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**TOWARDS INTERDISCIPLINARY PERSPECTIVE OF ELECTRONIC
NEGOTIATION SUPPORT SYSTEMS**

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by

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ABSTRACT

The principle objective of this research is to develop a prototype for negotiation support systems which aid human negotiators with strategies in electronic negotiation environments.

Negotiation is a multi-party decision making process and is conceptualized as decision making activities. The negotiation process is also complex in that an overall understanding of all goals, solutions, and their interactions can be extremely entangled. Negotiation complexity affects the various interests in many research fields such as social science, economics, computer sciences and information systems.

The field of Negotiation Support Systems (NSS) is also developing a number of innovative research areas and covers a wide range of individual and group decision support technologies. However, many negotiation support systems have not been used in practice negotiation situations because much NSS research has focused on the design and implementation of NSS that often apply little behavioral and economic knowledge. In the past, behavioral issues were largely ignored in NSSs and DSSs, which are based on formal approaches because these systems were designed for the analysts and experts rather than negotiators themselves. Thus, e-negotiation media and support systems necessitate integration of the results of behavioral studies in models proposed in decision theory, game theory, and negotiation analysis. To achieve an interdisciplinary approach, behavioral issues are critical for the adoption of the emerging field of e-negotiations and NSS.

Research into experimental games provides theoretical and empirical tools for investigating interactive decision making. These tools provide methods for theory validation as well as information on empirical behavioral regularities that are of potential value to real world decision making.

For the research objective, an empirical negotiation game context is introduced as a two-party, distributive (single issue) and incomplete information context with an electronic text-base (i.e., chatting tool) not face-to-face negotiation. Through a descriptive symmetrical test within the provided negotiation context and previous behavioral research review, the negotiation support contents (NSCs) model which has two phases of negotiation process: Preparation and Initial offer phases, is defined.

To evaluate the NSCs model, two types of experiments are designed and conducted. One is symmetric descriptive (Type 1) and the other is asymmetric prescriptive/descriptive (Type 2). In the Type 1 experiment, both parties join the experiment without the NSCs. However, only role sellers in the Type 2 experiment join experiment with NSCs, not the role buyer. The compared results of the Type 1 and the Type 2 experiments show that the role sellers' initial counteroffers in Type 2 are significantly higher than those of the Type 1 sellers. This initial offer behavior of Type 2 sellers affects the final prices which are higher than the Type 1 final prices.

Based on empirical results, the NSCs model applies to the design of NSS and is an aiding tool for novice negotiators. This study also suggests that a behavioral studies perspective could apply to the design of NSS research and the study suggests a methodology to satisfy the desire for an interdisciplinary perspective in NSS study.

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Chapter 1

INTRODUCTION

1.1 Definitions of Negotiation

Some authors consider the negotiation and bargaining processes to be identical (Lim & Benbasat, 1992-1993). Although some writers try to distinguish negotiating from bargaining, in popular usage the terms are interchangeable. Moreover, efforts to distinguish the two words do not enhance our understanding of the process. Hence, the terms are used interchangeably in this paper.

Numerous negotiation definitions exist for negotiation related research areas with five characteristic negotiation definitions cited from previous negotiation studies. First, negotiation is a process involving at least two parties aimed at reaching an agreement that is acceptable to both parties involved. It is communication, direct or tacit, between individuals who are trying to forge an agreement of mutual benefit (Young, 1991). Second, negotiation is a process, in the public domain, in which two parties, with various supporters, attempt to reach a joint decision on issues under dispute (Gulliver, 1979). Third, negotiation is a process in which participants bring their goals to a bargaining table, strategically share information, and search for alternatives that are mutually beneficial (Robinson & Volkov, 1998). Fourth, negotiation is a special form of communication that centers on perceived incompatibilities and focuses on reaching mutually acceptable agreements (Putnam & Roloff, 1992). At last, negotiation means the method by which

two or more parties communicate in an effort to agree to change or refrain from changing their relationship with respect to an object or objects (Goldman & Rojot, 2003).

Although these definitions differ in their details, De Moor and Weigand (2004) delineated common elements in negotiation: two or more interdependent parties have some individual goals that may be partially incompatible, and in some form of process, investigating alternatives has the purpose arriving at an agreement for one of them.

1.2 Negotiation Complexity and Emerging Negotiation Support Systems

For negotiation, a whole understanding of all goals, solutions, and their interactions can be extremely complex. Participants may not know or want to reveal their goals, and solutions for some goals may have complex interactions with the solutions for other goals. Even in the simplest of negotiation, participants must gather and process multiple pieces of information, many of which are predictably affect the outcome of the negotiation.

The complexity of negotiation affects the various interests in many research fields such as social, economic, computer sciences and information systems. The perspective of social and economic sciences focuses on the interactions leading to participants' conflicts or coalitions. Without negotiation techniques or strategies, participants often focus on persuading others to accept a ready solution, rather than seeking new solutions that may be acceptable to all. Expert human negotiators address these problems through a combination of social and analytical techniques (Pruitt, 1981). Experts or negotiation theorists provide and focus on strategic advice which involves when to generate new

solutions and when to persuade others. Moreover, they use a specific set of techniques for coordinating interactions, generating resolutions, and deriving agreements (Robinson & Volkov, 1998).

