

Videoconferencing NSS and Conflict Level: An Experimental Study

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Abstract

The advent of business-to-business (B2B) e-commerce market has created needs and opportunities for firms to negotiate deals online. Most negotiation support systems (NSS) in past research are text-based and the related findings could not be generalized to negotiating situations utilizing advanced electronic communication technology. This paper investigates the impact of NSS and conflict level on negotiation outcomes where participants communicated through a videoconferencing channel. Findings suggested that dyads with videoconferencing NSS support achieved higher joint outcome, but spent more time in reaching agreements - in low but not high conflict negotiation situation. Conclusion and implications were drawn.

Keywords

Decision Making, Negotiation Support Systems, Electronic Commerce, Videoconferencing

1. INTRODUCTION

Negotiations have been studied from many perspectives including psychology, sociology, political science, economics, applied mathematics, computer science and artificial intelligence (e.g., Cohen 1991; Ikle & Leites 1962; Pruitt 1981). While negotiation is common and important for managers, it is also a challenging task due to its complex nature. Bui et al. (1992) describe negotiations as complex, ill structured and evolving tasks requiring sophisticated decision support. Weak information processing capacity and capability, cognitive biases and socio-emotional problems often hinder the achievement of optimal negotiations (Bazerman et al. 1985). These challenges of negotiation and the cognitive limitations of human negotiators have led researchers to pursue computer support of negotiations in the form of Negotiation Support Systems (NSS). Recent empirical research on NSS has shown that computer-aided negotiations generally yielded higher joint outcomes (i.e., combined utilities for all parties) and greater satisfaction; in short, NSS help to improve negotiation outcomes and processes (e.g., Goh et al. 2000; Delaney et al. 1997; Jones, 1988; Rangaswamy & Shell, 1997). In recent years, new computing and communication technologies have made feasible for small and medium-size firms to enter the global marketplace, and therefore, to negotiate deals on international markets online (Kersten & Noronha 1999). With the advent of Internet and vast emergence of electronic commerce, e-commerce players are increasingly adopting advanced telecommunication technologies, such as videoconferencing, which essentially shrinks geographic distances and reduces the growing costs and time associated with executive travel. However, despite the increasing use of videoconferencing that allows geographically separated individuals and firms to interact in an approximation of face-to-face interaction (Snizek & Crede, 2002), most NSS empirical studies were still limited to simple keyboard interaction like email or text-based chat facility, thus limiting their findings away from negotiators using advanced communication technologies. The purpose of this study is to gain insights and provide evidence about the capability of a computerized NSS to enhance negotiation outcomes using videoconferencing channel. As an important factor, conflict level was also investigated to distinguish between integrative and distributive bargaining situations (Walton & McKersie 1965). More specifically, this study seeks answers to the following **research questions**: (1) Can videoconferencing-based NSS improve the outcomes of dyadic remote negotiation over those facilitated by a pure videoconferencing channel? (2) Does conflict level moderate the result? The next session provides a literature review on negotiation models, NSS evolutions and videoconferencing technology. Next, we present the research model and hypotheses, followed by research method, data analysis and discussion of the findings.

