

E-NEGOTIATION: CAN A DECISION SUPPORT SYSTEM (DSS) HELP IN NEGOTIATIONS EVEN IF ONLY ONE PARTICIPANT HAS A DSS?

William C. Perkins, Indiana University
1146 W. Sugarberry Ct., Bloomington, IN 47404
perkinsw@indiana.edu, (812) 929-0760

Abbas Foroughi, University of Southern Indiana
Business & Engineering Center BE 2069, University of Southern Indiana,
8600 University Boulevard, Evansville, IN 47712
aforough@usi.edu, (812) 465-1667

James C. Hershauer, Arizona State University
20 E. Kelly Lane, Tempe, AZ 85284
james.hershauer@asu.edu, (480) 940-0738

ABSTRACT

A negotiation support system includes both a decision support system (DSS) component and an electronic communication component. In this laboratory study, all buyer-seller bargaining pairs communicated electronically but access to the custom-built DSS was varied, with the goal of answering the important question asked in the paper's title.

Keywords: decision support system (DSS), e-negotiation, negotiation, negotiation support system (NSS)

INTRODUCTION

Negotiating is one of the major decisional roles played by many managers, including sales managers and purchasing managers. It has been estimated that managers spend up to 20% of their working hours in negotiation activities (Shea, 1983). An increasing proportion of these negotiations are being conducted using the Internet (e-mail, instant messaging, or other communication tools), and these negotiations are referred to as e-negotiations.

Several researchers have suggested that it may be possible to enhance the effectiveness of negotiations, especially e-negotiations, by providing an appropriate decision support system (DSS) to each of the parties in the negotiation. When the use of a DSS is combined with electronic communication between the negotiating parties, this is called a negotiation support system (NSS). As of this writing, the use of a comprehensive NSS (electronic communication plus a DSS) is quite limited, while the prevalence of e-negotiations is increasing. The reason for this discrepancy is simple: It is much easier to establish the necessary electronic communication links than it is to develop a DSS that is appropriate for a given negotiation task.

The available research results, however, suggest that the use of a DSS is more important than the use of electronic communication in terms of enhancing negotiation results, while the electronic communication is more important in terms of enhancing post-bargaining negotiator attitudes. Thus we need to learn more about the value of a DSS in negotiations in order to help organizations decide whether the development of an appropriate DSS is worth the effort and expense. The present study represents a step in that direction by investigating whether or not both parties in a buyer-seller negotiation need to have access to a DSS in order to gain the benefits of a comprehensive NSS. It might be, for instance, that a manufacturer would find it worthwhile to develop a DSS that could be used in negotiations with several different buyers of its product even though none of the buyers has a DSS.

NEGOTIATION SUPPORT SYSTEMS: THEORY AND RESEARCH

Negotiation support systems (NSSs) are a special category of group support systems (GSSs) designed to support the activities of two or more parties in a negotiation. A GSS is an information system which combines electronic communication, computers, and decision technology to support group work (Dennis et al., 1988). An NSS is a subclass of GSS in which the parties being supported are attempting to negotiate or bargain to reach an agreement. The core components of an NSS are an individual decision support system (DSS) for each party in the negotiation plus an electronic communication channel between the parties (Lim and Benbasat, 1992-93). In addition, a comprehensive NSS may also incorporate a structured negotiation process, computerized group process structuring techniques, and support for a facilitator (Anson and Jelassi, 1990).

Why should the use of an NSS result in enhanced negotiation results and attitudes? In their 1992-93 paper, Lim and Benbasat lay out a theory of negotiation support systems that includes some possible answers to this question. They suggest that the impact of electronic communication will be that each party will perceive the commitment of the opponent to be greater, and that this greater perceived commitment will result in greater satisfaction with the process and a reduced time to settlement. Further, they suggest that the DSS will provide increased information-processing capacity and capability, and this increased capability will result in joint solutions that are closer to the efficient frontier (the locus of achievable joint outcomes from which no joint gains are possible) and closer to the Nash (or fair) solution, as well as solutions in which the parties are more confident. Many of the NSS experimental studies conducted since the publication of the Lim and Benbasat paper have focused on confirming or rejecting their suggestions. The present study goes one step further by investigating whether or not both parties in a buyer-seller negotiation need to have access to a DSS in order to gain the benefits of a comprehensive NSS.

Our review of NSS research will be divided into two parts. First, we will consider empirical studies of the use of an NSS that are not directly or indirectly related to the present study. We will not, however, discuss studies involving automated agents to conduct negotiations, which are outside the scope of this paper. Then we will turn to the cumulative series of laboratory experiments that have culminated in the present study. In this latter section, we will include two studies that are not part of the cumulative series but are closely related.

Prior to the 1990s, rudimentary implementations of computer support for negotiations in the business world, international affairs, labor law, and environmental and salary disputes demonstrated the potential of an NSS for making negotiation problems more manageable and comprehensible for negotiators. For reviews of these early studies, see Nyhart and Goeltner, 1987; Jelassi and Foroughi, 1989; Eden, 1992; and Foroughi, Perkins, and Jelassi, 1995.

Rangaswamy and Shell (1997) created an NSS called NEGOTIATION ASSISTANT (or NA), which included a process to help the negotiators prepare for the negotiation, a structured communication process during the negotiation, and a post-settlement evaluation process that can suggest Pareto-efficient solutions (solutions which are better for one or both parties without making either side worse off). To test their NSS, the researchers devised a buyer-seller negotiation scenario in which the subjects were to negotiate four issues for a specific product: price, delivery date, type of currency to be used, and the forum for dispute resolution should contractual disputes arise. The subjects, who were first-year MBA students, were randomly assigned to one of four negotiation conditions: face-to-face, e-mail, NA used for preparation but followed by face-to-face negotiation, and NA used for preparation and for structured communication. Those negotiating in the fourth condition who did not reach a Pareto-efficient solution were given the opportunity to employ the post-settlement evaluation process to improve their solution. The hypotheses tested all related to the Pareto-efficiency of the negotiation outcomes. The results indicated that negotiating pairs in the NA-preparation condition achieved more Pareto-efficient trades than either face-to-face or e-mail negotiating pairs, that NA was superior to e-mail, that NA-preparation was more important than the remaining portion of NA, and that the post-settlement option did not help much. This is a valuable study, but it looked only at Pareto efficiency of solutions, and only for a single, relatively low level of conflict between the negotiators.

