On-line Trade Negotiations: A Study of Perceived Fairness of Negotiation-Support Tools Usage

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Abstract

The proliferation of the digital economy has created a need for firms to negotiate business deals online. Negotiation support tools are likely to play a more critical role in web portal sites, manufacturer-supplier procurement sites, and on-line exchanges. Prior research has shown that negotiators concern themselves with fairness because they care about building and strengthening business relationships among trading partners, while some negotiators are even willing to forego material benefits to achieve it. Notwithstanding their importance, the impact of the different degree of sophistication of computer negotiation support on the perceived fairness of negotiation outcomes and processes are not well understood. This research addresses this gap by conducting laboratory experiments to investigate negotiating dyads’ perceived fairness of the negotiation process and outcome in multi-issue, on-line trade negotiations supported by three types of computer negotiation support tools with different degrees of sophistication – web-based electronic messaging (EM), negotiation support systems (NSS), and autonomous electronic bargaining agents (EBA). Two types of bargaining situation were investigated: integrative and distributive bargaining. Our findings show that the degree of sophistication in the negotiation support does affect different dimensions of the perceptions of fairness of negotiation outcomes and processes in integrative and distributive bargaining situations. EM was typically found to have the highest evaluations in perceived fairness of negotiation process and outcome in integrative and distributive negotiations, while there are no significant perceived differences in fairness of negotiation outcomes and processes in EBA and NSS-supported distributive negotiations. Implications for NSS and EBA implementation and research are drawn.
1. INTRODUCTION

With the proliferation of the digital economy, e-commerce is changing the methods by which firms establish inter-organizational relationships in both conventional and electronic markets. On electronic markets enabled by the Internet, business relationships among firms may tend to be short-lived and be governed solely by market-level contractual terms, instead of mutual trust and goodwill that contribute to long-term, viable trading partnerships. Indeed, inter-organizational relationships in e-commerce are increasingly carved out and shaped by computer negotiation support tools in web portal sites, manufacturer-supplier procurement sites, and online exchanges such as FreeMarket Inc. and Covisint LLC (Kersten 1999; Laseter, et al. 2001).

Nevertheless, as research in the information systems literature have shown, cultivating trust and goodwill in inter-organizational relationships among trading partners or customers is a challenging issue which has not been entirely resolved (Ratnasingam 2000; Schoder and Yin 2000). In particular, a crucial antecedent to developing trust and goodwill in firm-level relationships of B2B e-commerce is the perceived fairness of negotiation processes and outcomes achieved in on-line negotiations. Negotiators concern themselves with fairness of negotiation processes and outcomes because they care about building, preserving, and strengthening business relationships among trading partners (Mawr and Aycock 2000; Deutsch 1985). Furthermore, prior research has shown negotiators care about fairness and that they are willing to forego material benefits to achieve it (Guth, et al. 1982). Strong relationships among trading partners have intrinsic value in providing either emotional satisfaction or a more efficient means to acquire required resources from secure, familiar parties (Tripp, et al. 1995). This is especially pertinent in B2B e-commerce on the Internet – where transaction costs are low, marginal search costs are essentially zero, and switching costs are not prohibitive – thus heightening the risks of losing long-cultivated relationships and trading opportunities among
firms. Therefore, studying negotiators’ perceived fairness of negotiation processes and outcomes in on-line negotiations is crucial to engendering goodwill and trust among firms.

To date however, most empirical studies on computer negotiation support concentrate heavily on three aspects: examining the functionalities of various types of computer negotiation support tools, comparing various types of computer negotiation support with face-to-face negotiation, and studying the objective economic measures of the impact of computer negotiation support (see for e.g., Foroughi, et al. 1995; Rangaswampy and Shell 1997; Oliver 1997; Croson 1999; Swaab, et al. 2002; Purdy, et al. 2000). On the other hand, no study in the negotiation literature has examined the impact of the different degree of sophistication of computer negotiation support on perceptual measures of negotiation in different bargaining situations, specifically focusing on perceived fairness in negotiation outcomes and processes.

Drawing from the bargaining, negotiation support systems (NSS), social psychology, and computer-mediated communication literature, we investigate negotiating dyads’ perceptual measures of fairness in multi-issue, on-line trade negotiations supported by three types of computer negotiation support tools with different degrees of sophistication. The least sophisticated tool is web-based electronic messaging (EM), while the web-based NSS is more sophisticated than EM in terms of the provision of decision-support aids (besides messaging facilities) during negotiation processes. The most sophisticated negotiation-support tool is web-based, automated electronic bargaining agents (EBA). In evaluating the perceptual measures of fairness of using the above negotiation-support tools, we also distinguish between integrative and distributive bargaining situations (Walton and McKersie 1965). Specifically, we also distinguish between the perceived fairness of the bargaining process as well as of the negotiated outcome. In sum, this study aims to answer the following research question: Will the use of more
sophisticated negotiation-support tools such as EBA and NSS affect the perceptions of fairness in negotiation processes and outcomes in integrative and distributive bargaining situations?

The contributions of this research are as follows. From an academic perspective, we evaluate negotiators’ perceived fairness of using various negotiation support tools in a B2B e-commerce context in terms of multiple dimensions seldom documented in the negotiation literature – accuracy, consistency, correctability, and ethicality (Leventhal 1980). Unlike most studies which only investigate how different negotiation support affects the objective outcomes of negotiations, we compare how negotiating parties’ perceived fairness of negotiation processes and outcomes differ under various degree of sophistication in different negotiation support tools. In addition, we document the “negotiation dances” (Milter, et al. 1996; Mumpower 1991) of all intermediate offers and counter-offers of negotiating parties – an analysis which few negotiation studies have attempted. Such an integrative analysis can provide a rigorous, well-developed theoretical vantage point from which to assess negotiation support tools’ impact.