2. LITERATURE REVIEW

2.1 Negotiation Models

Success in negotiation was once considered an art, based on “interpersonal skills, the ability to convince and to be convinced, the ability to employ a basketful of bargaining ploys, and the wisdom to know when and how to use them” (Raiffa 1982, p. 8). However, not all negotiators have the opportunity, experience or interpersonal skills to master the art of negotiation. Even the most capable negotiators often find it difficult as well as risky to rely solely on their own subjective judgments for obtaining feasible resolutions to conflict (Antrim & Lax, 1987). In other cases, even if negotiation parties do reach an agreement, they may not have achieved the best possible solution. **Normative, game-theoretic models** of negotiation (Nash 1950, 1953; Rubenstein 1982) assume rationality and focus on the outcome that should emerge from these rational actions by all negotiating parties. Because of its explicit assumptions of individual rationality and normative analyses of negotiation behavior, game theory has been simultaneously a goal and a foil against which much descriptive experimental research has been directed (Dawes 1988; Kahneman et al. 1982). These models focus on the best outcome but ignore the process of the negotiation itself. In contrast, **descriptive theories** of negotiation in sociology, psychology and organizational behaviour have mostly emphasized contextual characteristics of negotiation and negotiators’ cognition and interaction processes (Bazerman & Carroll 1987; Pruitt & Rubin 1986). These descriptive theories examine the influence of individual differences, situational determinants and cognitive processes on judgment, behavior and outcomes in negotiation (Bazerman & Carroll 1987; Hausken 1997; Thompson 1990). It is commonly understood that the core of negotiation is to resolve conflict among parties involved, and the amount of conflicts determines the structure of negotiation. **Conflict of interest** encompasses situations in which two or more parties have separate interests or goals which conflict, such that one party’s goal achievement will prevent the achievement of the opposing party’s goals (Brehmer 1976). Based on the conflict level between parties, Walton and McKersie (1965) distinguished between distributive and integrative negotiation situations. Integrative type allows for “better compromise”, “win-win solutions” and “expanding the pie” whereas distributive type is generally known as “competitive”, “win-lose” and “value claiming” situation (e.g., Fisher & Ury 1991). This categorization has influenced many negotiation researchers and practitioners and provided a basis for further description studies of negotiation processes (Lewicki & Litterer 1985; Pruitt & Rubin 1986).

2.2 Negotiation Support Systems

Since 1960s, when computer models were first employed for the support of individual negotiating sides, interest has been growing in the possibility of using computer technology and information systems to support negotiations. In early 1980s, researchers began developing NSS, known as a special type of Group Support System (GSS), intended to support negotiation parties (and possibly a human mediator) in reaching an agreement (DeSanctis & Gallupe 1987; Jarke et al. 1987). NSS was conceptualized to comprise an individual Decision Support System (DSS) for each party in the negotiation plus an electronic communication channel between the parties (Lim & Benbasat, 1993). More recently (from late 1980s to 1990s), significant work had been undertaken to build interactive, session-oriented NSS which would support the entire negotiation process (e.g., Carmel & Herniter, 1989). Rangaswamy and Stark (2000) provide a comprehensive overview of eight empirical studies that could be located in the literature for this period. Four of these studies, which are more relevant to the present work, are to be mentioned in the following. In Jones’ (1988) experiment, dyads bargained face-to-face over a four-issue manufacturing negotiation problem. In the experimental condition, negotiators began bargaining face-to-face and, after twelve minutes, viewed together contract suggestions that maximized their joint outcome on a video screen. Jones also introduced the level of conflict as a second factor. The conflict level between the buyer and the seller was manipulated via differential assignments of importance weights to the four issues. Jones found that in the low conflict condition, computer suggestions led to higher joint outcomes, but negotiators took more time. In high conflict situations, negotiators perceived the climate to be more collaborative with computer support than without. The laboratory experiments by Foroughi et al. (1995), Perkins et al. (1996) and Delaney et al. (1997) are a series of cumulative studies. All three studies used bargaining task that was previously used by Jones (1988) and employed the same interactive NSS, except for Perkins et al.’s (1996) study which made use of only the DSS component. It is to be noted that these studies investigated the level of conflict, underscoring the importance of this factor. The system consists of two components: a module for electronic communication between the parties, and a DSS to assist in the generation and evaluation of alternative contracts. Each negotiator provided his own interests to the decision tool as private data, as well as his guesses on the other party’s preferences. The DSS then computed and displayed the three contract alternatives with the highest joint outcome.

