (2.41)	6.14 (3.08)
<u>INCENTIVE:</u> COOPERATIVE	18	4.96 (2.26)	7.01 (3.10)
COMPETITIVE	16	4.45 (2.27)	8.24 (2.91)
<u>MEDIUM, INCENTIVE</u> FTF, COOPERATIVE	8	6.08 (1.61)	7.23 (2.70)
FTF, COMPETITIVE	9	5.15 (1.84)	8.45 (2.19)
COMPUTER, COOPERATIVE	10	3.84 (2.39)	5.84 (2.94)
COMPUTER, COMPETITIVE	7	3.64 (2.46)	6.57 (3.25)

\* mean (standard deviation)

**TABLE 2**  
Manova Results Face to Face vs Computer

i. TRANSFER QUANTITY					
<u>SOURCE</u>	<u>DF</u>	<u>ANOVA SS</u>	<u>MEAN SQUARE</u>	<u>F VALUE</u>	<u>PR&gt;F</u>
MEDIUM	1	284.47	284.47	64.28	0.0001
INCENTIVE	1	9.77	9.77	2.21	0.1383
MEDIUM*INCENTIVE	1	27.64	27.64	6.25	0.0129
ERROR	336	1486.88	4.43		
ii. MINUTES					
<u>SOURCE</u>	<u>DF</u>	<u>ANOVA SS</u>	<u>MEAN SQUARE</u>	<u>F VALUE</u>	<u>PR&gt;F</u>
MEDIUM	1	257.69	257.69	33.49	0.0001
INCENTIVE	1	115.98	115.98	15.07	0.0001
MEDIUM*INCENTIVE	1	0.00	0.00	0.00	1.0000
ERROR	336	2585.39	7.69		

**Effectiveness**

Effectiveness was measured by the quantity transferred. The optimal quantity of either 6 or 7 units had the highest firm profit. The average quantity transferred is presented in Table 1. As expected CMC led to a lower level of effectiveness, with an average of 3.76 units transferred, than did face-to-face communication, with 5.59 units transferred. Also as expected, a cooperative situation led to a higher level of effectiveness, an average of 4.96 units transferred, than a competitive situation, 4.45 units transferred, although the main effect for incentive was not significant. The directions of these results are consistent with media naturalness theory.

Hypothesis 1 predicts that the impact of moving from face-to-face to CMC will be greater when the negotiators are in a cooperative situation than when negotiators are in a competitive situation. The results of the MANOVA presented in Table 2 - Section i indicate that the main effect for medium is significant, the main effect for incentive is not significant, and the interaction term is significant. This significant interaction implies that the

prediction in Hypothesis 1 was supported. In the cooperative situation, CMC, with an average of 3.84 units transferred, was *less* effective than face-to-face, with an average of 6.08 units transferred (6 or 7 units transferred give the optimal profit). In the competitive situation, CMC, with an average of 3.64 units transferred, was again less effective than face-to-face, with an average of 5.15 units transferred. This indicates that CMC significantly decreased the effectiveness by an average 2.24 units in a cooperative situation and 1.51 units in a competitive situation.

**Efficiency**

Efficiency was measured as the average time to agreement or impasse. The maximum time was 12 minutes. As can be seen from Table 1, CMC, with an average of 6.24 minutes, is more efficient than face-to-face, with an average of 7.88 minutes. This result is not consistent with the predictions of media natural theory. A cooperative situation, with an average of 7.01 minutes, is more efficient than a competitive situation, with an



average of 8.24 minutes. This is consistent with media naturalness theory.

Hypothesis 2 predicts that the difference in efficiency between face-to-face and computer communication will be significantly greater in the cooperative situation than in the competitive situation. The results of the MANOVA presented in Table 2 — Section ii indicate that while both main effects are significant for minutes, the interaction term is not significant. This implies that the prediction in Hypothesis 2 was not supported. In a cooperative situation, CMC, with an average of 5.84 minutes till agreement, was more efficient than face-to-face, with an average of 7.23 rounds till agreement. In a competitive situation, CMC, with an average of 6.57 minutes, is more efficient than face-to-face, with an average of 8.45 minutes. However, while CMC improved the efficiency by an average 1.39 in a cooperative situation and 1.88 minutes in a competitive situation, these improvements are not statistically different from each other.

### CONCLUSIONS

One body of literature has examined the effect of moving to CMC in decision-making tasks. Another body has examined the effect of different incentives. The purpose of this paper is to examine whether the impact of moving from face-to-face communication to CMC differs depending upon the incentive scheme.

Moving from face-to-face to virtual negotiations (CMC) led to a decrease in effectiveness (transfer quantity and, therefore, profitability) in both cooperative and competitive organizational situations. In addition, the interaction was significant, the decrease was larger in the cooperative situation than in the competitive situation. These results emphasize the importance of considering the organizational environment when designing and implementing CMC. It supports the contention of Baltes, et al. (2002) that face-to-face interactions may be more appropriate than CMC in some organizational environments. It also supports their contention that there may be unintended consequences of advanced communication technology.

Moving from face-to-face communication to virtual negotiations (CMC) led to an increase in efficiency in both cooperative and competitive organizational situations. This is the intended effect. The interaction was not significant, so designers of management control systems cannot predict the impact on negotiation time of virtual negotiations.

These results are similar to Barkhi, et al. (2004) in that the incentive scheme interacted with communication medium. But the results are different from Barkhi, et al. in that the highest combined performance in their study was with computer-mediated communication in the cooperative situation, and the highest firm performance in our study was with face-to-face in the cooperative situation. This difference is probably explained by the difference in tasks: theirs was a consensus task and ours was a negotiation task. Media naturalness theory [15, 16] recognizes that less cognitive effort is required for the 'natural' medium (face to face negotiations) than for virtual negotiations and the negotiation task may require higher cognitive effort (see [26] for an example in a virtual outsourcing scenario). But regardless of the difference, it is clear that there may be unintended consequences with CMC. Organizations need to be aware of these consequences and take steps to mitigate them.

One limitation of this study is the use of undergraduate subjects. While no expertise was required for the negotiations here, masters

students or experienced negotiators could potentially have behaved differently. Experience usually leads to enhanced skills and the manipulations may not have been as effective with experienced negotiators. Buyer/seller personal traits could be considered (see [14] for an e-auction study of personal traits). Even though participants were earning cash, lab studies do not have the same pressures for performance as actual negotiations. Finally, future research could also examine interorganizational (supply chain) transfer price negotiations. The management control issues are more complex because it is often more difficult to negotiate face-to-face because of the global nature of many supply chains. And it is more difficult to design interorganizational incentive schemes.

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