E-NEGOTIATION SYSTEMS: A THEORETICAL FRAMEWORK AND EMPIRICAL INVESTIGATION

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TABLE OF CONTENTS

SUMMARY

The process by which two or more parties with conflict of interests reach a compromise or agreement is a much researched topic of many disciplines, which is referred by economists as a market mechanism or "negotiation". Recent advancements in information and communication technologies (ICTs) have triggered a surge of interest in the computerization of negotiations. The computer-based negotiation systems take many forms in terms of their design goals, the underlying technologies and system architectures, collectively studied in the broad field of e-Negotiation Systems (ENSs) research. In contrast to the ever-growing attention, the awareness and widespread adoption of ENSs still seem to be slow-paced in the industry. This dissertation is highly motivated to contribute towards the successful design and use of advanced negotiation support technologies as an endeavor to shed light on ENS-application in organizations, through the development of a theoretical framework and subsequent empirical investigation. In this endeavor, the effectiveness and efficacy of differing ENS functionalities are evaluated by a dual theoretical lens employing the *economic, game-theoretic* perspective of negotiation outcomes in terms of efficiency and fairness, as well as the *social-psychological* measures of negotiation process and outcomes such as negotiators' satisfaction and perceived collaboration. Furthermore, we also examine how the task characteristics interplay with the different configurations of system design in affecting negotiations.

This dissertation attempts to address three appealing research issues centered on ENSs: 1) the conceptual classification of key ENS functionalities incorporating decision support, multimedia communication support and agent-based automation, 2) the systematic examination of the effects of different ENSs, and 3) elucidating the practitioners' perceptions of e-Negotiations in B2B e-marketplaces. A theoretical research framework is proposed which triangulates the effects of ENS functionalities with respect to both economic and social-psychological measures of the negotiation process and outcome. Based on this framework, system prototypes featuring key ENS

functionalities are developed, followed by a series of experimental studies utilizing factorial design. Together, our findings suggest that ENS technologies have significant effectiveness and efficacy when situated in appropriate settings. Among others, pre-negotiation support, decision support and multilingual support tools are shown to have positive impacts in enhancing negotiators' joint outcomes. Compared to decision support tools, the effects of agent-based negotiation systems differ significantly in terms of negotiators' satisfaction with negotiated settlement and on their perceived control towards the system. In addition, a field study is carried out in a B2B e-market context with the aim of inquiring potential ENS-users' perceptions of e-Negotiation technologies. The findings highlight important situational factors leading to ENS adoption intentions and suggest positive opportunities in jointly engaging diverse forms of e-Negotiation technologies in B2B e-market growth. The dissertation ends by envisioning the outlook of e-Negotiations and articulating directions for future research.

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

Bargaining and negotiation has long been a topic of interest to economists, social scientists, psychologists and organizational behavior researchers. Being common in the business and social world, negotiation is also a rather complex task and its success is dependent on a variety of factors. Weak information processing capacities and capabilities, cognitive biases, and socio-emotional problems associated with human negotiators often hinder the achievement of optimal negotiations (Foroughi and Jelassi, 1990; Foroughi et al., 1995). These "stumbling blocks" to successful negotiation have led researchers to pursue computer-supported negotiations in the form of **Negotiation Support Systems (NSSs)** since the 1990s. Rather than considering negotiation as an "art", NSSs stress a "scientific" approach to the negotiation process. This "scientific" approach (Raiffa, 1982) refers to a systematic analysis of problem solving. In the realm of negotiation, the focus of the analytical approach is on optimizing the outcomes for both parties and achieving a win-win solution rather than on specific strategies, tactics, and maneuvers, which will allow one party to "beat" the other. Early research on NSSs has primarily focused on two key technological aspects: (1) group decision and/or conflict resolution models to help negotiators reduce discord and increase the chances of reaching consensus, and, (2) providing rich communication media to enhance communication exchange between negotiators (Bui and Shakun, 1997).

With the advance of information and communication technologies (ICTs) over the years, the notion of NSS has apparently evolved. Automated negotiations using advanced agent-based technologies have become an increasingly important area of Artificial Intelligence (AI) research (Sycara, 1990; Huang and Sycara, 2002; Li and Cao, 2004). Furthermore, with the globalization

of the world's economy as well as the growth of e-commerce, an increasing number of business activities are going online. Negotiation, as one of the key activities of business transaction in the marketplace, has to be effectively and efficiently supported by mechanisms such as process facilitation and automation. Compared to the traditional view of NSS which focuses on supplementing face-to-face negotiations, web-based systems deployed over the Internet are designed to support and/or automate online negotiation activities. These systems are thus collectively referred to as **e-Negotiation Systems**, or **ENSs** (Braun et al., 2006; Goh et al., 2000; Kersten, 2003; Strobel and Weinhardt, 2003).

More recently, the development and evolution of B2B e-commerce has demonstrated great potential for applying e-Negotiation technologies to online markets. In today's growing e-marketplaces, intermediaries match tens of thousands of small and medium size enterprises (SMEs) globally, thus opening doors for global buyers and sellers to interact and gain access to previously unattainable foreign markets. This has triggered awareness of a number of new issues related to e-Negotiations which have not been addressed adequately in existing literature. While both researchers and practitioners have come to realize the potential contributions and commercial values of "negotiated e-commerce" (Moai.com, 2000), it is just as critical to understand the complications behind the possible success of e-Negotiations. How the exact nature of negotiation and the ever-changing contextual environment interplay with various forms of e-Negotiation technologies have become compelling and important issues.

There are two intertwining themes throughout this dissertation: the various forms of e-Negotiation *technologies* that assume different roles in supporting negotiations, and the *contexts* in which the theoretical and empirical investigations take place. In other words, this dissertation makes attempts to investigate the joint effects of technological artifacts and contextual factors by addressing a few key arenas which impose contemporary, noteworthy and contextual challenges

to ENS research. This doctoral dissertation is concerned with theoretical and empirical work incorporating the following arenas.

The **first** arena deals with the need to provision effective support for *all stages of negotiation.* In existing literature, tasks employed in many NSS laboratory studies (e.g., Jones, 1998; Foroughi et al., 1995; Delaney et al., 1997; Goh et al., 2000) are largely structured with clearly-defined issues and values for the negotiation task. The common assumption is that the pre-negotiation activities which involve defining the negotiation problem, selecting issues and discussing value options, have taken place a priori. As such, research findings could be rather limited vis-à-vis the complex nature of real-world negotiations involving problem definitions at the pre-negotiation stage. Empirical examination on how pre-negotiation preparation tools can improve negotiation outcomes is lacking. (See Chapter 5)

The **second** arena concerns the *phenomenal number of negotiations involving cross cultural and linguistic groups*. As a result of globalization, the cultural dimension has become more and more prevalent in business negotiations, i.e., the number of business negotiations involving people from different national and cultural backgrounds has increased tremendously. When international business partners speaking different languages interact, potential communication problems are expected to affect the effective and efficient conduct of negotiation processes. This problem has triggered a growing reliance on computer-based multilingual support. With multilingual support, communication barriers and problems are expected to be addressed among international negotiators of different language backgrounds. (See Chapter 6)

The **third** arena concerns the use of electronic *communication media with every-growing capabilities.* Advances in ICTs such as videoconferencing essentially shrink geographical distances, and result in considerable savings in costs and time which are both associated with business trading activities. However, despite the increasing use of videoconferencing for cross-regional businesses, most NSS experimental studies have been limited to simple keyboard

interactions like email or other text-based chat facilities, thus limiting their findings on negotiators who are using advanced communication technologies. Empirical study is required to gain insights that will provide evidence regarding the capability and efficacy of ENS to enhance negotiation outcomes via the videoconferencing communication channel. (See Chapter 7)

The **fourth** arena pertains to how advances in *agent-based technologies* of AI research affect the design of ENS. While the traditional approach to designing an e-Negotiation system has been centered on providing decision support tools, the AI approach advocates the use of intelligent autonomous agents, equipped with personality configurations and learning capabilities, to conduct negotiation on behalf of human users. While each approach has received increasing attention, little empirical research has been conducted to critically compare the effects of alternate design approaches, including both economic and user-perception measures. Experimental investigation on alternate designs for agent-based negotiation is deemed relevant and important. (See Chapter 8)

The **fifth** arena deals with the role of e-Negotiations in contributing to the success and growth of online marketplaces. Despite research efforts which have centered on ENS over the past decades, the adoption of such technologies has been slow-paced. Not surprisingly, the adoption of e-Negotiations is a very complex issue involving interplay of technological, social-cultural, infrastructural, and institutional factors. The goal of this part of our research efforts is to explore a set of specific factors pertaining to ENS adoption in emerging e-marketplaces. (See Chapter 9)

1.2 RESEARCH SCOPE AND OBJECTIVES

Due to the large volume of published literature on negotiation from various disciplines, it is necessary to keep the research scope focused so that the intended propositions are empirically examinable. Prudently, defining the following-mentioned research scope helps to confine this

thesis from overly general discussions and to concentrate on issues that are important from the theoretical and practical perspectives.

The central phenomenon of interest in my dissertation is on *multiple-issue, two-party* **negotiations** between mostly *geographically-dispersed* negotiators in the business context. The underlying rationales for this interest are: 1) When *multiple issues* are present, an integrative bargaining (win-win) situation is likely to emerge in contrast to single-issue bargaining. Accordingly, there are opportunities for the use of computer support tools to help structure and facilitate negotiations between buyers and sellers.

2) Being a complex process, a negotiation situation involving more than two parties, such as in the case of multilateral negotiations or group negotiations, is even more complicated to examine. By concentrating on the simplest and most common form of *dyadic* negotiation, the findings of empirical research are free from the confounding complexity of multilateral/group negotiation scenarios.

3) Some earlier empirical research has been conducted in the context where an NSS system is used to complement face-to-face negotiation, in which verbal communication and direct contact are available. However, with an increase in trading activities being transacted over the Internet, the scope of NSS should also grow to incorporate effective telecommunication support. In such situations, *geographically-dispersed* business partners from different regions or countries should be able to negotiate through various forms of electronic communication media.

Currently, research in the NSS/ENS field requires greater effort to be devoted towards theoretical development. Existing NSS experimental studies have mostly dealt with comparisons of the effects of IT-supported negotiations versus those that are non-supported, and have shown inconclusive results. This is arguably due to the confounding effects of different forms of technologies when they assume different support roles for negotiations. To clearly understand how each technological feature can contribute to the improvement of negotiation processes and

outcomes, we need advanced theoretical conceptualizations and empirical underpinnings on e-Negotiation technologies. It is also important to take into consideration the social and psychological processes that underlie the negotiator-ENS interaction.

The goal of this doctoral research is to develop theoretical classifications of various e-Negotiation technologies and to provide a series of empirical studies on their effects from both the economical and social-psychological perspectives. As a natural consequence of these endeavors, this dissertation also puts forward insights on the application of ENS in emerging e-marketplaces. Specifically, three main research objectives are addressed:

1. *How can we holistically conceptualize the numerous e-Negotiation systems available in existing literature?* Chapter 4 directly addresses this issue.

2. *How do different forms of ENS affect negotiation process and outcomes? How do the system artifacts interplay with level of conflict?* Chapters 5 to 8 present empirical studies to address these questions through experimentation on the effects of different system artifacts.

3. *What are the present and future applications of e-Negotiations in e-marketplaces?* Chapter 9 focuses on current state and future trends in the commercialization of e-Negotiations and examines the practitioners' perceptions towards this issue, by means of both conceptual analysis and an exploratory field study.

1.3 DISSERTATION OUTLINE

The dissertation is organized as follows. First, in Chapter 2, we will examine existing negotiation literature and then explore the key dynamics and factors involved in negotiations. Chapter 3 reviews literature specific to IT solutions for negotiation, and considers how e-Negotiations literature has evolved as far as empirical studies and theoretical development are concerned. At

the end of the literature review chapters, variables studied in previous NSS/ENS studies are summarized in a generic framework.

Chapter 4 presents the theoretical framework guiding the empirical investigations for this dissertation. Technological factors are examined in terms of three categories differing in their design goals and functionalities in supporting negotiations. The negotiation process and outcomes are assessed from both the economic and social-psychological perspectives. Theoretical constructs are defined along each perspective. High level propositions are presented, based on theoretical reflection and justification.

Chapters 5 to 8 present four experimental studies that are conducted based on the theoretical framework. Experiment 1 focuses on the Category I system, while experiments 2 and 3 cover the categories I and II systems, and Experiment 4 relates all the three system categories. Each study addresses a particular set of technological and contextual configurations and examines their effects. For each experiment, we articulate the specific research questions, the relevant research models and hypotheses, the experiment design, data analysis and the discussion of results. Limitations and implications are also discussed.

Chapter 9 represents an attempt to step beyond laboratory experiments by seeking practitioners' perceptions towards e-Negotiation technologies in industry. We extend our research context to include a particular scope in terms of the "marketplace" concept and functions, and analyze the ways e-Negotiation technologies can play a part in the growth of online marketplaces. A field study is conducted to enrich our understanding with regard to e-Negotiations in practice.

Chapter 10 summarizes the overall findings of the dissertation and provides insights and recommendations on the industrial use of e-Negotiation technologies. The thesis ends with a discussion of the limitations and contributions of the entire dissertation and concludes with future research directions.

CHAPTER 2 LITERATURE REVIEW ON NEGOTIATION

Negotiation is a complex, multi-faceted phenomenon which is common in both social life and the business world. It is a well-studied topic of many disciplines such as economics, sociology, psychology, political science, organizational behavior, and computer science. Although each discipline develops its own theories on negotiation, the underlying concepts are intertwined. This chapter reviews the various streams of literature in order to holistically understand the impact of important dynamics on negotiation process and outcomes.

We will first define "negotiation", and then present an overview of three major streams of classic negotiation theories, namely the normative, descriptive and prescriptive theories. Next, we will look at the factors that influence negotiation, i.e., the negotiation dynamics which form the fundamentals of negotiation research. These dynamics include the goals and negotiation strategies, task characteristics, individual characteristics, group characteristics, negotiation processes, as well as the political and cultural infrastructures.

2.1 NEGOTIATION

Success in negotiation was once considered an *art*, based on "interpersonal skills, the ability to convince and to be convinced, the ability to employ a basketful of bargaining ploys, and the wisdom to know when and how to use them" (Raiffa, 1982, p. 8). However, not all negotiators possess the opportunities, experience or interpersonal skills to master the art of negotiation. Even the most capable negotiators frequently find it difficult as well as risky to rely solely on their own subjective judgments for obtaining feasible resolutions to conflict (Antrim and Lax, 1987). In other cases, even if negotiation parties do reach an agreement, they may not have achieved the best possible solution. Traditionally, the focus of negotiation studies has been on complex and difficult negotiation problems and on training negotiation experts. Guidelines for negotiators

include suggestions for specific strategies, tactics and maneuvers which could help one win in a negotiation setting (e.g., Zartman and Berman, 1982).

Most theorists share the notion of negotiations as a process. To Carnevale and Isen (1986), **negotiation** is a process by which two or more people make a joint decision with regard to one or multiple issues about which there are initial differences in preferences. It has four basic features: *the negotiation parties, their interests, the negotiation processes* and *the negotiation outcomes* (Thompson, 1990). Negotiation processes and outcomes are always affected by numerous elements such as goals and strategies, the amount of conflict in negotiation interests, negotiators' personalities, relationships, experiences and environment factors and including time pressure and information. A large number of theoretical models of negotiation have been developed in attempts to understand negotiation in terms of these four basic features. Next, we focus on the following three major approaches towards theoretical analyses on negotiation (Raiffa et al., 2002):

- *Normative* approach (Game Theory): how *ideally* negotiation decisions should be made (by super-rational individuals)
- *Descriptive* approach (Social-Psychological and Behavioral Theories): how real people *actually* negotiate (very often at variance with the normative abstraction)
- *Prescriptive* approach (Joint Decision Making Theory or Negotiation Analysis): how *real* people could negotiate *more advantageously* (with some systematic reflection).

2.2 THEORETICAL MODELS OF NEGOTIATION

Normative, game-theoretic models of negotiation (Nash, 1950, 1953; Rubenstein, 1982) assume rationality and focus on the outcomes that should emerge from these rational actions by all negotiating parties. The objective of normative models is to determine the best decision given certain explicit and reasonable assumptions. Because of its explicit assumptions of individual

rationality and normative analyses of negotiation behavior, game theory has been simultaneously a goal of much descriptive experimental research as well as a foil against such research (Dawes, 1988; Kahneman et al., 1982). These models focus on the best outcomes but ignore the process of the negotiation itself. As such, a major critique of game-theoretic negotiation models is the lack of predicting power on *how* the "best" solution can be made in the real world. Besides its limitations, the game-theoretic approach is still well referenced as it provides clear articulation of economically modeled negotiation outcomes in terms of bargainers' utilities received from a bargaining session.

In contrast, **descriptive theories** of negotiation in sociology, psychology and organizational behavior have mostly emphasized the contextual characteristics of negotiation as well as negotiators' cognition and interaction processes (Bazerman and Carroll, 1987; Pruitt and Rubin, 1986). Instead of having a single, well-established theory as in the normative approach, descriptive theory is a collection of hypotheses, predictions and low-level theoretical statements covering a wide range of situational determinants. These descriptive theories examine the influence of individual differences, situational determinants and cognitive processes on judgment, behavior and outcomes in negotiation (Bazerman and Carroll, 1987; Hausken, 1997; Thompson, 1990).

On its part, the micro-level perspective of descriptive theories looks at *individual differences* which refer to those individual attributes (such as gender, personality variables, language and culture, motivated behavioral tendencies and experience) that are unique to individual negotiators.

On the contrary, *situational* research focuses on a macro-level observation of the negotiation process and its dynamics, including social norms, the magnitude of negotiators' conflict of interests, relative powers of negotiators, prevailing deadlines and time pressure, the relationship between negotiators, third party intervention, and forms of communication between negotiators. Research on situational variables has contributed much to understanding of the negotiation

process and has directed both practitioners and academics to consider important structural components.

Bazerman and Carroll (1987) proposed another stream of negotiation study from the perspective of the behavioral decision theory on human cogitation in general. The *cognitive perspective* or *information processing approach* of negotiation holds the position that the reasons for not achieving optimal or near-optimal outcomes lie in the very limitations of human beings as information-processing systems (Bazerman and Neale, 1983). They argue that it is not the objective, external aspects of the situation that directly affect negotiator behavior; rather, it is the way the negotiator perceives the opponent as well as his/her own bargaining role and the bargain situation, and then using these perceptions to interpret and screen information. Examples of cognitive bias in negotiation include fixed-pie assumption, frame and escalation. Limitations concerning intelligence and perceptions further constrain the ability of decision-makers to make necessary calculations and identify the optimal choice from available information.

The **prescriptive theory** of negotiation (later referred to as **Negotiation Analysis**) integrates descriptive decision analysis and game theory in order to provide formal and meaningful support for the negotiation problem (Raiffa, 1982). The goal of this approach is to bridge the gap between descriptive qualitative models and normative formal models of bargaining. The analytical approach involves three steps: 1) defining issues and their ranges; 2) preference elicitation (weightages and utility functions are elicited from each party[1]); and 3) (game-theoretic) optimal solution(s) is (are) computed for each party's consideration.

This "scientific" approach (Raiffa, 1982) refers to a systematic analysis for problem-solving in the realm of negotiation. Negotiation Analysis adopts a number of behavioral concepts (e.g., reservation values, BATNA, integrative/distributive negotiations, and principled negotiations)

[1] In order to simplify subsequent computations, utility functions are generally assumed to be linear or additive.

and incorporates them in quantitative game-theoretic models (e.g., utility functions and preference elicitation techniques). Its strength and contributions lie in the consideration of aspects and features which are disregarded in game-theoretic normal models and decision analysis but which take place in real-life situations. In the realm of negotiation, the focus of the analytical approach is on optimizing the outcomes for both parties and achieving a win-win solution instead of focusing on specific strategies, tactics, and maneuvers, which will allow one party to "beat" the other.

2.3 NEGOTIATION DYNAMICS

The above overview indicates that in negotiation literature, whereas game theorists focus on the issues and value functions for the negotiation tasks, descriptive and behavioral research concerns a great variety of social-psychological factors that affect negotiations. Thompson et al. (1995) suggest four major social context factors that affect negotiations: 1) the number of parties and relationships among those parties; 2) the social norms that govern the negotiation (group and cultural norms and practices); 3) the social knowledge and goals that the parties have (what the parties want, what they know about each other, and what their outcome objectives are); and 4) the communication processes that the parties use (verbal versus written, how the parties interact, and the informal rules that govern their interaction). Following the prescriptive perspective suggested by Raiffa (1982), we will review notions and concepts studied in both descriptive and normative literature in order to obtain a holistic understanding of negotiation.

While existing literature has been loosely structured in terms of the constructs and hypotheses, we attempt to organize this section by visiting the important factors grouped according to task, people, process, and environment with regard to negotiations (see Figure 2-1).

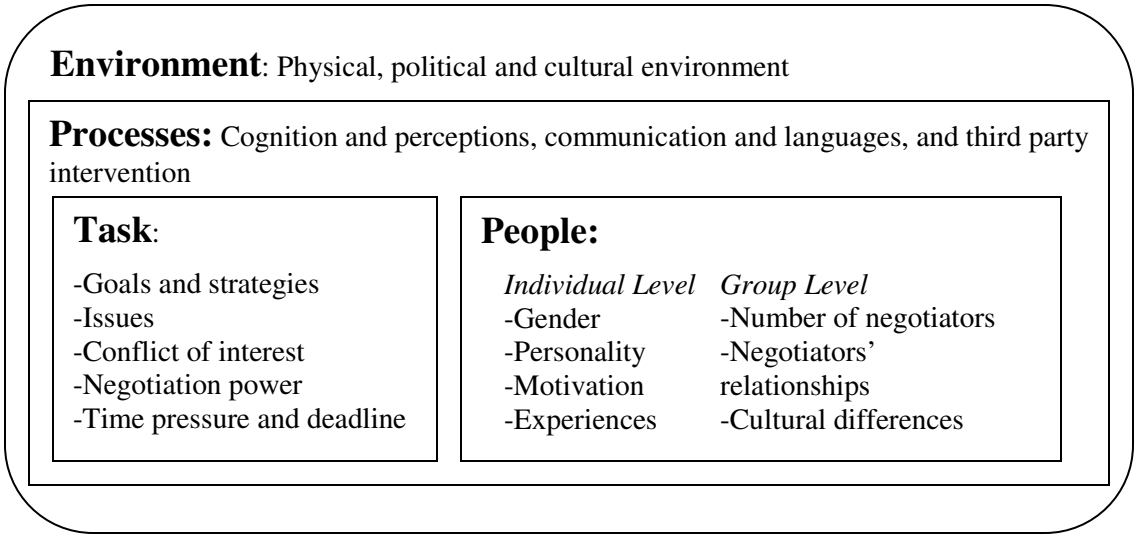

Figure 2-1. An Overview of Negotiation Dynamics

2.3.1 Task Characteristics

2.3.1.1 Goals and Strategies

Strategies or tactics[2] are almost at the heart of negotiation. A negotiation **strategy** is manipulated by a number of concession parameters, such as the initial and final offers, and concession frequency and magnitude (Yukl, 1974). How people will choose different strategies depends on their goals on negotiation.

The **dual concern model** (Pruitt and Rubin, 1986) describes the basic orientation that people take towards conflict[3]. In a two-person interaction, individuals in conflict have two levels of inter-related concerns: the concern for one's outcomes as well as the concern for the outcomes of others. As depicted in Figure 2-2, there are four types of initial strategies for negotiators: avoidance, accommodation, competition, and collaboration.

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[2] Following standard English language, strategies refer to long-term, high level plan to achieve a goal; tactics are the short-term, adaptive moves designed to enact or pursue higher-level broad strategies.

[3] Savage et al. (1989) have also proposed a similar model for the choice of a negotiation strategy.

Is relationship outcome important?	Is substantive outcome important?	
	No	**Yes**
No	**Avoidance** *don't care*	**Competition** *win-lose*
Yes	**Accommodation** *lose-win*	**Collaboration** *win-win*

Figure 2-2. Dual Concern Model (Adapted from Pruitt and Rubin, 1986)

The **avoidance** strategy is a non-engagement strategy as both substance and relationship outcomes are not concerned, showcasing an "I do not really care" attitude of negotiator. This may happen in a situation when it may not worth the time and effort for a party to negotiate; or a party has very strong/weak alternative to be engaged in current negotiation; or a negotiator is in a trainer's position (Lewicki et al., 1999).

Accommodative, competitive and collaborative strategies are more common negotiation strategies. The **accommodation** strategy is an "I may lose, but I would prefer to make sure you will win" strategy. It is appropriate when the negotiator believes the relationship outcome is more important than substantive outcome. When a long-term relationship is expected, a negotiator may engage accommodative strategy in order to obtain future reciprocal accommodation (tit for tat) from the counterpart (Homans, 1961).

Competition is commonly described as *distributive* or *win-lose* bargaining where the primary goal of a negotiator is to maximize his/her own outcome. In distributive bargaining, the goals of one party are usually in direct conflict with the goals of the counterpart. When the goals are similar, negotiation parties are mostly in competitive positions in order to win from a limited resource (often reflected as money, e.g., price of a product or salary for an employment contract). The strategies or tactics that negotiators will employ play an important role in determining one or both parties' negotiation outcomes (Walton and McKersie, 1965). The literature suggest that the central strategies that negotiators can employ in competitive situations are to *safe guard their own*

information, and try their best to learn their counterpart's information as much as possible in order to gain a strategic advantage (Lewicki et al., 1999). One should be cautious that competitive strategies are useful and powerful when a negotiator's goal is to maximize his/her own outcome while the relationship with the other party is not important (refer to Figure 2-2).

In contrast, **collaboration** is also referred to as *integrative* or *win-win* negotiation where a negotiator is trying to seek for maximizing joint outcome. When the goals are different, one party can gain value not necessarily at the expense of the other party's value-loss. Through discussion and exploration of each others' goals, negotiation parties can achieve win-win outcome even though the conflicts appear win-lose at the initial stage (Walton and McKersie, 1965). The literature has suggested at least five different methods to achieve integrative agreement, namely *expanding the pie, logrolling, nonspecific compensation, cost cutting* and *bridging* (see Pruitt and Carnevale, 1993; Pruitt and Rubin, 1986 for a series of refocusing questions to reveal win-win solutions). ***Logrolling*** is an important and practical technique to achieve win-win, integrative solutions. At the preparation stage, parties can find more than one issues in conflict, then agree to trade off among issues so that one party achieves a highly preferred outcome on the first issue and the other achieves a highly preferred outcome on the second issue. If only one primary issue is at stake at the initial stage, the parties can continue to brainstorm for more issues. "Unbundling" (Lax and Sebenius, 1986) or "unlinking" (Pruitt, 1981) can be engaged so that one issue can be separated into two or more issues.

2.3.1.2 Issues and Interests

Issue is a basic parameter to negotiations and has been frequently discussed in negotiation research. An **issue** is a topic of discussion that is of particular *interest* in a negotiation. The **interests** of negotiators are the preference or utilities each negotiator placed on the resources to be divided among them (Kahneman et al., 1986).

The number of issues (i.e., the negotiation domain) divides negotiations into single-issue and multiple-issue negotiations (Holsapple et al., 1996; Holsapple et al., 1998; Lomuscio et al., 2001). For example, a very common day-to-day form of negotiation is on a single issue[4] – the price of a product. With more issues (e.g., quantity, delivery time and warranty period), there are more opportunities for parties to tradeoff their different interests over the issues and hence achieve more integrative solutions.

2.3.1.3 Conflict of Interests

Conflict occurs ubiquitously in everyday life as a result of various sources including ideas, thoughts, emotions, values, predispositions, or drives that are in conflict with each other between or among individuals and groups (Lewicki et al., 1999). There are many ways to resolve conflicts traditionally, e.g., surrendering, using violence, filing a lawsuit, and even breaking wars. Regardless of the cause of the conflict, negotiation can play an important role in resolving it.

In the business world, conflicts of interests frequently occur in labor-management contract disputes and between organizations over mergers or purchasing contracts. **Conflict of interests** encompasses "situations in which two or more parties have separate interests or goals which conflict, such that one party's goal achievement may prevent the achievement of the opposing party's goals" (Foroughi et al., 1995, p. 486). In the form of negotiation for conflict resolution, the intensity of the conflict has been discussed in terms of "size", "degree", "amount", "intensity", etc (Foroughi et al., 2005).

Based on the *degree of conflict* between parties' interests, Walton and McKersie (1965) proposed a behavioral theory of bargaining that distinguished between *distributive* and *integrative* negotiation situations. The integrative negotiation, also known as "soft" negotiation or "win-win"

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[4] Single-issue negotiation is often called *bargaining,* while *negotiation* is more on multiple issues. In many published materials, bargaining and negotiation have been used interchangeably.

situation, allows negotiation parties to "expand the pie" through problem-solving, creativity, and identification of differences in priorities and/or compatibility of interests; whereas in the distributive negotiation, also known as "hard" negotiation or "win-lose" situation, parties can only bargain over a "fixed pie" (Fisher and Ury, 1981). Based on the study of Jelassi and Foroughi (1989), the integrative negotiation occurs when the goals of the parties are not mutually exclusive and it is possible for both parties to achieve their objectives; yet the distributive negotiation is characterized by the fact that (1) the goals of each party are in direct conflict with those of the opposing one; (2) resources are fixed and limited; and (3) each party wants to maximize its share of the resources.

The categorization of distributive bargaining and integrative bargaining has influenced many negotiation researchers and practitioners and provided a basis for further descriptive studies on negotiation processes. Thereafter, significant effort was made in the formulation of principles and strategies underlying the integrative negotiation to achieve a win-win situation through information sharing (e.g., Pruitt, 1983; Raiffa, 1982; Shakun, 1988). Instead of enhancing one's position or power by strategies and maneuvers, this integrative approach emphasizes the optimization of both parties' outcomes (Jelassi and Jones, 1988). Hence, integrative bargaining connotes an element of co-operation often contrary to the conflicting nature of the negotiation process.

2.3.1.4 Negotiation Power

In negotiations, power is often used synonymously with leverage. Common knowledge tells us that bargaining power is important to negotiations, because it gives a negotiator advantage over the other party. Being a very intangible concept, power has been defined in many ways. Deutsch (1973) suggests a relational notion of **power**: "power is a relationship concept; it does not reside in the individual but rather in the relationship of the person to his environment" and in this way, "(An actor) has power in a given situation to the degree that he can satisfy the purposes (goals,

desires, or wants) that he is attempting to fulfill in that situation" (Deutsch, 1973, pp. 84-85). According to French and Raven (1959), power may come from five major sources, namely expert power, reward power, coercive power, legitimate power, and referent power. In negotiation context, Lewicki et al. (1999) suggest three variations that negotiation power may come from: 1) information and expertise (mastery of a body of information), 2) control over resources such as money, material, labor, time, and so on, and 3) location in an organizational structure, e.g., formal authority in a hierarchical organization.

In empirical studies, bargaining power has been manipulated in three major ways – through the status of the players, through the experiment's reward structure, and through Best Alternatives to a Negotiated Agreement (BATNAs). For the first way in manipulating power through status, research finds that subjects made more cooperative choices when playing against an individual of equal status, in contrast to playing against an opponent of higher status (Rekosh and Fiegenbaum, 1966; Faley and Tedeschi, 1971). In the second way using reward structure, it is suggested that subjects with equal power were more likely to behave cooperatively than those with unequal power (e.g., Swingle, 1970).

Fisher and Ury (1981) propose a widely-adopted idea to formulate bargaining power, the BATNAs concepts. A **BATNA** represents an alternative option if no agreement can be reached. It is an important source of power because it gives a negotiator the power to walk away from any negotiations when the emerging deal is not good. If a negotiator has many attractive alternatives, he/she can set the goals and reservation value higher and make fewer concessions. When a negotiator has no other alternative, such as in a monopoly market dealing with a sole supplier, he/she has much less negotiation power and will make more concessions in order to clinch a deal. Pinkley et al. (1994) show that dyads that had equal BATNAs, whether high or low, achieved superior outcomes when compared to those dyads with unequal power.

2.3.1.5 Time Pressure and Deadline

Time pressure is frequently studied by both economists and psychologists. It is often conceptualized as a changing cost over time, and has been generally manipulated in two ways: 1) through explicitly setting deadline (e.g., Maule and Hockey, 1993; Pruitt and Drews, 1969; Stuhlmacher and Champagne, 2000), and 2) through a discounting function of utility (e.g., Contini, 1968). In the first way, high and low time pressure is controlled by the amount of time participants are given to reach an agreement. In the second way, time pressure is represented by a discounting function of duration or number of rounds.

Time pressure can influence both the processes and the outcomes of negotiations. Studies have shown that high time pressure is believed to affect the speed of the negotiation, producing quicker concessions, quicker agreements, and lower demands than low time pressure (e.g., Hamner, 1974; Lim and Murnighan, 1994). In terms of final agreement, high time pressure produces less efficient outcome (e.g., Contini, 1968).

The existence of time pressure may also create **deadline** effect, which is the phenomenon of a striking concentration of agreements reached in the very last seconds before the deadline (Roth and Murnighan, 1982; Roth et al., 1988). For example, in Roth and Murnighan's (1982) experiment, a significant fraction (35 percent) of all agreements involved settlements in the final 30 seconds of the 25-minute bargaining period. About half of these occurred in the last five second.

2.3.2 Negotiator(s) Characteristics

Negotiation is a kind of social interaction. One of its basic features is the negotiation party, i.e., the negotiator. Some people can perform better than others in negotiations. How do the better negotiators think and behave differently from the average? Researchers have been examining the effects of negotiators differences on the process and outcomes of negotiations since 1950s. The

first four sub-sections review those factors concerning *individual* characteristics that affect negotiations, including gender, personality, language and culture, motivation and experiences. The latter three sections review *group* level factors such as the number of negotiators, negotiators' relationships and cultural differences.

2.3.2.1 Gender

The most empirically researched individual factor in negotiations has been probably the search for sex differences – the **gender** effects on negotiations. While empirical results are numerous, the effects of gender on negotiations are rather contradicting. Two meta-analysis studies conclude that females behave more cooperatively and less competitively in negotiation than males (Walter et al., 1998), and that males tend to negotiate better outcomes than women (Stuhlmacher and Walters, 1999). While the reviews suggest some conclusions, it is to be cautioned that the differences are small in magnitude. Chodorow (1974) attributed this discrepancy to gender effects in early developmental experience: females develop their sex-role identities in an interdependent interplay between mother and child, whereas males establish their sex-role identities through separation and individuation form their mothers. These different experiences lead women to define themselves *in relation to* others, and men to define themselves *in contrast to* others. Kray et al. (2001) discuss stereotype threat effect drawing upon a social psychological theory (Steele, 1997) and examined how the performance of male and female negotiators varies depending on the kinds of sex-role stereotypes that are activated in a particular situation.

With the development of contemporary research in gender and social behavior, researchers argue that gender effects in negotiation would arise, be absent, or even reversed under certain circumstances (Pruitt et al., 1986; Stuhlmacher and Walters, 1999 ; Kray et al., 2001). In all means, gender shall be observed carefully when one attempts to understand negotiation processes and outcomes.

2.3.2.2 Personality

Personality attributes may include many dimensions of individual traits such as *cognitive ability* (which is synonymous with the general notion of *intelligence*), *emotional intelligence* (as opposite to cognitive intelligence), *risk preference*, and so on. Do people who are smarter or more capable or more extroversive make themselves better negotiators? Both everyday experience and academic research suggest that personality plays an important role in the negotiation process and outcomes, however, no single personality trait or characteristic is found *consistently* linked to success in negotiation (Ma and Jaeger, 2005). For example, to the extent that negotiation entails the navigation of complex problem-solving tasks, it is reasonable to expect that individual cognitive ability may predict negotiation processes and outcomes (Fulmer and Barry, 2002). However, the role of cognitive ability is not clear as far as empirical work is concerned. Rubin and Brown (1975) review early bargaining research and conclude that intelligence is unrelated to bargaining behavior. In contrast, strong relationship has been found between cognitive ability of negotiators and the ability to reach integrative settlements in more complex negotiation settings (Barry and Friedman, 1998; Kurtzberg, 1998).

When examined in experiment settings, one would find that personal trait factors do not account for much variance in negotiation behaviors; the small and subtle effects of individual differences can be easily overridden by other factors, such as situational power (Ma and Jaeger 2005). Therefore, even though personality traits deemed important factors that affect negotiation behaviors and outcome, they simply offer limited potential for predicting negotiation outcomes.

2.3.2.3 Motivation

Researchers have also examined the effects of **aspiration** on negotiation behaviors and outcomes. Generally speaking, negotiators with high aspirations can obtain a large share of joint profit as they can make smaller concessions, make larger demands, take longer to reach agreement and

earn higher profits than those with low aspirations (Siegel and Fouraker, 1960; Huber and Neale, 1986; McAlister et al., 1986; Neale and Bazerman, 1985a).

2.3.2.4 Experiences

It is a common perception that professional negotiators – the experts who negotiate for a living – should be better negotiators than do the novices or inexperienced negotiators. The effects of **experiences** on negotiations have not been a popular topic, probably due to the fact that less nontrivial findings can be expected. In two experimental studies that compare the performance of experts and novices on integrative task, results show that experts resolved conflicts more quickly and were more successful in reaching integrative outcomes (Neale and Northcraft, 1986; Scholz et al, 1982).

2.3.2.5 Number of Negotiators

Negotiations can take place involving the following social structures differed by **number of negotiators**: a negotiating dyad, agents on behalf of their constituencies, multiparty negotiators, two-party negotiation with teams, and third parties (Lewicki et al., 1999). The simplest social structure in a negotiation occurs when two isolated individuals negotiate for their own needs and interests. The many other possible participants such as additional team members, constituents and bystanders may be viewed as audience which may introduce audience effects. The physical presence, outcome dependency, and degree of involvement make the effects of different audiences vary from each other (see Lewicki et al, 1999, pp. 289-312 for more details on negotiation dynamics between agents and constituents).

When negotiations involve multiple parties, such as two buyers and one seller, the negotiation dynamics may change as parties may form **coalitions** or subgroups in order to strengthen their bargaining position. Multiparty negotiations are more complex and difficult to manage due to the following the number of parties and their roles, informational and computational complexity,

social complexity, procedural complexity, and strategic complexity (Bazerman et al., 1988; Kramer, 1991). Touval (1988) outline three key stages that characterize multilateral negotiations and provide practical guide how a single negotiator can do in multilateral negotiations.

2.3.2.6 Relationships

In real life, negotiations largely take place between negotiators with existing relationships. Even in the simplest form of negotiation between a dyad, different forms of relationships may exist. Fiske (1991) discuss four types of social **relationships**: 1) *communal sharing* which is typically found in families, clubs, fraternal organizations and neighborhoods, 2) *authority ranking* which is typically between subordinates to bosses, soldiers to commanders, and negotiators to their constituents, 3) *equality matching* which is tit-for-tat-based reciprocity, and is typically found in team members who need to work together and coordinate their actions, and 4) *market pricing* which is in all forms of buyer-seller transactions. According to Lewicki et al. (1999), *trust*, *emotions* and *justice* form the three core elements which are common to many negotiations within relationships. Among all, trust issues are central to relationships especially communal-sharing relationship. Emotion is also critical to relationships. Justice and fairness are also absolutely central to relationship negotiations.

A great amount of negotiation research, which is laboratory-based, has simulated market transactions where parties have no prior relationships and expect no future relationships. Parties' past relationship or expectations of future relationships may significantly change the dynamics of negotiations. For example, Valley et al. (1995) show that different negotiation outcomes are achieved by strangers, friends and married couples in dyadic negotiation with integrative potential. Friends reported less competitive behavior and achieved solutions with high joint utility than either did strangers or married couples.

According to Sheppard and Tuchinsky (1996), relationships have certain parameters that could dramatically change our understanding of negotiation strategy and tactics. For instance,

traditional prescriptive theories of negotiation tell that in order to be effective, negotiators must separate the person from the problem or the task (Fisher et al., 1991). However, when negotiators are in a social relationship, the other person is essentially part of the problem. In some other negotiations, relationship preservation is the negotiation goal, and parties may make concessions on substantive issues to preserve or enhance the relationship[5].

2.3.2.7 Cultural Differences

In the 1980's, the negotiation literature has largely focused on descriptive single-cultural studies and multicultural comparative studies, rather than on studies investigating *cross-cultural* interaction. Recently, due to the growth of international negotiations over the last two decades, researchers have started to pay more attention to cross-cultural interactions. A great deal of books and articles has been written about negotiation styles for people from different nationalities, such as American (Druckman, 1996; Le Poole, 1989); Chinese (Pye, 1992; March and Wu, 2007); Japanese (De Monte, 1987; March, 1988; Graham, 1993); and comparisons between countries (Graham, 1984; Tse et al., 1994).

How do cultural differences of negotiating parties influence negotiations? Foster (1992) suggests that culture can influence negotiations across borders in at least eight different ways, namely definition of negotiation, selection of negotiators, protocol, communication, time, risk propensity, groups versus individuals, and nature of agreement. Tinsley et al. (1999) suggested that intercultural negotiations reflect a "dilemma of differences", where differences between cultural scripts can cause conflict at the bargaining table, but differences in preferences can provide

[5] For example, a car sales negotiation between a dealer and a stranger client may be simple; however, if the client is the mother of the dealer, can the dealer easily treat the mother by engaging same bargaining strategy? Furthermore, different cultural contexts may have profound impact on people's view on relationships. We will continue to discuss the effects of cultural environment on relationship perceptions, which subsequently impact negotiation strategies in Section 2.3.4.

opportunities for integrative agreements. That is, if culture leads two negotiators to value issues differently, this may provide the basis of a trade on those issues.

To empirically understand the effects of culture, one has to be able to measure culture in operationalizable ways. Among others, the most influential work on culture would include defining of cultural dimensions (Hofstede, 1989; 1991) and the developing of constructs such as communication competence (Holden, 1987). The research by Hofstede (1989; 1991) can be seen as a foundation that could help theory building in cross-cultural negotiations at the national level. National **culture** is defined as the "collective mental programming" of people in an environment. Primarily, *uncertainty avoidance, individualism, masculinity* and *power distance* comprise the Hofstede framework. For example, uncertainty avoidance refers to "to what extent a culture programs its members to feel either uncomfortable or comfortable in unstructured situations" (Hofstede, 1989, p.196). Unstructured situations are characterized by rapid change and novelty, whereas structured situations are stable, secure, and absolutist. Negotiators from high uncertainty-avoidance cultures are not comfortable with ambiguous situations and are more likely to seek stable rules and procedure when they negotiate. Negotiators from cultures more comfortable with unstructured situations are likely to adapt to quickly changing situations and will be less comfortable when the rules of the negotiation are ambiguous or shifting.

As far as empirical work is concerned, Graham and Mintu-Wimsat (1997) used a theoretical negotiation model to directly test Hofstede's theories of culture. Graham (1985) conducted an exploratory study on the influence of culture on the process of business negotiations. Both verbal and nonverbal behaviors among three different cultural groups (Americans, Japanese and Brazilians) were observed. His purpose was to identify how the bargaining processes of these three groups might differ. His study provided empirical support for greater cooperation in intra-cultural negotiations compared to cross-cultural ones. It is consistent with Evan's (1963) idea of negotiator similarity. Gelfand and Christakopoulou (1999) examined intercultural negotiations

between Greek and U.S. students. They argued that cultural ideals and values in individualistic cultures emphasize separating from others and promoting one's own internal attributes; this led them to predict that negotiators in these cultures would focus on their own interests during negotiations, which would inhibit an accurate understanding of their counterparts' interests. They also argued that cultural ideals and values in collectivist cultures emphasize maintaining relatedness and fitting in with relevant others; this led to the prediction that negotiators in these cultures would be directed to the needs of others during negotiations, which would enhance an accurate understanding of their counterparts' interests. The data supported these predictions.

2.3.3 Negotiation Processes

2.3.3.1 Cognition and Perception

Negotiation can be a very difficult process, not only because of the complexity of conflicts involved, but also because of the extreme difficulty to eliminate various barriers such as cognitive difficulties, negative framing and ego, to fruitful negotiation[6]. There are numerous laboratory experiments that show impacts of negotiators' cognitive and perceptual differences on negotiation outcomes. For example, Whyte (1991a) studied *framing* effects in decision failure. Many examples showed that framing effects underlie the occurrence of many major decision failures. He also gave some suggestions to mitigate framing effects. In a separate study by Whyte (1991b), the possibility was investigated that group decision making in the initial stages of an investment project might reduce the *escalation tendency* by diffusing responsibility for initiating a failing project. It is showed that escalation effects occurred less frequently and were less severe among individuals described as participants in a group who originally initiated a failing course of action than among individuals described as personally responsible for the initial decision.

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[6] Jelassi and Foroughi (1990) summarized major stumbling blocks to successful negotiation, which often act as guideline for NSS design and empirical examination of the exact effectiveness of an NSS (see Section 3.2.2.1 for details).

2.3.3.2 Communication and Language

Negotiation, after all, is "a process of communicating back and forth for the purpose of reaching a joint decision" (Fisher et al., 1991, p.32). The communication component therefore is crucial to any negotiation activity. This becomes more evident in cross-cultural negotiations and becomes more complex and potentially problematic due to the influence of culture on effective communication styles. Generally, communication occurs through many different *media* which set the context for communication, influence communication patterns and affect managerial effectiveness (Yates and Orlikowski, 1992).

Language may be a source of communication barriers. Shakun (2003) highlighted a recent example on the significance of language difference over the U.S.-China plane collision negotiation. A deadlock took place when China rejected the U.S. government's 'regret/bao qian' but demanded for an 'apology/dao qian' where the formal wording was believed by the Chinese that it carries no acknowledgment of guilt. On the other hand, linguists have indicated that language plays a large and significant role in the totality of culture. According to Whorf (1952), language is not simply a mode of communication, but rather is itself the shaper of ideas, the program, and guide for the individual's mental activity. That is, our pattern thoughts are largely shaped by the linguistic systems in our minds. Therefore, it is impossible to understand a language outside of its cultural context.

In traditional face-to-face negotiations, language is the main vehicle for verbal communication. In diverse lingual groups where negotiators do not speak a common language, communication can be a problem; even when there exists a common language among the parties, one or more speakers often may not be fully proficient in the shared language, thus there is potential for misunderstandings associated with meanings or contexts associated with supposedly ordinary words (Aiken et al., 1998; Tung and Quaddus, 2002). Interpersonal interaction and information exchange, which are essential for mutual understanding and co-operation, are hindered.

Cross-cultural studies suggest that language patterns are indicative of negotiation outcomes in electronic channels. In computer-based negotiations or e-Negotiations, the mode of communication is essentially different from that in face-to-face negotiations. For instance, the use of text-based chatting facilities essentially imposes a lack of visual cues and social presence to negotiations. While text-based interaction represents a depersonalized mode of business communication, it can also help negotiators to focus on task-orientated bargaining process. Language used in e-Negotiations is inevitably significant as negotiators' communication is largely relying on text-based information exchanges. Therefore, the exchanges of message (in the form of written language) are vitally important to help researchers to interpret the outcome of negotiations (Sokolova et al. 2005).

2.3.3.3 Third Party Intervention

Negotiations often enter deadlocks when critical issues or emotional conflicts heat up or both. Under such circumstances, without external help, it would be impossible for the negotiators to proceed to resolve their dispute. This is the situation when a third party is needed to come into the scene to assist the negotiating parties in reaching an agreement.

Third-party interventions may take different forms. Sheppard (1984) suggests that negotiators may surrender control over the dispute process and the dispute outcome, and the levels of control surrender create four forms of **third-party interventions** for conflict resolution. Figure 2-3 depicts the model.

		Level of Negotiator's Control of Outcome	
		Low	High
Level of Negotiator's Control of Process	Low	**Autocracy**	**Mediation**
	High	**Arbitration**	**Negotiation**

Figure 2-3. Four Forms of Third-Party Intervention (Adapted from Sheppard, 1984)

In the upper left cell, surrender of both process and outcome controls constitutes an extreme case of "**Autocracy**": a complete withdrawal of the negotiators by allowing a third party to manage the dispute in whatever process and outcome. In the lower right cell, "**Negotiation"** represents the situation where negotiators surrender control neither to the process and outcome. This is exactly the basic form of conflict resolution that we have discussed in earlier sections.

"**Arbitration**" is probably the most common form of third-party dispute resolution, which is often used as a dispute resolution mechanism in labor relations (e.g., Elkouri and Elkouri, 1985) or in violations of legal contracts in business transactions (Corley et al., 1977). Parties in dispute, after having reached a deadlock or time deadline without obtaining any solutions, may send their positions to a neutral third party. In other words, arbitration takes place at a point when negotiators have gone through controlling the process yet are willing to surrender control over outcome. Apart from the clear advantage of imposing clear-cut outcome in a non-prolonged fashion, arbitration appears to have several negative consequences such as chilling effect and narcotic effect (Kochan, 1980).

"**Mediation**", including other similar forms of process-only control such as facilitation or process consultation, is less intrusive in that negotiators surrender control only over the process while maintaining control over outcomes. The major difference between arbitration and mediation is that mediation seeks to achieve the object – to resolve conflict – by having the parties themselves develop and endorse the agreement (Lewicki et al., 1999). Brett et al. (1996) have found that mediation, when compared to arbitration, was les costly, less time-consuming, and produced greater disputant satisfaction. In fact, mediation has been called "an extension and elaboration of the negotiation process" (Moore, 1996, p. 136) that "has always been an informal accompanist of negotiation" (Wall and Blum, 1991, p. 284). Mediation is also to reconcile the competing interests of the conflicting parties, and help them coordinate their activities (needs) and to be more effective in their bargaining.

2.3.4 Political and Cultural Environment

Negotiation, being a social process, cannot be completely understood without reference to the context in which it takes place. We have discussed the impact of cultural differences on negotiation process and outcomes at group levels (see Section 2.3.2.7), when negotiation takes place in a new environment as a result of global trading, the negotiation process and outcomes may change. As Rubin and Brown (1975) suggested, the physical environment and the cultural context in which a negotiation takes place will also have major impact on its process and outcomes.

The globalization of today's economy has attracted great attention in studying negotiations in culturally sensitive situations such as the Eastern context. Of particular interest to our research is the emerging economy of China. China is a radically distinct context in both ethnic and cultural terms; it is highly conceivable that the Chinese social behavioral patterns and business norms dynamically intervene with the way negotiations are conducted. At the same time, policies may also play a role in international trade negotiations. Anecdotal evidence and industry experience suggest that successful international trade in China could not be fully explained without considering the factors associated with the governmental policies.

According to Hofstede (1991), besides the four popular dimensions of culture, there exists a fifth dimension named the *long-term orientation.* The notion of long-term orientation is used to capture a unique characteristic of the Chinese culture, which is fundamentally based on *Confucian dynamism*[7]. The key ideas include belief in substantial savings, willingness to invest for long-term benefits, acceptance of slow results, and sensitivity to social relationships. Along with this fifth dimension, China and other Asian countries are found to have an extraordinary

[7] Confucian dynamism refers to the selective promotion of particular sets of ethics found in Confucian teachings (Hofstede and Bond, 1988)

long-term orientation compared to Western countries[8]. Previous negotiation studies concerning cultural influences suggest that compared to North America, Australia and most European countries, Asian countries display a higher level of cooperation behavior due to the collectivistic character (Graham et al., 1994).

The Chinese culture inherently views some of negotiation dynamics differently. For example, while people customarily discuss the outcome of labor negotiations, divorce suits and business deals in terms of its "fairness" to the parties involved, the degree in which they perceive a certain agreement is efficient and fair may depend on the underlying social and cultural norms. With an inherent Confucian mindset, the Asians relatively treasure a deep sense of harmony and stability of relationships. Such relationship-centric perspective is advantageous for the conduct of long-term businesses (Hofstede and Bond, 1988). Compared to the Western approach that emphasizes and strives for outcome balance and equality, the Asian approach tends to avoid open and direct conflicts, accomplished by the search for *sufficiently* favorable – versus optimal – outcome. It is pertinent to recognize the existence of implicitness as well as its importance for Asian negotiators.

[8] Indeed, Confucian Ethic is at the heart of the Chinese cultural value system that has even influenced the Korean and Japanese civilizations.

CHAPTER 3 LITERATURE REVIEW ON E-NEGOTIATIONS

Chapter 2 reviews a wide range of factors that may influence the process and outcomes of negotiations. With the advent and advancements of computer technologies, the IT solution to negotiation represents a new weapon to approach the negotiation problem. There are at least two primary motivations behind the development of computer-based systems to supporting negotiations: 1) to find ways to overcome the limitations of face-to-face negotiations, i.e., to remove the stumbling blocks to successful negotiations, and 2) to deploy newer and more advanced technologies to improve the process and outcomes of negotiations (Starke and Rangaswamy, 2000). In recent years, the growth of e-commerce has created another motivation which is to look into the roles and values of e-Negotiations in the growth of electronic marketplaces. The potential value of e-Negotiation technologies is spurring researchers and practitioners to step beyond traditional NSS design and extend ENS research to a larger, newer context.

This chapter is dedicated on the ***IT artifacts*** to negotiation problem, and on how computer technologies can theoretically and practically facilitate or enable successful negotiations. We will overview the evolution of NSS/ENS empirical studies in three chronological periods, and discuss the theories and models that are specific to computer-based negotiations at large.

3.1 CHRONOLOGICAL EVOLUTION OF E-NEGOTIATIONS RESEARCH

Similar to negotiation research, ENS studies have gained research interest from a great variety of disciplines for several decades. This section organizes existing NSS/ENS literature into three chronological "eras", in which each era is characterized with a particular theme of research interest. Collectively, the historical view of the ENS-related literature is helpful for understanding the current state as well as future directions for negotiation support technologies.

3.1.1 Early 1960s to 1980s: "Era" of Decision Support

Since the 1960s, when computer models were first employed for the support of human decision making, interest has been growing in the possibility of using computer technology and information systems to support negotiations. This era is featured with the excitement of the advanced information-processing capabilities and capacities of computers, and the attempts that researchers have made to match the need to approach classic negotiation problems with computer technologies.

The first attempt is known as DSSs (Decision Support Systems), which combine the use of computer models and analytic techniques with traditional data access and retrieval functions to support individual decision makers. Decision analysis or especially **Multi-Attribute Utility Theory (MAUT)** has been studied extensively. MAUT (Keeney and Raiffa, 1991) is a tool for making rational decisions involving multiple interdependent objectives based on uncertainty and preference (utility) analysis. Originally MAUT was used as a tool for decision makers to explicate and discuss their preferences and identify possible trade-offs, which helps avoiding emotional decision biases (Rangaswamy and Shell, 1997).

MAUT has been applied to be the basis for development of many decision support systems. For example, PERSUADER system (Sycara, 1990; 1992) is an early system that used MAUT to resolve conflicts through negotiation in the domain of labor dispute. Other examples of early prototypes using MAUT approaches are PERSUADER (Sycara, 1990; 1992) and GENIE (Wilkenfeld et al., 1995). Besides MAUT-based techniques, expert system approaches, such as CAP/DECISION MAKER (Fraser and Hipple, 1981) and NEGOTEX (Rangaswamy et al., 1989; Eliashberg et al., 1992), are also used to support activities in pre-negotiation strategy formation[9].

[9] A more complete list of ENS prototypes studied in existing literature, according to their underlying design concepts and technologies under three categories, will be reviewed and summarized in Section 4.1.

In the early 1980s, researchers began developing Negotiation Support Systems, historically known as a special type of GSSs[10] (Group Support Systems), intended to support negotiation parties (and possibly a human mediator) in reaching an agreement (DeSanctis and Gallupe, 1987; Kersten, 1985; Jarke et al., 1987). NEGO (Kersten, 1985) is a typical prototype developed as non-cooperative GSS used for negotiation support.

The fundamental of NSSs is negotiation analysis. Different from decision analysis, negotiation analysis is aimed at bridging the gap between descriptive qualitative models and normative models of bargaining (refer to Section 3.2 for review and discussion on NSS theories).

3.1.2 Late 1980s to 1990s: "Era" of Laboratory-Based NSS Studies

More recently in the late 1980s to the 1990s, significant work has been undertaken to build interactive, session-oriented NSS which would support the entire negotiation process (e.g., Carmel and Herniter, 1989; Delaney et al., 1992). Subsequent experimental studies to actually use the systems to perform negotiation tasks are then conducted. The characteristics of this era of negotiation support research are the emphasis of supporting co-located negotiators with both decision and electronic communication support functionalities.

Stark and Rangaswamy (2000) provide a comprehensive overview of eight empirical studies that could be located in the literature for the period. In the experiment by Jones (1988), dyads bargained face-to-face over a four-issue manufacturing negotiation problem. In the experimental condition, negotiators began bargaining face-to-face and, after 12 minutes, viewed together contract suggestions that could maximize their joint outcomes on a video screen. Jones also introduced the level of conflict as a second factor. The level of conflict between the buyer and the

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[10] A GSS is an information system which combines electronic communications, computers, and decision technology to support group work. An NSS is a traditionally considered a subclass of GSS where the parties being supported are attempting to negotiate for bargain to reach an agreement (Dennis et al., 1988; DeSanctis and Gallupe, 1987).

seller was manipulated by assigning importance indicators of weightage points to the four issues. Jones found that in the low conflict condition, computer suggestions led to higher joint outcomes, but negotiators took more time in reaching agreements. In high conflict situations, negotiators perceived the climate to be more collaborative with computer support than without.

The laboratory experiments by Foroughi et al. (1995), Perkins et al. (1996) and Delaney et al. (1997) are a series of cumulative studies. All three studies use bargaining task that was previously studied by Jones (1988) and employ the same interactive NSS, except for the study by Perkins et al. (1996) using a DSS component only. These studies also investigate the level of conflict as an additional factor. The NSS consists of two components: a module for electronic communication (EC) between the parties, and a DSS to assist in the generation and evaluation of alternative contracts. Each negotiator provided his/her own interests to the decision tool as private data, as well as his/her guesses on the other party's preferences. The DSS then computed and displayed the three contract alternatives with the highest joint outcome. Foroughi et al. (1995) indicated that independent from the conflict level, NSS-supported dyads achieved significantly higher joint outcomes, greater contract balance, and greater satisfaction with lengthier time to reach agreement. No significant differences were found on the number of contracts proposed and collaborative climate perceived for negotiators in both conflict levels.

Perkins et al. (1996) conducted another experiment involving managers instead of students, and used only a standalone DSS. By using 16 pairs of negotiators, they find that similar results were obtained for manager sample albeit DSS-supported managers used less negotiation time.

To further sort out the separate effects caused by DSS and EC, Delaney et al. (1997) conducted a third experiment. Three levels of computer support were compared: a comprehensive NSS (DSS+EC), DSS only, and no computer support. The comparison between NSS and DSS was used to test the effect due to the EC component; the comparison between DSS and no-support situations was used to examine the effect due to the DSS component. Their study indicates the

following insights. 1) The results examining the **effect of DSS** showed that DSS-supported dyads achieved significantly higher joint outcomes (in both conflict levels), greater contract balances (in low but not high conflict level) and used more time to reach agreements (in both conflict levels). No significant impact was found for DSS component on perceived collaborative climate and satisfaction. The findings support Lim and Benbasat's predictions that DSS support primarily improve economic outcomes such as efficiency and fairness, but do not provide evidence on the assertions that DSS will give negotiators more confidence on solution. 2) The results examining the **effect of EC** showed that independent from conflict level, NSS-supported and DSS-supported dyads achieved comparable joint outcomes, contract balances using similar amount of time; NSS and DSS also did not show effect on perceived collaborative climate. However, NSS dyads are significantly more satisfied than DSS dyads. In effect, the findings on effect of EC support Lim and Benbasat's predictions (1993).

Rangaswamy and Shell (1997) have developed another interactive NSS named NEGOTIATION ASSISTANT (NA) and conducted a one-way experimental study based on the system. The DSS component consists of MAUT-based techniques and conjoint analysis to facilitate preference elicitation, alternative evaluation, as well as optional functions for Pareto-optimization in the post-negotiation settlement stage. Negotiators can also communicate electronically such as sending messages and exchange offers. Subjects negotiated over a four-issue task on the purchase of some hospital equipment. The results are mainly focused on whether subjects reached integrative settlements, which served as a surrogate measure of joint utility value of the contract. Four conditions were manipulated: a) face-to-face, b) e-mail messaging system, c) DSS only featured by NA for using preparation (preference elicitation) support, followed by face-to-face for actual negotiation, and d) NSS featured by using NA for the entire negotiation process in both preparation and actual negotiation stages. In their design, the comparison between DSS only for preparation vs. face-to-face and emails was used to test the effects due to DSS tools for

preference elicitation. The comparison between the NSS and the DSS was used to test the effects of EC. Their study indicates the following insights. 1) The results examining the **effect of DSS** suggest that dyads using DSS for preparation (in the DSS and NSS treatment groups) achieved significantly higher number of integrative trades, and not surprisingly used more time, than those who were unsupported (in the face-to-face and emails treatment groups). However, DSS did not show effect on satisfaction as there were no significant differences in satisfaction levels among NSS, DSS and face-to-face conditions. 2) The results examining the **effect of EC** suggest that the addition of EC did not lead to better outcomes in terms of integrative settlements. Furthermore, comparison between NSS and email conditions was used to test their hypothesis that using email will not better the integrativeness of outcomes. The data supported this assertion.

3.1.3 Late 1990s to Now: "Era" of E-Negotiations and Automated Negotiation

With the growth of B2B e-commerce market from the late 1990s until now, web-based NSS have been implemented and studied in examining the negotiation support in e-commerce context (e.g., Goh et al. 2000). Already there are some publicly available web-based NSS prototypes (e.g. Carleton University's INSPIRE www.business.carleton.ca/inspire) to provide users with the facility to specify preferences from which utility functions are constructed to evaluate offers, exchange messages, and view the negotiation progress graphically. Much research has focused on the roles and contribution of NSS in electronic marketplaces (e-Negotiations). For example, Kersten (2003) provides insights on the achievement of NSS research and implementation up to then and offers some new perspectives with regard to using NSS technology via digital channels. Bui and Ondrus (2003) propose a system analysis approach of mobile computing design to support real-time negotiation, using telemedicine as an illustration. Three major supporting functions, knowledge-based information processing, communication processes and transaction processing, are identified for NSS to possess in conducting e-Negotiations. Negotiation processes in the future, as envisioned, are to be conducted via a complex network of computer and

telecommunications allowing decision maker to perform decision and negotiation task in an anywhere-anytime mode.

In computer science, researchers have paid increasing attention to the design and implementation issue of **automated negotiation**, where computational agents are engaged to find and prepare contracts on behalf of the real-world negotiation parties they represent (Beam and Segev, 1997). Ever since AI has been recognized as a reference discipline to DSS research (Goul et al., 1992), much more intelligent features are proposed to enhance agent-based negotiation with more capabilities to handle complex negotiations.

More recently, advance in computing discipline has introduced a new paradigm that essentially views "IT as a service". This paradigm of Service-Oriented Computing (SOC) (Papazoglou and Georgakopoulos, 2006) signifies automation of service delivery which is of great practical value in terms of capability enhancement and cost saving. Negotiation, as a key coordination mechanism for service providers and clients to interact and reach agreements, would be a "bottleneck" in the entire automated process, if otherwise manual. Increasing research effort has been devoted to negotiation technologies. For instance, Hung et al. (2004) proposed a framework to apply e-Negotiations to Web Services (WS), where the three components of WS-negotiation, namely negotiation message, negotiation protocol and negotiation decision making are discussed. They also present a service level agreement (SLA) template model illustrated with different domain specific vocabularies to support different types of business negotiation in the context of WS-negotiation.

While some researchers regard automated negotiation is another step in the evolution of NSS (Oliver, 1997; Starke and Rangaswamy, 2000), others believe that agent-based negotiation study is in its infancy and it is only in relatively well-structured areas where the use of automated negotiation pays off (Yuan et al., 2003; Weigand et al., 2003). In summary, NSS without automated agents are still relevant in most business settings as the actual negotiations are

complex and less structured. Along with all the research effort over time, it is worthwhile to advance the diverse forms of e-Negotiation technologies so as to cater for a fuller spectrum of negotiators' needs, in today's complex business and technological contexts where negotiations take place.

3.2 THEORETICAL FOUNDATION FOR NSS/ENS

3.2.1 Principled Negotiation

3.2.1.1 Stumbling Blocks to Negotiations

From an information-processing perspective, negotiations are viewed as complex, ill-structured, and evolving tasks requiring sophisticated decision support (Bui et al., 1992). Negotiation analysis suggests that differences between the parties regarding their priorities, risk preferences, and utilities, represent one of the richest sources of value to be mined in a negotiation situation (Lax and Sebenius, 1986). Nevertheless, it is sometimes difficult to identify and optimally trade on these differences due to limited information processing capacity and capability, socio-emotional obstacles, cognitive biases, asymmetric knowledge about counterparts (Jelasi and Foroughi, 1990; Foroughi, 1995). These are collectively known as **stumbling blocks to successful negotiations**. In cognitive sciences and psychology, researchers study the following aspects of stumbling blocks to negotiations:

1) cognitive limitations, which is referred to as human's *cognitive difficulty* encountered in generating, evaluating the utility of alternative settlements and determining tradeoffs.

"Cognitive difficulty": The cognitive difficulty of evaluating the utility of alternative settlement for each party and determining tradeoffs often impedes successful conflict resolution (Lewicki and Litterer, 1985).

2) cognitive biases, such as the *consideration of issues one at a time*, *negative framing* of the negotiation, a win-lose/*fixed-pie mentality*, *premature closure*, and *preference for salient, easily available solutions*.

"Consideration of issues in isolation": Negotiators tend to consider issues one at a time, in a stepwise fashion, instead of integrating multiple issues into a single package so that potential tradeoffs can be recognized (Erickson et al., 1974; Kelley, 1966; Froman and Cohen, 1970).

"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 the risk-avoiding behavior which is conducive to finding a cooperative agreement (Bazerman and Lewicki, 1983; Tversky and Kahneman, 1981; Neale and Bazerman, 1983, 1985b).

"Fixed-Pie mentality": Negotiators often assume that their interests are in direct conflict with the other party's interests, that they are in competition for fixed-pie of resources, and that one side will win at the expense of the other. Negotiators may ignore the need to cooperate and use creative problem solving to find integrative solutions (Bazerman, 1983; Pruitt, 1983a and 1983b).

"Premature closure and finalizing of positions": Negotiators tend to prematurely finalize their positions, often before all possible solution alternatives have been recognized and considered (Kelley, 1966).

"Preference for available, salient information or solutions": Negotiators tend to recall and value 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 unusual alternative solutions because they are more salient, while rejecting or neglecting to consider other alternatives.

3) socio-emotional aspects of negotiator behavior, including *face-saving behavior*, *ineffective communication*, *overconfidence*, and tendency towards *non-rational escalation of conflict*.

"Face-Saving behavior": Negotiators tend to avoid agreements in which they feel they are "giving-in". This face-saving behavior may take precedence over reaching a viable agreement with the opposing side (Pruitt and Rubin, 1986; Brown, 1977; Hiltrop and Rubin, 1981; Bazerman, 1983).

"Ineffective communication": Barriers to effective communication such as distraction caused by attention to physical appearance of opposing parties, semantic differences, absence of feedback, and status and power differences can seriously hinder effective negotiation (Lewicki and Litterer, 1985).