With the growth of B2B e-commerce market from the late 1990s until now, web-based NSS have been implemented and studied in examining the negotiation support in e-commerce context (e.g., Goh et al. 2000). Computer science researchers also increasingly shifted their attention to the design and implementation issue of “*automated negotiation*”, where computational agents find and prepare contracts on behalf of the real-world parties they represent (Beam & Segev 1997). However, automated negotiation research is in its infancy and it is only in relatively well-structured areas where the use of automated negotiation pays off (Yuan et al. 2003; Weigand et al. 2003). NSS without automated agents can still be helpful in most business settings as the actual negotiations are complex and less structured. Rangaswamy and Stark (2000) also pointed out that rigorous empirical research that examines the efficacy of NSS is still lacking in providing insights on how NSS and its subcomponents can improve negotiation process and outcomes.

2.3 Videoconferencing as communication channel

Most of the empirical studies reviewed above on dispersed negotiators focused on keyboard interaction only. In other words, there was no visual contact or audio communication between or among negotiating parties. Consequently, the findings may not be generalized to groups using advanced collaborative technologies, such as videoconferencing (Sniezek & Crede 2002). Videoconferencing involves the use of electronic telecommunications to enable people to see and hear each other in spite of physical separation. Although the concept of videoconferencing is by no means novel, it was only in recent years that this rich medium offered possibilities for individuals, schools and business enterprises to achieve efficient communication. Recently, technological developments have allowed the use of videoconferencing in decision making research. Sniezek and Crede (2002) suggested that decision making via videoconferencing may lead to both a reduction in transportation costs and a commensurate improvement in the time taken to reach decisions. When two dispersed parties need to negotiate, it is advantageous for them to use rich media to communicate. Videoconferencing, as one of such media, is the closest thing to “being there” (Egido 1988). The presence of visual and audio channels enables the participants to make use of social cues, for example eye-contact, facial expression and gesture, to support the social interaction (Bordia 1997). Furthermore, the use of videoconferencing in research context allows the manipulation and recording of various independent variables that are not possible otherwise. As such, greater knowledge can be derived from laboratory research into group decision-making processes.

3. RESEARCH MODEL AND HYPOTHESES

Lim and Benbasat (1993) have proposed a theory of NSS pertaining directly to a two-person, session-oriented, multiple-issue setting such as that used in this study. The theory emphasizes the importance of evaluating the impact of each of the two subcomponents of NSS – the individual DSS for each party and the electronic communications channel between the parties – instead of evaluating NSS as a single entity. The DSS portion improves the human information-processing capacity and its effects can be best understood within the reference disciplines of game theory and economic theory. The electronic communication channel improves perceived commitment and its effects can be best understood within the context of social-psychological theories of negotiation. Delaney et al. (1997) examine the separate effects of these two sets of components and showed that DSS component alone led to higher joint outcomes and more balanced contracts. The present study continues to sort out the effects of the two components and further explore the impact of the computer support on negotiation outcome, with particular interest paid to videoconferencing.

Negotiation task characteristics, especially conflict level, have been shown to be of significant influence on negotiation processes and outcomes (Benbasat et al. 1993). Empirical research in NSS indicated that NSS effectiveness is likely to be moderated by the type of negotiation situation or the amount of conflict between negotiators (Jones 1988; Foroughi et al. 1995; Goh et al. 2000). Consistent with past work (e.g. Jones, 1988; Foroughi et al, 1995; Lim, 2000), dependent variables in the current study include joint outcome (total utility of the negotiated settlement for both parties), contract balance (the absolute difference between the total utility scores achieved by each negotiator) and negotiation time. We examine the role of conflict level in moderating the relationship between degree of NSS support and negotiation outcomes. Figure 1 depicts the research model.