From another perspective, interest has increased for the application of computer technologies to facilitate negotiations and support human negotiators, as well as software agent collaboration. In an increasingly interdependent and rapidly changing environment, negotiation within and among organizations are incessant activities, consuming substantial time and effort. Computer-based systems that can improve negotiation efficiency or effectiveness will have a pronounced impact on organizations and individuals. Conceiving and creating such negotiation support systems (NSS) presents a major research challenge that is still in the early stage of investigation.

1.3 Negotiation Support Systems (NSS)

The field of Negotiation Support Systems (NSS) is now developing a number of innovative research areas and covers a wide range of individual and group decision support technologies. Thus, a mature theory on business negotiation support does not yet exist. In addition, generally acceptable definition of the term Negotiation Support Systems has not yet been found. Robinson & Volkov (1998) described a relatively general definition of NSS as a composite of computer techniques that support the social or analytical aspects of the negotiation life cycle and Jelassi and Foroughi (1989) described NSS as expert systems which assist human negotiators to make a deal, and are typically used “behind the scenes”. Hung et al.(2004) described NSS as normally

assisting negotiators to assess situations, generate and evaluate the expected value of options, and implement decisions. NSSs attempt to match negotiation needs and technological capabilities in order to assist the user in overcoming cognitive biases, manage the complexity of the negotiation environment, guide the user towards competitive or collaborative action, and reduce the risk of emotional negotiation.

Rangaswamy and Shell (1997) presented at least two reasons for this growing research interest in or for computer-supported negotiations. First, research consistently suggested that conventional face-to-face negotiations often lead to inefficient outcomes. NSSs offer the promise of improving negotiation outcomes for the negotiating parties by helping them prepare for a negotiation, and/or by providing computer-structured mechanisms to order the negotiation process. NSSs improve the quality of negotiation outcomes through their various functionalities. Computers are better than people at providing many of these functionalities, e.g., keeping track of and ordering intermediate negotiation results. Second, business transactions are increasingly being conducted over computer networks, but without dedicated software support. Securitized trading is already computerized, and the use of computers to assist other kinds of trades is spreading rapidly. The growth of networked systems portend the greater use of computer-mediated negotiations. NSSs can facilitate negotiations in these emerging “electronic bargaining tables” (Rangaswamy & Shell, 1997), for instance, electronic commerce (e-commerce) and business-to-business (B2B) marketing on the Internet. Facilitation occurs by providing systematic models that structure network negotiations and render them more economically productive.

1.4 Interdisciplinary Negotiation Research

Negotiation is a multi-party decision making process and its conceptualization is as decision making activities. An entity which is a person, organization or group involved in a negotiation cannot achieve its goals without the other entities' interactions.

Negotiations, appearing numerous forms, occur in very different situations and are social, cultural and ethical circumstances affect them. Thus, negotiation research spread its disciplines into psychology and sociology (Galinsky & Mussweiler, 2001), economics (Sebenius, 1992), computer science (Faratin et al., 1998) and information systems (Lim, 1999). Investigation of negotiations have encompassed descriptive, prescriptive, and normative perspectives (Raiffa et al., 2002) and under different assumptions have lead to a diversity of theories, models and negotiations procedures. The various perspectives and disciplines have created different terminologies, definitions, notations, concepts and formulations. As a result, interdisciplinary cooperation among concerned fields of study suffers from inconsistencies and contradictions (Gulliver, 1979). However, negotiation research requires an interdisciplinary approach because of its psychological, social and cultural character; economic, legal and political considerations; quantitative and qualitative aspects; and strategic, tactical and managerial perspective. Interdisciplinary approaches surly provide richer and more comprehensive models of negotiators and negotiations (Bichler et al., 2003).

A schematic representation of the different perspective and influences on negotiation research is shown in Figure 1-1. Law and social sciences are the main contributors to the prescriptive and descriptive models, heuristics and qualitative studies

of negotiations processes and negotiators' behavior (Pruitt, 1981; Raiffa et al., 2002). Economics and management science concentrate on construction of formal models and procedures of negotiations, rational strategies and the prediction of outcomes (Nash, 1950). Computer science and information systems, contributions include construction of electronic negotiation tables, decision and negotiation support systems (DSS, NSS), artificial negotiating software agents (NSA) and software platforms for bidding and auctioning (Guttman, May, 1998; Holsapple et al., 1998; Kersten, 1997).