"Negotiator overconfidence": Negotiators are overly optimistic about the probability of their own judgments being correct (Einhorn and Hogarth, 1978; Fishchhoff, 1981) and 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 are also more overconfident of winning if they do not give in, which reduces the incentive to bargain and compromise (Neale and Bazerman, 1983; Bazerman and Neale, 1983).

"Non-rational escalation of conflict": Negotiators often escalate the level of conflict irrationally and unnecessarily (Lewicki and Litterer, 1985; Bazerman, 1983), "locking in" on opening moves and attitudes, which may be hostile, and continuing them through the negotiation process (Pilisuk and Skolnick, 1978).

3.2.1.2 Guidelines and Principles

According to Walton and McKersie's (1965) **behavioral theory of bargaining**, the most important conditions leading to the achievement of integrative bargaining agreements are: 1) simultaneous consideration of issues so that mutual trade-offs can be made, 2) a problem-solving orientation, 3) free exchange of information about preferences and needs, and trust in the accuracy of these exchanges, 4) avoidance of distributive behavior, and 5) the maintenance of

high aspiration levels by the bargainers. The theory emphasizes the avoidance of distributive behavior and advocates the integrative approach to achieve win-win situation.

In order to lessen the potential effects of the stumbling blocks, Fisher and Ury (1981) have proposed several general principles to structure the negotiation process. The **Fisher and Ury's principles** include: 1) separate the people from the problem, 2) identify and focus on negotiators' interests, 3) generate options for mutual gain, and 4) use objective criteria and data. Next, we will examine in further details on how the stumbling blocks and principles have motivated and guided the design and development of NSS.

3.2.1.3 The IT Solution of Negotiation Problem

NSS offer the IT solution to enhance the problem-solving process and to help alleviating the cognitive and socio-emotional stumbling blocks to successful negotiation (Foroughi and Jelassi, 1990). For instance, NSS generate all possible alternatives based on the inputs of all parties, thus rectifying the tendency of finalizing prematurely on an agreement before considering all possible alternatives. In addition, NSS help to eliminate the cognitive difficulty of evaluating the attractiveness of various alternatives by supporting analytical processing of data (Jelassi and Foroughi, 1989). This not only brings about a sense of rationality, but negotiating parties will also be able to make more objective judgments and identify solutions beneficial to all parties. Moreover, NSS allow consideration of all issues as a package (Jelassi and Jones, 1988). The display of an entire contract enables "logrolling" among issues. Therefore, negotiating parties can focus on determining tradeoffs among the issues instead of discussing about single issues. A detailed table of major stumbling blocks to successful negotiation and possible NSS solutions is presented in Table 3-1, which is adapted based on Foroughi et al's paper (1995).

The design of NSS that foster as much integrative bargaining as possible in a given situation solutions essentially agrees with the principles suggested by negotiation experts (Fisher and Ury, 1981; Walton and McKersie, 1965). Specifically, as articulated in Foroughi et al. (1995), the

Table 3-1. Major Stumbling Blocks to Successful Negotiations and NSS solutions (Adapted from Foroughi et al., 1995)

The Negotiation Problem	Descriptions	NSS Solutions	The NSS Component	Measures
I. Cognitive limitations				
A. cognitive difficulty	The difficulty of evaluating the utility of alternative settlements and determining tradeoffs (Lewicki and Litterer, 1985)	- Analytically process of subjective preference and/or external objective data - Identify high joint befit solutions or strategies (Jelassi and Foroughi, 1989)	DSS (alternative generation and evaluation)	- Joint Outcome - Contract Balance
II. Cognitive biases				
B. Consideration of issues one at a time	The failure to integrate single issues into a single package so that potential trade-offs can be recognized (Kelly, 1966; Erickson et al., 1974).	- Display entire contract for discussion to enable ”logrolling” among issues (Jelassi and Jones, 1988)	DSS (alternative generation and evaluation encourage simultaneous issue consideration)	- Joint Outcome
C. Negative framing	Evaluation of potential losses instead of potential gains, which can lead to risk-seeking behavior (Tversky and Kahnemen, 1981; Bazerman and Neale, 1983).	- Establish interaction rules and use pre-negotiation modules requiring parties to identify their interests (Anson and Jelassi, 1990)	DSS (give negotiators more confidence of getting a fair, satisfactory outcome)	- Perceived collaborative and negative climate
D. Fixed-pie mentality	The assumption that their interests are in direct conflict with the other party, and that one side will win at the expense of the other (Pruitt, 1983).	- Display conflicting views, paring of related items interests (Anson and Jelassi, 1990) and - Analytical methods to identify alternative solutions	DSS (alternative generation) and Structured integrative negotiation process (encourage negotiators to seek a mutually beneficial solution)	- Perceived collaborative and negative climate
E. Premature closure	Tendency to prematurely finalize positions before considering all possible solution alternatives (Kelly, 1966).	- Present a negotiation text (Fisher, 1978) of equivalent value to both sides as a starting point (Jelassi and Jones, 1988), - Provide rules requiring consideration of all issues (Jelassi and Jones, 1988)	DSS (ensure that bargainers find a good, integrative solution before closure)	- Joint Outcome

F. Preference for salient solutions	Tendency to recall and value most that information which is most salient or familiar (Tversky and Kahnemen, 1981).	- Provide rules requiring consideration of all issues (Jelassi and Jones, 1988) - Suggest possible concessions, solutions and tradeoffs (Jelassi and Foroughi, 1989)	DSS (simplify alternative evaluation, and thus ensure considering of multiple alternatives)	- Joint Outcome
III. Socio-emotional aspects of negotiator behavior				
G. Face-saving behavior	Avoidance of agreements in which they feel they are giving in (Brown, 1977; Hiltrop and Rubin, 1981).	Suggest possible concessions to help achieve optimal joint outcomes and permit negotiators to compromise while still saving face (Anson and Jelassi, 1990)	NSS (DSS+EC) (help negotiators find an agreement which is good for both and will not make them lose face)	- Satisfaction (with the contract)
H. Ineffective communication	Distraction due to physical appearance of opposing parties, semantic differences, and status and power differences (Lewicki and Litterer, 1985).	- Present participation rules - Display organized feedback (DeSanctis and Gallupe, 1987) - Non-verbal/written wording to focus group attention and encourage preciseness - Document the agreement (Jarke and Jelassi, 1986)	EC (provide an extra channel of communication, encourage bargainers to clarify thoughts before inputting, reduce personality conflicts)	- Joint Outcome
I. Negotiator overconfidence	Overrating of their own judgments (Einborn and Hogarth, 1978), belief that neutral parties will judge in their favor (Farber, 1981).	- Bring sense of rationality by analytical processing of subjective preference and/or external objective data and the determination of possible solutions (DeSanctis and Gallupe, 1987)	DSS (support alternative evaluation that bring a sense of rationality which encourages objective, realistic decision-making)	- Perceived collaborative and negative climate
J. Non-rational escalation of conflict	Tendency to escalate the level of conflict irrationally (Lewicki and Litterer, 1985), "locking in" on hostile opening moves (Pilisuk and Skolnick, 1978).	- Focus attention away from personalities and on issues resulting from use of electronic communication (DeSanctis and Gallupe, 1987) - Provide participation rules (Anson and Jelassi, 1990)	EC (depersonalize the atmosphere, focus bargainers' attention on issues instead of personalities and deescalate conflict by increasing their confidence in achieving a good agreement)	- Perceived collaborative and negative climate

alternative evaluation and generation components of DSS explicitly require negotiators' "simultaneous consideration of issues" in the form of contract alternative packages. The two components also provide alternative evaluation in terms of both a negotiator's own utility and his/her opponent's value functions, as well as encourage jointly beneficial solutions by alternative generations to maximize joint utility. These functions facilitate the "problem solving orientation" and discourage "distributive behavior", which are underlined in principled negotiation models.

The electronic communication channel reduces the impact of personality conflicts (DeSanctis and Gallup, 1987; Lim and Benbasat, 1993; Poole et al., 1991; Sheffied, 1992) by providing an extra channel of communication and encouraging negotiators to clarify their thoughts before inputting (Jarke and Jelasi, 1986). In addition, the presence of external support tool of NSS should give negotiators more confidence in their ability to reach an agreement with higher joint outcomes, thus helping them to maintain "high aspiration levels". Therefore, NSSs are believed to have great potential for influencing the dynamics of negotiation by creating an atmosphere that emphasizes order, rationality, equality and empathy with the other party's position (Bui, 1994).

3.2.2 Theory of NSS

3.2.2.1 Two Components of an NSS

Lim and Benbasat's (1993) articulate a theory which pertains directly to two-person, face-to-face negotiations in session-oriented, multiple-issue setting. Their **theory of NSS** emphasizes the importance of evaluating the impact of each of the two subcomponents of an NSS – the **individual DSS** for each party and the **electronic communications (EC) channel** between the parties – instead of evaluating NSS as a single entity.

The theory hypothesizes that the DSS portion improves the human information-processing capacity and its effects can be best understood within the reference disciplines of game theory and economic theory. The electronic communication channel improves perceived commitment

and its effects can be best understood within the context of social-psychological theories of negotiation. For the theory's configuration, the negotiators "are confined in a face-to-face setting, and verbal communication between them is available" (Lim and Benbasat, 1993, p. 33).

According to the information processing perspective of negotiations, the reasons for not achieving optimal or near-optimal negotiation solutions lie in the very limitations of human as information process system (Bazerman and Neale, 1985). "When such processing capability and capacity are improved (by external memory and processor such as computer-based system), self need can be readily analyzed and the rival position can also be strategically examined" (Lim and Benbasat, 1993, p. 37). Based on this position, the theory hypothesizes that the *distance from the efficient frontier*[11] (a measure of efficiency) and the *distance from Nash solution*[12] (a measure of fairness) will be smaller for negotiators supported with DSS than for dyads not supported. At the same time, as the decision aid help negotiators to be capable of performing rational analyses, negotiators would gain "a sense of control" over the course and settlement of negotiation. As a result, it is also posited that dyads supported with DSS will achieve higher *confidence with the solution* than those not supported.

The electronic communication channels are used to link up individual DSSs, so that common referents can be generated as reasoning of arguments. Lim and Benbast (1993) argue that compared to verbal communications, electronic communication offers "an ideal mechanism for transmitting task-oriented communication involving technical data and graphics" (Lim and Benbasat, 1993, p. 40). The theory hypothesizes that the *perceived commitment* and the

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[11] The efficient frontier is defined as the locus of achievable joint evaluations from which no joint gains are possible. It is also called Pareto (Optimal) Frontier after economist Vilfredo Pareto. See Section 4.2.1.1 for further discussions.

[12] The Nash solution is one that maximized the payoffs of both parties on a basis of "fairness" (Nash, 1950). See Section 4.2.1.2 for further discussions.

satisfaction will be greater for negotiators supported with full communication and decision support than for dyads provided with DSS only.

3.2.2.2 Scope of the Theory

In their review article, Starke and Rangaswamy (2000) point out the following picture when applying existing empirical results to the DSS/electronic communication dichotomy of NSS (Lim and Benbasat, 1993): (1) The DSS component helps users develop better problem representations and eventually reach more integrative agreements, but access to a DSS does not make users more satisfied with their settlements. (2) The effectiveness of the electronic communication component can vary from situation to situation and, in certain circumstances, induce parties to negotiate in a more non-cooperative fashion, increasing the likelihood of impasses.

Such observation, however, reveals certain misunderstandings over the scope of the theory. The original theory of NSS by Lim and Benbasat (1993) is laid out under the basic configuration in which negotiators are confined in a face-to-face setting, and verbal communication between them coexists. In a sense, one has to note that directly applying this theory to an e-commerce negotiation setting where negotiators are geographically disperse and mostly lacks face-to-face verbal communication is not feasible. Nevertheless, the theory of NSS has positive power which informed and guided a number of subsequent NSS empirical studies as well as this research work.

3.2.2.3 Related Experimental Studies

In this section, we shall further analyze results of related NSS experimental studies towards a clearer picture concerning a theory of NSS. In most NSS experiments (see Section 3.1.2), it is consistently shown that, under controlled experimental conditions, the use of NSS result in greater joint utility and more balanced contracts. In other words, the DSS element, from a seemingly objective point of view, accomplishes what it is setup to do. However, the empirical NSS literature has also suggested inconsistencies in terms of varying impacts of NSS on

negotiation process and outcomes. In the he following, we discuss four dimensions that should deserve further examination, as far as theoretical and empirical work is concerned.

1) **Effects of DSS on economic measures (efficiency, fairness and time)** are widely supported in empirical work, which is also consistent with Lim and Benbasat's (1993) hypotheses. Nevertheless, it shall be noted that the levels of DSS technologies and their uses vary from one study to another. The varying technologies, while showing effects on economic outcome measures such as joint profits, may indeed impact negotiators' psychological processes much differently. The more subtle differences in negotiators' perceptions would be more useful to understand their intentions for future use. In this dissertation, we will propose a theoretical research framework that aims to further differentiate DSS technologies so as to understand the effect of each specific tool. Conceptual differentiation and careful examination of different tools allow better understanding on the effects of available technologies, and hence provide more insights for both theoretical advancement and practices on ENS.

2) It appears that the **effects of DSS on social-psychological measures** have "not been supported" in empirical results. The studies by Delaney et al. (1997) and Rangaswamy and Shell (1997) suggest that DSSs did not lead to significant differences in satisfaction levels between treatment groups. Superficially, such results contradict with the theoretical hypothesis by Lim and Benbasat (1993). However, the original theoretical construct, confidence with solution, proposed by Lim and Benbasat (1993) is not a same concept compared to "satisfaction" measured in the empirical work. In fact, the "satisfaction" measures in Delaney et al. (1997) covered more meaning than "confidence with solution" that was intended in the theory of NSS. In effect, higher satisfaction with the settlement may have "coincided with favorable evaluations of the negotiation experience (i.e., perception of the match of negotiation experience and expectations), rather than the worth of the settlement in comparison to the negotiators' interests" (Starke and Rangaswamy, 2000, p. 18). Negotiators' attitude towards the process is arguably a better determinant for

"confidence with solution" as proposed by Lim and Benbasat (1993). In other words, the measures of "satisfaction" as in Delaney et al. (1997) may have factored in negotiators' perceptions of their own interests versus the actual settlement. Plausibly, subjects who have attain higher utility scores do not necessarily know they have done better or not, and hence reported that they were neither more, or less, satisfied with the settlement than those who indeed obtained lower scores. This implies that the effect of DSS might be of limited influence on negotiators' *satisfaction.* It should be more appropriate to examine the effect of DSS on *negotiators' beliefs that they can do better with DSS support*, i.e., their "confidence with solution".

3) **Effects of EC on economic measures** are not significant in empirical work, which is consistent with Lim and Benbasat's (1993) theory. However, both existing theoretical and empirical studies examining the effects of EC are limited in the situations where negotiations taking place between *homogenous* parties. In turn, empirical literature ignores the possible impact of communication channels for negotiation parties who have unequal capabilities in terms of verbal/written communication. In this dissertation, we take note of this limitation and will examine the effects of EC in an appropriate negotiation scenario (negotiation between linguistically diverse negotiation dyads).

4) The existing NSS experimental literature has suggested most inconsistent and even contradicting **effects due to EC on social-psychological measures**. For illustration, Delaney et al. (1997) conclude that the extra EC channel has led to *significant higher* "satisfaction" in supporting the theoretical assertion by Lim and Benbasat (1993). In contrast, Rangaswamy and Shell (1997) revealed *no differences* in "satisfaction with the agreement" across conditions, even though five out of 67 pairs communicating electronically failed to reach a settlement, while all 68 pairs bargaining face-to-face reached a settlement. For perceptions towards "collaborative atmosphere", likewise, electronic communication had shown *no significant effect* on the negotiators' perceptions in Delaney et al. (1997), as subjects perceived the negotiation climate to

be similarly negative or collaborative regardless of the medium by which they communicated. In contrast, in Rangaswamy and Shell (1997), those bargaining pairs that used the electronic communication channels indicated that they considered the negotiation process to be *less friendly*.

In summary, our analysis examining the inconsistent conclusions due to the EC component of an NSS show that although superficially, it is not clear how EC could affect negotiators' perceptions, the very reason was due to different interpretation of EC from one study to another. Delaney et al. (1997) examine the effects of EC by comparing DSS and NSS supported dyads, where in both conditions face-to-face communications were allowed. This is in line with the original theory proposed by Lim and Benbasat (1993). In contrast, other studies (e.g., Rangaswamy and Shell, 1997) have looked at a different setting in which the negotiating dyads who used "electronic communication channels" were not allowed to have face-to-face communications. Compared to face-to-face negotiation dyads and NSS dyads, the communication media for *social purpose*, instead of the *task-focused* mode of EC, may have attributed to the fact that negotiators perceived less the atmosphere friendly and reported indifferent levels of satisfaction.

3.3 SUMMARY OF VARIABLES USED IN NSS/ENS LITERATURE

Based on extensive review on generic negotiation theories as well as the conceptual and empirical development on e-Negotiations, we summarize variables used in ENS/NSS empirical research which focuses on computer technology, as an extension to Starke and Rangaswamy (2000) with enriched determinants of negotiation outcomes. ENS features are emphasized as the independent variable which has dominant impact on negotiation process and hence outcomes. Other important contextual factors on individual/party and task characteristics are viewed as situational variables which have moderating impact. Furthermore, the summary also includes system-related dependent variables. Figure 3-1 presents the summary.

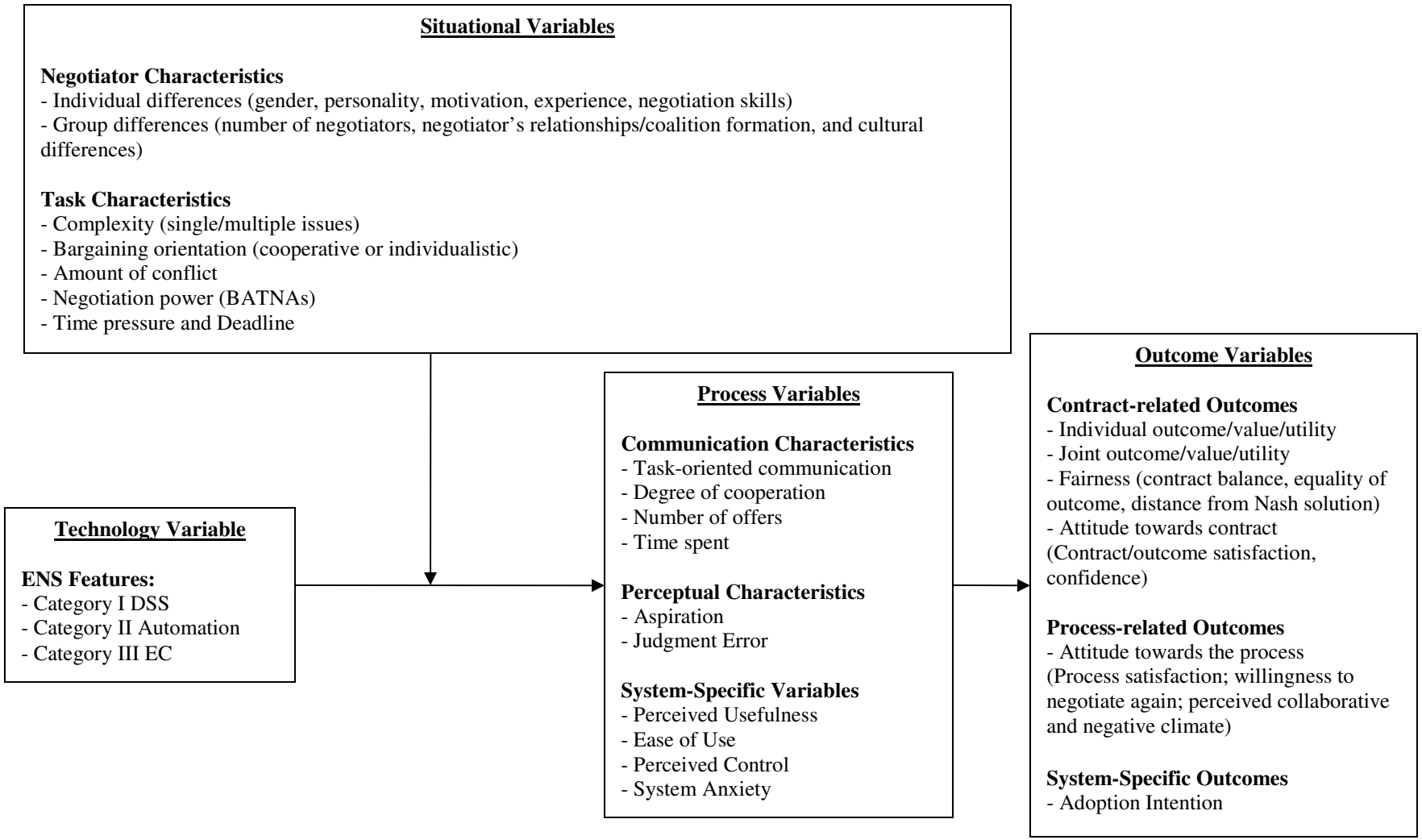

Figure 3-1. Summary of Variables in ENS Literature

CHAPTER 4 THE THEORETICAL FRAMEWORK

In this chapter, a theoretical research framework is developed so as to guide subsequent empirical studies for this dissertation, based on the extensive review of existing literature and related theoretical and empirical work.

This research framework investigates the effects of technological and situational factors on negotiation process and outcomes. It encompasses the **independent variable** in terms of three *categories of ENSs* that are based on different design objectives and functionalities, namely group decision support, multimedia communication support, and agent-based automation. The examination of the "quality of negotiation", i.e. the **dependent variables** of our research framework are based on different perspectives. According to the Dual Concern model (Pruitt and Rubin, 1986), people view conflicts in terms of two concerns: their own concerns and those of others. Informed by this model, e-Negotiation technologies are accessed in terms of their efficacy in improving the settlement contracts arising from the concerns of two parties by means of the concepts of *efficiency* and *fairness* in economics. At the same time, to have a better insight on how negotiators would arrive at certain settlements, it is also important to understand the specific psychological and behavioral patterns during the negotiation process, using the lens of descriptive theories. Furthermore, we also consider the negotiators' views on the system per se in order to gain insights that enable us to enhance the design and understand the effects of systems on other outcomes. In summary, we categorize our assessment of the "quality of negotiations" by examining the economic, social-psychological and system-specific aspects regarding perceptions towards e-Negotiation systems.

We also choose to examine one particular task-related situation variable, i.e., the *level of conflict* as the **moderating variable**, to access the effects of some important e-Negotiation technologies under different degrees of negotiators' conflict of interests. Other situational issues that are

known to affect negotiations are treated as **control factors** in this research framework. Figure 4-1 depicts the guiding research framework in this dissertation.

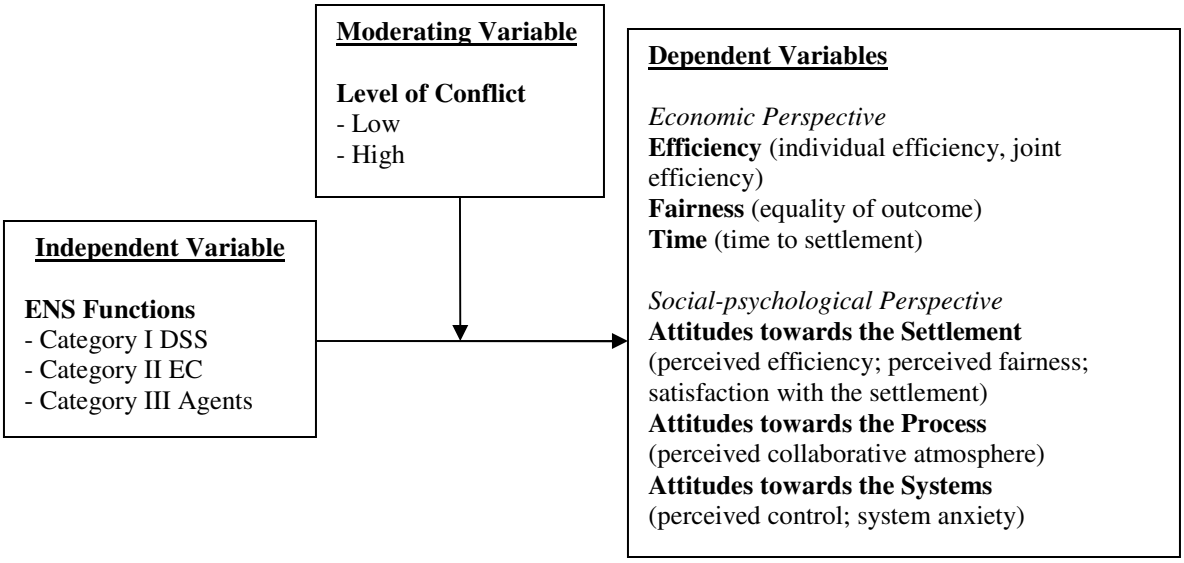

Figure 4-1. The Theoretical Framework

4.1 THE INDEPENDENT VARIABLE – ENS FUNCTIONALITIES

4.1.1 Classification of ENS Functionalities

Existing literature demonstrates that ENS systems vary significantly in their design goals and their modeling approaches to negotiation. To understand the effects of e-Negotiations and their success, it is important to develop a classification of ENS functionalities that captures a fuller and richer spectrum of these systems.

The various categorizations/classifications of NSSs can be traced in various previous works. An early attempt offers two methods of categorizing NSSs (Matwin et al., 1991). The first method classifies NSSs into *analytically-based* and *knowledge-based* categories according to the representation and model of the negotiation problems; the other classifies NSSs into *mediator* and *advisor* categories based on the degree of completeness of the information supplied by the system

to the users. Lim and Benbasat (1993) propose two major components of NSSs in dyadic and multiple-issue settings: a *decision support* component and a *communication support* component. The decision support component enhances the information processing capabilities of negotiators, whereas the communication support component facilitates the exchange of offers and arguments. In a further development, Starke and Rangaswamy (2000) suggest a similar NSS classification, which is based on the fundamental differences in the design and functionality of NSSs. They classify NSSs into: 1) *preparation and evaluation systems*, which provide negotiation decision support before or during a negotiation; and 2) *process support systems*, which provide users with the means to communicate with each other, and are used as electronic "bargaining tables" which may additionally assume a more active role by providing mediation or arbitration mechanisms. Their effort share a common trait: they do not incorporate automated agents and the latest e-commerce technologies for negotiation. This dissertation extends the scope of NSSs by highlighting the missing aspects which have become increasingly important and interesting.

Yuan et al. (2003) view systems developed to support negotiations as *process support, decision support,* and *agent-based NSSs*. The objective of process-support NSSs is to facilitate a structured negotiation process through electronic media. Decision-support NSSs aim to help negotiating parties reach a better solution, in preparing for negotiation, in assessing their own positions and preferences as well as those of the other party, and in suggesting better alternative solutions (Kersten and Noronha, 1999). Agent-based-NSSs mainly focus on automating negotiation so that software agents can negotiate with each other autonomously in an environment governed by rules. Yuan et al. (2003) argue that from a communication perspective, the process-support NSS is less about how different media such as text, audio, and video can affect negotiation in the online setting. The results of their experiments show that video and audio negotiations were significantly preferred to text-only negotiation. Nevertheless, the addition of the video medium to audio and

text communication was not significant. This may be due to the fact that the technological capability of video is hindered by the underlying network bandwidth and resolution limitations.

Thus our review suggests that employing computer-based technologies in negotiation activities has centered on addressing different types of problems encountered in human negotiations. The growing interest in NSS is largely rooted in the technology's potential to overcome the limitations (and frustrations) of face-to-face negotiation. While there has been considerable theoretical reasoning behind the implementation of NSSs, the underlying concepts have to be examined with dedicated theories. This section pertains to the theoretical categorization of NSSs and e-Negotiations.

The **first** aspect of computer-based negotiation technologies addresses the cognitive limitations and biases of human negotiators. As human brains have limited information processing capacities and capabilities, dedicated decision support tools can be embedded to facilitate decision-making during negotiation. Traditionally regarded as a subtype of GDSS, this stream of e-Negotiation Systems aims to enhance face-to-face negotiations by incorporating group decision support tools. The first category of systems, labeled *Category I Group Decision Support* in this thesis, has also been regarded by various researchers as: a) decision support component (Lim and Benbasat, 1993), b) analytically-based systems (Matwin et al., 1989), c) preparation and evaluation systems (Starke and Rangaswamy, 2000), and d) decision support NSSs (Yuan et al., 2003).

The **second** aspect deals with the communication mode for conducting negotiations. There are two kinds of needs for negotiation communication: a) the *social-oriented* needs to build rapport and relationships, and b) the *task-oriented* needs for exchanging information and proposals. In this aspect, the e-Negotiation systems assume the role of communication channels or media to link up negotiating parties. Many communication functionalities, such as text-based information exchange, multilingual support, videoconferencing and emotional icons can be incorporated for this purpose. This system is labeled *Category II Multimedia Communication,* corresponding to

earlier researchers' recognition of it as both a communication support component of NSS (Lim and Benbasat, 1993) and a process support NSS *(*Starke and Rangaswamy, 2000; Yuan et al., 2003) .

The **third** aspect focuses on providing autonomous agents to automate the negotiation process. As negotiation is tedious and often routine and repetitive, dedicated autonomous agents can be designed to negotiate on behalf of their human principals. This stream of e-Negotiation Systems is labeled *Category III Negotiation Agents, or* agent-based NSSs as in Starke and Rangaswamy (2000) and Yuan et al. (2003).

This classification scheme distinguishes the different *aspects* that IT contributes to facilitate negotiation needs in order to clearly understand different e-Negotiation technologies based on the roles they assume to fulfill design goals. Going beyond existing classifications covering NSS designs, we also classify system designs under each broad category. In Category I, we further examine decision support tools for different stages of negotiation; while in Category II, two purposes of communication needs for negotiation are distinguished; and in Category III, agent-based systems with differing levels of intelligence and automation are proposed and differentiated.

Three common assumptions are made which are specific to this classification scheme: 1) the computer element is essential and is involved to different extents in different types of e-Negotiation technologies; 2) It is assumed that both negotiation parties enjoy the same source of negotiation support technologies; i.e., the unit of analysis is the dyad. 3) The classification scheme takes a "tight" definition of negotiations that differ from the "problem-solving" process or "group decision making" process. As conflict of interests is an inevitable part of negotiation, the interests of the parties are considered as private information and negotiators refrain from publicizing them as joint problem representation (Jelassi and Foroughi, 1989).

This view of NSS (Lim and Benbasat, 1993; Starke and Rangaswamy, 2000) customarily excludes "cooperative GDSSs" that are designed to aggregate objectives and preferences of

individual decision-makers into a group representation, e.g., as a joint utility function (see Jarke et al., 1987), and as "arbitrating agents" that assume agents can gather all players' objectives and preferences to reach negotiation agreement (see Espinasse et al., 1997)[13]. Each of the different streams is analyzed in detail and the role of the systems in each category is further classified in the following sections.

4.1.2 Category I: Group Decision Support

The decision support component of an NSS has been studied extensively in DSS literature and its effectiveness is proven to be relatively consistent in supporting individuals and groups to obtaining better decision outcomes. Significant work has been conducted to develop decision aid tools to facilitate negotiation in face-to-face settings. Figure 4-2 illustrates the basic architecture/setting under this research realm.

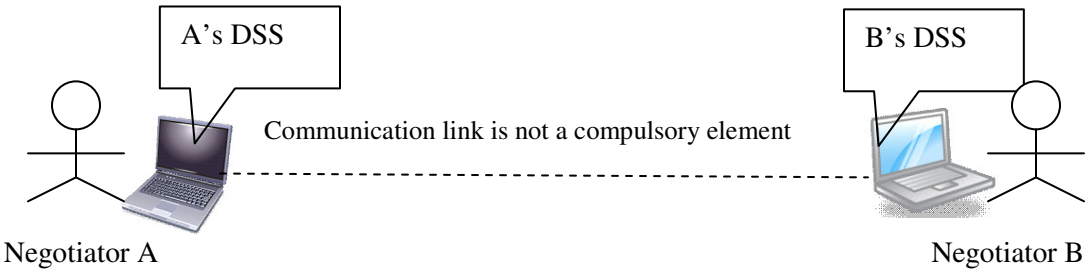

Figure 4-2. ENS Architecture Focused on Group Decision Support

[13] The issue lies in the heart of "what one means by negotiation support" (see Starke and Rangaswamy, 2000). It is necessary to define a clear boundary for "negotiation support" by comparing a negotiation process to a group problem-solving process. The group decision making approach to negotiation support presumes all players are in consensus in the tradeoffs of different alternatives (Kersten, 1985). However, such assumption may not be applicable or make sense to real-life business negotiations. This dissertation echoes the classification by Starke and Rangaswamy that systems which assume the pre-existence of group utility functions should be precluded from NSS and ENS taxonomy, which is different from some previous notions in NSS literature (Jarke et al., 1987; Espinasse et al., 1997).

4.1.2.1 Overview of Category I System Prototypes

To date, a number of web-based negotiation support prototypes can be named: Inspire (Kersten and Noronha, 1999; Vetschera et al., 2006), WebNS (Yuan et al. 1998; Yuan et al. 2003), SmartSettle (Thiessen and Soberg, 2003), DOC.COM (Schoop and Quix, 2001a, 2001b), Negoisst (Schoop et al., 2003; Kohne et al., 2005), as well as CAKES-NEGO (Lee et al., 2007). One of the most recognized examples is the Internet Negotiation Support System (INSS) developed at Carleton University, Canada. The system contains a facility for specification and assessment of preferences, internal messaging system, and graphical displays of the negotiation progress. This system can be categorized as a solution-driven NSS. It provides a method to construct a negotiator's utility functions for evaluating proposals. It also provides suggestions or solution alternatives in the sense of Pareto optimization.

Among all, decision support tradition in negotiation research has shown significant influences to the design of these prototypes. Specifically, Negotiation Assistant (Rangaswamy and Shell, 1997), Inspire (Kersten and Noronha, 1999; Vetschera et al., 2006) and SmartSettle (Thiessen and Soberg, 2003) have applied decision-theoretic approaches dominated by MAUT. MAUT is used in different phases and aspects of negotiation support. In pre-negotiation preparation phase, MAUT is used in its original sense to facilitate preference elicitation from individual decision makers. After the preference information such as rankings and point structure are constructed, alternative evaluation and generation can be facilitated during the negotiation. MAUT is also used to identify Pareto-optimal solutions in post-settlement phase.

Other systems primarily support strategy formation in pre-negotiation preparation and can be further classified as expert systems. Examples include DECISION MAKER (Fraser and Hipple, 1981), NEGO (Kersten, 1985) and NEGOTEX (Rangaswamy et al., 1989; Eliashberg et al., 1992). These systems focus on supporting individual negotiators as decision makers in providing negotiation knowledge such as effective communication and facilitating strategy formulation.

Table 4-1 summarizes the existing e-Negotiations research prototypes that emphasize on Category I technologies, sorted by the years of publication. It is noted that the examples shown in this category do not exclude other functions to support negotiations such as communication channel. The primary focus of this table is on the illustration of these systems on the decision support component.

Table 4-1. Illustrative Prototypes for Category I Systems

System Package	Type of Support	Models and Components	Supporting Level	Role of System
Standalone DSS as Expert System (for individual mediator or negotiator)				
CAP/DECISION MAKER (Fraser and Hipple, 1981)	Mediation aid as expert system	Metagame Decision Models	Individual mediator	"Consultant"
PERSUADER (Sycara, 1990; 1992)	Mediation aid; design goal is to facilitate problem solving during negotiations	MAUT and case-based reasoning	Individual mediator	"Consultant"
NEGOTEX (Rangaswamy et al., 1989; Eliashberg et al., 1992)	Expert system that provides knowledge on negotiations and supports pre-negotiation strategy formulation; focus on international negotiations	Rule-based	Individual Negotiator	"Consultant"
GENIE (Wilkenfeld et al., 1995)	Expert system	MAUT	Individual Negotiator	"Consultant"
NEGOTIATOR (Bui and Shakun, 1996)	Expert system	Guiding individual negotiators	Individual Negotiator	"Consultant"
NEGOPLAN (Matwin et al., 1989)	Expert system	structure strategic issues only	Individual Negotiator	"Consultant"
An Advisory Agent (Chen et al., 2004)	Expert system deployed on Web	provide knowledge and info about counterpart	Individual	"Consultant"
NSS as Linked DSS (for dyadic negotiators)				
NEGO (Kersten, 1985)	Mediation aid as expert system NSS (as non-cooperative GDSS)	- Multi-objective Linear Programming (satisfising and maximizing) - LAN-based Electronic Communication	Multiple negotiators	"Facilitator"

"Interactive NSS" (Foroughi et al., 1995; Perkins et al., 1996; Delaney et al., 1997)	NSS	- DSS: MAUT for alternative evaluation and generation only - LAN-based Electronic Communication	Two Negotiators	"Facilitator"
NEGOTIATION ASSISTANT (Rangaswamy and Shell, 1997)	NSS	- DSS: MAUT for both pre-negotiation preparation, as well as alternatives evaluation; also includes mediation function such as "post-settlement" option - Internet-based Electronic Communication	Two Negotiators	"Facilitator" (optionally as "Mediator")
INSPIRE (InterNeg Support Program for Intercultural Research) (Kersten and Noronha, 1997) http://www.business.carleton.ca/interneg	Web-based NSS to support inter-cultural negotiations	MAUT and suggestion for Pareto-optimal solutions; Phase model; Rating function Other features include ratings, automated messaging, visualization, history, compromise efficiency.	Two Negotiators	"Facilitator" (optionally as "Mediator")
Cooperative GDSS (these GDSS can be used for negotiations, but may be difficult to be applied in real-world negotiation settings)				
MEDIATOR (Jarke et al., 1987)	Cooperative GDSS (assumes group utility function exists)	DSS for Multi-criteria decision making; Mediation through joint-problem representation	Mediator and multiple negotiators	"Mediator"
NEGOiad (Espinasse et al., 1997)	Cooperative GDSS (assumes group utility function exists)	Distributed Artificial Intelligence model	Mediator and multiple negotiators	"Mediator"
DECISION CONFERENCING (Rao and Jarvenpass, 1991)	GDSS that can be applied in a negotiation context	Decision-analytic techniques; "democratic protocols" using decision trees, expected utility maximization, and Pareto algorithms	Negotiation parties with the help of a third part facilitator	"Mediator" with "democratic protocols"

4.1.2.2 Design Objectives

This broad category of ENS systems aims to *address negotiators' cognitive limitation and biases* by provision group decision support tools. DSS tools as the fundamental component of early NSS research are designed and developed to overcome the stumbling blocks encountered in face-to-

face negotiations[14]. Decision support software available in NSSs include modeling capabilities such as decision trees, risk analysis, forecasting methods, and multi-attribute utility functions, as well as structured group methods like electronic brainstorming, and Nominal Group and Delphi techniques. Among all, MAUT is most often used in decision support tools for negotiations. This feature is present in most of the NSS prototypes.

4.1.2.3 Sub-Classification of DSS Support

Several researchers who have studied the flow of negotiations have confirmed that negotiation, like communication in problem-solving groups and in other forms of ritualistic social interaction, proceeds through distinct phases or stages (Douglas, 1962; Greenhalgh, 2001; Morley and Stephenson, 1977). The phase or stage view takes the dimension of *time* into the negotiation modeling.

Based on the concept of integrative bargaining, Mumpower et al. (1988) proposed the use of *analytical mediation*, or computer-assisted conflict resolution techniques, to achieve mutually satisfactory agreements. The analytical mediation methodology focuses on asymmetries of interests between negotiating parties, awarding each party more on those issues that are more important to it. For example, if the delivery date is of higher priority to a buyer than the price, whereas the seller holds the opposite view, then both will be more satisfied if they settle on an earlier date and a higher price. This approach entails four important steps. First, negotiation issues and their ranges are defined. Second, importance weightings, for the construction of utility curves, are elicited from each negotiator. Third, optimal proposals, or solutions that maximize the utility for both parties, are computed. Fourth, proposals are presented to negotiators for deliberation. Activities of step one correspond to pre-negotiation planning, while those of the remaining steps correspond to actual negotiation (Fisher and Ury, 1981; Jelassi and Jones, 1988).

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[14] Their guiding principles and theories are examined in Section 3.2.1.

At the basic, negotiations evolve from pre-negotiation preparation, negotiation to post-negotiation settlement stages (see Figure 3-2). Many NSS studies follow the basic model of staged-based negotiation (e.g. Lim, 1999; Kersten and Noronha, 1999). Next, the basic three stages are distinguished to guide our systematic examinations of DSS technologies used for each stage.

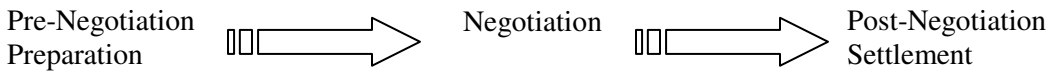

Figure 4-3. The Three Stages of Negotiation

4.1.2.3.1 DSS for Pre-Negotiation Stage

Pre-Negotiation planning (i.e., issue identification and preference elicitation) is fundamental to conducting useful analysis of negotiation (Keeney and Raiffa, 1991). The activities in this phase are designed to help negotiators understand what the other party is thinking about: each side develops and discusses its position, the issues which it thinks are significant, and the concessions it is willing to make towards consensus (Jelassi and Jones, 1988). Examples of NSS prototypes incorporating pre-negotiation support include NEGOTEX which is a rule-based standalone expert system model focused on international negotiation (Eliashberg et al., 1992), and INSPIRE which is a web-based NSS developed in Carleton University (Kersten and Noronha, 1999).

DSS tools for problem definition could enhance defining a negotiating party's initial position by supporting the following group processes: (1) issue generation, (2) issue selection, and (3) range limit setting (options definition). The purpose of the *issue generation* tool is to generate, simultaneously and anonymously, a large number of creative issues pertaining to the negotiation task. *Issue selection* allows negotiators to create a concise list of issues that they think are most important to the negotiation. Selected issues may also be ranked or rated to reflect their relative priority. Finally, *range limit setting* allows negotiators to define the ranges of values they prefer for the issues to be negotiated.

4.1.2.3.2 DSS for Negotiation Stage

DSS tools for preference elicitation provide for, among other things, the quantifying of a negotiator's importance weightings for each issue. The following processes are supported: (4) preference elicitation (to elicit the relative preferences among issues) and (5) utility specification (to elicit the relative preferences for the options for each issue)[15]. Through these activities, the system can help the parties disaggregate their own preferences and priorities in order to better understand them (see Rangaswamy and Shell, 1997). Preference assessment is based on combination of simple additive utility functions recommended by Keeney and Raiffa (1991), and *conjoint analysis* techniques that have found wide application in psychology and marketing research (Green and Srinivasan, 1978; Green and Krieger, 1993). Keeney and Raiffa (1991) suggested that quantification of issue preferences not only illustrates the preferable alternative agreements, it also helps to focus negotiators' effort in a negotiation. These activities ensure that, prior to the negotiation session, the negotiator's position is well defined and that he or she understands the importance of the various issues (Jelassi and Jones, 1988). In addition, negotiators' positions on and preferences over issues are revealed to the opponent through the series of pre-negotiation activities. Thus, negotiators will be able to identify the issues that matter more to them, as well as to their opponents (Jelassi and Jones, 1988; Keeney and Raiffa, 1991). Self need can then be readily analyzed, and the rival's position, strategically examined. Subsequently, asymmetrical interests, and hence the opportunity to cooperate and score outstanding joint outcomes, can be readily distinguished.

Negotiation commences when negotiators can officially send proposals and counter-proposals. **DSS tools for alternative evaluation and generation** include (6) *alternative evaluation* function that can be readily done using the utility structure obtained from previous activities, and (7)

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[15] Activities (4) and (5) have also been classified as "Prepare" and "Ratings" stages (Rangaswamy and Shell, 1997).

alternative generation function based on Pareto and maximization of joint utilities. The high computation power offered by NSS can help to compute optimal individual solutions for each negotiator effortlessly, thus relieving negotiators of having to resort to *satisfising* strategies (March and Simon, 1958) to reach an agreement. In addition, based on the negotiator's estimation of his/her opponent's utility functions, a "simulated" joint outcome can be generated to help the negotiator better identify optimal solutions.

4.1.2.3.3 DSS for Post-Negotiation Stage

DSS tools for post-negotiation stage can help parties to identify Pareto-superior settlements. After the parties have reached an agreement, the system (8) analyzes the settlement and identifies possible superior settlements in terms of Pareto-efficiency. Because Pareto-optimal solutions are the better solutions that can let at least one party gain without the other party worse off, changing settlement on the Pareto-optimal solutions in the post-negotiation stage is possible. In this way, the system assumes the role of a mediator which provide support for minimizing "value left on the table" after parties have reached a settlement by themselves (Raiffa, 1985). Examples of prototypes using post-settlement optimization techniques are NEGOTIATION ASSISTANT (Rangaswamy and Shell, 1997) and INSPIRE (Kersten and Noronha, 1997).

For post-settlement optimization functions to be invoked, a third party, being human mediator or the system, must be trusted by the negotiating parties as access to both party's private preferences is a pre-condition in suggesting Pareto-optimal solutions[16].

4.1.3 Category II: Multimedia Communication Support

From the economic and analytical negotiation perspectives, negotiation is a special form of decision and NSS is a special kind of decision support systems (Kersten et al., 1991). However,

[16] This pre-condition or assumption of post-negotiation settlement techniques naturally involves trust issues and problems that may inhibit negotiators' acceptance in real-life settings.

decision support models and techniques often face realistic challenges when applied to real-life negotiation settings, and are even more difficult to fully operationalize in Internet-based electronic systems (Kohne et al., 2004). Another stream of research proposes to look at computer-supported negotiation from a communication perspective (Weigand et al., 2003; Yuan et al., 2003; Schoop et al. 2003; Kohne et al. 2005).

In a broader sense, the communication medium or channel can be employed alone or in configuration with other technologies to support negotiations. When employed *alone*, electronic communication channels for negotiation share most of the common characteristics of multimedia tools for general communication purpose. The effectiveness of the various channels has been extensively studied in the Computer-Mediated Communication (CMC) literature. When *linked* to decision support technologies, the integrated provision of electronic communication and decision support functions forms the central piece for NSS research**.** NSS prototypes are typically designed to facilitate face-to-face negotiations by connecting negotiators' standalone DSSs via networks.

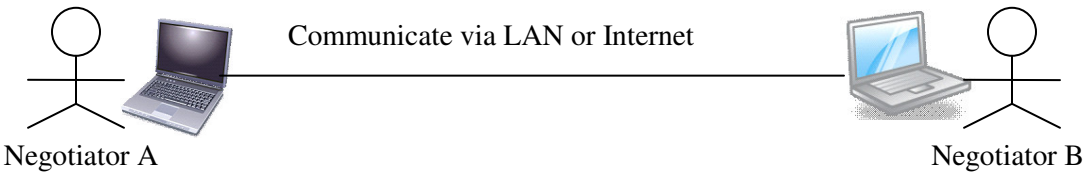

Figure 4-4. ENS Architecture Focused on Multimedia Communication Support

4.1.3.1 Overview of Category II System Prototypes

Negotiators primarily communicate for two purposes: obtaining mutual understanding (the social- and relational-oriented purpose) and achieving an agreement by exchanges of proposals (the task- and outcome-oriented purpose for negotiation). Correspondingly, communication system for negotiation should cater for these two intrinsic needs. For example, the Web-based Negotiation Support system (WebNS) provides full process structuring support as well as multimedia channels (such as audio, video and text) for online negotiation and mediation (Yuan et al., 2003).

Table 4-2 summarizes the existing e-Negotiation system prototypes that emphasize on the Category II functionalities.

Table 4-2. Illustrative Prototypes for Category II Systems

System Package	Background	Functions	Role of System
EC for Task-Oriented Communication (Focus attention away from people on task per se; however, by focus on task, an element of trust can be lost – this is a negative side effect that need to considerate; arguably only useful in face-to-face setting)			
TOPIC COMMENTER as in the "Interactive NSS" (Foroughi et al., 1995; Delaney et al., 1997)	Software created at the University of Arizona; served as means of electronic communication between negotiators	Support entering comments and proposals, displaying them on public screen	"Proposal Exchanger"
Proposal Exchange as in the NEGOTIATION ASSISTANT (Rangaswamy and Shell, 1997)	Software implemented at the University of Pennsylvania Northwestern University and Penn State University.	Support message and proposal exchanges	"Proposal Exchanger"
DOC.COM (Schoop and Quix, 2001a; 2001b)	Supported by MEMO: Mediating and Monitoring E-Commerce project	Communication and document management system for electronic negotiations	"Negotiation Communication Manager"
EC for Social-Oriented Communication			
Email system used in Valley et al. (1995)	Examine the "mode of communication" on single-issue negotiation outcomes: face-to-face significantly result in mutually beneficial outcomes than email-facility	Written offers and messages transferred through Messenger systems simulating an email-facility	Bilateral
WebNS (Yuan et al., 2003) URL: http://webns.mcmaster.ca	Web-based; Multimedia communication channels; Structured negotiation process.	Phase model Media theories	Bilateral
Negoisst (Schoop et al., 2003; Kohne et al., 2005)	Communication-oriented system DSS only provide utility estimations for semi-structured messages	Structured negotiation based on speech acts theory Natural language annotation	Bilateral

4.1.3.2 Design Objectives

This category of ENS system aims to address *communication needs* for negotiations. In e-Negotiations where face-to-face meeting may not be feasible, the communication support can further include functions such as the multimedia channels, the exchange of structured offers with accompanying arguments, free-text messages and automatic email notification of the partner's activity (e.g. Kersten and Lo, 2001). **Multimedia communication** may include audio, video communication and emotional icons and file transfer features, as we often see in popular instant messaging software such as MSN and Yahoo! Messenger. Although the Internet now enables audio and video communications, most ENS prototypes such as Inspire (Vetschera et al., 2006) and Negoisst (Kohne et al., 2005) are still based on text messages. The presence of visual and audio channels enables the participants to make use of social clues, such as eye-contact, facial expression and gesture, to support their social interaction (Bordia, 1997). In addition, videoconferencing may lead to both a reduction in transportation costs and a commensurate improvement in time taken to reach decision (Sniezek and Crede, 2002). Recent research (e.g, Yuan et al., 2003) advocates the importance of communication channels for negotiations and calls for empirical research on the effects of multimedia on negotiation process and outcomes.

4.1.3.3 Sub-Classification of Communication Support

4.1.3.3.1 EC for Social-Oriented Communication

Internet-based communication technologies can provide inexpensive electronic channels to conduct negotiation activities. Given the various forms of multimedia channels, a primary issue to ask is the choice of the appropriate channels for the task of negotiation.

The effectiveness and appropriateness of different electronic communication channels may be better understood from the CMC literature. ***Media richness theory*** (Daft and Lengel, 1984, 1986) proposed that leaner media will be less effective for performing ambiguous tasks, but will be

more effective for tasks requiring uncertainty reduction such as making a formal agreement. Daft and Lengel (1986) created a hierarchy of media richness with face-to-face communication at the top, followed by telephone, electronic mail and print communications (e.g., personal documents such as letters and memos, impersonal written documents and numeric documents). Newer media (computer-mediated communication) were not directly considered in the original theory. Past research on videoconferencing suggests richness of videoconference medium shall be below face-to-face (Kydd and Ferry, 1994; Nahl, 1993; Webster and Hackley, 1997).

In general, we may expect that richer media will result in better performance. Empirical tests however, did not provide strong support for this assertion. Tasks which primarily involve information exchange or simple problem solving have generally not shown benefits of video over audio-only communication technologies (Anderson et al., 2000). However, task involving bargaining and negotiations have been reported to show such benefits (Short et al. 1976; Whittaker, 1995; Williams, 1997). McGrath and Hollingshead (1993, 1994) suggested that user performance is affected not only by the richness of the media used, but also by the fitness between the media and the task. This is known as ***task-media fit theory***. They hypothesized that if a task utilizes a leaner medium than is required, the medium may act as a "constraint". Alternatively, if a task utilizes a richer medium than is required, the media may act as a "distraction". These communication constraints or distractions are likely to negatively affect task performance. Evidence was found that decisions made in "less rich" communication media were of higher quality than those reached in face-to-face meetings (Walther, 1996), presumably due to an enhanced ability to focus more on the task-related matters and less on the interpersonal matters.

In their task-media fit hypothesis table (McGrath and Hollingshead, 1993), the task of negotiating conflict of interests was best fit with face-to-face communication. This was followed by video systems (marginal fit), audio systems (poor fit) and text-based computer systems (poorest fit). As indicated as "less rich" compared to face-to-face communication, the reasoning is that video-

based systems usually transmit the image of the person's upper body and the quality depends on the communication bandwidth.

For most Internet-based trading activities, face-to-face interaction is not economically preferred compared to means through electronic communication. Hence it is necessary to investigate alternative communication technologies that combines text/graphics, audio and video channels in real-time communication, such as videoconferencing and instant messaging, would contribute to a more task-oriented negotiation of requirements (Damian, 2003).

4.1.3.3.2 EC for Task-Oriented Communication

The electronic communication channel, as one of the two major components in Lim and Benbasat's NSS theory (1993), has focused on task-oriented mode of additional electronic medium to enhance negotiators' performance. Compared to verbal communication, computer can provide mechanisms for transmitting task-oriented communication involving technical data and graphics, as well as text-based offer exchanges. These activities require a certain level of negotiators' keyboarding skills as well as literacy in reading and writing.

Negotiators' inaccurate perceptions of the other party often lead to cognitive biases and, subsequently, sub-optimal negotiation outcomes (Bazerman and Carroll, 1987). The facilitation of information exchange between negotiators can significantly reduce these judgment errors, such that accuracy of information exchanges or "information clarity" (Yuan et al., 2003) can be improved. In existing NSS literature, there are inconclusive findings concerning effects of the availability of electronic communication channel (Starke and Rangaswamy, 2000). While Delaney et al.'s (1997) study confirmed Lim and Benbasat's (1993) prediction that the addition of electronic communication channel to DSS support would increase negotiators' satisfaction compared to those provided only with individual DSS, Rangaswamy and Shell's (1997) experiment suggested no significant differences across conditions between EC only, DSS, and

NSS (DSS+EC) supported dyads. Furthermore, those dyads used electronic communication channels indicated that they considered the negotiation process to be less friendly.

The seemingly contradictive findings make at least two points pertinent for examinations. First, when applying or testing the theory of NSS (Lim and Benbasat, 1993), one has to note that an important precondition is that the theory assumes a setting where negotiators meet face-to-face and direct verbal communications are available. The addition of EC to DSS can hence contribute to the overall satisfaction by increased commitment to the problem-solving process. Comparing situations where the conditions are not met deserves further theoretical underpinnings. Second, the degree of EC or the richness of communication media is not made explicit in the theory. For example, *Email* as used in study by Rangaswamy and Shell (1997) represents the asynchronous mode of communication and hence is not comparable with the concurrent mode of electronic communication i.e., *instant chatting facility,* as is implied in the theory. This also calls for an enhanced theory on the effects of electronic communication media on negotiation outcomes.

4.1.4 Category III: Agent-Based Automation

The issue of the design and implementation of *automated negotiation* - where computational agents find and prepare contracts on behalf of the real-world parties they represent - has attracted great interest in recent years (Beam and Segev, 1997). An **agent** is an encapsulated computer system that is situated in a certain environment and that is capable of flexible, autonomous action in that environment, in order to meet its design objectives (Jennings et al. 2001). Figure 4-5 illustrates the pattern of agent-based negotiations. The agents for negotiators A and B communicate via LAN or the Internet and are autonomously governed by protocols and decision making rules.

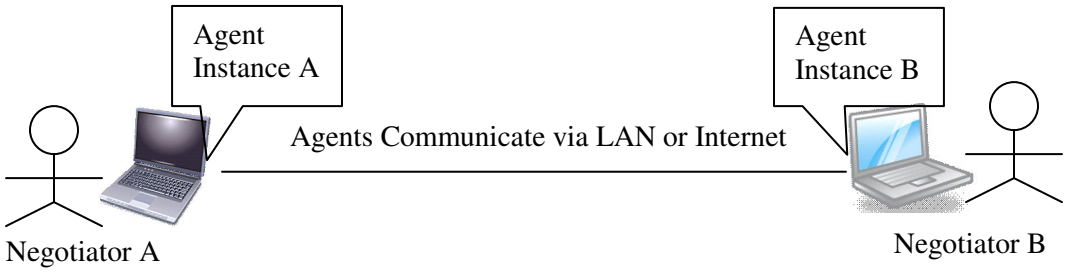

Figure 4-5. ENS Architecture Focused on Agent-Based Automation

4.1.4.1 Overview of Category III System Prototypes

Table 4-3 summarizes the existing ENS research prototypes that emphasize Category II system functionalities. Following the decision analysis tradition, MAUT-based approaches are also used in some agent-based negotiation systems such as Tete-a-Tete (Maes et al., 1999).

Table 4-3. Illustrative Prototypes for Category III Systems

System Package	Background	Models	Supporting Level
AAA (Oliver, 1997)	Agents' strategies evolve with a Genetic Algorithm-based search process	Algorithm-based	Automated agents
Tete-a-Tete (Maes et al., 1999)	Tete-a-Tete provides an integrative negotiation to retail sales. Agents negotiate on multiple terms.	MAUT-based value function; Concession function; Acceptable set	Automated agents
Kasbah (Chavez and Maes, 1996)	MIT Media Lab's Kasbah is an online, multi-agent C2C transaction system. Users create agents to buy and sell for them, and specify parameters to guide and constrain agents' behavior.	Concession function; Acceptable set	Automated agents
DESIRE (Jonker and Robu, 2004; Jonker et al., 2007)	A negotiation model completed in the DESIRE agent platform, built at the Vrije Universiteit, Amsterdam.	MAUT-based utility functions; Guessing heuristic by using history of the opponent's bids to predict his preferences	Automated agents

4.1.4.2 Design Objectives

Multiple-issue negotiations are commonplace in real-world business transactions. With multiple issues (e.g., price, delivery terms, warranty periods, purchase quantities and delivery time, and so

on), there are opportunities for the use of computer support tools (known as NSSs) to help structure and facilitate negotiations between buyers and sellers. Some online business transactions, while by their nature routine and repetitive, however have varying contract terms with each transaction. Rather than being performed by human negotiators, it is also likely that such routine transactions would be automated through autonomous agents that negotiate on behalf of their human "clients". In such situations, negotiation agents have significant benefits such as time-saving for human negotiators in monitoring market change, avoiding unnecessary cognitive conflict such as "face-saving behavior", and lowering transaction costs (Oliver, 1997; Starke and Rangaswamy, 2000). While automation and agent-based software themselves are distinct research topics in the areas of Computer Science and AI, in the context of Information Systems research, fully automated negotiation is conceived as another step in the evolution of NSS.

Put it simply, this category of ENS systems aims to *automate the negotiation process* by using intelligent agents. Starke and Rangaswamy (2000) posit that negotiation agents can offer a number of potential benefits. 1) The use of autonomous agents decreases the opportunity costs of transactions. For humans, time is synonymous with opportunity costs. Software agents have near zero opportunity costs (they can replicate themselves at zero marginal costs if needed). Even complex agents with machine-learning technologies impose only modest computational costs with today's high-speed computers. 2) A system of autonomous agent-based negotiations could increase the efficiency of settlements even for semi-structured, multi-issue business bargaining problems (Oliver, 1997). 3) Face-to-face encounters can be avoided for some individuals who are uncomfortable about "haggling with another person" by using an autonomous negotiating agent on their behalf. 4) Finally, autonomous agents offer new commercial possibilities offered. Lower costs associated with bargaining through agents might provide the means for new types of transactions by turning conventional multi-issue business transactions into negotiation-based transactions (Oliver, 1997).

Besides possessing a known advantage like achieving improved outcome efficiency with NSS support, automated negotiation can distinctly help to reduce negotiation time (by making large volumes of transactions possible in a very short period) and also remove some of the reticence of human negotiators to engage in embarrassing situations (Lomusico et al., 2003).

Using agents to conduct negotiations autonomously is fundamentally a different process compared to the previous two forms in engaging ICTs (decision support and communication support). According to Lomusico et al. (2003), there are two important aspects for the design of negotiation agents: the negotiation protocol and negotiation strategy. The ***protocol*** specifies the *public* rules of agents' interaction, e.g., the structure of offers that agents can make or the sequence of offers and counter-offers that are allowed (Rosenschein and Zlotkin, 1994). In general, agents must first agree on the negotiation protocol before negotiation proper begins. The ***strategy*** determines the way the agent behaves in an interaction as regulated by protocol; the strategies are agents' *private* decision-making models. There may be many possible strategies for an agreed protocol. Designers can program various strategies (see Section 2.3.1.1 for negotiation strategies) into the negotiation agents. Examples include rule-based strategies of a deterministic nature, hard-coded strategies of concession in multiple-issue negotiations (e.g., Matwin et al., 1991), case-based reasoning for planning and support of negotiations (e.g., Sycara, 1990), and strategies that incorporate machine-learning methodologies such as artificial adaptive agents using genetic algorithm-based learning techniques (e.g., Oliver, 1997). It should be noted that in general, one strategy that works well in a certain scenario may not work as well in others. Furthermore, in automated negotiation where protocol may vary, the choice of strategy is a function of not just of the specifics of the negotiation scenario, but also of the protocol in use (Lomusico et al., 2003).

A key problem of agent-based negotiation research is how to design agents in order to strategically negotiate with their counterparts. Agents without learning capabilities are inevitably

limited in capabilities. Nascent negotiation agents may have inherent risks when they adopt a *single* negotiation strategy throughout the negotiation process (Sierra et al., 1997). In other words, negotiation agents with very limited knowledge of their opponents will have greater difficulty in making trade-offs during negotiations. For instance, if the agent is too strict or rigid, it may lose the chance to earn more profits by making a deal with its opponent; on the other hand, if the agent is too easy-going or generous, it would probably just earn marginal profits even when it gets a deal with its opponent (Huang and Sycara, 2002). Furthermore, agent-based systems are associated with such barriers as the need for ontology and the strategy problem (Beam and Segev, 1997), as well as other uncertainty, risks and challenges due to their built-in negotiation protocols, strategies or tactics (Starke and Rangaswamy, 2000).

In an attempt to overcome the problem of agents' limited information about their opponents, recent AI research advocates a focus on the learning capabilities of negotiation agents. This means that agents can learn their opponents' preferences from previous encounters, thereby applying the acquired information to make better offers/counter-offers or trade-offs (Coehoorn and Jennings, 2004; Faratin et al., 2000; Soo and Hung, 2002; Zeng and Sycara, 1998). Huang and Sycara (2002) propose the implementation of personality features of negotiation agents. According to their model, the negotiation process is driven by the internal beliefs of participating agents. To realize different "personalities", one needs only to plug in suitable "subjective beliefs" to one's agents. With the personalized internal beliefs, the heterogeneous, self-interested agents can interact and negotiate with each other, so as to make deals with their opponents.

4.1.4.3 Sub-Classification of Agent-Based Automation

For both conceptual and empirical purposes, it is useful to further categorize negotiation agents based on the different design concepts used to automate negotiation process. The following section elaborates on the three alternate designs of e-Negotiation systems that have differing design features and advantages, which can be characterized with increasing **system intelligence**

levels, i.e., the extent to which the computerized negotiation support tool can imitate human negotiation behaviors with three system intelligence levels ranging from levels 1 to 3. It is not assumed nor argued in this definition that the difference in intelligence between Level-1 and 2 is comparable to that of Level-2 and 3. The Level-1 system is incorporated into this formulation in order to serve as a *baseline* system that represents traditional decision support tool for negotiations[17].

4.1.4.3.1 Level-1: Traditional NSS with Decision-Support Focus

The Level-1 system provides technical functions aimed at improving negotiators' decision-making quality[18]. According to Lim and Benbasat (1993), an NSS which pertains directly to a two-person, session-oriented, and multiple-issue setting, can be conceptualized as a combination of two major components – the individual Decision Support System (DSS) for each party and the electronic communications channel. The DSS portion improves the human information-processing capacity and its effects can be best understood within the reference disciplines of game theory and economic theory. The electronic communication channel improves perceived commitment and its effects can be best understood within the context of social-psychological theories of negotiation. Examples of such NSS prototypes can be found in greater detail in a series of cumulative studies (see Delaney et al., 1997; Foroughi et al., 1995; Goh et al., 2000; Jones, 1988). The NSS prototype specified in these studies consists of two important components: a module for electronic communication between the parties, and a DSS to assist in the generation and evaluation of alternative contracts. Each negotiator inputs his/her own interests to the decision tool as private data, as well as his/her estimates of the other party's preferences. The DSS

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[17] Kersten and Lo (2003) and Chen et al. (2004) look at the systems from a slightly different yet theoretically valid angle. To them, Level-3 system can be considered an integrated system that incorporates both decision support "agents" and automation "agents". The integrated system will have its well-defined roles based on their protocols and be used in different contexts and users.

[18] This type of system represents "traditional" functions of NSSs that focus decision support, also as classified as Category I system in our framework.

then computes and displays the three contract alternatives with the highest joint outcomes. The Level-1 system has *relatively* lowest level of system "intelligence" among the three, with the key functions to evaluate alternatives and suggest optimal solutions, where the human users perform the core processes involved in negotiations.

4.1.4.3.2 Level-2: Fully Automated Negotiation Agents

The Level-2 system aims to fully automate the negotiation process by implementing self-interested electronic agents. By specifying issue preferences and the bottom line based on negotiator's BATNA in the pre-negotiation preparation phase, an agent can then negotiate with the opponent to reach an agreement on behalf of its human master. A practical negotiation tactics that can be adopted by this system is the concession-based negotiation tactic (Lopes et al., 2001). Agents can make small concessions in each proposal without losing patience as human beings do. For negotiators as users, the design can be easily understood and used, and in addition, greatly eases negotiators' effort and reduces time spent in the negotiation process. However, when an agent adopts a pre-specified negotiation tactic in all scenarios, it has limited ability to reflect a negotiator's personal negotiation style. Furthermore, as the agent has very limited preference information about the opponent due to a lack of learning capability, it is only interested in maximizing its own utility without considering the concerns of the opponent's utility. Obviously, a poor algorithm can render Level-2 useless; while it needs to be assumed here that there are no inadequacies in relation to design and the system is in no way compromised by the design.

4.1.4.3.3 Level-3: Automated Negotiation Agents with Personality Features and Learning Capability

The Level-3 system is characterized by a sophisticated intelligent agent with personality features and the capability of adjusting negotiation strategies by learning the opponents' preferences. Due to the personality features (Huang and Sycara, 2002), human negotiators are able to inform the

agents to change negotiation tactics throughout the negotiation process and update their agents' beliefs about the opponents. A combination of different tactics can be built into the system such as the time-dependent tactic, resource-dependent tactic, behavior-dependent or imitative tactic (Sierra et al., 1997; Faratin et al., 1998), as well as different opening or concession tactics (Lopes et al., 2001). To "plug in" different beliefs into the agent, a human negotiator only needs to change his/her estimations of their opponent's issue-preference ratings.