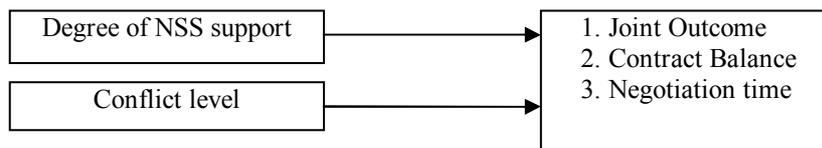


Figure 1: The Research Model

For low conflict task, greater efficiency and fairer outcomes are expected with computer decision support than without computer support for negotiating dyads communicating through VC channel. In other words, NSS-

supported dyads are to achieve higher joint outcomes and lower contract balances. For high conflict task, NSS may not be particularly useful in distributive negotiation situations where negotiating parties tend to “split the difference” in coming up a reasonably efficient and fair settlement by using a satisfying strategy (Raiffa 1982; Goh et al. 2000). Hence the following interaction hypotheses are put forth.

H1: *When conflict level is low, bargainers with NSS support will achieve higher joint outcome than those with VC support only; when conflict level is high, there will be no significant difference on joint outcome between bargainers with NSS support and those with VC support only.*

H2: *When conflict level is low, bargainers with NSS support will achieve lower contract balance than those with VC support only; when conflict level is high, there will be no significant difference on contract balance between bargainers with NSS support and those with VC support only.*

For negotiation time, conflict level will not show moderating effect as the time in reaching agreement is mainly determined by the additional use of the NSS tool. GSS research demonstrates that the use of technology generally tends to extend decision time (Dennis et al. 1988). It is proposed that the time involved in using NSS for the alternative generation and evaluation of alternatives increases the time required for the NSS over negotiation with no NSS support, because the NSS introduces explicit additional activities into the negotiation process.

H3: *Bargainers with NSS support will take more time in reaching agreement than those with VC support only.*

4. RESEARCH METHOD

4.1 Experimental Design

The experiment employed a 2X2 factorial design to investigate the impact of conflict level and degree of NSS support on negotiation outcomes. **Conflict level** was manipulated by assigning different utility points to the four negotiating issues to dyads. The construction of **negotiation task** and point sheets was adapted from Jones’ study (1988), which involves negotiation between a seller (Simo Parts Distributor) and a buyer (Roberts Enterprise Inc.) over four issues - unit price, purchased quantity, time of first delivery and warranty period - for a purchase agreement for an engine sub-component called turbochargers. In the **low conflict** treatment, the assigned weights for negotiation issues were different. The buyer’s most important issue was quantity, followed by delivery time. The two least important issues were warranty period and price. For the seller, price was the most important issue, followed by warranty period. Delivery time and quantity were the least crucial issues. When the priorities of negotiators differ, the potential for mutually beneficial tradeoffs exists and integrative bargaining situation was created. In the **high conflict** treatments, negotiation issues for both buyer and seller were weighted similarly (i.e., assigned approximately equal utility points). Price was given the most weight, followed by quantity; the two least important issues were delivery item and warranty period. This resulted in a zero-sum or distributive bargaining situation where one party’s gains were almost equal to the other party’s losses. **Degree of NSS support** was manipulated by the availability of a computer support tool to NSS treatment groups. The support tool, named as ProNeg, was developed based on the specification of NSS used in the series studies by Foroughi et al. (1995), Perkins et al. (1996) and Delaney et al. (1997). In both treatments, negotiators communicated through videoconferencing channel but the NSS treatment groups were additionally supported with ProNeg. Microsoft’s NetMeeting, a multimedia meeting system with text-chatting facility, audio/video channels and real-time file sharing capabilities, was the VC software used for all treatment groups.

Subjects were recruited from students from a large university. Two separate rooms were used to simulate remote negotiation setting. In each room, PCs were equipped with headphone and web camera and installed the Microsoft’s NetMeeting software. Figure 2 depicts the experimental design.

<u>Conflict level</u>	<u>Degree of NSS Support</u>	
	VC only	NSS (VC and DSS)
Low Conflict	8 Dyads	8 Dyads
High Conflict	10 Dyads	9 Dyads

Figure 2: Experimental Design

4.2 Dependent Measures and Experimental Procedure

Joint outcome was measured by the sum of total, multi-attribute utility scores of the dyads for the final agreement. **Contract balance** was computed by the absolute value of the difference between the total utility scores achieved by each negotiator. It is zero for a balanced contract and higher for an unbalanced one. **Negotiation time** was measured in minutes from the beginning of the negotiation until the dyads reached an agreement.