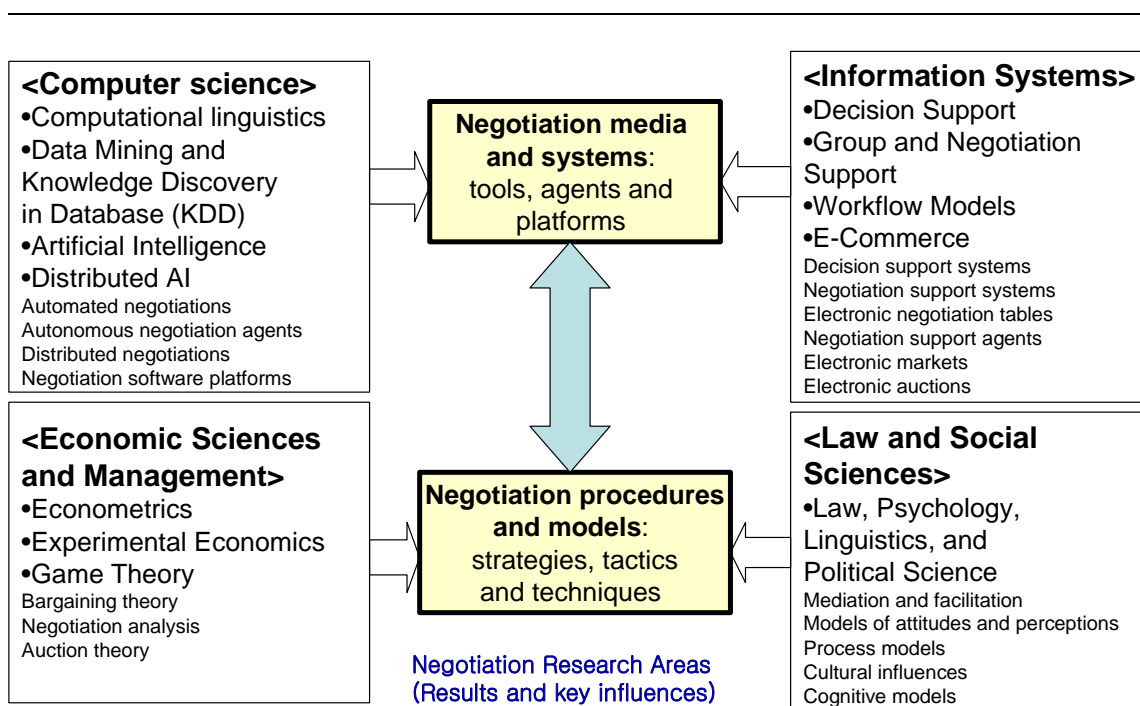


Figure 1-1: Negotiation research areas, their results and key influences

The four horizontal arrows in Figure 1-1 connect areas of studies with results. The bi-directional arrow indicates that the negotiation systems, agents and platforms are often based on the results of the studies in economic and social sciences, and thus,

computational models and systems increasingly influence the construction of negotiation techniques, models and procedures (Bichler et al., 2003).

1.5 Issues and Problems in NSS

The rapid development in e-commerce has made the Internet an important and inevitable channel of trade and business communication, including in e-negotiations. Indeed, over 80% of commerce occurs through negotiated trade (*Negotiated trade: the next frontier for B2B e-commerce*, 2000), and most negotiated trade takes place electronically, facilitated by e-commerce and e-business.

However, many negotiation support systems have not been used in practice negotiation situations because much NSS research has focused on the design and implementation of NSS that often apply little behavioral and economic knowledge. Most, in not all, NSSs are not used in real-life negotiations but used well-defined negotiation situations. One could state that these types of systems have no practical potential. In effect, these systems well developed are easy to use and appealing, allowing users to delegate many complex decision and negotiation tasks but do not have sufficient concern of the users' needs and expectations, particularly those of qualitative nature, and their cognitive capabilities and limitations (Bichler et al., 2003). Empirical evidence is also lacking for how and in what situation NSSs can be beneficial (Foroughi & Jelassi, 1990). Thus, a significant need exists to consider the research perspectives of economic science, social sciences and empirical behavioral studies for design and development of negotiation media and systems.

In the past, behavioral issues were largely ignored in NSSs and DSSs, which are based on the formal approaches because these systems' designs were for the analysts and experts rather than negotiators themselves. In addition, much of the NSS research literature concerned describing particular systems devised to support one or another aspect of negotiation, a certain kind of negotiation situation, and various types of negotiation participants (Jelassi & Foroughi, 1989). Apparently, these prototypes and implementations contained no common, underlying, systematic, precise, explicit model of the phenomenon of negotiation. The major focus of these systems has been to provide information analysis during negotiation and support for individuals participating in negotiation without providing structure to negotiation processes or dealing with participant's cognitive and socio-emotional biases (Foroughi & Jelassi, 1990).

In another prospect, the computerization of negotiation processes increasingly affects the way organizations and individuals interact with each other. Electronic negotiations promise higher levels of process efficiency and effectiveness, and most importantly, higher quality and faster emergence of agreements. Empirical research on NSS has shown that computer-aided negotiations generally yielded higher joint outcome and greater satisfaction. In short, NSS help to improve the negotiation process as well as the negotiation outcome (Delaney et al., 1997; Foroughi et al., 1995).

Recent developments of computing and networking power also created an opportunity for mutual fertilization of research approaches, and for integration of different perspectives on negotiations into an interdisciplinary or multidisciplinary research effort to develop an engineering approach to an electronic negotiation system or process which brings together the finding about negotiators and negotiation processes

from the different research areas. For example, new information technologies increasingly have use for constructing media for engagement in social and economic processes such as negotiation. However still, they are still parallel and independent of the behavioral and normative models of these processes.

Thus, e-negotiation media and support systems necessitate integration of the results of behavioral studies in models proposed in decision theory, game theory, and negotiation analysis. To achieve interdisciplinary approach, behavioral issues are critical for the adoption of the emerging field of e-negotiations and NSS. Research of social and economic sciences also need to account for the design of these media and as well as their implications for the processes themselves.

1.6 Research Objective

The principle objective of this research is to develop a prototype for negotiation support systems which support and aid human negotiators with negotiation strategies in electronic negotiation environments.

Several issues and problems of NSS research have been identified in Section 1.5. The NSS research is not a single disciplinary research problem anymore. It needs a study approach from interdisciplinary/multidisciplinary perspectives for accurate design and clearly defined implications of NSSs. Without this effort, most NSS would be useless for real-life negotiation situation. To build a more practical NSS, social science and economics and behavioral issues need to integrated or melted into the design and application of NSS because much negotiation research in social science and economic

sciences has been concentrated on the human cognitive limitation, capability of human negotiators' nature and also negotiation analysis with human behaviors.