Gregory Kersten and co-authors published two papers which investigated the impact of national culture on the negotiation process when using their Web-based NSS, called INSPIRE. The first paper was co-authored by Sunil Noronha and appeared in 1999. INSPIRE, like NA, incorporated a post-settlement option, but very few negotiators used this option. The second paper (2003), co-authored with Sabine T. Koeszegi and Rudolf Vetschera, employed a larger sample size and carried out more analysis than the first paper, but it still focused on the impact of culture on process, outcome, and expectation variables rather than on whether or not an NSS enhances performance or negotiator attitudes.

In a 2000 paper, John Lim carried out a laboratory experiment, using student subjects, to investigate the impact of an NSS and the proximity of the subjects on negotiation outcomes. Lim used two levels of proximity, face-to-face and distributed, and the presence or absence of an NSS, for a 2 x 2 experimental design. During the negotiations, the subjects were seated opposite each other in the same room; for the distributed condition, they were separated by a partition so that they could not see each other's faces. Lim's NSS consists only of a DSS, not electronic communication. Although not clearly defined in the paper, the DSS involves articulating utilities for various negotiation issues and then adding these utilities to evaluate proposed agreements. The task for the study involves the negotiation of employment terms between an employer (a partner in a multinational company) and an employee (a senior analyst) when the employee is promoted to a new position as a project leader. Lim's study involved eight bargaining pairs in

each of the four cells, for a total of 32 bargaining pairs. The results suggest that the use of the NSS led to higher individual outcomes, higher joint outcomes, and fairer (more balanced) outcomes for both face-to-face and distributed bargaining pairs.

A CUMULATIVE SERIES OF LABORATORY EXPERIMENTS

A series of five studies on the use of an NSS have been conducted at Indiana University and Arizona State University, beginning in 1988 and continuing through 2005. The primary research question asked by all of these studies is: What is the effect of an NSS on negotiation outcomes and negotiator attitudes? Other research questions considered the effect of the individual NSS components (i.e., electronic communications, DSS) on negotiation outcomes and attitudes; asked whether NSS support is equally effective in situations of high conflict and low conflict of interest; and investigated whether NSS support is equally effective in a face-to-face negotiation setting, in negotiation via telephone, and in negotiation via computer conferencing. All the studies in this series are laboratory experiments in which the subjects are playing the roles of buyer and seller in an industrial bargaining situation. The studies build upon one another to provide an increasingly comprehensive view of the efficacy of using a negotiation support system to support both parties in a negotiation situation.

Study 1: Jones, 1988

In the initial study in this set, Beth Jones conducted a laboratory study using student subjects in which computer support (a rudimentary NSS) was provided to the negotiators at one specific point in the negotiation process. After twelve minutes of face-to-face bargaining, contract suggestions that were optimal or near-optimal in terms of the joint outcome were displayed on a video screen to both parties.

For her study, Jones designed a manufacturing bargaining task involving negotiation of four issues (unit price, purchase quantity, time of first delivery, and warranty period) for a three-year purchase agreement for an engine subcomponent. High and low conflict of interest conditions were created by varying the weights assigned to the issues. The low-conflict treatments were simulated by assigning different weights to the issues for the buyer and the seller, creating a bargaining situation in which mutually beneficial trade-offs were possible. The high-conflict treatments featured the issues for both parties being weighted similarly, creating a near-zero-sum situation in which one party's gain was nearly equal to the other party's loss. For both conflict levels, point sheets were constructed for the buyer and the seller using these weights. The task materials for both buyer and seller included an "alternative contract," representing a contract offer by another company, which provided the subjects with a minimum point level to achieve in the negotiations. Note that the Jones task was used in all studies in this cumulative series and in the present study.

In Jones' study, the performance of subjects who received the computer contract suggestions was compared to subjects performing the same task, but without the computer suggestions. The results indicated that the computer suggestions led to higher joint outcomes in low conflict, but required greater negotiation time. In the high-conflict treatments, negotiators perceived that

there was a greater level of collaborative climate with computer support than without. However, this was not the case in the low-conflict treatments.

Study 2: Foroughi, Perkins, and Jelassi, 1995

The second study in this set, conducted by Abbas Foroughi, William C. Perkins, and M. Tawfik Jelassi, used Jones' task as outlined above—again with student subjects—but employed an interactive, comprehensive NSS that provided computer support throughout the negotiation process. Two kinds of software tools were used. First, Topic Commenter, a module of the GroupSystems GSS created at the University of Arizona, served as a means of electronic communication between the bargainers to be used for entering their comments and proposals, displaying them on a public screen, and allowing viewing of each other's inputs on their private screens.

The second type of software was a decision support system (DSS) developed for this study to support alternative contract generation and evaluation. Each negotiator had his or her own DSS, which consisted of a spreadsheet with two windows, running on a standalone microcomputer placed beside the networked electronic communication device. Negotiators used Window #1, the Decision Tool, to input their own priorities for the issues as well as their perception of the other party's priorities based on what they learned during the "statement of interests" stage of the negotiation. During this stage of the structured integrative bargaining process, the negotiators provided each other with strong clues about their respective rankings of the four issues, enabling each negotiator to estimate the opponent's ranking of the issues from 1 to 4. Based on the priorities input by the subjects, the Decision Tool estimated the point structure of the other party, generated all the possible contract alternatives, and ranked them in descending order according to the joint outcome they would give. Then the Decision Tool displayed the three contract alternatives which gave the highest joint outcome based on the estimated rankings of the issues. Note that these three contract alternatives were often different for the two negotiators because of differences in the estimated rankings. The Decision Tool was designed to display only three contract alternatives to avoid the information overload that might result from displaying too many contract options. Window #2 contained a Contract Point Evaluator, which was used for alternative contract evaluation. It incorporated the complete point structure of the negotiator. The negotiator could plug in alternative contracts, and the algorithm determined the total points (for his or her side only) that could be achieved with each contract. The Decision Tool was used in all the studies that followed in this cumulative series as well as in the present study.

Although all the negotiating pairs used the same structured integrative bargaining process, only half of the negotiating pairs used the NSS. Each bargaining pair went through the same steps in the bargaining process, with the facilitator playing the same role, in both NSS and non-NSS situations. The non-NSS bargaining pairs met in a non-computer lab, with negotiators seated across from each other at the same distance as in the NSS treatments. The negotiators and the facilitator communicated orally, and the negotiators wrote their suggested contract proposals on a blackboard. In summary, data were collected for four cells (2 x 2 design): NSS, low conflict; NSS, high conflict; no NSS, low conflict; and no NSS, high conflict.