At the same time, based on previous encounters with the opponent and some domain knowledge (Zeng and Sycara, 1997), the agent can automatically estimate the opponent's preference information. According to Faratin et al. (2000), the preference information can be either in the form of perfect information (i.e., the opponent's actual issue ratings), or partial information (i.e., the opponent's issue priorities). Possible learning mechanisms are the Bayesian learning mechanism (Li and Cao, 2004; Zeng and Sycara, 1998), the neural network learning algorithm (Soo and Hung 2002), kernel density estimation (Coehoorn and Jennings, 2004) and so on. In addition, similarity criteria (Faratin et al., 2000) can be used and coupled with concession tactics, to generate offers that could yield comparable utilities to the negotiator but may benefit his/her opponent; i.e., to increase the opponent's utility without leaving its own utility at a disadvantage. This approach would increase the overall joint outcomes. With the personality features and the learning capabilities, the proposed Level-3 system will have the highest potential to imitate human negotiation behaviors among the three design alternatives. At the same time, it is worthwhile to note that the Level-3 agent requires more human involvement and cognitive effort than the Level-2 agent does.

4.2 THE DEPENDENT VARIABLES - NEGOTIATION PROCESS AND OUTCOMES

Reflecting the interdisciplinary nature centered on negotiation research, a number of theoretical models of negotiation have been developed in attempts to understand negotiation and each

suggests different measures of negotiation performance. **Descriptive** negotiation theories have mostly emphasized the contextual characteristics of negotiation and negotiators' cognition and interaction processes (Bazerman and Lewicki, 1983; Pruitt and Rubin, 1986). Thus measurement of negotiation outcomes typically includes elements of social perception such as negotiators' perceptions of the bargaining situation, the bargaining opponent, and of themselves (Thompson and Hastie, 1990). From the **normative/game-theoretic** perspective (e.g., Nash, 1950, 1953; Rubenstein, 1982), negotiation outcome is formulated with economic measures of negotiation performance in terms of the efficiency and fairness of the negotiated agreement. Most of the empirical studies on NSS/Negotiation Agents incorporate joint utility and contract balance as primary dependent variables to reflect outcome of negotiation, showing the significant impact of the analytical approach on negotiation. The following sections detail the dependent variables for each perspective[19].

4.2.1 Economic Perspectives

Negotiation outcome is the product of a bargaining situation, which may be an impasse or a mutual agreement. In terms of an agreement, economists analyze the two-person bargaining problem in terms of *utility* received by each bargainer from any settlement. Developed from game-theoretic models (Nash, 1950, 1953; Rubenstein, 1982), negotiation outcome is assessed in terms of **efficiency** and **fairness**. Typical measures of negotiation outcome used in most general negotiation studies comprise joint profit/utility/value, contract balance (also known as equality of outcome), the number of contracts/offers proposed, and so on. (e.g., Delaney et al., 1997;

[19] Although culture is not manipulated in our research framework, it is recognized that efficiency, fairness and time are *culturally* dependent concepts. While there is no established theory that pertains directly to the effects of ENS per se to culture-specific negotiation outcomes, we hold the position that insights are warranted in understanding the dynamics of different system features using a culture-sensitive perspective. As ENS studies have attracted worldwide research interest, such insights are particularly useful when empirical results are compared to those in the literature where experiments are conducted in different countries and cultures without explicitly stating the possible impacts of cultural influences. We will illustrate this effort catering the sense of cultural complications in the first experimental study.

Foroughi et al., 1995; Jones, 1988; Lim, 2000). Some researchers have also proposed measuring negotiation outcomes in terms of the Pareto-efficiency concepts (Lax and Sebenius, 1987; Tripp and Sondak, 1992; Milter et al., 1996; Lim and Benbasat, 1993; Goh et al., 2000).

4.2.1.1 Efficiency

It has been widely recognized that not all negotiators are able to achieve *efficient agreement*, i.e., to reach situations in which neither negotiator could do better without the other doing worse (Lax and Sebenius, 1986; Pruitt and Rubin, 1986). Failure to achieve efficient agreement is also described as "leaving money on the table" (Raiffa, 1982) or failure to find an "integrative" solution (Walton and McKersie, 1965). This perspective has tended to measure the quality of negotiations in terms of the extent to which the agreed utilities *deviate* from predicted outcomes.

4.2.1.1.1 The Concepts Related to Efficiency

Negotiators' performance can be assessed at both the individual and the dyadic levels. At the individual level, **individual efficiency** reflects the extent to which an individual negotiator's utility payoffs approach the maximum value, which is 100% in extreme cases. The operationalized terms are also called individual outcomes and individual values and so on. At the dyadic level, **joint efficiency** reflects the extent to which a negotiation dyad's utility payoffs approach a frontier. From the system point of view, people are primarily interested in the dyadic level of negotiators' performances. To understand dyadic performance or more generally the distribution of resources, we will next look at the concept of Pareto efficiency.

The basic theory underlying the optimization algorithms of negotiation support systems can be effectively illustrated using the Pareto-efficiency concept. Generally speaking, a goal of negotiations is to be as "Pareto Efficient" as possible. A *Pareto efficient* outcome is one in which there is no other agreement that would result in both parties being better off (Nash, 1950), assuming the utility function is convex or quasi-convex. An *efficient frontier* refers to the locus of

achievable joint evaluations from which no joint gains are possible, i.e., the set of *Pareto optimal* agreements (Raiffa, 1982). **Pareto efficiency** is the extent to which an agreement approaches the frontier.

Geometrically, an efficient frontier is reflected as a finite set of points (such as M or N) or a line (see Figure 4-6). All other possible agreement points in the shaded area (such as point A) are non-Pareto optimal outcomes. There is potential for improving non-Pareto optimal outcomes to become optimal.

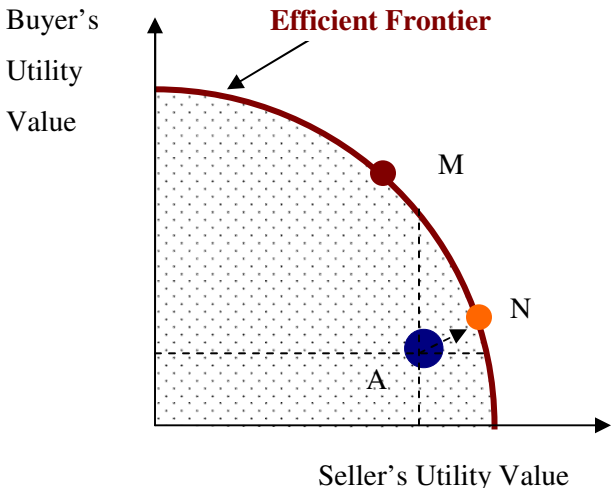

Figure 4-6. Pareto Efficiency

4.2.1.1.2 The Efficiency Concept for Measuring Dyadic Negotiation Outcomes

In existing literature, there are two ways of measuring dyadic or joint negotiation outcomes: by using the Pareto-efficiency concept and by using joint profit. The following sub-sections elaborate on measurement issues of negotiation outcomes so as to provide a better understanding of their different underlying concepts.

In terms of the total utility of a negotiated settlement, **joint utility** (also known as joint profit, joint value) is presumably the most common dependent variable to assess dyadic negotiation performance (see the review by Tripp and Sondak, 1992). It is the sum of the total, multi-attribute

utility scores of the buyer and the seller for the final agreement; and the higher the value of the joint points, the higher the joint utility. Tripp and Sondak (1992) identify three major reasons underlying the popularity of using joint utility: the ease of calculation; the simplicity of underlying concepts without need for referencing economic models; and its reflection of subjective measures in negotiation contexts which are adopted in the social psychological traditions of studying cooperation (Pruitt, 1981; Pruitt and Rubin, 1986).

Some researchers argue that joint utility is not a "sensitive" measure of negotiation efficiency (Lax and Sebenius, 1987). Individuals are believed to entertain different aspirations or expectations of negotiation outcomes (Oliver et al., 1994) and measuring final outcome without taking into account each negotiator's initial expectations (prior to the negotiation activity) neglects such a difference. **Gain** reflects the disparity of one's initial expected utility and the actual outcome achieved with the final agreement. **Joint gain** is hence calculated as the sum of individual gains obtained by both buyer and seller.

4.2.1.1.3 Pareto Efficiency and Joint Utility

In their examination of the relationship between Pareto Efficiency and Maximum Joint Utility, Tripp and Sondak (1992) postulated that while all agreements that maximize joint profit are Pareto optimal, but for any given function measuring joint utilities, not all Pareto optimal agreements necessarily maximize joint outcomes. Hence, measuring joint performance by means of join outcome may result in different conclusions compared to measuring by means of Pareto Efficiency, as far as experimental studies are concerned.

Geometrically, when Point M represents a Pareto optimal agreement that maximizes joint utility, Point N represents another Pareto optimal solution with a lower joint utility. Certainly a rational negotiator (in this case, the seller) ***would not*** be willing to move from N to M as this will result in a lower individual utility to him/her, and hence measures of dyadic performance ***should not*** imply that he or she should make the move (see Figure 4-7).

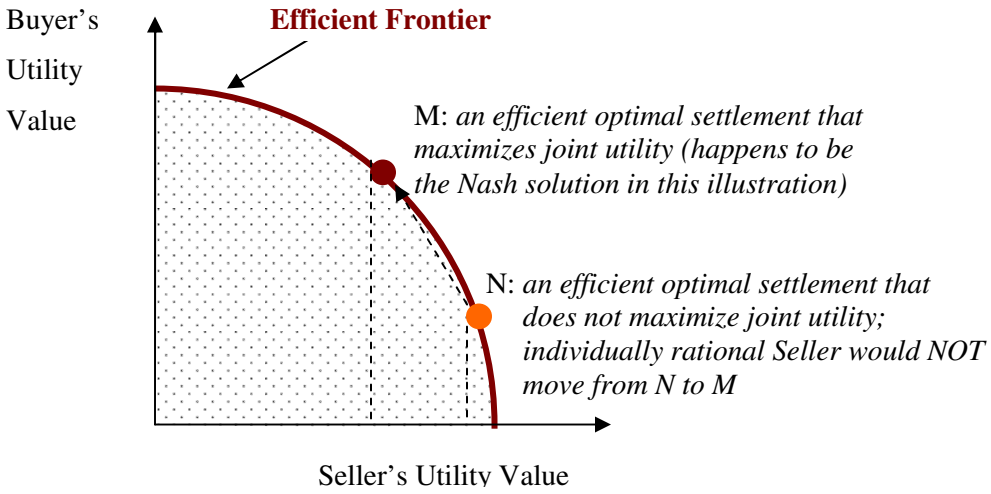

Figure 4-7. Pareto Efficiency and Joint Utility

In comparing the two measurements of joint outcome, it has been suggested that the quality of negotiated agreements can be better measured by Pareto efficiency rather than by joint utility because "Pareto efficiency better incorporates theoretical models of individual rationality" (Tripp and Sondak, 1992, p. 292). When joint utility is used as an efficiency measure, an implicit assumption is that negotiators should sometimes act against their individual interests for the sake of joint profit. In those situations where only a subset of possible Pareto optimal agreements maximize joint profit, negotiation researchers who use joint utility as a measure of dyadic performance may "confound distributive norms with rational choice by negotiators" (Tripp and Sondak, 1992, p. 282).

There are different formulas for measuring negotiation outcome using Pareto-efficiency concepts, such as the *integrative quotient* (Lax and Sebenius, 1987), the *improved integrative quotient* which is an adjusted formula in consideration of inefficient frontiers (Tripp and Sondak, 1992), the *constant ratio distance* (Milter et al., 1996), and the *distance to the efficient frontier* (Lim and Benbasat, 1993; Goh et al., 2000). Clyman (1995) examines the two integrativeness-based

measures proposed by Lax and Sebenius (1987) and Tripp and Sondak (1992), and concludes that the measures do not always work well.

Tripp and Sondak (1992) further suggest three criteria to operationalize Pareto efficiency: 1) it should be comparable across studies, 2) it should not include irrelevant comparisons among possible agreements, and 3) it should reflect the difficulty of the bargaining task.

All ratio-based operationalizations (as in Lax and Sebenius, 1987; Tripp and Sondak, 1992; Milter et al., 1996) satisfy the first criterion. By removing solutions in inefficient portions, operationalizations such as those of Tripp and Sondak (1992) and Milter et al. (1996) further satisfy the second criterion. The formula devised by Tripp and Sondak (1992) also satisfies the third criterion by reflecting task complexity.

Goh et al. (2000, p. 110) have provided a way of operationalizing the distance to the efficient frontier. All efficient solutions on the efficient frontier must be determined before the distance can be calculated. The distance to the efficient frontier, D_1, is hence calculated by the minimum distance among all lines linking a settlement to all efficient solutions (Goh et al., 2000, p. 110):

$$D_1 = \min_{i=1}^{n} \left(\sqrt{(F_b - E_{b_i})^2 + (F_s - E_{s_i})^2} \right)$$

where F_b, F_s and E_{bi}, E_{si} denote the buyer's and seller's utility scores for the final agreement and for efficient solution i, respectively. Here i is the sequential index into efficient solutions, and n is the total number of efficient solutions.

Indeed, measuring dyadic performance in mixed-motive negotiation can be a challenging task. Given the inconsistent views and mechanisms, it perhaps deserves further discussion to differentiate the situations: **1) when joint utility is appropriate as a measure of efficiency,** and **2) when the Pareto-efficiency concept is appropriate as a measure of efficiency of negotiation outcomes**. There is so far no universally accepted measure that can be considered appropriate in all settings. While examples have shown that joint profit may not reflect individual

rationality (Lax and Sebenius, 1987; Tripp and Sondak, 1992; Milter et al., 1996; Goh et al., 2000), measures using Pareto-efficiency concepts are also not appropriate for some negotiation settings (Clayman, 1995). Measures should be used by researchers fitting to the questions they ask and reflecting their theoretical assumptions. This dissertation holds a view similar to the impossibility theorem which states that it is impossible to construct a single measure that works in all negotiating settings: the choice of measures "must be examined for appropriateness to the particular experimental setting" (Clayman, 1995, p. 40).

For the **first** situation, by engaging joint utility, one implicitly assumes that negotiation parties are motivated to pursue efficient solutions maximizing the joint-level performance, and neither individual efficiency nor equality of individual efficiencies is implied. In an experimental setup that institutionally motivates and technically facilitates negotiation parties to pursue the highest joint performance, joint utility should be arguably chosen as a dependent measure to reflect outcome efficiency. An alternative generator (a component of decision support tools for negotiation) is one typical system artifact (see Foroughi et al, 1995; Delaney et al., 1997) that aims to promote highest joint outcome. Therein researchers consider it appropriate to engage joint utility to reflect outcome efficiency.

For the **second** situation, in contrast, by using the distance to efficient frontier, one implicitly assumes negotiators are rational, self-motivated decision makers. The idea is that there is no reason to reject moving to a point where at least one party's utility improves, while the other's is either unchanged or also improved. This measure does not concern equality of individual efficiencies. In an experiment setup that institutionally motivates and technically facilitates negotiators to purse individual efficiency (such as Pareto-optimization functions as illustrated in SmartSettle), Distance to Efficient Frontier can be arguably chosen as a dependent measure to reflect efficiency.

4.2.1.2 Fairness

In integrative negotiations or more generally in cooperative games, fairness is often one of the most important criteria for parties to deciding on particular settlements or solutions (Albin, 1993). The major problem for using efficiency measures to assess the quality of negotiation outcome is the lack of the notion of *fairness*. The fairness or equality concern[20] connotes the second fundamental aspect of settlement quality.

4.2.1.2.1 The Concepts Related to Fairness

The concepts related to fairness, such as equality, equity, justice and impartiality, have been the subjects of discourse by scholars dating as far back as Aristotle of Ancient Greece. It is acknowledged that *equality* differs from equity in that absolute *equality* implies that each party receives the same outcome whereas absolute *equity* implies parties in a relationship receive outcomes in relationship to their input. Younge (1991) provides several examples showing why sometimes an equal share of the final agreement cannot be regarded as fair solutions. Younge (1991) further suggests that measuring fairness using the Nash solution is a more defensible approach as far as equity is concerned. The Nash solution establishes a form of parity between negotiators by considering their relative rates of utility gain.

In his widely adopted bargaining theory, Nash (1950, 1953) integrated the Pareto standard with a set of fairness principles to define what came to be known as the Nash bargaining solution. The Nash bargaining theory strives to maximize the joint gains of two negotiation parties while taking into consideration the notion of fairness in a formal, scientific manner. Nash imposes three axioms: independence of irrelevant alternatives, efficiency and symmetry. The **Nash bargaining solution** is a single point that satisfies all the three axioms. Simply, this solution is a fair

[20] In fact, fairness is sometimes used interchangeably with equality in negotiation studies.

settlement that maximizes joint utility[21]. In informal terms, it is a solution point from which no party has incentives to deviate.

Geometrically, the Nash solution can be derived by drawing the largest rectangle that will fit inside the bargaining space *S*, i.e. one with the southwest vertex on the disagreement point/origin, and the northeast vertex on the Pareto-frontier. Since the area of this rectangle is the product of its length and height, the largest rectangle will be the one that maximizes the product of the two players' utility. The bargaining solution will be the northeast vertex of this rectangle (see Figure 4-8).

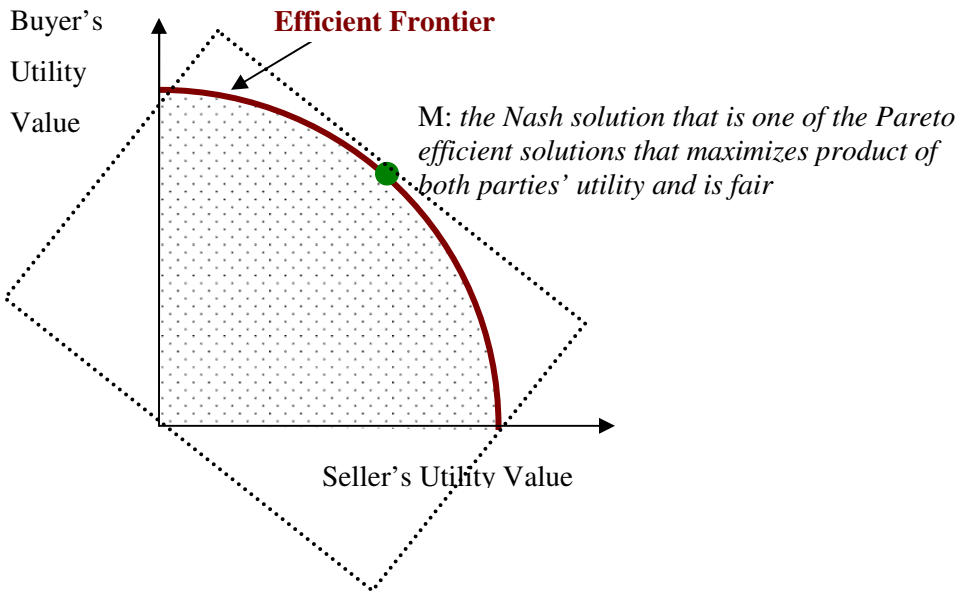

Figure 4-8. Nash Bargaining Solution

4.2.1.2.2 The Fairness Concept for Measuring Dyadic Negotiation Outcomes

The simplest and most often used tool to measure fairness is known as **contract balance** or alternatively **equality of outcome**. The contract balance is computed by the absolute value of the

[21] Nevertheless, it is to be pointed out that Nash solution is "fair" assuming parties are rational, and in that sense the solution still does not take into account the distribution of what socially or individually considered just, right, or fair.

difference between the total utility scores achieved by each negotiator. It is zero for a balanced contract and a higher number for one that is unbalanced.

Contract balance is criticized as a non-standardized measure of negotiation fairness (Lax and Sebenius, 1987). Some researchers have proposed measuring outcome fairness in terms of the **distance to the Nash bargaining solution** (Lim and Benbasat, 1993; Goh et al., 2000). In fact, Goh et al. (2000, p. 110) have provided a way of operationalizing the distance to the Nash bargaining solution. Thus the Nash solution is identified before the distance can be calculated. **The distance to the Nash bargaining solution,** D_2, is hence calculated by the distance of the line linking from a settlement point to the Nash solution:

$$D_2 = \sqrt{(F_b - N_b)^2 + (F_s - N_s)^2}$$

where $F_{b,}$ F_s and $N_{b,}$ N_s denote the buyer's and seller's utility scores for the final agreement and for the Nash bargaining solution, respectively.

4.2.1.2.3 Nash Solution and Contract Balance

The Nash solution specifies the maximum score of the two parties' utility gains, and is regarded as fair because it gives each party exactly half of the maximum payoff it can rationally expect. One should note the difference between such a settlement and a settlement that gives the two parties the same payoff. In Figure 4-9, Point B that splits two parties with the same utility values (and hence minimizes contract balance to zero) does not maximize joint utilities.

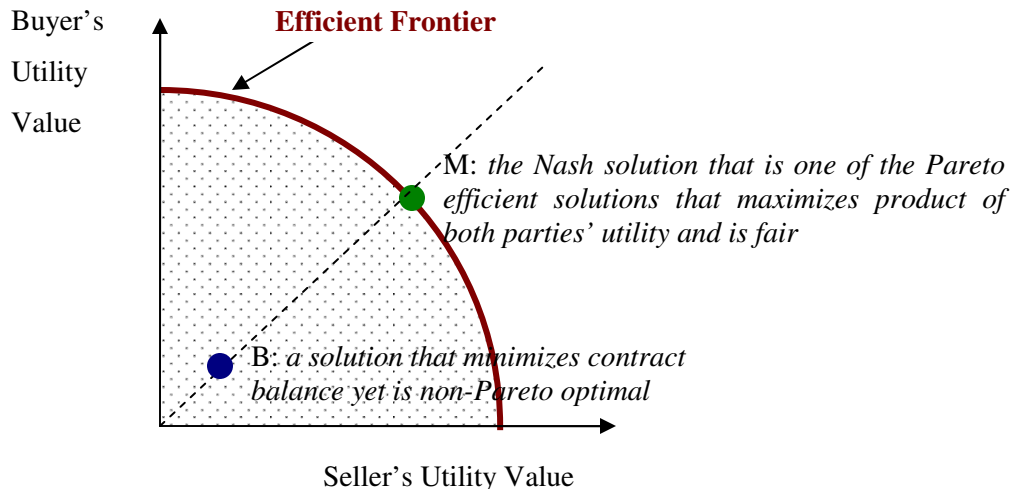

Figure 4-9. Nash Solution and Contract Balance

The following attempts to distinguish the situations: **1) when contract balance is appropriate as a measure of fairness, and 2) when the Distance to Nash's Solution is appropriate as a measure of fairness of negotiation outcomes,** based on its underlying logic.

For the **first** situation, it should be noted that contract balance is an absolute equality concept. Based on this criterion *solely*, the best or most balanced solution is the one that equalizes both parties' profits. Therefore, solely using this measure is risky as one party would need to irrationally drag down the other's profits to match a low level of his/her own profit, in order to attain "equality" of the settlement. Although this behavior has been observed in descriptive studies, it contradicts an assumption of economic theories that people are *rational* decision makers. This is plausibly why so far no system artifacts have been designed to simply equalize negotiators' payoffs.

According to Nash's bargaining theory, we generally aim at a single best outcome that maximizes production and equalizes distribution. In the opinion of this dissertation, contract balance is only meaningful for comparing two settlements with the same joint profits, in which the more balanced one should be regarded as a "better" outcome. In other words, contract balance, as an

absolute measure of fairness, should be used as a complementary measure to assess the quality of negotiation outcomes.

For the **second** situation, Figure 4-10 is depicted to facilitate sorting out the situations when the distance to Nash solution shall be used to measure the fairness of negotiated settlement. Based on the formula of Goh et al. (2000), settlements on Points C and D will result in the same "distances" to the Nash Solution (Point M). This does not tally with the basic idea of "fairness" because Point D obviously represents a more unequal settlement than Point C. In view of this analysis, the distance to the Nash bargaining solution is not *absolutely a sensitive measure of fairness per se*, because the Nash solution includes both of fairness as well as the Pareto-efficiency concept, while the latter corresponds to the individual efficiency of a negotiated settlement.

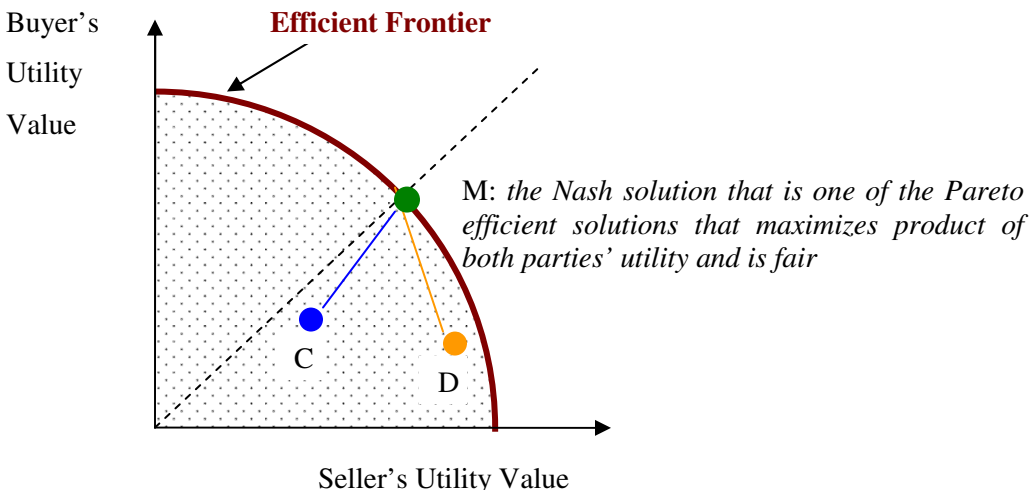

Figure 4-10. Using Distance to Nash Solution as Fairness Measure

4.2.1.3 Time to Settlement

Time can be considered as an efficiency measure for the negotiation *process*. Negotiation **time** is the total time taken for negotiation parties to reach a final agreement, if there is one. As the complexity of a negotiation task increases, negotiation often becomes a prolonged and tedious process. Generally speaking, other outcomes being equal, it is more desirable for negotiators to

shorten the time to reach an agreement. Nevertheless, the reduction of negotiation time should not be achieved at the expense of obtaining non-integrative negotiation outcomes.

In experimental studies, when time to reach settlement is used as a dependent variable, all parties are to be given sufficient time to reach an agreement. This is different from manipulating time as an independent factor, such as exerting time pressure in examining deadline effects (see Section 2.3.1.5 for more details on time as a factor).

4.2.2 Social-Psychological Perspectives

Descriptive negotiation theories have mostly emphasized the contextual characteristics of negotiation and negotiators' cognition and interaction processes (Bazerman and Lewicki, 1983; Pruitt and Rubin, 1986). Measurement of negotiation outcome in descriptive studies includes elements of social perception such as negotiators' perceptions of the bargaining situation, of the bargaining opponent, and of themselves (Thompson and Hastie, 1990). In this section, important social-psychological measures for negotiation settlement, the negotiation process as well as e-Negotiation Systems are discussed separately.

4.2.2.1 Attitudes towards the Negotiation Settlement

Negotiators' attitudes towards the negotiated settlement are important beliefs contributing to the success of negotiations from both self-interested and relationship concerns. While economists measure the notions of efficiency and fairness by means of utility values, it is rarely true that in real-world negotiations, an actual utility structure can be readily constructed and negotiators' performances in terms of utility points can be revealed to both parties. Psychologists believe that what matters most is the efficiency and fairness *perceived* by the negotiators. Negotiators often leave the bargaining table with two feelings, that of being either a "winner" or a "loser" (Lim and Benbasat, 1993). **Perceived Efficiency** reflects the subjective belief that a negotiator has achieved efficient solutions in terms of individual performance. It corresponds to the negotiators'

self-concerns. Lim and Benbasat (1993) also refer to this belief as "confidence with solution". **Perceived Fairness** (Rubin and Brown, 1975) reflects the subjective perceptions concerning the *equality* and *equity* of the negotiated settlement; and that it corresponds to the negotiators' concern-for-others. The Equity Theory (Adams, 1963; 1965; Walster et al., 1978) defines **equity** as the evaluation result of the discrepancy between one's input and rewards in comparison to the other party's input and rewards. In negotiations, parties might evaluate the fairness of the settlement in terms of *equal* shares between themselves and their opponents, as well as in terms of the *equitable* returns, compared to their input such as time and costs devoted to negotiations.

It is generally believed that negotiators who have are *satisfied* with negotiation process and outcomes in the past will approach future negotiations with positive attitudes, thus improving their performance in the long run (Delaney et al., 1997). "Satisfaction" is a multi-faceted variable studied by many disciplines, including organizational behavior, marketing, human decision and psychology. McLone (1990) suggests that satisfaction comes from perceptions of both output-oriented and affect-oriented outcomes. Oliver et al. (1994) specify that in evaluation of satisfaction in negotiations, the output-oriented outcomes concern the *objective* allocations of negotiated resources resulted from the bargaining encounter, whereas the affect-oriented outcomes refer to the *subjective* social perceptions held by negotiating parties following the encounter. In our research framework, we are primarily interested in the impact of alternate system designs in improving negotiation process and outcomes. Therefore, we choose to focus on the output-oriented dimensions such as *negotiators' satisfaction towards the negotiated settlement*, instead of *user satisfaction towards system use*. **Satisfaction with the Settlement**[22]

[22] In Information System research, user satisfaction is defined as a "multidimensional attitude towards various aspects of MIS…and various user constructs such as feelings of participation and understanding" (Raymond, 1985). Negotiators using an ENS and performing dual roles as *negotiators* to obtain agreement and *end-users* of the system will attribute their overall satisfaction based on their own performance, their perceptions of their opponents, as well as interactions with the system artifacts. Future research may look into the overall evaluation and examination of ENS-user satisfaction from multiple dimensions.

reflects the subjective feeling towards the negotiated agreement contract. This dimension of negotiators' subjective beliefs towards the outcome per se is also termed "satisfaction with the outcome of the negotiation" (Eliashberg et al., 1992) and "satisfaction" (Lim and Benbasat, 1993; Foroughi et al., 1995; Perkins et al., 1996). Foroughi et al. (1995) argue that rational negotiators would feel satisfied with the contract if they believed that efficient and/or fair agreements have been reached, if negotiators can achieve a higher joint outcome (a reflection of efficiency) and better contract balance (a reflection of fairness) resulting from the computer decision support, then they are likely to be more satisfied with the negotiated settlement.

4.2.2.2 Attitudes towards the Negotiation Process

Besides being concerned with output-related satisfaction, an NSS should ideally help smooth the negotiation process and foster good future business relationships. Negotiators' feelings and beliefs towards the negotiation process need not be directly related to the utilities gained for the final contract as those who are not satisfied with the negotiation process dealing with their opponents are not very likely to cooperate again in the future. The **Perceived Collaborative Atmosphere** is a process-related measure that we define as the extent to which a negotiation party perceives his/her opponent to have behaved cooperatively during the negotiation process. It positively reflects the level at which the negotiator's opponent has cooperated in reaching final agreement, which may in turn lead to future business relationships. This notion is also termed "perceived collaborative/negative climate" (see Foroughi et al., 1995), or "satisfaction with the general atmosphere" (Eliashberg et al., 1992).

4.2.2.3 Attitudes towards the System

4.2.2.3.1 Perceived Control

The notions of perceived control and system anxiety are introduced herein to study the effects of agent-based negotiation support tools. The construct "**perceived control**" comes from social

psychology research. An individual's perception of the control that he can exert has been found to be a very strong predictor of both behaviors and emotional outcomes, and therefore has stimulated a great deal of research in disciplines such as psychology, marketing, and organizational behavior (Fox et al., 1993; Lacey, 1979; Sargent and Terry, 1998). It is viewed as the degree to which a person feels that he/she can impact outcomes in his/her environment through voluntary actions (Lacey, 1979). On his part, Averill (1973) views perceived control as a multi-dimensional construct which includes cognitive control, behavioral control, and decisional control. *Cognitive control* addresses the interpretation of an event into a cognitive model or plan. *Decisional control* addresses the ability to choose among different courses of action. *Behavioral control* deals with the existence of some means of exerting influence over an event. The last dimension has been extensively researched in the IS iterature involving Azjen's (1991) theory of planned behavior.

In IS research, the notion of perceived control is adopted to understand human's perception towards system use. However, the control construct is not examined using multiple dimensions. For instance, Sengupta and Te'eni (1993) studied the effects of cognitive feedback on cognitive control and strategy convergence in a group decision support system. Control is investigated as the "extent to which the decision maker controls the execution of his or her decision strategy" (Sengupta and Te'eni 1993, p. 90). It is also recognized that as the execution of decision strategy is only a part of control dimension, the "control" lacks other dimensions such as the internal, cognitive aspects (Morris and Marshall, 2004).

The first remarkable attempt integrating the various aspects of control into the IS domain was made by Frese (1987). It provides a conceptual discourse on the aspects of control from the perspective of information systems. Based on this concept, Morris and Marshall (2004) developed and tested 55 items concerning user's experiences working with an interactive information system. The factor analysis produced five key factors that represent perceived control: feedback signal,

feedback duration, strategy, metaphor knowledge, and timeframe. The *metaphor knowledge* factor directly accesses the ability of the user to conceptualize the functioning of the system and integrates those functions within their mental model of the system. This factor corresponds to cognitive control (Averill, 1973; Frese, 1987). The *strategy* factor supports decision control (Karasek, 1979), which deals with the decision latitude of the user as regards his/her ability to decide on a strategy for attempting to achieve the goals. It appears that the ability to make decisions about the actions to perform (decisional control) and the ability to take those actions (behavioral control) are intertwined; both are related to the *timeframe* factor. As this factor deals with the issue of having sufficient time to make decisions and then attempting to enact those decisions, the revealed relationship is not surprising. Dealing with feedback that the user receives from the system, the factors *feedback signal* and *feedback duration* do not correspond to a particular dimension of control. However, feedback is an integral component of any form of control (Frese, 1987). Figure 4-11 shows the comparison between the two approaches.

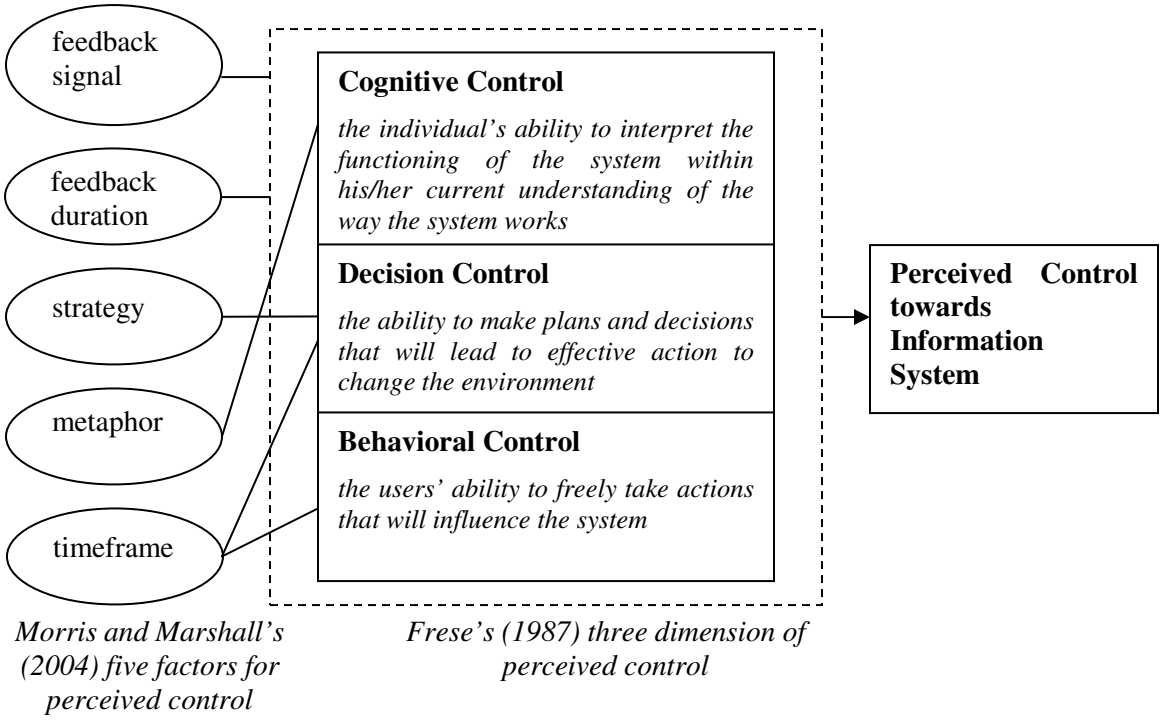

Figure 4-11. An Exploration of the Concept of Perceived Control in IS

Our framework adopts the three-dimensional concept of **perceived control** to assess the degree to which negotiators are able to voluntarily utilize ENS systems to achieve their expected outcomes.

4.2.2.3.2 System Anxiety

The term **anxiety** is most often used to describe an unpleasant emotional state or condition which is characterized by subjective feelings of tension, apprehension, and worry (Spielberger, 1972). In IS research, a widely studied aspect is computer anxiety, which can be defined in terms of a psychological response such as computer phobia (Ramalingam and Weidenbeck, 1998) or in terms of a cognitive reaction such as apprehension of computer technology (Joncour et al., 1994). In turn, Brown et al. (2004) argue that given the wide array of technological applications that are included under the umbrella of 'computer', it seems reasonable to expect that different anxieties would be associated with different uses of a computer. In their view, an application-specific measure of computer anxiety serves two purposes. First, it focuses on the particular computer application of interest, rather than on technology or computers in general. Second, it represents a more proximal representation of the context in an individual's recognition of that context, thus providing greater explanation and prediction.

Since the locus of control has been regarded as one salient correlate of computer anxiety in literature (e.g., Crable et al., 1994), perceived control is conceivable to be relevant to users' anxiety towards a particular system. In our framework, **system anxiety** refers to the anxiety towards an ENS. When agent-based technologies are applied to business negotiations, there would be a great change in the degree of control from humans to computer agents and thus may consequently result in users experiencing higher system anxiety. In turn, system anxiety may cause some negative behavior like the avoidance of ENS usage, and negative comments about the system, which may further influence the final outcome of negotiation in an undesired way.

4.2.2.3.3 Other System-related Perceptions and Intentions to Use the System

Users' intentions to use a particular information system can be attributed by a number of factors. Through numerous empirical tests, the technology acceptance model (TAM) has proved to be a parsimonious model of individuals' acceptance behavior towards new technology. It has been validated in a wide variety of information technologies in the workplace (e.g., Karahanna et al., 1999; Taylor and Todd, 1995) as well as in B2C contexts (e.g. Gefen and Straub, 2000). According to the TAM, the use of a new IT is determined by two concepts: the **perceived usefulness** of and the **perceived ease** in using the technology (Davis, 1989; 1993). External variables will affect perceived usefulness and perceived ease of use which will in turn affect attitudes towards using the system. The attitudes towards using a system will have an impact on the behavioral intention to use it, which will ultimately affect the actual use of the system. In fact, TAM studies have also analyzed the impact of technological attributes on technological acceptance. Overall, TAM constructs have been found to mediate the effects of system design features on use behavior, accounting for about 40% of the variance in predicting a system's use (Legris et al., 2003).

Nevertheless, TAM and its consequent insights are not helpful in understanding the reasons why users may reject an information system. As system anxiety may cause some negative behavior like avoidance of NSS usage and negative comments about the system, the concept of system anxiety is used in the framework to examine the negative impacts associated with ENS. We are primarily interested in the "control" perspective to evaluate alternate system designs, and choose not to put formal propositions to test the effects of ENSs using other system-related constructs.

4.3 RESEARCH PROPOSITIONS

4.3.1 Main Effects of ENS Functionalities

In our research framework, e-Negotiation systems are referred to as a collective set of system tools that can be used to support dyadic negotiation activities over the Internet. Our framework

can also be seen as an extension of NSS theory (Lim and Benbasat, 1993) which has focused on two technological features in a face-to-face setting.

In Section 4.1, we defined three general categories of ENSs, each differing in their design motivations and functionalities in supporting negotiations. The technological aspects related to the categories are: decision support, electronic communication media, and autonomous negotiation agents. Next, effects of the different technologies on negotiation process and outcomes will be posited separately.

4.3.1.1 Effects of Decision Support Tools

4.3.1.1.1 Effect of DSS on Efficiency and Fairness[23]

In Section 4.1.2.3, DSS technologies are further classified in terms of specific tools for different stages of the negotiation process. In summary, these tools include **DSS tools for problem definition** for issue generation, issue selection, and range limit setting; **DSS tools for preference elicitation** for eliciting negotiators' preferences and specifying utilities; **DSS tools for alternative evaluation and generation** for evaluating and generating negotiation alternatives; and **DSS tools for post-settlements** such as suggestions of Pareto-optimization solutions.

By and large, the effects of decision support tools on ***individual payoffs*** are in accord with the following theoretical angles. From the information processing perspective, the very limitation for human negotiators to reach efficient solutions lie in the very limitation of human's cognitive capability (Bazerman and Neale, 1983; Bazerman et al., 1985). The availability of decision

[23] In this proposition, it is to be noted that subsequent operationalizations of efficiency should be used in appropriate to the design goals of different DSS features. In particular, pre-negotiation support such as MAUT-based task structuring techniques and negotiation support such as alternative generator and evaluator will lead to greater efficiency as joint payoffs, whereas post-negotiation support such as Pareto-optimization suggestions will lead to greater outcome efficiency in terms of smaller distance to the Pareto-efficient frontier. We will not examine the effects of post-negotiation settlement on negotiation process and outcomes.

support tools improves human's decision-making quality by increasing their information processing capacities and capabilities (Lim and Benbasat, 1993) and by removing stumbling blocks to negotiation (Anson and Jellassi, 1990; Jelassi and Jones, 1988), and hence enhancing the efficiency of negotiated outcomes.

Specifically, we argue that DSS technologies for different stages of negotiation support will affect negotiation process and outcomes through different mechanisms. It is conceptually and practically more important to understand *the specific manner* in which the various DSS tools affect negotiation dynamics, instead of evaluating them as a whole.

1) **DSS tools for problem definition** allow the negotiating parties to be aware of the needs and concerns that are important to each other (i.e., deciding issues which are to be negotiated), and create opportunities for them to agree on the issues and the options to be negotiated in the next phase. These tools together with electronic brainstorming facilities can also encourage negotiators to express their preferences and opinions prior to the actual negotiation phase.

Negotiators tend to "frame" negotiations in a negative light, concentrating on potential losses instead of potential gains. Such perception may lead to risk-seeking behavior where cooperation aspect can be ignored (Bazerman and Lewicki, 1983; Kahneman and Tversky, 1982). As a result, each negotiator may expect to achieve an individual utility that is much less than the optimal possible. However, NSSs help to refine negotiators' objectives and relay them tactfully to the opponent (Bui, 1992). By embedding electronic brainstorming facilities, an NSS will encourage negotiators to express their preferences and opinions during the pre-negotiation phase. The integration of conflicting views during problem definition and issue definition by public display further deepens negotiators' understanding of each other's needs and expectations. Thus, negotiators will realize that there is room for cooperation, and hence they will strive collectively towards a settlement on or closer to the efficient frontier. Correspondingly, with an NSS, each negotiator will be able to achieve a higher individual outcome. In other words, an NSS will

enable negotiators to achieve an improvement (i.e., a gain) in their ***individual outcomes***, compared to their initial expectations.

The effects of decision support tools on contract balance are realized by the techniques that promote "a sense of mutuality" by creating awareness of negotiation opponents' payoffs. In fact, GSS studies have shown that electronic brainstorming systems (EBSs) can eliminate production blocking and reduce free riding (Nunamaker et al., 1991)[24]. Accordingly, the EBS approach encourages equal participation and provides a forum for shy people to express their opinions. Group process structuring techniques can be used to establish rules to govern interaction and to create a sense of agreement, trust and fairness. According to the theory of strategic choice (Pruitt and Rubin, 1986), trust is a precondition for information sharing, which is helpful towards achieving highly satisfactory joint outcomes. Moreover, through sharing information by means of issue generation and selection modules, negotiators are at the same time seeking an understanding of each other's needs and expectations, and are therefore more likely to be conscious of the notion of fairness as they strive towards an integrative outcome. Moreover, pre-negotiation modules can require negotiating parties to identify their interests in undertaking negotiations, thereby emphasizing the mutual benefits (Anson and Jelassi, 1990). Such a formalized way of exploring common interests jointly provided by pre-negotiation support is likely to foster a sense of mutuality in terms of integrative settlement (Raiffa, 1982; Walton and McKersie, 1965); and it is in turn expected to produce a fairer solution. Better ***contract balances*** are thus expected for negotiation dyads supported by DSS tools for problem definition than those without.

The problem definition processes are very realistic and meaningful for real-life negotiations where tasks are largely unstructured or semi-structured. Allowing negotiators to know each other, and establish a form of relationship and trust will have significant consequences for negotiation

[24] Differing views exist, such as the work of Pinsonneault et al. (1999).

processes and outcomes. Nevertheless, support functions related to the above activities are largely limited in use for existing experimental studies (Jones, 1988; Foroughi et al., 1995; Delaney et al., 1997; Rangaswamy and Shell, 1997; Goh et al., 2000) as pre-defined issues are imposed as part of the negotiation task, assuming that "all inventing and creating of issues has occurred" (Keeney and Raiffa, 1991, p. 132). Recognizing the significant potential impact of issue determination activities on negotiation process and outcomes, we will investigate the effects of these functions empirically. (See Chapter 5)

2) **DSS tools for preference elicitation** are designed to guide negotiators in disaggregating their own preferences and priorities in order to better understand them (Keeney and Raiffa, 1991; Rangaswamy and Shell, 1997). This task-focused mode brings a sense of rationality and "a problem-solving orientation" that are recognized as facilitating situations to integrative negotiations in the bargaining theory of Walton and McKersie (1965). Negotiators tend to "frame" negotiations in a negative light, concentrating on potential losses instead of potential gains. Such a perception leads to risk-seeking behavior that ignores the cooperation aspect (Bazerman and Lewicki, 1983; Kahneman and Tversky, 1982). As a result, each negotiator may expect to achieve an individual utility that is much less than the optimal possible. However, pre-negotiation preparation tools help to refine negotiators' objectives and relay them tactfully to the opponent (Bui, 1992). By displaying entire contracts for discussion, NSSs encourage negotiators to "consider issues as a package", known as "logrolling", thus highlighting the potential trade-offs among issues. Through logrolling instead of "considering one issue at a time", mutual trade-offs can be made (Walton and McKersie, 1965; Kelly, 1966; Erickson et al., 1974). Negotiators are hence better prepared for subsequent cooperation and compromise in the negotiation phase, and will be able to arrive at an agreement closer to the efficient frontier, and achieve better results in regard to those issues that are important (Lim and Benbasat, 1993). By focusing on the issues that are more important (of a higher rating), negotiators can hence obtain higher ***individual***

payoffs than when they are unsupported. When both parties are supported by preference elicitation tools, both of them will strive for higher payoffs. If the underlying task is featured with low conflict of interests between the two parties, both being able to achieve higher individual payoffs, then higher ***joint payoffs*** and lower ***contract balances*** are thus expected for negotiation dyads supported with DSS tools for preference elicitation than those that are unsupported.

3) **DSS tools for alternative generation and evaluation** are designed to compute the best alternatives which are Pareto-efficient and/or maximize both parties' joint payoffs, and also to evaluate contract packages proposed by their opponents. As the support tools simplify the process of evaluating and generating better solutions, negotiators would continue to explore the possibilities of clinching the deal instead of prematurely settling on salient, familiar solutions. In unsupported cases, preference for salient solutions may cause negotiators to accept non-optimal settlements. Thus it has been indicated in earlier empirical research (Anson and Jelassi, 1990, Jelassi and Jones, 1988) that computerized decision support helps subjects to overcome the cognitive difficulty of these tasks, the tendency towards premature closure, and the preference for more available and more salient solutions, thus helping them achieve better outcomes, compared to negotiators without DSS support (Foroughi et al., 1995; Delaney et al., 1997). Higher ***individual profits*** are thus expected for negotiation dyads supported with DSS tools for alternative evaluation and generation than those that are unsupported.

The alternative generator and evaluator tools are also designed to make the opponents' payoffs on every contract alternative *explicit* to the negotiators. This increases the amount of information that a negotiator can get with regard to the estimated utility points his/her opponent may possibly obtain from an alternative. The increased knowledge and awareness about each others' utilities enables negotiating parties to improve their mutual welfare (Fouraker and Siegel, 1963). The alternative generator (such as in Foroughi et al., 1995) can also be designed to generate three best outcomes that maximize joint payoffs. By making the generation process less cognitively difficult,

DSS-supported dyads can minimize the tendency for premature solution and preference for salient solution, and achieve more mutually beneficial outcomes than if unsupported. Higher ***joint profits*** are thus expected for negotiation dyads supported with DSS tools for alternative evaluation and generation than those that are not supported.

Negotiation support, such as analytical processing of subjective preference as well as the determination of possible solutions, will bring a sense of "rationality" to the negotiation and will help negotiators to make more objective, realistic judgments (DeSanctis and Gallupe, 1987). Lim and Benbasat (1993) suggest that as computer support improves the information-processing capacity and capability of negotiators, hence a fairer solution will then be generated. By making each party explicitly aware of the opponent's payoffs on every contract alternative, the alternative generator and evaluator tools are designed to foster integrative negotiations. Such awareness will help each negotiator find a contract alternative which he/she feels is fair for both parties so that both parties are willing to come to an agreement without "losing face" (Foroughi et al., 1995). Therefore, dyads which are otherwise unsupported will only achieve higher ***contract balances*** than those supported with such decision support tools.

4.3.1.1.2 Effect of DSS on Time to Settlement

In terms of **time to reach settlement**, we posit that negotiators using more sophisticated features of e-Negotiation technologies will take a longer ***time*** to reach agreement. This position is supported by general GSS research which confirms that the use of technology tends to extend decision time (Dennis et al., 1988; Gallupe, 1985; George et al., 1990). This assertion is consistent with previous NSS studies (Foroughi et al., 1995; Rangaswamy and Shell, 1997). As far as negotiation agreement is concerned, the extended decision time does not necessarily imply poorer performance. There are cases in which the party may fail to achieve a solution at all without a DSS, e.g., complex tasks such as international trade negotiations, joint venture, cooperate merging.

4.3.1.1.3 Effect of DSS on Attitudes towards Settlement, Process and Systems

The decision support functions help to address the problems associated with cognitive limitation and socio-emotional effects of human negotiations (refer to the summary in Table 3-1). The "cognitive difficulty" of evaluating the utility of an alternative settlement for each party and determining tradeoffs often impedes successful conflict resolution (Lewicki and Litterer, 1985). DSS essentially serves as an external information processor and memory that helps negotiators to overcome cognitive difficulties so as to simplify the processes of alternative evaluation and generation. Compared to unsupported cases, negotiators will feel more positive that they are able to obtain better, more efficient solutions. In a similar vein, Lim and Benbasat (1993) analyzed an efficiency-related perception construct known as "confidence with solution" in negotiation setting. Thus decision aid, through helping negotiators to be capable of performing rational analyses, was attributed to a large degree to an increase in confidence of the solution perceived by negotiators. Higher ***perceived efficiency*** or ***confidence with solution*** is thus expected for negotiation dyads supported with DSS tools than those without.

Negotiators tend to avoid agreements in which they feel they are "giving-in", thus manifesting "face-saving" behaviors (Hiltrop and Rubin, 1981). In other words, when walking away from the negotiation table, negotiators would feel they are losing if they think that they have compromised or have been taken advantage of by the opponents. NSS Decision aids can help to alleviate the "face saving" effects by suggesting possible concessions to facilitate the achievement of optimal joint outcomes and permit negotiators to compromise while still saving face (Anson and Jelassi, 1990). Higher ***perceived fairness*** is thus expected for dyads supported with DSS tools than those that are unsupported.

According to our summary in Section 3.1, the decision support functions help to address the problems associated with the cognitive biases and socio-emotional effects of negotiators when collaborating with each other. Negotiators often "negatively frame" the negotiation by evaluating

their potential losses instead of considering their potential gains. Negative framing can lead to risk-seeking behavior instead of the risk-avoiding behavior which is conducive to finding a cooperative agreement (Bazerman and Lewicki, 1983; Tversky and Kahneman, 1981; Neale and Bazerman, 1983, 1985b). This effect will be alleviated by the establishment of interaction rules and the use of pre-negotiation modules requiring parties to identify their interests (Anson and Jelassi, 1990). By explicitly understanding that the opponent may have given potential gains as a favor, negotiators would better appreciate the cooperative signals that may not be otherwise noticed without decision support. Furthermore, DSSs also encourage negotiators to seek a mutually beneficial solution by displaying conflicting views and pairing of related items interests (Anson and Jelassi, 1990), instead of assuming a "fixed-pie" on which their interests are always in direct conflict with the other party and in which one party will win at the expense of the other (Pruitt, 1983). A higher ***perceived collaborative atmosphere*** is thus expected for negotiation dyads supported with DSS tools than those that are unsupported.

Summarizing the above theoretical arguments in Section 4.3.1.1, we posit the first proposition:

Proposition 1[25]***:****The dyads supported with DSS technologies will achieve better settlement contracts in terms of economic and social-psychological outcomes, while taking a longer time to reach settlements compared to non-DSS-supported dyads.*

4.3.1.2 Effects of Communication Media

4.3.1.2.1 Effects of Social-Oriented Communication Media

According to task-technology fit theory (McGrath and Hollingshead, 1993; 1994), the effects of social-oriented communication offered by video/audio channels can be both positive and negative. While the presence of video and audio media facilitates the social communication needs for

[25] Empirical studies addressing Proposition 1 will be presented in chapters 5 to 8.

mutual understanding, personal identity and trust building, they can at the same time "distract" negotiators from focusing on the negotiation task (Yuan et al., 2003). In their study, Yuan et al. (2003) examined the impacts of different multimedia combinations (text only; text with audio; text with audio and video) on communication efficiency and effectiveness. Results indicate that media combing both text with audio as well as text with audio and video communication were significantly preferred to a medium using text alone. However, the addition of a video medium to text and audio communication was not found to significantly improve communication efficiency and effectiveness. This observation follows the task-media fit theory which posits that if a task utilizes richer media than is required, the media may act as a "distraction" (McGrath and Hollingshead, 1993, 1994).

On the other hand, text-based communication as a common form of computer-based communication is in fact an impersonal mode of communication, which might promote more non-cooperative behavior than face-to-face negotiation (Wichman, 1970; Arunachalam and Dilla, 1995). For instance, in their study, Rangaswamy and Shell (1997) observed that those bargaining pairs that used the electronic communication channels (where no face-to-face interaction was allowed) indicated that they considered the negotiation process to be less friendly. They were also more likely to "drive a hard bargain", perceive themselves to be "in control during the negotiation", and feel that they were being "rushed into reaching an agreement".

When multimedia (video, audio and text-based channels) communication is compared to the lean medium offered by communication that is only text-based, negotiators can choose to balance the use of different channels to maximize positive social communication needs. In general, we believe that richer media should be provided to negotiators for effective and efficient social communication purposes.

Proposition 2a[26]: *For homogeneous dyads, the availability of extra communication channels in terms of richer media (e.g., audio and video) will be more efficient in fulfilling social-oriented communication needs for negotiations, compared to leaner media only (e.g., text-based email, instant messaging, and fax).*

In contrast, when negotiating dyads are *heterogeneous* in terms of communication capabilities, there are significant opportunities to utilize special forms of support to improving communication efficiency. Prescriptive theories suggest that one of the stumbling blocks to successful negotiation is "ineffective communications" (Jelasi and Foroughi, 1990). Barriers to effective communication such as distraction caused by attention to the physical appearance of opposing parties, semantic differences, absence of feedback, and status and power differences can seriously hinder effective negotiation (Lewicki and Litterer, 1985).

In intercultural negotiations, one of the main obstacles to effective communication is the linguistic and communication barriers, including semantic and syntactic differences. Computer support tools can be designed in order to overcome such difficulties to achieve effective communication. For instance, the multilingual support [27] function of NSSs (including a multilingual system interface as well as translation of text-based messages to the negotiator's native language) provides languages that are native to negotiators in order to alleviate language-related communication problems. Thus the enhanced communication support will enable the 'weaker' party to utilize his/her own language to carry out the negotiation process. When linguistic communication inefficiency is minimized, compared to the unsupported negotiators,

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[26] In this dissertation, we will not manipulate conditions to examine Proposition 2a per se, but use it as conceptual rationales for investigating different communication settings where negotiation tasks are performed (see chapters 5 to 8).

[27] The term "multilingual support" is used in this dissertation to denote the provision of different language interfaces and environment that are local to different users. It may also be referred to as "localization" to different language locales in adaptive software.

those who are assisted by multilingual support are able to attain higher individual utility, which in turn results in greater ***joint outcomes*** and fairer ***equality of outcomes***.

Enriched communication media that are designed to overcome communication inefficiency, such as multilingual support for lingual heterogeneous dyads, will help to overcome linguistic barriers to achieve communication efficiency. Conversely, dyads may face communication breakdown which hinder them from achieving win-win solutions, and thus negotiators tend to benefit less from the negotiation process. We posit that the inclusion of multilingual support will enhance negotiators' positive beliefs towards being able to communicate more efficiently for better solutions and thus lead to greater ***satisfaction towards settlement***.

The sophistication of richer media and associated functions to alleviate ineffective communications introduce an additional layer of complexity to the use of computer-based systems. For instance, there will be time associated with typing non-English characters using editor software (Aiken et al. 1995) as well as the bidirectional translations into each party's native language. It is believed that the additional use of a richer media feature will result in a longer ***time*** for reaching an agreement. We posit the effects of richer communication media for heterogeneous dyads in terms of language proficiency as follows:

Proposition 2b[28]: *For heterogeneous dyads, richer communication media that are designed to overcome communication inefficiency (such as in the form of multilingual support) will lead to better settlement contracts in terms of economic* and *social-psychological outcomes,* while *taking a longer time to reach agreement, compared to leaner media.*

4.3.1.2.2 Effects of Task-Oriented Communication Media on Perceived Collaborative Atmosphere

[28] Empirical study addressing Proposition 2b will be presented in Chapter 6.

This proposition extends the hypothesis posited by Lim and Benbasat (1993) which only deals with the *availability* of electronic communication channels. While other empirical studies show that NSS support (DSS+EC) leads to higher joint payoffs and more balanced contracts than face-to-face negotiations without NSS support (Foroughi et al., 1995), Delaney et al. (1997) further found that DSS on its own, rather than the combined effects of the two components of NSS, contribute to the effects of NSS on efficiency and fairness measures. In line with Lim and Benbasat (1993), we also hold that the (task-focused) communication channels have no direct influences on efficiency and fairness outcomes. However, the task-focused communication channels will affect the negotiators' perceptions of the level of collaboration with their opponents.

Negotiators often escalate the level of conflict irrationally and unnecessarily (Lewicki and Litterer, 1985; Bazerman, 1983), "locking in" on opening moves and attitudes, which may be hostile, and continuing them through the negotiation process, manifesting "non-rational escalation of conflict" (Pilisuk and Skolnick, 1978). The task-focused mode of an electronic communication channel can depersonalize the atmosphere, focus negotiators' attention away from personalities and emotional conflicts that are often caused by verbal communication (DeSanctis and Gallupe, 1987). By deescalating the conflict between parties, negotiators would feel less negative, competitive tensions from their opponents.

Lim and Benbasat (1993) analyzed another process-related construct, i.e., "perceived commitment" in negotiation setting. Compared to verbal communication, the addition of electronic communication that links decision aids can provide common referents for the reasoning of arguments between negotiating parties. To the extent that such reasoning is used to back one's argument, the opposing party can be led to perceive the commitment of the first party. The increase in "perceived commitment" of the opponents can also help to explicate greater cooperation perceived in their opponents by negotiators.

Proposition 2c[29]: *The dyads supported by extra task-focused communication media (such as facilities for exchanges of proposals, public whiteboard and file transfer of technical data and graphics) will perceive more conducive collaborative atmosphere for the negotiation process than those that are unsupported (communicating through audio/video channels only).*

4.3.1.3 Effects of System Intelligence Levels

While there is some evidence suggesting that e-Negotiation technologies can help to achieve better negotiation outcomes for ENS-supported negotiators than those unsupported, a more interesting and relevant question is which design alternative can be superior; in other words, we seek to critically examine the effects of alternative designs on negotiation process and outcomes. To systematically investigate the effects of agent-based negotiation support tools, we define the notion of the level of intelligence of e-Negotiation systems involving agent technologies (see Section 4.1.4.3). According to this conceptualization, intelligent agents with advanced personality and learning functions will have more powerful decision support capabilities and will result in greater ***efficiency***. Furthermore, due to the learning capability and personality features, the preference information of the opponent is taken into account in the design of advanced agent-based systems. Thus more intelligent agents (Level-3 system) are expected to result in the ***fairest*** agreement among the three levels. Based on the studies of Dennis et al. (1988) and Foroughi et al. (1995), the use of technology generally tends to extend decision time. Since the Level-1 system adopts less sophisticated technology than the other two, which employ artificial intelligence techniques, it is expected to result in the shortest negotiation time. Moreover, incremental learning from other agent's proposals can speed up the negotiation process (Soo and Hung, 2002). Hence, the Level-3 system is expected to result in a shorter negotiation ***time*** than the Level-2 system.

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[29] We further elaborate and examine Proposition 2c and address methodological issues in Chapter 8.

In terms of social-psychological impact, compared to fully automated agents, more intelligent agents incorporate features that allow negotiators "plug in" their preferences on negotiation styles and strategies, thus exert a greater sense of ***control*** to ENS users. Such agent design allows negotiators to adjust negotiation strategy at any time during the negotiation process, and thus increases behavioral control perceived by negotiators. Because agents perform proposal and counter-proposal exchanges, there will be minimal level of personal interaction between human negotiators, by which non-rational escalation of conflict will be minimized (Lewicki and Litterer, 1985). Negotiators supported by agents will experience a higher level of ***Perceived Collaborative Atmosphere*** compared to those supported by DSS only (in line with **Proposition 2c**).

Proposition 3[30]: *Dyads supported by negotiation agents with higher system intelligence levels will achieve better settlement contracts in terms of economic* and *social-psychological outcomes.*

4.3.2 Moderating Effects of Levels of Conflict

Task characteristics have been shown to have a significant influence on the effects of management support systems (Benbasat et al., 1993). A conflict level is regarded as one of the fundamental variables pertaining to the task characteristics of negotiation that shape bargaining orientation and strategies, and the literature has revealed that it affects negotiator behaviors as well as negotiation outcomes to a certain extent (Starke and Rangaswamy, 2000). Previous studies on NSS (Jones, 1988; Foroughi et al., 1995; Delaney et al., 1997; Goh et al., 2000) also adopt the notion of conflict level, and treat conflict as belonging on a continuum ranging from "low" to "high".

Our research framework incorporates the factor of conflict level to examine the effects of e-Negotiation technologies under different levels of conflict of interests. In a low conflict situation,

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[30] The detailed theoretical arguments and empirical study addressing Proposition 3 will be presented in Chapter 8.

negotiators may have different preferences for the negotiation issues and thus mutual benefits are potentially available. In such circumstances, there is room for e-Negotiation technologies to assist negotiators in exploring more ***economic*** outcomes. However, in high conflict situations where negotiators share similar preferences for the issues that are pitted directly against each other, there is little room for e-Negotiation technologies to be effective.

In a low conflict situation, there will be minimum levels of non-rational escalation of conflict and negative framing. However, in a high-conflict situation, negotiators' preferences for the issues are weighted similarly, and thus one party's gain is nearly equal to the other one party's loss. The presence of e-Negotiation technologies may have the potential to improve the situation by providing a task-oriented mode of negotiations which in turn, reduce the negative effects of socio-emotional biases. Hence in a high-conflict situation, e-Negotiation technologies will reduce the amount of negative ***social-psychological perceptions***.

Proposition 4[31]: *The level of conflict will moderate the effects of e-Negotiation technologies on negotiation outcomes.*

4.4 OUTLINE OF ENS EXPERIMENTAL STUDIES

This chapter presents a high level framework comprising three categories of ENS functionalities which potentially compose a "full" ENS system, and proposes the effects of different functions on negotiation process and outcomes. As empirical examination of the propositions, the subsequent chapters present four experimental studies that are conducted to find the specific manners in which different ENS design features will affect negotiations, and in turn to advance theoretical understanding concerning negotiation support technologies.

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[31] Empirical studies addressing Proposition 4 will be presented in chapters 7 and 8.

The first two experiments were conducted at an earlier phase of our ENS research program. Chapter 5 presents an experimental study that examines how pre-negotiation preparation tools and negotiation support tools (as decision support functions of an ENS) can contribute to negotiation outcomes. With the primary interest on the Category I system, lower-level hypotheses are derived based on Proposition 1. Chapter 6 further examines both Categories I and II NSSs and explores the potential effects of multilingual support features. The experimental study is designed to address Propositions 1 and 2b.

The third and fourth experimental studies extend our research further by incorporating level of conflict as a moderating variable with the effects predicted in Proposition 4, to investigate the interplay of task characteristics and ENS design. The third experiment was designed to examine Proposition 1 in a new social-oriented communication channel. In Chapter 7, the effects of specific decision support tools (alternative evaluator and generator) were investigated at both low and high levels of conflict, with negotiating parties communicating via videoconferencing. In Chapter 8, the most comprehensive experiment (Experiment 4) was carried out in an attempt to examine the effects of three levels of agent-based ENSs and at two different conflict levels. Three system prototypes were designed and implemented for experimental investigation.

CHAPTER 5 EFFECTS OF PRE-NEGOTIATION AND NEGOTIATION SUPPORT FOR UNSTRUCTURED NEGOTIATION TASK[32] (CATEGORY I SYSTEM)

Previous NSS laboratory studies (e.g., Jones, 1998; Foroughi et al., 1995; Delaney et al., 1997; Goh et al., 2000) have generally shown that the potential benefits of using NSS support for negotiations have been encouraging: NSS-supported groups achieve higher and more balanced outcomes and greater satisfaction. However, one common limitation of these studies is the use of highly structured negotiation task assuming negotiation issues and negotiators' utilities have been *pre-determined*. However, an essential activity in real-life business negotiations is for negotiating parties to jointly explore and identify critical issues to be negotiated prior to the actual negotiation phase. For international transactions, the preparatory phase is even lengthier and more tedious than for domestic ones due to the difficulty in gathering all necessary preliminary information (Cellich and Jain, 2004). Specifically, this study seeks to answer the following research question:

How will NSS support for different negotiation stages (i.e., pre-negotiation preparation tool and negotiation support tool) improve the negotiation outcomes for unstructured tasks?

5.1 THE RESEARCH MODEL AND HYPOTHESES

5.1.1 The Research Model

A few empirical studies exist which have attempted to distinguish the system effects due to DSS alone or the combination of both DSS and electronic communication channels based on Lim and

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[32] This experiment was completed at an earlier phase of our ENS research program as a joint work with other contributors. The published paper can be found at *Journal of Global Information Management,* 15(1), January-March 2007, pp. 18-42 (Lim and Yang, 2007a).

The study is presented *briefly* here that helps to address part of the guiding research framework.

