Minimizing Negotiation Process Losses With Computerized Negotiation Support Systems

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Abstract

The growing frequency of negotiation situations as well as an increasing complexity of the issues that need to be resolved in a negotiation have generated interest in computer support for negotiation. Negotiation Support Systems (NSS) show potential for alleviating or overcoming major process losses which hinder the effectiveness of negotiations, including the negative effects of cognitive limitations, cognitive biases and dysfunctional socio-emotional aspects of negotiator behavior. This paper gives a brief overview of existing NSS and presents a framework for research in the NSS area, which highlights empirical research, which has already been conducted in this area. Also included is a discussion of future research directions, which are needed in the area of NSS.

Introduction

The ever-shrinking world of the late 20th century is witnessing a growing incidence of conflicts of interest, in which two or more parties have separate, but conflicting goals or interests. In the business world, conflicts of interest frequently occur in labor-management contract disputes and between organizations over mergers or purchasing contracts. Negotiation or bargaining (terms which are used interchangeably in this paper), a process in which opposing sides discuss the issues involved and reach an agreement which is mutually acceptable, have always been extremely useful means for achieving peaceful resolution of disputes.

It has been suggested that conflict inter-

vention methods are becoming even more important and more frequently employed. Rubin (1980) describes conflict intervention as of increasing importance as a means of avoiding global war. Harnett and Cummings (1980) argue that negotiation is increasingly important because of the growing scarcity of resources needed and wanted by all nations, the growing interdependence of all human beings and their institutions, and the unfeasibility as well as the tremendous cost involved in solving disputes by alternatives to negotiation such as force or war. At the organizational level, managers are said to spend up to 20% of their working hours in resolving conflict (Shea, 1983).

Negotiation is most effective and satisfying for the parties involved when they are able to reach integrative solutions which maximize the outcomes for both parties, rather than just for

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one party at the expense of the other (Pruitt, 1981). Such win-win, integrative agreements have been shown to be more stable over time, promote harmonious relations between negotiating parties, and benefit the welfare of society in general (Pruitt and Rubin, 1986). However, despite the recognized advantages of reaching integrative agreements, negotiation research (Raiffa, 1982; Lax and Sebenius, 1986; Pruitt and Rubin, 1986; Bazerman and Neale, 1983) indicates that negotiators often fail to arrive at integrative solutions (Thompson, 1989). Several factors serve as stumbling blocks to the achievement of integrative agreements. First, without guidance or prior experience in integrative bargaining, bargainers may not assume the problem solving, collaborative orientation, which is necessary for the achievement of integrative solutions (Walton and McKersie, 1965).

Second, negotiations are becoming increasingly complex in terms of the number and type of interactions, possible coalitions, issues, and potential compromise agreements (Nyhart and Goeltner, 1987). Even the most capable negotiators often find it difficult and risky to rely solely on their own subjective judgments for obtaining feasible resolutions to conflict (Antrim and Lax, 1987). Conflicts can sometimes become so complex that practical resolutions are not reached because of the cognitive difficulty of identifying and understanding them (UNISYS, 1987). In many other cases, even if negotiating parties do reach an agreement, they may not have achieved the best possible solution.

Third, negotiator decision making is often adversely affected by judgmental, cognitive biases and certain aspects of bargaining behavior, which serve as stumbling blocks to decision making in negotiation.

Interest is growing in the possibility of using computer technology and information systems to support negotiators in a collaborative, integrative bargaining process, and to help them alleviate the negative impact of their cognitive

limitations, cognitive biases, and socio-emotional problems. One of the most recent developments is the concept of Negotiation Support Systems (NSS), a special type of Group Support Systems (GSS) intended to support negotiating parties (and possibly a human mediator) in reaching an agreement (DeSanctis and Gallupe, 1987; Jarke, Jelassi and Shakun, 1987; Jarke and Jelassi, 1986; Kersten, 1985; Anson and Jelassi, 1990; Carmel and Herniter, 1989; Carmel, Herniter, and Nunamaker, 1993; Foroughi and Jelassi, 1990a, 1990b; Foroughi, Perkins, and Jelassi, 1995; Perkins, et al., 1996; Delaney, Foroughi, and Perkins, 1997).

The purpose of this paper is to discuss the major stumbling blocks to successful negotiation and present possible solutions to these problems, which have been suggested by NSS researchers and designers. Section II discusses decision making in negotiation, the impact of cognitive biases on negotiators' decision making, and socio-emotional aspects of negotiator behavior which often impede conflict resolution. Section III presents a brief overview of existing NSS and discusses the possible impact of NSS features on the major process losses, which impede successful negotiation. Section IV presents a framework for research in the NSS area and discusses empirical research, which has been conducted, as well as those areas. Section V describes conclusions reached, and Section VI identifies areas still in need of investigation in the field of computerized negotiation support systems.