From a practical perspective, this research benchmarks the fairness perceptual effects of NSS and EBA against EM in a B2B e-commerce context and informs practitioners about the types of negotiation tools and the related design issues that are relevant for negotiations in e-commerce. Research on the above-proposed issues has important implications for e-commerce technologies using computer negotiation supports. First, negotiation support tools used to achieve superior settlements in on-line trade negotiations may have differential effects in terms of objective and perceptual measures of negotiation outcomes and processes. Second, we argue that such negotiation support tools can affect the perception measures of fairness in negotiations that ultimately will influence firms’ long-term trading relationships with other businesses.
2. CONCEPTUAL FOUNDATIONS AND HYPOTHESES

2.1 Theoretical Perspectives of Perceived Fairness

*Fairness of outcomes* is often thought in terms of “distributive justice” in the justice literature (Deutsch 1985). A significant finding in the negotiation literature is that individuals have different perceived standards of distributive justice or fairness in terms of equity, equality or need (Tripp, et al. 1995; Loewenstein, et al. 1989). Studies on distributive justice have concluded that perceived fairness of negotiation outcome is conditional upon perceptual, interpersonal, and situation factors (Hegtvedt and Markovsky 1995; Hegtvedt and Killian 1999). Examples of such factors include an individual’s negotiation outcome payoff and performance level.

In particular, individuals’ own interest may also affect judgment of perceived fairness in negotiation outcomes (Hegtvedt 1992). Many studies have emphasized the egocentric bias in justice evaluations where individuals care about fairness perceptions only to the extent that they affect their own outcomes (Messick and Sentis 1979; Cohen and Greenberg 1982). As such, negotiators tend to judge that a greater amount of outcome payoff to self as fair but that the same amount to the other party might be deemed unfair (Hegtvedt and Killian 1999).

In addition to a negotiator’s outcome payoff, it is found that perceptions of fairness of pay divisions are conditioned by the individual’s performance level. High performers who receive less than equitable outcomes are more likely to evaluate the distribution as unfair than low performers who receive more of their equitable share (Messick and Sentis 1979; Hegtvedt and Killian 1999). Therefore, individuals with satisfactory or higher (unsatisfactory or lower) than expected negotiation outcomes will have higher (lower) evaluations of perceived fairness of the negotiation outcomes.
Fairness of processes is often judged by standards or principles broadly labeled as “procedural justice” within the justice literature. Following Leventhal (1980), we drill down and identify four dimensions of procedural fairness below for the purpose of this study:

a) **Accuracy**: the extent to which decisions are based on accurate information.

b) **Consistency**: the extent to which decision procedures are predictable and followed across decision situations.

c) **Correctability**: the extent to which the process provides opportunities for appeals, reversals of decisions, or grievances.

d) **Ethicality**: the extent to which procedures avoid violations of moral and ethical standards such as lying and bribery.

Negotiation is a complex process as it involves both human cognitive and social dimensions (Tripp, et al. 1995). Examining perceived fairness in negotiation processes in terms of these four dimensions allow us to gain an in-depth understanding of the complex negotiation process and facilitate us to pin-point the specific dimension that deserves closer attention under each type of negotiation support tool in on-line trade negotiations.

During a negotiation process, individuals tend to interpret conflict situations in a self-serving manner. Specifically, negotiating parties often engage in a struggle to achieve their own fair agreement (Thompson and Lowenstein 1992). The extent of the differences in payoff division each party makes is negatively associated to the perceived fairness in the negotiation process (Hegtvedt and Killian, 1999). We thus expect that individuals in high conflict bargaining situations (or distributive negotiations) will have lower evaluations of the perceived fairness in the negotiation process than individuals in low conflict bargaining situations (or integrative negotiations).
Negotiators’ perceptions of the negotiation process are fundamental to any negotiation because it affects both negotiators’ perception of the negotiation outcome and the acceptance of the negotiation agreement. Specifically, negotiators who perceive the bargaining process as fair are more likely to perceive their own and others’ outcomes as fair (Lind and Tyler 1988; Hegtvedt and Killian 1999). This is known as the “fair process effect” – how people see fairness of a process influences their perceptions of the outcome, which then influences their acceptance of agreements resulting from the negotiation process (Pruitt, et al. 1993).

In particular, the “fair process effect” is illustrated by the dashed arrows in Figure 1 which shows our research conceptual framework for this study. Additionally, Figure 1 shows the types of negotiation situations examined and the various types of negotiation support studied in this paper. We elaborate these components of our conceptual framework in the next few sections.

[Insert Figure 1 about here.]

2.2 Integrative and Distributive Negotiations

Within the negotiation literature, the amount of conflict of interest over negotiation issues that exist between negotiating parties has been widely studied and explored (for e.g., Walton and Mckersie 1965; Thompson 1990). Distributive negotiations (high-conflict bargaining situations) are those in which negotiating parties bargain over a fixed pie in which there can be little compromise over a small number of mutually identical issues of high priority. In addition, one party’s gain is usually the other party’s loss (i.e., zero-sum or “fixed pie” outcomes prevail in such circumstances). Therefore, distributive negotiations typically require less exchanges of information over the small number of similar high-priority issues, are more structured and straightforward even though the negotiation environment may be more hostile (Strobel 2000).
In contrast, integrative negotiations (low-conflict bargaining situations) allow negotiating parties to “expand the pie” through novel problem solutions, creativity, and identification of differences in priorities and/or compatibility of interests. Thus, integrative negotiations allow negotiating parties to explore their conflict and identify opportunities for increased mutual benefits. As a result, integrative negotiations typically involve less hostile and more socially interactive environments that facilitate mutual analyses and sharing of information, and complex exchanges of information over a varied number of different high-priority negotiation issues.