Benbasat's (1993) theoretical work (e.g., Delaney et al., 1997; Rangaswamy and Shell, 1997). In a similar vein, the current research, rather than studying the negotiation activities as a single entity, distinguishes between the effect of pre-negotiation support tools and negotiation support tools on negotiation outcomes. We study two independent variables, NSS support for pre-negotiation and NSS support for negotiation, and three dependent variables, gain (individual outcome achieved by a negotiator with respect to his/her initial expected outcome), contract balance (the difference of the utility scores between the two parties), and negotiation time. Figure 5-1 depicts the research model.

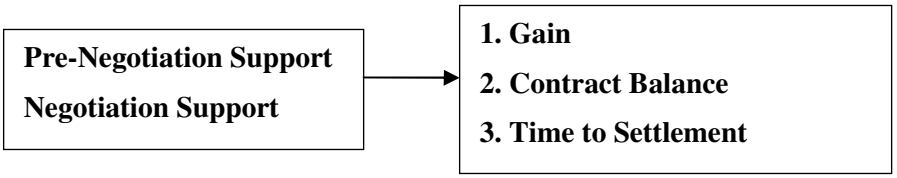

Figure 5-1. The Research Model

The research model is examined at face-to-face negotiation settings where direct verbal communications between negotiation parties are allowed.

5.1.2 Hypotheses

This model adopts "gain" and "contract balance" to reflect the two basic measures of negotiation performance in terms of efficiency and fairness respectively. Although used widely, joint utility is not considered a sensitive measure of negotiation efficiency (Lax and Sebenius, 1987). One of the rationales is that individuals are believed to entertain different aspirations or expectations of negotiation outcomes (Oliver et al., 1994) and measuring final outcome without taking into account of each negotiator's initial expectation (prior to the negotiation activity) neglects such difference. In the context of ambiguous and unstructured tasks (in the case of salary negotiations), it is more appropriate to use ***gain*** that reflects the disparity of one's initial expected utility and

actual outcome achieved with the final agreement. We use ***contract balance*** to reflect the equality of the outcome where a more equal outcome connotes with a lower value of contract balance.

5.1.2.1 Gain

Negotiators often negatively "frame" negotiations in evaluation of potential losses instead of potential gains (Bazerman and Lewicki, 1983; Kahneman and Tversky, 1982). Consequently, negotiators may expect to achieve an individual utility that is much less than the optimal possible. In line with **Proposition 1**, pre-negotiation support tools for problem definition allow negotiation parties to understand each others' concern and work out issues and values for each issue of a specific negotiation task. Thus, negotiators will realize that there is room for cooperation, and hence they will together strive towards a settlement that is closer to efficient frontier. We suggest that NSS can help to enable negotiators to achieve an improvement (i.e., a gain) in their individual outcomes, compared to their initial expectations[33].

***Hypothesis 5-1a**: **Gain** will be higher for dyads supported with pre-negotiation tools than for dyads not supported with these tools.*

In line with **Proposition 1**, support tools for preference elicitation and alternative evaluation/generation can enhance negotiation outcomes by effectively removing stumbling blocks for negotiations (i.e., cognitive limitations and bias are addressed by the task-focused mode of decision support). Hence, with NSS support for the negotiation phase, we hypothesize that NSS help each negotiator to achieve a higher individual outcome than their expectation.

***Hypothesis 5-1b**: **Gain** will be higher for dyads supported with negotiation tools than for dyads not supported with these tools.*

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[33] In this research model, we are interested in negotiation tasks where issues and negotiators' initial expectations are not pre-assigned. It is appropriate to use "gain" to measure the efficiency of negotiation outcome as "gain" can capture the initial expectations that may vary across individual negotiators (refer to section 4.2.1.1.2). This is to differentiate from subsequent three experiments where negotiators initial expectations are pre-assigned and controlled by specifying a BATNA in the negotiation task.

5.1.2.2 Contract Balance

In line with **Proposition 1**, group process structuring techniques including pre-negotiation problem definition tools can be used to establish rules to govern interaction and to create a sense of agreement, trust and fairness. Furthermore, through sharing information, such as defining and ranking issues, negotiators are at the same time seeking an understanding of each other's needs and expectations, and therefore are more likely to be conscious about the notion of fairness as they strive towards an integrative outcome. Moreover, pre-negotiation modules can require negotiating parties to identify their interests in undertaking negotiations, thereby emphasizing the mutual benefits of negotiations (Anson and Jelassi, 1990). Such formalized way of exploring common interests jointly provided by pre-negotiation support is likely to foster a sense of mutuality in terms of integrative settlement (Raiffa, 1982; Walton and McKersie, 1965); in turn, it is expected to produce a fairer solution.

Hypothesis 5-2a*: There will be more equal settlements (in terms of smaller* ***contract balances****) for dyads supported with pre-negotiation tools than for dyads not supported with these tools.*

In line with **Proposition 1**, existing literature suggests that negotiation support tools, such as analytical processing of subjective preference as well as the determination of possible solutions, can enable negotiators to achieve more equal final contract as the NSS provides a systematic and unbiased support for both negotiating parties (DeSanctis and Gallupe, 1987; Lim and Benbasat, 1993; Foroughi et al., 1995). The focus of this "scientific" or analytical approach is on optimizing the outcomes for both parties and achieving a win-win solution rather than on specific strategies, tactics, and maneuvers, which will allow one side to "beat" the other (Raiffa, 1982). We therefore expect to see more equal outcomes for NSS-supported dyads.

Hypothesis 5-2b*: There will be more equal settlements (in terms of smaller* ***contract balances****) for dyads supported with negotiation tools than for dyads not supported with these tools.*

5.1.2.3 Time to Settlement

Consistent with findings of GSS research (e.g., Dennis et al., 1988; Gallupe, 1985), the computer technology is expected to bring about lengthier sessions, because the support tool introduces an additional layer of complexity into the negotiation process. NSS empirical studies also indicated a marked increase in time for NSS-supported dyads to reach agreement (e.g., Foroughi et al., 1995; Delaney et al., 1997). For pre-negotiation, there will be time involved in electronic brainstorming, keying in issues and comments, and coordinating with each other, which together contribute towards increased total time required. During the negotiation phase, the technology incurs additional time with events including assigning of utilities, proposing of agreements, and waiting for the other party's response to contract proposals. In line with **Proposition 1**, we posit that

***Hypothesis 5-3a**: **Time to settlement** will be longer for dyads supported with pre-negotiation tools than for dyads not supported with these tools.*

***Hypothesis 5-3b**: **Time to settlement** will be longer for dyads supported with negotiation tools than for dyads not supported with these tools.*

5.2 EXPERIMENTAL DESIGN

A laboratory experiment with 2x2 factorial designs was conducted. The four experimental conditions are: "full" negotiation support, NSS support for negotiation only, NSS support for pre-negotiation only, and no support (baseline). Figure 5-2 presents the experimental design. "Pre-Negotiation Support" refers to support tools made available to participants in the pre-negotiation phase. "Negotiation Support" indicates that support tools are available to participants in the negotiation phase. The digit in each cell denotes the number of dyads in each treatment.

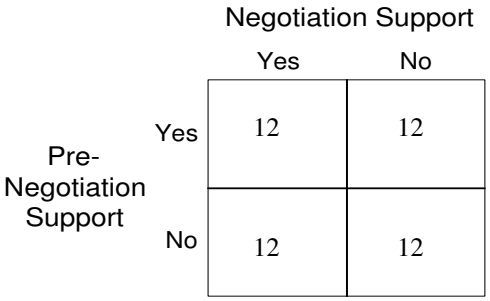

Figure 5-2. Experimental Design (Experiment 1)

Ninety-six undergraduates from a large university participated in the experiment. A total of 48 dyads were formed, with 12 in each treatment group. The two subjects in each negotiation session were randomly assigned to the role of "employer" or "employee". The remaining sections detail the support tools, dependent variables, negotiation task and experimental procedures.

5.2.1 Independent Variables

The independent variables are manipulated by the availabilities of pre-negotiation support and negotiation for the negotiation support system. Comparisons between dyads supported by pre-negotiation support and those with no support indicate the *effects of pre-negotiation tools* (featuring a specific DSS support technique) on negotiation outcomes. Comparisons between NSS-supported and non-supported dyads indicate the *effects of NSS* (featuring both DSS and task-oriented communication support) on negotiation outcomes.

The system was developed based on the concept of assigning relative weightages to the individual issues and seeking trade-off values among the different issues. The pre-negotiation modules provided are issue generation, issue selection (rating), and range-limit setting. The negotiation modules are utility specifications and proposal generation. These modules are further described in the following.

Pre-Negotiation Support: The **issue generation** module is used to brainstorm issues that are relevant to the negotiation. The issues entered were available to both parties for viewing. This

will enhance "piggy-backing" of ideas, which may in turn help to produce better decisions (Osborn, 1957). The **issue selection** module allows users to select the issues that they want to negotiate. Users then rate the selected issues on a scale of one to ten, with one being the least important, and ten being the most important. The rating inputs are then merged and presented to both parties. Rating was selected over ranking because some issues may be equally important to the negotiator. With the **range-limit setting** module, users specify the ranges they prefer for each of the selected issues. Information solicited includes minimum and maximum values for each issue, and the number of different values users would like to have within each range. The ranges input from both parties are then combined and a new range (encompassing both parties' ranges) will be generated.

Negotiation Support: With the **utility specifications** module, users first distribute 100 points among the issues according to the relative important of each issue to the rest of the issues. Then, for each value of each issue, users will enter their utility values based on their discretion. A user may simulate the opponent's values for analysis purpose. Upon completion, the various outcomes (e.g. individual outcome, joint outcome, simulated outcome, fairness) are combined and presented to the user for analysis. For obvious reasons, utilities and outcomes of one party are not revealed to the other party. The **proposal generation** module facilitates the presentation of the various issues and their respective values to users for generating proposals. Users select from each issue the value they would like to propose, and the entire contract (comprising all issues) is sent to the other party. Users can then view all the proposals submitted by everyone.

5.2.2 Dependent Variables

The following deliberations aim to explain the first two dependent variables at operationalization level. According to Keeney and Raiffa (1991), each party assigns *weightage points* to reflect the degree of importance or preference he places on the range of values for a particular issue. These weightage points also reflect the trade-off values between the various issues, as well as between

the various values of each issue. The negotiators' efficient frontier can then be computed by summing up their weightage points (Keeney and Raiffa, 1991). Suppose the negotiating parties, A and B, have reached an agreement on three issues, X, Y and Z, which they have been negotiating. Based on the agreement, A derives the following utilities, or weightage points: U_{xa} for X, U_{ya} for Y, and U_{za} for Z. Similarly, B derives the following utilities, or weightage points: U_{xb} for X, U_{yb} for Y, and U_{zb} for Z. Thus, the absolute individual outcomes of A and B are $(U_{xa} + U_{ya} + U_{za})$ and $(U_{xb} + U_{yb} + U_{zb})$ respectively. For instance, A's utility score is 70, and B's utility score is 60.

However, these scores do not offer much insight into the nature of the negotiation outcome. Individuals are believed to entertain aspirations or expectations of negotiation outcomes (Oliver et al., 1994). Suppose A has an initial expectation (formed prior to the negotiation session) of 80, while B has an initial expectation of 50. Compared to their individual final outcomes, A has actually obtained a lower outcome than he has desired, whereas B a better outcome than desired. Accordingly, it is more appropriate to measure the **Gain** in outcome.

The expected individual outcome for each negotiating party is measured as the total weightage points of the particular party, derived from his initial expectation: I_{xa} for X, I_{ya} for Y, and I_{za} for Z. Likewise, B's utility values for his initial expectation could be: I_{xb} for X, I_{yb} for Y, and I_{zb} for Z. Therefore, the expected individual outcome of A is the sum $(I_{xa} + I_{ya} + I_{za})$, and the expected individual outcome of B is the sum $(I_{xb} + I_{yb} + I_{zb})$. The final individual outcome for each negotiating party is measured as the total weightage points of the particular party, derived from the final agreement. That is, the final individual outcome of A is the sum $(U_{xa} + U_{ya} + U_{za})$. Therefore, A's gain is the difference of the above two sums to reflect disparity of his initial expected and actual outcome, i.e., $((U_{xa} + U_{ya} + U_{za}) - (I_{xa} + I_{ya} + I_{za}))$. **Contract balance**[34], or equality of outcome, is measured as the absolute difference between the two parties' weightage

[34] It is noted that the boss-subordinate negotiation context connotes an element of power imbalance and may thus impose a limitation on the use of equality concepts.

points for the final agreement. In our example, the contract balance is the absolute value of ((U_{xa} + U_{ya} + U_{za}) - (U_{xb} + U_{yb} + U_{zb})).

Negotiation time was measured in minutes as the time taken from the beginning of the task to the point reaching of an agreement.

5.2.3 Negotiation Task

The negotiation task used in this study involves multiple issues in an employer-employee case, adapted from Lax and Sebenius (1986). The employer, John, is a partner in a multinational company, and heads one of the divisions in the company. An accountant by profession, he has risen into senior management ranks seven years ago. Throughout these seven years, he has cautiously but steadily improved his division's results. Currently, he is setting up a new IT department in his division, and has offered Lisa (the employee) the position of project leader. At present, Lisa is a senior analyst who has worked in an IT department of another division of the company for five years. The focus of this negotiation is on the terms and conditions for Lisa's new position as a project leader. The following aspects of employment terms were presented to both parties: annual salary, working hours, annual leave, medical benefits (i.e., amount of medical subsidies) and medical leave. In addition to these issues, subjects were asked to consider new issues pertaining to the project leader position, for example, staff strength and departmental budget. Preferences for the issues were up to each negotiator. Based on the information given, John and Lisa will then negotiate on issues vital to their negotiation.

5.2.4 Experiment Procedure

Upon arriving for the study, the two subjects were seated opposite each other. Where applicable, subjects underwent a brief hands-on training session on how to use the system. The experimenter then handed out the problem description, accompanied by the instruction sheet for the appropriate

experimental condition. Having read through the problem, the dyad then proceeded with the negotiation. In all conditions, negotiation time was measured.

A **full-NSS-support condition** proceeded as follows. For the *pre-negotiation* phase, subjects first brainstormed as many issues as they felt were relevant to their negotiation using the Issue Generation module. Next they discussed verbally all the issues generated, and decided on three to five issues to negotiate. The Issue Selection module, using a rating mechanism, aided the selection of issues. After they had agreed on the issues, subjects wrote down their expected outcome for each of the agreed issues. Subjects then went on to set the ranges (minimum and maximum values, and the number of different values within each range) for each of the issues using the Range Limit Setting module. Both parties' ranges were combined and a new range was generated.

For the *negotiation* phase, subjects first used the Utility Assignment feature in the Evaluation module to enter the weightages for the various issues (divide 100 points among the issues). Next, for each of the issues, they assigned utility values to each of the issue values. Upon completion, subjects viewed the various outcomes. From there, they proceeded to submit proposals to each other using the Proposal Generation feature in the Evaluation module. During this stage, subjects also discussed verbally what they thought of the proposals. Based on the discussions, new proposals were made. This cycle continued until subjects reached an agreement.

The **no-support condition** proceeded as follows. After reading the task, subjects first discussed the issues they were going to negotiate on. After they had decided on the issues, they wrote down their expected outcomes for each of the agreed issues. Next, subjects wrote down the weightages for each of the issues. Then, subjects wrote down the different values they prefer for each issue, as well as the utility values for each of these values. After they had done this, subjects proceeded to negotiate freely with each other. They recorded any values proposed on a form. Negotiation ended when an agreement had been reached.

The **pre-negotiation-support-only** condition proceeded as follows. Subjects went through the pre-negotiation phase as the full-NSS-supported dyads. Then, subjects wrote down the different values they prefer for each issue, as well as the utility values for each of these values. After they had done this, subjects proceeded to negotiate freely with each other. They recorded any values proposed on a form. When the subjects had reached an agreement, the negotiation ended.

The **negotiation-support-only condition** proceeded as follows. After reading the task, subjects first discussed the issues they were going to negotiate on. After they had decided on the issues, they wrote down their expected outcomes for each of the agreed issues. Next, subjects wrote down the range of values they prefer for each issue, as well as the number of different values for that issue. The experimenter then input these data for each party into the system, which calculated the final range. Based on the new range, subjects went through the negotiation phase as the full-NSS-supported dyads did.

5.3 DATA ANALYSIS AND RESULTS

ANOVA tests were conducted on the dependent variables. Significant main effects were found on NSS Support for pre-negotiation on all dependent variables[35]. NSS Support for negotiation showed significant impact on gain and negotiation time, but not contract balance. No interaction effects were observed. Table 5-1 summarizes the ANOVA results. We elaborate the results of statistical analysis and discussion for each of the dependent variables in the subsections.

Table 5-1. Summary of ANOVA Results

Dependent Variables	Interaction Effect	Main Effects	
		NSS for Pre-Negotiation	NSS for Negotiation
1. Joint Gain	NO (F=0.83, P=0.36)	F=2.72, P=0.10*	F=3.16, P=0.08*

[35] Note that a marginally significant P-value of 0.10 is adopted here, as the study is preliminary and exploratory.

3. Contact Balance	NO (F0.01, P=0.93)	F=8.89, P=0.00**	F=1.46, P=0.23
3. Time to Settlement	NO (F=0.07, P =0.79)	F=10.59, P=0.00**	F=3.01, P=0.09*

(* denotes p<.10, ** denotes p<.01)

Summary of propositions testing is presented in Table 5-2.

Table 5-2. Summary of Results on Hypotheses Testing (Experiment 1)

Hypotheses	Mean		P-Value	Hypotheses Supported?
	Support	No support		
1. Joint Gain				
5-1a. With pre-negotiation support > Without	-2.18	-10.89	P = 0.10*	YES
5-1b. With negotiation support > Without	-1.84	-11.23	P = 0.08*	YES
2. Contract Balance				
5-2a. With pre-negotiation support < Without	15.69	30.19	P = 0.00**	YES
5-2b. With negotiation support < Without	-	-	P > 0.10	NO
3. Time to Settlement***				
5-3a. With pre-negotiation support > Without	32.65	25.41	P = 0.00**	YES
5-3b. With negotiation support > Without	30.96	27.10	P = 0.09*	YES

(* denotes p<.10, ** denotes p<.01; *** Time to Settlement is measured in minutes for all studies in this dissertation)

5.4 DISCUSSION

5.4.1 Gain

The results show that NSS tools for **pre-negotiation** can help to improve individual gains. ANOVA test indicated a main effect due to pre-negotiation support for at p = 0.10 level. Dyads provided with NSS support during the pre-negotiation phase obtained higher gain (mean = -2.18; s.d. = 27.29) than dyads with no NSS support (mean = -10.89; s.d. = 24.93). Negotiation outcomes are often affected by power imbalances, as well as the tactics and maneuvers employed by negotiators. Prior to actual negotiation, a negotiator may have an aspiration list ready for the joint resolution of issues. However, during the course of negotiation, the other negotiator may force him to make some tough value trade-offs (Keeney and Raiffa, 1991). So in preparing for negotiations, the negotiator should sort out his preferences. The various NSS tools for pre-negotiation, such as issue generation and rating modules, help each negotiator to quantify

preferences, which in turn may help him to be clear about trade-offs during the negotiation stage. Hence, negotiators may be able to meet their expectations better (**Proposition 1**). [36]

Experimental results support the propositions that NSS would improve the individual outcome during the **negotiation** phase. NSS dyads provided with negotiation support experienced improvements (i.e., gains) in their individual outcomes. A main effect was observed due to NSS support for negotiation. Dyads provided with NSS support during the negotiation phase obtained higher gain (mean = -1.84; s.d. = 24.49) than dyads without NSS support (mean = -11.23; s.d. = 27.57). This contrasted sharply with dyads not provided with NSS negotiation support. In fact, the latter group saw a substantial decrease in individual outcomes at the end of the negotiation. This suggests that NSS may play a crucial role towards enhancing negotiations. Negative framing of negotiations causes negotiators to be risk seeking (Bazerman and Lewicki, 1983; Kahneman and Tversky, 1979) - a behavior which often connotes with distributive bargaining. NSS help by means of its utility specifications and proposal generation facilities; functionally, they allow the manipulation and organization of numerous complex issues, thus presenting a more manageable scope to negotiators, and at the same time, discouraging distributive negotiations. High individual-outcome solutions are easily computed and identified; moreover, the presentation of solutions as an entire contract promotes logrolling, encouraging negotiators to focus on trade-offs among issues, instead of arguing about single issues. NSS also help to ensure that all pertinent information and alternatives are given due deliberation. This in turn helps the negotiators make

[36] Some cultural-sensitive thoughts are applied to understanding the results. We suggest that for other cultural groups, stronger effects due to the pre-negotiation support may be observed. The experimental study was conducted in Singapore, whose culture demonstrates a low level of uncertainty avoidance which is characterized to be relatively more comfortable in unstructured situations. Insofar as the "uncertainty avoidance" dimension of culture (Hofstede, 1991) is concerned, pre-negotiating support tool may be more helpful for people with high uncertainty avoidance to prepare for a more structured task on hand and stable rules to follow. Correspondingly, the environment becomes less ambiguous as the pre-negotiation support has facilitated the negotiators to specify issues and weightages, prior to the actual negotiation. It is conceivable that negotiators from a higher uncertainty-avoidance culture will spend more time and effort in the preparation process with the help of pre-negotiation support tool since they might have developed a lower limit for risk perception.

objective and realistic judgments, thus achieving higher individual outcomes as well as gains **(Proposition 1)**.

5.4.2 Contract Balance

Experimental results confirm our conjecture that the negotiation settlements for dyads with **pre-negotiation** support would be more equal than dyads without such support. ANOVA indicated a strong main effect on contract balance due to pre-negotiation support ($F=8.89$, $p = 0.00$). Dyads provided with NSS support for the pre-negotiation phase obtained more equal outcomes (mean = 15.69; s.d. = 11.36) than dyads without these tools (mean = 30.19; s.d. = 20.79). From a design perspective, NSS revolve around the concept of integrative bargaining and enable negotiators to attain mutually beneficial agreements. With group process structuring, NSS guide the negotiators through a series of negotiation stages, creating a sense of agreement, trust and fairness (Anson and Jelassi, 1990). By appealing to standards of fairness, the negotiators increase the probability of an agreement by narrowing the range of possible disagreement. It converts what might otherwise degenerate into an arbitrary contest of wills into a justifiable principled or objective solution (Fisher and Ury, 1981). Therefore, negotiators provided with NSS pre-negotiation support tend to be less aggressive in their negotiations. Correspondingly, negotiators are more cooperative and less competitive, and are better placed for a more equal outcome. In our study, the issue selection facility of pre-negotiation support tools elicits negotiators' preferences for the issues, and with the range setting tool, negotiators define the acceptable range of values for the issues to be negotiated. These sets of values are later merged and presented to negotiators. These tools together promote information sharing, which helps a negotiator to gain an understanding of his position, as well as knowledge of his opponent's expectations. This awareness of the existence and extent of asymmetrical interests gives negotiators a sense of room for cooperation to achieve mutually satisfactory settlements. As negotiators participate in integrative bargaining, each seeks to find an agreeable proposal that he perceives would meet the expectations of both parties.

Ultimately, such perception of balance could be translated to real balance, resulting in a more equal negotiation outcome.

However, the role of NSS support during the **negotiation** phase was not manifested in this experiment. Interestingly, while contract balance has been theorized and found improved by the help of NSS in some studies (Lim and Benbasat, 1993; Foroughi et al., 1995), others suggest no significance (Jones, 1998; Goh et al., 2000; Lim, 2000). A first reason for this result may lie in the lack of exact knowledge of the other party's utility values. The complex nature of negotiations often leads to ambiguity concerning negotiators' valuations of the issues involved (Thompson and Loewenstein, 1992). Typically, negotiators are more informed about their own positions than that of the other party's (Raiffa, 1982). During the negotiation stage, one's utility values were not presented to the opponent. Thus, other than their own outcomes, negotiators had no idea of the utilities of the other party, much less the joint outcomes and fairness of alternative contracts. Such ambiguity, in turn, caused multiple and different interpretations of "fair" or equitable settlements (Thompson and Loewenstein, 1992). Subsequently, negotiators proposed agreements that were more in their favors. In other words, a bargainer often accepted a settlement in which the partner had many more points than he did, since he did not know exactly the points the opponent achieve (Jones, 1998). As a result, the high outcomes achieved by NSS dyads might be biased towards the more dominant party. Secondly, inconsistent empirical findings on contract balance in the NSS literature are plausibly attributable to the perception aspect; it is of research interest that actual contract balance could in some way be affected by how fair the players perceive the contract is to them, or "perceived fairness" (the social psychological measure of the relevant aspect of the

quality of negotiated outcome) (Rubin and Brown, 1975). Such perception would be affected by many dynamics including personality, experiences, social value orientation and cultural norms. [37]

5.4.3 Time to Settlement

As hypothesized, negotiation time was longer for NSS dyads provided with **pre-negotiation** support than for dyads without these tools. The analysis showed a strong main effect due to NSS support for pre-negotiation ($F=10.59$, $p = 0.00$). NSS-supported dyads took more time (measured in minutes) to reach a settlement (mean = 32.65; s.d. = 6.59) compared to no-pre-negotiation-support dyads (mean = 25.41; s.d. = 8.84). Negotiation time was also longer for NSS dyads provided with **negotiation** support than for dyads without these tools. ANOVA showed a main effect due to NSS support for negotiation ($F=3.01$, $p = 0.09$). Dyads provided with NSS support for the negotiation phase (mean = 30.96; s.d. = 8.25) took longer to reach an agreement than dyads not provided with NSS negotiation tools (mean = 27.10; s.d. = 8.55).

These results are consistent with both NSS and GSS research, which confirms that the use of electronic meeting technology tends to extend decision time (Jones, 1988; Jones and Jelassi, 1988). This can be explained by relative unfamiliarity of the subjects with the computer support system (Foroughi et al., 1995; Delaney et al., 1997). The time involved in inputting issues and ranges, as well as coordinating with the opponent, contributes to the increase of (total) negotiation

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[37] Some cultural-sensitive thoughts are applied to understanding the results. It is conceivable that the aspect of fairness can be better appreciated when a cultural lens is applied, in particular along with the notion of Confucian Dynamism which manifests the diversity between the Eastern and the Western value systems (Hofstede, 1991). As suggested earlier, Asian business negotiators implicitly regard long-term relationship, maintaining harmony, and concern for face-saving as important and relevant for social and business activities. They tend to avoid open and direct conflicts, accomplished by the search for sufficiently favorable – versus optimal – outcome.

In managing conflict and negotiating, parties would tend to work towards compromising (Tung and Quaddus, 2002). The Asian mindset described may also lead negotiators to compromise and be content with a sufficiently favorable agreement, without striving for the optimal outcome. Hence, contract balance was not significantly different across different treatment groups. The above observation calls for more rigorous, in-depth, and dedicated investigation of the joint impact of technological and cultural dynamics on negotiation.

time. The significant increase in time also suggests that in situations where NSS support was available, negotiating parties considered their options more thoroughly with strengthened belief that more efficient and fairer settlements can be achieved (Goh et al., 2000). NSS, in this case, increase subjects' confidence in achieving better outcomes and thus willingness to explore further negotiation with their opponents. Conceivably, ongoing use of the NSS should tend to reduce negotiation time (Delaney et al., 1997). In the long run, NSS are expected to improve negotiators' performance by reducing time needed to reach an agreement (Lim and Benbasat, 1993). Such effects are to be empirically assessed by future studies involving the comparison between experienced NSS users and novel NSS users.[38]

5.5 CONTRIBUTIONS AND LIMITATIONS

It is widely recognized that systematic planning and preparation are critical elements of successful business negotiations. Experienced executives often devote substantial time to these functions before sitting down at the negotiating table. Computer technology is believed to enable superior negotiation outcomes. In this study, computer-based pre-negotiation and negotiation support tools are developed and examined in terms their effects in enhancing negotiation outcomes. The findings of this experiment show the usefulness of NSS in enhancing the quality of differing stages of negotiation. We advocate the incorporation of pre-negotiation support in ENS design, and empirically tested its effectiveness and efficacy in improving negotiators' performance.

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[38] Some cultural-sensitive thoughts are applied to understanding the results. Culture largely determines what time means and how it affects negotiations (Hofstede, 1991). Behavioral negotiation studies suggest that while people in the United States generally hold that "faster" is better than "slower" because it symbolizes high productivity, other cultures have quite different views about time (Lewicki et al., 1999). In more traditional societies, especially those in hot climates, the pace is slower than in the United States. They tend to reduce the focus on time, at least in the short term. In some other cultures, such as China, time per se is not important. The focus of negotiations is on the task and relationship building, regardless of the amount of time that is takes. From this perceptive, the results that technologies did not shorten the settlement time may be confounded by the subjects' time perception.

The study is recognized to have several limitations, which also point to possible future research opportunities. First, due to the early state of research on pre-negotiation support, student subjects are used in a controlled laboratory setting, under the assumption that their bargaining behavior with and without computer support would provide insights into the effectiveness of NSS in actual organizational settings. Although students have been found to be acceptable surrogates for organizational decision makers (Gallupe, 1985) and earlier negotiation research suggested strong similarities between the bargaining behavior and outcomes of industrial sales personnel and college students (Siegel and Harnett, 1964), the research methodology of laboratory experimentation and use of student subjects may connote with reduced realism vis-à-vis real-world negotiations.

Second, the sample size was small and the experiment focused on dyads, or two-party negotiations. However, there is a major difference between conflicts involving two parties and those involving more than two parties. The dyadic setting is appropriate for a buyer-seller (e.g., employer-employee) setting, a basic yet important negotiation context; NSS can be particularly useful for dyads involved in distant or distributed negotiations. Multiple-party negotiations involve further intricacies, including coalition formation and audience effects. Future research should attend to the latter setting, but only in a systematic and progressive manner.

Another extension is to open up the black box and perform content analysis to better understand the process related variables. It is not known in this study, for example, whether trust and collaborative atmosphere have been developed in the pre-negotiation stage which might bring about a positive influence on the actual negotiation stage. Qualitative approaches may be utilized as an alternative mode of research (Gopal and Prasad, 2000). More advanced design features of NSS, such as intelligence and explanations (Gregor and Benbasat, 1999), should be incorporated and studied for their impact on negotiation outcomes.

CHAPTER 6 EFFECTS OF NSS AND MULTILINGUAL SUPPORT FOR ENGLISH-CHINESE NEGOTIATORS[39] (CATEGORY I AND II SYSTEMS)

In e-Negotiation contexts where users typically communicate through text-based exchanges, there is substantive room to make use of unbiased and synchronous mode of computer translations. However, despite the growing attention in using multilingual tools to alleviating communication barriers, little empirical examination has been done to understand the effect and efficacy of multilingual negotiating support. The study consists of the development of a bilingual English-Chinese NSS, as well as an experiment that aims to understand the effectiveness of multilingual negotiation support systems on negotiation performance across different linguistic groups. We attempt to differentiate the effects caused by the NSS and the multilingual support function by invoking 2X2 factorial design in an experiment, in addressing the following research question:

How do negotiation support (NSS) and multilingual support, separately and in conjunction, make differences over negotiators' performance between lingual-heterogeneous dyads?

6.1 THE RESEARCH MODEL AND HYPOTHESES

6.1.1 The Research Model

This study represents an exploratory effort in understanding the effect of multilingual negotiation support on negotiation outcomes; rather than studying a single entity, we choose to examine two

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[39] This experiment was completed at an earlier phase of our ENS research program as a joint work with other contributors. It was accepted for publication at a forthcoming issue of *Behaviour & Information Technology* (Lim and Yang, 2008). A preliminary version of this study was presented at *the 38th Annual Hawaii International Conference on System Sciences: HICSS38*, Hawaii, United States, 3-6 January 2005 (Lim and Yang, 2005).

The study is presented *briefly* here that helps to address part of the guiding research framework.

independent variables: NSS support and multilingual support, so as to better discern between these two components and to see what added-value (to NSS) might be provided by the multilingual support. In this study, the dependent variables assessing negotiation outcomes involve individual outcome, joint outcome, contract balance, time to settlement, and satisfaction with settlement. Figure 6-1 depicts the research model.

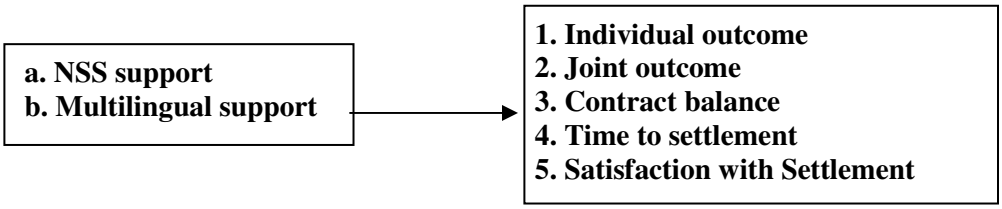

Figure 6-1. The Research Model

To simulate Internet-based negotiations, the research model is examined at electronic negotiation settings where all communications between negotiation parties go through a default CHAT facility, assuming no face-to-face communication is available.

6.1.2 Hypotheses

6.1.2.1 Individual Outcome, Joint Outcome and Contract Balance

Individual outcome and joint outcome reflect the efficiency of the negotiation outcome at individual and group levels respectively, and contract balance reflects the fairness of a negotiated contract; the three measures demonstrate the economic negotiation outcomes concerning the final agreement. Earlier empirical research (Anson and Jelassi 1990, Jelassi and Jones 1988) suggests that computerized decision support helps subjects overcome the cognitive difficulty of these tasks, the tendency towards premature closure, and the preference for more available and more salient solutions, thus helping them achieve better outcomes, compared to negotiators without NSS support. Such effects have also been confirmed in more recent studies (Jones 1988, Foroughi et al. 1995, Delaney et al. 1997). As suggested by Lim and Benbasat (1993), the decision support

portion of the NSS, instead of the (task-oriented) electronic communication channel, provides the greatest contribution to the contract balance. Moreover, Delaney et al. (1997) show that the DSS component alone leads to higher joint outcomes and more balanced contracts. In line with **Proposition 1**, we posit that full NSS will lead to higher individual/joint outcomes as well as better equality than electronic communication channel alone (CHAT facility).

Hypothesis 6-1a: *Dyads*[40] *with NSS support (DSS+CHAT) will achieve higher* ***individual outcome*** *than those with CHAT facility only.*

Hypothesis 6-2a: *Dyads with NSS support (DSS+CHAT) will achieve higher* ***joint outcome*** *than those with CHAT facility only.*

Hypothesis 6-3a: *Dyads with NSS support (DSS+CHAT) will achieve lower* ***contract balance*** *(better equality of outcome) than those with CHAT facility only.*

Lewicki and Litterer (1985) suggest that distraction due to semantic differences lead to ineffective communication that prevents negotiators achieve successful negotiations. One of the main obstacles to successful international business is the linguistic and communication barriers, including semantic and syntactic differences. Negotiators communicating in a language other than their mother tongue should rely to a great extent on visual aids, printed materials, samples and references to fact and figures (Cellich and Jain 2004). For a negotiator who does not speak the common language in a proficient manner, the ability for him/her to effectively communicate and negotiate for desirable deals can be severely limited. Furthermore, dyads with language barriers will find it difficult to communicate and understand each others' needs in accomplishing mutual benefits. The multilingual features of NSS (including multilingual system interface as well as translation of text-based messages to the negotiator's native language) provide languages native

[40] In this chapter, dyads refer the two lingual-heterogeneous negotiating parties who have different native languages.

to negotiators to alleviate language-related communication problems, in which the enhanced communication support will enable the 'weaker' party to utilize his/her native language to carrying out the negotiation process. It is conceivable that compared to the unsupported negotiators, those who are assisted by multilingual support are able to minimize linguistic barriers and negotiate more efficiently, so as to attain higher individual utility, greater joint outcome and more balanced contracts. Hence in line with **Proposition 2b**, we posit that

Hypothesis 6-1b: *Dyads with multilingual support will achieve higher* ***individual outcome*** *than those without multilingual support.*

Hypothesis 6-2b: *Dyads with multilingual support will achieve higher* ***joint outcome*** *than those without multilingual support.*

Hypothesis 6-3b: *Dyads with multilingual support will achieve more equal settlements (in terms of smaller* ***contract balances****) than those without multilingual support.*

6.1.2.2 Time to Settlement

Negotiation time refers to the time taken to reach an agreement in negotiation process. Findings of GSS research (e.g., Dennis et al. 1988, Gallupe 1985) suggest that the technology is expected to bring about lengthened sessions, because the computer support introduces an additional layer of complexity into the negotiation process. NSS empirical studies also indicated a marked increase in time for NSS-supported dyads to reach an agreement (e.g., Foroughi et al. 1995; Delaney et al, 1997). For the multilingual support, there will be time associated with typing non-English characters using editor software (Aiken et al., 1995) as well as the bidirectional translations into each party's native language. Corresponding to **Proposition 1** and **Proposition 2b**, it is believed that the additional use of NSS and multilingual feature will result in a lengthier negotiation for reaching an agreement.

Hypothesis 6-4a: *Dyads with NSS support (DSS+CHAT) will take more* ***time*** *in reaching agreement than those with CHAT facility only.*

Hypothesis 6-4b: *Dyads with multilingual support will take more* ***time*** *in reaching agreement than those without multilingual support.*

6.1.2.3 Satisfaction with Settlement

As argued in **Proposition 1**, DSS support can help to overcome cognitive difficulty and alleviate face-saving emotions, which in turn enable negotiators to achieve more efficient and fairer agreements. If negotiators achieve a higher joint outcome and better contract balance, they are likely to be more satisfied (Foroughi et al., 1995). It is hence believed that negotiators with NSS support can achieve greater satisfaction towards the contract than those without support (Lim and Benbasat, 1993; Foroughi et al., 1995).

Hypothesis 6-5a: *Negotiators with NSS support (DSS+CHAT) will be more* ***satisfied with the negotiated settlement*** *than those with CHAT facility only.*

Multilingual support essentially removes linguistics barriers in its effect to equip lingual-heterogeneous negotiating parties with more efficient communication mechanisms. Conversely, dyads may face communication breakdown which hinder them from achieving win-win solutions, and thus tend to have less enjoyment from the negotiation process. As argued in **Proposition 2b**, we posit that the inclusion of multilingual support will lead to greater satisfaction towards the negotiated contract.

Hypothesis 6-5b: *Dyads with multilingual support will be more* ***satisfied with the negotiated settlement*** *than those without multilingual support.*

6.2 EXPERIMENTAL DESIGN

A laboratory experiment, employing a 2x2 factorial design (see Figure 6-2), was conducted. The two independent variables are the availability of NSS support (yes versus no) and the availability of multilingual support (yes versus no). Dyads provided with NSS support used the negotiation support system (with a CHAT facility), while dyads without NSS support used only the CHAT facility for communication. For the multilingual negotiations, negotiating parties negotiated in their first languages (English or Chinese). For monolingual sessions, negotiating parties negotiated in English, which is a foreign language for one of the parties.

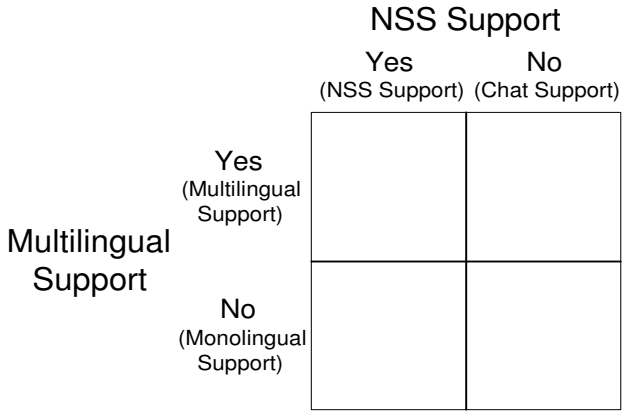

Figure 6-2. Experimental Design (Experiment 2)

Ninety undergraduates were recruited as subjects from a large university in a multi-racial country with English as working language. Each negotiating group consisted of two subjects, one whose first language is Chinese, and the other whose first language is English. Thus, there were a total of 45 linguistic-heterogeneous dyads. The subjects were paired randomly. However, three dyads ended up in deadlocks and were disqualified. The final set of data came from 42 dyads.

6.2.1 Independent Variables

The independent variables were manipulated by the availabilities of multilingual support and negotiation support of a bilingual English-Chinese negotiation support system. It provides a structured negotiation process and an electronic communication channel (CHAT facility).

Four modules of the NSS used in this experiment are 1) Set Range, 2) Assign Utilities, 3) Analyze Outcomes, and 4) Propose Agreements. In the **set range** module, each party decides on the range of possible values for each of the issues. The system combines these ranges when both parties have entered the values. In the **assign utilities** module, negotiating parties assign weightages to the issues based on the issues' relative importance. Their utilities for each individual value are also assigned. These utilities indicate the acceptability of the values to the negotiating party, and are used in computing individual outcome, joint outcome, and contract balance. The **analyze outcomes** module makes use of utility values inputted in the earlier module; the system generates all possible solutions and calculates the utility score for each. This is where both parties can analyze the various alternatives and strive towards a higher joint outcome and better contract balance, keeping in mind that their individual outcomes are not revealed to the other party. The **propose agreements** module is intended for formal propositions to be presented by either party, after analyzing the various alternatives. Figure 6-3 shows the interfaces.

Figure 6-3. The Bilingual User Interface

The four modules together with the CHAT facility make up the negotiation support system for this study. In conditions where NSS support is not provided, only the CHAT facility is used. In conditions where multilingual support is not provided, only English interfaces are presented to both negotiating parties, otherwise each party receives the interface corresponding to his/her native language. Comparisons on negotiation outcomes between NSS-supported and non-

supported dyads indicate the *effects of NSS* (featuring both DSS and task-oriented EC support). Comparisons between dyads supported by multilingual support and those without multilingual support indicate the *effects of multilingual support* (featuring social-oriented EC support technique for heterogeneous users).

6.2.2 Dependent Variables

The MAUT (Keeney and Raiffa 1991) provides a widely adopted tool to specifying negotiators' preferences using multi-attribute utility values (see an illustration in Section 5.2.2). The **individual outcome** for each negotiating party is measured as the total weightage points of the particular party. Therefore, the individual outcomes of A and B are ($U_{xa} + U_{ya} + U_{za}$) and ($U_{xb} + U_{yb} + U_{zb}$) respectively. The **joint outcome** of the negotiating parties provides a measure for the total utility of the negotiated agreement, which is the sum of their individual outcomes. With respect to the above example, the joint outcome of A and B is the sum of (($U_{xa} + U_{ya} + U_{za}$) + ($U_{xb} + U_{yb} + U_{zb}$)). **Equality**, synonymous with contract balance, is a fairness measure on how well the negotiated settlement reflects the balance of each negotiation party. It is measured using the absolute difference between the two parties' weightage points for the final agreement. In our example, the contract balance is the absolute value of (($U_{xa} + U_{ya} + U_{za}$) - ($U_{xb} + U_{yb} + U_{zb}$)). The higher this value is, the less equal the contact means between the dyads. It is zero for a balanced contract and a positive value for any unbalanced ones. Negotiation **time** is measured in minutes as the time spent for dyads in reach agreements. Perceptual variable - **satisfaction with settlement -** is measured using a post-negotiation questionnaire.

6.2.3 Negotiation Task

The task specifies negotiation scenario between two business partners of several years – a buyer (Wellco Enterprise, Inc.) and a seller (New Dragon Parts Distributor), over four issues of a three-year purchase agreement for turbochargers, an engine sub-component (adapted from Jones 1988).

The issues are unit price, purchase quantity, warranty period and the date of first delivery. Representatives from both companies are to resolve existing conflicts over the four issues through negotiation. Both representatives have a set of guidelines on the four issues acceptable for their companies. Each company has an attractive alternative purchase/sales contract with other companies. Hence, each may take up the alternative should the negotiation fail. However, due to the good working relationship between the two companies, they would like, as far as possible, to close a deal with each other.

Background information of the two companies was made available to both subjects who were randomly assigned as buyers and sellers; as well, each subject received confidential information pertaining to the company he represented.

6.2.4 Experiment Procedure

Each session involved two subjects, forming a dyad. In *pre-negotiation* phase, subjects first filled in a background questionnaire. This was followed by two activities: (1) training on how to use the system and (2) an English language proficiency test. Training was carried out in English for both subjects in monolingual conditions and for local subjects whose first language is English in multilingual conditions. For Chinese subjects in multilingual conditions, training was conducted in Mandarin. The English language proficiency test was a 30-minute test. Beforehand, the test had been administered to two facilitators to ensure that the duration was reasonable for its length. The format of the test was similar to the Graduate Record Examinations (GRE) as test questions were consolidated from past GRE sample tests.

After both subjects had completed both the test and the training separately, they were randomly assigned as the role of buyer or seller and hence their sitting locations. They then took seats at the negotiation table, separated by a partition. The partition was meant to prevent verbal communication as well as nonverbal communication involving body language. Subjects were

then given the instruction sheet and the task sheet with given sufficient time. An expected outcome form was filled up, in which subjects wrote down the exact values that they expected to obtain at the end of the negotiation

After completing the expected outcome form, subjects started the *actual negotiation* phase. '**NSS support**' dyads would log in to the system and timing of the negotiation process would begin. The subjects went through all four modules of the system and negotiated via the CHAT facility. For '**CHAT support**' subjects, a 'utility form' where given in which they filled the weightages for each of the issues based on the relative importance. They wrote down values they most desired and values they would not accept for each of the issues. These values would be used to calculate their utilities during data analysis. The form was then returned to the experimenter. At this point, negotiation (and timing of its process) began. Subjects negotiated via the CHAT facility without a structured negotiation procedure.

Chinese subjects in **multilingual** conditions entered their messages using software Chinese Star 2.0. In **monolingual** sessions, all subjects entered their messages in English. A log file was used to capture all interactions. Timing stopped when an agreement was reached. The agreement was recorded and subjects completed a feedback questionnaire. The *post-negotiation* phase was ended with asking the subjects not to reveal any information regarding the experiment.

6.3 DATA ANALYSIS AND RESULTS

Altogether, 45 sessions were conducted. However, three sessions ended in deadlocks and were discarded, leaving 42 groups for analysis. ANOVA was performed on the scores of the English language proficiency test for a manipulation check, and showed a significant main effect of member (local or Chinese) on the English test scores (F-ratio = 20.16; p = 0.00). Local subjects (i.e., subjects with English as their first language) obtained significantly higher test scores (mean = 18.19; s.d. = 4.84) than Chinese subjects (i.e., subjects with Chinese as their first language)

(mean = 13.79; s.d. = 3.91). This shows that our assumption is appropriate that the Chinese subjects would not be as comfortable with the English language as the local subjects.

ANOVA tests were conducted on the dependent variables (see Table 6-1). No significant results were obtained for satisfaction with outcome and hence not presented. Summary of hypotheses testing is presented in Table 6-2. We elaborate the results of statistical analysis and discussion for each of the dependent variables in the next section.

Table 6-1. Summary of ANOVA results

Dependent Variables	Interaction Effect	Main Effects	
		NSS Support	Multilingual Support
1. Individual Outcome	NO (F=2.91, P=0.09)	F=9.36, P=0.00**	F=1.37, P=0.25
2. Joint Outcome	NO (F=2.59, P=0.12)	F=8.31, P=0.01*	F=1.22, P=.28
3. Contract Balance	YES (F=8.46, P=0.01*)	F=0.45, P=0.51	F=2.56, P=0.12
4. Time to Settlement	NO (F=0.01, P=0.94)	F=3.22, P=0.08	F=4.75, P=0.04*

(* denotes p<.05, ** denotes p<.01)

Table 6-2. Summary of Results on Hypotheses Testing (Experiment 2)

Hypotheses	Mean		P-Value	Hypotheses Supported?
	Support	No support		
1. Individual Outcome				
6-1a. NSS > No NSS	59.77	58.53	P = 0.00**	YES
6-1b. Multilingual > No Multilingual	50.01	55.41	P = 0.25	NO
2. Joint Outcome				
6-2a. NSS > No NSS	119.64	90.67	P = 0.01*	YES
6-2b. Multilingual > No Multilingual	-	-	P = 0.12	NO
3. Contract Balance				
6-3a. NSS < No NSS	22.00	25.00	P = 0.51	NO
6-3b. Multilingual < No Multilingual	39.82	27.06	P = 0.12	NO
NSS: Multilingual > No Multilingual	24.91	19.05	-	Interaction Effect
No NSS: Multilingual < No Multilingual	14.91	35.06	P = 0.00**	
4. Time to Settlement				
6-4a. NSS > No NSS	-	-	P = 0.08	NO
6-4b. Multilingual > No Multilingual	48	34.85	P = 0.04*	YES
5. Satisfaction with Settlement				
6-5a. NSS > No NSS	-	-	P > 0.05	NO
6-5b. Multilingual > No Multilingual	-	-	P > 0.05	NO

(* denotes p<.05, ** denotes p<.01)

6.4 DISCUSSION

6.4.1 Individual Outcome

It was hypothesized that individual outcome would increase if **NSS support** was provided (H6-1a). This is supported by our results that show significant difference between NSS-supported groups and groups without NSS support (i.e., CHAT support conditions). Such result can be explained by the fact that NSS display the utility scores for all the possible alternatives (Lim and Benbasat, 1993). Hence, negotiating parties can work towards an outcome that is favorable for them, i.e., increase the efficiency of negotiated agreement at the individual level (**Proposition 1**).

Individual outcome appears to be not significantly improved for subjects provided with **multilingual support**. This refutes our hypothesis of H6-1b (**Proposition 2b**). Sheffield (1992) indicates that media efficiency has a marked impact on negotiation outcomes. An efficient communication medium is required to closely examine negotiation issues and to reduce uncertainty in the negotiation task itself. The ineffectiveness occurred here may be due to the fact that Chinese subjects in multilingual conditions typed in Chinese characters using Chinese Star 2.0, a Chinese editor. Unfamiliarity with the editor often causes problems for some Asian users in using multilingual support software. For instance, Malaysian students rated the multilingual GSS higher than Koreans, Chinese and Japanese, because the former used the Roman alphabet – thus, no keyboard mapping was needed (Aiken, 2002). When compared to their counterparts, communication process for Chinese subjects using the Chinese editor is much slower and hence ineffective. The inefficiency using the inputting software may have confounded the effects of multilingual support in improving individual outcomes. Future study should take care of this aspect by engaging more experienced users in using editor software.

6.4.2 Joint Outcome

Results support the hypothesis that joint outcome will be higher for **NSS-supported** dyads than dyads provided with CHAT facility (H6-2a). This is consistent with the results obtained by Jones (1988), Foroughi et al. (1995), and Delaney et al. (1997). Foroughi et al. (1995) offer some explanations for the higher joint outcome (**Proposition 1**). Firstly, NSS allow simultaneous consideration of all issues. Subjects could consider the entire alternative instead of just one issue at a time. Therefore, they can have a better assessment of the tradeoffs. Secondly, subjects have increased knowledge about their opponent's simulated utilities (Lim and Benbasat, 1993). With this increased knowledge, they are able to work towards the efficient frontier and hence, improve their joint outcomes. Another explanation is that the NSS tools generate all possible alternatives for the subjects. In this way, the system helps the subjects overcome tendency towards premature closure, and the preference for more available and more salient solutions (Jelassi and Jones, 1988). In contrast, without NSS support, subjects tend to *satisfise* rather than optimize (March and Simon, 1958) – they stop negotiating for the best possible outcome when a satisfactory solution had been reached. This is because they would not know each other's utility function and may not even be explicitly aware of their own utility function. Even if they do, it is simply not possible for human negotiators to process all of the hundreds or thousands of possible solutions.

Joint outcome was not significantly improved due to the **multilingual support** (H6-2b) (**Proposition 2b**). As analyzed earlier, the use of Chinese Star 2.0 may have hindered the multilingual supported Chinese subjects from effectively communicating with their counterparts. As joint outcome is the sum of the individual outcome, it follows that the joint outcome would be lower.

6.4.3 Contract Balance

The ANOVA test shows a significant interaction effect between multilingual support and NSS support on the contract balance of negotiated settlements (Figure 6-5).

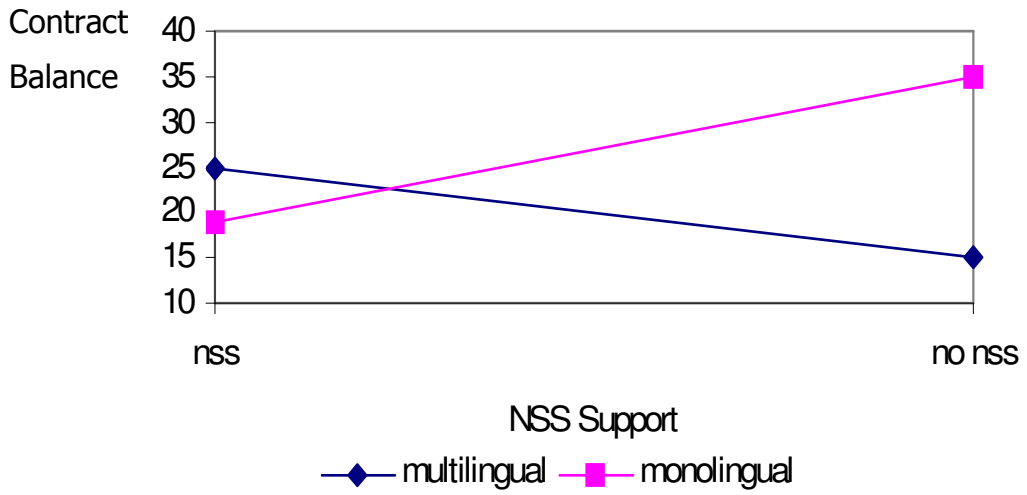

Figure 6-4. The Interaction Effect of NSS and Multilingual Support on Contract Balance

Dyads with multilingual support but no NSS support obtain more balanced contracts corresponding to higher equality of outcome (mean = 14.91; s.d. = 11.39) than dyads with monolingual support and NSS support (mean = 19.05; s.d. = 13.79). In addition, dyads provided with both NSS and multilingual support obtain outcomes fairer (mean = 24.91; s.d. = 16.43) than dyads provided with only the CHAT support and with monolingual support (mean = 35.06; s.d. = 15.81). When only the CHAT support is provided (i.e., no NSS support), a significant difference between the means is obtained between dyads provided with multilingual support and those with only monolingual support ($t = 3.32$; $p = 0.00$). The effect of multilingual support is less prominent in groups provided with NSS.

This may be due to the synergistic effect of **multilingual support** and **NSS support**. The better equality of negotiated settlements shows that although the average individual outcome was lower, the individual outcomes for both subjects in the same dyad were comparable, such that the

absolute difference between the two outcomes was small. A possible explanation is that there may be goal differences between dyads with multilingual support and those without multilingual support (i.e., monolingual support conditions), when only CHAT facility but no NSS is supported for dyads. There was a chance that subjects assigned to multilingual conditions may have aimed to achieve fair solutions while those assigned to monolingual conditions aimed for solutions with high individual and high joint outcomes. We suggest that in further studies, subjects' initial goals should be recorded so as to provide a statistical confirmation for this explanation.

6.4.4 Time to Settlement

Our hypothesis that dyads provided with **NSS support** will take a longer time to reach an agreement is not proved to be significant (H6-4a) (**Proposition 1)**. Nevertheless, a marginally significant value (p=0.08) is observed, indicating certain level of effects due to decision technologies. It was asserted that there should be an increased time when using the NSS as it is confirmed in GSS research that the use of technology tends to extend decision time (George et al., 1990). Ongoing use of the NSS should tend to reduce negotiation time (Delaney et al., 1997) and the effects should be confirmed by future studies that compare experienced negotiators who are pre-trained and familiar with the use of NSS, against those novice users. Another possible explanation is due to the use of the lean medium of CHAT facility for lingual heterogeneous dyads at both conditions. As non-NSS-supported dyads solely communicate with CHAT facility, their communication efficiency will be much lower compared to those with extra NSS support (**Proposition 2a**). This assertion should be confirmed by future studies which are configured to examine effects of media differences in conjunction with NSS technologies for dyads with varying levels of communication capability.

The results for time to settlement support the hypothesis that dyads provided with **multilingual support** will take a longer time to reach an agreement (H6-4b) (**Proposition 2b**). The use of the Chinese editor by Chinese subjects in multilingual conditions accounts for the result largely. In

other words, using the Chinese editor slows the process down. Aiken et al. (1995) in their study to compare performance for Korean and English groups using bilingual GSS, also question whether Koreans studying in America are identical with those from their native country. The subjects' slower typing speeds using the Korean character set may have biased the results towards the use of an English GSS. Koreans in their native country may be forced to type better Korean words since they are less likely to be proficient in English. Besides, in multilingual conditions, every message entered is processed. The translation involved also slows down the negotiation process.

6.4.5 Satisfaction with Settlement

Satisfaction with the settlement was comparable between **NSS-supported** groups and those without NSS support (H6-5a). One reason may be that NSS-supported negotiators may not be aware of the possible better agreements that they have achieved, thus making their perceptions insignificantly different from those unsupported. Another possible explanation may be due to the negotiation setting which was limited to pure electronic communications. The electronic communication channel provides a sort of 'formality' which depersonalizes the negotiation and allows negotiators to concentrate on the content of the negotiation rather than on each other's personalities (Lim and Benbasat, 1993; Sheffield, 1992). In this study, all groups negotiate via the electronic communication channel – the CHAT facility. While existing theories predicting the effects of NSS largely assume negotiations are conducted in face-to-face setting; nevertheless, the text-based chatting is a fundamentally different mode of communication. From the perspective of communication richness, the lack of nonverbal (e.g. expressions and gestures) and verbal cues in the communication process for dyads to use the CHAT facility may result in an increase of turbulence in the flow of communication. Tung and Quaddus (2002) point out that the lack of emotive cues may lead to misunderstanding amongst multicultural group participants. Coupled with the inability to transmit subtle meanings, this misunderstanding makes communication for dyads largely dependent on text-only information. Emotive cues to express subtle human

expressions such as despair, hand shaking, waving, kissing, and the like, are not presented in the NSS we developed for this study. This limitation may result in the insignificant level of satisfaction of dyads using multilingual NSS, and conceivably explains the lack of significant difference in satisfaction perceived by NSS-supported and non-NSS-supported groups.

Based on **Proposition 2a** which is derived from media richness theories, lean media may result in lower communication efficiency. However, it is not obvious that the same effects will be observed when DSS technologies co-exist. The effect of DSS on negotiators' perceptions towards the negotiated contract may be overridden by the underlying communication inefficiency of the use of pure text-based media. The situation may be changed if one were to provide a richer medium for communication purpose, such as an addition of audio or video facility, on top of the CHAT function. This assertion should be confirmed by future studies which are configured to examine the media effects in conjunction with NSS technologies for dyads with varying levels of communication capability.

Results indicate that **multilingual support** does not significantly increase the satisfaction of the subjects with the settlement (H6-5b) (**Proposition 2b**). Again, the level of accuracy of the translation may contribute to the ineffective use of multilingual NSS. At times, the subjects may not fully apprehend what the opponent was trying to say. This hinders effective communication which is essential for successful negotiations (Chong and Kelemen, 1995). Hence, satisfaction with the settlement was not increased even with multilingual support.

6.5 CONTRIBUTIONS AND LIMITATIONS

This study advocates the use of computer technologies to effectively support multilingual negotiation dyads whose native languages are diverse. The findings derived from the experimental study suggest that NSS support helped to improve individual outcome and joint outcome significantly, which is consistent with past NSS empirical studies. The results also

showed that multilingual support helped to improve equality of outcome (under qualified conditions) but the time taken was significantly longer.

The study contributes to both research and practice concerning e-Negotiations. For research, it represents a first step towards investigating to the notion that multilingual negotiations can be managed effectively by providing multilingual negotiation support. The study provides initial empirical evidence into the area of multilingual negotiation support and serves as a starting point for future studies. To system designers and practitioners, this study highlights the significance of addressing diverse linguist groups in global negotiation context by incorporating computer-based multilingual support features. Such element is especially prevalent to the fast-growing B2B e-marketplaces which facilitate global SMEs to conduct business activities online. The provision of negotiation support tools that as well support multilingual communications is likely to attract non-English speaking individuals and companies to reach previously unattainable foreign business partners at a very low cost. Future work should pay greater attention to the opportunities as well as challenges of providing multilingual support for cross-cultural negotiators.

A limitation of the system we employed for this study is its processing speed when multilingual support is present. For every message that the subjects enter, there is a backend process where the message undergoes translation. This translation process could take quite a while for some phrases. In addition, the translation application does not cater for complex sentences and idiomatic phrases. Moreover, Chinese subjects were required to use a Chinese editor, Chinese Star 2.0, when multilingual support was provided. The typing of Chinese characters is not as straightforward as that of English words. Even if the subjects were familiar with the software, the process of keying in Chinese words is still slower than the typing process of English words. This may have negatively affected the subjects' satisfaction with the negotiation process. One possible way to reduce such unwanted effect could be through introducing a time delay for dyads not using the

translation system for a fairer comparison. The time delay can be determined a priori through a pilot study.

Automatic translation programs are known to lack 100 percent accuracy due the complex nature of language (Aiken et al., 1994). Hence the ongoing multilingual system research relies on a high accuracy and fast translation speed and is still a promising area. Furthermore, good translation should embed 'culture due diligence' which can serve to introduce some of the originating culture's sensibilities to the receiving culture (Ditaranto, 2005). It is yet to become feasible for us to conduct business negotiations freely with our native languages, due to the joint complexity of inadequate technology maturity and the subtle nature of language and cultures. Nevertheless, having personalized interfaces catered for different lingual groups serves as the starting point of developing a multilingual support system, which provides opportunities for non-English speaking businessmen to participate in online trading and negotiation. The lingual- and cultural-sensitive interfaces, together with translation-embedded e-Negotiation systems, can arguably contribute to enlarging the customer base for and add value to e-marketplaces.

CHAPTER 7 EFFECTS OF DECISION SUPPORT AND CONFLICT LEVEL FOR NEGOTIATIONS VIA VIDEOCONFERENCING[41] (CATEGORY I AND II SYSTEMS)

Despite the increasing use of videoconferencing that allows geographically dispersed individuals and firms to interact in an approximation of face-to-face interaction (Sniezek and Crede, 2002), most NSS empirical studies are still limited to simple keyboard interaction like email or text-based chat facility, thus limiting their findings away from negotiators using advanced communication technologies. The purpose of this study is to provide evidence about the capability of a computerized NSS to enhance negotiation outcomes using videoconferencing channel. As an important factor, conflict level was investigated in the research model to distinguish between integrative and distributive bargaining situations (Walton and McKersie, 1965). This study seeks answers to the following research questions:

Can videoconferencing-based DSS improve the outcomes of dyadic remote negotiation over those facilitated by a pure videoconferencing channel? Does conflict level moderate the result?

7.1 THE RESEARCH MODEL AND HYPOTHESES

7.1.1 The Research Model

Delaney et al. (1997) examine the separate effects of these two sets of components and showed that DSS component alone led to higher joint outcomes and more balanced contracts. The present

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[41] The study has been presented at *the IFIP TC8 International Conference on Decision Support Systems: DSS2004*, Prato, Tuscany, Italy, 1-3 July 2004 (Lim and Yang, 2004), based on Yang Yinping's Honors Year Project, *School of Computing, NUS* in year 2003.

The study is presented *briefly* here that helps to address part of the guiding research framework.

study continues to sort out the effects of the two components and further explore the impact of the computer support on negotiation outcome where videoconferencing NSS is incorporated.

Negotiation task characteristics, especially conflict level, have been shown to be of significant influence on negotiation processes and outcomes (Benbasat et al., 1993). Empirical research in NSS indicated that NSS effectiveness is likely to be moderated by the type of negotiation situation or the amount of conflict between negotiators (Jones, 1988; Foroughui et al., 1995; Goh et al., 2000). Consistent with past work (e.g. Jones, 1988, Foroughui et al., 1995, Lim, 2000), dependent variables in the current study include joint outcome (total utility of the negotiated settlement for both parties), contract balance (the absolute difference between the total utility scores achieved by each negotiator) and negotiation time. We examine the role of conflict level in moderating the relationship between degree of DSS support and negotiation outcomes. Figure 7-1 depicts the research model.

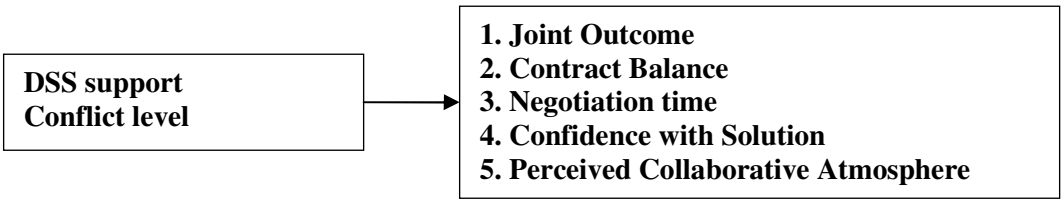

Figure 7-1. The Research Model

To simulate Internet-based negotiations, the research model is examined at electronic negotiation settings where all communications between negotiation parties go through a default videoconferencing facility when no face-to-face communication is available.

7.1.2 Hypotheses

7.1.2.1 Joint Outcome and Contract Balance

In line with **Proposition 1**, theoretical and empirical work has generally suggested the effects of NSS on improved efficiencies and fairness that are measured by joint outcome and contract

balance. For instance, Foroughi et al. (1995) study shows that the dyads with the comprehensive NSS had a higher joint outcome than the dyads with no computer support. Delaney et al' (1997) follow up study, however, intended to examine whether this higher joint outcome is a result of the DSS portion of the NSS or of the combined effect of the DSS and the electronic communication component of the comprehensive NSS. Their hypotheses were supported that joint outcome differences are due to the DSS portion rather than to the combined effect of the two components of the comprehensive NSS.

Contract balance is expected to become smaller when the DSS is used, because each party will be aware of the approximate number of points earned by the opponent for a particular solution. This awareness will help each bargainer find a contract alternative which he/she feels is fair both for himself and for his partner and which he/she can accept without losing face. The Foroughi et al. study (1995) resulted in a better contract balance (closer to zero) with the NSS than with no computer support. Delaney et al. (1997) further found that DSS alone contribute to more equalized contract balance in low conflict setting.

VC channel provides the videos, verbal communication as well as text-based communication that are close to face-to-face setting, where the latter sets Lim and Benbasat's (1993) theoretical arguments on the effectiveness of NSS. It is conceivable that the theory can be extended to VC channels (in line with **Proposition 2a**). Greater efficiency and fairer outcomes are expected with computer decision support than without computer support for negotiating dyads communicating through VC channel. In other words, for low conflict task where mutual gains are potentially available, we posit that NSS-supported dyads are to achieve higher join outcomes and lower contract balances than those unsupported using VC only (in line with **Proposition 4**). For high conflict task, NSS may not be particularly useful in distributive negotiation situations where negotiating parties tend to "split the difference" in coming up a reasonably efficient and fair settlement by using a *satisfising* strategy (Erickson et al., 1974; Raiffa, 1982; Jones, 1988).

Hypothesis 7-1*: Negotiators with extra DSS support (DSS+VC) will achieve higher* ***joint outcome*** *than those with VC support only in the low-conflict situation but not in the high-conflict situation.*

Hypothesis 7-2*: Negotiators with extra DSS support (DSS+VC) will achieve more equal settlements (in terms of smaller* ***contract balances****) than those with VC support only in the low-conflict situation but not in the high-conflict situation.*

7.1.2.2 Time to Settlement

For negotiation time, conflict level will not show moderating effect as the time in reaching agreement is mainly determined by the additional use of the NSS tool. GSS research demonstrates that the use of technology generally tends to extend decision time (Dennis et al. 1988). It is proposed that the time involved in using NSS for the alternative generation and evaluation of alternatives increases the time required for the NSS over negotiation with no NSS support, because the NSS introduces explicit additional activities into the negotiation process (in line with **Proposition 4**).