Current, NSS engineers who are trying to discover behavioral regularities and processes of negotiations from the different research areas (i.e., empirical negotiation, cognitive decision making). However, neither the interdisciplinary perspective approach nor the methodology for NSS has been introduced as an application for NSS design from empirical behavior researchers. These phenomena in NSS research became a motivation of this interdisciplinary study. In an effort to overcome this gap between social sciences and NSS research engineers, this study proposes, a prototype for and an electronic negotiation support systems (ENSS) based on the interdisciplinary methodology shown in Figure 1-2.

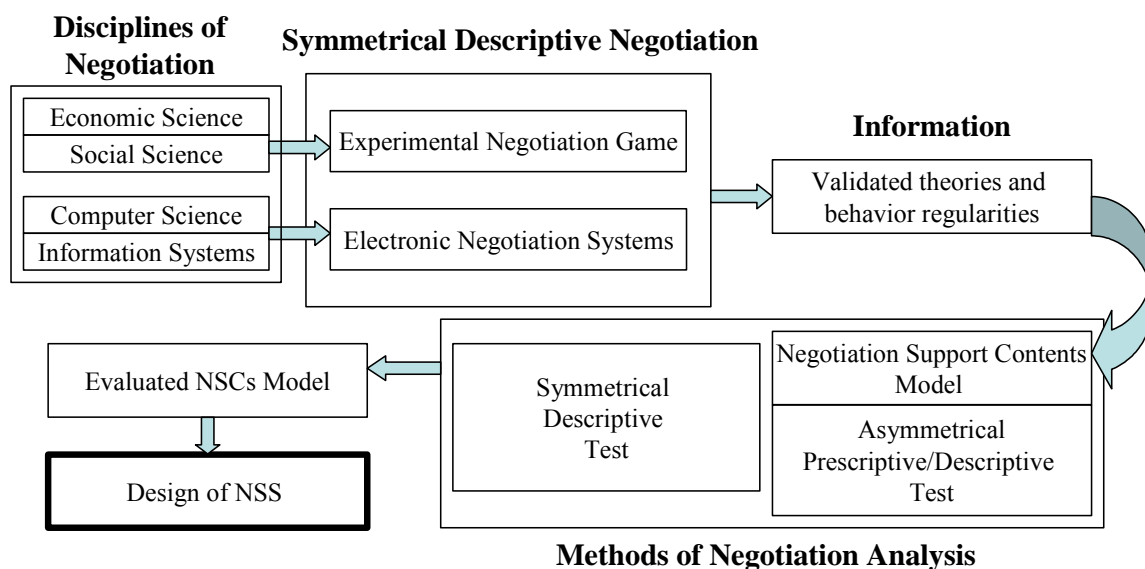


Figure 1-2: Interdisciplinary methodology for NSS

To meet the research objective of this study requires the following task steps:

1. Define a negotiation type and context which is general and practical negotiation situation in a real-world negotiation case.
2. Design an electronic negotiation environment which is a network system for e-negotiation and provides a location of negotiation.
3. Define a negotiation process model for this study.
4. Conduct a symmetric descriptive empirical test under a negotiation context defined in Step 1 and an electronic negotiation environment designed in Step 2 to collect the empirical behavioral data.
5. Define a model of negotiation support contents (NSCs).
6. Evaluate the NSCs model, conduct two types of empirical tests: Type 1 experiment is a symmetric descriptive negotiation, and Type 2 experiment is an asymmetric prescriptive/descriptive negotiation.
7. Compare the results of Type 1 and Type 2 experiments with methods of statistical analysis.
8. Recommend a prototype for electronic negotiation support systems.

1.7 Research Questions

In light of the research objective and tasks as outlined, the following questions are the basis of investigation within the context of development of a prototype for electronic negotiation support systems (ENSS):

Question 1: Can symmetrical descriptive negotiation (SDN) test results elicit negotiation principles to establish the design of an electronic negotiation support content (NSC) model?

- Question 1-1: Can initial offer strategies affect an entire negotiation process and outcome in an SDN test?
- Question 1-2: Can concession strategies affect the final price results?

Question 2: Can a phased NSCs model, which consists of different strategic assistance at various phases of the negotiation process, promote more effective performance?

- Question 2-1: Does the NSCs model mitigate negotiation bias and promote better final prices?

Answering Question 2 and Question 2-1 requires conducting an asymmetrical prescriptive/descriptive negotiation test, called Type 2 and another SDN test, called Type 1. Type 1 tests for counterparts of the Type 2 test results. These two types of empirical test examine three central variables: the first offers (independent variable), the initial counteroffers (dependent variable), and the final agreement prices (dependent variable). If Type 2 experiments' variables are significantly better than those of Type 1 experiments, it is argued that the phased NSCs model can then be applied to the design of an electronic negotiation support system. If the final agreement prices are insignificantly different between Type 1 and Type 2 experiments, the phased NSCs model cannot be considered for the design of an electronic negotiation support system.