Cognition and Decision Making in Negotiation

Recent negotiation research borrows ideas from the fields of cognitive psychology and behavioral decision research (Bazerman and Carroll, 1987; Pinkley, 1988; Pennington and Hastie, 1985; Kruglanski, 1987; Sheppard, et al. 1987). According to this decision making approach, each party in a negotiation is a decision maker, whose behavior is a result of choices based on judgments he/she makes about the ne-

gotiation situation (Bazerman and Carroll, 1987).

Cognitive Biases

According to behavioral researchers, negotiator behavior is "selective, abbreviated, and even biased...", with each stage in the decision process affected by negotiators' oversimplifications and errors (Bazerman and Carroll, 1987, p. 252). This less than optimal decision making is the result of what March and Simon (March and Simon, 1958) call "bounded rationality" or cognitive limitation, which causes them to "subjectively optimize" or satisfice instead of seeking optimal solutions.

In an effort to compensate for their cognitive limitations, negotiators typically use decisional heuristics or simplifying rules called knowledge structures which are based on their particular set of past experiences (Fiske and Taylor, 1984). Unfortunately, knowledge structures can also lead to cognitive, judgmental biases which have adverse effects on the quality of decision making and negotiators' ability to achieve an optimal resolution of their conflict (Bazerman and Neale, 1983; Einhorn and Hogarth, 1978).

1. Consideration of issues in isolation

Negotiators tend to consider issues one at a time because it is cognitively difficult for them to integrate multiple issues into a single package. As a result, potential tradeoffs remain unrecognized (Erickson et al., 1974; Froman and Cohen, 1970; Kelley, 1966).

2. Negative framing of the negotiation

Negotiators often "frame" the negotiation negatively by evaluating their potential losses instead of considering their potential gains. Negative framing can lead to risk-seeking behavior instead of to the risk-avoiding behavior which is conducive to finding a cooperative agreement (Bazerman and Lewicki, 1983; Neale

and Bazerman, 1983; Tversky and Kahneman, 1981).

3. The fixed-pie, win-lose mentality

Negotiators often assume that their interests are in direct conflict with the other party's interests, that they are in competition for a fixed-pie of resources, and that one side will win at the expense of the other. This assumption may cause negotiators to ignore the need to be cooperative and to use creative problem solving to find an integrative solution (Bazerman, 1983; Pruitt, 1983a and 1983b).

4. Premature closure or finalizing of positions

Because of their limited ability to recognize all possible alternative solutions, negotiators tend to prematurely finalize their positions, often failing to consider other potentially feasible solutions to their dispute (Kelley, 1966).

5. Preference for available, salient information or solutions

Negotiators tend to recall and value most those bits of information, which are most salient or familiar to them (Tversky and Kahneman, 1981). This may cause them to select either familiar or very unusual alternative solutions because they "stand out", while rejecting or neglecting to consider other alternatives.

Socio-Emotional Aspects of Negotiator Behavior

In addition to the cognitive biases discussed above, certain socio-emotional aspects of negotiator behavior also impede the successful resolution of conflict in negotiation.

1. Facing-Saving behavior

Negotiators tend to avoid agreements in which they feel they are "giving in". Often, the major determinant of their behavior during a negotiation may be the avoidance of "losing face"

in front of the opposing party or in front of their own constituents. This face-saving behavior may take precedence over reaching a viable agreement with the opposing side (Bazerman, 1983; Brown, 1977; Hiltrop and Rubin, 1981; Pruitt and Johnson, 1970; Pruitt and Rubin, 1986; Rubin, 1980; Wall, 1984).

2. Ineffective communication

Communication has been described as being "at the heart" of the negotiating process (Lewicki and Litterer, 1985). For this reason, barriers to effective communication such as distraction caused by attention to physical appearance of opposing parties, semantic differences, the absence of feedback, and status and power differences can seriously hinder effective negotiation (Lewicki and Litterer, 1985).

Recent research on cognition in negotiation stresses the importance of the fact that two different individuals can evaluate the same information very differently (Jervis, 1976), depending on their perception of the situation. If negotiators do not effectively communicate to each other their perceptions as well as the motives for their actions, they may grossly misinterpret each others' statements (Pinkley, 1988).