The results showed that the NSS did help bargainers achieve higher joint outcomes and more balanced contracts in both high- and low-conflict situations, but that NSS support significantly increased negotiation time. In terms of negotiator attitudes, satisfaction was greater for NSS negotiating pairs in both high and low conflict, and perceived negative climate was reduced for NSS bargaining pairs in low conflict.

Study 3: Perkins, Hershauer, Foroughi, and Delaney, 1996

This third study, co-authored by William C. Perkins, James C. Hershauer, Abbas Foroughi, and Michael M. Delaney, was nearly a replication of Study 2, but with two differences: First, there was no electronic communication between the bargainers in the NSS condition; and second—and more important—the subjects were purchasing managers, not students. This study had the same focus on structured integrative bargaining as Study 2, the same task, the same two levels of conflict, the same two-person buyer-seller negotiations, the same procedures, and the same dependent variables. The negotiation sessions were conducted on-site at the host corporations, which were located in the Phoenix and Indianapolis areas. Data for four cells were collected for this study (2 x 2 design): DSS only, low conflict; DSS only, high conflict; no NSS, low conflict; and no NSS, high conflict.

The sample size of this study was much smaller than Study 2, so there were few statistically significant results. Nevertheless, the direction of the results was consistent with the results found using student subjects. In both low- and high-conflict situations, managers with computer support (a DSS) had higher joint outcomes and better contract balance than those without computer support. Furthermore, managers with computer support made fewer offers and took less negotiation time than those without computer support. However, the results differed from Study 2 in that there were no significant differences in negotiator attitudes between bargaining pairs with computer support and those without. The key conclusion of Study 3 is that students and managers appear to have similar bargaining behavior, except that managers take less time to negotiate when they have computer support while students take more time.

Study 4: Delaney, Foroughi, and Perkins, 1997

The fourth study in the series, co-authored by Michael M. Delaney, Abbas Foroughi, and William C. Perkins, investigated the impact of using the decision support system alone as compared to a comprehensive NSS (DSS and electronic communication). In this study, the data from Foroughi et al.'s Study 2 were used and data from two additional cells were collected—high and low conflict with each party having access to the DSS only. These additional data were collected in a later semester using student bargaining pairs from the same undergraduate computer class as used in Study 2. In summary, data from six cells (3 x 2 design) were available: full NSS, low conflict; full NSS, high conflict; DSS only, low conflict; DSS only, high conflict; no NSS, low conflict; and no NSS, high conflict.

Compared with non-computer supported negotiating sessions, the DSS helped bargainers achieve higher joint outcomes for both levels of conflict but with longer negotiation times. The DSS improved contract balance (compared to no NSS) in the low-conflict situation. In terms of negotiator attitudes, however, the attitude measures for the DSS alone were not significantly

different from those with no NSS, and the satisfaction measure was less for the DSS than for the full NSS for both conflict levels. The results seem to indicate that—at least for student subjects using this specific task—it is the DSS component of an NSS that permits higher joint outcomes and more balanced contracts, while the electronic communication component impacts positively on negotiator attitudes.

Study 5: Foroughi, Perkins, and Jessup, 2005

The fifth study, co-authored by Abbas Foroughi, William C. Perkins, and Leonard M. Jessup, compared the use of audio-conferencing (via telephone) and computer conferencing (via Lotus Notes) in a dispersed negotiation setting. In this study, no face-to-face bargaining took place; the bargainers were located in separate rooms, with all bargaining taking place either by telephone or by computer conferencing. Once again, this study had the same focus on structured integrative bargaining as the previous three studies, the same task, the same two levels of conflict, the same two-person buyer-seller negotiations, the same procedures, and the same dependent variables. Subjects were students, and both parties in all bargaining pairs had the use of the DSS. The design was a 2 x 2, with data collected for four cells: audio-conferencing, low conflict; audio-conferencing, high conflict; computer conferencing, low conflict; and computer conferencing, high conflict.

The study result that stands out is that joint outcome was higher with the telephone in high conflict. Otherwise, it did not make any difference whether negotiations were conducted by computer conferencing or by telephone in terms of joint outcome and contract balance. As expected, negotiation time was greater with computer conferencing than with audio-conferencing. In terms of attitude measures, audio-conferencing enhanced negotiator attitudes (higher perceived collaborative climate, higher satisfaction, and lower perceived negative climate) in low conflict and did not negatively impact attitudes in high conflict. When there is little conflict, it appears as though computer conferencing (e.g., the mechanics of using the system and the impersonality of communicating via the computer) just got in the way, while the audio-conferencing let the bargainers get the job done quickly and easily. In high conflict, the efficiency aspects of audio-conferencing—a richer medium in which more communication can take place more quickly (people can speak faster than they can type)—overshadowed any negative social cues transmitted over the telephone, and the result was an improved joint outcome using less negotiation time. To summarize these conclusions in another way, efficiency matters to the bargainers! They were able to achieve outcomes that were just as good or better with audio-conferencing, with less bargaining time, and thus their attitudes toward audio-conferencing were either no different or more favorable than with computer conferencing.

Related Study: Goh, Teo, Wu, and Wei, 2000

Khim-Yong Goh, Hock-Hai Teo, Haixin Wu, and Kwok-Kee Wei carried out a laboratory experiment to investigate the impact of Web-based electronic messaging, a Web-based NSS, and an autonomous electronic bargaining agent on the outcomes of a multi-issue electronic commerce negotiation. Goh et al. chose to use the Jones manufacturing bargaining task as described in Study 1 above and the Foroughi et al. DSS as described in Study 2 above. Goh et al. used two independent variables in their study: level of conflict (low conflict and high

conflict) and the tools available to assist in the negotiations (electronic messaging, an NSS including electronic messaging and Foroughi et al.'s DSS, and an electronic bargaining agent). The use of an electronic bargaining agent is a new twist; unfortunately, how the electronic bargaining agent works is not clearly explained in the paper.

The findings of Goh et al. confirmed that the NSS significantly improved joint outcome and contract balance in the low-conflict situation. However, the findings did not confirm the same improvement in the high-conflict situation. The electronic bargaining agent was found to achieve outcomes comparable to but not significantly better than human bargaining pairs with electronic communication only.