1.8 Chapter Outline

This chapter presented the definition of negotiation, NSS, multidisciplinary issues and problems of NSS and research objectives, tasks and questions for the research. In Chapter 2, relevant previous negotiation studies are surveyed, such as negotiation perspectives on decision making, theoretical model and different contexts of negotiation, and current NSSs. Chapter 3 introduces the tasks and the negotiation context and develops the electronic negotiation website developed for this study. Chapter 4 defines the negotiation process model and introduces the core concepts of negotiation. Chapter 5 describes the conduct of a symmetric descriptive negotiation (SDN) experiment and presents hypotheses and results of the SDN experiment. The NSCs model develops from core concepts and results of SDN test. Chapter 6 presents the methods and procedures for two empirical tests, followed by hypotheses, results and analysis of the two empirical tests in Chapter 7. Finally, Chapter 8 summarizes results, and contributions of this research, and suggests areas for further research.

Chapter 2

LITERATURE REVIEW

This chapter provides the relevant negotiation studies for research. Section 2.1 contains an overview of negotiation perspectives on decision making as well as negotiation on game theory, negotiation analysis and the characterized negotiation analysis orientations such as descriptive, normative and prescriptive. The negotiation process is different in a number of issues and involved entities. To understand the general structure and process of negotiation, a theoretical negotiation framework appears in Section 2.2. This study concentrates on a negotiation context which is a two-party, distributive with incomplete information, context. In Section 2.3, the negotiation context for this study is introduced and compared with the other types of negotiation contexts. Finally, the remaining sections present the trends of NSS research, existing NSSs and classification of NSSs.

2.1 Negotiation Perspectives for Decision Making

2.1.1 Negotiation in Game Theory

The bargaining problem, first presented by Edgeworth (1881), describes the set of individually rational Pareto optimal agreements. Gradually emerging since the late 1920s,

an early presentation of game theory was the work of von Neumann and Morgenstern (1944).

Game theory is a distinct and interdisciplinary approach to the study of human behavior. It is the study of multiperson decision problems in which each party's (player's) action influences payoffs of other parties (or players). The disciplines most involved in game theory are mathematics, economics, computer science and the other social and behavioral sciences.

Game theory has been especially useful for understanding repeated negotiations in well-structured situations such as various financial and business markets. It has offered useful guidance for the design of negotiation and bidding mechanisms, has uncovered some powerful competitive dynamics, has usefully analyzed many “fairness” principles, has generated intriguing hypotheses, and now flourishes both on its own and in applications such as the economics of industrial organization. With non-specialist audiences in mind, a number of analysts have recently described some of the most useful contributions of game theory for understanding negotiating behavior (Myerson, 1991; Wever, 1985; Young, 1991).

Game theory has been used in a variety of disciplines. One of them is strategic negotiation theory, where time-strategic, institutional, informational, and commitment aspects are crucial. Game theory allows for analyzing foundational features that are relatively culture-independent and assume self-interest. Strategic negotiation theory has a combined focus on equilibrium and efficiency. Dating back to the Fundamental Welfare Theorems by Arrow and Debreu (1954) and Debreu (1959), the focus has been

comparing equilibrium behavior with efficient behavior. While, Chatterjee and Samuelson (1983) among others concentrate more on efficient behavior.

Game theory treats negotiation as a kind of game and negotiating agents as the players in a game. Game theory provides formal concepts to analyze the strategic interaction among agents in negotiation (Binmore, 1992). However, game theory has two fundamental assumptions: common knowledge and perfect computational rationality. In the first assumption, all information about possible strategies, the outcome from each configuration of strategies, etc., are common knowledge, known to each agent. Perfect computational rationality assumes a negotiation agent has unbounded computational power. With this power, agents can actually find the optimal strategies at the beginning of the game. Game theory, as opposed to behavioral and descriptive studies, provides formal and normative approaches to bargaining model. One of the distinctive key features of game theory is the consideration of zero-sum and non-zero-sum games, which were adopted to distinguish between distributive and integrative processes.

The limitations of game theory in providing prescriptive advice sought by negotiators and their advisers on one hand, and the developments in multiple criteria decision-making and interactive methods on the other, provide the groundwork for negotiation analysis (Raiffa, 1982; Sebenius, 1992; Young, 1991). Observation, together with weakened rationality assumptions, provided the basis for negotiation analysis (Sebenius, 1992). With the objective of providing advice to one party, negotiation analysis takes prescriptive/descriptive orientation in that it assumes rationality of one party but not necessarily of the other (Young, 1991).

2.1.2 Negotiation Analysis

The engineering approach to e-negotiation systems design requires making use of models describing different negotiation characteristics and processes. The richness and complexity of negotiations on one hand, and the significance of the negotiated decisions on the other, led to numerous studies in a number of research disciplines. One perspective for the studies' comparisons is their descriptive, normative and prescriptive orientation (Bell et al., 1991).

Raiffa, et al. (2002) in their book "*Negotiation Analysis*," suggested approaches to decision making. Decision making classifies into individual decisions and group decisions. Each type of decision has general research orientations. Descriptive studies involve understanding how people negotiate, why they engage in a particular type of a process, and why particular outcomes are achieved. Normative studies focus on the design of models of rational negotiators and procedures of interaction among them. Prescriptive studies concern the design of procedures that define the goodness of the negotiation process and its outcomes, identify good process and compromises, and help negotiators to achieve good outcomes (Kersten, 2002).

Group decisions can classify as game theory and negotiation theory by the interactions between the individuals. The situation gets more complicated when researcher study how individuals behave in a group setting. In game theory, multiple individuals make separate decisions that interact and the payoffs for each are dependent on their decisions and that of others. Otherwise, multiple individuals, in negotiation theory, cooperate to arrive at a single decision, and all share joint consequences or

payoffs. A graphic representation of classification of decision analysis appears in Figure 2-1. Analysis of negotiation might entail mixtures of descriptive, normative, and prescriptive orientations.