3. Negotiator overconfidence

Negotiators tend to be overly optimistic about the probability of their own judgments being correct (Einhorn and Hogarth, 1978; Fischhoff, 1981) as well as the probability that a neutral party will judge in their favor (Farber, 1981). The more difficult the task, the more overconfident they become (Clark, 1960; Pitz, 1974). They also are overconfident of winning if they do not give in, which reduces the incentive to bargain and compromise (Bazerman and Neale, 1983; Neale and Bazerman, 1983).

4. Nonrational escalation of conflict

Negotiators tend to escalate the level of

conflict irrationally and unnecessarily (Bazerman, 1983; Lewicki and Litterer, 1985), often "locking in" on opening moves and attitudes, which may be hostile, and continuing them through the negotiation process (Pilisuk and Skolnick, 1978).

Negotiation Support Systems

A Brief Overview of Existing Systems

Since the 1960s, computer models have been employed for negotiation support (Nyhart and Goeltner, 1987). This was long before the term "NSS" or the field of NSS was formalized. Only in the past few years has the name NSS been given to a type of Group Support Systems (GSS) which is designed especially to support decision makers in noncooperative, mixed motive tasks. True NSS consist of, at minimum, an individual Decision Support System (DSS) for each party in the negotiation plus an electronic communication channel between the parties (Lim & Benbasat, 1992). Full-feature session-oriented NSS (Anson and Jelassi, 1990; Carmel and Herner, 1989; Foroughi, Perkins and Jelassi, 1995; Foroughi and Jelassi, 1990a, 1990b; Perkins et al., 1996; Delaney, Foroughi, and Perkins, 1997) also offer group process structuring techniques, support for a mediator, and documentation of the negotiation. The future holds the possibility of rule-based NSS which would use expert systems to perform analysis of conflict contingencies, suggest appropriate process structuring formats or analytical models, monitor the semantic content of electronic communications, suggest settlements with high joint benefits, and provide automatic mediation and Parliamentary procedure (Kersten, 1985, 1988; Kersten et al., 1986; Anson and Jelassi, 1990; DeSanctis and Gallupe, 1987).

NSS researchers now believe that NSS have the potential to enhance negotiations by alleviating the impact of negotiator cognitive limitations, cognitive biases, and socio-emotional problems (Anson and Jelassi, 1990; Carmel and

Herniter, 1989; Foroughi, Perkins, and Jelassi, 1995; Foroughi and Jelassi, 1990a, 1990b; Perkins et al., 1996; Delaney, Foroughi, and Perkins, 1997).

The cognitive difficulty which negotiators encounter in evaluating the utility of alternative settlements and determining trade-offs can be minimized by NSS features such as analytical processing of subjective preference and/or external objective data (UNISYS, 1987; Jelassi and Foroughi, 1989) and the display of entire contracts for discussion (Jelassi and Jones, 1988). Negative framing of the negotiation can be avoided by the use of interaction rules and pre-negotiation modules requiring parties to identify their interests (Anson and Jelassi, 1990). The public display of conflicting views and analytical methods to identify alternative solutions can help prevent the fixed-pie mentality (Anson and Jelassi, 1990). Premature closure and the preference for salient information can both be prevented by the presentation of a negotiation text (Fisher, 1978) of equal value for both sides as a starting point (Jelassi and Jones, 1988), rules requiring consideration of all of the issues (Jelassi and Jones, 1988), and by NSS suggestions of possible concessions, solutions, and trade-offs (Jelassi and Foroughi, 1989).

NSS features can also have a positive impact on negotiations by minimizing some negative socio-emotional aspects of negotiation behavior. Face-saving behavior can be prevented by the suggestion of possible concessions to help achieve optimal joint outcomes and permit negotiators to compromise while still saving face (Anson and Jelassi, 1990). The ubiquitous problem of ineffective communication can be alleviated by the use of participation rules, the display of organized feedback (DeSanctis and Gallupe, 1987), writing wording to focus group attention, encourage preciseness, and to document the agreement (Jarke and Jelassi, 1986).

The sense of rationality provided by analytical processing of subjective preference

and/or external objective data and the determination of possible solutions (DeSanctis and Gallupe, 1987) can help prevent negotiator overconfidence. The use of electronic communication (DeSanctis and Gallupe, 1987) and the use of participation rules (Anson and Jelassi, 1990) can help prevent nonrational escalation of conflict.