Related Study: Lim and Yang, 2004

John Lim and Yin Ping Yang investigated the impact of level of conflict (low conflict and high conflict) and NSS support (having a DSS available or not) on negotiation outcomes—where all communication between the bargainers took place via videoconferencing. Lim and Yang again chose to use the Jones manufacturing bargaining task, and they used their own implementation of the Foroughi et al. DSS, which they called ProNeg. Student subjects were used, with from 8 to 10 bargaining pairs in each of the four cells of the experimental design. In effect, Lim and Yang replicated four of the six cells in the Goh et al. study above (all but the electronic bargaining agent cells) except that they substituted videoconferencing for text-based electronic communication.

Lim and Yang's results are not as supportive of the value of an NSS as Delaney et al.'s Study 4 results. In the high-conflict situation, the NSS did not improve joint outcomes or contract balance compared to the videoconferencing-only treatments. In low conflict, the NSS did improve joint outcome but did not improve contract balance. Bargaining pairs also spent more time in reaching agreements in the low-conflict situation, but not in the high-conflict situation.

Summary

The cumulative series of laboratory experiments described in this section—including the related studies—provides a useful and interesting perspective on the value of using a computerized negotiation support system. The core components of an NSS are an individual decision support system (DSS) for each party in the negotiation plus an electronic communication channel between the parties. This series of studies suggests that it is the DSS component of an NSS that permits higher joint outcomes and more balanced contracts, while the electronic communication component impacts positively on negotiator attitudes.

The electronic communication component of an NSS can take different forms. Most of the studies used text-based electronic communication, but two of them used different media: audio-conferencing (telephone) and videoconferencing. These two studies were quite different so no comparisons between these alternative media can be made. Nevertheless, the results make it clear that both audio-conferencing and videoconferencing—which are richer media than text-based electronic communication—tended to enhance the negotiation process.

The DSS component of an NSS appears to be the driving force in improving negotiation outcomes. In the low-conflict situation, the studies all agree that the use of a DSS with electronic communication improves joint outcome and contract balance compared to the use of electronic communication only or compared to no computer support. The situation is not as clear for the high-conflict situation, with several studies suggesting that a DSS improves joint outcome and contract balance while two studies did not find this result. In most cases—the notable exception being the study which used purchasing managers as subjects—the use of a DSS or a comprehensive NSS increased negotiation time compared to no computer support. There are, of course, costs and drawbacks to the use of an NSS, but the negative factors appear to be greatly outweighed by the potential benefits.

THE PRESENT STUDY

The previous NSS studies have investigated the presence or absence of a DSS, the presence or absence of electronic communication, the electronic communication media employed, and combinations of these factors. However, all of these studies have assumed symmetry in terms of the use of a DSS: Either both parties had a DSS or neither party had a DSS. In these early laboratory experiments, it was reasonable to assume that both parties had a DSS. In the real world, however, the negotiating parties represent different organizations, and each organization would have to develop or procure its own DSS customized for its own priorities. It may be reasonable for a large manufacturer which sells to a large number of buyers to develop a DSS, but not for the smaller buyers to make a similar investment in a customized DSS. Similarly, it may be reasonable for a large multi-store retailer to develop a DSS, but not for the various vendors from which it buys to make such an investment. The present study removes the symmetry requirement by investigating whether or not both parties in a buyer-seller negotiation need to have access to a DSS in order to gain the benefits of an NSS.

The present study was designed to answer the following research question: Is it necessary for both parties in the negotiation to have access to a DSS to gain the benefits of using an NSS?

To answer this research question, a study was designed with the level of DSS support as the key independent variable. The study used four levels of DSS support: both bargainers have DSS, seller only has DSS, buyer only has DSS, and neither has DSS. Further, the study used the same task as described in Study 1 above, the same two-person buyer-seller negotiations, the same DSS as described in Study 2 above, the same focus on structured integrative bargaining as in Studies 2-5, the same two levels of conflict as in Studies 1-5, the same dependent variables as in Studies 2-5, and almost the same procedures as in earlier studies in this series (more on this later). Electronic communication between the negotiating pairs was used for all experimental conditions. The dependent variables included four outcome measures—joint outcome (total benefits for both parties), contract balance (absolute value of the difference between the outcomes of the two bargainers in each negotiating pair), negotiation time, and the number of contracts proposed—and three post-bargaining attitude measures—perceived collaborative climate, perceived negative climate, and satisfaction. Individual differences were controlled by random assignment of subjects to the role of buyer or seller and to bargaining pairs, and with pairs randomly assigned to experimental treatments.

RESEARCH HYPOTHESES

Seven sets of hypotheses—one for each of the dependent variables—were formulated to address the research question. Each set consists of six hypotheses: For both low- and high-conflict tasks, one hypothesis compares the dependent variable when both bargainers have DSS support with that when neither party has DSS support; a second hypothesis compares the dependent variable when only the buyer has DSS support with that when neither party has DSS support; and a third hypothesis compares the dependent variable when only the seller has DSS support with that when neither party has DSS support. Recall that electronic communication between the negotiating pairs was used for all experimental conditions in this study, so the results will not be comparable to Studies 2-4 where comparisons were made to results when neither party was provided with any computer support.

Joint Outcome

In both the low- and high-conflict treatments, joint outcome is expected to increase when both parties use the DSS, because communication between the parties becomes more effective, all four issues are considered simultaneously, cognitive difficulty is reduced, and premature closure is avoided because alternative generation and evaluation are much easier (see Foroughi et al., 1995 for further discussion). Further, we expect that joint outcome will increase when either one of the negotiating parties uses the DSS. The reasons provided earlier certainly apply to the party using the DSS. We expect that the party without the DSS will be pushed toward simultaneous consideration of all the issues through the communications he or she receives from the party with the DSS.

H1.1: In the low-conflict treatments, bargaining pairs who both have DSS support will achieve a higher joint outcome than bargaining pairs without DSS support.

H1.2: In the low-conflict treatments, bargaining pairs when only the buyer has DSS support will achieve a higher joint outcome than bargaining pairs without DSS support.

H1.3: In the low-conflict treatments, bargaining pairs when only the seller has DSS support will achieve a higher joint outcome than bargaining pairs without DSS support.

H1.4: In the high-conflict treatments, bargaining pairs who both have DSS support will achieve a higher joint outcome than bargaining pairs without DSS support.

H1.5: In the high-conflict treatments, bargaining pairs when only the buyer has DSS support will achieve a higher joint outcome than bargaining pairs without DSS support.

H1.6: In the high-conflict treatments, bargaining pairs when only the seller has DSS support will achieve a higher joint outcome than bargaining pairs without DSS support.