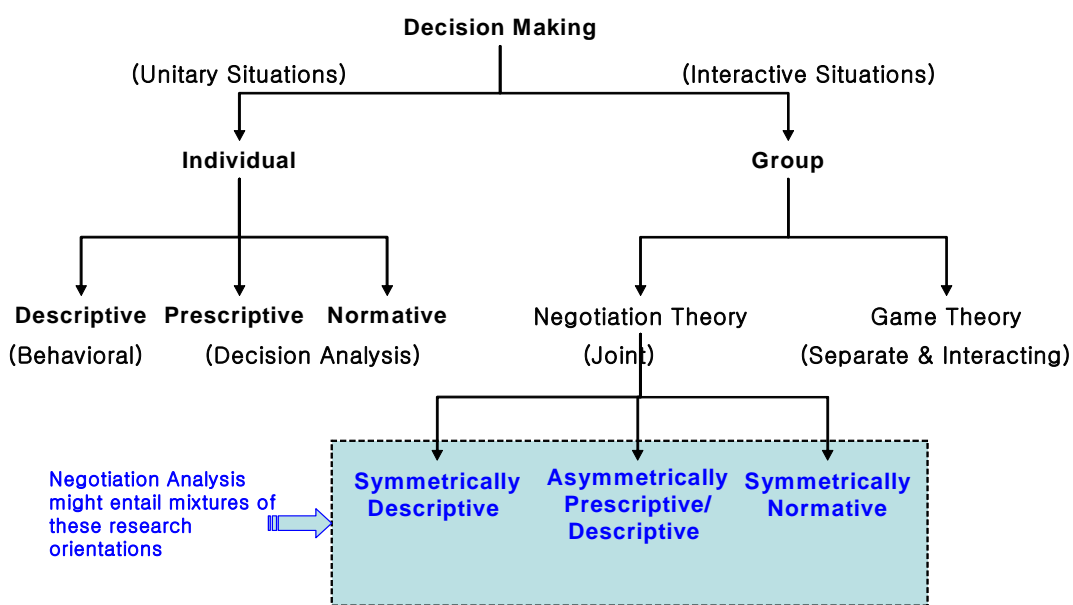


Figure 2-1: Perspective negotiation for decision making

First, a symmetrically descriptive orientation might be interested solely in describing the behavior of all the negotiators or all players in a game context, without having any interest whatsoever in prescribing how they should behave (Raiffa et al., 2002). Descriptive theories of negotiation in social psychology and organization behavior, normative, game-theoretic models of negotiations (Nash, 1950; Rubinstein, 1982) tend to assume rationality and focus on the outcome that should emerge from these rational actions by all negotiating parties. Because of its explicit assumptions of individual rationality and normative analyses of negotiation behavior, game theory has

been, simultaneously, a goal and a foil against which much descriptive experimental research has been directed (Hastie & Dawes, 2001; Kahneman et al., 1982).

Second, a symmetrically normative orientation examines what ultra-smart, impeccably rational, super-people should do in competitive, interactive situations (Raiffa et al., 2002). Normative models of negotiation have advanced the understanding of conflict behavior by providing compelling analyses of optimal or rational behavior in competitive situations. Economic measures of negotiation performance (Gupta & Livne, 1988; Kalai & Smorodinsky, 1975) represent the most well-defined specifications and benchmarks of optimal negotiation performance in terms of efficiency and fairness.

Third, an asymmetrically prescriptive/descriptive orientation concerns with studying and understanding the behavior of real people in real negotiations, so that researchers can better advise one party about how it should behave in order to achieve its best outcome. This type of analysis takes a prescriptive perspective for the benefit of one party, and views the competing parties in descriptive terms from this focal party's vantage point (Raiffa et al., 2002). Many of the developments in management science, decision analysis and negotiation analysis have prescriptive orientation. Models based on the multi-attribute utility theory, optimization models and multiple criteria decision making are examples of solutions proposed to represent and support negotiators. Being concerned with providing a meaningful and helpful support, prescriptive models typically take an external perspective, that is, developing models allow analysts to help negotiators to make good decisions.

While the theoretical objective of the above perspectives is to predict the processes and outcomes of negotiation, the practical goal is to help people negotiate more

effectively (Raiffa, 1982). The contributions of negotiation analysis include: (1) a subjective perspective on the process and outcomes, (2) concentration on the possible agreements rather than the search for one equilibrium point, and (3) acceptance of goal-seeking rather than game-theoretic rationality. This makes an “asymmetrically prescriptive/descriptive” orientation possible (Raiffa, 1982; Raiffa et al., 2002; Sebenius, 1992). Other approaches have possible symmetrical orientation: Behavioral studies focus on descriptions of the parties and their interactions, and game theory and optimization assume that the parties are rational; hence they have symmetrically prescriptive orientation. In contrast, negotiation analysis generates prescriptive advice to the supported party given a descriptive assessment of the opposing parties. In other words negotiation analysis reconciled several important concepts of behavioral research and game theory. Its developed purpose is to help negotiation analysts and advisors, hence, its external standpoint and the underlying assumption that its users possess knowledge not embedded in the model.