2.3 Negotiation Support Systems

Sophisticated computer assistance for negotiators in the form of NSS can help negotiators to overcome their cognitive limitations by supporting them with different types of negotiation aids such as decision-making tools, communication facilities, and visualization tools (see for e.g., Rangaswamy and Shell 1997; Kersten and Lo 2001; Swaab, et al. 2002). Thus, NSS offer the potential to help and advise negotiators, structure and analyze negotiation problems, determine feasible efficient settlement alternatives, store and share information, and facilitate communication among negotiating parties. These negotiation support aids have been shown to improve negotiation processes and outcomes in terms of various objective measures (for e.g., joint outcomes and contract balances), ultimately leading to successful negotiations (Jelassi and Foroughi 1989; Anson and Jelassi 1990; Nunamaker, et al. 1991).

Empirical studies have indicated that NSS could be very valuable in integrative negotiations (Jones 1988; Foroughi, et al. 1995; Delaney, et al. 1997). In particular, these studies have shown that NSS-supported dyads have achieved better economic outcomes compared to dyads with no computer support. Furthermore, cross-cultural studies have also shown that some
Asian cultures prefer and perform better during computer-supported integrative negotiations (Potter and Balthazard 2000). More importantly, NSS with its in-built negotiation support functionalities allow negotiators to overcome the “fix pie bias” by allowing them to explore options that will lead to mutually beneficial agreements. Specifically, the fixed pie bias is the mythical fixed pie of negotiators’ expectations that negotiators bring to negotiations (Thompson 1990). While the elaboration of the literature in Section 2.1 has emphasized that self-serving biases exist among negotiators when evaluating perceived fairness of negotiations (e.g., see Babcock, et al. 1995), we expect that negotiators will perceive negotiation outcomes as fair when mutually beneficial agreements are achieved in integrative negotiations using NSS. Thus we postulate that NSS will increase the likelihood that negotiators will perceive negotiation outcomes as fair during integrative negotiations, relative to on-line negotiations conducted using simple negotiation support tools such as EM facilities.

In evaluating perceived fairness of negotiation processes, we consider these four dimensions of procedural justice – accuracy, consistency, correctability, and ethicality. Specifically, with its ability to handle a high volume of data, capture, store and retrieve information, NSS provide structure and transparency to negotiators’ decision-making process and provide continuity to negotiation processes. Such NSS provisions increase negotiators’ perceptions of accuracy, consistency, correctability, and ethicality during the negotiation process in integrative negotiations, as compared to negotiations accomplished using less sophisticated tools such as EM facilities.

Hence, we hypothesize that:

\textbf{H1}: In integrative negotiations, perceived fairness of outcome is higher for dyads with NSS support than for dyads with EM support.
H2(a) - H2(d): In integrative negotiations, perceived fairness of process in terms of (a) accuracy, (b) consistency, (c) correctability, and (d) ethicality, is higher for dyads with NSS support than for dyads with EM support.

In contrast, for distributive negotiations, NSS have been shown to be less useful for achieving mutually acceptable or favorable outcomes for negotiating parties. In particular, Jones (1988) found that NSS-supported dyads did not achieve better outcomes in distributive negotiations, compared to dyads without any negotiation support aids. One of the plausible explanations is that while NSS enhances information sharing between the negotiating parties, researchers have found that information sharing during high conflict negotiations did not create a climate of trust (Bulter 1999). Instead, mutual information sharing during disputes or conflicts may cause negotiators’ expectations or perceptions of fairness to deviate widely from preconceived ones prior to engaging in the negotiation process (Babcock, et al. 1995). As a result, we argue that in NSS-aided distributive negotiations where disputes are more prevalent, perceived fairness of negotiation outcome as well as process in terms of accuracy, consistency, correctability, and ethicality will be low, compared to on-line negotiations conducted with simple negotiation support such as EM aids.

Therefore, we hypothesize that:

H3: In distributive negotiations, perceived fairness of outcome is lower for dyads with NSS support than for dyads with EM support.

H4(a) - H4(d): In distributive negotiations, perceived fairness of process in terms of (a) accuracy, (b) consistency, (c) correctability, and (d) ethicality, is lower for dyads with NSS support than for dyads with EM support.
2.4 Electronic Bargaining Agents

As discussed above, NSS-supported negotiations are not automated in the sense that they still require continuous human monitoring and inputs during the bargaining process. Automated negotiation support implemented using software agents is more sophisticated than NSS. Specifically, software agents are computer programs that carry out certain operations on behalf of a human or another program in an independent and autonomous manner (Jennings and Wooldridge 1998; Maes 1995; Kernsten and Lo 2001). Increasingly, software agents are deployed in many e-commerce activities such as searching for the best price, identifying and retrieving product information from different websites.

In this study, we use the term Electronic Bargaining Agents (EBA) to denote software agents used for negotiation purposes. Specifically, EBA can be used to automate the most time-consuming stages of the negotiation processes, such as offering and counter-offering settlement proposals (Kraus 1997). Automated negotiation is highly desirable especially in the e-commerce arena because humans are freed from the routine and mundane negotiation operations (Maes, et al. 1999). In addition, EBA possess the ability to operate continuously and semi-autonomously, thus helping to create new opportunities for optimizing business-to-business transactions and for reducing frictional costs incurred by inter-organizational transactions (Maes 1994).