Contract Balance

In both the low- and high-conflict treatments, contract balance is expected to be smaller when both parties use the DSS, because each party will be aware of the approximate number of points to be received by the opponent for a particular solution. This awareness will help each bargainer find a contract which is perceived to be fair to both parties and not disproportionately advantageous to one side. On the other hand, we expect contract balance to be larger when only

one party uses the DSS. In this case the bargainer using the DSS will have a distinct advantage and is expected to increase his or her share of the points at the expense of the bargainer without the DSS.

H2.1: In the low-conflict treatments, contract balance will be lower for bargaining pairs who both have DSS support than for bargaining pairs without DSS support.

H2.2: In the low-conflict treatments, contract balance will not be lower for bargaining pairs when only the buyer has DSS support than for bargaining pairs without DSS support.

H2.3: In the low-conflict treatments, contract balance will not be lower for bargaining pairs when only the seller has DSS support than for bargaining pairs without DSS support.

H2.4: In the high-conflict treatments, contract balance will be lower for bargaining pairs who both have DSS support than for bargaining pairs without DSS support.

H2.5: In the high-conflict treatments, contract balance will not be lower for bargaining pairs when only the buyer has DSS support than for bargaining pairs without DSS support.

H2.6: In the high-conflict treatments, contract balance will not be lower for bargaining pairs when only the seller has DSS support than for bargaining pairs without DSS support.

Negotiation Time

There are good arguments for expecting the use of a DSS to increase negotiation time, as well as good arguments for expecting the use of a DSS to decrease negotiation time. In terms of increasing negotiation time, the use of a DSS introduces another layer of complexity into the negotiation process. The mechanics of using the DSS, including the use of the keyboard, could be expected to lengthen negotiation time. On the other hand, both parties are already using the keyboard for electronic communication; it is only necessary for a bargainer to switch from the electronic communication application to the DSS or vice versa by choosing a different tab. In terms of decreasing negotiation time, the DSS quickly provides reasonable contract alternatives to suggest in the negotiations, which may help the bargaining pair arrive at a contract more quickly than would happen if such suggestions were not available. We believe that the increased negotiation time found in Study 2 when comparing negotiation time using an NSS to time without an NSS was primarily the result of adding electronic messaging, which required the use the keyboard for all communications, rather than adding the DSS. Considering these arguments, we expect that there will be no difference in negotiation time in any of the experimental conditions. Because we expect no differences in negotiation time, we will not formally state the six hypotheses, but the results will be shown in Table 1.

Number of Contracts Proposed

Once again, there are good arguments for expecting the use of a DSS to increase the number of contracts proposed, as well as good arguments for expecting the use of a DSS to decrease the number of contracts proposed. In terms of increasing the number of contracts proposed, the use of a DSS facilitates the generation of reasonable alternatives and permits the efficient analysis of a large number of contract proposals. With the use of a DSS, there is no reason to limit the number of contracts proposed—the party or parties with the DSS should keep proposing alternatives until arriving at an acceptable result. In terms of decreasing the number of contracts proposed, the use of a DSS should assist the party or parties with the DSS to quickly identify

contracts which are relatively attractive to both parties without having to generate as many alternatives as would be required without the DSS. Of course, if only one party has the DSS, then the contracts identified would certainly expect to be more attractive to the party with the DSS. Considering these arguments, we expect that there will be no difference in number of contracts proposed in any of the experimental conditions. The six hypotheses for number of contracts proposed will not be formally stated, but the results will be shown in Table 1.

Post-Bargaining Negotiator Attitudes: Perceived Collaborative Climate, Perceived Negative Climate, and Satisfaction

Post-bargaining negotiator attitudes were measured by a questionnaire (developed by Jones, 1988) administered at the end of the bargaining session. The subjects responded to each item in the questionnaire by circling a number from 1 to 7 on a seven-point Likert scale. Based on factor analysis of the questionnaire data collected in Study 2 (Foroughi et al., 1995), the items were condensed into three factors that the authors named perceived collaborative climate, perceived negative climate, and satisfaction.

For several reasons, we hypothesize that there will be no difference in perceived collaborative climate or perceived negative climate in any of the experimental conditions. First, in the low-conflict treatments, bargainers' preferences for the issues differ, and there is room for tradeoffs. There will be a minimum of nonrational escalation of conflict whether or not one or both users have access to a DSS, and thus the presence or absence of a DSS is not expected to have an effect on perceived collaborative climate or perceived negative climate. Second, electronic communication will be used for all communications in all experimental conditions in this study. With electronic communication, the attention of the negotiators is focused on the content of the negotiation instead of on any personal idiosyncrasies, thus tending to create a more collaborative climate and minimizing nonrational escalation of conflict and perceived negative climate. Third, the way this task is framed to the negotiators—they are to reach an agreement that gives their company as many points as possible but also maximizes joint outcome—and the structured integrative bargaining process that will be employed in all experimental conditions will lead to a generally positive climate at the beginning of the process that is expected to be maintained throughout the negotiation because all communication is carried out electronically.

Previous research (see Foroughi et al.'s Study 2) found that when both parties have a comprehensive NSS (electronic communication and a DSS) they are more satisfied than if the bargaining pair had no computer support. This result was expected; the authors of Study 2 argued that if negotiators achieve higher joint outcomes and better contract balance (as hypothesized and confirmed in Study 2) they are likely to be more satisfied. However, Delaney et al.'s Study 4 found that providing both parties with a DSS—but no electronic communication—did not make them more satisfied than if they had no computer support. This points to the possibility that it is the addition of electronic communication that increased satisfaction in Study 2. Now the question is whether adding one or two DSSs to a situation where the bargaining pair already enjoys electronic communication will increase satisfaction.

Considering only the experimental conditions where one of the two parties is provided the use of a DSS, we do not expect satisfaction to be increased in either conflict level. In this case, the

negotiating party with a DSS might be more satisfied—he or she has more control over the negotiation and can reasonably expect to do at least as well as the other negotiator—but it seems unreasonable to expect the other party to be more satisfied. In this case, the overall satisfaction measure, which is the average across all participants in that particular experimental condition, is unlikely to be significantly increased.

If both negotiating parties have the use of a DSS, the impact on satisfaction is more difficult to predict. On the one hand, it seems reasonable that if negotiators achieve higher joint outcomes and better contract balance, as hypothesized above, they will also be more satisfied. On the other hand, both negotiators are already using electronic communication and the addition of a DSS, helpful as it may be, might provide only an insignificant boost to the satisfaction measure. We expect this latter argument to prevail, and thus we expect that there will be no difference in satisfaction between bargaining pairs when both bargainers have DSS support and bargaining pairs without DSS support. Because we expect no differences in any of the three attitude measures, we will not formally state these three sets of hypotheses; the results will be shown in Table 2.