2.2 A Theoretical Model of Negotiation

Lai (1989) defined that a negotiation activity can consider two major constituents: *negotiation context* and *negotiation process*. Negotiation context in Figure 2-2 refers to the issue space, participating entities, rules of negotiation, and perhaps an intervenor. An issue space represents the nature and scope of the issues involved in a negotiation activity. Participating entities are prime movers who must agree with the ultimate solution. In contrast to a participating entity, an intervenor need not agree with the ultimate solution

but assists in the negotiation process. Finally, rules of negotiation impose some constraints on a negotiation process.

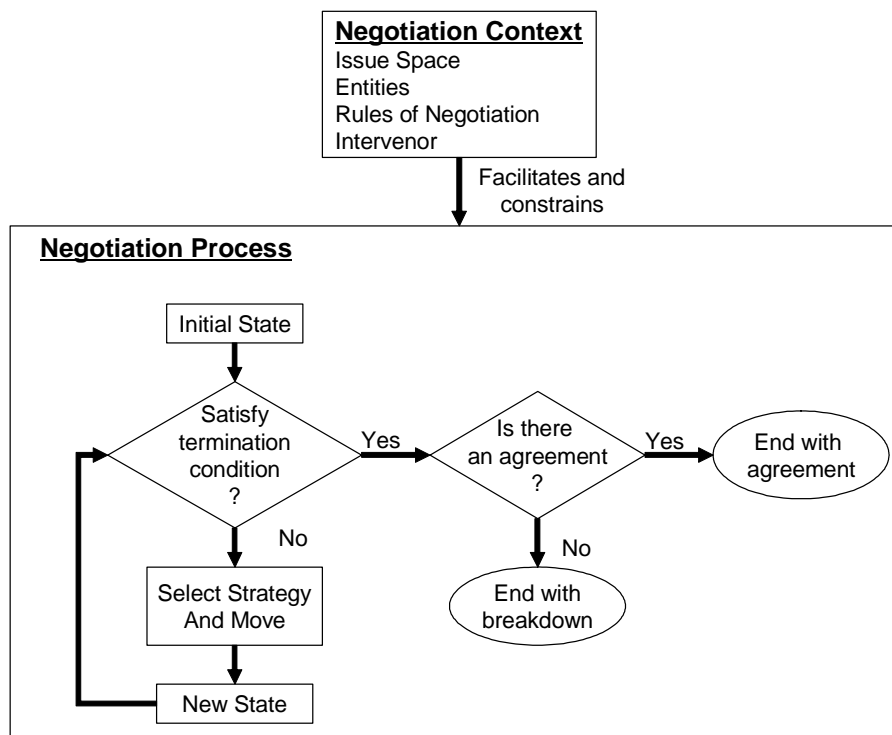


Figure 2-2: Basic negotiation framework

The general flow of a negotiation process illustrated in Figure 2-2 is a common pattern. The negotiation context influences and constrains. Initially, each participating entity has a location in the issue space of a negotiation. As the negotiation activity proceeds, it will change its location based on its strategies, other entity's moves, and constraints imposed by the rules of negotiation. Moreover, an intervenor may influence a negotiation process. When the state of a negotiation process satisfies some termination conditions, the negotiation ceases. A negotiation may terminate with either a breakdown or a solution.

Based on Lai's negotiation framework, Holsapple, et al. (1997) suggested a negotiation model that characterizes a negotiation activity in terms of eight elements:

$$N = (I, E, ACCEPT, LOC, S, M, R, A),$$

where

- I = issue space in which the negotiation occurs;
- E = set of entities (parties) who are involved in the negotiation;
- ACCEPT = acceptance regions of the entities;
- LOC = locations of the entities in the issue space, (i.e., state of the negotiation process);
- S = strategies of the entities;
- M = movements of the entities;
- R = rules of negotiation and
- A = assistance from intervenors.

Some of elements may be null at the outset of a negotiation, for instance, a lack of initial assistance from an intervenor. A particular element can change as negotiation unfolds. The value of LOC, for example, changes to reflect the current state of a negotiation process; entity strategies can change, and acceptance regions are not necessarily fixed. Holsapple, et al. (1998) who introduced a theoretical model of negotiation activity to guide the development of negotiation support systems defined all of these elements and their interactions.

No individual NSS has all elements implied by the theoretical model. Those desirable elements depend on the targeted role for the particular NSS and the degree of

sophistication required. A developer, faced with the task of building a particular NSS or NSS shell whose knowledge system can be filled in to meet the needs of a specific negotiation application. The model of Holsapple, et al. (1998) leads to a consideration of which of the possible NSS types is desired.

2.3 Two-Party Negotiations

Two-party negotiations are important mechanisms to achieve distributed conflict resolution when it is in the common interest of the parties to cooperate. Negotiating with opponents is impossible. Thus, two-party negotiation is the general negotiation context in most negotiation disciplines.

While, generally, two primary kinds of negotiation exist, Thompson (1998) avoided the distinction between distributive and integrative types. Instead she considers pure conflict, pure coordination and mixed motive negotiations. However, since Walton and McKersie (1965) proposed distinguishing between distributive and integrative negotiations many of those who study and teach negotiations, and who observe and advise negotiators have been strongly influenced by the limitations and opportunities offered by each of the two types.

2.3.1 Distributive vs. Integrative Negotiation

Distributive Negotiation

Distributive negotiation is a process in which a gain for one party is a loss for the other and in which each party maximizes own outcome, such as money. Descriptions of distributive negotiations include as win-lose, zero-sum, pure conflict, and competitive. Walton and McKersie (1965) noted that distributive bargaining is often a competition over the division of resources; who achieves more depends largely on the strategies and tactics employed. Parties have a fixed-pie perception and focus on their differences, ignoring what they have in common (Kersten, 2001). The parties assume an insufficient supply and they cannot “expand the pie,” so the more one side gets, the less the other side gets.