The study of deploying autonomous software agents in negotiations has been fairly recent (e.g., Guttman and Maes 1998a; Guttman and Maes 1998b; Oliver 1997; Sandholm 1999). Thus, the objective and subjective effects of EBA in different bargaining situations have not been well understood. The majority of the literature on software agents has indicated that EBA are commonly used in simple activities such as simple information exchanges because EBA are still not capable of operating effectively in context rich and complex negotiations (Maes, et al. 1999;
Guttman, et al. 1998). Kernsten and Lo (2001) further argue that EBA is more suitable in structured and simple bargaining situations. However, some researchers argue that EBA are more effective and more beneficial during low conflict bargaining situations, because these situations allow the agents to cooperate and search for common goals (Hunhns and Stephens 1999).

Most negotiations require a fair amount of social exchanges between the negotiating parties. This is especially more so in integrative bargaining situations where the negotiating parties need to understand the problems across different dimensions of negotiation issues, their implications, and concession strategies before making settlement offers or counter-offers. Such complexities and social exchanges are typically difficult to be pre-programmed in computer software agents and are deemed too complicated to be carried out solely by EBA without human intervention. In fact, Brown and Duguit (2000) have stressed that “agents are blind to complex social trade-offs”. Therefore, we argue that integrative negotiations, where the settlement issues are fuzzy, ambiguous and less well-defined, are more suitably handled by human negotiators since EBA are not particularly effective in such negotiations. Specifically, we believe that EBA will not be able to produce satisfactory or optimal negotiation outcomes in integrative bargaining situations. Consequently, since the outcomes of negotiations affect how negotiators perceive distributional and procedural fairness in negotiations (Hegtvedt and Killian 1999), we expect that perceived fairness in negotiation outcome and process (in terms of accuracy, consistency, correctability, and ethicality) is low in EBA-supported integrative negotiations, relative to integrative negotiations conducted by humans with EM support.

Thus, we hypothesize that:

**H5**: In integrative negotiations, perceived fairness of outcome is lower for dyads with EBA support than for dyads with EM support.
**H6(a) - H6(d):** In integrative negotiations, perceived fairness of process in terms of (a) accuracy, (b) consistency, (c) correctability, and (d) ethicality, is lower for dyads with EBA support than for dyads with EM support.

The majority of the automated negotiation literature indicates that EBA are effective in simple negotiations where there is little or no need for social exchanges. Since negotiation interactions in distributive negotiations are relatively straightforward and inexpensive to build and coordinate than those in integrative negotiations (Strobel 2000), EBA are able to achieve favorable objective settlement outcomes in an efficient manner during distributive negotiations. However, as elaborated by Thompson (1990), perceptual measures of negotiators may differ substantially from objective measures, thus we argue that perceived fairness in the negotiation process and outcome will not be better off with the use of EBA in distributive bargaining situations. Specifically, we observe that EBA typically have no concern for fairness, and since they have execution autonomy, they can be programmed theoretically to deceive or mislead the other negotiating party (Huhns and Stephens 1999). Consequently, we reason that EBA will create a climate of distrust with very little social interactions. This will negatively affect the perceptions of fairness of negotiation processes and outcomes. Therefore, we argue that perceived fairness in negotiation outcome and process (in terms of accuracy, consistency, correctability, and ethicality) is still low in EBA-supported distributive negotiations, compared to human-conducted distributive negotiations aided by EM tools.

Hence, we put forward the following hypotheses:

**H7:** In distributive negotiations, perceived fairness of outcome is lower for dyads with EBA support than for dyads with EM support.
**H8(a) - H8(d):** In distributive negotiations, perceived fairness of process in terms of (a) accuracy, (b) consistency, (c) correctability, and (d) ethicality, is lower for dyads with EBA support than for dyads with EM support.

### 3. RESEARCH METHODOLOGY

#### 3.1 Experimental Design

Three series of controlled laboratory experiments were conducted to investigate the impact of web-based computer negotiation support on the perceived fairness of negotiation processes and outcomes. Each experiment examined one type of computer negotiation support, i.e., EM, NSS or EBA. Within each series of experiment session, we compared two types of negotiation situations, i.e., either integrative or distributive negotiations. Experiments sessions of EM-supported dyads served as the control group and were used as the baseline comparisons to evaluate the perceptions of NSS and EBA. Table 1 shows the number of dyads in each treatment and bargaining situation (integrative and distributive). Student subjects were recruited from our undergraduate MIS degree program. Our design initially consisted of 72 dyads (144 subjects). However, only 69 dyads were used for final data analyses because 3 dyads were found to collude among themselves based on our log file analysis.

[Insert Table 1 about here.]

#### 3.2 Independent Variables

In the *integrative negotiation* treatments, the assigned weights for negotiation issues were different. When the priorities of negotiators differ, the potential for mutually beneficial tradeoffs exists and the relationship might be characterized as one of low conflict. In the *distributive*
negotiation treatments, negotiation issues for both buyer and seller were weighted similarly (i.e., assigned approximately equal utility points). This resulted in a zero-sum or high conflict bargaining situation where one party’s gains were almost equal to the other party’s losses. Table 2 illustrates the weights given to the four issues negotiated in the different bargaining situations.

[Insert Table 2 about here.]

Type of computer negotiation support was manipulated by implementing three types of negotiation support in the form of EM, NSS and EBA. These computer negotiation support tools are accessible through popular web browsers such as Netscape Navigator or Microsoft Internet Explorer. In the EM treatment groups, dyads negotiated with each other only through a text-based, electronic messaging facility (see Figure 2).