Hypothesis 7-3*: Negotiators with extra DSS support (DSS+VC) will take more* ***time*** *in reaching agreement than those with VC support only.*

7.1.2.3 Confidence with Solution

In line with **Proposition 1**, DSS essentially serve as external information processor and memory that help negotiators to overcome cognitive difficulties (Lewicki and Litterer, 1985) to simplify the processes of alternative evaluation and generations. Compared to unsupported cases, negotiators will feel more positive that they are able to obtain better, more efficient solutions. Lim and Benbasat (1993) analyze an efficiency related perception construct "confidence with solution" in negotiation setting. The decision aid, through helping negotiators to be capable of

performing rational analyses, was attributed to the large portion to the increase of confidence with solution perceived by negotiators.

Hypothesis 7-4*: Negotiators with extra DSS support (DSS + VC) will obtain higher level of* ***confidence with the negotiated solution*** *than those with VC support only.*

7.1.2.4 Perceived Collaborative Atmosphere

In line with **Proposition 1**, the decision support functions help to address the problems associated with cognitive biases and socio-emotional effects of human negotiations in collaborating with each other. DSS also encourage negotiators to seek a mutually beneficial solution by displaying conflicting views and pairing of related items interests (Anson and Jelassi, 1990), instead of assuming a "fixed-pie" on that their interests are always in direct conflict with the other party and that one side will win at the expense of the other (Pruitt, 1983). Furthermore, even though dyads have accessed to rich medium of videoconferencing, the task-focused mode and problem solving orientation (Raiffa, 1982) provided by DSS support can help negotiators to focus attention away from the possible non-rational escalation of conflict as a result of very "personal" communication, in turn lead to more collaborative atmosphere.

Hypothesis 7-5*: Negotiators with extra DSS support (DSS + VC) will obtain higher level of* ***perceived collaborative atmosphere*** *than those with VC support only.*

7.2 EXPERIMENTAL DESIGN

The experiment employed a 2x2 factorial design to investigate the impact of conflict level and degree of DSS support on negotiation outcomes. Subjects were recruited from students from a large university. Two separate rooms were used to simulate remote negotiation setting. In each room, PCs were equipped with headphone and web camera and installed the Microsoft's NetMeeting software. A NSS prototype developed specifically for this experiment was made

available for subjects in NSS treatment groups. Figure 7-2 depicts the experimental design. The digit in each cell denotes the number of dyads in each treatment group.

	Degree of DSS Support	
Conflict level	VC only	NSS (VC and DSS)
Low Conflict	8	8
High Conflict	10	9

Figure 7-2. Experimental Design (Experiment 3)

Subjects were recruited from students from National University of Singapore. Out of 102 people registered through an online registration system, 84 subjects had actually participated and formed 42 negotiating dyads initially. However, only 35 dyads were used for final data analyses because 3 dyads were found to collude among themselves based on chat log files and experiment instructor's records. 4 dyads failed to reach agreements.

7.2.1 Independent Variables

Degree of NSS support was manipulated by the availability of a computer support tool to DSS treatment groups. Comparisons on negotiation outcomes between DSS-supported and non-supported dyads indicate the *effects of alternative evaluation and generation tools* (featuring a specific DSS support technique).

This DSS prototype used in this experiment (named as ProNeg) incorporated two components: alternative generator and alternative evaluator which have been described and used in earlier studies (e.g., Foroughui et al., 1995; Goh et al., 2000; Delaney et al., 1997). The **alternative evaluator** is to support alternative contract evaluation based on the preset preference scores of the negotiator (see Figure 7-3). It helps to calculate how a specific contract is beneficial to individual negotiator represented by the utility points. Users can plug in alternative contracts and this tool display the total score that is to be achieved.

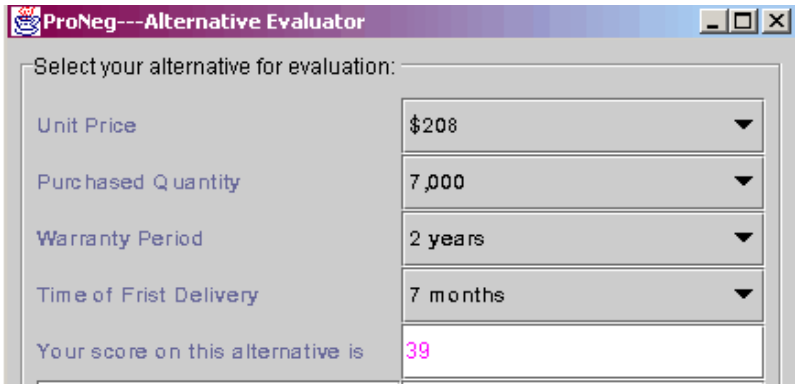

Figure 7-3. Alternative Evaluator - Score for the Alternative Evaluated

The **alternative generator** is used to support alternative generation and possible concessions and/or solutions suggestions (see Figures 7-4). Based on the preset (one's own) and estimated (the opponent's) point structure of the negotiating dyads, it will calculate and generate hundreds of all possible contract alternatives. This tool hence facilitates decision making for the negotiators by displaying the best three alternatives in terms of highest joint outcome.

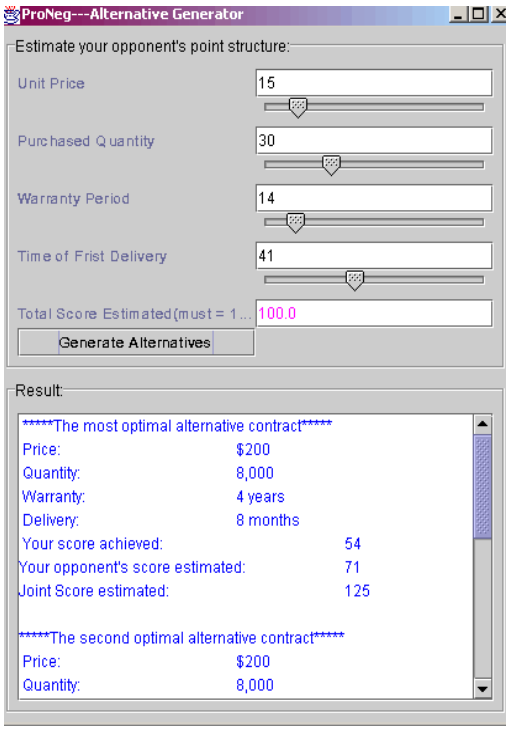

Figure 7-4. Alternative Generator - Three Contract Alternatives Generated

In both treatments, negotiators communicated through videoconferencing channel but the NSS treatment groups were additionally supported with ProNeg. Microsoft's NetMeeting, a multimedia meeting system with text-chatting facility, audio/video channels and real-time file sharing capabilities, was the VC software used for all treatment groups.

Conflict level was manipulated by pre-assigning different utility points to the four negotiating issues to dyads. The construction of negotiation task and point sheets was adapted from Jones' study (1988), which involved negotiation between a seller (Simo Parts Distributor) and a buyer (Roberts Enterprise Inc.) over four issues - unit price, purchased quantity, time of first delivery and warranty period - for a purchase agreement for an engine sub-component called turbochargers (see Appendix A.2 for the public information for the negotiation task).

In the low conflict treatment, the assigned weightages/utility points for negotiation issues were different. The buyer's most important issue was quantity, followed by delivery time, whose utility points have been assigned 39 and 29 respectively. The two least important issues were warranty period and price. For the seller, price was the most important issue, followed by warranty period (corresponding points are 37 and 28). Delivery time and quantity were the least crucial issues. When the priorities of negotiators differ, the potential for mutually beneficial tradeoffs exist and integrative bargaining situation was created.

In the high conflict treatments, negotiation issues for both buyer and seller were weighted similarly (i.e., pre-assigned approximately equal utility points). Price was given the most weight, followed by quantity; the two least important issues were delivery item and warranty period. In practice, the most important issues for the buyer were price and quantity, whose utility points are assigned 39 and 29 respectively. Similarly, points for the seller on these two issues were assigned 35 and 29 as the seller's most important issues as well. Hence there was little potential for them to logroll and the two parties were in high conflict of interests. This resulted in a zero-sum or

distributive bargaining situation where one party's gains were almost equal to the other party's losses (see Appendix A.3 for the private information for the negotiation task).

The effects of age, gender and NSS experience were controlled through random assignment. Two experimenters, one for each of the two computational laboratories, used standardized instruction scripts to minimize experimenter bias. Before the experimental sessions, subjects were explicitly told that each of them would receive a small gift at the completion of the experiment and the best pair with the highest joint outcome would additionally receive $10 cash as incentive.

7.2.2 Dependent Variables

Consistent with previous empirical NSS studies and experimental studies in Chapter 5 and 6, multi-attribute utility techniques (Keeney and Raiffa, 1991) were used to measure dependent variables. The **joint outcome** of A and B was calculated as $((U_{xa} + U_{ya} + U_{za}) + (U_{xb} + U_{yb} + U_{zb}))$. **Contract balance** was calculated as the absolute value of $((U_{xa} + U_{ya} + U_{za}) - (U_{xb} + U_{yb} + U_{zb}))$. **Negotiation time** was measured in minutes from the beginning of the negotiation until the dyads reached an agreement. **Confidence with Solution** and **Perceived Collaborative Atmosphere** are measured using a post-negotiation feedback questionnaire. Items are adapted from previous studies (Foroughi et al., 1995; Eliashberg et al., 1992; Lim, 2000) (see Appendix A.7).

7.2.3 Negotiation Task

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

The background information (see Appendix A.2) further highlights to the subjects that due to the long geographic distance and to avoid unfavorable travel for both executives, the management

committees of the two companies had a prior discussion and jointly decided that they would use Microsoft NetMeeting to negotiate for the business deal.

The low conflict nature was simulated by assigning different weightages for the issues, creating a bargaining situation in which mutually beneficial tradeoffs can be possible (see Appendix A.3). The high conflict was created by weighting the four issues similarly for the two negotiating parties resulting a distributive bargaining situation in which one party's gain was nearly equal to the other one's loss. A BATNA (an alternative offer from another company) was provided to both parties. This gave subjects a minimum point level to achieve in the negotiation.

7.2.4 Experiment Procedure

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

7.3 DATA ANALYSIS AND RESULTS

Control checks in each treatment group were performed prior to hypotheses testing. ANOVA tests (on age, year of study, and experience) and Mann-Whitney U test (on gender) a showed no significant differences cross four different treatment groups.

Reliability analysis on the only multi-item construct (confidence with solution) shows acceptable value (alpha= 0.825) in terms of construct reliability (Nunnally, 1978).

ANOVA tests were conducted on the dependent variables (see Table 7-1). Statistical results show that conflict level and NSS support have main effects on joint outcome and perceived collaborative atmosphere; level of conflict has significant effect on joint outcome and contract balance. Significant interaction effects of the two independent variables were also found on joint outcome and negotiation time.

Table 7-1. Summary of ANOVA Results

Dependent Variables	Interaction Effect	Main Effects	
		Level of Conflict	Degree of NSS Support
1. Joint Outcome	YES (F=8.33, P=0.01**)	F=126.56, P=0.00**	F=6.61, P=0.02*
2. Contract Balance	NO (F=0.06, P=0.80)	F=6.50, P=0.02*	F=0.001, P=0.97
3. Negotiation Time	YES (F=7.63, P=0.01**)	F=0.47, P=0.50	F=0.86, P=0.36
4. Confidence with Solution	NO (F=1.58, P=0.21)	F=0.56, P=0.46	F=0.13, P=0.72
5. Perceived Collaborative Atmosphere	NO (F=0.65, P=0.48)	F=0.91, P=0.42	F=6.27, P=0.04*

(* denotes p<.05, ** denotes p<.01)

Cell means, standard deviation, and hypotheses testing are presented in Table 7-2.

Table 7-2. Summary of Results on Hypotheses Testing (Experiment 3)

Dependent Variables	Conflict Level	Mean (Standard Deviation)		Hypotheses	P-Value
		VC Only	VC with DSS		
Joint Outcome	Low	117.13 (10.12)	127.13 (4.55)	H7-1: VC Only < NSS	.02*
	High	101.80 (1.23)	101.22 (1.86)	VC Only = NSS	.43
Contract Balance	Low	9.63 (5.97)	10.13 (5.64)	H7-2: VC Only > NSS	.87
	High	7.39 (4.43)	4.68 (1.86)	VC Only = NSS	.86
Negotiation Time	Low	21.63 (10.41)	37.75 (14.76)	H7-3: VC Only < NSS	.02*
	High	30.70 (16.03)	22.67 (13.25)	VC Only < NSS	.20
Confidence with Solution	-	5.03 (0.71)	5.71 (0.57)	H7-4: VC Only < NSS	.72
Perceived Collaborative Atmosphere	-	5.24 (1.30)	5.86 (0.99)	H7-5: VC Only < NSS	.04*

(* denotes p<.05, ** denotes p<.01)

7.4 DISCUSSION

7.4.1 Joint Outcome

Conflict level shows significant moderating effect for DSS impact on joint outcome as we hypothesized (H7-1) (**Proposition 1 and 4**). An important result obtained here is that for **low conflict** task, we confirmed that DSS can help physically dispersed dyads to improve joint outcome significantly. As predicted by earlier NSS research (Anson and Jelassi 1990, Jelassi and Jones 1988), computer support helped subjects overcome the cognitive difficulty of these tasks, the tendency towards premature closure, and the preference for more available and more salient solutions, thus helping them achieve better joint outcomes than dyads who only had VC support (Foroughui et al. 1995). Without DSS support, subjects tended to *satisfise* rather than optimize (March and Simon, 1958) – they stopped negotiating when a satisfactory solution had been reached. This is because they did not know *precisely* each other's utility function and might not

even be explicitly aware of their own utility function. Therefore, they simply can not easily determine if one alternative is better than another one due to the problem complexity for the negotiation task and cognitive limitations associated with human. Additional information and processing capabilities provided by DSS as decision aids had the effect of raising the negotiators' expectations and hence resulted in further exploration for mutual gains.

In **high conflict** settings, DSS+VC and VC dyads achieved comparable joint outcomes. Similar to research findings obtained in early studies (Jones 1988, Goh et al. 2000) when conflict level is high, there were no significant differences in negotiation outcomes found in our result between DSS+VC supported and VC supported dyads. This result underlines the important moderating effect of conflict level on the effectiveness of NSS. Arguably, compared to the general proven effectiveness of NSS, the seemingly indifferent effect of DSS in high conflict setting suggests that DSS does pay off where potential joint benefits are moderately possible. However, when negotiating parties are already in direct conflict towards issues of interests, i.e., there is little room for negotiators to potentially cooperate and all or most feasible alternatives are near-efficient, the additional decision support tool does not make significant difference to improve joint outcome for the dyads, as shown in our result.

7.4.2 Contract Balance

The results indicate that contract balance is comparable between DSS+VC and VC dyads in **both conflict levels**. Contrary to our hypothesis (H7-2) (**Proposition 1 and 4**), dyads with DSS+VC support did not achieve lower contract balance (higher balanced contract) than VC dyads in low conflict setting. This result is consistent with some studies (Jones 1988, Goh et al. 2000) but not as in (Foroughui et al. 1995). It can be explained that such result was due to the fact that a bargainer often accepted a settlement in which the partner had many more points than he did, since he didn't know exactly what his bargaining partner's points were (Jones, 1988). Possible explanation can also be found in the design of the negotiation support tool used in this study. The

DSS tools explicitly encouraged subjects to achieve the highest joint outcomes. The *alternative evaluator* helped subjects to estimate the opponents' point structures, and the *alternative generator* gave optimal solutions in terms of the three best optimal joint outcomes. Hence contract balances (fairness of outcome) were neither emphasized nor not highlighted through the course of experiment.

7.4.3 Time to Settlement

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

7.4.4 Confidence with Solution

In contrary to our hypothesis 7-4 (**Proposition 1**), DSS+VC dyads did not report significantly higher level of confidence with solution than VC dyads. As suggested in literature review, DSS did not lead to significant differences in satisfaction levels between the groups (Delaney et al., 1997; Rangaswamy and Shell, 1997). In Section 4.3.1.1.3, we argued that compared to satisfaction, confidence with solution (Lim and Benbasat, 1993) would be a better surrogate to assess the psychological effect due to DSS support. Our data, however, did not provide evidence for this hypothesis. According to Stake and Rangaswamy (2000)'s review of NSS experimental studies, it is analyzed that subjects who have attain (indeed) higher outcomes do not necessarily know that they have done better, and hence reported that they were neither more, or less, satisfied with the settlement than those who (indeed) obtained lower outcomes. It could be the same case for the reported level of confidence with solution. As far as measurement issues are concerned, post-negotiation questionnaire may be ineffective to capture the psychological state that reflects the process-related confidence. It is thus a challenging, yet important task, for future research to undergo more ways to measure the level of confidence gained by using DSS technologies for negotiation tasks.

7.4.5 Perceived Collaborative Atmosphere

Hypothesis 7-5 asserting DSS will positively enhance negotiators' perceptions towards collaborative atmosphere is supported by our data (**Proposition 1**). Further analysis on different conflict settings suggest that the DSS significantly improve Perceived Collaborative Atmosphere in high conflict level ($p=0.03$) but not in low conflict level settings ($p=0.38$). When negotiators' interests are similar, i.e., conflict level is high, one party's gain is largely on the other's loss. In such situations, unsupported negotiating dyads will behave in distributed manner and perceive each other less friendly and collaborative. DSS, however, can help negotiators to be focused in

task and minimize the percentage of direct interactions through social channels which reduce further escalation of conflict. Such effects may not be observed in low conflict setting where negotiators have room to trade for mutual benefits. Hence, DSS will be particularly useful to improve negotiators' relationships in distributive bargaining by lowering the amount of conflict perceived by negotiators.

7.5 CONTRIBUTIONS AND LIMITATIONS

This study was conducted to investigate whether remote negotiation realized by a videoconferencing environment alone could be as effective as those additionally supported by DSS, for two levels of conflict. The distinctive contribution of this present study is twofold. First, it is noted that most of the past researchers did not evaluate the effects of the DSS and the electronic communication separately; this study examined a full NSS and proceeded to sort out the individual effects of the two components following suggestion in (Delaney et al. 1997). As well, the electronic communication component engaged in this study was more advanced and enriched with multiple communication features: audio, video, and electronic messaging. Second, resulting from the use of videoconferencing, negotiating dyads were physically separated and hence a remote negotiation setting was created in this study to simulate a negotiation activity for physically dispersed dyads. This added to the knowledge of empirical NSS research where studies on remote negotiation are relatively rare.

The current study has the following limitations in terms of the generalizability of the results. Student subjects are used in a laboratory setting, under the assumption that their bargaining behavior with and without computer support would provide insights into the usefulness of NSS in actual organizational settings. Although student subjects have been found to be acceptable surrogates for organizational decision makers (Gallupe 1985), the research methodology of laboratory experimentation and use of student subjects may connote with reduced realism vis-à-

vis real-world negotiations. A small sample may also limit the generalizability of the results. In addition, similar to recent research, this study adapted the negotiation task developed in Jones' (1988) work. The negotiation case used in this study assumed the willingness of the negotiators to share information with each other about their preferences for the issues, a situation which does not always occur in real-life negotiations. Hence this well-structured and fixed negotiation task may not fully reflect the complex nature of negotiation problems of the real world. Nevertheless, our analyses on the impact of DSS over social-psychological attitudes, negotiators' confidence with solution and perceived collaborative atmosphere, have been preliminary in this study. The next study will incorporate an in-depth instrument development process and more attitudinal measures to capture the effects of ENS on negotiation processes. In summary, although we have shown the DSS technology can generally enhance mutual benefits of negotiators for low conflict negotiation tasks, the findings are limited due to its size, sample and task. Hence, generalization of the findings to more complex, unstructured negotiation task involving business negotiators should be cautioned.

CHAPTER 8 EFFECTS OF AUTOMATED NEGOTIATION SUPPORT AND CONFLICT LEVEL INVOLVING INTELLIGENT AGENTS[42] (CATEGORY I, II AND III SYSTEMS)

In terms of the extent to which computerized negotiation support tool can imitate human negotiation behaviors, ENS can be categorized by the *intelligence level* of the agents (as defined in Section 4.1.4.3). It is conceivable that different levels of e-Negotiation systems in terms of agent intelligence may result in different extents to which human negotiators interact with the systems and the outcomes will vary accordingly. At the same time, empirical studies have shown that the effectiveness of NSS is likely to be moderated by level of conflict between the negotiation parties (Foroughi et al., 1995; Rangaswamy and Shell, 1997; Goh et al., 2000). The initial conflict of interests displays basic characteristics of the negotiation scenario which would likely impact the bargaining orientations and negotiators' attitudes. This study attempts to investigate the joint impact of the intelligence level of NSS and the level of conflict on negotiation outcomes and perceptions towards the system, seeking answers to the following research questions:

(1) How will system intelligence levels influence the negotiation outcomes measured from both economic and psychological perspectives? How will the level of conflict moderate the above relationship?

(2) How will system intelligence levels affect users' perceived control and anxiety towards the system?

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[42] This research project takes place during years 2004 to 2006 with contributions from other collaborators. A preliminary work was presented at *Group Decision and Negotiation 2005*, Vienna, Austria, 10-13 July 2005 (Yang et al., 2005). Major part of the research was presented at the *International Conference of Human-Computer Interaction 2007,* Beijing, China, July 22-27, 2007 (Yang et al., 2007a) and *16th Workshop on Information Technology and Systems: WITS06*, Milwaukee, Wisconsin, United States, 9-10 December, 2006 (Yang et al., 2006). This chapter reports details of this research.

8.1 THE RESEARCH MODEL AND HYPOTHESES

8.1.1 The Research Model

Our research model posits that intelligence level of NSS and level of conflict have joint impacts on negotiation outcomes, assessed in terms of joint outcome, contract balance, and negotiation time, as well as on perceived collaborative atmosphere and satisfaction. The former set of variables reflects the economic outcomes of negotiation outcomes while the latter measure the social-psychological outcomes that assess the possibility of win-win situation and future business relationship. Apart from outcomes associated with negotiations, the model also examines the main effects of the types of NSS on users' specific perceptions towards using the system. Figure 8-1 depicts the research model.

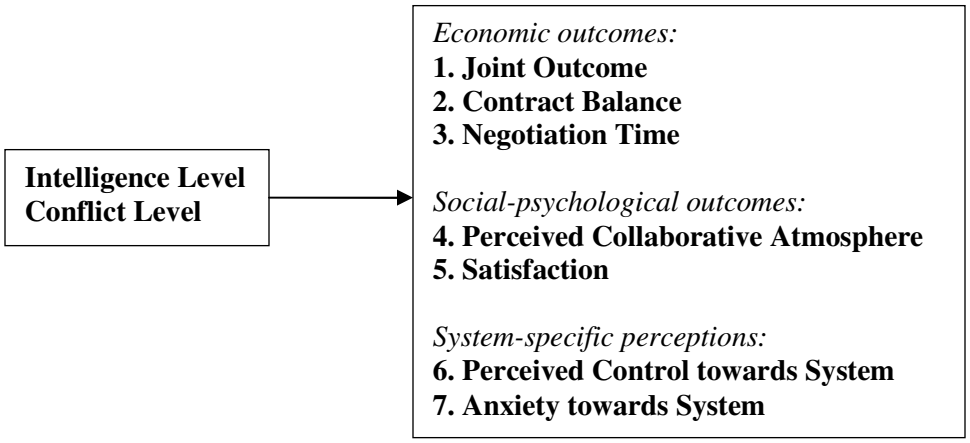

Figure 8-1. The Research Model

To simulate Internet-based negotiations, the research model is examined at electronic negotiation settings where all negotiation parties communicate through a default text-based messaging facility when no face-to-face communication is available.

8.1.2 Hypotheses

8.1.2.1 Joint Outcome and Contract Balance

Among the three, the Level-3 system is virtually designed with the most powerful decision-making support capabilities. For Level-1 system, negotiators have to communicate with each other and reach agreement with decision aids (alternative generator) which is based on negotiators' estimation on their opponents' preferences. As human negotiators have inherent socio-emotional bias that will result in communication inefficiency and cognitive barriers that hinder them from objective judgment (Einhorn and Hogarth, 1978; Fishchhoff, 1981; Lewicki and Litterer, 1985), certain risks in reaching optimal agreements are still faced by negotiations using Level-1 system. Furthermore, erroneous predictions about opponent's preference information can result in poorer outcomes (Faratin et al., 2000). Level-3 system, however, engage sophisticated agent's estimation on opponent's issue priorities and its high processing power help to promote holistic considerations of all the issues, focusing on trade-offs rather than zero-sum situations. In line with **Proposition 3**, it is hypothesized that Level-3 system will lead to higher joint outcomes than Level-1 system. However, in the high-conflict situation, studies demonstrate comparable joint outcomes for computer-supported and no-computer-supported dyads (Jones, 1988). In other words, negotiators with NSS support are not particularly useful in distributive negotiation as negotiators tend to "split the difference" in arriving at reasonably efficient settlements using satisfising strategies (Goh et al., 2000).

Hypothesis 8-1a*: Negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will achieve a higher* ***joint outcome*** *than those with the decision-support focused NSS (Level-1 system) in the low-conflict situation but not in the high-conflict situation.*

The Level-2 system, which implements a self-interested agent, has powerful processing capability in searching the negotiation space without engaging human negotiators' inputs and cognitive

effort. Although it has advantages in reducing users' cognitive load, without learning capability and adequate information about opponents' preferences, Level-2 system will obtain solutions that are optimal under its "internal" models that may depart from those truly superior settlements for the opponents. The Level-3 system allows negotiators to provide estimations about opponents' preferences and cross-references its own estimation from the learning components, can better reflect opponents' preference structure. The joint outcome, as a sum of self and opponent's utility scores, is expected to be improved for Level-3 system compared to Level-2 system (in line with **Proposition 3**).

Hypothesis 8-1b*: Negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will achieve a higher* ***joint outcome*** *than those with the fully autonomous negotiation agents (Level-2 system) in the low-conflict situation but not in the high-conflict situation.*

Similar to the analysis for joint outcome, the Level-3 system has the most powerful decision support capabilities among the three (**Proposition 3**). Furthermore, due to its learning capability and personality features, it takes into account of the preference information of the opponent and more truthfully take care of opponents' preference in reaching settlements. Thus the Level-3 system is expected to result in the fairest agreement among the three. When conflict level is high, in similar logic of system effects on joint outcomes, the effects of different level of systems may not be manifested in terms of improvement of contract balances (Goh et al., 2000) (suggested by **Proposition 4**).

Hypothesis 8-2a*: Negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will achieve more equal settlements (in terms of smaller* ***contract balances****) than those with the decision-support focused NSS (Level-1 system) in the low-conflict situation but not in the high-conflict situation.*

Hypothesis 8-2b*: Negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will achieve more equal settlements (in terms of smaller* ***contract balances****) than those with the fully autonomous negotiation agents (Level-2 system) in the low-conflict situation but not in the high-conflict situation.*

8.1.2.2 Time to Settlement

In the low-conflict negotiation context, mutually beneficial trade-offs are possible since negotiation parties have different ratings for each of the issues. Thus, there is bigger room for negotiation agreement to be settled. In such situations, negotiators using any of the three systems can relatively easily reach agreements with their opponents. The negotiation time mainly depends on the sophistication of different technologies. Based on Dennis et al.'s (1988) and Foroughi et al.'s (1995) studies, the use of technology generally tends to extend decision time. Since the Level-1 system adopts less sophisticated technology than the other two, which employ artificial intelligence techniques, it is expected to result in shortest negotiation time. Moreover, incremental learning from other agent's proposals can speed up negotiation process (Soo and Hung, 2002). Hence, the Level-3 system with learning capabilities is expected to result in shorter negotiation time than the Level-2 system (**Proposition 3**).

Hypothesis 8-3a*: In the low-conflict situation, negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will take more* ***time*** *than those with the decision-support focused NSS (Level-1 system) in reaching an agreement.*

Hypothesis 8-3b*: In the low-conflict situation, negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will take less* ***time*** *than those with the fully autonomous negotiation agents (Level-2 system) in reaching an agreement.*

However, in the high negotiation context, one party's gain is nearly equal to the other one's loss. Thus, it is highly unlikely for the other party to accept proposals that maximize one party's utility

points. Hence, human negotiators with the Level-1 system need to undergo many rounds of offers or counteroffers to reach an agreement, where a great amount of time is spent in considering whether or not to accept opponent's offers or waiting for the opponents' decisions. According to Goh et al.'s (2000) study, electronic bargaining agents have the potential to save human negotiators' time as they are able to make decisions promptly based on the built-in decision functions. Soo and Hung (2002) demonstrate that agent's incremental learning capabilities can even shorten the negotiation time. Therefore, agent-based NSS are hypothesized to result in less negotiation time than non-agent-based NSS, and agent-based NSS with learning capabilities are hypothesized to result in even less negotiation time than agent-based NSS without learning capabilities.

Hypothesis 8-3c*: In the high-conflict situation, negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will take less* ***time*** *than those with the decision-support focused NSS (Level-1 system) in reaching an agreement.*

Hypothesis 8-3d*: In the high-conflict situation, negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will take less* ***time*** *than those with the fully autonomous negotiation agents (Level-2 system) in reaching an agreement.*

8.1.2.3 Satisfaction with Settlement

Satisfaction with the settlement reflects the subjective feeling towards the negotiated agreement contract. Recent empirical research has shown that negotiations with NSS generally yield greater satisfaction than those without. The increase in satisfaction is not mainly due to the DSS portion of NSS, but also the electronic communication component. Lim and Benbasat (1993) assert that satisfaction will be higher for negotiators provided with full communication (task-oriented) and decision support than for dyads provided only with decision support.

Nevertheless, there are no theoretical arguments that we can directly relate to the effects of alternate designs involving DSS and agent technologies on negotiators' satisfaction. Assuming that rational negotiators would feel satisfied with the contract if they believe that efficient and/or fair agreements have been reached, satisfaction can be assessed from the two dimensions of perception: perceived efficiency (confidence with solution) and perceived fairness. As argued earlier, Level-3 systems integrate most sophisticated support technologies which are predicted to result in better efficiency and fairness for negotiation dyads. Negotiators using Level-3 systems will tend to be more satisfied as they have confidences in reach efficient and fair solutions. Thus, we put forth

Hypothesis 8-4a*: Negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will be more* ***satisfied*** *than those the decision-support focused NSS (Level-1 system).*

Hypothesis 8-4b*: Negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will be more* ***satisfied*** *than those with the fully autonomous negotiation agents (Level-2 system).*

8.1.2.4 Perceived Collaborative Atmosphere

In the low-conflict situation, negotiators may have different preferences for the issues and mutual benefits are potentially available; there will be a minimum of non-rational escalation of conflict (Lewicki and Litterer, 1985) and negotiators will be able to sense the atmosphere in the course of negotiation more collaborative than competitive. In such situations, the intelligence level of NSS is expected to have comparable effect on Perceived Collaborative Atmosphere.

However, in the high-conflict negotiation context, negotiators' preferences for the issues are weighted similarly, and thus one party's gain is nearly equal to the other one's loss. Negotiators will sense the atmosphere in the course of negotiation more competitive than collaborative.

Electronic communication component of NSS is believed to help focus negotiators' attention on the content of the negotiation instead of any personal conflicts (Lim and Banbasat, 1993; Foroughi et al., 1995). As agent-based NSS (i.e., the Level-2 and Level-3 systems) employs agents to autonomously communicate with the opponents in terms of offers and counter-offers, less personal conflicts will be manifested than non-agent-based NSS (i.e., the Level-1 system). In other words, agent-based NSS and non-agent-based NSS differ in terms of the degree of process *automation* which supersedes negotiators' *communication* process. These differences are expected to escalate when negotiators face high level of conflict of interests. According to Starke and Rangaswamy (2000), agents can help people who are uncomfortable with "haggling with another person" to negotiate better. By decreasing the chance of conflicting interaction with the opponents (which is very likely to happen when negotiators' preferences for the negotiation issues are pitted directly against each other), conflict is deescalated and the competitive atmosphere is depersonalized further.

Hypothesis 8-5a*: Negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will perceive greater* ***collaborative atmosphere*** *than those the decision-support focused NSS (Level-1 system) in the high-conflict situation but not in the low-conflict situation.*

Hypothesis 8-5b*: Negotiators with the fully autonomous negotiation agents (Level-2 system) will perceive greater* ***collaborative atmosphere*** *than those with the decision-support focused negotiation agents (Level-1 system) in the high-conflict situation but not in the low-conflict situation.*

8.1.2.5 Perceived Control

We examine users' perceived control over the NSS depends on their perception or belief about the three dimensions of control, namely behavioral control, decision control and cognitive control (Frese, 1987). If trainings are provided for understanding the functionality of all the three types of

system, cognitive control may not vary significantly from one another. Hence, perceived control may mainly differ in the aspect of decision making and action taking.

The classical conflict resolution concepts are good candidate to make analogy to explain the "notion" of control in negotiation process. As discussed in Section 2.3.3.3, negotiators may surrender control over the dispute process and the dispute outcome and the levels of control surrender create four forms of third-party interventions for conflict resolution (Sheppard, 1984). Level-1 system which employs traditional DSS support approach assumes the role of "facilitator" for negotiations; the negotiators still have high level of control in the conduct of negotiations. NSS with decision support focus on mainly providing supplementary analytical tools. They still require human negotiators to make decision and take the action to negotiate with opponents (decision and behavioral control). Conversely, Level-3 system which is a fully autonomous agent assumes a role similar to "arbitrator" would constitute an extreme case of a change in the locus of control from humans to computer agents (Rangaswamy and Shell, 1997). Agent-based NSS without personality on behalf of the human users take over the control on both action taking and decision making. Thus, Level-1 and Level-2 systems are presenting two extreme cases in terms of control of the course of negotiations. Level-3 system which incorporates additional features of personalization and learning stands in between, as users can plug in their preferences and adjust agent's negotiation strategy in any time during the negotiation process (behavioral control).

Hypothesis 8-6a: *Negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will result in lower* ***perceived control*** *than those with the decision-support focused NSS (Level-1 system).*

Hypothesis 8-6b: *Negotiators with the negotiation agents with personality and learning capabilities (Level-3 system) will result in higher* ***perceived control*** *than those with the fully autonomous negotiation agents (Level-2 system).*

8.1.2.6 System Anxiety

Computer anxiety is the product of combinations of psychological variables such as neuroticism and locus of control (Marakas et al., 2000). Locus of control has been regarded as one salient correlate of computer anxiety in the literature (e.g., Crable et al., 1994). System anxiety which is considered as the anxiety associated with the particular use of a system comes under the umbrella of computer anxiety. Therefore, most literature of the latter is relevant to the former. We hypothesize users with higher perceived control are expected to experience lower anxiety towards using the system.

Hypothesis 8-7: *The level of* ***system anxiety*** *is negatively related to the level of perceived control of the system.*

8.2 EXPERIMENTAL DESIGN

An experiment with a 3x2 random factorial design was conducted. First, pilot study that involves 8 subjects was conducted one week before the actual experiment. Experimental procedures were smoothened, system interfaces were modified and questionnaire instruments were finalized, according to the constructive feedback gathered in the pilot study. All negotiation sessions were conducted online where buyer and seller were seated in different locations. The three web-based system prototypes are developed which enable simulation of e-Negotiations activities across geographical span when it is infeasible for business partners to travel for face-to-face negotiation.

For the actual experiment, we have recruited a total of 130 subjects who are pursuing undergraduate and postgraduate studies at a large university. They are randomly assigned as the role of buyer and seller. Each pair is then randomly assigned to different treatment groups. Due to the absences of some subjects, the final data set used for statistical analysis come from a total of 112 subjects (56 pairs) who have completed the entire experiment for valid data analysis.

To motivate participations, subjects received appreciation gifts for their participation. Cash voucher worth of S$200 was announced to award the pair who would obtain highest joint outcome. Figure 8-2 depicts the experimental design, with the number of dyads contained in each of the treatment cells.

Conflict Level	System Intelligence Level: Level-1	Level-2	Level-3
Low	10	9	9
High	10	8	10

Figure 8-2. Experimental Design (Experiment 4)

8.2.1 Independent Variables

The **system intelligence level** was manipulated using three web-based ENS distinguished in agent intelligence. The other related functions are made *identical* for all the three systems – preparation functions in pre-negotiation phase (rate issues, input point structure, specify bottom line), a text messaging tool and an agreement screen – to remove confounding effects from system artifacts. The Level-2 and the Level-3 agent-based NSS adopted concession-based patterns in terms of negotiation strategies. The Level-3 system that integrates decision support as well as agent-based technologies with personalized features is of particular theoretical interests for examinations. *Effects of additional autonomous features* are examined when the differences between Level-3 and Level-1 system are compared along each dependent variable. *Effects of additional personalized and learning features* are examined when differences between Level-3 and Level-2 systems are compared for each dependent variable. The differences between Level-1 and Level-2 are compared in post-hoc manner.

The Level-1 system (see Figure 8-3) incorporates an alternative evaluator and an alternative generator that necessitate typical NSS functions used in previous empirical studies (Delaney et al. 1997; Foroughi et al. 1995; Goh et al. 2000). The system captures negotiator's own issue

preferences and utility structure in the pre-negotiation phase; the alternative evaluator component calculates the utility point achieved for a particular contract; the alternative generator component computes the best three optimal agreements with the highest joint outcome and lowest contract balance, by allowing user to input his/her estimation on the opponent's issue rating. The text-messaging tool facilitates online communication and the exchange of offers. Contract-related buttons including "Propose", "Reject" and "Accept" are integrated into the text messaging tool, to ease the effort of keying in the details of every single contract or decisions on opponents' offers from time to time. It serves as a baseline system.

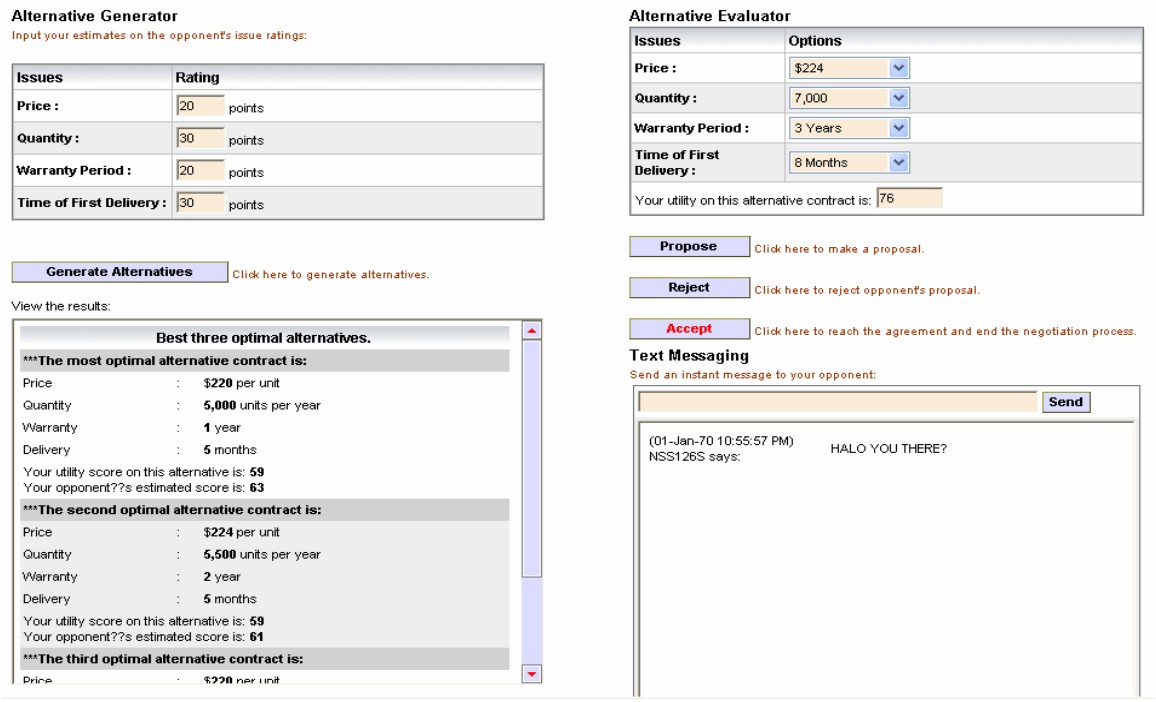

Figure 8-3. Main Page of the Level-1 System

The Level-2 system (see Figure 8-4) implements a self-interested agent with concession-based negotiation tactic. The agent was programmed to first propose the highest self utility points (100) and then concede bit by bit based on user's pre-specified utility point structure in the pre-negotiation phase. The buyer and seller agents will take turn to make proposal until one party

would accept the other's offer. The proposal history window that reflects the agent's negotiation process is available.

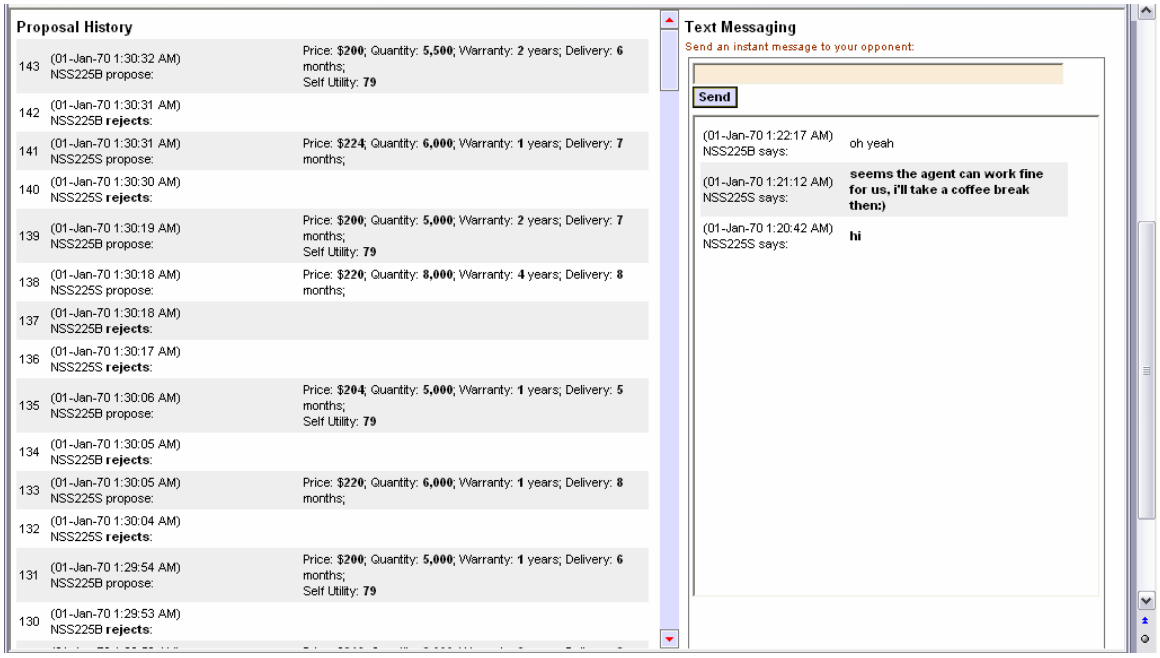

Figure 8-4. Main Page of the Level-2 System

The Level-3 system (see Figure 8-5) implements a sophisticated agent with personality features and learning capability and an alternative evaluator. The latter function is similar to the one in type I system. Personality features were realized through functions providing choice between the two negotiation tactics - Soft Concession/Conceder and Tough Concession/Boulware[43] (Faratin et al., 1998; Lopes et al., 2001) – so that negotiators are able to adjust the style they want to approach the bargaining process, conceding by either faster (soft) or slower (soft). Additionally, the system has an agent's estimation function based on the idea of Bayesian Theorem, through

[43] The *Boulware* strategy is named after Lemuel Boulware (1895-1990), a former vice president of General Electric. When faced with a strike, Boulware became famous for telling the International Union of Electrical Workers (IUE) at the onset of negotiations that the company had already evaluated the workers' needs and was putting forth its "first, last and best offer" on the table. The Labor Unions bitterly fount these positions and continued to resent them years after the companies abandoned this strategy (Northrup, 1964; Selekman et al., 1958). In negotiation, a *Boulwarism* is an offer or counter-offer that is not meant to be negotiated, denoting a very "tough" attitude in negotiations.

negotiation history study and probability analysis. After more than 50 encounters with the negotiation opponents, the agent can "learn" from the behaviors of its opponents and was able to provide estimations on opponents' issue priorities [44]. While the agent was automatically negotiating, the user was able to modify their estimation on opponents' issue ratings during the process; the agent's belief can be updated and adjusted to reflect how the user's belief on tactics appropriated for the subsequent negotiation.

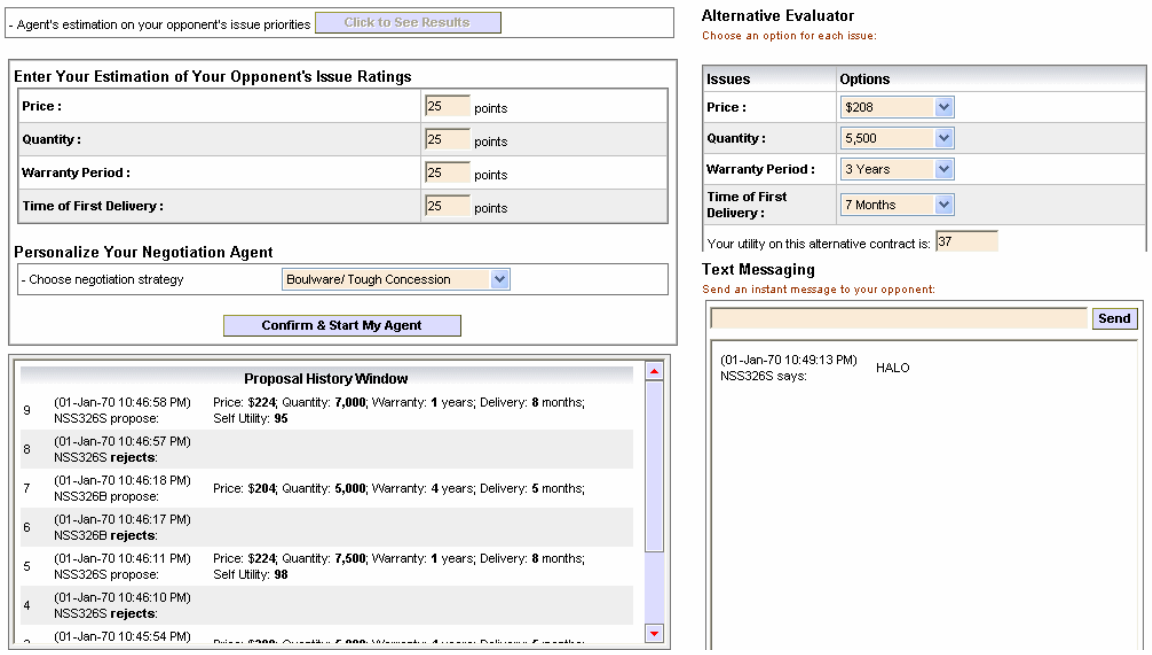

Figure 8-5. Main Page of the Level-3 System

The other independent variable **conflict level** was manipulated by assigning weightage points to each of the negotiation issues. Keeney and Raiffa (1991) suggest that the weightage points assigned in the preparation session of negotiation reflect negotiator's preference for a particular issue. The total weightage points reflect the tradeoff values between various issues as well as between the various values for each issue; they sum up to 100. In line with Jones (1988) study,

[44] Faratin et al. (2000) regard this as partial information, and they have proved that there is no significant difference between negotiation outcomes achieved by using partial information or perfect information (i.e., the exact issue ratings.

low-conflict treatment was simulated by assigning different weightages for the issues whereas high-conflict treatment was manipulated such that issues for both parities were weighted similarly. For illustration, a low-conflict situation was where buyers concerned purchased quantity and delivery time, with weightage points 39 and 29 respectively; while sellers cared about the other two issues, i.e., unit price and warranty period, with weightage points 37 and 28 accordingly. On the contrary, in a high-conflict treatment, both buyers and sellers focused on unit price and purchased quantity, with weightage points 39 and 29 for buyers and 35 and 29 for sellers (see Appendix A.3).

All other pertinent variables not studied in this study were randomized or kept consistent to ensure adequate control and internal validity. Effects of age, gender and past experience were controlled through random assignment. Two experimenters, one for each of the two computational laboratories, used standardized instruction scripts to minimize experimenter bias. Before the experimental sessions, subjects were explicitly told that each of them would receive a small gift at the completion of the experiment and the best pair with the highest joint outcome and lowest contract balance would additionally receive $200 cash-equivalent shopping vouchers.

8.2.2 Dependent Variables

According to Keeney and Raiffa's (1991) weightage point method, the **joint outcome** of a negotiation dyad was calculated as the sum of each party's total weightage points whereas the **contract balance** was the absolute difference between the two parties' weightage points for the final agreement. Consistent with the literature and our previous studies, the joint outcome of A and B for the final agreement was $((U_{xa} + U_{ya} + U_{za}) + (U_{xb} + U_{yb} + U_{zb}))$ and the contract balance between them was $|\ ((U_{xa} + U_{ya} + U_{za}) - (U_{xb} + U_{yb} + U_{zb}))\ |$. **Negotiation time** was measured in minutes. It was calculated by the system server automatically, as the time when dyads start the negotiation process and when they reach the final agreements were recorded by the systems. A

post-negotiation attitude questionnaire was administered to subjects in all treatment groups (see Appendix A.7).

Perceived collaborative atmosphere and **satisfaction with settlements** were assessed by a post-negotiation questionnaire. Subjects' perceptions towards efficiency and fairness formed up two dimensions towards satisfaction with settlement. Questionnaire items on were adapted from previous NSS studies (Eliashberg et al., 1992; Lim, 2000; Foroughi et al., 1995).

Based on Morris and Marshall's (2004) work to measure perceived control towards IS using a 55-item questionnaire derived from the literature and experts' input, we develop the measurement of **perceived control towards NSS** by breaking the construct down into three dimensions compromising cognitive control, behavioral control, and decisional control. Cognitive control was addressed by the internal factors such as knowledge which is specific to the understanding of how the system (ProNeg) works. Decisional control was addressed by factors that deal with the ability to set expected outcome and make decisions about the strategy and sequence. Behavioral control was addressed through the factors that deal with strategic choosing and task approach towards the usage of ProNeg. **System anxiety** is the specific anxiety associated with the use of the NSS. We adapted the items for an email system anxiety measurement (Brown et al. 2004) to the system of our interest, i.e., the ProNeg e-Negotiation systems.

8.2.3 Negotiation Task

The experimental task, consistent with Experiment 3, was adapted from Jones' study (1988), As described in the background information (see Appendix A.2), due to the long geographic distance and the inconvenient timing for the managers to travel, the management committees of the two companies had a prior discussion and jointly decided that they would use a web-based Negotiation Support System that is offered by a neutral third party to negotiate for a deal.

8.2.4 Experiment Procedure

In the **pre-negotiation preparation** phase, subjects were briefed about the experiment procedures and were reminded that they have a chance to win a $200 cash voucher (Appendix A.1). They were then asked to read the background information of the negotiation case (Appendix A.2); at the same time, the experimenters randomly assigned each subject to the role of buyer or seller. This assignment in turn determined their seating locations in different laboratories to simulate remote negotiation. Once reaching their respective decision rooms, subjects were asked to read the confidential information sheet on point structure and bottom line for their own company, as well as to do a simple exercise to ensure they understood the task (Appendix A.3). Depending on different treatment groups, subjects were trained on how to use the ProNeg system with user manuals (Appendix A.4) and short Q&A session was conducted. Subjects were asked to fill in a pre-negotiation questionnaire on past experiences and computer self-efficacy (Appendix A.5). Subjects were provided a distinguished login ID (adjacent ID numbers pair up two subjects) randomly to access the web-based ProNeg system.

Subjects were asked to log into the ProNeg system and start **actual negotiation**. No time limit was set for reaching agreements.

In the **post-negotiation** phase, upon settlement, subjects were asked to record down their final agreement (Appendix A.6). Subjects filled in a post-negotiation questionnaire assessing perceived control, system anxiety, as well as demographic information (Appendix A.7). Before leaving, subjects received small gifts and were debriefed. Throughout the experiment process, standardized scripts were used.

8.3 DATA ANALYSIS AND RESULTS

The SPSS (Statistical Package for Social Science) for Windows Release 15.0 was used to perform statistical analysis on the experimental results. Prior to statistical testing, control checks on age, gender and past experiences were performed to check the effectiveness of random assignment. Then reliability and construct validity were examined to ensure questionnaire items reflected for the constructs they were intended. Descriptive statistics for each of the six dependent variables were presented in line with the experimental design. Proposed main effects and interaction effects were tested using MANOVA whereas hypotheses testing was performed using One-way ANOVA with planned comparisons.

8.3.1 Control and Reliability Tests

Prior to validation checks, demographic information is analyzed. The average age of subjects was 23.0 years and 67.9% were males. All subjects had experiences with group work. The subjects have relatively high computer efficacy (5.13 out of 7) and computer use experience (4.56 out of 5); they have been moderately exposed to business decisions (2.33 out of 5).

To examine the internal validity, validation tests for controlled variables were performed to examine the effectiveness of random assignment. Two-way ANOVA tests on age, past experiences (of group work, computer usage, business decisions and NSS usage), and computer efficacy and Mann-Whitney U and Jonckheere-Terpstra tests on gender showed that subjects under different treatments did not differ significantly. However, the age of subjects differed across different conflict level ($p=0.01$), further data analyses hence employed age of subjects as covariate to examine the potential impact of age on the dependent variables (Neter et al. 1990). The results indicated that effects of these variables are adequately controlled (details for control check are presented in Appendix B.1).

To assess construct validity and reliability of subjective data collected via post-negotiation questionnaire, factor analysis and reliability tests were performed on items intended for

satisfaction with settlement, perceived collaborative atmosphere, perceived control and system anxiety (see Appendix B.2). Exploratory factor analysis on items intended for satisfaction with settlement, perceived collaborative atmosphere, perceived control and system anxiety showed that PC_CC_3 and PC_CC_4 from perceived control and SA_3 from system anxiety did not satisfy the discriminant and convergent criteria; they were dropped for subsequent analysis[45].

Next, confirmatory factor analysis was performed extracting five factors from the final set of items. The results show satisfactory convergent and discriminant validity where the factor loadings for the intended constructs were greater than the commonly accepted threshold of 0.5[46] (Hair et al., 1995). Finally, reliability analysis was conducted and the results show acceptable results on satisfaction with settlement (alpha =0.920), perceived collaborative atmosphere (alpha =0.792), perceived control (alpha =0.919) and system anxiety (alpha = 0.822), according to Nunnally's (1978) suggestion that Cronbach's alpha of at least 0.7 would indicate that a construct had sufficient reliability. Hence with the assurance of reliability and construct validity, we proceed to use the items obtained in Table B-10 (Appendix B.2) for subsequent inferential test.

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[45] This is supported by a careful reflection and theoretical examination. For PC_CC_3 and PC_CC_4, the two items were intended to measure users' perception of similarity comparing ProNeg with *other* systems, which may not be well related to users' perception in terms of cognitive control. Unlike other applications such as email and Microsoft office, the NSS technology is relatively specialized software for supporting business negotiations. It is still an emerging technology which is yet adopted in the industry (Lim, 2003), and has not been previously exposed to most the subjects in our study (average of NSS usage is 0.14 out of 5). Hence, it is conceivable that dropping them did not affect the comprehension of perceived control towards NSS. SA_3 was a reversed item intended for system anxiety. As removing it would not affect face validity of the construct, it was also dropped.

[46] Nevertheless, PC_CC_1 and PC_CC_2 do not load on the same latent factor as the other items for perceived control. This may be due to the fact that perceived control has three theoretical dimensions as we defined, and the cognitive control dimension does not necessarily load with other dimensions demonstrating characteristics of formative dimensions. In order to capture the differences between them, subsequent data analysis involved separate examination on the different dimensions of perceived control (PCONTROL_CC and PCONTROL_DCBC).

8.3.2 Analysis of Variance Tests and Hypotheses Testing

The nature of the task used in the experiment created a situation in which negotiators attempted to maximize their joint outcome rather than merely maximize their individual scores. Thus, cooperative atmosphere was generally achieved for all negotiators (mean = 5.06 out of 7). Moreover, negotiators in low-conflict treatments generally perceived significantly higher collaborative atmosphere (mean = 5.39) than those in the high-conflict treatments (mean = 4.72) ($F=9.77$, $p=0.002^{**}$). This suggested that the manipulation of conflict level was effectively perceived by the subjects in different treatment conditions.

Prior to analysis of variance tests, descriptive statistics and profile plots are generated (see Appendix B.3). Two-way Multivariate ANOVA (MANOVA) tests were performed to investigate the proposed main and interaction effects of system intelligence level and conflict level. MANOVA was selected because it could test multiple dependent variables simultaneously while keep track of their correlation with each other. In addition, MANOVA could protect against type I error rate inflation if the dependent variables were correlated[47]. Homogeneity of Variances tests were conducted in order to examine if the assumption of analysis of variance tests can be met. Details of Two-Way MANOVA tests are presented in Appendix B.4.

The results show main effect of system type on joint outcome, satisfaction with settlement (and the perceived efficiency dimension), and perceived control (and the decisional and behavioral control dimensions), main effect of conflict level on all dependent variables except for perceived control (and its dimensions). Significant interaction effects were detected on negotiation time, and perceived collaborative atmosphere. Table 8-1 summarizes the results of the Two-Way MANOVA tests.

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[47] ANOVA tests on each of the dependent variables were also performed. The results are indifferent with those obtained from MANOVA tests.

Table 8-1. Summary of Two-Way MANOVA Results

Dependent Variables	Interaction Effect	Main Effects	
		Level of Conflict	System Intelligence Level
1. Joint Outcome	NO (F=1.28, P=.283)	F=1705.27, P=.000**	F=3.51, P=.034*
2. Contract Balance	NO (F=1.28, P=.283)	F=4.53, P=.036*	F=2.31, P=.104
3. Negotiation Time	YES (F=15.45, P=.000**)	F=6.60, P=.012*	F=1.89, P=.156
4. Satisfaction	NO (F=.59, P=.554)	F=12.92, P=.000**	F=3.82, P=.025*
- Perceived Efficiency	NO (F=.88, P=.419)	F=14.43, P=.000**	F=6.51, P=.002**
- Perceived Fairness	NO (F=.61, P=.548)	F=6.66, P=.011*	F=0.45, P=.637
5. Perceived Collaborative Atmosphere	YES (F=5.67, P=.005**)	F=9.77, P=.002**	F=0.41, P=.666
6. Perceived Control	NO (F=1.01, P=.368)	F=2.70, P=0.103	F=6.86, P=.002**
- Cognitive Control	NO (F=0.37, P=.692)	F=4.43, P=.038	F=0.69, P=.502
- Decisional and Behavioral Control	NO (F=1.11, P=.335)	F=1.67, P=.200	F=9.49, P=.000**
7. System Anxiety	NO (F=0.77, P=.466)	F=13.63, P=.000**	F=2.40, P=.096

(* denotes p<.05, ** denotes p<.01)

Hypotheses were mainly tested using contrast tests based on Two-Way MANOVA outputs where system type has main effect, and based on One-way ANOVA for each conflict levels where interaction effects are significant (details on hypotheses testing are presented in Appendix B.5). Although multiple statistical tests on a set of data may increase the vulnerability of the test to Type I errors, Coakes and Steed (2000) suggest that performing one less comparison than the number of levels of the independent variables is permitted to control the familywise error rate. Table 8-2 summarizes the cell means, standard deviations as well as results of hypotheses testing.

Table 8-2. Summary of Results on Hypotheses Testing (Experiment 4)

Dependent Variables	Conflict Level	System Intelligence Level Mean (Standard Deviation)			Hypotheses	P-Value
		Level-1	Level-2	Level-3		
Joint Outcome	Low	127.20 (3.33)	126.11 (3.89)	129.33 (4.14)	H8-1a: Level-3 > Level-1 H8-1b: Level-3 > Level-2	>.05 >.05
	High	101.30 (2.20)	101.38 (4.05)	102.10 (1.86)	H8-1a: Level-3 = Level-1 H8-1b: Level-3 = Level-2	>.05 >.05
Contract Balance	Low	11.80 (8.23)	6.33 (6.36)	6.89 (7.25)	H8-2a: Level-3 < Level-1 H8-2b: Level-3 < Level-2	>.05 >.05

	High	6.00 (5.75)	5.00 (9.22)	5.50 (5.01)	H8-2a: Level-3 = Level-1 H8-2b: Level-3 = Level-2	>.05 >.05
Negotiation Time	Low	28.85 (10.03)	54.77 (18.77)	40.14 (10.65)	H8-3a: Level-3 > Level-1 H8-3b: Level-3 < Level-2	.005** .021*
	High	54.80 (18.02)	42.26 (16.31)	48.36 (13.17)	H8-3c: Level-3 < Level-1 H8-3d: Level-3 < Level-2	>.05 >.05
Satisfaction with Settlement	Both	5.27 (1.16)	4.53 (1.52)	5.08 (1.18)	H8-4a: Level-3 > Level-1 H8-4b: Level-3 > Level-2	>.05 .030*^
Perceived Collaborative Atmosphere	Low	5.79 (0.87)	5.00 (0.92)	5.33 (0.81)	H8-5a: Level-3 = Level-1 H8-5b: Level-2 = Level-1	.214 .013*
	High	4.21 (1.35)	4.97 (5.04)	5.04 (1.24)	H8-5a: Level-3 > Level-1 H8-5b: Level-2 > Level-1	.045* .082
Perceived Control	Both	5.22 (0.88)	4.16 (1.46)	4.69 (1.32)	H8-6a: Level-3 < Level-1 H8-6b: Level-3 > Level-2	.042*^ >.05
System Anxiety	Both	2.43 (1.32)	2.68 (1.27)	3.03 (1.19)	H8-7: Level-3 > Level-1 H8-7: Level-3 < Level-2	.031* >.05

* denotes p<.05, ** denotes p<.01

^ Significant effects are observed on Perceived Efficiency (for Satisfaction with Settlement) and on Decisional and Behavioral Control dimensions (for Perceived Control).

A linear regression test on perceived control and system anxiety was conducted to investigate if there was any main effect between them. The results indicate that the level of anxiety is negatively related to perceived control (Beta = -0.468).

Post-hoc multiple comparisons tests as shown in Table B-13 and Table B-16 are analyzed to detect possible significant effects that are not hypothesized a priori. Tukey HSD test and Games-Howell test are chosen for situations where homogeneity of variances can or cannot be assumed. The results are discussed along dependent variables where significant effect is detected.

8.4 DISCUSSION

8.4.1 Joint Outcome and Contract Balance

The differences between Level-3 versus Level-1 systems (likewise between Level-3 Vs. Level-2 systems) have not proved to be significant in **both conflict settings**. Plausible explanations may

be found in the design of the three systems. First of all, all of the three systems employed information processing technologies and electronic communication tool to support negotiations. Thus, the differences in joint outcomes and contract balances among these three systems may not be as significant as those between NSS and non-NSS.

Furthermore, the alternative generator of the Level-1 system was developed to return the best three optimal agreements with the highest joint outcome and lowest contract balance, based on negotiators' own issue ratings and their estimation of opponents' preferences. Although it was hypothesized to face the risk of erroneous predictions, the online text-messaging tool may arguably just offset this risk by allowing negotiators to communicate and learn from each other's interests. Nevertheless, both of the Level-2 and Level-3 systems used simple concession-based negotiation tactics, although differing in the availability of learning mechanisms and personality features. According to Jennings et al.'s (2001) study, agents playing monotonic concession protocol will reach agreement on a deal that is Pareto optimal. The monotonic concession protocol means that negotiation proceeds in a sequence of rounds, where at every round each agent puts forward a proposal. If the proposals do not overlap, then negotiation proceeds to a further round, where the agents either make a concession or else put forward the proposal they made on the preceding round. The concession-based negotiation tactic built into the two agent-based NSS in this study was actually monotonic; negotiators using these two agent-based NSS can achieve comparable performance with those using the Level-1 system. The capability that negotiators with agent-based systems can achieve comparably outcomes in terms of efficiency and fairness with those supported by NSS speaks for the feasibility of agents in performing moderately structured negotiation tasks.

8.4.2 Time to Settlement

As predicted in H8-3a and H8-3b, the Level-2 system yielded the longest time to settlement, and then followed by the Level-3 and the Level-1 system in the **low-conflict** treatments. This result

confirms that the use of more sophisticated technology tended to extend the decision time (Dennis et al., 1988; Foroughi et al., 1995). Nevertheless, it casts doubts on the efficiency of adopting simple concession-based negotiation tactics for the agent-based NSS in the low-conflict negotiation context. As agent with fixed strategy of concession always started with the highest self utility points, and then conceded bit by bit by proposing a series of contracts with diminishing values. This would probably lead to the time wastage in the early stage of the negotiation process. However, this needs to be confirmed by future studies on agent-based NSS built-in with other flexible negotiation tactics.

In the **high-conflict** treatments, results indicate no significant differences in negotiation time among the three systems. The non-significant difference in negotiation time may be due to the built-in concession-based negotiation tactic as discussed above. Arguably, it was also likely that the result was an artifact of users' unfamiliarity with the agent-based NSS used in the experiment study. Although trainings are conducted for users to understand the functionalities in each treatment, the relative novel features and its underlying mechanisms (especially for Level-3 system) can be harder for users to comprehend. Ongoing use of the NSS could still possibly reduce the negotiation time (Lim and Benbasat, 1993), and this needs to be confirmed by future studies where negotiators' familiarity with the NSS used in the experiment is ensured beforehand.

8.4.3 Satisfaction with Settlement

Measured from the perceived efficiency dimension, negotiators with the Level-3 system were more satisfied with the settlement than those with the Level-2 system as hypothesized in H8-4b. However, negotiators with the Level-3 system were comparably satisfied as those with the Level-1 system (H8-4a). Furthermore, our analysis showed that negotiators with the fully automated Level-2 system perceived lowest level of efficiency towards the system, albeit the fact that all the three systems have led to compared outcomes in terms of efficiency and fairness.

The disparity of actual performance and users' perceived performance is consistent with findings in IS literature. The result that negotiators perceived lowest efficiency with Level-2 system implies that total automation, despite its similar level of efficiency and effectiveness compared to traditional negotiation support tools, would not be the optimal design for NSS as people may not be able to perceive its capability. Arguably, the negotiation task employed in the experiment might be relatively undemanding for cognitive processing, which causes the agent-based NSS to be under-appreciated by users. When users are confronted with a more complicated task involving more issues with tremendous cognitive effort beyond the capability of human negotiators, people may better appreciate agent-based systems (Level-3 and Level-2 compared to Level-1) that help to automate the negotiation process. Another possible reason pertains to the relative unfamiliarity of negotiation support systems. While allowing more control and adaptability, Level-3 system also demonstrated a relative difficulty to comprehend its underlying mechanisms. If users can not fully appreciate the sophisticated built-in features, there is almost no difference between system Level-3 and system Level-2 in spite of the enhanced design features.