EXPERIMENTAL PROCEDURES

This study employed a 4 x 2 experimental design, with 14 pairs of bargainers in each of the eight cells, for a total of 112 bargaining pairs or 224 individual subjects. One independent variable was the level of DSS support provided (neither party has DSS, both parties have DSS, only buyer has DSS, or only seller has DSS), and the second independent variable was the level of conflict (low conflict or high conflict). The subjects were volunteers from the junior-level Operations and Logistics Management course at Arizona State University. To provide an incentive to subjects, participants received five bonus exam points (1.43% of the student's grade in the course). In addition, subjects were told that each pair of bargainers should attempt to maximize their joint score, and that a monetary reward of \$20 per student would be given to the bargaining pair with the highest joint outcome in each of the eight experimental conditions.

All bargaining sessions were conducted in one of the computer classrooms in the Computer Commons building at Arizona State University. The first author of this paper served as the facilitator for all sessions, aided by a graduate assistant. The number of bargaining pairs in each bargaining session varied from a low of one bargaining pair to a high of nine bargaining pairs, with most sessions involving two to six pairs. Each session had a single level of DSS support (e.g., seller only had DSS) and a single level of conflict (e.g., high), but participants did not know this. Students signed up to participate in their Operations and Logistics Management class, and when they arrived at the computer classroom they were randomly assigned to bargaining pairs and to the buyer or seller role. Bargaining pairs were never seated near each other, and in many cases subjects did not even know with whom they were negotiating.

Each experimental session was conducted in three phases. During Phase 1, subjects filled out a consent form and a pre-negotiation attitude questionnaire, and a brief training session was held on the use of the electronics communication software, WebBoard. Subjects were then provided a two-page case study describing the negotiation in which they would be involved, as well as a page of confidential information about their company (either the buyer or the seller). An

example of this information—in this case for the buyer in the low-conflict treatments—is provided in the Appendix to Foroughi et al., 1995, pp. 507-510. After these materials had been read by the subjects, they were given point sheets for their respective companies. Subjects then completed a Point Sheet Exercise, in which they were asked to add up the points for each issue of the alternative (“third party”) contract and verify that the score given at the bottom of the point sheet was correct. This was done to make sure that the subjects understood how the total scores were computed.

The next step in Phase 1 varied depending upon the level of DSS support provided in the particular session. For those sessions in which neither party had the use of the DSS, this step was omitted. Where both parties had the use of the DSS, approximately ten minutes of software training was given on the DSS, which was already running on the computers they were using and could be opened by pressing a tab. For those sessions in which only the buyers or only the sellers had the use of the DSS, the group was split, with those subjects having the use of the DSS staying in the computer classroom with the facilitator and receiving approximately ten minutes of software training on the DSS. The subjects who did not have the use of the DSS were taken into an area outside the computer classroom by the graduate assistant; he discussed how the bargaining was going to take place and gave these subjects the opportunity to ask any questions about the negotiations. (He was very careful not to give any hints about what the other participants were doing in the computer classroom.) As the last part of Phase 1, subjects filled out a pre-negotiation questionnaire to ensure that they understood the task.

In Phase 2, subjects were given a final instruction sheet with an outline of the negotiation process. They then proceeded to negotiate, with all communications taking place via WebBoard. When an agreement was reached, they signed a final agreement form.

In Phase 3, all subjects answered a post-bargaining attitude questionnaire. Throughout all three phases of the experiment, the facilitator directed the activities of the bargaining pairs, following a detailed script.

STATISTICAL ANALYSIS AND EXPERIMENTAL RESULTS

The SPSS statistical package was used to analyze the experimental results, using a fixed-effects two-way analysis of variance (2-way ANOVA) model for each of the seven dependent variables (both outcome and attitude variables), with DSS support level and conflict level as the main effects. The only significant interaction between DSS support level and conflict level occurred with the joint outcome measure. Next, for each dependent variable and each conflict level, a one-way ANOVA was performed followed by a series of planned comparisons among the four levels of DSS support. The planned comparisons of the means were carried out using a t-test with an alpha of 0.05. Tables 1 and 2 summarize the hypotheses and the results.

TABLE 1

Hypotheses and Results

(sample size: eight cells, 14 dyads per cell, total of 112 dyads, total of 224 subjects)

| Hypotheses | Mean | | | | Both with DSS vs. neither with DSS | | Buyer with DSS vs. neither with DSS | | Seller with DSS vs. neither with DSS | |
|---|-----------------------|-----------------------|--------------------|---------------------|------------------------------------|----------------------|-------------------------------------|----------------------|--------------------------------------|----------------------|
| | Neither party has DSS | Both parties have DSS | Only buyer has DSS | Only seller has DSS | Level of significance | Hypothesis supported | Level of significance | Hypothesis supported | Level of significance | Hypothesis supported |
| JOINT OUTCOME—LOW CONFLICT TASK: H1.1 Both DSS>Neither DSS H1.2 Buyer DSS>Neither DSS H1.3 Seller DSS>Neither DSS | 115.00 | 128.14 | 125.50 | 123.64 | p<0.01 | YES | p<0.01 | YES | p<0.02 | YES |
| JOINT OUTCOME—HIGH CONFLICT TASK: H1.4 Both DSS>Neither DSS H1.5 Buyer DSS>Neither DSS H1.6 Seller DSS>Neither DSS | 100.79 | 101.79 | 101.00 | 101.86 | p<0.23 | NO | p<0.78 | NO | p<0.15 | NO |
| CONTRACT BALANCE—LOW CONFLICT TASK: H2.1 Both DSS<Neither DSS H2.2 Buyer DSS=Neither DSS H2.3 Seller DSS=Neither DSS | 11.00 | 5.29 | 8.07 | 9.21 | p<0.02 | YES | p<0.24 | YES | p<0.49 | YES |
| CONTRACT BALANCE—HIGH CONFLICT TASK: H2.4 Both DSS<Neither DSS H2.5 Buyer DSS=Neither DSS H2.6 Seller DSS=Neither DSS | 5.36 | 3.64 | 4.43 | 3.71 | p<0.26 | NO | p<0.55 | YES | p<0.32 | YES |
| NEGOTIATION TIME—LOW CONFLICT TASK: H3.1 Both DSS=Neither DSS H3.2 Buyer DSS=Neither DSS H3.3 Seller DSS=Neither DSS | 31.62 | 29.64 | 34.14 | 34.21 | p<0.71 | YES | p<0.66 | YES | p<0.57 | YES |
| NEGOTIATION TIME—HIGH CONFLICT TASK: H3.4 Both DSS=Neither DSS H3.5 Buyer DSS=Neither DSS H3.6 Seller DSS=Neither DSS | 47.93 | 50.14 | 57.14 | 51.57 | p<0.67 | YES | p<0.10 | YES | p<0.50 | YES |
| NO. OF CONTRACTS—LOW CONFLICT TASK: H4.1 Both DSS=Neither DSS H4.2 Buyer DSS=Neither DSS H4.3 Seller DSS=Neither DSS | 6.38 | 4.86 | 5.57 | 5.86 | p<0.26 | YES | p<0.55 | YES | p<0.67 | YES |
| NO. OF CONTRACTS—HIGH CONFLICT TASK: H4.4 Both DSS=Neither DSS H4.5 Buyer DSS=Neither DSS H4.6 Seller DSS=Neither DSS | 8.93 | 9.00 | 8.43 | 10.00 | p<0.97 | YES | p<0.77 | YES | p<0.56 | YES |