[Insert Figure 2 about here.]

In the NSS treatment groups, three computer tools were provided (see Figure 3): a text-based, electronic messaging facility (on the lower right), an alternative evaluator (on the upper right), and an alternative generator (on the left). The alternative evaluator (Foroughi, et al. 1995) was specially developed to support alternative contract evaluation based on the preset preference scores of the negotiator. The negotiator could plug in alternative contracts to determine the total score that could be achieved. The alternative generator (Delaney, et al. 1997) was used to support alternative generation and possible concessions and/or solutions suggestion. Based on the preset (one’s own) and estimated (the other party’s) point structure of the negotiating parties, it generated all the 784 contract alternatives and displayed the best three for consideration by the negotiator.
In the *EBA treatment* groups, two computer tools were provided (see Figure 4): an agent tailor and an event viewer. The *agent tailor* (on the top) allowed the negotiator to specify his/her contract preferences: highest acceptable price, maximum purchase quantity, shortest acceptable warranty period, and longest acceptable delivery schedule. Using the *event viewer* (on the bottom), the negotiator could track his/her bargaining agent’s operation and performance. Our implementation of EBA contains a concession-based algorithm similar to Matwin, et al. (1991) and into which the preset preference scores of the negotiator are built. Based on these scores and the negotiator’s requirements, the EBA generates all possible alternatives, ranks them in descending order on total score, and proposes the alternative with the highest score to its opponent agent as its first offer. If the offer is accepted, the two agents clinch an agreement; if rejected, the opponent agent comes back with a counter-offer. This offer and counter-offer routine continues until the agents come to an agreement or one of the agents exhausts its possible alternatives and sends a quit message. Within the bargaining cycle, the EBA employs some specific “decaying” function on total score to determine which proposal to put forward next.

3.3 Dependent Variables

*Perceived fairness of negotiation process* is measured using the dimension of accuracy, consistency, correctability, and ethicality in the context of procedural justice (Leventhal 1980). *Perceived fairness of negotiation outcome* is measured using the notion of equity in the context of distributive justice (Deutsch 1985).
We implemented a survey questionnaire that was divided into the two sections - procedural justice and distributive justice sections. The procedural justice section consisted of a total of twelve questions, with three questions each to measure every one of the four dimensions of procedural fairness (i.e., accuracy, consistency, correctability and ethicality). The distributive justice section consisted of four questions to measure the notion of equity of negotiation settlements. All questionnaire items were assessed using 7-point Likert scales.

3.4 Experimental Task and Procedures

The experiment task used was adapted from Jone’s (1988) study, which involves negotiations between a buyer (Roberts Enterprise, Inc.) and a seller (Simo Parts Distributor) over four issues – unit price, purchased quantity, time of first delivery, and warranty period – of a purchase agreement for turbochargers (an engine sub-component).

Training on how to use the computer-support negotiation tools was provided to all subjects. Prior to each session’s start of negotiations, subjects were told that cash rewards that depend on their negotiation performance would be given at the end. All experiment sessions lasted two hours and were carried out by the same experiment administrator who followed standardized guidelines and instructions (due to space constraints, experiment instructions are not included but are available from the authors on request). In each session, subjects were randomly assigned the role of buyer or seller. This would determine their seating positions, which were separated by partitions to prevent verbal interactions and opportunities for collusion. All subjects were given ample time to read and understand the experiment case. Subjects were required to complete a pre-negotiation questionnaire of personal information and outcome expectations before the negotiation. At the end of each session, subjects were required to
complete a post-negotiation, feedback questionnaire to measure their perception of their negotiation experience. Subjects were also paid according to their negotiation performance measured by their objective total score. They were warned explicitly not to reveal the experimental details to others.

3.5 Control Variables

To establish non-spuriousness and to ensure internal validity, variables that are not studied in this research are kept consistent in the experiments. Table 3 lists the variables together with the measures taken to keep these variables consistent.

[Insert Table 3 about here.]

4. DATA ANALYSES AND RESULTS

4.1 Statistical Analyses

The research question examined in this study is: Will the use of the more sophisticated tools such as EBA and NSS affect the perceptions of fairness of negotiation process and outcome in integrative and distributive bargaining situations?

Prior to statistical testing, control checks on gender and negotiation experience (data which is recorded in the pre-negotiation questionnaire) in each treatment group were performed. ANOVA tests of gender and negotiation experience across six different treatment groups showed no significant differences. Thus, our controls on gender and negotiation experience enforced through randomization were deemed effective. In addition, reliability tests on the perception measurement scales (shown in Table 4) showed that the dependent variable measures were measured with sufficient precision and reliability.
Statistical analyses of the experiment results were performed using a two-way ANOVA model for the dependent measures of perceived fairness of outcome and perceived fairness of process. The analyses of each perceived measure began with a two-way ANOVA using the type of negotiation support and bargaining situation as the main effects. Differences in mean values of each dependent measure were identified. For each measure and each type of bargaining situation, a one-way ANOVA was performed, followed by a series of planned comparisons among the three types of computer negotiation support tool.

The planned comparisons of means were carried out using a multiple-comparison t-test (LSD – Least Significant Difference Test) with an alpha of 0.05 for a one-tailed test. The alpha was modified to adjust for the three types of negotiation support. As a check, non-parametric tests were also used for these planned comparisons. The results were essentially similar to the planned multiple-comparison tests of LSD Test. A summary of the results of the statistical and hypotheses tests is presented in Table 5.