Our analysis highlighted another noteworthy point – the perceived fairness dimension of satisfaction was insignificant across different system type treatments. This implies that negotiators' perceptions towards the notion of fairness may not be adequately captured by the system artifacts. In order words, perceived fairness shall not be regarded as direct dependent variables in NSS studies. Its variances may be due to other psychological variables reflecting the process of negotiations, which deserves further investigations in future studies.

Negotiators who have been satisfied with negotiation settlements in early encounters are likely to approach future contacts with positive attitudes, thus improving their performance in the long run (Delaney et al., 1997). Therefore, improving satisfaction is extremely crucial for the future design of agent-based NSS and factors that contribute to user satisfaction in negotiation settings needs to be further explored.

8.4.4 Perceived Collaborative Atmosphere

Results show that in **high-conflict** situation, negotiators with agent-based systems (Level-3 and Level-2) perceived a friendlier atmosphere than non-agent-based Level-1 system (supporting H8-5a and H8-5b)[48]. This result provided important evidence that NSS with certain degrees of process automation could deescalate the conflict and depersonalize the negotiation atmosphere, thereby creating better collaborative atmosphere in distributive negotiation as we hypothesized.

Our data analysis also suggested that in **low-conflict** situation, negotiators using non-agent-based Level-1 system perceived greater collaborative atmosphere than agent-based system in this circumstance (post-hoc analysis showed that Level-1 and Level-2 is significantly differed at p=0.023 level). In the low-conflict treatments, as negotiators' preferences for the four issues were not pitted directly against each other, there were not many conflicts involved and trade-offs are available. Therefore, negotiators supported by decision making functions only (Level-1 system) would have perceived the positive collaborative mood during their encounters with their opponents, other than those supported with autonomous agents. The result implies an interesting observation: agent-based systems that assert a great deal of automation of negotiation process can *moderate* or *balance* the effect of the level of conflict. When the conflict of interests is high, the agents communicate on behalf of human negotiators and thus avoid direct confrontation between the negotiating parties; when conflict is low, negotiators would not realize degree of cooperation of their opponents. Future research shall look into this interesting phenomenon in order to confirm the potential benefits of agent-based NSS in promoting friendliness and minimizing negative atmosphere catered for different conflict settings.

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[48] There difference between level-3 and level-1 system is significant at $p<0.05$; level-2 and level-1 is marginally significant ($p=0.082$).

8.4.5 Perceived Control

In line with H8-6a, Level-1 NSS with decision support focus result in higher perceived control (mean=5.22) than Level-3 agent-based NSS with personality features (mean=4.69). Post-hoc analysis showed that negotiators using Level-1 system also perceived significantly higher control than Level-2 system (mean=4.16). From a human-centric perspective of system design, being blocked away from the decision making process causes people to feel a loss of control. The automation feature of ENS will significantly lower users' perception towards their capability to control the negotiation process. Psychology research also suggests that as control is the general motive for human activities, losing motive may result in a negative relation towards the final outcome. This is an important message to researchers interested in system design. It is again implied that total automation, despite its efficiency and effectiveness, is not the optimal design for NSS when people desire a self control for negotiation activities.

However, the data also reveal that users did not perceive higher control over Level-3 system with personality and learning features than Level-2 agent-based NSS without personality; H8-6b is not supported. Possible reasons may lie in the relatively *undemanding* negotiation task. The task comprises four issues of interests that generate total of 728 contract alternatives. Arguably, this might be a relatively not-so-complex task for cognitive processing, which causes the agent-based systems to be under-appreciated by users. When users are confronted with a more complicated task involving more issues with tremendous cognitive effort beyond the capability of human negotiators, people may better appreciate Level-3 system that help to better approach the negotiation process with situated strategy and control the process. Another possible reason is users' relative unfamiliarity of negotiation support systems. Allowing more control and adaptability, Level-3 also demonstrated a relative difficulty to comprehend its underlying mechanisms. If users can not fully appreciate the features associated with Level-3 system, there stands little difference between Level-3 and Level-2 system in spite of the enhancement of design.

Our analysis highlighted that the cognitive control dimension of perceived control towards systems was insignificant across different system type treatments. This may be explained by the demographic analysis of our study's sample. The sample is based on university students who are in computing-related major. The relative high computer self-efficacy and experiences may for these subjects make cognitive differences between them insignificant. In order words, the decisional and behavioral dimensions showed to be more sensitive to the treatment effects of system types. Future studies should be extended to more diverse sample to capture the variability of all three theoretical dimensions of perceived control.

8.4.6 System Anxiety

Negotiators using Level-3 system reported significantly higher level of anxiety towards the system (mean=2.43) than those using Level-1 system (mean=2.43), whereas no significant differences were observed between Level-3 and Level-2, Level-1 and Level-2 systems. Perceived control can be used as an intermediate psychological variable to explain these effects. As users with Level-3 system experienced lower level of control, they felt more anxious during the negotiation process working with the system compared to those with Level-1 system leaving more control to users. The negative relationship between perceived control and system anxiety asserted and in line with the psychology literature supported the interpretation of results. The model explains the effects of system artifacts over human perception during the negotiation process, which is believed to enhance the current development to understand NSS effectiveness from socio-emotional perspective.

System anxiety is an important psychological attitude that would affect negotiators' performance including achieving win-win solutions and greater satisfaction. Better understanding and assessing this variable may help to diminish a negative effect caused by system. Understanding the psychological effects due to alternate system designs will contribute to better the design for next-generation e-Negotiation systems involving agent technologies.

8.5 CONTRIBUTIONS AND LIMITATIONS

The study investigates the joint impact of system intelligence level and conflict level on negotiation outcomes measuring from economic effectiveness and efficiency as well as psychological values. With alternate designs and empirical examinations incorporating agent-based negotiation, substantive findings and implications were drawn. New insights, which are previously not provided in the literature, suggest valuable and instructive to subsequent research on the design of agent-based NSS.

With the increasing possibility that negotiation agents are used to support B2B negotiations, the design and evaluation of agent-based ENS offer a fertile area of research. Starke and Rangaswamy (2000) suggest that NSS are intended to assist negotiators in negotiating effectively and a measure of the effectiveness of NSS may be defined as the degree to which NSS increases the likelihood of enabling a Pareto-efficient contract while satisfying other criteria, e.g., minimized contract imbalance. Consistent with Goh et al.'s (2000) findings, we suggest that agent-based NSS can save human negotiators' effort without jeopardizing the negotiation outcomes, particularly, joint outcome and contract balance. However, the possibility that the use of NSS can reduce the negotiation time (Lim and Benbasat, 1993) still needs to be confirmed. Thus, researchers and practitioners interested in agent-based NSS ought to investigate more on the negotiation tactics and machine-learning mechanisms that can be practically implemented into the systems to achieve better performances, i.e., greater outcome efficiency and equality (joint outcome and contract balance) and process efficiency (negotiation time).

Secondly, as negotiators' perceptions may differ substantially from objective negotiation economic analyses (Thompson and Hastie, 1990), the insights gained from how different intelligence levels of NSS affect psychological measures of negotiation outcomes will help NSS designers to better the future design of negotiation agents. The issue of locus of control needs to be concisely addressed as it has a potential impact on negotiators' behaviors and attitudes. From a

human-centric perspective, full automation may not be the final goal for the design of NSS. More useful and sophisticated personality features, which can enable a better representation of negotiators' preferences and strategies, are desirable for advanced agent-based system design, so as to achieve a level of satisfaction comparable to, if not better than, that of the fundamental NSS.

This study has also captured an empirical investigation of perceived control in assessing the effect of the e-Negotiation systems per se. It produces a parsimonious eight-item measurement from three dimensions of control studied in psychology literature, which is to better situate perceived control in the realm of NSS research. With a better understanding on perceived control from users' perspective, the design and implementation of NSS can be directed to focus on the intrinsic needs of the negotiators.

The findings of this study are limited in the following. First, we continue to use the same task developed by Jones (1988) which was studied in a series of NSS experiments. The use of same task in NSS literature allows consistent comparison of research findings. However, the task is relatively structured and is limited to represent cognitive demanding negotiation scenarios in real life negotiations. This has also resulted that the superiority of advanced system designs over simper ones may not be manifested in our study. Second, our sample demographic analysis suggested that the subjects demonstrated a relatively high level of computer experiences and self-efficacy. The findings of our study may be limited to more diverse and larger sample where negotiators may have different levels of computer skills. Finally, the strategies used for agent-based systems in our study are tied with the underlying research model assuming equal bargaining power of the negotiating parties with adequate time to reach agreements. Adaptation to these strategies should be made to cater for other negotiation situations, in the presence of unequal bargaining power and/or time limit.

CHAPTER 9 THE CURRENT STATE AND FUTURE OF E-NEGOTIATIONS IN E-MARKETPLACES

Consider a generic business negotiation scenario in today's global marketplace: a supplier company and a buyer company in a certain industry need to identify each other, make initial contact, and prepare to negotiate an agreement. The companies are geographically dispersed and face-to-face meetings may be costly. They have Internet access and a moderate level of knowledge in computer and communication technologies. How can Internet-based e-Negotiation systems be designed to cater for the negotiation needs in such general business pursuits? Figure 9-1 depicts the basic architecture/setting of the fifth research arena that was identified in Section 1.1. This chapter presents research efforts which explore how e-Negotiations can be designed to contribute to the growth of present-day B2B e-marketplaces, in addressing the third research objective of this dissertation.

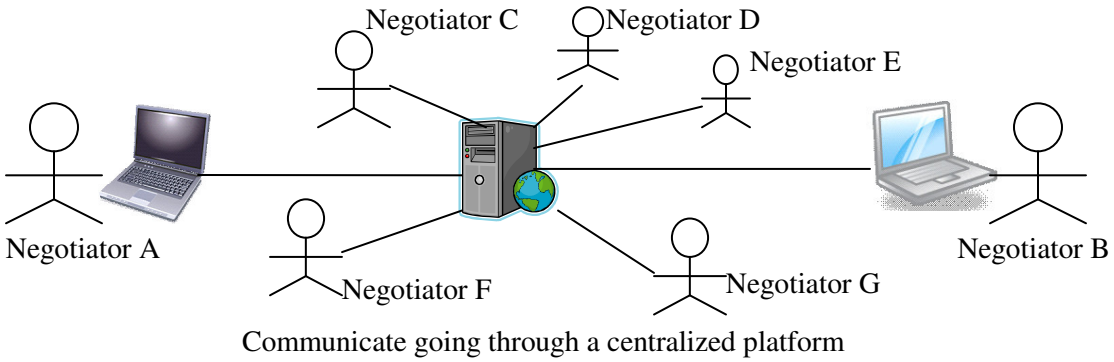

Figure 9-1. ENS Architecture for Negotiations in e-Marketplaces

Supporting negotiation activities in B2B e-marketplaces directly pertains to the collective contributions of e-Negotiation technologies. While various e-marketplace websites have emerged and launched support functions to facilitate buyer/seller trading (e.g., Alibaba.com's *TradeManager*), negotiation support features are rarely incorporated. The relatively poor awareness of NSS/ENS technologies and its slow adoption in industry does not quite agree with

the academic research effort of three decades towards the design and implementation of computer-supported negotiations tools. This discrepancy partly accounts for the recent surge in research aimed at a better understanding of NSS adoption issues. Earlier attempts involved utilizing IT acceptance theories to explore the use of standalone NSSs (Lim, 2003; Lee et al., 2007). More recently, several studies (Köhne et al., 2003; Vetschera et al., 2006; Turel and Yuan, 2007; Kersten et al., 2007) have attempted to study this interesting phenomenon by addressing more NSS-specific and novel factors in NSS adoption. For instance, Turel and Yuan (2007) have proposed studying the "perceived intention of the negotiation partner" in the e-Negotiations context, a topic which has not been explored in technology acceptance studies generally. Vetschera et al. (2006) and Kersten et al. (2007) conducted exploratory and confirmatory studies on user assessment with the Inspire system. Culture, gender and system features were highlighted in their empirical findings.

Although understanding of NSS acceptance has undoubtedly advanced beyond general technology adoption, several important questions remain unaddressed. To acquire a fuller perspective of the pertinent issues, extensive research in the form of longitudinal studies combining qualitative and quantitative examinations is required. The conceptual and empirical work presented in this chapter represents very initial attempts in meeting this objective. Specifically, it aims to extend our understanding of existing literature and the findings of laboratory studies to a greater and relevant context in which e-Negotiation technologies can be applied.

9.1 OVERVIEW OF COMMERCIAL NEGOTIATION SERVICES AND PACKAGES

We begin our quest by reviewing existing negotiation-related commercial packages. A growing number of commercial e-Negotiations services have emerged in the market in recent years, with some commercial e-Negotiation services based on prototypes intended initially for research

purposes, e.g., the SmartSettle software based on a NSS research prototype of ICANS (Thiessen and Loucks, 1994; Thiessen et al., 1998). Table 9-1 summarizes negotiations services that have appeared as commercial packages in different categories, as an update and extension of the summary of Yuan and Turel (2004).

Table 9-1. Commercial Negotiation Services and Packages

Service Types	Package and Descriptions	URL
Training and Consultation	WinSquared	**www.winxwin.com**
	WinSquared is negotiation software that offers a systematic guide to help negotiators communication effectively, reach agreement and obtain cooperation.	
	NegotiationEdge	**www.negotiatingedge.com**
	The Negotiating Edge is a global consulting company that provides training and consulting services in negotiation, sales negotiation, project management negotiation, negotiation for purchasers, persuasion and influence skills, cross-cultural negotiation, and conflict resolution as well as targeted programs for negotiators.	
	ICN	**www.dobetterdeals.com**
	International Computer Negotiations (ICN) is a consulting organization, dedicated to helping technology professionals get the best deals possible when negotiating with suppliers. ICN has the Managed Acquisition Process™ to allow clients to manage negotiation.	
	The Negotiation Institute	**www.negotiation.com/**
	The Negotiation Institute, Inc. is located in New York. It provides customized training for the art and the success of negotiation	
	Program on Negotiation, Harvard University	**www.pon.harvard.edu/**
	This web site provides information about the research and education program on negotiation at the Law School of Harvard University.	
Contract Management	Contract Management Solutions	**www.cmsi.com**
	Contract Management Solutions provides web-based contract management software and solutions that encompass the entire contract life-cycle including contract negotiations.	
	UpsideContract	**www.upsidecontract.com**
	UpsideContract is contract management software that offers a fully automated web-enabled contract management process, including contract negotiations. UpsideContract is provided by Upside Software Inc. located in Edmonton, Alberta, Canada.	
	WinSquared	**http://www.winxwin.com/**
	Win² is negotiation software help negotiators' in terms of communicating, reaching agreement and obtaining cooperation. Using a database of more than 600 techniques, Win² analyzes the facts of users' negotiation situation and recommends practical approaches for exchanging information, making proposals and gaining concurrence.	
Mediation and Arbitration	Internet Neutral	**www.internetneutral.com**
	Internet Neutral administrates the mediation process. Internet Neutral has developed a standard mandatory mediation clause, which can be easily inserted into a commercial	

	contract. To prepare mediation, a mediation agreement has to be signed by the parties involved and the mediation is scheduled and conducted jointly or privately through email, instant message, chatting room or videoconferencing.	
	NovaForum	**www.novaforum.com**
	Novaforum is an online arbitration service that offers businesses ways to resolve legal conflicts online with a verdict guaranteed within 72 hours. The company piloted 200 online cases from January to June 2000 before its beta site was launched. Due to the voluntary nature of the service (both parties must agree to participate), rates of compliance with NovaForum's solutions are higher than other forms of judgment.	
	Online Resolution	**www.onlineresolution.com**
	Online Resolution provides three types of dispute resolution services including online negotiation, mediation and arbitration. It also sells Resolution Room, a licensed secure online groupware, to dispute resolution professionals for their private practices.	
	CyberSettle	**www.cybersettle.com**
	CyberSettle is an online system that supports users to negotiate insurance claims over the Web. The parties follow a well-defined protocol to guide the negotiations between insurer and claimant.	
	Square Trade	**www.squaretrade.com**
	The SquareTrade Online Dispute Resolution Service (ODR) is a fast and convenient way for parties anywhere in the world to resolve issues that have arisen over online transactions. During ODR, parties work together to resolve problems within the SquareTrade system quickly, either independently using our Direct Negotiation tool, through mediation, or through arbitration. The Online Dispute Resolution service is web-based and capable of handling disputes between parties based in different countries.	
Negotiation Support	All Settle	**www.allsettle.com**
	Allsettle is an automated Internet dispute resolution service for a single value settlement. Claimants and Claims Adjusters can make and continuously adjust confidential demands and offers in order to reach a settlement.	
	SmartSettle	**www.smartsettle.com**
	SmartSettle, by ICAN Systems Inc., is a secure negotiation support system using optimization to produce fair and efficient solutions based on negotiators' private preferences. SmartSettle provides analytical support which has its roots in decision and negotiation analysis in order to guide negotiating parties towards Pareto-optimal frontier. This system is extended from a web-based research prototype ICANS (Thiessen and Loucks, 1994; Thiessen et al., 1998).	
E-marketplace (focus on electronic "market" function; match and facilitate big pool of buyers and sellers, so full range of activities that e-marketplace can support range from sourcing and matching, negotiation, settlement, as	LiveExchange	**www.moai.com**
	LiveExchange™, by **Moai Technologies, Inc**. (founded in 1996 at San Francisco, CA), focuses on providing strategic sourcing solutions to deliver global reach and increased supplier competition to corporations and net market makers. Similar to EcommBuilder, LiveExchange also provides process-oriented negotiation support capable in handling multi-issue and multi-stage negotiations. Moai is allied with Accenture.	
	Ozro Negotiate (formerly EcommBuilder)	**www.ozro.com** (formerly www.tradeaccess.com) (The site is no longer publicly accessible.)
	EcommBuilder™, a proprietary negotiation platform by **TradeAccess(R) Inc.** (founded in 1998 at Cambridge, MA.), is launched in 2000 to handle business processes involved in negotiating commercial relationships. EcommBuilder provides process-oriented negotiation support capable in handling multi-issue and multi-stage negotiations. TradeAccess changes name to **Ozro Inc.** in March 2001. Ozro itself offers the means to	

<table>
<tr><td rowspan="5">well as delivery)</td><td colspan="2">the middle path through its patented Negotiation technology, Ozro Negotiate™, that provides iterative multivariate negotiation solution and provide easy connectivity to enterprise data and third-party applications.
Source: http://www.eyedeas.net/clients/ozro/aboutus/factsheet.cfm</td></tr>
<tr><td>Square Trade</td><td>www.squaretrade.com</td></tr>
<tr><td colspan="2">SquareTrade provides web-based tools for parties to resolve dispute in auction through direct online negotiation, mediation or arbitration.
SquareTrade is allied with eBay.</td></tr>
<tr><td>TradeManager (Alitalk)</td><td>www.alibaba.com</td></tr>
<tr><td colspan="2">TradeManager (Alitalk), developed by Alibaba.com, is an in-house developed tool to facilitate buyer-seller communications. The features include multimedia communication, file transfer, and contact management etc.</td></tr>
</table>

9.2 E-NEGOTIATIONS IN B2B E-MARKETPLACES

Interest in e-Negotiation in industry has grown exponentially since the late 1990s, possibly as a consequence of the globalization of the world's economy; the rapid penetration rate of the Internet in both developing and developed countries; the advance of information and communication technologies; the swift advance in Internet users' online communication skills; and the growth of e-commerce and e-marketplaces. In this section we will examine how e-Negotiations can be linked to the current development of e-marketplaces.

The increase in B2B transactions over the Internet has been phenomenal. The total value of global commerce was estimated to have exceeded US$50 trillion by 2005, with as much as 10% of transactions being conducted online, according to various analysts. With the latest developments in the B2B e-marketplace, there is great potential for online intermediaries to match suppliers and buyers involving tens of thousands of small and medium size enterprises (SMEs) globally.

In a general sense, markets (electronic or otherwise) serve three main functions: to match buyers and sellers, facilitate transactions, and provide the institutional infrastructure for business (Bakos, 1998). In traditional marketplaces, *intermediaries* are the ones who provide trading infrastructure (such as a sales network) and manage the complexity of matching buyers' and sellers' needs; they can enable, to different extents, the completion of a transaction (Turban et al., 2002). Mediated

transactions use an outside, third-party intermediary to provide some assistance to at least one party in one or more commercial functions. In contrast, unmediated transactions require the buyer and supplier to determine their needs, locate each other, negotiate, and for both to settle directly.

The introduction of Internet and e-commerce has resulted in the automation of many tasks provided by intermediaries. While some traditional agents may have vanished, others have survived, or will even prosper. The key here is whether the new mediators are bringing *value* to the changed paradigms. New intermediaries are in a position to provide a variety of value-added services, to both suppliers and buyers, which may more than offset the negative effects of the additional costs that intermediation is supposed to introduce into the value chain (Giaglis et al., 2002). Based on Bakos' (1998) work, Giagilis et al. (2002) outlined the potential values that intermediation can provide (see Table 9-2). Such value-added services require an integrated approach. For instance, a well serviced travel package which takes care of the entire trip, including buying tickets for high-season concert shows, is likely to attract customers to remain with travel agencies offering such packages instead of switching to other less expensive, less integrated tour packages.

Table 9-2. Potential Value-Added Roles of Intermediaries

Market function	Sub-functions (Bakos, 1998)	Potential added value of intermediation (Giaglis et al., 2002)	Functions currently adopted?*
Matching buyers and sellers	Determination of product offerings	Intermediaries receive market signals and pass them on to sellers, allowing them to configure an improved product mix.	YES
	Searching	Intermediaries can reduce search costs for both sellers and buyers by providing a 'one-stop shop' for information gathering, advertising and transaction management.	YES
	Price discovery	Intermediaries can generate the necessary liquidity for smooth market operation and in certain cases (e.g. auctions) may even provide the infrastructural mechanism for price discovery.	YES
Facilitation of transactions	Logistics	Intermediaries can achieve economies of scale and scope for logistical operations more easily than individual sellers can.	NO

	Settlement	Intermediaries facilitate, monitor and guarantee the settlement transactions.	NO
	Trust	Intermediaries guarantee to sellers and buyers the non-opportunistic behavior of other market participants	Moderate
Institutional infrastructure	Legal	Intermediaries (usually governments and international bodies) provide the legal basis for market operation.	NO
	Regulatory	Intermediaries provide mechanism for the enforcement of legal, ethical, and behavioral rules in markets.	NO

* Three websites that lead China's trading e-marketplaces are examined: Alibaba (www.alibaba.com), Global Sources (www.globalsources.com) and Hong Kong Trade Development Council (www.tdctrade.com)

A similar idea may be extended to online intermediaries including B2B e-marketplaces. E-marketplaces[49] rely on advanced use of IT to perform essentially the same functions as traditional markets, albeit with increased efficiency and reduced transaction costs (Malone et al., 1987). In contrast with the company-centric models which utilize e-procurement systems, e-marketplace models typically involve online intermediaries which serve multiple buyer and supplier companies. The revenue of e-marketplace websites mainly comes from annual membership fees, transaction fees (flat or percentage), fees for value-added services, and advertisement income. Figure 9-2 illustrates three major many-to-many B2B models which vary in terms of the sophistication of market functions: from simple catalog-based exchanges, to B2B portals with facilitation functions, and to sophisticated dynamic exchanges[50].

[49] The term *e-marketplaces* is also referred to as *exchanges, e-markets, trading communities, trading exchanges, exchange hubs, Internet exchange, B2B portals*, and many others with a variety of functions (Turban et al., 2002).

[50] In this specification, the characteristics of a B2B dynamic exchanges is considered a highly sophisticated type of e-marketplace, which can be matched to the first two market functions identified by Bakos (1998).

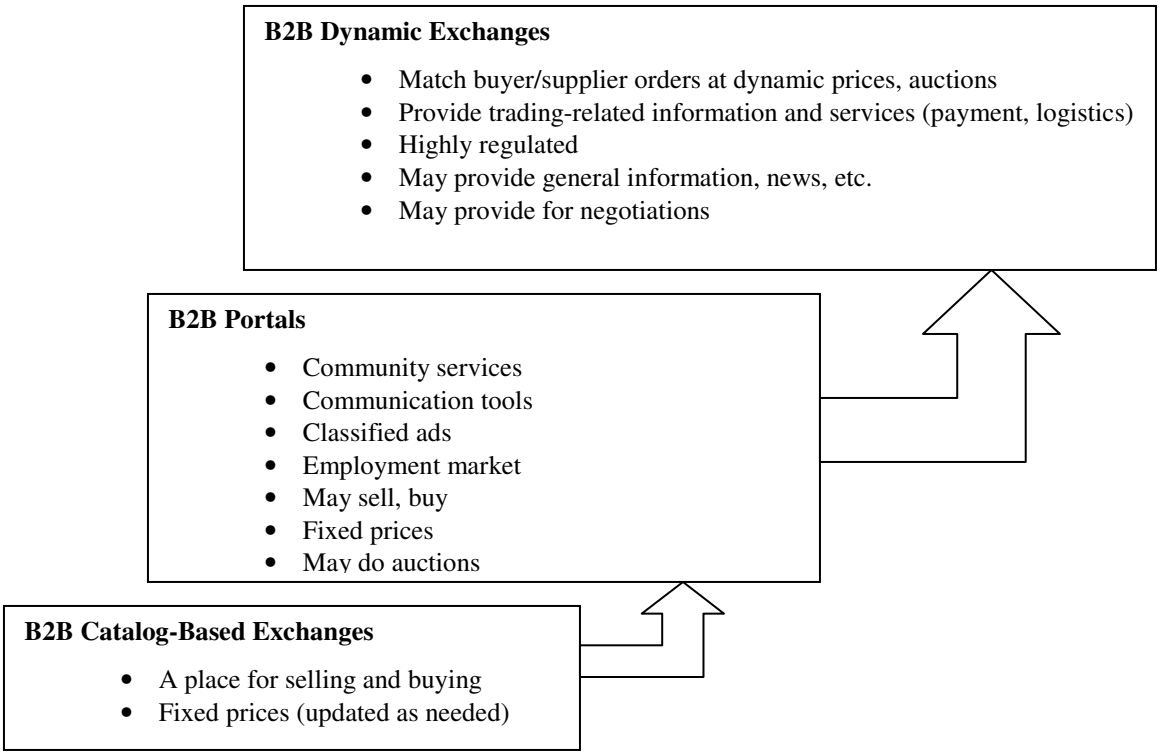

Figure 9-2. Many-to-Many B2B Models and Their Characteristics (Turban et al., 2002)

9.3 AN EXPLORATORY STUDY ON PERCEPTIONS OF E-NEGOTIATIONS IN CHINA'S B2B E-MARKETPLACES[51]

In the past decades, the rapid growth of China's economy has put the country in the forefront of most of the world's Internet companies. This section illustrates the current status and growth opportunities of e-Negotiations in the China online market, which represent one of the most active entities in the world economy. In this dissertation, an exploratory field study was carried out to discover a comprehensive list of technological and social-psychological factors leading to negotiators' intention to use e-Negotiations services.

[51] The field study, as a joint work with other contributors, has appeared in the proceedings of *Group Decision and Negotiation 2007: GDN2007*, Montreal, Canada, 14-17 May, 2007.

9.3.1 Background

While e-commerce is changing the way companies all over the world conduct business, the viability and advantages of having a B2B e-marketplace in the Chinese context are significant for at least two trading parties: 1) for the domestic *suppliers,* especially the small manufacturing, private companies; and 2) the global *buyers* abroad. By acting as global trade intermediaries, e-marketplace sites are allowing many SMEs to reach far wider markets and to compete directly with larger competitors. At the same time, with a relatively low-cost labor market as well as the Chinese government's willingness to facilitate foreign investment that result in an ever-improving infrastructure, China is poised to consolidate its dominance in the manufacturing and exporting sectors. Her commitments to the World Trade Organization (WTO) with the promise of lower tariffs and increased foreign access to the Chinese market, have also fuelled the interest of global businesses in the country which implies foreign trade to China's manufacturers.

Sensing the great potential in linking up domestic suppliers in China and global purchasers, a number of B2B e-marketplace websites have been launched. Alibaba.com, based in mainland China, is one of the dominant e-marketplace websites that are emerged during the dotcom era. Its main commitment in matching Chinese suppliers and global buyers has seen competition from traditional import/export intermediaries that also utilize the Internet channel (e.g., the Hong Kong-based company, Global Sources, which has a 36-year experience in the import/export industry). At the same time, similar online catalogs have been put up by websites initiated by city-level government/trading authorities such as tdctrade.com (the Hong Kong Trade Development Council) and ebusiness.cantonfair.org.cn (the China Foreign Trade Centre).

Not all trading activities and processes, however, have been effectively supported in existing e-marketplaces that assume intermediary roles. Initially, fixed-price or *single-issue* (auction)[52]

[52] Auction is considered a simplified form of negotiation, featuring a single issue on *price*.

systems attracted much attention owning to e-market development effort (e.g., eBay, Yahoo! Auctions, and Amazon Auctions). Nevertheless, as the complexity of closing a deal increased with multiple issues (e.g., price, purchase quantities, warranty periods, and delivery terms), m*ultiple-issue* negotiations that were commonplace in real-world business transactions required more sophisticated support. When multiple negotiation issues exist, there is more room for integrative, win-win solutions as well as opportunities for the use of computer support tools to help structure and facilitate negotiations between buyers and suppliers. Apparently, consolidation and strong competition exist in the e-marketplace industry.

Millions of users, who may be concurrently subscribing to more than one e-marketplace site, have witnessed very fierce competition in the online intermediary industry targeting the China segment. The majority of e-marketplaces have since evolved from "catalog-based exchanges" to higher-stage B2B business models characterized by the "B2B portals" (see Figure 9-2). One of the active e-marketplace players, Alibaba, has already positioned itself as reaching the "B2B dynamic exchanges" model. The site provides extended trading-related information such as industry news and trading tutorials, an instant communication tool for buyers and sellers to contact each other (*TradeManager*), and payment services (*Alipay*). However, its current practices have not reached the full comprehensiveness of the "B2B dynamic exchanges" model. At present, users are still seen to seek other means to make initial contact (through phone calls, emails, and other instant messaging tools such as MSN Messenger), negotiate, and make deals with each other. None of the e-marketplace websites that we have examined so far have attended to these unsupported areas.

This gap provides potential for more integrated services, such as more effective communication, negotiation support, and post-negotiation settlements, which represent emerging areas and opportunities for e-marketplace growth. At the conceptual level, we envisage further investigations on the understanding of e-marketplace industry and suggest viable negotiation

support facilities to enhance the functions offered by e-marketplace websites, destined towards an integrated seamless web-based trading environment.

9.3.2 Research Approach

The participating SMEs in e-marketplace websites represent a large pool of potential users who could adopt advanced trading services, such as negotiation tools for decision support, communication and automation. We chose to interview participants on China's B2B e-marketplace website. It was stressed earlier that there are two important reasons for studying the practices of e-marketplaces targeting the Chinese market. First, in recent years, the rapid growth of China's economy has attracted an ever-increasing number of Internet companies, including e-marketplace intermediaries. The online matchmaking services are especially pertinent to China's international trading transactions: they open doors for global buyers to meet a large number of domestic manufacturers who supply attractive products, and at the same time provide local businesses with access to previously inaccessible foreign markets.

Second, many NSS adoption studies tend to be characterized by a North American perspective, while in actual practice trading companies continually adapt to new circumstances and varying cultural contexts. The insights and perspectives from the East will produce potentially new and useful knowledge.

In this exploratory work, twelve companies which participated in two large international trade exhibitions were studied. The exhibitions are held in spring and fall every year in Hong Kong, and are organized by an e-marketplace website as well as Hong Kong SAR's local government separately. Each of the exhibitions attracts thousands of suppliers from China as well as more than 30,000 global purchasers. We have randomly approached twelve companies for focused interviews on research in e-Negotiations adoption. A general architecture for the e-Negotiation systems was presented to interviewees, as well as descriptions of a typical NSS prototype with a

screenshot that included a messenger (as electronic communication channel) and decision support tool (see Appendix C.1). We incorporated a list of possible ENS functions and features, namely multilingual interface design, automatic documentation, and negotiation agents. Then we asked for the respondents' comments on the attractiveness of each function. Guiding Questions used in the Interviews (Translated from Chinese) are:

a. What do you think of the e-Negotiation systems (as described earlier)? Would you use the system once it is implemented and made available in e-marketplace websites?

b. Do you think the following features can help in terms of the system's usability?

- Multilingual Interface such as Chinese-English Translation
- Contract Documentation
- Mediation from e-Marketplace Websites
- Automatic Negotiation using Intelligent Agents

c. Please illustrate any concerns your company may have in adopting the system.

The interviews were not limited to seeking answers to the above questions; In fact, general and more elaborated comments were also recorded. Mandarin was the language used in our data collection.

9.3.3 Results

Appendix C.2 records the wide range of issues that concerned the managers when they were asked to consider accepting e-Negotiation functions offered by e-marketplace websites. We analyzed the trends of the concerns and synthesized revealed factors into a research framework on ENS adoption (see Figure 9-3). The factors for four categories were identified as system characteristics, negotiation characteristics, as well as institutional and situational characteristics. They were proposed to correlate with perceived system effectiveness and trust beliefs, which jointly determine a company's intention to adopt e-Negotiation systems. Propositions were

related to each relationship and derived with brief justification from the data analysis and relevant literature[53].

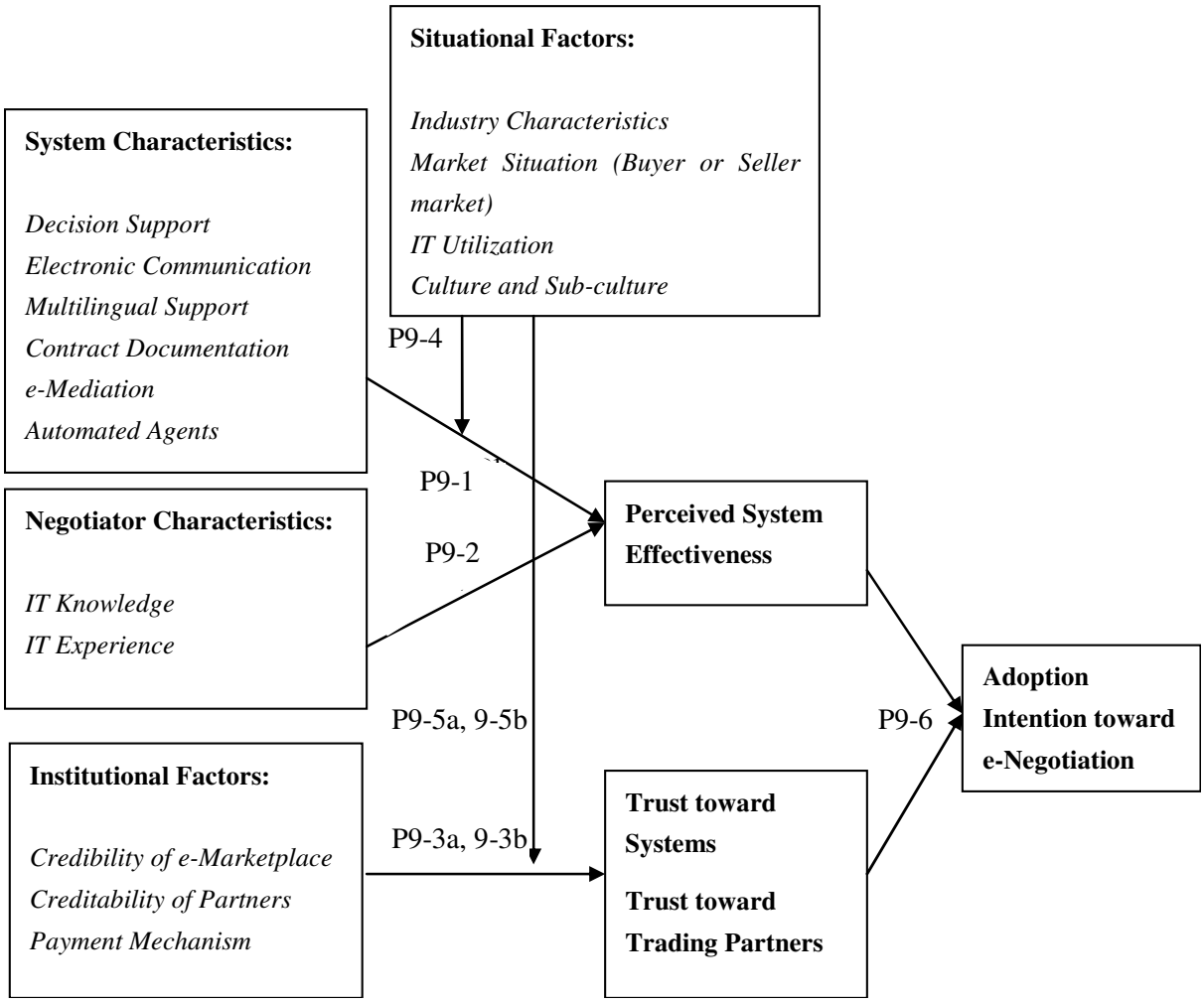

Figure 9-3. Proposed Research Framework for ENS Adoptions

9.3.3.1 System Characteristics and Perceived System Effectiveness

System characteristics have been decomposed into various functionalities that e-Negotiation systems can incorporate, namely decision support, electronic communication and multimedia,

[53] The framework and propositions are preliminary and high level in nature. It deserves future efforts to underpin them to lower level research models and hypotheses that are empirically examinable.

multilingual support, contract documentation, e-mediation (escrow or dispute resolution performed by e-marketplace websites), and automated agents. Not surprisingly, the basic characteristics or features of the system are the underlying artifacts that affect users' attitudes toward them. From our field study, the sales manager in Case 2 indicated that: "I might be willing to use the system, depending on the performance of the DSS component if it is accurate." Moreover, the sales manager in Case 2 showed great interest in NSS functions such as multilingual support, contract drafting and e-market mediation. Additionally, the sales manager in Case 3 implied that: "If the mediation role is assumed by the e-marketplace that we currently subscribe to, we may consider adopting it." Overall, because the system characteristics were in favor of the sales manager in Case 3, a very positive attitude was revealed towards the effectiveness of e-Negotiation systems. Based on these findings and in line with NSS acceptance literature, we posit:

Proposition 9-1: *The different system characteristics and functions affect the effectiveness of e-Negotiation Systems as perceived by negotiators.*

9.3.3.2 Negotiator's Characteristics and Perceived System Effectiveness

Individual traits have long been the subject of interest of psychologists studying negotiation problems. Users' demographics such as age, gender and general experience (Taylor and Todd, 1995; Venkatesh et al., 2003; Kersten et al., 2007) are not manifested to be critical characteristics in our observed data. This may be due to the relative small pool of interviewees who may represent a group who are dominantly young, male and relatively experienced sales managers.

IT experience and IT knowledge are however found to be salient user characteristics that are related to positive attitudes towards NSS technologies. Quite a number of our cases reported negative feelings toward the multilingual support function due to previous negative experiences in using translation software (e.g., cases 3 and 4). In addition, the interviewee in Case 7

questioned the efficiency of the ENS system and particularly felt skeptical in using it because of his previous experience with the limited network bandwidth.

Proposition 9-2: *Negotiators' IT experience and knowledge are positively related to their beliefs on the effectiveness of e-Negotiation systems.*

9.3.3.3 Institutional Factors and Trust in e-Negotiation Systems and Trading Partners

Trust is one party's belief that the other party will take action to honor agreements that have been reached (Wilson and Moller, 1991). Recent e-commerce literature has also centered on building effective electronic marketplaces with institution-based trust (McKnight et al., 2002; Pavlou and Gefen, 2004; Gefen and Pavlou, 2006). Institutional mechanisms include feedback features, escrow services and credit card guarantees that are created by third parties (or intermediaries) to facilitate transaction success. Pavlou and Gefen (2004) proposed that users' perceived effectiveness of feedback mechanism, of escrow services, and of credit card guarantees, as well as of trust in intermediaries consist of "institutional structures". These four constructs correlate to trust and perceived risk towards the community of sellers.

In this proposed framework, we differentiate between the potential adopters' trust beliefs towards the e-Negotiation system itself and towards the trading partners. Quite a number of the cases we studied highlighted trust issues regarding the credibility of e-marketplaces, owing to the fact that the e-marketplace is a third party mediating between the buyer and seller (cases 4 and 10). In our data analysis, it was found that there was no trust issue between clients with established relationships (Case 1). In contrast, trust is a main concern if the client is not an acquaintance, in particular, when the client is from a foreign country (cases 1, 6, 7, and 12). The interviewee in Case 10 found it "hard to build up trust with clients if communication and negotiation are undertaken by using only a computer" (Case 10). The underlying reason is that the existing trading system cannot really protect the sellers though contracts were signed. In addition, some

interviewees revealed that international lawsuits were too expensive and time-consuming (cases 3, 4, and 9).

Proposition 9-3a: *Trust towards e-Negotiation systems is related to the perceived credibility of e-marketplaces (system providers) and the perceived reliability of payment mechanisms.*

Apart from institutional trust, interpersonal trust in the traditional dyadic (one-to-one) sense has been understood as belief that the seller/or buyer will behave in accordance with the consumer's confident expectations by showing ability, integrity, and benevolence (see Doney and Cannon, 1997; Luhmann, 1979). Trust building between two trading partners is a difficult process, especially in an Internet environment (Case 4). In fact, the interviewee in Case 7 felt that buyers from the Internet were less trustworthy. From an e-marketplace perspective, both seller and buyer are customers; and this may cause distrust if a seller does not trust the e-marketplace to take on the mediation role properly (Case 9).

Companies are always willing to do business with established, creditable partners. The credibility of new potential business partners, especially those from the Internet, is difficult to assess. Hence, mechanisms have been implemented to establish branding effects and trust for well-trusted companies (e.g., "premium suppliers" and "VIP buyers" schemes in Alibaba.com). Besides, new clients can enhance their credibility by agreeing to use certain reliable payment mechanisms (as in cases 2 and 12). The interviewee in Case 2 felt that "payment is another major concern in international trading; and this is even more crucial than the price". On its part, the interviewee in Case 3 preferred a letter of certificate issued by a bank when dealing with new clients, while it was willing to accept telegraphic transfer for established clients.

Proposition 9-3b: *Trust towards trading partners is related to the perceived credibility of e-marketplaces (system providers), the perceived creditability of partners, and the perceived reliability of payment mechanisms.*

9.3.3.4 The Moderating Role of Situational Factors

Companies in different industries tend to have different attitudes towards e-Negotiation Systems. For instance, the interviewee in Case 1 pointed out that an element of physical touch for their products should be emphasized, that in logo-printing, which was their primary business, customization was necessary for most of their buyers who were mainly supermarkets and department stores. Thus it was not feasible for them to participate in online product exhibition. Consequently, the e-Negotiation system was not perceived as useful in her opinion. By contrast, the interviewee in Case 11 dealt with professional audio systems which were standardized in industry, and hence considered web-based categories as suitable and relatively sufficient.

Proposition 9-4: *The relationship between system characteristics and perceived effectiveness of e-Negotiation systems is moderated by the industry characteristics associated with the company, the market situation, its IT utilization, and its culture and sub-culture.*

A company's utilization of IT, reflected in the existence of its company website presence and the use of other enterprise level systems, demonstrates a level of acceptance of IT by that company in general. Hence such higher utilization of IT may lead to higher trust beliefs towards the e-Negotiation systems.

Proposition 9-5a: *The relationship stated in Proposition 9-3a is moderated by a company's utilization of IT and cultural/sub-cultural orientations.*

Culture is believed to have a profound impact on how people in the marketplace perceive, behave and communicate. In almost all cultures, trust provides the foundation upon which both parties to a negotiation can work together. However, negotiators from some cultures trust that opposing parties will fulfill their obligations because there is a signed contract and the sanction of law to back it up, while negotiators from other cultures trust that the opposing party will fulfill their obligations because of the relationship that exists between them (Bird and Metcalf, 2003). When the negotiation is taking place in a western context where the legal system is relatively

established and mature, the governmental agencies are viewed as providing an adequate, reliable, and effective underpinning for commercial transactions. It can be a very different scenario for negotiations in countries with relatively less mature legal systems. Here, negotiators trust the opposing parties because they have invested in a relationship that has been built up over time, and they believe that the opposing parties are committed to it. The relationship between the parties is what really matters; the contract is simply a symbol of the bond between the parties who drafted it (Victor, 1992). Consequently, less emphasis is placed on detailed, written contracts. In our interview, the interviewees in cases 4 and 9 revealed that the "contract is merely a form"; and "even if the buyer breaks the contract, we wouldn't go to court as it is too complicated and expensive. We would rather bear the expenses".

Proposition 9-5b: *The relationship stated in Proposition 9-3b is moderated by cultural/sub-cultural orientations.*

9.3.3.5 Determinants of Adoption Intention of e-Negotiations

In the proposed framework, adoption intention is a joint result of technological factors (perceived system effectiveness and Trust towards Systems) as well as trust towards trading partners. We found that the effectiveness of systems was highlighted almost by almost all our case companies, which suggests that technology effectiveness and efficiency are still a major concern for companies regarding adopting novel systems. Trust beliefs in the system (as a result of institutional mechanisms) and towards the trading partners are particularly crucial in practitioners' acceptance decisions on e-Negotiations functions. We suggest that the research framework addressing NSS adoption factors should include the three key constructs in the framework, especially trust beliefs in the system and towards partners, which have not been extensively examined in earlier empirical studies.

Proposition 9-6: *Perceived effectiveness of e-Negotiation systems and trust beliefs towards e-Negotiation systems and buyers determine a company's intention to adopt e-Negotiation systems.*

9.3.4 Discussion and Remarks

It is unquestionably interesting as well as important for researchers and practitioners alike to understand the key determinants of a company's intention to adopt ENS technologies. This study contributes to an ongoing effort in the ENS-research community: in a particular culture of interests, how and why e-Negotiations are deemed effective and trustworthy; and the key factors leading to companies' adoption intentions. Specifically, we hold that the key factors fall into four important categories: *system characteristics, negotiator characteristics,* as well as *institutional* and *situational characteristics.* The factors interplay as antecedents to users' beliefs towards system effectiveness, and trust towards using the system. The effectiveness of e-Negotiation systems and trust beliefs are major determinants of users' intentions to adopt Negotiation Support functions in e-marketplaces.

Indeed, the adoption of ENS in today's e-marketplaces is a complex and timely research issue. The derived research framework and propositions in this study are rather preliminary and high level in nature; they deserve further theoretical and empirical underpinnings. Confirmatory studies utilizing large-scale surveys of SMEs participating in e-marketplaces is an area for future study. Accumulatively, the utilization of strengths from both qualitative and quantitative approaches and culture-orientated data collection will provide relevant and deeper insights into unanswered questions, as well as achieve generalizability to intended populations.

CHAPTER 10 CONCLUDING REMARKS

10.1 SUMMARY OF FINDINGS

This dissertation looks into a particular business phenomenon, i.e., negotiation, and investigates effects of various computer-based systems that are designed to enhance negotiation process and outcomes. A theoretical research framework was built aiming to clearly classify three key functionalities of ENSs and to define appropriate metrics that can assess the quality and efficacy of the ENS artifact on negotiation process and outcomes, in which both economic and social-psychological perspectives are applied as our theoretical lens. In this dissertation, different methodologies were leveraged in order to acquire a holistic understanding of the joint impact of ENS technologies and their social-psychological complications.

With regard to the three ENS categories as well as their sub-classifications, a series of laboratory experiments were carried out to examine the effects of different configurations of technological features and level of conflict on negotiation outcomes. Furthermore, in order to acquire rich, contemporary knowledge on industry perceptions towards ENS technologies, we studied the collective use of ENS technologies in an emerging business environment in the B2B e-marketplace. Due to the exploratory nature of this quest, field interviews were conducted based on a status quo analysis of existing e-Negotiations packages in commercial settings. Collectively, our research findings and insights are summarized as follows.

First, it was found that under controlled experiment settings, especially under a low conflict level, decision support tools (used in pre-negotiation and negotiation stages) can generally help negotiators to achieve higher joint outcomes, while pre-negotiation and multilingual support tools (when used together with DSSs) help to create more equal contracts. Negotiators supported by all extra system artifacts tended to spend more time to reach agreement than unsupported ones.

Second, alternate designs of negotiation agents, compared with decision support tools, do not significantly vary in terms of the economic aspects of negotiation process and outcomes; however, there is a significant interaction effect due to system intelligence level and conflict level on negotiators' perceived collaborative atmosphere. Furthermore, system intelligence level has significant main effect on negotiators' satisfaction with negotiated settlement and on perceived control towards the system, where the latter would be the underlying psychological cause that results in different levels of user anxiety towards the system. Additionally, the use of autonomous negotiation agents can help to alleviate the negative aspects of social-psychological perceptions in high-conflict situations.

Third, the potential for e-Negotiation technologies is promising, especially in emerging new contexts such as B2B electronic marketplaces. Our exploratory field study highlighted important technological, individual and institutional factors leading to the adoption of ENS. Among others, system characteristics, trust beliefs, and cultural mechanisms are deemed critical factors leading to successful adoption of ENS in today's e-marketplaces.

10.2 IMPLICATIONS AND RECOMMENDATIONS

Before e-Negotiations can be largely adopted in industry and add value to the growth of B2B electronic marketplaces, a number of socio-technological issues ought to be addressed through empirical tests and finer-grained theoretical underpinnings.

This dissertation contributes to e-Negotiation research and practices in the following ways. Primarily, it conceptually classifies three key technological aspects of e-Negotiation systems. The experimental studies involving all the three system designs in this dissertation provide an enriched spectrum of theoretical and empirical insights in terms of e-Negotiation design and use, which in turn make our findings more pertinent and generalizable to ENS research and practice communities. The human aspect of computer-based negotiation support and the dynamics

between users and ENS are deemed the keys to developing a highly relevant and comprehensive theory to advance our understanding of ENS success. While we discussed the implications particular to each study in chapters 5 to 9, the synthesizing insights brought about by the empirical studies were presented following three perspectives, i.e., in terms of theories, ENS designers, and in terms of e-marketplace stakeholders.

Implications for Theoretical Development. ENSs differ significantly in their design objectives and functionalities, such as the improvement of task clarity and increase of salience of certain negotiation issues, the elimination of communication barriers, as well as automation of the negotiation process. The differing designs will provide markedly different consequences on negotiation process and outcomes. It is of immense theoretical interest to understand the specific manner in which a certain ENS influences cognition, behavior of its users and their performances.

Existing literature suggests mixed effects due to ENS technologies on negotiation process and outcomes. This dissertation contributes to the theoretical development of ENSs by conceptualizing three key categories of ENS functionalities: group decision support, multimedia communication support, and agent-based automation. We further examined the three important technological aspects for e-Negotiation systems by looking at DSS technologies based on the different negotiation stages they support, at EC channels differing in social-oriented and task-oriented purposes, as well as at agents technologies distinguished by their intelligence levels in automating the negotiation process.

The effects of ENS technologies are assessed from multiple dimensions in terms of negotiation process and outcomes, and consisting of economic measures on efficiency, fairness and time to settlement as well as social-psychological perceptions on satisfaction and on the collaborative atmosphere. We believe that this multi-dimensional assessment provides a reasonable and meaningful way to triangulate the notion of “negotiation quality”, which can be used to evaluate the efficacy of ENS functionalities. The findings contribute towards understanding in which

specific manner e-Negotiations will affect the negotiators' performance and perceptions, towards a finer-grained theoretical model of ENSs. Moreover, the results in comparing different ENS design concepts widen our knowledge of ENSs by analyzing how various system artifacts influence users' cognition and behavior which subsequently enhance the efficiency and efficacy of negotiations, following the suggestion by Starke and Rangaswamy (2000).

Implications for ENS Design and Development. It has been discussed in this dissertation that multi-issue negotiations common in the business world require sophisticated support involving decision and communication support technologies. When negotiations take place electronically in an e-commerce setting, a wider range of as well as more complex forms of technologies are necessitated for computer-based negotiations to be effective and successful. Consistent with ENS literature, the findings of this dissertation emphasize the significant opportunities for computer technologies to help people and firms to achieve superior settlements in appropriate settings.

Nevertheless, ENS developers need to be cautious that it is unwise to simply including all seemingly useful features into an ENS without careful integration. As Ramesh and Kannan (2001) argued, a major impediment to the adoption of negotiation support systems is that they are often developed as stand-alone applications and do not seamlessly integrate with tools used in everyday work processes. With the popularity of instant messaging in today's workplaces, the ENS developer may consider integrating ENS features into the already available communication software wherever appropriate.

Implications for e-Market Stakeholders. From the perspective of online intermediaries, negotiation support is an element that will need to be built into the next generation of e-marketplaces. Some service providers, such as Moai Technology's *CompleteSource* software package, already have this function available in their current service offerings. Intermediaries that integrate negotiation facilitation function will have a significant competitive advantage over e-markets that do not (Raisch, 2001). Our field study with e-market participants highlights the

expressive needs for effective negotiation support in online businesses. For intermediaries to survive and sustain in today's highly competitive e-marketplaces, more integrated functionalities should be built into their online platform or larger systems in order to sustain a critical mass of market participants for competitive advantage. The seamless integration of ENS technologies is envisioned to be the next significant area to contribute to the growth of e-marketplaces.

10.3 LIMITATIONS AND FUTURE RESEARCH

In concluding the experimental studies of this dissertation, we posit some higher-level methodological comments apart from the limitations stated in each study. First, MAUT-based approaches have had a wide impact on the design of existing DSS or agent-based negotiation systems including those in our studies. As an important enabling mechanism, all these systems are challenged by the inherent limitation of MAUT-based techniques centered on the elicitation of decision-makers' preferences. Preference elicitation, or more generally preference modeling, has been a topic of discussion ever since the early part of this century (von Neumann and Morgenstern, 1944). Nevertheless, preferences are difficult to measure and rationality is a scarce resource in real world settings (Simon, 1957). It will continually be a critical task for agent-based negotiation systems as agents must be parameterized with the negotiators' preferences before being delegated to the negotiation task for making decisions.

It is also noted by several scholars that the availability of background information together with a value point structure can reduce the level of experimental control that can be asserted (Korhonen et al., 1995; Teich et al., 2000). While we have adopted negotiation tasks consistent with previous literature that are derived from real-life negotiation scenarios (salary negotiation in Experiment 1 and manufacturer-supplier negotiation in experiments 2 to 4), there still exists a likelihood that our subjects could have followed their *personal* preferences by constructing their own point

structures other than the ones provided. This situation stimulates a realistic methodological challenge to the design of negotiation experiments.

The favorable results arising from ENS support in improving outcome efficiency have to be tempered by the realization that the assessment relies on certain conditions imposed by the experiment, including relatively structured task and negotiator preferences that remain unchanged over the course of a negotiation. These conditions might or might not be met in practice.

There are several possible areas for extending the work of this doctoral dissertation to greater breadth and depth in future research. First, it would be interesting to integrate a greater sense of human "control" into the design and implementation of automated negotiation engine. This involves deeper research on personalizing agents with more intelligent and flexible strategies. To improve our design of ENS for the ultimate adoption of human users, a good balance of system "flexibility" (giving certain control to users) and "efficiency" (having machine automation) needs to be built into the next-generation of agent-based e-Negotiation systems.

Second, in the emerging paradigm of service-oriented architecture that essentially views "IT as a service", automation of service delivery has been regarded as a key advancement which will be of great practical value. There is growing interest in investigating the use of negotiation agents to establish service level agreements efficiently and automatically. In this new paradigm, it will be an exciting challenge to apply and adapt existing ENS technologies to contribute to the design of an e-Negotiation engine for automating the entire process of IT service delivery.

Third, building functionalities to support buyers and suppliers' negotiation process is believed to be the next challenge as well as a key area for future growth of B2B e-marketplaces. Further research should be conducted in an extension to the exploratory study of ENS adoption carried out in this dissertation. Trust mechanisms and market efficiencies should be investigated as conditional factors to discovering institutional enablers for the success of ENS in e-marketplaces.

BIBLIOGRAPHY

Adams, J. S. (1963). “Towards an Understanding of Inequity”, *Journal of Abnormal and Social Psychology*, 67(5), pp. 422-436.

Adams, J. S. (1965). “Inequity in Social Exchange”, In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology*, Vol. 2. San Diego: Academic Press, pp. 267-300.

Aiken, M. (2002). “Multilingual Communication in Electronic Meetings”, *SIGGROUP Bulletin*, 23(1), pp. 18–19.

Aiken, M., Kim, D., Hwang, C. and Lu, L. C., (1995). “A Korean Group Decision Support System”, *Information and Management*, 28(5), pp. 303-310.

Aiken, M., Martin, J., Shirani, A. and Singleto, T., (1994). “A Group Decision Support System for Multicultural and Multilingual Communication”, *Decision Support Systems*, 12(2), pp. 93–96.

Aiken, M., Sloan, H., and Martin, J. (1998). "Using a Bilingual Group Support System", *Behaviour and Information Technology*, 17(3), pp. 141-144.

Anson, R., and Jelassi, M.T. (1990). “A Developmental Framework for Computer-Supported Conflict Resolution”, *European Journal of Operational Research*, 46(2), pp. 181-199.

Arunachalam, V. and Dilla, W.N. (1995). “Judgment Accuracy and Outcomes in Negotiation: A Causal Modeling Analysis of Decision-Aiding Effects”, *Organizational Behavior and Human Decision Processes*, 61, pp. 289-304.

Adler, N.J. and Graham, J.L. (1989). “Cross-cultural Interaction: The International Comparison Fallacy?”, *Journal of International Business Studies*, 20, pp. 515-537.

Albin, D. (1993). “The Role of Fairness in Negotiation", *Negotiation Journal*, 9, pp. 223-243.

Antrim, L.N. and Lax, D.A. (1987). "Support and Analysis for International Commercial Debt Negotiations", *Working Paper Series, WP-10, Program on the Processes of International Negotiation*, American Academy of Arts and Sciences, Cambridge, MA.

Averill, J.R. (1973). “Personal Control over Aversive Stimuli and Its Relationship to Stress”, *Psychological Bulletin*, 80, pp. 286-303.

Azjen, I. (1991). “Theory of Planned Behavior”, *Organizational Behavior and Human Decision Process*, 50, pp. 179-211.

Barry, B. and Friedman R A. (1998). “Bargainer Characteristics in Distributive and Integrative Negotiation”, *Journal of Personality and Social Psychology*, 74, pp. 345-359.

Bakos, Y. (1998). "The Emerging Role of Electronic Marketplaces on the Internet", *Communications of the ACM,* 41(8), pp. 35–42.

Bazerman, M.H. and Carroll, J.S. (1987). *Negotiator Cognition - Research in Organizational Behavior*, Greenwich, CT: JAI Press.

Bazerman, M.H., Magliozzi, T., and Neale, M.A. (1985). “Integrative Bargaining in a Competitive Market”, *Organizational Behavior and Human Decision Processes*, 34, pp. 294-313.

Bazerman, M.H., Mannix, E.A., and Thompson, L.L. (1988). "Groups as Mixed Motive Negotiations", In Lawler, E.J., and Markovsky, B. (Eds.), *Advances in Group Processes* (Vol. 5, pp. 195-216). Greenwich, CT: JAI Press.

Bazerman, M.H., and Neale, M.A. (1983). "Hueristics in Negotiation: Limitations to Effective Dispute Resolution", in *Negotiation in Organizations*, In Bazerman, M. and Lewicki, R. (Eds), Beverly Hills, CA: Sage.

Beam, C., and Segev, A. (1997). "Automated negotiations: a survey of the state of the art", *Wirtschaftsinformatik*, 39(3), pp. 263-268.

Benbasat, I., DeSanctis, G., and Nault, B.R. (1993). "Empirical Research in Managerial Support Systems: A Review and Assessment", in Holsapple, C.W., and Whinston, A.B. (Eds.), *Recent Developments in Decision Support Systems*, Springer Verlag, Berlin, Germany.

Bird, A., and Metcalf, L. (2003). "Integrating Twelve Dimensions of Negotiating Behavior and Hofstede's Work-Related Values: A Six-Country Comparison." in *Proceedings of The Seventh International Conference on Global Business and Economic Development*, Bangkok, Thailand, January 8-11, 2003, pp. 802-815.

Box, G.E.P. (1954). "Some theorems on quadratic forms applied in the study of analysis of variance problems." *Annals of Statistics*, 25: 290-302.

Braun, P., Brzostowski, J., Kersten, G., Kim, J. B., Kowalczyk, R., Strecker, S. (2006). "E-Negotiation Systems and Software Agents: Methods, Models, and Applications", In *J. Gupta, G. Forgionne, and M. Mora (Eds.), Intelligent Decision-Making Support Systems: Foundation, Applications, and Challenges*, London: Springer, 2006.

Brett, J., Barsness, Z., and Goldberg, S. (1996). "The Effectiveness of Mediation: An Independent Analysis of Cases Handled by Four Major Service Providers", *Negotiation Journal*, 12, pp. 259-269.

Brown, B.R. (1977). "Face-Saving and Face-Restoration in Negotiations", in D. Druckman (Ed.): *Negotiations: Social Psychological Perspectives*. Beverly Hills, CA: Sage Publications.

Brown, S.A., Fuller, R.M., and Vivian, C. (2004). "Who's Afraid of the Virtual World? Anxiety and Computer-Mediated Communication", *Journal of the Association for Information Systems*, 5(2), pp. 79-107.

Bui, T. X. (1992). "Building DSS for negotiators: a three–step design process", In Proceedings of the *25th Annual Hawaii International Conference on System Sciences*, Hawaii, U.S., 1992.

Bui, T.X. (1994). "Evaluating Negotiation Support Systems: A Conceptualization", In Proceedings of the *27th Annual Hawaii International Conference on System Sciences*, Hawaii, U.S., 1994.

Bui, T.X., and Shakun, M.F. (1996). "Negotiation Processes, Evolutionary Systems Design and Negotiator", *Group Decision and Negotiation*, 5, pp. 339-353.

Bui, T. X., and Shakun, M.F. (1997). "Negotiation Processes, Evolutionary systems Design, and Negotiator", In M.F. Shakun (Ed.), *Negotiation Processes: Modeling Frameworks and Information Technology*. Kluwer Academic Publishers, 39-55.

Bui, T.X. and Ondrus, J. (2003). "M-Computing for Real-Time Negotiation Support", In *Proceedings of 36th Hawaii International Conference on System Science*. Hawaii, U.S., 2003.

Carmel, E. and Herniter B.C. (1989). "MEDINASS: Conceptual Design of a System for Negotiation Sessions", In *Proceedings of the 9th International Conference on Decision Support Systems*, San Diego, CA, 1989, pp. 239-256.

Carnevale, P.J.D., and Isen, A M. (1986). "The influence of positive affect and visual access on the discovery of integrative solutions in bilateral negotiation", *Organizational behavior and Human Decision Processes*, 1986, 37, pp. 1-13.

Cellich, C., and Jain, S.C. (2004). *Global Business Negotiations: A Practical Guide*. South-Western, Mason, Ohio.

Chavez, A., and Maes, P., (1996). "Kasbah: An Agent Marketplace for Buying and Selling Goods", In *Proceedings of the First International Conference on the Practical Application of Intelligent Agents and Multi-Agent Technology*, pp. 75-90.

Chen, E., Kersten, G.E., and Vahidov, R. (2004). "Agent-Supported Negotiations on E-Marketplace", *International Journal of Electronic Business*, 3(1), pp. 28-49.

Chodorow, N. (1974). "Family Structure and Feminine Personality", *Women, Culture and Society*, in Rosaldo, M.Z. and Lamphere, L. (Eds), Stanford: Stanford University Press.

Chong, J.C., and Kelemen, M. (1995). *Cultural Competences: Managing Co-operatively Across Cultures*, London: Dartmouth Publishing.

Clayman, D.R. (1995). "Measures of Joint Performance in Dyadic Mixed-Motive Negotiations", *Organizational Behavior and Human Decision Processes*, 64(1), pp. 38-48.

Coehoorn, R.M., and Jennings, N.R. (2004). "Learning an Opponent's Preferences to Make Effective Multi-Issue Negotiation Trade-Offs", *6th International Conference on Electronic Commerce*, ACM, 2004, pp.59-68.

Contini, B., (1968). "The Value of Time in Bargaining Negotiations: Some Experimental Evidence", *The American Economic Review*, 58, pp. 374-393.

Corley, R., Black, R.L., and Reed, O.L. (1977). *The Legal Environment of Business* (4th Ed.). New York: McGraw-Hill.

Crable, E.A., Brodzinski, J.D., Scherer, R.F., and Jones, P.D. (1994). "The Impact of Cognitive Appraisal, Locus of Control and Level of Exposure on the Computer Anxiety of Novice Computer User", *Journal of Educational Computing Research*, 10(4), pp. 329-340.

Dawes, R.M. (1988). *Rational Choice in an Uncertain World*. New York:.Harcourt Brace Jovanovich.

Delaney, M.M., Foroughi, A., and Perkins, W.C. (1997). "An Empirical Study of the Efficacy of a Computerized Negotiation Support System (NSS)", *Decision Support Systems*, 20(3), pp. 185-197.

De Monte, B. (1987). *How to Do Business with the Japanese: a Complete Guide to Japanese Customs and Business*. Lincolnwood, Ill.: NTC Business Books.

Dennis, A.R., George, J.F., Jessup, L.M., Nunamaker, J.F. and Vogel, D.R., (1988). "Information Technology to Support Electronic Meetings", *MIS quarterly*, 12(4), December 1988, pp. 591–624.

DeSanctis, G. and Gallupe, R.B. (1987). "A Foundation for the Study of Group Decision Support Systems", *Management Science*, 33(5), pp. 589-609.

Deutsch, M. (1973). *The Resolution of Conflict*. New Haven, CT: Yale University Press.

Ditaranto, E. (2005). "Translating Culture", *Multilingual Computing and Technology*, 75, pp. 4546.

Doney, P.M., and Cannon, J.P. (1997). "An Examination of the Nature of Trust in Buyer-Seller Relationships", *Journal of Marketing*, 61(1), pp. 35-51.

Douglas, A. (1962). *Industrial peacemaking*. New York: Columbia University Press.

Druckman, D. (1996). "Is There a U.S. Negotiating Style?", *International Negotiation*, 1, pp. 327-334.

Einhorn, H., and Hogarth, R. (1978). "Confidence in Judgment: Persistence of the Illusion of Validity", *Psychology Review*, 85, pp. 395-416.

Eliashberg, J. Gauvin, S., Lilien, G.L., and Rangaswamy, A. (1992). "An Experimental Study of Alternative Preparation Aids for International Negotiations, *Group Decision and Negotiation*, 1, pp. 243-267.

Elkouri, F. and Elkouri, E. (1985). *How Arbitration Works* (4th Ed.). Washington, DC: BNA, Inc.

Erickson, B., Holmes, J., Frey, R., Walker, L., and Thibaut, J. (1974). "Functions of a Third Party in the Resolution of Conflict: The Role of a Judge in Pretrial Conferences", *Journal of Personality and Social Psychology*, 30, pp. 293-306.

Espinasse, B., Picolet, G., and Chouraqui (1997). "Negotiation Support Systems: A Multi-Creteria and Multi-Agent Approach", *European Journal of Operational Research*, 103, pp. 389-409.