TABLE 2

Hypotheses and Results

(sample size: eight cells, 14 dyads per cell, total of 112 dyads, total of 224 subjects)

| Hypotheses | Mean | | | | Both with DSS vs. neither with DSS | | Buyer with DSS vs. neither with DSS | | Seller with DSS vs. neither with DSS | |
|---|-----------------------|-----------------------|--------------------|---------------------|------------------------------------|----------------------|-------------------------------------|----------------------|--------------------------------------|----------------------|
| | Neither party has DSS | Both parties have DSS | Only buyer has DSS | Only seller has DSS | Level of significance | Hypothesis supported | Level of significance | Hypothesis supported | Level of significance | Hypothesis supported |
| PERCEIVED COLLABORATIVE CLIMATE—LOW CONFLICT TASK: H5.1 Both DSS=Neither DSS H5.2 Buyer DSS=Neither DSS H5.3 Seller DSS=Neither DSS | 5.38 | 5.63 | 5.39 | 6.50 | p<0.45 | YES | p<0.96 | YES | p<0.29 | YES |
| PERCEIVED COLLABORATIVE CLIMATE—HIGH CONFLICT TASK: H5.4 Both DSS=Neither DSS H5.5 Buyer DSS=Neither DSS H5.6 Seller DSS=Neither DSS | 5.08 | 5.13 | 5.41 | 5.40 | p<0.88 | YES | p<0.36 | YES | p<0.33 | YES |
| PERCEIVED NEGATIVE CLIMATE—LOW CONFLICT TASK: H6.1 Both DSS=Neither DSS H6.2 Buyer DSS=Neither DSS H6.3 Seller DSS=Neither DSS | 2.62 | 2.70 | 2.73 | 1.38 | p<0.83 | YES | p<0.79 | YES | p<0.51 | YES |
| PERCEIVED NEGATIVE CLIMATE—HIGH CONFLICT TASK: H6.4 Both DSS=Neither DSS H6.5 Buyer DSS=Neither DSS H6.6 Seller DSS=Neither DSS | 3.62 | 3.31 | 3.32 | 3.42 | p<0.39 | YES | p<0.50 | YES | p<0.61 | YES |
| SATISFACTION—LOW CONFLICT TASK: H7.1 Both DSS=Neither DSS H7.2 Buyer DSS=Neither DSS H7.3 Seller DSS=Neither DSS | 5.41 | 5.64 | 5.26 | 6.34 | p<0.43 | YES | p<0.62 | YES | p<0.38 | YES |
| SATISFACTION—HIGH CONFLICT TASK: H7.4 Both DSS=Neither DSS H7.5 Buyer DSS=Neither DSS H7.6 Seller DSS=Neither DSS | 5.11 | 5.06 | 5.35 | 5.02 | p<0.88 | YES | p<0.31 | YES | p<0.77 | YES |

DISCUSSION OF RESULTS

Joint Outcome and Contract Balance

For the low-conflict treatments, the joint outcome and contract balance hypotheses were all supported. When both parties have the DSS, joint outcome is higher and contract balance is smaller than when neither party has the DSS. These results are consistent with earlier studies. The new result is that when either the buyer or the seller has the DSS the joint outcome is higher than when neither party has the DSS. It is not necessary for both parties to have the DSS to gain the higher joint outcome from the DSS! As hypothesized, providing either the buyer or the seller with the DSS did not improve contract balance. The negotiating party using the DSS has a distinct advantage and was able to increase his/her share of the joint outcome at the expense of the party without the DSS.

For the high-conflict treatments, none of the joint outcome hypotheses was supported. While the use of the DSS by both parties or by one party did increase the joint outcome, the increase was not statistically significant. Recall that the baseline “neither party has DSS” condition does have electronic communication, and that the baseline in previous Studies 2 and 4—where the results showed an increase in joint outcome in the high-conflict treatment—did not have electronic communication. Perhaps this difference in communication is the key: In Studies 2 and 4 the negotiators communicated orally, and the negotiators wrote their suggested contract proposals on a blackboard. Oral communication is a richer medium than electronic communication, and it seems likely that this is important in a high-conflict situation which requires more work, more cooperation, and more focus on simultaneous issue consideration than is necessary in low conflict. In Study 5, for instance, joint outcome in the high-conflict audio-conferencing treatment was higher than in the high-conflict computer conferencing treatment. It would be interesting to investigate whether providing the DSS to one of the negotiating parties in a high-conflict audio-conferencing treatment would increase joint outcome compared to a high-conflict audio-conferencing treatment when neither party has the DSS.

Another reason for the lack of support of the joint outcome hypotheses in the high-conflict treatments may be an artifact of the experimental design in this study. Multiple negotiating pairs were negotiating at the same time in the same room in this study. Each pair did not have any oral or electronic communication with other pairs during the study, but they were certainly aware when other pairs completed negotiation and left the room. This may have caused some negotiating pairs to prematurely end their negotiation by adopting a “satisficing” contract rather than pressing on for a better joint outcome. This appears not to have been a problem in the low-conflict treatments, where it was relatively easy to arrive at a contract that was good for both parties, but it may well have been a problem in the high-conflict treatments where more effort and more cooperation were necessary to arrive at a good joint solution.