The computer negotiation support tools kept log files of the entire transcripts of the negotiation processes in all the EM, NSS, and EBA treatments. From the negotiation process log files, we extracted the bargaining offers and counter-offers specified in terms of the levels of negotiation issues of price, quantity, warranty, and delivery time. The utility scores of the individual negotiation issues were then used to calculate a total, multi-attribute utility score for each offer or counter-offer proposed by a negotiator. The multi-attribute utility score or payoff of
each offer and counter-offer was then plotted in a chart depicted as in Figure 5, showing the negotiation dance for the negotiating parties of buyer and seller. Typically, the negotiators began by making offers that would have settled most issues entirely in their own favor. As the negotiation progressed, each negotiator made successive concessions, “dancing” near or along the efficient frontier, until both negotiators reached a settlement in which both negotiators either won completely on their more important issues or had to split their differences. As shown in Figure 5, the seller starts in the upper left-hand corner and the buyer starts in the lower right-hand corner, and as the negotiation proceeds, they typically make counter-offers that move them closer to the other negotiator’s current offer.

[Insert Figures 5 to 7 about here.]

5. DISCUSSIONS AND IMPLICATIONS

5.1 Results for Negotiations with NSS support

We compare perceived fairness in outcome and perceived fairness in process in terms of accuracy, consistency, correctability, and ethicality for NSS-supported dyads and EM-supported dyads in both integrative and distributive negotiations. Our results indicate that in integrative negotiations, EM-supported dyads have marginally significant higher perceived fairness in outcome (p < 0.065) and significantly higher perceived fairness in process in terms of consistency (p < 0.028), correctability (p < 0.06), and ethicality (p < 0.022). Perceived fairness in process in terms of accuracy is also higher for EM-supported dyads in integrative negotiations but is not significant (p < 0.129).

In distributive negotiations, EM-supported dyads have significantly higher perceived fairness in process in terms of accuracy (p < 0.004) and marginally significant perceived fairness
in process in terms of consistency (p < 0.082). Perceived fairness in outcome (p < 0.14) and perceived fairness in process in terms of correctability (p < 0.256) and ethicality (p < 0.402) are also higher for EM-supported dyads in distributive negotiations but are not significant. These results support our hypotheses H3 and H4a-4d but do not provide support for hypotheses H1 and H2a-2d.

In analyzing the reasons why H1 and H2a-2d are not supported, we contend that the main reason is due to the longer negotiation time for integrative negotiations that consequently affects the perceptual measures of the negotiators. In particular, Figure 6 illustrates the longer time and more tedious requirements needed in NSS-supported integrative negotiations. Specifically, integrative negotiation is time-consuming, as it requires extensive information exchanges to examine new options (Purdy et al. 2000). The use of NSS in integrative negotiations allows negotiators to learn that they can reach more mutually beneficial agreements by exploring alternative options at the expense of the negotiation time. As a result, even though the economic gains may be more favorable, the negative perceptual that develop due to the time wasted in reaching the agreement affect the perceived fairness of the outcome and process. Indeed, prior negotiation research has shown that perceived fairness in outcome is contingent upon situational factors and negotiators’ performance level (Hegtvedt and Markovsky 1995). Specifically, negotiators may attribute the cause of the time wasted during the negotiation to their inadequate negotiation performance. Furthermore, costly and lengthy process of resolution may also cause negotiators to evaluate the negotiation process as unfair (Hegtvedt and Killian 1999).

5.2 Results for Negotiations with EBA support
We compare perceived fairness in outcome and perceived fairness in process in terms of accuracy, consistency, correctability, and ethicality for EBA-supported dyads and EM-supported dyads in both integrative and distributive negotiations. Our results show that in integrative negotiations, EM-supported dyads have significantly higher perceived fairness in outcome (p < 0.000) and perceived fairness in process in terms of accuracy (p < 0.001), consistency (p < 0.000), correctability (p < 0.000), and ethicality (p < 0.000). In distributive negotiations, EM-supported dyads have significantly higher perceived fairness in process in terms of in terms of accuracy (p < 0.004), and correctability (p < 0.013). Perceived fairness in outcome (p < 0.162) and perceived fairness in process in terms of consistency (p < 0.214) and ethicality (p < 0.402) are also higher for EM-supported dyads in distributive negotiations but are not significant. These results justify our hypotheses H5, H6a-6d, H7 and H8a-8d.

We further compare the results of the EBA-supported dyads with the NSS-supported dyads. The results indicate that in integrative negotiations, NSS-supported dyads have significantly higher perceived fairness in process in terms of consistency (p < 0.048) and correctability (p < 0.017) and marginally significant higher perceived fairness in outcome (p < 0.073) and perceived fairness in process in terms accuracy (p < 0.072) and ethicality (p < 0.062) than EBA-supported dyads. In distributive negotiations, there were no significant differences in the perceived fairness in outcome and perceived fairness in terms accuracy and ethicality for both EBA-supported dyads and NSS-supported dyads. The results for perceived fairness in process in terms of consistency and correctability require further elaboration. Specifically, we found that EBA-supported dyads have higher evaluations for consistency (p < 0.611) than NSS-supported dyads while NSS-supported dyads have higher evaluations for correctability (p < 0.160) but these results are not significant.
The difference in the above results for the two dimensions for perceived fairness in process – consistency and correctability are anticipated. First, when human negotiators are not directly involved in the negotiating process as in the case of EBA, they may be less responsive and attentive to potential mistakes made during the negotiation process that require corrective actions for reversals of decisions. This accounts for the low evaluation of correctability among EBA-supported dyads. Second, EBA-supported dyads rely largely on the software agents whereas NSS-supported dyads rely mainly on human negotiators during the negotiating process. Given the fact that software agents are computer programs, it is not surprising that software agents are evaluated to have higher consistency in EBA negotiations.