Two experimenters, each in one room, administered the standardized guidelines and instructions. Before the experimental session, subjects were explicitly told that they would receive extra cash on top of the basic participation rewards based on their negotiation performance. In the **pre-negotiation** stage, subjects were randomly assigned the role as buyer or seller. After receiving the general instruction, each subject was given sufficient time to read through experiment scenario for his respective company. Training on using Microsoft NetMeeting was conducted. Subjects next proceeded to read the confidential information of their negotiation task. After that, they were given to the point sheet and did an exercise of computing the utility score of an agreement to ensure they knew how to produce utility scores for contracts. For NSS treatment groups only, subjects were trained to use ProNeg. Subjects completed a pre-negotiation questionnaire on personal information and a short quiz to make sure they understood their tasks. Both experimenters coordinated and announced the start of **actual negotiation** and recorded down the starting time. Upon **settlement**, subjects completed an agreement form. Both experimenters recorded the ending time. Dyads with the highest joint outcome in each experimental cell were then rewarded.

5. DATA ANALYSIS AND DISCUSSION

Control checks in each treatment group were performed. ANOVA tests (on age and experience) and Mann-Whitney U test (on gender) across four different treatment groups showed no significant differences. ANOVA tests were conducted on the dependent variables (see Table 2). Cell means and hypotheses testing are presented in Table 3.

Effect Dependent Variable	Interaction Effect	Main Effects	
		Level of Conflict	Degree of NSS Support
1. JOINT OUTCOME	YES (F=8.33, p=.01**)	F=126.56, p=.00**	F=6.61, p=.02*
2. CONTRACT BALANCE	NO (F=.06, p=.80)	F=6.50, p=.02*	F=.001, p=.97
3. NEGOTIATION TIME	YES (F=7.63, p=.01**)	F=.47, p=.50	F=.86, p=.36

Table 2: Summary of ANOVA Results (* denotes p<.05, ** denotes p<.01)

Dependent Variables	Mean		Significance Level (p)	Hypotheses	Hypotheses Supported?
	VC Only	NSS			
1. JOINT OUTCOME				H1	
Low Conflict	117.13	127.13	p = .02*	VC Only < NSS	YES
High Conflict	101.80	101.22	p = .43	VC Only = NSS	YES
2. CONTRACT BALANCE				H2	
Low Conflict	9.63	10.13	p = .87	VC Only > NSS	NO
High Conflict	7.39	4.68	p = .86	VC Only = NSS	YES
3. NEGOTIATION TIME				H3	
	26.67	29.76	p = .02*	VC Only < NSS	NO

Table 3: Cell Means and Results of Hypotheses Testing

Conflict level shows significant moderating effect for NSS impact on **joint outcome** as we hypothesized. An important result obtained here is that for low conflict task, we confirmed NSS helped physically dispersed dyads to improve joint outcome significantly. As predicted by earlier NSS research (Anson & Jelassi, 1990; Jelassi & Jones, 1988), computer support helped subjects overcome the cognitive difficulty of these tasks, the tendency toward premature closure, and the preference for more available and more salient solutions, thus

helping them achieve better joint outcomes than dyads who only had VC support (Foroughi et al. 1995). Without NSS support, subjects tended to *satisfice* rather than optimize (March & Simon 1958) – they stopped negotiating when a satisfactory solution had been reached. This is because they did not know each other's utility function and might not even be explicitly aware of their own utility function. Even if they did, it is simply not possible for human negotiators to process all of the hundreds or thousands of possible solutions. Additional information and processing capabilities provided by NSS as decision aids had the effect of raising the negotiators' expectations and hence resulted in further exploration for mutual gains. In high conflict settings, NSS and VC dyads achieved comparable joint outcomes, which is consistent with our hypothesis. Similar to Jones' (1988) and Goh et al.'s (2000) findings in high conflict negotiation, there were no significant differences in negotiation outcomes between NSS-supported and VC-supported dyads.