In the high-conflict treatment, the hypothesis that contract balance will be lower for bargaining pairs who both have DSS support than for bargaining pairs without DSS support was not supported. Contract balance was improved, but not enough to be significant. Again, the use of a lean medium of communication—electronic communication—may have made it more difficult

to carry out the tougher negotiations necessary to achieve better contract balance in high conflict. As hypothesized, providing either the buyer or the seller with the DSS did not improve contract balance in the high-conflict treatments.

Negotiation Time and Number of Contracts Proposed

As hypothesized, there were no differences found in negotiation time—in either low conflict or high conflict—whether or not both negotiating parties used the DSS or either one of the negotiating parties used the DSS. In the earlier discussion of the hypotheses, it was suggested that factors tending to increase negotiation time—such as the mechanics of using the DSS—and factors tending to decrease negotiation time—such as the DSS quickly providing reasonable contract alternatives—might tend to balance out, and that appears to have been what happened.

Also as hypothesized, there were no differences found in number of contracts proposed—in either low conflict or high conflict—whether or not both negotiating parties used the DSS or either one of the negotiating parties used the DSS. In the earlier discussion, it was suggested that factors tending to increase the number of contracts proposed—such as the DSS facilitating the generation of reasonable contract alternatives and permitting the efficient analysis of a large number of contracts—and factors tending to decrease the number of contracts proposed—such as the DSS quickly identifying contracts which are reasonably attractive to both parties without the necessity of considering a large number of contracts—might tend to balance out, and, again, that appears to be what happened.

Perceived Collaborative Climate and Perceived Negative Climate

All of the hypotheses related to perceived collaborative climate and perceived negative climate were supported. There were no differences in perceived collaborative climate or in perceived negative climate, in either low conflict or high conflict, whether or not both negotiating parties used the DSS or either one of the negotiating parties used the DSS. Because electronic communication was used in all experimental conditions, the attention of the negotiators was focused on the content of the negotiation and not on any personal idiosyncrasies, thus tending to increase perceived collaborative climate and minimize perceived negative climate. In addition, the structured integrative bargaining process and the way in which the task was framed to the negotiators—they were to reach an agreement that gives their company as many points as possible but also maximizes joint outcome—led to a generally positive climate at the beginning of the process that was maintained throughout the negotiation because all communication was carried out electronically.

Satisfaction

All of the hypotheses relating to satisfaction were supported. Four of the hypotheses suggested that, in either low conflict or high conflict, there would be no differences in satisfaction between bargaining pairs when only the buyer or only the seller has DSS support and bargaining pairs without DSS support. While the negotiating party with the DSS might be more satisfied because he or she has more control over the negotiation, the other party has no reason to be more satisfied. As expected, the overall satisfaction measure, which is the average across all participants in that particular experimental condition, was not significantly increased.

The other two hypotheses, which asserted that there would be no differences in satisfaction between bargaining pairs when both bargainers have DSS support and bargaining pairs without DSS support, were also supported. As expected, the outcome gains (which occurred only in low conflict) were not sufficient to increase satisfaction to the bargainers when they already enjoyed electronic communication.

SUMMARY AND CONCLUSIONS

In summary, this study showed that—for low-conflict treatments—negotiating pairs when both bargainers have DSS support and negotiating pairs when only one bargainer (buyer or seller) has DSS support achieved higher joint outcomes than negotiating pairs without DSS support. For high-conflict treatments, joint outcomes increased when DSS support was provided to one or both participants but not enough to be statistically significant.

For low-conflict treatments, negotiating pairs when both bargainers have DSS support achieved a lower contract balance than negotiating pairs without DSS support. For high-conflict treatments, the contract balance was lowered when DSS support was provided to both participants but not enough to be significant. In both low- and high-conflict treatments, if only one participant was provided DSS support, contract balance was not lowered—the bargainer with the DSS had an advantage.

Furthermore, there were no significant differences in any of the other dependent variables—negotiation time, number of contracts offered, perceived collaborative climate, perceived negative climate, and satisfaction—across all experimental conditions. In our view, the lack of significant differences in the negotiation time and number of contracts occurred because forces tending to increase or decrease these measures essentially balanced out. This “balancing out” may also have occurred for the three negotiator attitude measures. In addition, it seems that the presence or absence of DSS support had very little impact on these attitude measures when the negotiators already enjoyed electronic communication in all experimental conditions.

What did we learn from this study? First, we answered the question posed in the title of this paper: Can a decision support system help in negotiations even if only one participant has a DSS? The answer is yes! In low conflict, bargaining pairs when only one party had DSS support achieved higher joint outcomes than bargaining pairs without DSS support. In high conflict, joint outcomes went up although not enough to be statistically significant. This result means that it may be reasonable for a large manufacturer which sells to a large number of buyers to develop a DSS even if the smaller buyers do not opt to make a similar investment in a customized DSS, or it may be reasonable for a large multi-store retailer to develop a DSS even if the various vendors from which it buys do not make such an investment.

Second, this study—when considered in conjunction with Foroughi et al.’s Study 2 and Delaney et al.’s Study 4—provided support for the notion that it is primarily the DSS component of an NSS that permits higher joint outcomes and more balanced contracts, while it is the electronic communication component that impacts positively on negotiator attitudes. In this study all experimental conditions included electronic communication, and there were no significant

differences in the negotiator attitude measures across all treatments. This study varied the DSS component and found significant improvement in joint outcomes in the low-conflict treatments when one or both bargainers used the DSS, as well as better contract balance when both bargainers used the DSS. In the high-conflict treatments the results were not as strong, but still tended toward higher joint outcomes when one or both parties used the DSS and better contract balance when both bargainers used the DSS.

Third, this study showed the need for further research in the use of an NSS. A valuable follow-up to the present study would be to investigate whether providing the DSS to one of the negotiating parties in audio-conferencing treatments (both low conflict and high conflict) would increase joint outcomes compared to audio-conferencing treatments when neither party has the DSS. Studies also need to be conducted on the effects of an NSS on bargaining between negotiating teams (rather than individuals) and in different mixed-motive task environments. Also needed are experiments using different NSSs to assist in the same negotiating situation, so that comparisons can be made between the NSSs. Most important, researchers need to study the use of an NSS in actual negotiation situations. Building the NSS will be a very difficult task, for it will involve translating the bargaining priorities of both sides into a “point structure” of some sort that makes sense, and it will require the combined efforts of systems professionals and buying/selling professionals to develop such an NSS.

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