5.3 Discussions of Overall Results

There are several possible explanations why EM-supported dyads have higher perceived fairness in outcome and perceived fairness in process in terms of accuracy, consistency, correctability, and ethicality than NSS-supported dyads and EBA-supported dyads. First, EM provides the online chatting environment for developing social interaction and reinforcing informal communication. Studies on computer-mediated communication have shown that informal communication enhances trust and relationship building among team members (Argote 1993; Kraut 1990). Since the type of relationship between negotiators affects judgment of fairness (Tripp et al. 1995; Sondak et al. 1994) and perceived fairness is a crucial antecedent to developing trust, it is not surprising that EM-supported dyads have higher evaluations of perceived fairness. One may argue that the NSS-supported dyads are also provided with an online chatting environment since the NSS in our study also includes an electronic messaging tool. However, we find that most of the required information is provided by the NSS and thus the
EM tool is not useful to the NSS-supported dyads as they do not need to use the EM tool to interact.

Second, EM allows negotiators to make use of emoticons, popularly used in computer-mediated communication, to convey tones of humor or dissatisfaction. These interactions compensated for the lost visual and aural cues that are essential for successful negotiations (Straus and McGrath 1994; Drolet and Morris 1995), which ultimately increase the perceived fairness of the negotiation process and outcome.

Third, given the widespread of electronic messaging, it is expected that subjects are much more familiar and experienced with EM than with NSS and EBA. Prior IS studies have indicated that users with more experience with a technology will develop a more positive perception of using the technology than those without the experience (Fulk et al. 1990). Therefore, we reason that the subjects’ prior experience with similar electronic messaging systems increase the perceived fairness of the negotiation process and outcome.

One interesting finding from our study is that the use of EBA is sometimes more preferable than NSS in terms of evaluating perceptions of fairness during distributive negotiations. A plausible explanation is that EBA allows for "detachment" or "buffering" of highly charged emotions in high-conflict situations (Rubin and Sander 1995). Specifically, EBA allows human negotiators to misrepresent their real preferences during the negotiation process and as Rubin and Sander (1995) have indicated that effective negotiation requires some forms of artifice. Since our result on the difference between NSS and EBA for distributive negotiations is not significant we feel that this interesting finding warrants further investigation.

An important finding from our study is that EBA-supported dyads have the lowest evaluations of perceived fairness in both process and outcome during integrative negotiations. A
possible reason is that EBA eliminates the need for direct interaction or communication between negotiating parties. This lack of interpersonal communication for EBA-supported dyads seems to have a deep impact on the evaluation of perceived fairness. As Nyerges (1995) elaborated, “because negotiations is an interaction between persons, the personal element is of great importance”.

Another likely reason for the poor evaluation of perceived fairness for EBA-dyads during integrative negotiations is that EBA may have raised the aspiration levels of negotiating parties in the process of bargaining but these aspiration levels were not achieved in the outcome. In delegating the actual tasks of proposing offers and evaluating counter-offers to bargaining agents, negotiators could have come off thinking that EBA could help them achieve the most optimal negotiation outcome in their favor. Past research has shown that negotiators with high aspirations have fewer successful transactions than do negotiators with lower aspirations (Bazerman, et al. 1985; Huber and Neale 1987). Consequently, negotiators will perceive the negotiation outcome as unfair when their expectations are not met (Hegtvedt and Killian 1999).

Several implications for practical application can be drawn from our study. First, computer negotiation support has to incorporate protocols for social exchanges and informal communication. Thus, developers for computer negotiation support should keep in mind the importance of the social context of how the tools are being used. Second, it is practical for computer negotiation support to incorporate both EBA and NSS. Specifically, EBA and NSS can complement each other for different situations thus EBA can be used in conjunction with NSS to help human negotiator and vice versa.

5.4 Limitations
This study has a number of potential limitations that suggest directions for future research. First, the fixed strategy of concession adopted by EBA may be too simple. Particularly, our implementation of EBA strategy perpetuates the fixed-pie bias – a tendency for negotiators to assume that their own interests directly conflict with those of the other party (Bazerman and Carroll 1987; Thompson and Hastie 1990). This bias may have interfered with EBA’s abilities to discover mutually beneficial tradeoffs. Second, our experimental task assumes the willingness of the negotiating parties to share information with each other about their preferences for the issues. Third, the study uses college students as subjects and since most college students have little or no working experience in the real world, their decisions may not reflect those made by real world business organizations. Since the focus of our study is analyzing judgments of fairness, we reckon that perceptual of fairness should not be attached to working experiences.

6. CONCLUSIONS

In this research, we investigate the perceived fairness in negotiation outcome and process of three types of e-commerce negotiation support tool (EM, NSS, and EBA) with varying degree of sophistication in either an integrative or distributive bargaining context.

We conclude that the degree of sophistication in the computer negotiation support does interfere with the perception of fairness in negotiation outcome and process during integrative and distributive bargaining situations. Specifically, our findings show that EBA-supported dyads have the lowest evaluation of perceived fairness in outcome and process in integrative negotiation. The perceived fairness in outcome in distributive negotiation is not significantly different between NSS-supported dyads and EBA-supported dyads. The results on perceived fairness in process in distributive negotiation is not conclusive. Specifically, our results indicate
that EBA-supported dyads have the lowest perception evaluation in the correctability dimension while NSS-supported dyads have the lowest perception evaluation in the consistency dimension. As for perception evaluation on accuracy and ethicality, our results indicate that both EBA-supported dyads and NSS-supported dyads are not significantly different.