A Framework for NSS Research

Figure 1 presents a framework for research in the area of negotiation support systems. This framework is based on a general framework for GDSS research which was developed by Dennis et al., 1988. The framework shows the various types of independent variables (group variables, task variables, context variables, and computer system variables) which can be manipulated in the study of the effects of NSS on negotiation as well as relevant dependent variables (group process variables and negotiation outcome variables) which can be measured. The following sections describe the extent to which NSS research has shed light on the effects of the various NSS components on negotiation processes and outcomes (see summary of research results in Table 1).

Independent Variables

1. Group Variables:

Most NSS studies to date have been conducted in face-to-face settings, with the exception of a study conducted by Sheffield (1995), which included remote settings.

2. Task Variables:

Almost all of the NSS empirical studies have compared varying levels of conflict of interest.

3. Context Variables:

With the exception of studies conducted by Balke et al. (1973) and Perkins et al. (1996),

Figure 1
Framework for NSS Research

Table 1
Summary of Empirical Findings Concerning NSS Effects on Negotiation Process Losses

Process Loss	Potential NSS Solution	Measures	Results to Date
Cognitive limitations	DSS processing of preferences, support for alternative solution generation/evaluation (UNISYS, 1987; Jelassi and Foroughi, 1989; Anson & Jelassi, 1990; Jelassi & Jones, 1988; Lim & Benbasat, 1992)	Joint outcome Contract balance Problem understanding	Mixed Positive Positive
Consideration of issues in isolation	Display of entire contract for discussion, enabling "logrolling" among issues, achievement of higher jt. outcomes (Erickson et al., 1974; Jelassi and Jones, 1988)	Joint outcome	Mixed
Negative framing of the negotiation	Establishment of interaction rules and use of pre-negotiation modules requiring parties to identify their interests (Foroughi & Jelassi, 1989; Anson & Jelassi, 1990)	Satisfaction Perceived collaborative, Negative climate	Positive Mixed
Fixed-pie mentality	Public display of conflicting views with pairing of related items (Anson & Jelassi, 1990), analytical methods to identify alternative solutions (Jelassi and Foroughi, 1989; Anson & Jelassi, 1990), structured integrative bargaining process to encourage bargainers to seek a mutually beneficial solution (Foroughi & Jelassi, 1989)	Contract balance Perceived collaborative climate	Positive Mixed
Premature closure	Presentation of a negotiation text (Fisher, 1978) of equal value to both sides as a starting point (Jelassi & Jones, 1988), rules requiring consideration of all issues (Jelassi & Jones, 1988), DSS support for alternative generation/evaluation (Anson & Jelassi, 1990)	Joint outcome #contracts proposed	Mixed Positive
Preference for salient information	Rules requiring consideration of all issues (Jelassi & Jones, 1988), NSS suggestions of possible concessions, solutions, and trade-offs (Jelassi & Foroughi, 1989), consideration of multiple alternatives made possible by DSS simplification of alternative evaluation (Anson & Jelassi, 1989)	Joint outcome # contracts proposed	Mixed Positive
Face-saving behavior	Suggestion of possible concessions to help achieve optimal joint outcomes and permit negotiators to compromise while still saving face (Foroughi & Jelassi, 1989; Anson & Jelassi, 1990),	Satisfaction Contract balance	Positive Positive
Ineffective communication	Participation rules, display of organized feedback (DeSanctis & Gallupe, 1987); written wording to focus group attention, encourage preciseness, depersonalize the atmosphere, and document the agreement (Jarke & Jelassi, 1986; DeSanctis & Gallupe, 1987; Lim & Benbasat, 1992; Sheffield, 1995)	Joint outcome Perceived collaborative/ negative climate	Mixed Mixed
Negotiator overconfidence	DSS support for alternative evaluation lends a sense of rationality which encourages objective, realistic decision-making (DeSanctis & Gallupe, 1987)	Perceived collaborative/negative climate	Mixed
Nonrational escalation of conflict	Electronic communication focuses attention on issues instead of personalities (DeSanctis & Gallupe, 1987; Lim & Benbasat, 1992; Sheffield, 1995), increasing confidence of achieving a good agreement (Anson & Jelassi, 1990; Foroughi & Jelassi, 1989)	Perceived collaborative/ negative climate Satisfaction	Mixed Positive

which used practicing managers and workers, NSS studies have been conducted almost exclusively in laboratory settings, using student subjects.

4. Computer Systems:

A variety of systems have been used in NSS studies, some focusing exclusively on DSS

support, some on electronic communication, and some using both. Balke et al. (1973) used interactive graphics displays of a program that performed judgment analysis. Jones (1988) used a DSS that presented contract suggestions. Sainfort et al. (1987) compared the impact of an interactive program that took bargainers through a structured negotiation process and a video presentation viewed by subjects prior to a multi-step

conflict resolution process.