Faley, T., and Tedeschi, J.T. (1971). "Status and Reactions to Threats", Journal of Personality and Social Psychology, 17, pp. 192-199.

Faratin, P., Sierra, C. and Jennings, N.R. (1998). "Negotiation Decision Functions for Autonomous Agents", *Robotics and Autonomous Systems* September, 24(3), pp. 159-182.

Faratin, P., Sierra, C. and Jennings, N.R. (2000). "Using Similarity Criteria to Make Negotiation Trade-Offs", *Proceedings of the 4th International Conference on Multi-Agent Systems*, 2000, pp. 01-19.

Farber, H.S. (1981). "Divergent Expectations, Threat Strategies, and Bargaining under Arbitration", Presented to the *Econometric Society*, San Diego, CA.

Fisher, R. and Ury W. (1981). *Getting to Yes: Negotiating Agreement without Giving In*. Boston: Houghton Mifflin.

Fisher, R., Ury, W. and Patton, B. (1991). *Getting to Yes: Negotiating Agreement without Giving In***.** 2nd Ed. New York, N.Y.: Penguin Books.

Fiske, A.P. (1991). *Structures of Social Life*. New York: The Free Press.

Foroughi, A. (1995). "A Survey of the Use of Computer Support for Negotiations", *Journal of Applied Business Research*, 11(4), pp. 121-134.

Foroughi, A. and Jelassi, M.T. (1990). "NSS Solutions to Major Negotiation Stumbling Blocks". In *23rd Annual Hawaii International Conference on System Sciences*, Hawaii, U.S., 1990.

Foroughi, A., Perkins, W.C., and Jelassi, M.T. (1995). "An Empirical Study of an Interactive, Session-oriented Computerized Negotiation Support System", Group Decision and Negotiation, 6(4), pp. 485-512.

Foroughi, A., Perkins, W. C., and Jessup, L.M. (2005). "A Comparison of Audio-Conferencing and Computer Conferencing in a Dispersed Negotiation Setting: Efficiency Matters!", *Journal of Organizational and End User Computing*, *17(3)*, pp. 1-26.

Foster, D.A. (1992). *Bargaining Across Borders: How to Negotiate Business Successfully Anywhere in the World*. New York: McGraw-Hill.

Fox, M.L., Dwyer, D.J., and Ganster, D.C. (1993). "Effects of Stressful Job Demands and Control on Physiological and Attitudinal Outcomes in a Hospital Setting", *Academy of Management Journal,* 36(2), pp. 289-318.

Fraser, N.M., and Hipel, K.M. (1981). "Computer Assistance in Labor-Management Negotiations", *Interfaces*, 11(2), pp. 22-29.

French, J.R.P., and Raven, B. (1959). "The Bases of Social Power", In Cartwright, D. (Ed.), *Studies in Social Power*. Ann Arbor, MI: Institute for Social Research.

Frese, M. (1987). "Theory of Control and Complexity: Implications for Software Design and Integration of Computer Systems into the Work Place", In *Psychological Issues of Human Computer Interaction in the Work Place*, Frese, M., Ulich, E., and Dzida, W. (Eds.), Elsevier Science Publishers: Holland.

Fulmer, I.S. and Barry, B. (2002). "The "Smart" Negotiator: Cognitive Ability and Emotional Intelligence In negotiation", In *Proceedings of the Fifteenth Conference of the International Association for Conflict Management*, Park City, Utah.

Gallupe, R.B. (1985), "The Impact of Task Difficulty on the Use of a Group Decision Support System", *Ph.D. Thesis*, University of Minnesota.

Gefen, D. and Pavlou, P.A. (2006). "The Moderating Role of Perceived Regulatory Effectiveness of Online Marketplaces on the Role of Trust and Risk on Transaction Intentions." in *Proceedings of 27th International Conferences of Information Systems (ICIS)*, Milwaukee, U.S., December 10-13, 2006.

Gelfand, M.J., and Christakopoulou, S. (1999). "Culture and Negotiator Cognition: Judgment Accuracy and Negotiation Processes in Individualistic and Collectivistic Cultures", *Organizational Behavior and Human Decision Processes*, 79, pp. 248-269.

George, J., Easton, G., Nunamaker, Jr. J.F., and Northcraft, G. (1990). "A Study of Collaborative Group Work with and without Computer-Based Support", *Information Systems Research*, 4, pp. 394-415.

Giaglis, G.M., Klein, S., and O'Keefe, R.M. (2002). "The Role of Intermediaries in Electronic Marketplaces: Developing a Contingency Model", *Information Systems Journal, 12(*3), pp. 231-246.

Goh, K.Y., Teo, H.H., Wu, H.X., and Wei, K.K. (2000). "Computer-Supported Negotiations: An Experimental Study of Bargaining in Electronic Commerce," In *Proceedings of the 21st Annual International Conference on Information Systems*, Brisbane, Australia, pp. 104-116.

Goul, M., Henderson, J.C., and Tonge, F.M. (1992), "The Emergence of Artificial Intelligence as a Reference Discipline for Decision Support Systems Research", *Decision Sciences*, 23(6), pp. 1263-1276.

Graham, J.L. (1984). "A Comparison of Japanese and American Business Negotiations", *International Journal of Research in Marketing*, 1, pp. 50-68.

Graham, J.L. (1985). "The Influence of Culture on the Process of Business Negotiations: An Exploratory Study", *Journal of International Business Studies*, 16, pp. 81-96.

Graham, J.L. (1993). "The Japanese Negotiation Style: Characteristics of a Distinct Approach", *Negotiation Journal*, 9, pp. 123-140.

Graham, J.L., and Mintu-Wimsat, A. (1997). "Culture's Influence on Business Negotiations in Four Countries", *Group Decision and Negotiation*, 6(5), pp. 483-502.

Graham, J.L., Mintu-Wimsat, A., and Rodgers, W. (1994). "Explorations of Negotiation Behaviors in Ten Cultures using a Model Developed in the United States", *Management Science*, 40(1), pp. 72-95.

Greenhalgh, L. (2001). *Managing Strategic Relationships*. New York: The Free Press.

Hamner, W.C. (1974). "Effects of Bargaining Strategy and Pressure to Reach Agreement in a Stalemated Negotiation", Journal of Personality and Social Psychology, 30, pp. 458-467.

Fraser, N.M., and Hipel, K.M. (1981). "Computer Assistance in Labor-Management Negotiations", *Interfaces*, 11(2), pp. 22-29.

Hair, J F., Anderson, R. E., Tatham, R. L., and Black, W. C. (1995). *Multivariate Data Analysis with Reading*. 4th Edition. Englewood Clffs, NJ: Prentice Hall.

Hausken, K. (1997). "Game-Theoretic and Behavioral Negotiation Theory", G*roup Decision and Negotiation*, 6, pp. 511-528.

Hiltrop, J.M., and Rubin, J.Z. (1981). "Position Loss and Image Loss in Bargaining", *Journal of Conflict Resolution*, 25, pp. 521-534.

Hofstede, G. (1989). "Cultural Predictors of National Negotiation Styles", In. F. Mautner-Markhof (Ed.), *Processes of international negotiations* (pp. 193-201). Boulder, CO: Westview Press.

Hofstede, G. (1991). *Cultures and Organizations*. Berkshire, England: McGraw-Hill.

Hofstede, G., and Bond, M.H. (1988). "The Confucian Connection: From Cultural Roots to Economic Growth", *Organizational Dynamics*, 16(4), pp. 4-21.

Holden, N. J. (1987). "The Development of the Concept of Communication Competence to Evaluate Industrial Firms' Performance in Cross-cultural Interactions", *R&D Management*, 17(2), pp.137-151.

Holsapple, C.W., Lai, H., and Whinston, A.B. (1996). Implications of Negotiation Theory for Research and Development of Negotiation Support Systems, *Group Decision and Negotiation, 6 (3)*, p. 255-274.

Holsapple, C.W., Lai, H., and Whinston, A.B. (1998). A Formal Basis for Negotiation Support System Research, *Group Decision and Negotiation, 7(3)*, p. 203-227.

Homans, G.C. (1961). *Social Behavior: Its Elementary Forms*. New York: Harcourt, Brace & World Co.

Huber, V., and Neale, M. (1986). "Effects of Cognitive Heuristics and Goals on Negotiator Performance and Subsequent Goal Setting", *Organizational Behavior and Human Decision Processes*, 38, pp. 342-365.

Huang P. and Sycara K. (2002). "A Computational Model for Online Agent Negotiation", *Proceedings of the 35th Hawaii International Conference on System Sciences*, Hawai, pp. 438-444.

Hung, P.C.K., Li, H., and Jeng, J-J. (2004). "WS-Negotiation: An Overview of Research Issues", In *Proceedings of the 37th Hawaii International Conference on System Sciences*. Hawaii, U.S., 2004.

Jarke, M. and Jelassi, M.T. (1986). "View Integration in Negotiation Support Systems", *Transactions of the Sixth International Conference on Decision Support Systems, Washington, DC*, pp. 180-188.

Jarke, M., Jelassi, M.T., and Shakun, M.F. (1987). "Mediator: Towards a Negotiation Support System", *European Journal of Operational Research*, 31(3), pp. 314-334.

Jelassi, M.T., and Foroughi, A. (1989). "Negotiation Support Systems: An Overview of Design Issues and Existing Software", *Decision Support Systems*, 5(2), pp. 167-181.

Jelassi, M.T., and Jones, B.H. (1988). "Getting to yes with NSS: How Computers Can Support Negotiations", In R.M. Lee, A.M. McCosh and P. Migliarese (Eds.), *Organizational Decision Support Systems*, Amsterdam: North Holland, pp. 75-85.

Joncour, N., Sinclair, K., and Bailey, M. (1994). "Computer Anxiety, Computer Experience and Self-Efficacy", In *Proceedings of Annual Conference of the Australian Association for Research in Education*, Newcastle, New South Wales, 1994.

Jones, B.H. (1988). "Analytical Mediation: an Empirical Examination of the Effects of Computer Support for Different Levels of Conflict in Two-Party Negotiation", *Unpublished Ph.D. dissertation*, Indiana University Graduate School of Business, Bloomington, Indiana.

Jonker, C., and Robu, V. (2004). "An Agent Architecture for Multi-Attribute Negotiation", In B.Nebel (Ed.). In *Proceedings of the 17th International Joint Conference on AI, IJCAI'01*, 2001, pp. 1195-1201.

Jonker, C.M., Robu, V., and Treur, J. (2007). "An Agent Architecture for Multi-Attribute Negotiation using Incomplete Preference Information", *Autonomous Agents and Multi-Agent Systems*, 15(2), pp. 221-252.

Kahneman, D., Knetsch, J. and Thaler, R. (1986). "Fairness and the Assumption of Economics", *Journal of Business*, 59, pp. 285-300.

Kahneman, D., Slovic, P., and Tversky, A. (1982). *Judgment under Uncertainty: Heuristics and Biases.* Cambridge, England: Cambridge University Press.

Kahneman, D., and Tversky, A. (1979). "Prospect Theory: An Analysis of Decisions under Risk", *Econometrica*, 47, pp. 263-291.

Karasek, R.A. (1979). "Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign", *Administrative Science Quarterly* (24), pp. 285-308.

Keeney, R., and Raiffa, H. (1991). "Structuring and Analyzing Values for Multiple-issue Negotiations", In H.P. Young (Ed.) *Negotiation Analysis* (Ann Arbor: University of Michigan Press), pp. 131-151.

Kelley, H.H. (1966). "A Classroom Study of the Dilemmas in Interpersonal Negotiations", In Archibald K. (Ed.), *Strategic Interaction and Conflict: Original Papers and Discussion*. Berkeley, CA: Institute of International Studies.

Kersten, G.E. (1985). "NEGO-Group Decision Support System", *Information and Management*, 8(5), pp. 237-246.

Kersten, G.E. (1987). "On Two Roles Decision Support Systems Can Play in Negotiations", *Information Processing & Management*, 23(6), pp. 605-614.

Kersten, G.E. (2003). "The Science and Engineering of e-Negotiation: an Introduction", In *Proceedings of 36th Hawaii International Conference on System Science*. Hawaii, U.S., 2003.

Kersten, G.E., Etezadi, J., Chen, E., and Vetschera, R. (2007). "User Assessment of E-negotiation Systems", *Proceedings of the 40th Hawaii International Conference on Systems Sciences,* Hawaii, U.S., 2007, pp. 1-9.

Kersten, G.E., and Lo, G. (2001). "Negotiation Support Systems and Software Agents in E-Business Negotiations", *The First International Conference on Electronic Business*, Hong Kong.

Kersten, G.E., and Lo, G. (2003). "Aspire: An Integrated Negotiation Support System and Software Agents for e-Business Negotiation", *International Journal of Internet and Enterprise Management*, 1(3).

Kersten, G.E., Michalowski, W., Cray, D., and Lee, I. (1991). "An Analytic Basis for Decision Support in Negotiations", *Naval Logistic Research*, 38, pp. 743-761.

Kersten, G.E., and Noronha, S.J. (1999). "WWW-Based Negotiation Support: Design, Implementation, and Use", *Decision Support Systems*, 25, pp. 135-154.

Kochan, T.A. (1980). *Collective Bargaining and Industrial Relations*. Homewood, IL: Richard D. Irwin.

Kohne, F., Schoop, M., and Staskiewicz, D. (2005). "An Empirical Investigation of The User Acceptance of Electronic Negotiation Support System Features", In *Proceedings of the European Conference on Information Systems (ECIS)*. Regensburg, Germany, 2005.

Korhonen, P., Oretskin, N., Teich, J. and Wallenius, J. (1995). „ The Impact of a Biased Starting Position in a Single Negotiation Text Type Mediation", *Group Decision and Negotiation*, 4, pp. 357-374.

Kramer, R.M. (1991). "The More the Merrier? Social Psychological Aspects of Multiparty Negotiations in Organizations", In Bazerman, M., Lewicki, R., and Sheppard, B.H., *Research on Negotiation in Organizations* (Vol. 3, pp. 307-332), Greenwich, CT: JAI Press.

Kray, L.J., Thompson, L, and Galinsky, A. (2001). "Battle of the Sexes: Gender Stereotype Confirmation and Reactance in Negotiations", *Journal of Personality and Social Psychology*, 80, pp. 942-958.

Lacey, H.M. (1979). "Control, Perceived Control, and the Methodological Role of Cognitive Constructs", in Perlmuter, L.C. and Monty, R.A. (Eds.), *Choice and Perceived Control*, Hillsdale, NJ: Lawrence Erbaumn Associates.

Lax, D.A., and Sebenius, J.K. (1986). The *Manager as Negotiator: Bargaining for Cooperation and Competitive Gain,* The Free Press, NY.

Lax, D.A., and Sebenius, J.K. (1987). "Measuring the Degree of Joint Gains Achieved by Negotiators", Unpublished Manuscript, Harvard University, Cambridge, MA.

Le Poole, S. (1989). "Negotiating with Clint Eastwood in Brussels", *Management Review*, 78, pp. 58-60.

Lee, K. C., Kang, I., and Kim, J. S. (2007). "Exploring the User Interface of Negotiation Support Systems from the User Acceptance Perspective", *Computers in Human Behavior*, 23, 2007, pp. 220-239.

Lewicki, R., and Litterer, J. (1985). *Negotiation*. Homewood, IL: Richard D. Irwin, Inc.

Lewicki, R.J., Saunders, D.M., and Minton, J.W., (1999), *Negotiation*. 3rd Ed Boston : Irwin/McGraw-Hill.

Li, J., and Cao, Y.D. (2004). "Bayesian Learning in Bilateral Multi-Issue Negotiation and Its Application in MAS-based Electronic Commerce", In *Proceedings of the IEEE/WIC/ACM International Conference on Intelligent Agent Technology*, 2004, pp. 437-440.

Lim, J.L.H. (1999). "Multi-Stage Negotiation Support: A Conceptual Framework", *Information and Software Technology*, 41(5), pp. 249-255.

Lim, J. (2000) An Experimental Investigation of the Impact of NSS and Proximity on Negotiation Outcomes", *Behavioral and Information Technology*, 19(5), pp.329-338.

Lim, J. (2003). "A Conceptual Framework on the Adoption of Negotiation Support Systems", *Information and Software Technology*, 45, pp. 469-477.

Lim, L.H. and Benbasat, I. (1993). "A theoretical perspective of negotiation support systems", *Journal of Management Information Systems, 9(3),* pp. 27-44.

Lim, S.G., and Murnighan, J.K. (1994). "Phases, Deadlines and the Bargaining Process", Organizational Behavior and Human Decision Processes, 58, pp. 153-171.

Lim, J. and Yang, Y.P. (2004). "Videoconferencing NSS and Conflict Level: An Experimental Study", In *Proceedings of the IFIP TC8 International Conference on Decision Support Systems: DSS2004*, Prato, Tuscany, Italy, 1-3 July 2004.

Lim, J. and Yang, Y.P. (2005). "Exploring Multilingual Negotiation Support for English-Chinese Dyads: An Experimental Study", In *Proceedings of the 38th Annual Hawaii International Conference on System Sciences: HICSS38*, IEEE Computer Society, Hawaii, United States, 3-6 January 2005.

Lim, J. and Yang, Y.P. (2007). "Enhancing Negotiators' Performance with Computer Support for Pre-Negotiation Preparation and Negotiation: An Experimental Investigation in an East Asian Context ", *Journal of Global Information Management*. 15(1), January-March 2007, pp. 18-42.

Lim, J. and Yang, Y.P. (2008). "Exploring Computer-Based Multilingual Negotiation Support for English-Chinese Dyads: Can We Negotiate in Our Native Languages?" *Behaviour & Information Technology*. Forthcoming.

Lomuscio, A.R., Wooldridge, M., and Jennings, N.R. (2001). A Classification Scheme for Negotiation in Electronic Commerce, *Agent-Mediated Electronic Commerce: A European Perspective. Springer Verlag*, pp. 19–33.

Lopes, F., Novais, A.Q., Mamede, N., and Coelho, H. (2001). "Negotiation Tactics for Autonomous Agents", *12th International Workshop on Database and Expert Systems Applications*, pp. 07-08.

Luhmann, N. (1979). *Trust and Power*. John Wiley and Sons: London, U.K.

Ma, Z.Z. and Jaeger, A. (2005). "Getting to Yes in China: Exploring Personality Effects in Chinese Negotiation Styles", *Group Decision and Negotiation,* 14, pp. 415-437.

McKnight, D.H., Choudhury, V., and Kacmar, C. (2002). "Developing and Validating Trust Measures for e-Commerce: An Integrative Typology", *Information Systems Research,* 13(3), September 2002, pp. 334-359.

Maes, P., Guttman, R.H., and Moukas, A.G. (1999). "Agents that Buy and Sell", *Communication of the ACM*, 42(3), pp. 81-91.

Marakas, G.M., Johnson, M.D., and Palmer, J.W. (2000). "A Theoretical Model of Differential Social Attributions Towards Computing Technology: When the Metaphor Becomes the Model", *Journal of Human-Computer Studies*, 52, pp. 719-750.

March, R.M. (1988). *The Japanese Negotiator: Subtlety and Strategy beyond Western Logic*. Tokyo, New York: Kodansha International.

March, J.G., and Simon, H.A. (1958), *Organizations* (New York: John Wiley).

March. R.M., and Wu, S.H. (2007). *The Chinese Negotiator: How to Succeed in the World's Largest Market*. Tokyo, New York: Kodansha International.

Matwin, S., Szapiro, T., and Haigh, K. (1991). Genetic Algorithms Approach to a Negotiaition Support System, *IEEE Transactions on Systems*, *Man, and Cybernetics 21(1)*, pp. 102–114.

Matwin, S., Szpakowicz, S., Koperczak, Z., Kersten, G., and Michalowski, W. (1989). "Negoplan: An Expert System Shell for Negotiation Support", *IEEE Expert*, 4(4), pp. 50-62.

Maule, A.J., and Hockey, R.J. (1993). "State, Stress, and Time Pressure", In Svenson, O. and Maule, A.J. (Eds.), *Time Pressure and Stress in Human Judgment and Decision Making*. New York: Plenum Press, pp. 83-101.

McAlister, L., Bazerman, M.H., and Fader, P. (1986). "Power and Goal-setting in Channel Negotiations", *Journal of Marketing Research*, 23, pp. 228-236.

Malone, T., Yates, J., and Benjamin, R.I. (1987). "Electronic Markets and Electronic Hierarchies", *Communications of the ACM, 30*(6), pp. 484–497.

Milter, R.G., Darling, T.A., and Mumpower J.L. (1996). "The Effects of Substantive Task Characteristics on Negotiators' Ability to Reach Efficient Agreements", *Acta Psychologica*, 93, pp. 207-228.

Moai.com, (2000). "An Introduction to Dynamic Commerce and Negotiated e-Commerce: A Review and Analysis of Trends and Opportunities in Commerce on the Internet", *White Paper*, URL: http://www.ondemandsourcing.com/Papers/dynamiccommerce.pdf (Accessed at December, 2007).

Morris, S.A., and Marshall, T.E. (2004). "Perceived Control in Information Systems", *Journal of Organizational and End User Computing* (16:2), pp. 38-56.

Moore, C. (1996). *The Mediation Process: Practical Strategies for Resolving Conflict* (2nd Ed.). San Francisco: Jossey-Bass.

Morley, I., and Stephenson, G. (1977). *The Social Psychology of Bargaining*. London: Allen and Unwin.

Mumpower, J., Schuman, S., and Zumbolo, A. (1988). "Analytical Mediation: an Application in Collective Bargaining", In R.M. Lee, A.M. McCosh, and P. Migliarese (Eds.), *Organizational Decision Support Systems,* New York: Elsevier Science Publishers B. V. (North Holland), pp. 61-73.

Nash, J. (1950). "*The Bargaining Problem", Econometrica*, 18, pp. 155-162.

Nash, J. (1953). "*Two-person Cooperative Games", Econometrica*, 21(1), pp. 128-140.

Neal, M.A. and Bazerman, M. H. (1983). "The Role of Perspective-Taking Ability in Negotiating Under Different Forms of Arbitration", *Industrial and Labor Relations Review,* 36, pp. 378-388.

Neale, M.A., and Bazerman, M.H. (1985a). "The Effects of Externally Set Goals on Reaching Integrative Agreements in Competitive Markets", *Journal of Occupational Behavior*, 6, pp. 19-32.

Neale, M.A., Bazerman, M.H. (1985b), "The Effect of Framing on Conflict and Negotiator Overconfidence", *Academy of Management Journal*, 28(2), pp.34-49.

Neale, M.A. and Northcraft, G.B., (1986). "Experts, Amateurs and Refrigerators: Comparing Expert and Amateur Negotiators in a Novel Task", *Organizational Behavior and Human Decision Processes*, 38, pp. 305-317.

Oliver, J.R. (1997). "A Machine Learning Approach to Automated Negotiation and Prospects for Electronic Commerce", *Journal of Management Information Systems, 13(3),* Winter, 1996-97, pp. 83-112.

Oliver, R.L., Balakrishnan, P.V., and Barry, B. (1994), "Outcome Satisfaction in Negotiation: A Test of Expectancy Disconfirmation", *Organizational Behavior and Human Decision Processes*, 60, pp. 252-275.

Papazoglou, M.P., and Georgakopoulos, D. (2003). "Service-Oriented Computing*", Communications of the ACM*, 46(10), pp. 25-28.

Pavlou, P.A., and Gefen, D. (2004). "Building Effective Online Marketplaces with Institution-Based Trust." *Information Systems Research*, 15(1), pp. 37-59.

Perkins, W.C., Hershauer, J.C., Foroughi, A., Delaney, M.M. (1996). "Can a Negotiation Support System Help a Purchasing Manager?", *International Journal of Purchasing and Materials Management*, 32(2), pp. 37-45.

Pilisuk, N. and Skolnick, P. (1978). "Inducing Trust: A Test of the Osgood Proposal", *Journal of Personality and Social Psychology*, 8, p. 121-133.

Pinkley, R.L., Neale, M.A., and Bennett, R.J. (1994). "The Impact of Alternatives to Settlement in Dyadic Negotiation", *Organizational Behavior and Human Decision Processes*, 57, pp. 97-116.

Pruitt, D.G. (1981). *Negotiation Behavior*. New York: Academic Press.

Pruitt, D.G. (1983). "Strategic Choice in Negotiation", *American Behavioral Scientist,* 27, pp. 167-194.

Pruitt, D.G., and Carnevale, P.J.D. (1993). *Negotiation in Social Conflict*. Pacific Grove, CA: Brooks-Cole.

Pruitt, D.G., Carnevale, P.J., Forcey, B., and Van Slyck, M. (1986). "Gender Effects in Negotiation: Constituent Surveillance and Contentious Behavior", *Journal of* Experimental Social Psychology, 22(3), pp.264-275.

Pruitt, D.G., and Drews, J.L., (1969). "The Effect of Time Pressure, Time Elapsed, and the Opponent's Concession Rate on Behavior in Negotiation", *Journal of Experimental Social Psychology*, 5, pp. 43-60.

Pruitt, D.G., and Rubin, J.Z. (1986). Social Conflict: Escalation, Impasse, and Resolution, Reading. MA: Addison-Wesley.

Pye, L.W. (1992). *Chinese Negotiating Style: Commercial Approaches and Cultural Principles*. New York: Quorum Books.

Raiffa, H. (1982). *The Art and Science of Negotiations*. Belknap/Harvard University Press, Cambridge, MA.

Raiffa, H., Richardson J. and Metcalfe D. (2002). *Negotiation Analysis: The science and art of collaborative decision marking*. Cambridge, Massachusetts and London: The Belknap Press of Harvard University Press.

Ramalingam, V., and Weidenbeck, S. (1998). "Development and Validation of Scores on a Computer Programming Self-Efficacy Scale and Group Analyses of Novice Programmer Self-Efficacy", *Journal of Educational Computing Research,* 19(4), pp. 367-381.

Rangaswamy, A., Eliashberg, J., Burke, R., and Wind, J. (1989). "Developing Marketing Expert Systems: An Application to International Negotiations", *Journal of Marketing*, 53(4), October 1989, pp. 24-49.

Rangaswamy, A. and Shell, G.R. (1997). "Using Computers to Realize Joint Gains in Negotiations: Towards an Electronic Bargaining Table", *Management Science*, 43(8), pp. 1147-1163.

Rao, V.S., and Jarvenpass, S.L. (1991). "Computer Support for Groups: Theory-Based Models for GDSS Research", *Management Science*, 37, p. 1347-1362.

Rekosh, J.H., and Feigenbaum, K.D. (1966). "The Necessity of Mutual Trust for Cooperative Behavior in a Two-Person Game", *Journal of Social Psychology*, 69, pp. 149-154.

Roth, A.E., and Murnighan, J.K. (1982). "The Role of Information in Bargaining: An Experimental Study", *Econometrica*, 50, pp. 1123-1142.

Roth, A.E., Murnighan, J.K. and Schoumaker, F. (1988). "The Deadline Effect in Bargaining: Some Experimental Evidence", American Economic Review, 78(4), pp. 806-823.

Rosenschein J.S, and Zlotkin, G. (1994). *Rules of Encounter: Designing Conventions for Automated Negotiation among Computers*. The MIT Press: Cambridge, MA.

Rubin, J.Z, and Brown, B.R. (1975). *The Social Psychology of Bargaining and Negotiation*. New York: Academic.

Rubinstein, A. (1982). "Perfect Equilibrium in a Bargaining Model", *Econometrica*, 50(1), pp. 97-109.

Sargent, L.D. and Terry, D.J. (1998). "The Effects of Work Control and Job-Demands on Employee Adjustment and Work Performance", *Journal of Occupational and Organizational Psychology,* 71, pp. 219-236.

Scholz, R., Fleischer, A., and Bentpup, A. (1982). "Aspiration Forming and Predictions Based on Aspiration Levels Compared between Professional and Nonprofessional Bargainers", in Tietz, R. (Ed): *Aspiration Levels in Bargaining and Economic Decision Making*, pp. 109-121. Berlin: Springer-Verlag.

Schoop, M., Jertila, A. and List, T. (2003). "Negoisst: A Negotiation Support System for Electronic Business-to-Business Negotiations in E-Commerce", *Data and Knowledge Engineering*, 47(3), pp. 371-401.

Schoop, M. and Quix, C. (2001a). "DOC.COM: Combining Document and Communication Management for Negotiation Support in Business-to-Business Electronic Commerce", In *Proceedings of the 34th HICSS*, 2001.

Schoop, M. and Quix, C. (2001b). "Doc.Com: A Framework for Effective Negotiation Support in Electronic Marketplaces", *Computer Networks*, 37, pp. 153-170.

Sengupta, K., and Te'eni, D. (1993). "Cognitive Feedback in GDSS: Improving Control and Convergence", *MIS Quarterly*, 17(1), pp. 87-109.

Shakun, M.F. (1988). *Evolutionary Systems Design: Policy Making under Complexity and Group Decision Support Systems*, Oakland, CA.: Holden-Day.

Shakun, M.F. (2003). "United States-China Plane Collision Negotiation", *Group Decision and Negotiation*, 12(6), pp. 477-480.

Sheffield, (1992). "The Effects of Bargaining Orientation and Communication Medium on Negotiation", In *the Proceedings of the 25th Annual Hawaii International Conference on System Sciences*, pp. 174–184.

Sheppard, B.H. (1984). "Third Party Conflict Intervention: A Procedural Framework", In Staw, B.M. and Chummings, L.L. (Eds.), Research in Organizational Behavior (Vol. 6, pp. 141-190). Greenwich, CT: JAI Press.

Sheppard, B.H. and Tuchinsky, M. (1996). "Interfirm Relations: A Grammar of Pairs", In B.M. Star and Cummings, L.L. (Eds), *Research on Organizational Behavior* (Vol. 18, pp. 331-373). Greenwich, CT: JAI Press.

Siegel, S., and Fouraker, L.E. (1960). *Bargaining and Group Decision Making: Experiments in Bilateral Monopoly*, New York: McGraw-Hill.

Siegel, S. and Harnett, D.L. (1964). "Bargaining Behavior: A Comparison between Mature Industrial Personnel and College Students", *Operations Research*, 12(2), pp. 334-343.

Sierra, C., Faratin, P., and Jennings, N.R. (1997). "A Service-Oriented Negotiation Model between Autonomous Agents", In *Proceedings of the 8th Modeling Autonomous Agents in a Multi-Agent World (MAAMAW).*

Sniezek, J.A. and Crede, M. (2002). "Group Judgment Process and Outcomes in Videoconferencing VS. Face-to-Face Groups", In *Proceedings of the 35th Annual Hawaii International Conference on System Sciences*.

Sokolova, M., Nastase, V., Szpakowicz, S., and Shan, M. (2005). "Analysis and Models of Language in Electronic Negotiations", In M. Draminski, et al. (Eds.), *Issues in Intelligent Systems, Models and Techniques (pp. 197-211).* Warszawa: Akademicka Oficyna Wydawnicza EXIT.

Soo, V.W., and Hung, C.A. (2002). "On-Line Incremental Learning in Bilateral Multi-Issue Negotiation", *1st International Joint Conference on Autonomous Agents and Multi-Agent Systems*, pp. 314-315.

Spielberger, C.D. (1972). "Conceptual and Methodological Issues in Anxiety Research", in *Anxiety: Current Trends in Theory and Research* (2), Spielberger, C.D. and Sarason, I.G. (Eds.), Academic Press, New York, pp. 481-494.

Starke, K. and Rangaswamy, A. (2000). "Computer-Mediated Negotiations: Review and Research Opportunities", *Encyclopaedia of Microcomputers* (Vol. 26), New York: Marcel Inc.

Steele, C.M. (1997). "A Threat in the Air: How Stereotypes Shape Intellectual Identity and Performance", *American Psychologist*, 52, pp. 613-629.

Strobel, M., and Weinhardt, C. (2003). "The Montreal Taxonomy for Electronic Negotiations", *Group Decision and Negotiation,* 12(2), pp. 143-164.

Stuhlmacher, A.F., and Walters, A.E. (1999). "Gender Differences in Negotiation Outcome: A Meta-Analysis", *Personnel Psychology, 52*(3), pp. 653-677.

Swingle, P.G. (1970). “Exploitative Behavior in Non-Zero-Sum Games”, Journal of Personality and Social Psychology, 16, pp. 121-132.

Sycara, K.P. (1990). “Negotiation Planning: An AI Approach”, *European Journal of Operational Research*, 46, pp. 216-3-234.

Sycara, K. (1992). “The PERSUADER”, In *Encyclopedia of Artificial Intelligence*, Shapiro, D. (Ed.), John Wiley and Sons Inc., New York.

Taylor, S., and Todd, P.A. (1995) “Assessing IT Usage: The Role of Prior Experience.” *MIS Quarterly,* 19(4), 561-570.

Teich, J., Korhonen, P., Wallenius, H., and Wallenius, J. (2000). „Conducting Dyadic Multiple Issue Negotiation Experiments: Methodological Recommendations“, *Group Decision and Negotiation*, 9, pp. 347-354.

Thiessen, E.M., and Loucks D.P. (1994). “ICANS: Interactive Computer Assisted Negotiation Support”, In *Proceedings of the Workshop on Computer Assisted Negotiation and Mediation: Prospects and Limits*, Harvard, Harvard Law School, Cambridge, MA.

Thiessen, E.M., Loucks, D.P. and Stedinger, J.R. (1998). “Computer-Assisted Negotiations of Water Resources Conflicts”, *Group Decision and Negotiation*, 7(2), pp. 109-129.

Thompson, L. (1990). “Negotiation Behavior and Outcomes: Empirical Evidence and Theoretical Issues”, *Psychological Bulletin*, 108(3), pp. 515-532.

Thompson, L.L., and Hastie, R. (1990). “Social Perception in Negotiation”, *Organizational Behavior and Human Decision Processes*, 47, pp. 98-123.

Thompson, L. and Loewenstein, G. (1992). “Egocentric Interpretations of Fairness and Interpersonal Conflict”, *Organizational Behavior and Human Decision Processes*, 51, pp. 176-197.

Thompson, L., Peterson, E., and Kray, L. (1995). “Social context in negotiation: An information-processing perspective”, In R. Kramer and D. Messick (Eds.), *Negotiation as a Social Process*. New York: Russell Sage.

Tinsley, C., Curhan, J., and Kwak, R.S. (1999). “Adopting a Dual Lens Approach for Overcoming the Dilemma of Difference in International Business Negotiations”, *International Negotiation*, 4, pp. 1-18.

Toothacker, L.E. (1993). *Multiple Comparisons Procedures*. Thousand Oaks, CA: Sage Publications.

Touval, S. (1988). “Multilateral Negotiation: An Analytical Approach”, *Negotiation Journal*, 5(2), pp. 159-173.

Tripp, T.M., and Sondak, H. (1992). “An Evaluation of Dependent Variables in Experimental Negotiation Studies: The Role of Impasse Rates and Pareto Efficiency”, *Organizational Behavior and Human Decision Processes*, 51, pp. 273-295.

Tse, D.K., Francis, J., and Walls, J. (1994). "Cultural Differences in Conducting Intra- and Inter-Cultural Negotiations: A Sino-Canadian Comparison", *Journal of International Business Studies*, 25, pp. 537-555.

Tung, L.L., and Quaddus, M.A. (2002). "Cultural Differences Explaining the Differences in Results in GSS: Implications for the Next Decade", *Decision Support Systems*, 33(2), pp. 177-199.

Turban, E., King, D., Lee, J., Warkentin, M., and Chung, H.M. (2002). *Electronic Commerce 2002: A Managerial Perspective* (2nd Edition). Prentice Hall, 2002.

Turel, O., and Yuan, Y. (2007). "User Acceptance of Web-Based Negotiation Support Systems: The Role of Perceived Intention of the Negotiating Partner to Negotiate Online", *Group Decision and Negotiation (forthcoming).*

Tversky, A., and Kahnemen, D. (1981). "The Framing of Decisions and the Psychology of Choice", *Science*, 211, pp. 453-458.

Vallery, K.L., Neale, M.A., and Mannix, E.A. (1995). "Relationships in Negotiations: The role of Reputation, the Shadow of the Future, and Interpersonal Knowledge on the Process and Outcome of Negotiations", In Bies, R.J., Lewicki, R., and Sheppard, B. (Eds.), *Research in Bargaining and Negotiation in Organizations*. Vol. 5, Greenwich, CT: JAI Press.

Vetschera, R., Kersten, G., and Koeszegi, S. (2006). "User Assessment of Internet-Based Negotiation Support Systems: An Exploratory Study", *Journal of Organizational Computing*, 16(2), pp.123-148.

Victor, D. (1992). *International Business Communication,* New York: Harper Collins Publishers.

Wall, J.A., and Blum, M. (1991). "Negotiations", *Journal of Management*, 17, pp. 273-303.

Walster, E. H., Walster, G. W., and Berscheid, E. (1978). *Equity: Theory and Research*. Boston: Allyn & Bacon.

Walton, R.E., and McKersie, R.B. (1965). *A Behavioral Theory of Labor Negotiations*. McGraw-Hill Book Company, New York.

Weigand, H., Moor, A.D., Schoop, M., and Dignum, F. (2003). "B2B Negotiation Support: The Need for a Communication Perspective", *Group Decision and Negotiation, 12*, p.3-29.

Whorf, B.L. (1952). *Collected Papers on Metalinguistics*. Washington D.C: Department of State, Foreign Service Institute.

Wichman, H. (1970). "Effects of Isolation and Communication on Cooperation in a Two-Person Game", *Journal of Personality and Social Psychology*, 16, pp. 114-120.

Wilkenfeld, J., Kraus, S., Holley, K.M., and Harris, M.A. (1995). "GENIE: A Decision Support System for Crisis Negotiations", *Decision Support Systems*, 14, pp. 369-391.

Wilson, D.T., and Moller, K.E.K. (1991). "Buyer-Seller Relationships: Alternative Conceptualizations", in Paliwoda, S.J. (Ed.), *New Perspectives on International Marketing*, New York: Routledge, pp. 87-107.

Yang, Y.P., Zhong, Y., Guo, X. J., and Lim, J. (2005). "An Empirical Study on Negotiators' Perceived Control and System Anxiety towards Agent-based Negotiation Support Tool", In *Proceedings of Group Decision and Negotiation 2005: GDN2005*. Vienna, Austria, 10-13 July 2005.

Yang, Y.P., Lim, J., and Chen, Y. (2006). "Alternate Designs on Agent-Based e-Negotiation Systems: Concepts and Implementation", *16th Workshop on Information Technology and Systems: WITS2006*, Milwaukee, Wisconsin, United States, 9-10 December, 2006.

Yang, Y.P., Lim, J., Zhong, Y., Guo, X, and Li, X. (2007a). "Who is Taking Over Control? A Psychological Perspective in Examining Effects of Agent-based Negotiation Support Technologies". In D. Harris (Ed.): *Engineering Psychology and Cognitive Ergonomics, Proceedings of International Conference of Human-Computer Interaction 2007, LNAI 4562*, Springer-Verlag Berlin Heidelberg 2007, pp. 222-231, 2007.

Yang, Y.P., Zhong, Y., and Lim, J. (2007b). "Attitudes towards Accepting Negotiation Support Functions in e-Marketplace Websites: An Exploratory Field Study in China". *Group Decision and Negotiation 2007: GDN2007*, Montreal, Canada, 14-17 May, 2007.

Yates, J. and Orlikowski, W.J. (1992). "Genres of Organizational Communication: An Approach to Studying Communication and Media", *Academy of Management Review*. 17, pp. 299-326.

Young, H.P. (1991). "Fair Division", in Young, H.P. (Ed.), *Negotiation Analysis*, University of Michigan Press: Ann Arbor, pp. 25-45.

Yuan, Y., Rose, J., Suarga, S., and Archer, N. (1998). "A Web-Based Negotiation Support System", *International Journal of Electronic Markets*, 8(3), pp. 13-17.

Yuan, Y.F., Head, M., and Du, M. (2003). "The Effects of Multimedia Communication on Web-Based Negotiation." *Group Decision and Negotiation,* 12, pp. 89-109.

Yukl, G. (1974). "Effects of the Opponent's Initial Offer, Concession Magnitude, and Concession Frequency on Bargaining Behavior", *Journal of Personality and Social Psychology*, 30(3), pp. 323-335.

Zartman, I.W., and Berman, M.R. (1982). *The Practical Negotiator*. New Haven, CT: Yale University Press.

Zeng, D, and Sycara, K. (1998). "Bayesian Learning in Negotiation", *International Journal of Human Computer Studies, 48(1),* pp. 125-141.

APPENDIX A EXPERIMENTAL MATERIALS

A.1 GENERAL INSTRUCTIONS

(This portion is given to subjects in all treatments)

Thank you very much for participating in the online negotiation study. The following is an overview of the experimental procedures:

Pre-Negotiation preparation:

1. You will be assigned as the role of a purchasing manager or sales manager representing either Buyer Company or Seller Company. You will read the **File B: Background Information of Negotiation Case** for both your own and the opponent Company.
2. You will be given **File C: Confidential Information Sheet** for your own company. An exercise will be conducted to ensure you will understand the task.
3. You will be given **File D: User Manual for ProNeg** and be trained to use the Negotiation Support System.
4. You will be asked to fill in **File E: Pre-Negotiation Questionnaire**.
5. You will be given **File F: Negotiation Memo** and log into the online negotiation system using the Username and Password given.

Actual Negotiation:

6. Please **DO NOT** proceed to the actual negotiation until you are told to do so.
7. While you are negotiating with your opponent using the online Negotiation Support System (ProNeg), an instructor will be available in the room for assistance.

Note: There will be **NO TIME LIMIT** for your negotiation session.

Post-Negotiation:

8. After settlement, you will be asked to fill in File G: Post-Negotiation Questionnaire.

There are two rules you are expected to follow:
1) Try to imagine yourself as professional business people who try to clinch a deal with the other party. In other words, take your role seriously and play as well as you can.
2) You should not reveal any aspect of this study to anyone. It is important that people do not have preconceived notions or expectations about the procedures.

To appreciate your time and effort, the experiment administrator will give away a small gift as a token of appreciation. The pair of participants who achieve the HIGHEST join outcome will receive a $200 Takashimaya shopping voucher. (Joint outcome is calculated by adding up the utility scores achieved by both you and your opponent on the final agreement.)

A.2 PUBLIC INFORMATION ON THE BACKGROUND NEGOTIATION TASK

Background Information on Buyer, Roberts Enterprise, Inc. ***(This portion is given to Buyers)***
Roberts Enterprise, Inc. is a major U.S. engine manufacturer. During the last two quarters of 2005, total sales volume increased slightly; however, as a percent of market share, sales does not look

good. Roberts' market share remained constant during the third quarter and has dropped slightly during the fourth, despite vigorous sales effort.
In an effort to reverse this trend, the marketing research department has proposed introducing a lower priced engine, which would sell for approximately $3,000. An important subcomponent for this engine is the turbocharger, which Roberts can purchase for substantially less than they can manufacture themselves. The negotiation in which you are about to participate concerns the specific terms of a three-year contract to purchase this subcomponent.
Roberts' marketing department hopes that turbocharger delivery can begin within **five months** in order to penetrate the fall, 2006 boating market. The engineering department estimates that **$200.00/unit** is a reasonable price to pay for the turbocharger. Marketing has advised the purchasing department that a contract which guarantees purchase of more than **5,000 units per year** would be risky. In addition, it is very desirable to Roberts to obtain a full **four year warranty** (parts and labor) on turbochargers, as they have just lengthened their engine warranty to four years.
Roberts deals regularly with three major suppliers. All offer quality parts and good service and all have made good on all aspects of previous purchase agreements. Roberts is confident it can expect the same good performance in the future from these companies.

Background Information on Seller, Simo Parts Distributor ***(This portion is given to Sellers)***
Simo Parts Distributor has enjoyed a good working relationship with Roberts Enterprise for several years. The company began as a small engine parts supplier, with pistons and connecting rods accounting for the majority of their sales. Over the past several years the small engine parts market has become extremely competitive due to the increase in foreign imports. Simo responded by expanding its product line to include more expensive engine subcomponents such as crankshafts and turbochargers. They have found they can be very competitive in this area because they have the technical skill to build components to buyers' specifications and can use existing distribution channels.
Both marketing and production are in agreement that several less profitable small parts should be dropped from their production line in order to place more emphasis on the specialty subcomponent market. Simo is building a good reputation in this area and the company's future looks bright.
When a Roberts purchasing agent first mentioned the special turbocharger to Simo's sales representatives, the representatives called a meeting with major department heads to discuss what would be--in Simo's terms-- a “fair agreement". During the meeting the Vice-President of production explained that a significant investment in research and development would be required to finalize the design of the turbocharger. Additionally, the company would incur set up costs and lost production costs on the small parts lines which would have to be converted for turbocharger processing. The production VP is confident, however, that the first shipment could be ready within **eight months**. They are also very willing to offer **a full one-year warranty** on parts and labor.
In order to recoup costs, the production, marketing, and finance departments agree that the absolute minimum price they would be willing to commit to over the next three years is **$224.00/uint**. Further, they could only agree to this low price if Roberts agreed to purchase a **minimum of 8,000 units** per year. Considering the quality of the product they will be delivering and the development and production costs they will incur, Simo considers this to be a very reasonable offer.

Summary ***(This portion is given to subjects in all treatments)***
In summary, the two companies have a good working relationship with each other, and both would like to come to agreement on the terms of the purchase/sales contract. At the present time, however, their stands on the four issues of **price**, **minimum purchase quantity**, **warranty**

period, and **time of first delivery** are not compatible. It may be difficult to negotiate a compromise. Neither side should enter into an agreement where they feel they are "being taken"; conversely, neither should be so inflexible that compromise is impossible.
Due to the long geographic distance and the inconvenient timing for the managers to travel, the Management Committees of the two companies had a prior discussion and jointly decided that they would use a web-based Negotiation Support System, ProNeg that is offered by a neutral third party, to negotiate for this business deal online.

A.3 PRIVATE INFORMATION ON PAYOFF POINT STRUCTURE AND BATNA

Point Structure and the Bottom Line ***(This portion is given to Buyers in Low Conflict treatments)***
This is the confidential information about your company guideline in this negotiation case. It consists of the important POINT STRUCTURE of the utility scores that represent how favorable an alternative contract meant for your company.
It is of CRITICAL IMPORTANCE that the purchased quantity agreed upon does not exceed 5,000 units per year significantly, because your company does not have the money or the inventory space for subcomponents that are not currently needed. Your company also concerned about the delivery time of the first shipment. In order to capitalize on fall boat sales, your company desires an early shipment date, the earlier the better. This is VERY IMPORTANT.
Of course warranty time period and the price are IMPORTANT to your company. The less paid and the longer the warranty, the better. These issues are not as critical as quantity and delivery time. Thus, if the minimum quantity can be kept low and the product delivered quickly, your company would be willing to pay a higher price and sign a contract with a shorter warranty period.

The **utility point structure** summarizing your confidential negotiation task is as follows:

Price	$200	$204	$208	$212	$216	$220	$224
Score	**15**	13	11	8	5	3	**0**

Quantity	5,000	5,500	6,000	6,500	7,000	7,500	8,000
Score	**39**	33	27	20	13	7	**0**

Warranty	4 years	3 years	2 years	1 year
Score	**17**	10	5	**0**

Delivery	5 months	6 months	7 months	8 months
Score	**29**	19	10	**0**

As shrewd purchasing manager you have explored possible agreements with your other two major suppliers. One could not make delivery before August, so you ruled that company out. The other has made the following final bid

Price	**$208/unit**
Quantity	**7,000 units/year**
Warranty	**3 years**
Delivery	7 months

Utility score on this alternative is 11+13+10+10 = 44 (based on the utility point structure)

Note that this is what you will get from another supplier if you do not reach agreement with Simo, in other words, the final agreement you would make with Simo should be higher than this offer – the bottom line of this negotiation.

Point Structure and the Bottom Line ***(This portion is given to Sellers in Low Conflict treatments)***

This is the confidential information about your company guideline in this negotiation case. It consists of the important POINT STRUCTURE of the utility scores that represent how favorable an alternative contract meant for your company.

The most critical issue for your company is the price. Your company will have a large investment in research and development and etc. Setting a higher price in this contract is EXTREMELY IMPORTANT; not only it will be the price per unit for the next three years, but also it will form the price basis of any future negotiations. Also, the warranty period is VERY IMPORTANT. Your company has always offered a one-year warranty on all its parts, and intends to continue. Each year extended, will add a considerable expense to your company. So the shorter the warranty period the better!

Of course it is IMPORTANT that Roberts agree to buy a minimum quantity per year, and your company's marketing research department believes the 8,000/year request is reasonable. Delivery time is also IMPORTANT. Your company could deliver the product in five months, but desires a longer delivery time in order to properly research the product and set up production. To summarize, the minimum quantity and delivery time are both important issues. These issues should NOT be ignored; however, keep in mind that your company would be willing to accept a shorter delivery time and a smaller purchase quantity if Roberts agrees to a higher price and shorter warranty period.

The **utility point structure** summarizing your confidential negotiation task is as follows:

Price	$200	$204	$208	$212	$216	$220	**$224**
Score	**0**	6	12	19	25	31	**37**

Quantity	5,000	5,500	6,000	6,500	7,000	7,500	**8,000**
Score	**0**	3	5	8	10	13	**15**

Warranty	4 years	3 years	2 years	**1 year**
Score	**0**	9	19	**28**

Delivery	5 months	6 months	7 months	**8 months**
Score	**0**	7	13	**20**

Unknown by Roberts is that one of their major competitors has also demonstrated an interest in a small engine turbocharger. Your company does not have the capacity to handle contracts for both Roberts and Roberts' competitor, so only one agreement will be made. If you and Roberts' purchasing agent cannot come to terms, you will accept the following final offer made by the competitor:

Price	**$208/unit**
Quantity	**7,000 units/year**
Warranty	**3 years**
Delivery	**7 months**

Utility score on this alternative is 12+10+9+13 = 44
(based on the utility point structure)

Note that this is what you will get for selling the products if you do not reach agreement with Roberts, in other words, the final agreement you would make with Roberts should be higher than this alternative – the **bottom line** of this negotiation.

Point Structure and the Bottom Line ***(This portion is given to Buyers in High Conflict treatments)***

This is the confidential information about your company guideline in this negotiation case. It consists of the important POINT STRUCTURE of the utility scores that represent how favorable an alternative contract meant for your company.
The most CRITICAL issue for your company is price. Your company is counting on sales of this new engine to reverse the trend of declining market share. The only way for this engine to penetrate the market, however, is to price it competitively. Thus the subcomponent price must be kept at a minimum. It is also important to keep the price low because the amount agreed upon in this contract will form the basis for any future turbocharger negotiations with Simo. It is VERY IMPORTANT that the purchased quantity agreed upon does not exceed 5,000 units per year significantly, because your company does not have the money or the inventory space for subcomponents that are not currently needed.
Your company is also concerned about the delivery time of the first shipment. In order to capitalize on fall boat sales, your company desires an early shipment date, the earlier the better. This is IMPORTANT. Of course warranty time period is also IMPORTANT to your company. These issues are not as critical as price and quantity. Thus, if the price and minimum quantity can be kept low, your company would be willing to sign a contract with a shorter warranty period and accept later delivery.

The **utility point structure** summarizing your confidential negotiation task is as follows:

Price	$200	$204	$208	$212	$216	$220	$224
Score	**39**	33	26	20	13	7	**0**

Quantity	5,000	5,500	6,000	6,500	7,000	7,500	8,000
Score	**29**	24	19	15	10	5	**0**

Warranty	4 years	3 years	2 years	1 year
Score	**15**	10	5	**0**

Delivery	5 months	6 months	7 months	8 months
Score	**17**	11	6	**0**

As shrewd purchasing manager you have explored possible agreements with your other two major suppliers. One could not make delivery before August, so you ruled that company out. The other has made the following final bid

Price **$216/unit**
Quantity **7,000 units/year**
Warranty **3 years**
Delivery **6 months**

Utility score on this alternative is 13+10+10+11 = 44
(based on the utility point structure)

Note that this is what you will get from another supplier if you do not reach agreement with Simo, in other words, the final agreement you would make with Simo should be higher than this offer – **the bottom line** of this negotiation.

Point Structure and the Bottom Line ***(This portion is given to Sellers in High Conflict treatments)***

This is the confidential information about your company guideline in this negotiation case. It consists of the important POINT STRUCTURE of the utility scores that represent how favorable an alternative contract meant for your company.

The most critical issue for your company is the price of the turbocharger. Your company will have a large investment in research and development and etc. Setting a higher price in this contract is EXTREMELY IMPORTANT; not only it will be the price per unit for the next three years, but also it will form the price basis of any future negotiations. Also, the minimum quantity purchased is VERY IMPORTANT. Your company wants to use this opportunity to drop some of its small parts lines and get more entrenched in the larger parts market. Assuring a large quantity of sales of products will help your company achieve this goal. In addition, sales of more units will help recover the setup costs.

Of course it is IMPORTANT that the warranty period be kept to a minimum. Every year it is extended adds additional expense to the company. Also IMPORTANT is the delivery time. Your company could deliver the product in five months, but desires a longer delivery time in order to properly research the product and set up production. To summarize, warranty period and delivery time are both important issues. These issues should NOT be ignored; however, keep in mind that your company would be willing to accept a shorter delivery time and a longer warranty period if Roberts will agree to a higher price and larger minimum annual quantity.

The **utility point structure** summarizing your confidential negotiation task is as follows:

Price	$200	$204	$208	$212	$216	$220	$224
Score	**0**	6	11	18	23	29	**35**

Quantity	5,000	5,500	6,000	6,500	7,000	7,500	8,000
Score	**0**	5	10	15	19	24	**29**

Warranty	4 years	3 years	2 years	1 year
Score	**0**	7	12	**19**

Delivery	5 months	6 months	7 months	8 months
Score	**0**	6	11	**17**

Unknown by Roberts is that one of their major competitors has also demonstrated an interest in a small engine turbocharger. Your company does not have the capacity to handle contracts for both Roberts and Roberts' competitor, so only one agreement will be made. If you and Roberts' purchasing agent cannot come to terms, you will accept the following final offer made by the competitor:

Price	**$208/unit**
Quantity	**6,000 units/year**
Warranty	**2 years**
Delivery	**7 months**

Utility score on this alternative is 11+10+12+11 = 44 (based on the utility point structure)

Note that this is what you will get for selling the products if you do not reach agreement with Roberts, in other words, the final agreement you would make with Roberts should be higher than this alternative – **the bottom line** of this negotiation.

Understand Your Task ***(This portion is given to subjects in all treatments)***

1. My role is _____ (buyer/seller).
2. I will negotiate_____ (how many) issues.
3. The two most important issues to my company are _____and_____.
4. How many possible alternatives for the final agreement? _____ (Hint: there are 7 choices for the price issue, 7 choices for quantity, 4 for warranty and 4 for delivery.)
5. At the end of the bargaining session, the utility score for the final contract agreement must be no less than _____ points. (Hint: please refer to bottom line of your company)
6. I expect to obtain approximately _____ points, which will make me satisfied for my negotiation task. (Hint: This depends on your own expectation.)

A.4 USER MANUAL ON THE THREE PRONEG SYSTEMS

User Manual on ProNeg ***(This portion is given to subjects in Level-1 system treatments)***
ProNeg is the name of the web-based negotiation support system that facilitates negotiation activities online. It consists of pages for **Log In, Determine Issue Ratings, Point Structure, Specify Bottom Line** and **the main page** with the following components:

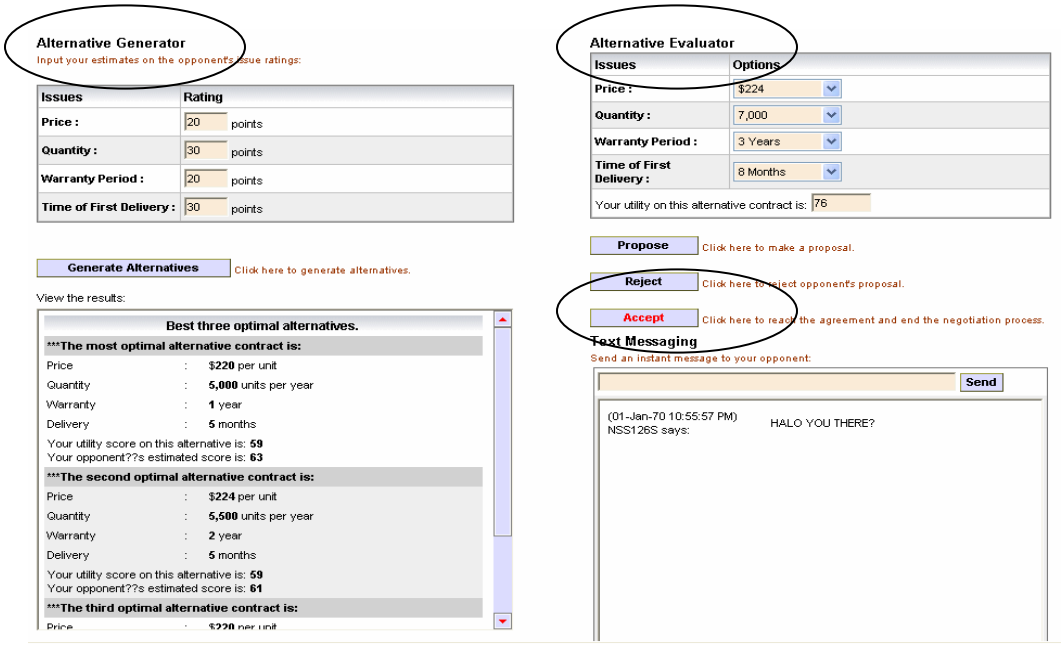

Figure 1. Screen Shot of the Main Page of ProNeg.

1. Alternative Evaluator:

It can help you to calculate your own utility scores for certain contract alternative that your opponent offered/proposed or contracts you want to offer to him/her.

2. Alternative Generator:

It can be used to generate the best three contract alternatives that give the highest JOINT OUTCOME. You need to input your estimation on how your opponents weight the four issues, i.e., to inform the system how you estimate the point structure of your opponents.
With this information and the point structure of your own (already built in the system), the component can compute from the 784 alternatives and suggest the best 3 alternatives in terms of joint utility score.

Note that the more you communicate with your opponent, the more accurate you would estimate your opponent's approximate point structure. With an accurate or near-accurate point structure, this component will give the contract alternative leading to highest joint outcome.

3. Text Messaging:

This component enables text-based electronic communication between you and your opponent. With this, you can **Propose** for new alternatives to your opponent, **Reject** offers from your opponent, or **Accept** an offer from your opponent.

User Manual on ProNeg ***(This portion is given to subjects in Level-2 system treatments)***
ProNeg is the name of the web-based negotiation support system that facilitates negotiation activities online. It consists of pages for **Log In, Determine Issue Ratings, Point Structure, Specify Bottom Line** and **the main page** with the following components:

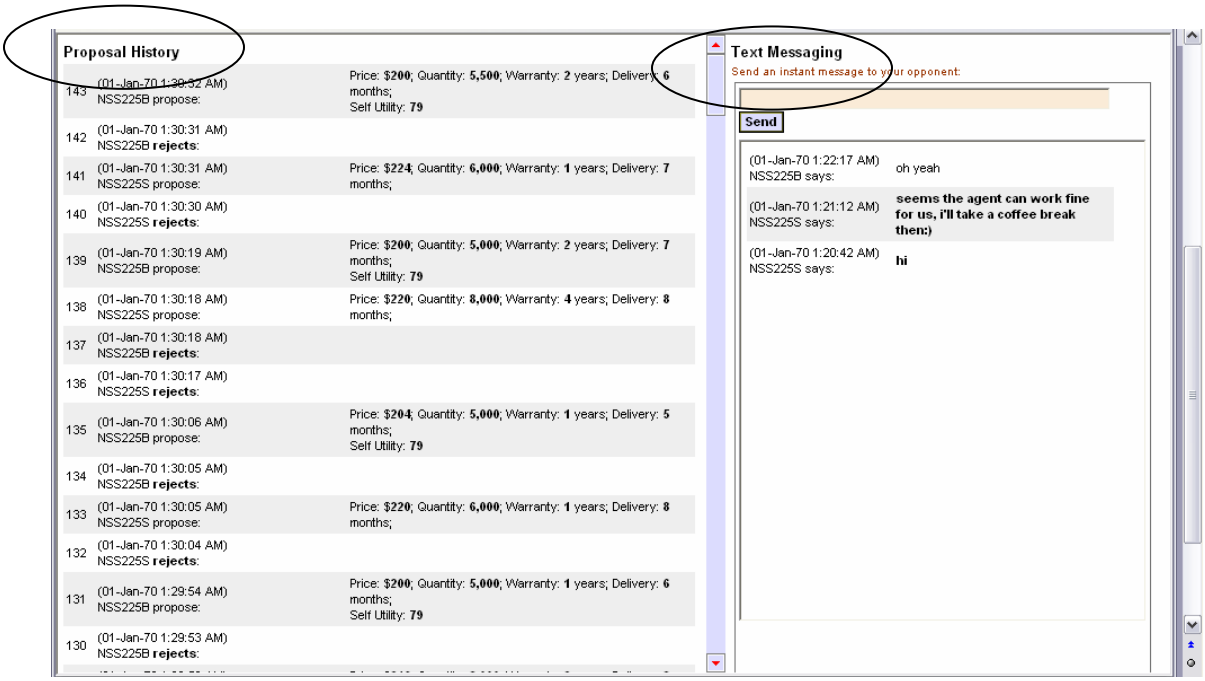

Figure 1. Screen Shot of the Main Page of ProNeg.

1. Intelligent Agent (reflected through Proposal History):

ProNeg works as an intelligent agent that automatically negotiates for the final agreement on behalf of you. Its activity is reflected in the **proposal history** (offers, rejections and final acceptation) made by the agent working on behalf of you and your opponents.
By inputting your own point structure and bottom line information, the agent starts from the highest utility score (100), make concessions slowly (propose alternative one by one that is favorable to you), until an agreement is reached. It will ensure to satisfy your bottom line (44), and achieve the highest possible final contract alternative while the opponent would agree with.
In the mean time while your agent is negotiating, you can take your time to chat with your opponent or leave the system idle to do other things, such as surfing net.

2. Text Messaging:

This component enables text-based electronic communication between you and your opponent.

User Manual on ProNeg ***(This portion is given to subjects in Level-3 system treatments)***
ProNeg is the name of the web-based negotiation support system that facilitates negotiation activities online. It consists of pages for **Log In, Determine Issue Ratings, Point Structure, Specify Bottom Line** and **the main page** with the following components:

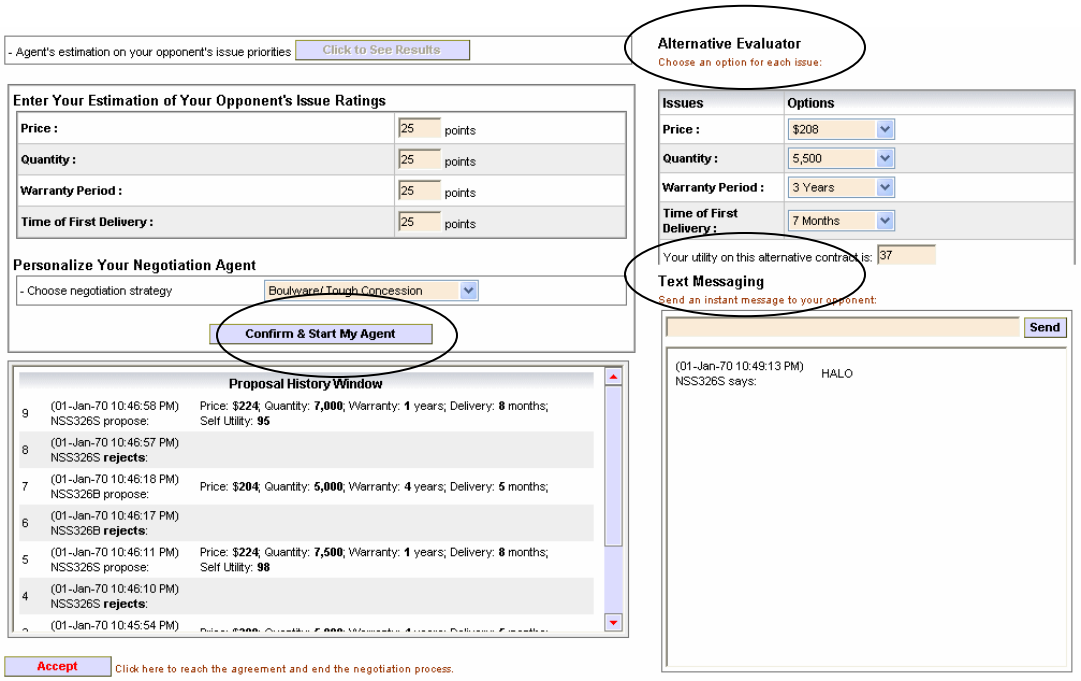

Figure 1. Screen Shot of the Main Page of ProNeg.

1. Alternative Evaluator:

It can help you to calculate your own utility scores for certain contract alternative that your opponent offered/proposed or contracts you want to offer to him/her.

2. Text Messaging:

This component enables text-based electronic communication between you and your opponent.

3. Intelligent Agent:

ProNeg works as an intelligent agent that automatically negotiates for the final agreement on behalf of you. Its activity is reflected in the **proposal history** (offers, rejections and final acceptation) made by the agent working on behalf of you and your opponents.
Generally, with your own point structure and bottom line information built in, the agent starts from the highest utility score (100), make concessions slowly (propose alternative one by one that is favorable to you), until an agreement is reached. It will ensure to satisfy your bottom line (44), and achieve the highest possible final contract alternative while the opponent would agree with.
You can start from chat with your opponent and estimate his/her issue weightages, then input your **estimation on how your opponents weight** the four issues, i.e., to inform the agent how you estimate the point structure of your opponents.
You can also **personalize your agent** by choosing negotiation strategies, soft or hard, whenever deemed appropriate. The Conceder/Soft strategy concedes faster while the Boulware/Tough strategy concedes slower. (Try NOT to use Conceder strategy when your self utility approaches BATNA since it may miss out some good offers)

* You can modify your estimation and negotiation strategy at any time to adjust the agent's concession-based automated negotiation process.
After the agent is started for some time, it can learn from the behavior of the opponent and analyze the opponent's point structure. The **estimation by the agent** will be available when

Becomes

By clicking then enabled button, you will be able to see the agent's estimation on your opponent's issue priorities that is highly accurate.
Note that the more you communicate with your opponent using the **Text Messaging** component, the more accurate you would estimate your opponent's approximate point structure. With an accurate or near-accurate point structure and appropriate strategies, the agent can work faster as well obtain better joint outcome.
In the mean time while your agent is negotiating, you can also take your time to chat with your opponent or leave the system idle to do other things, such as surfing net.