Our findings open several avenues for future research. First, we are interested to further investigate the inter-related effects of perceptual measures of fairness of negotiation outcome and process on the objective economic measures. Second, we are interested to pursue further research into investigating the negotiation process dynamics of dyads assisted by different tools of EM, NSS, and EBA. Further analyzing the “negotiation dances” of all intermediate offers and counter-offers will help to shed light on why negotiators’ subjective perceptions may differ from objective economic analyses of negotiations. Future research in these directions would be able to provide us with deeper insights into the economic effectiveness and socio-psychological value of negotiation support tools in on-line trade negotiations.
REFERENCES


FIGURES & TABLES

Figure 1 – Research Conceptual Framework

Degree of Sophistication in Computer Negotiation Support:
- EM
- NSS
- EBA

Bargaining Situations:
- Integrative
- Distributive

Perceived Fairness in Negotiation Outcome

Perceived Fairness in Negotiation Process:
- Accuracy
- Consistency
- Correctability
- Ethicality
Figure 2 – Screen Capture of Electronic Messaging (EM) Interface
Figure 3 – Screen Capture of Negotiation Support System (NSS) Interface
Figure 4 – Screen Capture of Electronic Bargaining Agent (EBA) Interface
Figure 5 – Negotiation Dances of Typical EM-Supported Negotiations

Integrative negotiations

Distributive negotiations
Figure 6 – Negotiation Dances of Typical NSS-Supported Negotiations

**Integrative negotiations**

**Distributive negotiations**
Figure 7 – Negotiation Dances of Typical EBA-Supported Negotiations

Integrative negotiations

Distributive negotiations
Table 1 – Number of Dyads in Each Treatment Group

<table>
<thead>
<tr>
<th>Type of Bargaining Situation</th>
<th>Type of Negotiation Support</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EM</td>
</tr>
<tr>
<td>Integrative</td>
<td>12 (6/6)</td>
</tr>
<tr>
<td>Distributive</td>
<td>11 (5/6)</td>
</tr>
</tbody>
</table>

* (male-male/female-female dyads in parentheses)

Table 2 – Weight Assignments in Different Bargaining Situations

<table>
<thead>
<tr>
<th>Type of Bargaining Situation</th>
<th>Negotiation Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Buyer</td>
</tr>
<tr>
<td>Distributive</td>
<td>All four issues were given equal weights.</td>
</tr>
</tbody>
</table>

Table 3 – Operational Measure of Variables to Establish Non-spuriousness

<table>
<thead>
<tr>
<th>Variable</th>
<th>Operational Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personality of subjects</td>
<td>Random assignment of role, dyad, and treatment group</td>
</tr>
<tr>
<td>Negotiation experience</td>
<td>Random assignment of role, dyad, and treatment group</td>
</tr>
<tr>
<td>Gender effects</td>
<td>Equal division of male-male and female-female dyads</td>
</tr>
<tr>
<td>Negotiator relationship</td>
<td>No history and future possibility of dyadic negotiation</td>
</tr>
<tr>
<td>Motivation of subjects</td>
<td>Cash rewards based on negotiation performance</td>
</tr>
<tr>
<td>Number of bargaining periods</td>
<td>Continuous, ongoing negotiation for two hours</td>
</tr>
<tr>
<td>Non-institutional interaction</td>
<td>Explicit separation of subjects, no interactions allowed</td>
</tr>
</tbody>
</table>
Table 4 – Result of Factor Reliability Test (Cronbach Alpha)

<table>
<thead>
<tr>
<th>Factor</th>
<th>No. of Items</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Fairness in outcome</td>
<td>5</td>
<td>0.8936</td>
</tr>
<tr>
<td>Perceived Fairness in process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Accuracy</td>
<td>3</td>
<td>0.8685</td>
</tr>
<tr>
<td>b. Consistency</td>
<td>3</td>
<td>0.6969</td>
</tr>
<tr>
<td>c. Correctability</td>
<td>3</td>
<td>0.7720</td>
</tr>
<tr>
<td>d. Ethicality:</td>
<td>3</td>
<td>0.7199</td>
</tr>
<tr>
<td>Dependent Variables</td>
<td>Type of Bargaining Situation</td>
<td>Type of Negotiation Support</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean (Standard Deviation)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>EM</strong></td>
</tr>
<tr>
<td>Fairness in Outcome: Equity</td>
<td>Integrative</td>
<td>5.4750 (1.0563)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distributive</td>
<td>5.0182 (1.2312)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integrative</td>
<td>5.5556 (1.0571)</td>
</tr>
<tr>
<td></td>
<td>Distributive</td>
<td>5.6364 (0.7692)</td>
</tr>
<tr>
<td></td>
<td>Integrative</td>
<td>5.5000 (0.8341)</td>
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<tr>
<td></td>
<td>Distributive</td>
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</tr>
<tr>
<td></td>
<td>Integrative</td>
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</tr>
<tr>
<td></td>
<td>Distributive</td>
<td>5.2424 (1.1960)</td>
</tr>
<tr>
<td></td>
<td>Integrative</td>
<td>5.7778 (0.8607)</td>
</tr>
<tr>
<td></td>
<td>Distributive</td>
<td>5.1970 (1.2500)</td>
</tr>
</tbody>
</table>

* $p < 0.10$
** $p < 0.05$
*** $p < 0.01$