(Perkins et al., 1996).

Sheffield (1995) compared four different communications media - computer conferencing (text only), decision room (text + visual), telephone (audio only), and face-to-face (audio + visual). Foroughi, Perkins and Jelassi (1995) used an interactive DSS for alternative generation and evaluation as well as electronic communication. A study by Delaney, Foroughi and Perkins (1997) compared the effects of this same combination of DSS/electronic communication with those of the DSS used alone.

Dependent Variables

1. Group Process Variables:

Jones (1988) found greater collaborative climate in high conflict dyads but not in low conflict dyads, while Foroughi, Perkins and Jelassi (1995); Delaney, Foroughi and Perkins (1997); and Perkins et al. (1996) found only marginal increases in perceived collaborative climate and decreases in negative climate with NSS support.

2. Negotiation Outcomes:

Jones (1988) found that DSS support resulted in higher joint outcomes in low conflict dyads, but not in high conflict dyads. Sheffield (1995) found that cooperative bargaining orientation and/or audio mode of communication increased joint outcomes. Foroughi, Perkins and Jelassi (1995); Delaney, Foroughi and Perkins (1997); Perkins et al. (1996) found that in all cases, NSS dyads achieved greater joint outcomes with NSS support.

Contract balance was found to be significantly improved with NSS support (Foroughi, Perkins and Jelassi, 1995; Delaney, Foroughi and Perkins, 1997; Perkins et al., 1996). Negotiation time increased with NSS in lab studies with student subjects (Foroughi, Perkins, and Jelassi, 1995; Delaney, Foroughi and Perkins, 1997) but decreased when used by practitioners

The number of contracts proposed has been shown to increase with DSS support alone (Sainfort et al., 1987; Delaney, Foroughi and Perkins, 1997) as well as with full NSS support - DSS + electronic communication (Foroughi, Perkins and Jelassi, 1995; Perkins et al., 1996). Solution quality and improved understanding of the problem were enhanced by the DSS support provided by Balke et al. (1973) and Sainfort et al. (1987).

Conclusions

The importance of research in the area of computerized support for negotiation is captured in a quotation from Bazerman and Carroll [1987, p. 248]:

"Despite the obvious prevalence and importance of negotiation, substantial evidence exists that negotiators frequently fail to attain readily available and mutually beneficial outcomes, and that these inefficiencies in the negotiation process reduce society's available resources, productivity, and creative opportunities, and increase society's conflict and self-destructiveness (Pruitt and Rubin, 1986; Raiffa, 1982). For example, in the labor-management domain, failures of negotiation lead to costly strikes, decreased harmony in the workplace, and threats to the survival of the organization and the jobs of organizational members (Kochan, 1980; Walton and McKersie, 1965). The dangers of negotiation failures in the international sphere include inefficient economic trade, war, and threats to our survival."

This paper has discussed major reasons why negotiators often fail to reach mutually satisfactory agreements, including the increased complexity of negotiation situations, and the impact of cognitive biases and dysfunctional socio-emotional aspects of negotiation behavior. The growing role of computer technology in the field of negotiation has also been discussed, and it has been shown that many NSS researchers believe

that computerized NSS have potential for alleviating or overcoming the major stumbling blocks to negotiation. These propositions have been backed up by the results of research using session-oriented NSS which has been conducted at Indiana University (Foroughi and Jelassi, 1990a, 1990b; Foroughi, Perkins and Jelassi, 1995; Perkins et al., 1996; Delaney, Foroughi and Perkins, 1997) and at the University of Arizona (Carmel and Herniter, 1989; Carmel, Herniter, and Nunamaker, 1993).

Suggestions for Future Research

NSS research is still in its infancy, and it needs to focus on the effectiveness of various types of NSS in different negotiation situations such as bargaining between negotiating teams, different mixed-motive task environments, and remote settings. The impact of the various NSS components and also of various NSS interfaces are in need of more investigation as is the role different systems that can play in negotiation settings. Most important, NSS need to be studied in real-life negotiation situations, with intensive analysis of the actual process of negotiation, using content communication analysis mechanisms such as Morley and Stephenson's (1977) Conference Process Analysis or the interaction coding used by Poole, Holmes and Desantis (1991). The use of such analysis mechanisms would greatly enhance the evaluation of the effects of NSS on the negotiation process and would provide valuable evidence of the potential benefits of NSS.

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