The results also indicate that **contract balance** is comparable between NSS and VC dyads. This result is consistent with Jones' (1988) and Goh et al.'s findings (2000) but not Foroughi et al.'s (1995). Possible explanation can be found in the design of the negotiation support tool used in this study. The experiment explicitly encouraged subjects to achieve the highest joint outcomes. The NSS helped a subject to estimate his opponent's point structure and suggest optimal solutions based on the three best optimal joint outcomes. Hence contract balance (fairness of outcome) was neither emphasized nor not highlighted through the course of experiment. Jones (1988) also explained that such result was due to the fact that a bargainer often accepted a settlement in which the partner had many more points than he did, since he didn't know exactly what his bargaining partner's points were.

Significant interaction effect between conflict level and degree of NSS support was detected for **negotiation time**. Results indicate that negotiation time was greater for NSS dyads than VC dyads in low conflict setting, instead of shorter as hypothesized by Lim and Benbasat (1993). This might be explained by relative unfamiliarity of the subjects with the computer support system (Foroughi et al. 1995; Delaney et al. 1997). The significant increase in time for low conflict negotiation also suggests that in situations where integrative solutions were possible, negotiating parties considered their options more thoroughly to achieve more efficient and fairer settlements (Goh et al. 2000). NSS, in this case, increase subjects' confidence in achieving better outcomes and hence would like to explore further negotiation with their opponents. Conceivably, ongoing use of the NSS should tend to reduce negotiation time (Delaney et al. 1997). This is to be confirmed by future studies in which negotiators are to be pre-trained and ensured familiar with the use of negotiation support tool and compared against those who those use NSS for very first time. In high conflict setting, negotiation time was shorter for NSS dyads than VC dyads. This suggests that in situations where negotiators were in direct conflict of interest, subjects did not intend to consider their options as thoroughly as in low conflict setting where mutual gains were possible, to seek for more efficient and fairer settlements. Future study is needed to further explore the important moderating role of conflict level for NSS impact on negotiation time.

6. CONCLUDING REMARKS

This study was conducted to investigate whether remote negotiation realized by a videoconferencing environment alone could be as effective as those additionally supported by NSS, for two levels of conflict. The distinctive contribution of this present study is twofold. First, it is noted that most of the past researchers did not evaluate the effects of the DSS and the electronic communication separately; this study examined a full NSS and proceeded to sort out the individual effects of the two components following Delaney et al.'s (1997) suggestion. As well, the electronic communication component engaged in this study was more advanced and enriched with multiple communication features: audio, video, and electronic messaging. Second, resulting from the use of videoconferencing, negotiating dyads were physically separated and hence a remote negotiation setting was created in this study to simulate a negotiation activity for physically dispersed dyads. This added to the knowledge of empirical NSS research where studies on remote negotiation are relatively rare. The current study has the following limitations. The research methodology of laboratory experimentation and use of student subjects may connote with reduced realism vis-à-vis real-world negotiations. In addition, similar to recent research, this study adapted the negotiation task developed in Jones' (1988) work. The well-structured and fixed negotiation task may not fully reflect the complex nature of negotiation problems of the real world.

Findings of this study suggest several avenues for future research. Conflict level continues to show significant moderating effect for NSS impact on negotiation outcomes for physically dispersed negotiators. Researchers working on web-based negotiation support systems would benefit from incorporating into their studies this factor. Further, rather than addressing NSS support in two levels, greater differentiations in the degree of support can be researched. More importantly, NSS researchers and designers need to address the use of real-world negotiation tasks and settings. Future research interested in this topic could also look into other conceptually significant dimensions, including multi-party bargaining and cross-cultural negotiations with telecommunication channel.

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