A.5 PRE-NEGOTIATION QUESTIONNAIRE

(This portion is given to subjects in all treatments)

1. What is your level of experience in working in groups?
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
   Very Low Medium Very High
2. What is your level of experience in making business decisions?
   1 2 3 4 5
   Very Low Medium Very High
3. What is your level of experience in using computers?
   1 2 3 4 5
   Very Low Medium Very High
4. Have you ever used Negotiation Support System or other decision support systems? __ (Yes/No)

If your answer is yes, what is your level of experience in using Negotiation Support System or other decision support systems?
1 2 3 4 5
Very Low Medium Very High

5. I could complete a job using a software package:

	Strongly Disagree						**Strongly Agree**
if there was no one around to tell me what to do as I go.	1	2	3	4	5	6	7
if I had never used a package like it before.	1	2	3	4	5	6	7
if someone showed me how to do it first.	1	2	3	4	5	6	7

if I had seen someone else using it before trying it myself.	1	2	3	4	5	6	7
if I could call someone for help if I get stuck.	1	2	3	4	5	6	7
if someone else had helped me get started.	1	2	3	4	5	6	7

A.6 NEGOTIATION MEMO

(This portion is given to subjects in all treatments)

NUSNET ID: _____
URL of ProNeg: http://172.18.181.137/nss

Your login details:

Username:
Password:

Important reminder:

- Strive to maximize your own utility score, and aim for higher joint outcome.
- You are not supposed to reveal confidential information about your company (File C).
- Utilize the tools/components of ProNeg to facilitate your negotiation activities.
- No time limit for reaching agreement.

Final Agreement

No.	Issue	Agreed Value
1	Unit price	
2	Minimum quantity purchased	
3	Warranty period	
4	Time of first delivery	

The utility score that you achieved on this agreement: ___ (should be at least 44).

A.7 POST-NEGOTIATION QUESTIONNAIRE

(This portion is given to subjects in all treatments)

A seven point Likert scale is used for the following post-negotiation questionnaire items, with 1 being the negative end indicating "Strongly Disagree" and 7 being the positive end representing "Strongly Agree".

Table A-1. Items for Perceived Collaborative Atmosphere and Satisfaction

Variables	Item No.	Items
Perceived Collaborative Atmosphere	CA_1	For the most part of negotiation, the opponent was considerate.
	CA_2	For the most part of negotiation, the opponent was flexible.

		CA_3	During the negotiation, the opponent was not a cooperative bargainer. (R)
		CA_4*	The atmosphere of the negotiation with my opponent is friendly.
Satisfaction with Settlement	Perceived Efficiency	SA_PE_1*	I am satisfied with the final agreement in this negotiation.
		SA_PE_2*	I am satisfied with my own performance as a negotiator.
		SA_PE_3	I am satisfied with the number of utility points I earned.
		SA_PE_4*	I think the outcome of the negotiation is satisfactory for my company.
	Perceived Fairness	SA_PF_1	I think the outcome of the negotiation was fair to both companies.
		SA_PF_1	I think my opponent and me had obtained similar utility scores on the final agreement.
		SA_PF_1	Neither of us is better off than the other.

* Items are used in post-negotiation attitude questionnaire in experiment 3.

Table A-2. Items for Perceived control

Cognitive Control	PC_CC_1	It was easy for me to visualize the way in which ProNeg works.
	PC_CC_2	I understood, at least abstractly, the components of ProNeg and how they work.
	PC_CC_3	I have used other systems that are similar to ProNeg in terms of the functionality.
	PC_CC_4	The objectives I attempt on ProNeg are very similar to the ones that I have successfully completed in the past.
Decision Control	PC_DC_1	ProNeg allowed me to make decisions about the way I would achieve my expected outcome.
	PC_DC_2	ProNeg allowed me to devise my own strategies to complete my negotiation task.
	PC_DC_3	ProNeg allowed me to update my expected outcome during the course of negotiation.
	PC_DC_4	ProNeg allowed me to attempt to achieve my expected outcome in any manner I want.
Behavior Control	PC_BC_1	I was able to use a very flexible approach to complete my negotiation task using ProNeg.
	PC_BC_2	I easily adjusted my negotiation strategies when I felt necessary to do so.

Table A-3. Items for System anxiety

System Anxiety	SA_1	Using ProNeg made me nervous.
	SA_2	Using ProNeg made me uneasy.
	SA_3	I felt comfortable using ProNeg. (R)
	SA_4	I felt tense using ProNeg.
	SA_5	I felt uncertain using ProNeg.

APPENDIX B MORE STATISTICAL OUTPUTS FOR EXPERIMENT 4 (CHAPTER 8)

B.1 VALIDATION TESTS ON CONTROLLED VARIABLES

(1) Age, Experiences and Computer Efficacy

The descriptive statistics for the control variables are presented in Table B-1.
Two-way MANOVA test are performed on age, past experiences and computer self-efficacy of subjects to examine differences caused by control variables across different treatment groups. Results of MANOVA tests are presented in Table B-2.
The MANOVA results showed no significant differences for past experiences and computer self-efficacy of subjects across different conditions, ensuring the effects of these variables are effectively controlled.
Age was not differed by system types but differed by conflict levels, i.e., main effects of conflict level on age were detected. To control the potential effect of age on dependent variables, further data analysis used age as covariate was conducted. MANOVA tests with/without age as the covariate was further performed to examine the impact of age on dependent variables. The results showed that age did not have main effect on all dependent variables expect perceived control. However, it did not influence the conclusion for effects of independent variables on perceived control. Table B-3 presents the MANCOVA results with age as the covariate. (Comparing results in Table B-3 and Table B-11 without engaging age as covariate, no differences due to effects of age are found) Control check on age was also completed.

Table B-1. Descriptive Statistics for Age, Past Experiences and Computer Self-efficacy across Treatment Groups

	Conflict Level	System Intelligence Level	Mean	Std. Deviation	N
Age	1	1	22.70	2.473	20
		2	21.94	1.434	18
		3	22.56	2.406	18
		Total	22.41	2.156	56
	2	1	23.80	2.484	20
		2	22.81	1.974	16
		3	23.95	2.800	20
		Total	23.57	2.478	56
	Total	1	23.25	2.509	40
		2	22.35	1.739	34
		3	23.29	2.680	38
		Total	22.99	2.384	112
Level of Experience in	1	1	3.65	.988	20
		2	3.83	1.043	18
		3	3.78	1.003	18

Groupwork		Total	3.75	.995	56
	2	1	3.30	.801	20
		2	3.88	.885	16
		3	3.80	.894	20
		Total	3.64	.883	56
	Total	1	3.48	.905	40
		2	3.85	.958	34
		3	3.79	.935	38
		Total	3.70	.938	112
Level of Experience in Business Decision	1	1	2.50	1.000	20
		2	2.44	.922	18
		3	2.56	.984	18
		Total	2.50	.953	56
	2	1	2.00	.725	20
		2	2.13	1.147	16
		3	2.35	.933	20
		Total	2.16	.930	56
	Total	1	2.25	.899	40
		2	2.29	1.031	34
		3	2.45	.950	38
		Total	2.33	.953	112
Level of Experience in Computer	1	1	4.60	.598	20
		2	4.56	.705	18
		3	4.56	.616	18
		Total	4.57	.628	56
	2	1	4.55	.605	20
		2	4.50	.730	16
		3	4.60	.598	20
		Total	4.55	.630	56
	Total	1	4.58	.594	40
		2	4.53	.706	34
		3	4.58	.599	38
		Total	4.56	.626	112
Level of Experience in NSS	1	1	.10	.447	20
		2	.06	.236	18
		3	.17	.707	18
		Total	.11	.493	56
	2	1	.15	.489	20
		2	.31	.873	16
		3	.10	.447	20
		Total	.18	.606	56
	Total	1	.13	.463	40
		2	.18	.626	34
		3	.13	.578	38

		Total	.14	.551	112
Computer Efficacy	1	1	5.2500	.93111	20
		2	5.2222	1.07558	18
		3	5.2222	.88377	18
		Total	5.2321	.94798	56
	2	1	4.9917	.99041	20
		2	4.7083	1.05321	16
		3	5.3417	1.12192	20
		Total	5.0357	1.06871	56
	Total	1	5.1208	.95779	40
		2	4.9804	1.08072	34
		3	5.2851	1.00443	38
		Total	5.1339	1.01042	112

Table B-2. Two-Way ANOVA Results on Age, Past Experiences and Computer Self-efficacy

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
ConflictLevel	Age	34.938	1	34.938	6.450	.013*
	Level of Experience in Groupwork	.253	1	.253	.287	.593
	Level of Experience in Business Decision	3.247	1	3.247	3.578	.061
	Level of Experience in Computer	.012	1	.012	.028	.867
	Level of Experience in NSS	.178	1	.178	.573	.451
	Computer Efficacy	1.317	1	1.317	1.285	.260
SystemLevel	Age	17.990	2	8.995	1.661	.195
	Level of Experience in Groupwork	3.128	2	1.564	1.777	.174
	Level of Experience in Business Decision	.897	2	.448	.494	.612
	Level of Experience in Computer	.056	2	.028	.068	.934
	Level of Experience in NSS	.073	2	.036	.117	.890
	Computer Efficacy	1.797	2	.899	.877	.419
ConflictLevel * SystemLevel	Age	1.253	2	.626	.116	.891
	Level of Experience in Groupwork	.936	2	.468	.532	.589
	Level of Experience in Business Decision	.430	2	.215	.237	.789
	Level of Experience in Computer	.059	2	.030	.072	.931
	Level of Experience in NSS	.477	2	.238	.765	.468
	Computer Efficacy	1.834	2	.917	.895	.412

Table B-3. Results of Two-Way MANCOVA Tests Using Age as Covariance

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
age	Joint Outcome	.071	1	.071	.006	.936
	Contract Balance	106.896	1	106.896	2.182	.143
	Negotiation Time	570.409	1	570.409	2.637	.107
	Satisfaction with Settlement	.002	1	.002	.002	.968
	Perceived Efficiency	.002	1	.002	.001	.974
	Perceived Fairness	.003	1	.003	.002	.964
	Perceived Collaborative Atmosphere	1.613	1	1.613	1.415	.237
	Perceived Control	8.030	1	8.030	5.337	.023*
	PCONTROL_CC	4.049	1	4.049	2.114	.149
	PCONTROL_DCBC	9.657	1	9.657	5.378	.022*
	System Anxiety	.199	1	.199	.138	.711
ConflictLevel	Joint Outcome	17679.711	1	17679.711	1593.920	.000**
	Contract Balance	289.721	1	289.721	5.915	.017*
	Negotiation Time	1821.893	1	1821.893	8.422	.005**
	Satisfaction with Settlement	18.139	1	18.139	11.998	.001**
	Perceived Efficiency	27.141	1	27.141	13.418	.000**
	Perceived Fairness	8.947	1	8.947	6.167	.015*
	Perceived Collaborative Atmosphere	12.606	1	12.606	11.056	.001**
	Perceived Control	1.736	1	1.736	1.154	.285
	PCONTROL_CC	5.582	1	5.582	2.914	.091
	PCONTROL_DCBC	.939	1	.939	.523	.471
	System Anxiety	17.473	1	17.473	12.117	.001**
SystemLevel	Joint Outcome	75.411	2	37.705	3.399	.037*
	Contract Balance	196.917	2	98.458	2.010	.139
	Negotiation Time	607.063	2	303.532	1.403	.250
	Satisfaction with Settlement	11.182	2	5.591	3.698	.028*
	Perceived Efficiency	25.387	2	12.694	6.275	.003**
	Perceived Fairness	1.290	2	.645	.445	.642
	Perceived Collaborative Atmosphere	.749	2	.375	.328	.721
	Perceived Control	24.966	2	12.483	8.296	.000**
	PCONTROL_CC	2.622	2	1.311	.684	.507
	PCONTROL_DCBC	40.441	2	20.220	11.261	.000**

	System Anxiety	6.861	2	3.430	2.379	.098
ConflictLevel * SystemLevel	Joint Outcome	28.113	2	14.056	1.267	.286
	Contract Balance	125.667	2	62.834	1.283	.282
	Negotiation Time	6864.959	2	3432.479	15.867	.000**
	Satisfaction with Settlement	1.780	2	.890	.589	.557
	Perceived Efficiency	3.512	2	1.756	.868	.423
	Perceived Fairness	1.740	2	.870	.600	.551
	Perceived Collaborative Atmosphere	12.998	2	6.499	5.700	.004**
	Perceived Control	3.558	2	1.779	1.182	.311
	PCONTROL_CC	1.535	2	.767	.401	.671
	PCONTROL_DCBC	4.663	2	2.331	1.298	.277
	System Anxiety	2.225	2	1.112	.771	.465

(2) Gender

Mann-Whitney U and Jonckheere-Terpstra tests are performed on the gender of subjects to examine differences across different treatment groups under conflict level and intelligence level respectively. The results showed no significant difference across different treatment conditions. Table B-5 and B-6 presented the descriptive statistics and Mann-Whitney U and Jonckheere-Terpstra tests respectively.

Table B-4. Frequencies of Male and Female Subjects across Treatment Groups

		Intelligence Level of NSS			
		Level-1	**Level-2**	**Level-3**	
Conflict Level	**Low**	15, 5	14, 4	13, 5	42, 14
	High	13, 7	4, 12	17, 3	34, 22
		28, 12	18, 16	30, 8	

Table B-5. Mann-Whitney U and Jonckheere-Terpstra Tests Results on Gender

Mann-Whitney Test Statistics(a)

	Gender
Mann-Whitney U	1344.000
Wilcoxon W	2940.000
Z	-1.611
Asymp. Sig. (2-tailed)	.107

a Grouping Variable: Conflict Level

Jonckheere-Terpstra Test(a)

	Gender
Number of Levels in System Intelligence Level	3
N	112
Observed J-T Statistic	1966.000
Mean J-T Statistic	2086.000
Std. Deviation of J-T Statistic	151.212
Std. J-T Statistic	-.794
Asymp. Sig. (2-tailed)	.427

a Grouping Variable: System Intelligence Level

B.2 FACTOR ANALYSIS AND RELIABILITY TESTS

Factor analysis was performed to validate the measurement model for items describing dependent variables. Exploratory factor analysis was used for instrument revision and verification. Subsequently, confirmatory factor analysis was used to confirm the grouping items. Reliability tests were then conducted to test the convergent validity.

Table B-6. Exploratory Factor Analysis - Rotated Component Matrix

	Component					
	1	2	3	4	5	6
CA_1	.393	.086	.000	-.029	.775	.138
CA_2	.351	.193	-.024	.009	.826	.032
CA_3	.048	.091	-.130	.066	.633	-.454
CA_4	.092	.154	-.293	.311	.609	-.242
SA_PE_1	.861	.244	-.148	.029	.109	.055
SA_PE_2	.754	.229	-.176	.130	.162	.096
SA_PE_3	.877	.253	-.154	-.005	.092	.064
SA_PE_4	.819	.327	-.193	.061	.111	.048
SA_PF_5	.767	.220	-.033	.238	.182	-.040
SA_PF_6	.694	-.033	.054	.417	.234	.076
SA_PF_7	.531	-.112	.106	.408	.278	-.023
PC_CC_1	.216	.258	-.182	.782	.117	.074
PC_CC_2	.170	.264	-.135	.722	.029	-.014
PC_CC_3	.096	.058	.079	.014	.002	.842
PC_CC_4	.070	.190	-.022	.030	-.104	.770
PC_DC_5	.134	.570	-.120	.543	-.003	.222
PC_DC_6	.235	.799	-.181	.258	.112	.144
PC_DC_7	.094	.844	-.162	.089	.087	.101

PC_DC_8	.216	.868	-.096	.066	.075	.063
PC_BC_9	.296	.813	-.087	.216	.114	.070
PC_BC_10	.181	.842	-.069	.169	.132	-.050
ANXIETY_1	-.019	-.106	.818	-.164	-.094	-.106
ANXIETY_2	-.191	-.292	.753	-.320	-.036	.052
ANXIETY_3	-.075	-.373	.317	-.474	.017	.183
ANXIETY_4	-.078	-.012	.778	.116	-.185	.077
ANXIETY_5	-.282	-.265	.656	-.295	.150	.163

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 7 iterations.

Table B-7. Confirmatory Factor Analysis - Rotated Component Matrix

	Component				
	1	2	3	4	5
CA_1	.468	.115	.073	.680	-.048
CA_2	.408	.207	.032	.771	-.014
CA_3	.005	.025	-.157	.772	.061
CA_4	.077	.127	-.302	.696	.279
SA_PE_1	.851	.240	-.168	.100	.037
SA_PE_2	.755	.239	-.188	.138	.129
SA_PE_3	.879	.254	-.163	.066	-.009
SA_PE_4	.821	.328	-.203	.093	.047
SA_PF_5	.750	.218	-.065	.188	.244
SA_PF_6	.706	-.003	.046	.180	.442
SA_PF_7	.537	-.088	.094	.234	.445
PC_CC_1	.209	.299	-.212	.111	.759
PC_CC_2	.136	.290	-.187	.051	.735
PC_DC_5	.142	.617	-.133	-.041	.512
PC_DC_6	.243	.825	-.187	.084	.224
PC_DC_7	.096	.853	-.164	.082	.060
PC_DC_8	.216	.874	-.106	.066	.034
PC_BC_9	.293	.825	-.104	.106	.185
PC_BC_10	.161	.833	-.096	.166	.146
ANXIETY_1	-.036	-.132	.794	-.072	-.130
ANXIETY_2	-.171	-.288	.773	-.092	-.263
ANXIETY_4	-.077	-.001	.762	-.210	.139
ANXIETY_5	-.232	-.247	.711	.068	-.253

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 6 iterations.

Table B-8. Results of Reliability Tests

Constructs	Number of Items	Cronbach's Alpha
Satisfaction with Settlements (SA)	7	0.920
Perceived Collaborative Atmosphere (CA)	4	0.792
Perceived Control (PC)	8	0.919
System Anxiety (ANXIETY)	4	0.822

B.3 DESCRIPTIVE STATISTICS AND PROFILE PLOTS

Mean, standard deviation and number of cases are presented for each of the dependent variables. Profile plots for the seven dependent variables were presented below for better visualization purpose. Note that for each profile plots, (a) used intelligence level as horizontal axis and conflict level as separated line, whereas (b) and used conflict level as horizontal axis and intelligence level as separated line.

(1) Descriptive Statistics (Mean and Standard Deviation)

Table B-9. Descriptive Statistics for Dependent Variables across Treatment Groups

	Conflict Level	System Intelligence Level	Mean	Std. Deviation	N
Joint Outcome	1	1	127.20	3.334	20
		2	126.11	3.894	18
		3	129.33	4.144	18
		Total	127.54	3.950	56
	2	1	101.30	2.203	20
		2	101.38	4.048	16
		3	102.10	1.861	20
		Total	101.61	2.735	56
	Total	1	114.25	13.408	40
		2	114.47	13.127	34
		3	115.00	14.127	38
		Total	114.57	13.454	112
Contract Balance	1	1	11.80	8.231	20
		2	6.33	6.362	18
		3	6.89	7.251	18
		Total	8.46	7.649	56
	2	1	6.00	5.749	20
		2	5.00	9.223	16
		3	5.50	5.011	20
		Total	5.54	6.592	56
	Total	1	8.90	7.598	40

		2	5.71	7.744	34
		3	6.16	6.127	38
		Total	7.00	7.258	112
Negotiation Time	1	1	28.8500	10.03385	20
		2	54.7700	18.77115	18
		3	40.1411	10.65358	18
		Total	40.8107	17.16718	56
	2	1	54.8030	18.01568	20
		2	42.2569	16.30822	16
		3	48.3590	13.17078	20
		Total	48.9170	16.43768	56
	Total	1	41.8265	19.49043	40
		2	48.8815	18.50940	34
		3	44.4663	12.59042	38
		Total	44.8638	17.21877	112
Satisfaction with Settlement	1	1	5.8071	.71093	20
		2	4.9762	1.12085	18
		3	5.3333	1.02549	18
		Total	5.3878	1.00415	56
	2	1	4.7357	1.27798	20
		2	4.0357	1.78467	16
		3	4.8429	1.27935	20
		Total	4.5740	1.45546	56
	Total	1	5.2714	1.15597	40
		2	4.5336	1.52380	34
		3	5.0752	1.17697	38
		Total	4.9809	1.31008	112
Perceived Efficiency	1	1	5.9375	.85792	20
		2	4.8889	1.39648	18
		3	5.3889	1.35099	18
		Total	5.4241	1.26932	56
	2	1	4.7625	1.35839	20
		2	3.5313	1.99348	16
		3	4.8625	1.44294	20
		Total	4.4464	1.66836	56
	Total	1	5.3500	1.26946	40
		2	4.2500	1.81221	34
		3	5.1118	1.40667	38
		Total	5.9375	.85792	20
Perceived Fairness	1	1	5.6333	.81578	20
		2	5.0926	1.00200	18
		3	5.2593	.88233	18
		Total	5.3393	.91340	56

	2	1	4.7000	1.36754	20
		2	4.7083	1.67719	16
		3	4.8167	1.29088	20
		Total	4.7440	1.41134	56
	Total	1	5.1667	1.20776	40
		2	4.9118	1.35415	34
		3	5.0263	1.12408	38
		Total	5.0417	1.22055	112
Perceived Collaborative Atmosphere	1	1	5.7875	.73572	20
		2	5.0000	.91956	18
		3	5.3333	.80896	18
		Total	5.3884	.87115	56
	2	1	4.2125	1.34818	20
		2	4.9688	1.21063	16
		3	5.0375	1.23617	20
		Total	4.7232	1.30530	56
	Total	1	5.0000	1.33613	40
		2	4.9853	1.04979	34
		3	5.1776	1.05252	38
		Total	5.0558	1.15407	112
Perceived Control	1	1	5.5625	.65707	20
		2	4.4236	1.45783	18
		3	4.5694	1.47043	18
		Total	4.8772	1.32040	56
	2	1	4.8750	.94416	20
		2	3.8672	1.45378	16
		3	4.6438	1.38202	20
		Total	4.5045	1.31122	56
	Total	1	5.2188	.87511	40
		2	4.1618	1.46115	34
		3	4.6086	1.40558	38
		Total	4.6908	1.32319	112
PCONTROL_CC	1	1	5.8000	1.10501	20
		2	5.5000	1.47529	18
		3	5.1667	1.30609	18
		Total	5.5000	1.30035	56
	2	1	4.9500	1.28657	20
		2	5.0000	1.72240	16
		3	4.8500	1.45186	20
		Total	4.9286	1.45361	56
	Total	1	5.3750	1.25958	40
		2	5.2647	1.59181	34
		3	5.0000	1.37546	38

		Total	5.2143	1.40256	112
PCONTROL_DCBC	1	1	5.4833	.60432	20
		2	4.0648	1.69981	18
		3	4.3704	1.60020	18
		Total	4.6696	1.48341	56
	2	1	4.8500	.91431	20
		2	3.4896	1.67384	16
		3	4.5750	1.46347	20
		Total	4.3631	1.45509	56
	Total	1	5.1667	.82948	40
		2	3.7941	1.68728	34
		3	4.4781	1.51230	38
		Total	4.5164	1.47076	112
System Anxiety	1	1	1.8250	.95663	20
		2	2.3194	.89445	18
		3	2.7500	1.08465	18
		Total	2.2813	1.03689	56
	2	1	3.0250	1.38815	20
		2	3.0938	1.51898	16
		3	3.2875	1.24413	20
		Total	3.1384	1.35757	56
	Total	1	2.4250	1.32433	40
		2	2.6838	1.27075	34
		3	3.0329	1.18717	38
		Total	2.7098	1.27721	112

(2) Profile Plots

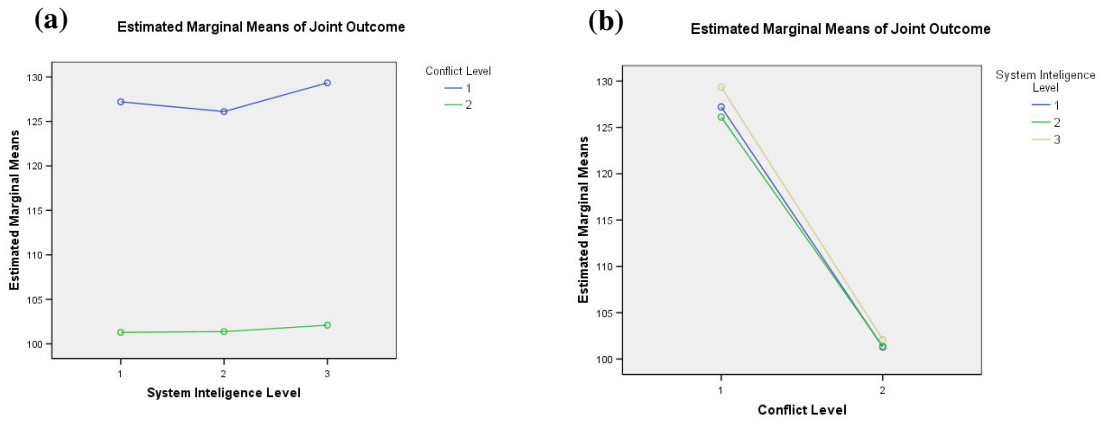

Figure B-1. Profile Plots for Joint Outcome

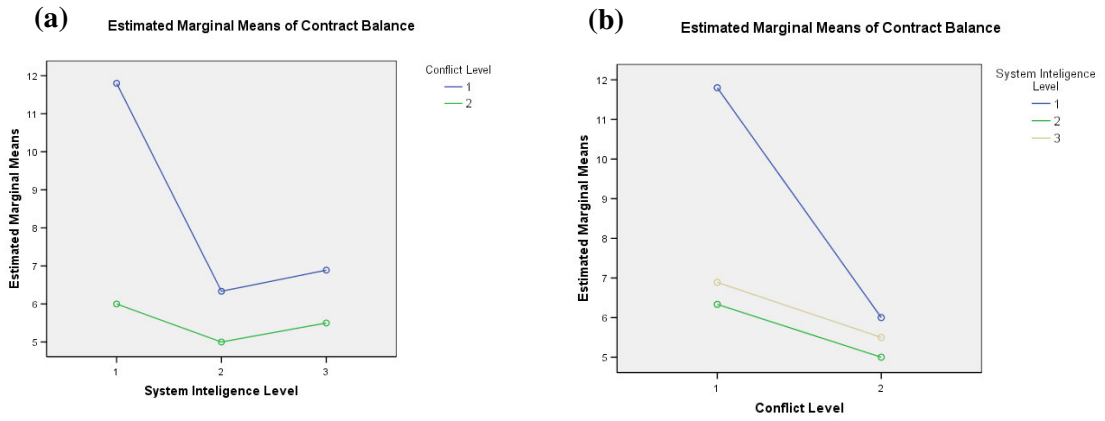

Figure B-2. Profile Plots for Contract Balance

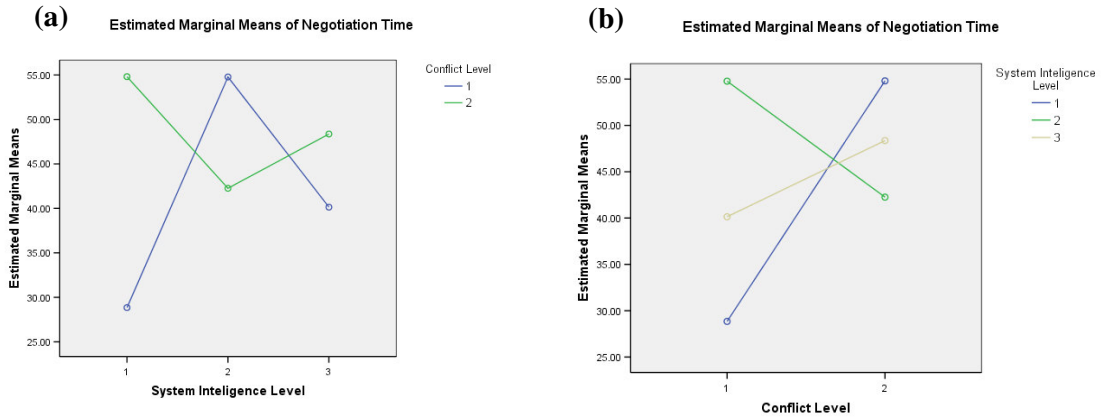

Figure B-3. Profile Plots for Time to Settlement

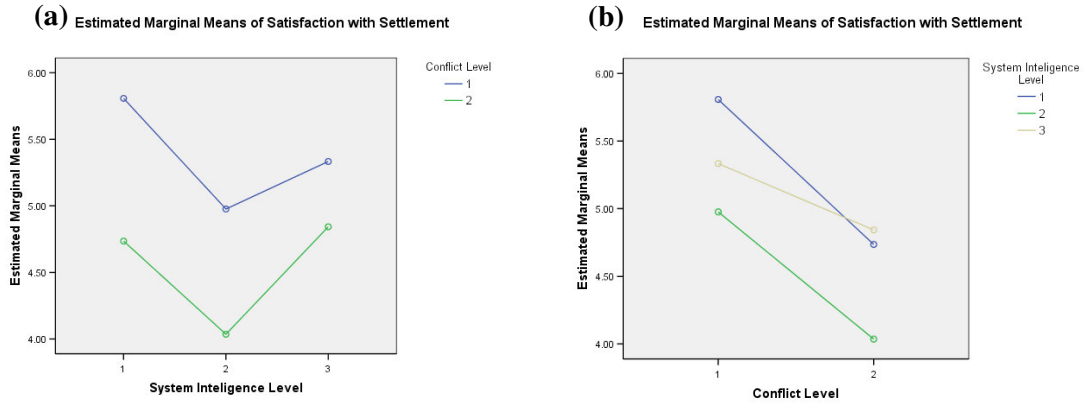

Figure B-4. Profile Plots for Satisfaction with Settlement

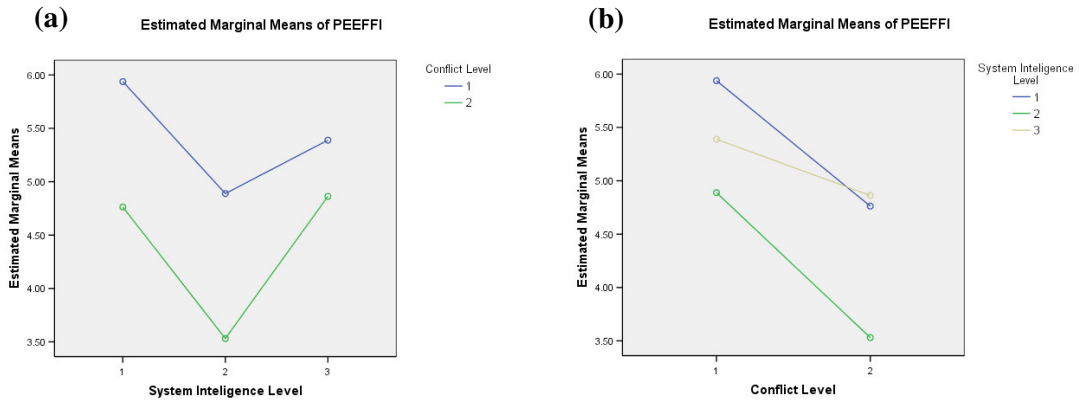

Figure B-5. Profile Plots for Satisfaction with Settlement (Perceived Efficiency)

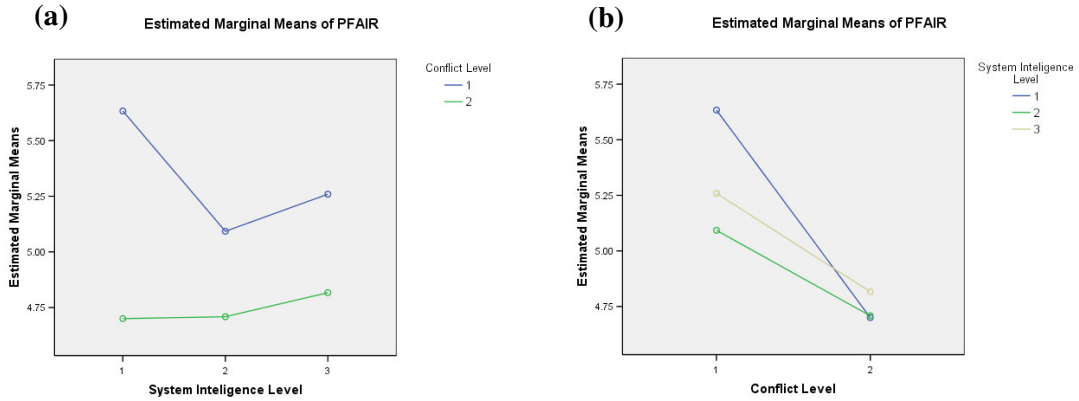

Figure B-6. Profile Plots for Satisfaction with Settlement (Perceived Fairness)

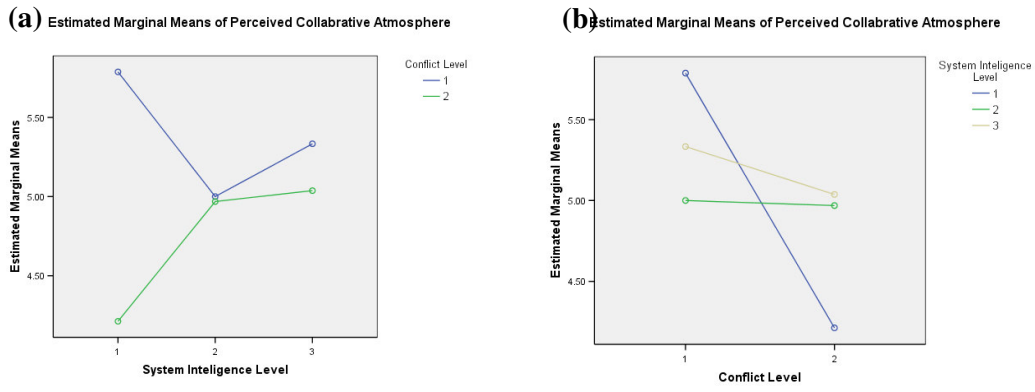

Figure B-7. Profile Plots for Perceived Collaborative Atmosphere

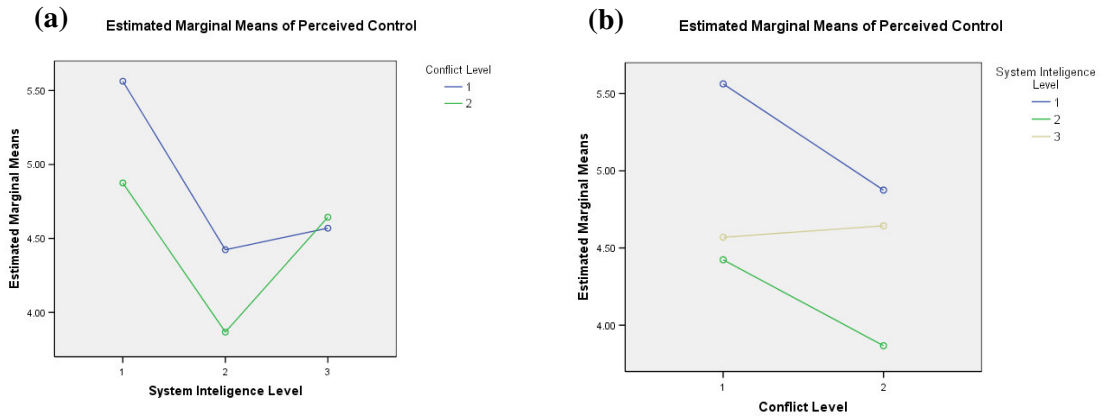

Figure B-8. Profile Plots for Perceived Control (All Dimensions)

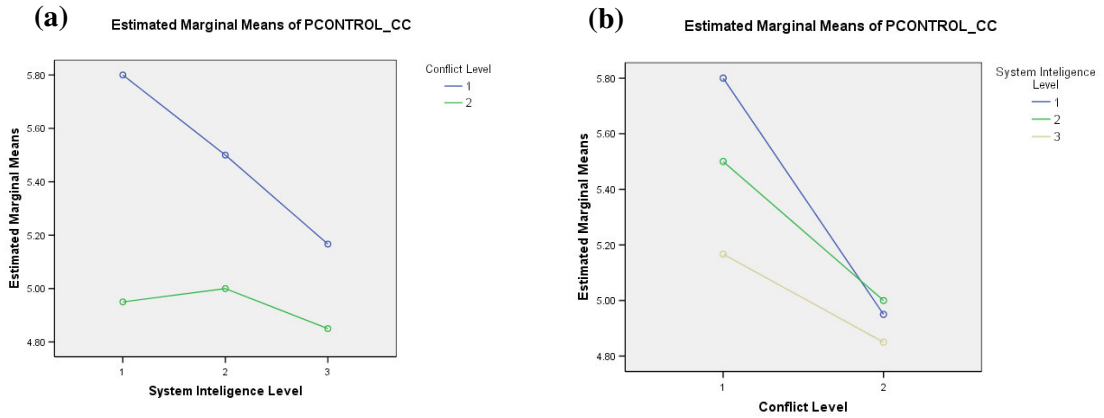

Figure B-9. Profile Plots for Perceived Control (Cognitive Control Dimension Only)

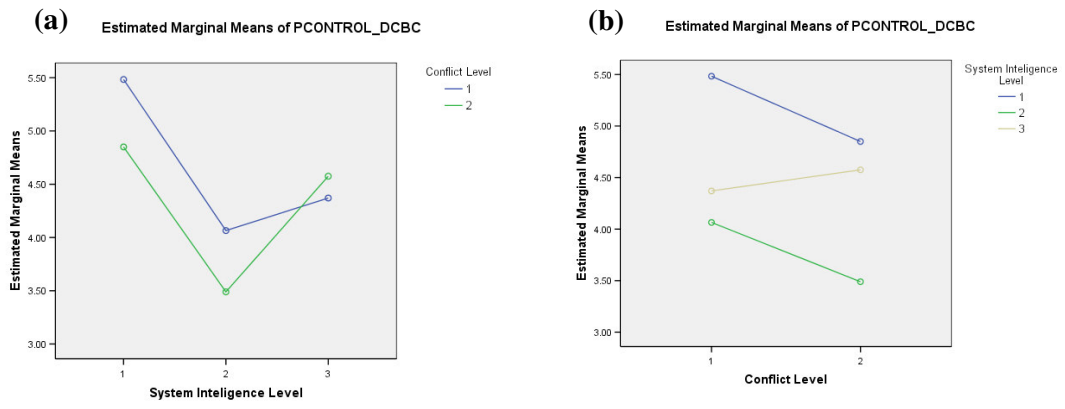

Figure B-10. Profile Plots for Perceived Control (Decisional and Behavioral Control Dimensions Only)

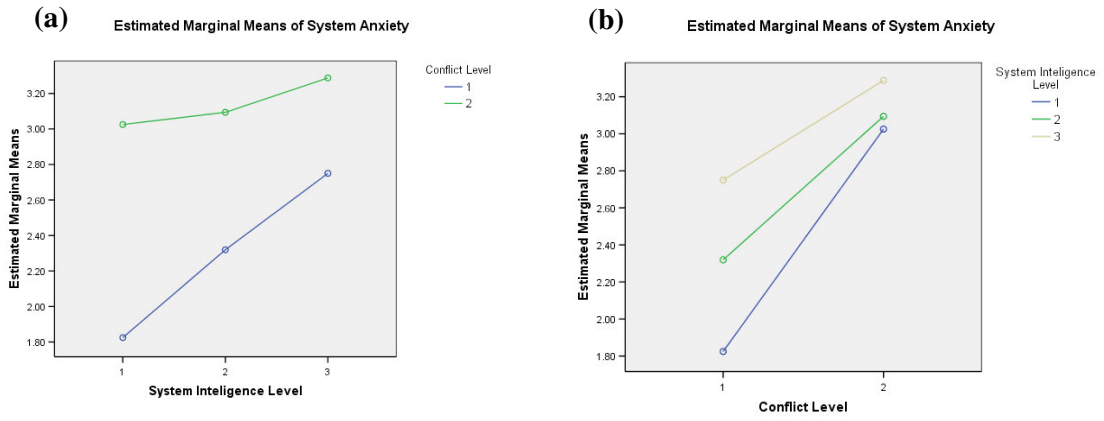

Figure B-11. Profile Plots for System Anxiety

B.4 TWO-WAY MANOVA TESTS OUTPUTS ON DEPENDENT VARIABLES

Prior to ANOVA tests, Levene's test of homogeneity of variance is computed by SPSS to test the ANOVA assumption that each group (category) of the independent variables has the same variance (Box, 1954). Results are shown in Table B-10. In the event that the assumption is not met, Games-Howell method is used to test the significance of the effects (Tootharer, 1993). ANOVA test outputs are also shown in Table B-11.

(1) Tests of Homogeneity of Variances

Table B-10. Tests of Homogeneity of Variances - Levene's Test of Equality of Error Variances

	F	df1	df2	Sig.
Joint Outcome	5.214	5	106	.000**
Contract Balance	.940	5	106	.459
Negotiation Time	4.572	5	106	.001**
Satisfaction with Settlement	2.217	5	106	.058
Perceived Efficiency	1.723	5	106	.136
Perceived Fairness	2.316	5	106	.049*
Perceived Collaborative Atmosphere	1.429	5	106	.220
Perceived Control	3.522	5	106	.006**
PCONTROL_CC	.869	5	106	.505
PCONTROL_DCBC	5.420	5	106	.000**
System Anxiety	1.313	5	106	.264

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a Design: Intercept+age+ConflictLevel+SystemLevel+ConflictLevel * SystemLevel

(2) Results of Two-Way MANOVA Tests

Table B-11. Results of Two-Way MANOVA Tests – Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
ConflictLevel	Joint Outcome	18737.460	1	18737.460	1705.266	.000**
	Contract Balance	224.431	1	224.431	4.531	.036*
	Negotiation Time	1449.452	1	1449.452	6.598	.012*
	Satisfaction with Settlement	19.350	1	19.350	12.921	.000**
	Perceived Efficiency	28.916	1	28.916	14.431	.000**
	Perceived Fairness	9.574	1	9.574	6.662	.011*
	Perceived Collaborative Atmosphere	11.180	1	11.180	9.767	.002**
	Perceived Control	4.227	1	4.227	2.699	.103
	PCONTROL_CC	8.584	1	8.584	4.434	.038*
	PCONTROL_DCBC	3.114	1	3.114	1.666	.200
	System Anxiety	19.496	1	19.496	13.630	.000**
SystemLevel	Joint Outcome	77.030	2	38.515	3.505	.034*
	Contract Balance	229.225	2	114.613	2.314	.104
	Negotiation Time	830.610	2	415.305	1.891	.156
	Satisfaction with Settlement	11.453	2	5.727	3.824	.025*
	Perceived Efficiency	26.068	2	13.034	6.505	.002**
	Perceived Fairness	1.301	2	.651	.453	.637
	Perceived Collaborative Atmosphere	.933	2	.467	.408	.666
	Perceived Control	21.494	2	10.747	6.862	.002**
	PCONTROL_CC	2.683	2	1.342	.693	.502
	PCONTROL_DCBC	35.496	2	17.748	9.492	.000**
	System Anxiety	6.861	2	3.431	2.398	.096
ConflictLevel * SystemLevel	Joint Outcome	28.042	2	14.021	1.276	.283
	Contract Balance	126.452	2	63.226	1.277	.283
	Negotiation Time	6785.679	2	3392.839	15.446	.000**
	Satisfaction with Settlement	1.778	2	.889	.594	.554
	Perceived Efficiency	3.512	2	1.756	.876	.419
	Perceived Fairness	1.740	2	.870	.605	.548
	Perceived Collaborative Atmosphere	12.972	2	6.486	5.666	.005**
	Perceived Control	3.162	2	1.581	1.009	.368
	PCONTROL_CC	1.432	2	.716	.370	.692
	PCONTROL_DCBC	4.137	2	2.069	1.106	.335
	System Anxiety	2.198	2	1.099	.768	.466

B.5 HYPOTHESES TESTING

Our hypotheses on dependent variables (joint outcome, contract balance, time, Perceived Collaborative Atmosphere) are specified in terms of the impact of different system types by intelligence levels and two conflict situations respectively.

(1) For those dependent variables where system type has significant effects shown in Table B-1 (i.e., Joint Outcome, Satisfaction with Settlement (and on the Perceived Efficiency dimension), and Perceived Control (and on the Decisional and Behavioral Dimensions)), to investigate the effects of specific system types (Level-3 Vs. Level-1, and Level-3 Vs. Level-2), contrast tests option with the last level (Level-3) as reference category was selected in the two-way MANOVA analysis procedure. Results of contrast tests were obtained from outputs of two-way MANOVA tests and are presented in Table B-12.

For Level-3 Vs. Level-1: Significant main effects were detected on Joint Outcome, Perceived Control (and on the Decisional and Behavioral Dimensions)[54]. Before conclusion, results of homogeneity of variances tests (Table B-10) were references to check if the assumption of ANOVA has been violated in order to prevent type I errors in the F test (wrongly rejecting the null hypothesis). All the mentioned dependent variables have unequal variances (sig > 0.05) except for Anxiety. We then refer to the post-hoc analysis of the two-way ANOVA outputs (Table B-13). As equal variances cannot be assumed, Games-Howell statistics were used and the results indicated no significant differences on Joint Outcome across the two system types (p=0.969). We conclude that Level-3 and Level-1 systems are significantly differed only on **Perceived Control (the Decisional and Behavioral Dimensions)** (p=0.042) based on Table B-13 without assuming equal variances.

For Level-3 Vs. Level-2: Significant main effects were detected on Joint Outcome, Satisfaction (and on the Perceived Efficiency dimension), and Perceived Control (the Decisional and Behavioral Dimensions). Before reaching conclusion, similar processes checking ANOVA assumptions and use respective statistics were used. We conclude that Level-3 and Level-2 systems are significantly differed only on **Satisfaction (the Perceived Efficiency dimension)** (p=0.030) based on Table B-13 assuming equal variances are met.

(2) Furthermore, for those dependent variables where interaction terms are significant as shown in Table B-11 (i.e., Negotiation Time, and Perceived Collaborative Atmosphere), one-way ANOVA are performed to examine significant main effects of system types under different conflict levels for (i) under low conflict (see Table B-15), and (ii) under high conflict (see Table B-18). Other related outputs are presented in Table B-16, B-17 and B-19.

For each conflict level, similar data analysis procedures as illustrated in (1) were applied. We conclude that (i) under low conflict level, Level-3 and Level-1 systems are significantly differed only on **Negotiation Time** (p=0.005); Level-3 and Level-2 systems are significantly differed only on **Negotiation Time** (p=0.021) and (ii) under high conflict level, Level-3 and Level-1 systems are significantly differed only on **Perceived Collaborative Atmosphere** (p=0.045).

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[54] The level of significance at 0.054 is considered as significant in this case as it is marginally bigger than the recommended value 0.05.

(1) Results of Two-Way MANOVA Tests – Contrasts and Post-Hoc Analysis

Table B-12. Results of Two-Way MANOVA Tests – Contrast Results (K Matrix)

System Intelligence Level Simple Contrast(a)			Dependent Variable						
			Joint Outcome	Negotiation Time	Satisfaction with Settlement	Perceived Efficiency	Perceived Control	PCONTROL_DCBC	System Anxiety
Level-1 vs. Level-3	Contrast Estimate		-1.467	-3.947	.183	.224	.612	.694	-.594
	Hypothesized Value		0	0	0	0	0	0	0
	Difference (Estimate - Hypothesized)		-1.467	-3.947	.183	.224	.612	.694	-.594
	Std. Error		.751	3.338	.277	.321	.284	.310	.271
	Sig.		.054	.240	.510	.486	.033*	.027*	.031*
	95% Confidence Interval for Difference	-2.956	-.367	-.412	-.413	.168	.197	-.565	-1.131
		.023	.733	.860	.877	1.286	1.406	.576	-.056
Level-2 vs. Level-3	Contrast Estimate		-1.974	3.133	-.582	-.916	-.461	-.695	-.312
	Hypothesized Value		0	0	0	0	0	0	0
	Difference (Estimate - Hypothesized)		-1.974	3.133	-.582	-.916	-.461	-.695	-.312
	Std. Error		.784	3.555	.289	.335	.296	.323	.283
	Sig.		.013*	.380	.047*	.007**	.122	.034*	.272
	95% Confidence Interval for Difference	-3.527	-1.156	-1.579	-1.532	-1.072	-1.407	-.776	-.873
		-.420	-.008	-.252	-.157	.119	-.119	.440	.248

Table B-13. Results of Two-Way MANOVA Tests – Post-Hoc Tests

Dependent Variable		(I) System Intelligence Level	(J) System Intelligence Level	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Joint Outcome	Tukey HSD	1	2	-.22	.773	.956	-2.06	1.62
			3	-.75	.751	.579	-2.53	1.03
		2	1	.22	.773	.956	-1.62	2.06
			3	-.53	.783	.778	-2.39	1.33
		3	1	.75	.751	.579	-1.03	2.53
			2	.53	.783	.778	-1.33	2.39
	Games-Howell	1	2	-.22	3.092	.997	-7.62	7.18
			3	-.75	3.122	.969	-8.21	6.71
		2	1	.22	3.092	.997	-7.18	7.62
			3	-.53	3.212	.985	-8.22	7.16
		3	1	.75	3.122	.969	-6.71	8.21
			2	.53	3.212	.985	-7.16	8.22
Satisfaction with Settlement	Tukey HSD	1	2	.7378(*)	.28546	.030*	.0593	1.4164
			3	.1962	.27722	.759	-.4627	.8552
		2	1	-.7378(*)	.28546	.030	-1.4164	-.0593
			3	-.5416	.28889	.151	-1.2283	.1451
		3	1	-.1962	.27722	.759	-.8552	.4627
			2	.5416	.28889	.151	-.1451	1.2283
	Games-Howell	1	2	.7378	.31890	.061	-.0283	1.5039
			3	.1962	.26431	.739	-.4357	.8281
		2	1	-.7378	.31890	.061	-1.5039	.0283
			3	-.5416	.32365	.224	-1.3188	.2356

		3	1	-.1962	.26431	.739	-.8281	.4357
			2	.5416	.32365	.224	-.2356	1.3188
Perceived Efficiency	Tukey HSD	1	2	1.1000(*)	.33019	.003**	.3151	1.8849
			3	.2382	.32066	.739	-.5241	1.0004
		2	1	-1.1000(*)	.33019	.003	-1.8849	-.3151
			3	-.8618(*)	.33416	.030	-1.6562	-.0675
		3	1	-.2382	.32066	.739	-1.0004	.5241
			2	.8618(*)	.33416	.030*	.0675	1.6562
	Games-Howell	1	2	1.1000(*)	.36997	.012	.2100	1.9900
			3	.2382	.30391	.714	-.4887	.9650
		2	1	-1.1000(*)	.36997	.012	-1.9900	-.2100
			3	-.8618	.38557	.073	-1.7877	.0640
		3	1	-.2382	.30391	.714	-.9650	.4887
			2	.8618	.38557	.073	-.0640	1.7877
Perceived Control	Tukey HSD	1	2	1.0570(*)	.29193	.001	.3631	1.7509
			3	.6102	.28350	.084	-.0637	1.2841
		2	1	-1.0570(*)	.29193	.001	-1.7509	-.3631
			3	-.4468	.29543	.289	-1.1491	.2555
		3	1	-.6102	.28350	.084	-1.2841	.0637
			2	.4468	.29543	.289	-.2555	1.1491
	Games-Howell	1	2	1.0570(*)	.28625	.002**	.3664	1.7476
			3	.6102	.26671	.065	-.0304	1.2508
		2	1	-1.0570(*)	.28625	.002	-1.7476	-.3664
			3	-.4468	.33880	.390	-1.2585	.3649
		3	1	-.6102	.26671	.065	-1.2508	.0304
			2	.4468	.33880	.390	-.3649	1.2585
PCONTROL_BCDC	Tukey HSD	1	2	1.3725(*)	.31896	.000	.6144	2.1307

		3	.6886	.30975	.072	-.0477	1.4249
	2	1	-1.3725(*)	.31896	.000	-2.1307	-.6144
		3	-.6840	.32279	.091	-1.4513	.0834
	3	1	-.6886	.30975	.072	-1.4249	.0477
		2	.6840	.32279	.091	-.0834	1.4513
Games-Howell	1	2	1.3725(*)	.31770	.000**	.6033	2.1418
		3	.6886(*)	.27818	.042	.0191	1.3581
	2	1	-1.3725(*)	.31770	.000	-2.1418	-.6033
		3	-.6840	.37936	.176	-1.5933	.2254
	3	1	-.6886(*)	.27818	.042*	-1.3581	-.0191
		2	.6840	.37936	.176	-.2254	1.5933

(2) Results of One-Way ANOVA Tests under Different Conflict Level Treatments – Contrasts and Post-Hoc Analysis

Table B-14. Tests of Homogeneity of Variances under Low Conflict - Levene's Test of Equality of Error Variances

	F	df1	df2	Sig.
Negotiation Time	9.588	2	53	.000**
Perceived Collaborative Atmosphere	.401	2	53	.672

Table B-15. Results of One-Way MANOVA Tests under Low Conflict– Tests of Between-Subjects Effects

	Sum of Squares	df	Mean Square	F	Sig.
Negotiation Time	6376.754	2	3188.377	17.186	.000**
Perceived Collaborative Atmosphere	5.956	2	2.978	4.410	.017*

Table B-16. Results of One-Way MANOVA Tests under Low Conflict– Results of Two-Way ANOVA Tests – Post-hoc Tests

Dependent Variable		(I) System Intelligence Level	(J) System Intelligence Level	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Negotiation Time	Tukey HSD	1	2	-25.9200(*)	4.42520	.000	-36.5903	-15.2497
			3	-11.2911(*)	4.42520	.036	-21.9614	-.6208
		2	1	25.9200(*)	4.42520	.000	15.2497	36.5903
			3	14.6289(*)	4.54016	.006	3.6814	25.5764
		3	1	11.2911(*)	4.42520	.036	.6208	21.9614
			2	-14.6289(*)	4.54016	.006	-25.5764	-3.6814
	Games-Howell	1	2	-25.9200(*)	4.96077	.000**	-38.2654	-13.5746
			3	-11.2911(*)	3.36740	.005	-19.5319	-3.0503
		2	1	25.9200(*)	4.96077	.000	13.5746	38.2654
			3	14.6289(*)	5.08732	.021	2.0132	27.2446
		3	1	11.2911(*)	3.36740	.005**	3.0503	19.5319
			2	-14.6289(*)	5.08732	.021*	-27.2446	-2.0132
Perceived Collaborative Atmosphere	Tukey HSD	1	2	.7875(*)	.26696	.013*	.1438	1.4312
			3	.4542	.26696	.214	-.1895	1.0979
		2	1	-.7875(*)	.26696	.013	-1.4312	-.1438
			3	-.3333	.27390	.449	-.9938	.3271
		3	1	-.4542	.26696	.214	-1.0979	.1895
			2	.3333	.27390	.449	-.3271	.9938
	Games-Howell	1	2	.7875(*)	.27211	.018	.1194	1.4556
			3	.4542	.25183	.183	-.1625	1.0708
		2	1	-.7875(*)	.27211	.018	-1.4556	-.1194

		3	-.3333	.28868	.488	-1.0412	.3746
	3	1	-.4542	.25183	.183	-1.0708	.1625
		2	.3333	.28868	.488	-.3746	1.0412

Table B-17. Tests of Homogeneity of Variances under High Conflict – Levene's Test of Equality of Error Variances

	F	df1	df2	Sig.
Negotiation Time	.913	2	53	.408
Perceived Collaborative Atmosphere	.185	2	53	.831

Table B-18. Results of One-Way MANOVA Tests under High Conflict – Tests of Between-Subjects Effects

	Sum of Squares	df	Mean Square	F	Sig.
Negotiation Time	1408.843	2	704.422	2.775	.071
Perceived Collaborative Atmosphere	8.157	2	4.078	2.527	.090

Table B-19. Results of One-Way MANOVA Tests under High Conflict – Contrast Results (K Matrix)

System Intelligence Level Simple Contrast(a)			Dependent Variables	
			Negotiation Time	Perceived Collaborative Atmosphere
Level-1 vs. Level-3	Contrast Estimate		6.444	-.825
	Hypothesized Value		0	0
	Difference (Estimate - Hypothesized)		6.444	-.825
	Std. Error		5.038	.402
	Sig.		.206	.045*
	95% Confidence Interval for Difference	-3.661	-1.631	-.412

		16.549	-.019	.860
Level-2 vs. Level-3	Contrast Estimate		-6.102	-.069
	Hypothesized Value		0	0
	Difference (Estimate - Hypothesized)		-6.102	-.069
	Std. Error		5.344	.426
	Sig.		.259	.872
	95% Confidence Interval for Difference	-16.820	-.923	-1.579
		4.616	.786	-.252
Level 2 vs. Level 1	Contrast Estimate		-12.546	.756
	Hypothesized Value		0	0
	Difference (Estimate - Hypothesized)		-12.546	.756
	Std. Error		5.344	.426
	Sig.		.023*	.082
	95% Confidence Interval for Difference	-16.820	-23.264	-.098
		4.616	-1.828	1.611

APPENDIX C GUIDES AND SUMMARY OF INTERVIEWS

C.1 FACILITATIVE GUIDES TO INTERVIEW

A Field Research on e-Negotiation systems
e-协谈系统的企业调查研究

Figure 1 shows the overall architecture for an e-Negotiation system in e-marketplace website. Suppliers and buyers can contact each other and conduct business negotiations through the e-Negotiation system offered by e-marketplace website. 图 1 展示 e-协谈系统的基本架构. 买方和供应方可以通过由电子商务网站提供的 e-协谈系统联系对方和进行商业谈判.

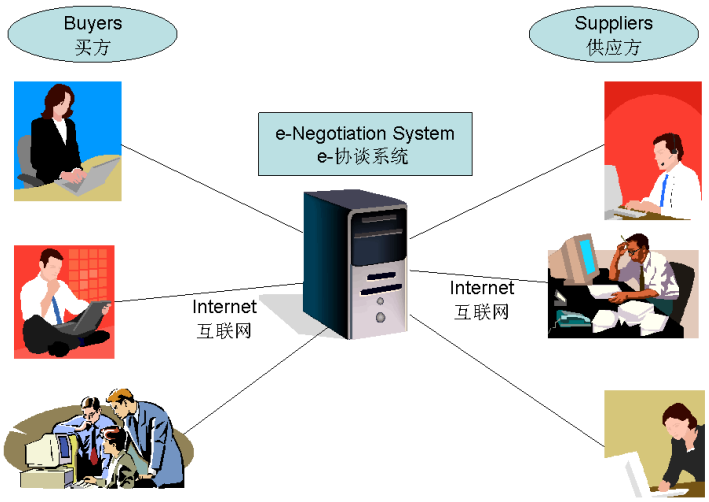
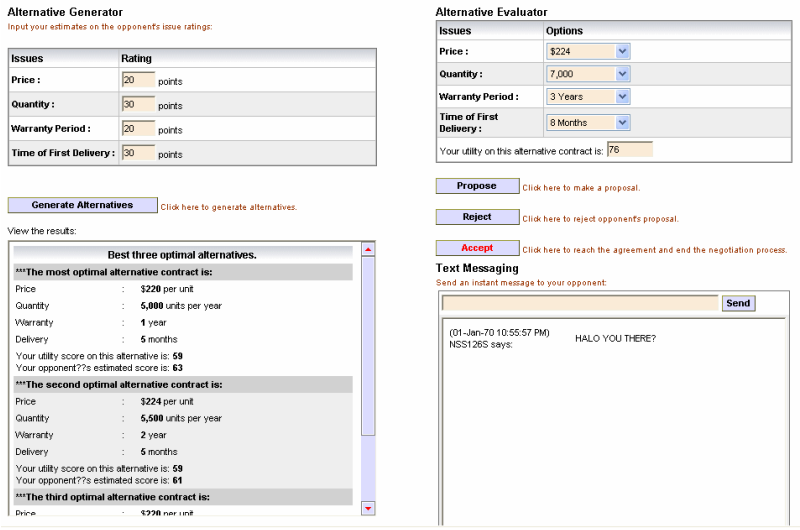


Figure 2 demonstrates the main interface of the e-Negotiation system. It includes a decision support component and a text messaging facility. 图 2 展示 e-协谈系统的主要界面,包括决策分析功能和即时通讯功能.



C.2 SUMMARY OF INTERVIEWS

Table C-1. Summary of Interviews

Cases	Company Background Information	Presence of Company Website	Interviewee (Designation, Gender, Age Range)	Interviewees' General Attitudes towards Accepting e-Negotiations Functions	Key Concerns in Accepting e-Negotiations Functions
1	This company sells low-end tote bags and athletic bags. It is targeting clients who order in large quantity; and relative low price products.	No	- Sales Manager - Female - 20-30	- Rather than using the NSS, emails are convenient and sufficient. - Quotation format is standardized, and in emails only simple English is required.	- The system may not meet all the needs in negotiating with new clients. - The physical display of their products are important, while it is not feasible for online product exhibition. - The only drawback of using email is that it has difficulty in communicating and keep track of clients' customization needs. - For new customers, risk is involved but willing to take it.
2	This company is specialized in the production of rucksacks and bags.	Yes (In addition to the company website, this company has web presence in two major e-marketplace websites)	- Sales Manager - Male - 30-40	- The NSS functions of multilingual, contract drafting and mediation functions are found to be meaningful and useful in facilitating negotiation.	-There is concern about the capability of the NSS to include all issues in negotiation. - The actual adoption depends on the system's accuracy in supporting decision makings, cost of the systems, and convenience of usage. - The most difficult issue about the current negotiation is to confirm with the clients the prices, and the customization requirement. -Payment is another major concern in international trading; this is even more crucial than the price.
3	This company is specialized in making sport shoes and causal footwear.	Yes	- Sales Manager - Male - 30-40	- The ability of computer to automate the whole process is an important concern. Its effectiveness is questioned though. This feature is perceived to be	- E-marketplace, as a third part, may cause additional security issues in mediation process. - Change management is required for the adoption. - This company has their own software to draft

				more suitable for small orders. - Multilingual support is not appreciated due to the high self-efficacy in using English (Interviewee has negative prior experience in using similar software).	contracts. The contract drafting function of e-Negotiation system is reported to be very attractive.
4	This company manufactures power supply and accessories targeting to sell to the Europe market.	Yes (The website provides up-to-date information of the products)	- Assistant Sales Manager - Female - 30-40	- She does not perceive the NSS different from emails. She prefers to use email, which can well serve as a valid documentation. - She does not regard e-marketplace is able to carry out the mediation role.	- The NSS in e-market place, being a third party, is a concern. - System is not sophisticated enough to translate the negotiation messages in real time. - Contract should be drafted case by case, instead of by software. - Internet cannot ensure credibility of clients.
5	This company is an industry leading company in manufacturing memory sticks.	Yes (The website provides basic e-commerce functions such as customer registration)	- Account Manager - Male - 20-30	- NSS is perceived useful to confirm an order in the latter stage of negotiation. - Relatively higher margin for the products is required to use the system, compared to face-to-face negotiation. - He is willing to subscribe to the mediation function. - Negotiation agent cannot maximize their profits as a same price is always quoted to all their clients.	- The cost of the system is a crucial concern. - The text-based nature is not desirable, though it can serve as proof. - Contracts should be drafted combining some decision support functions (e.g., interest calculation in various payment methods).
6	This company is specialized in producing a wide range of digital products including digital camera, mp3, and digital video.	Yes	- Vice General Manager - Male - 30-40 - Account Manager of Sales Department - Female - 30-40	- With tight control enabled, this kind of system (e-Negotiations and alike) can facilitate in filtering potential clients in the early stages of negotiation. - Multilingual function can provide references during negotiation but their effects are limited. - The DSS component in NSS is not useful; negotiation is too flexible in nature.	- Some concerns about NSS if they can be adjust to negotiate with different buyers - Trust is always an issue; the company will pay greater attention and feel more skeptical when negotiating with client from some foreign regions. - The capability of the negotiation agent in handling flexibility is questionable.
7	This company is	Yes	- Vice General	- Instead of the DSS component, the	- The main concern about the systems is that they

	dedicated to the development of traditional cotton knitwear, and has gradually boasted vast main businesses like garments, accessories, and home textiles.	(It is noted that the website does not provide information about new products; instead it only shows general company information.)	Manager - Male - 30-40	manager prefers to make his own decision as he feels he understand his business very well; inputting to the system is tedious and less efficient. - The mediation role cannot be achieved as intended since e-marketplace website is not a law-enforcing entity. - Negotiation agents can be used to filter out potential buyers at the early stage.	cannot consider customer relationship flexibly; it is less risky to do business with an established customer. - Initial contact with new customer is crucial; he prefers to handle it face to face. - He has great concern regarding the trust issues in negotiation; in particular he perceived buyers known form the internet are less familiar and less trustworthy. - Though the contract drafting function is not perceived favorable, this company has an existing system in handling the contract drafting.
8	This company is a professional supplier for power supply and PC casings.	No	- Export Manager - Male - 40-50	- NSS is perceived to be particularly useful in evaluating clients' offers. - The system is believed to be helpful in handling the negotiations with multiple issues. - The NSS functions, namely multilingual, mediation functions, and negotiation agents, are found to be meaningful and useful in facilitating negotiation.	- He has concern related to contract management solutions: one standard template cannot meet the needs of all contracts.
9	This company supplies leather material for bags, shoes, and accessories. They target in brand building and establish long-term partnerships with large buyers who can place large orders.	Yes (No company own website. They have web presence in two major e-marketplace websites)	- Sales Representative - Male - 20-30	- NSS is perceived to be useful in confirming an order in the latter stage of negotiation. - Negotiation agent is more helpful in the early stage, filtering potential buyers. - NSS is not deemed suitable in this company, because they do not expect to meet too many new customers online.	- The final negotiation outcome should always be determined by users rather than system or agents. - This company has simple template in drafting contracts; the contract drafting is not deemed attractive, - Both seller and buyer sites are customers of the e-marketplace; this may cause role conflict for e-marketplaces to assume mediator role.
10	This company produces high quality products of Liquid Crystal Displayers	No	- Manager - Male - 40-50	- He is willing to use NSS as a tool to assist him in decision making. - He questions the detailed mechanism for e-marketplaces to be e-mediators.	- It is really hard to build up trust with clients if communication and negotiation only take place using computer. - Quantifying issues is very difficulty and inefficient

	(LCD) and Liquid Crystal Modules (LCM), either standard series or customer-tailored product.			- Negotiation agents are only perceived useful in small, routine orders. - The contract drafting function is appreciated.	sometimes. There are a lot of issues that cannot be quantified. - The network bandwidth is a major concern; broad bandwidth is required to support real time communication in negotiation (e.g., videoconferencing). - Third party issue in mediation is another concern.
11	This company trades professional audio system, mainly targeting to European market.	Yes (In addition to a company website, the company has subscribed to Alibaba.com)	- Manager - Male - 20-30	- He intends to use NSS to facilitate analysis during the negotiation process. - In his opinion, NSS is more beneficial for big company. Having a small number of customers, he finds it not necessary to have the system to support negotiations.	- NSS should be incorporated into some enterprise systems and online business directory. - Email is preferred to NSS, as both he and his partners are very familiar with Email use.
12	This company specializes in producing professional communication equipments.	Yes (The company website is hosted in Alibaba.com)	- Sales Manager - Male - 20-30	- NSS is regarded to be a useful tool in providing clients the product quotations. - The system can facilitate in filtering out the potential clients in the early stage. - Agents are not deemed meaningful in this context; he prefers to be flexible in setting price to different customers.	- The actual negotiation practice is quite different from the NSS design assumptions; there are a lot of concerns which is very difficult to quantify. - Negotiation is very flexible while the system may not be flexible enough. - The cost of the subscription to the mediation function is a concern. - Trust is an issue; lower price is usually quoted to customers with established relationships.