Distributive bargaining encountered criticism because it tends to lead to destructive actions and sometimes forces the involved parties to focus too much on their differences. If people want to maintain a good relationship with one another, the argument goes, they should take an integrative approach to distribution as well as expansion of the pie.

However, in cases where the negotiator wants to maximize the value obtained in a single deal, and when the relationship with the other party is not important, distributive bargaining tactics may be very useful.

The process of distributive negotiation involves the interplay of one’s “walk-away” value - the minimum or maximum one can accept before walking away from the deal - and the adversary’s walk away value. The trick is for one party to infer an idea of

the opponent's walk-away value and then try to negotiate an outcome that is closer to one's own goals than theirs. Whether or not parties achieve their goals in distributive bargaining depends on the strategies and tactics they use.

Information is the key to gaining a strategic advantage in a distributive negotiation. Best efforts to guard information carefully and also try to obtain information from the opponent are strategically important. To a large extent, bargaining power depends on the clarity of goals, alternatives, walk-away values and knowledge of the opponents' attitudes to the goals, alternatives, and walk-away values. With these values known, a much stronger position emerges allowing decisions of when to concede and when to hold firm in order to best influence the response of the other side.

Integrative Negotiation

Integrative bargaining also called interest-based bargaining and win-win bargaining is a negotiation strategy in which parties collaborate to find a win-win solution to their dispute. This strategy focuses on developing mutually beneficial agreements based on the interests of the disputants. Interests include the needs, desires, concerns, and fears important to each side. They are the underlying reasons why people become involved in a conflict.

Integrative refers to the potential for the parties' interests to be combined in ways that create joint value or enlarge the pie. Potential for integration only exists when the negotiation involves multiple issues. This is because the parties must be able to make trade-offs across issues in order for both sides to be satisfied with the outcome.

Integrative bargaining is also important because it usually produces more satisfactory outcomes for the parties involved than does positional bargaining. The basis of positional bargaining is fixed, opposing viewpoints (positions) and tends to result in compromise or no agreement at all. Often, compromises do not efficiently satisfy the true interests of the disputants. Instead, compromises simply split the difference between the two positions, giving each side half of what they want. Creative, integrative solutions, on the other hand, can potentially give everyone all of what they want.

Integrative solutions are generally more gratifying for all involved in negotiation, as the true needs and concerns of both sides will be met to some degree. This method is a collaborative process, and therefore, ultimately the parties actually help each other. This prevents ongoing ill will after the negotiation concludes. Instead, interest-based bargaining facilitates constructive, positive relationships between previous adversaries. The Table 2-1 shows the characteristic differences between integrative and distributive negotiation.

Table 2-1: Integrative vs. Distributive Negotiation

Characteristic	Integrative Negotiation	Distributive Negotiation
Outcome	Win-Win	Win-Lose
Motivation	Joint gain	Individual gain
Interests	Congruent	Opposed
Relationship	Long-term	Short-term
Issue	Multiple issue	Single issue

2.3.2 Importance of Distributive Negotiation

Contrary to what a few authors have written, a win-lose, zero-sum negotiation does not exist. The proof is simple: by definition, a negotiation requires both parties to voluntarily say “Yes” in order to conclude a deal. Why would one voluntarily say, “Yes,” if losing by doing so is the end results? In order for the game to be a negotiation, outcomes must allow both to win, and indeed assuming base rationality, no deal results without such an outcome.

The proper definition of a distributive negotiation is that it involves usually one issue (i.e., price, time or space) or any other single commodity (Raiffa et al., 2002). Many such negotiations occur (i.e., negotiation for domain names).

Although distributive bargaining is frequently seen as the opposite of integrative bargaining, the two are not mutually exclusive. Even in cooperative negotiations,

distributive bargaining will come into play. Integrative bargaining is a good way to make the pie (joint value) as large as possible, but ultimately the parties must distribute the created value. If they are able to expand the pie enough, distribution is easy. If not enough to give each side what it wants, still remains distributive negotiation is more difficult (Lax & Sebenius, 1986). Distributive bargaining is also important because some disputes have no other path to resolution. If the stakes are high, such conflicts can be very resistant to resolution.

2.3.3 Complete vs. Incomplete Information

Most game-theoretic literature on bargaining assumed that the participants possess complete information about the negotiation situation. Important contributions in negotiation of complete information are provided by Nash (1950), Harsanyi (1956), Schelling (1960), Cross (1969) and Roth (1979). In two-party bargains, the custom is to stipulate that the set of possible actions of the parties and the player payoffs from any combination of actions are common knowledge. In the model of bilateral monopoly considered here, with the presumption of complete information, each bargainer, seller and buyer, knows the other's walk-away price. Then the bargainers negotiate a final price in the known range of mutually acceptable prices (i.e., between the seller's minimum and the buyer's maximum acceptable prices). Since any price can be supported as an equilibrium outcome, bargaining solutions usually result from specifying a concession mechanism leading to a distinct outcome, or set of axioms that a "reasonable" outcome should satisfy.

Despite the many advances, the complete information approach fails to mirror key features of actual negotiations (Chatterjee & Samuelson, 1983). The complete information assumption is limiting because uncertainty is endemic in most realistic applications. Thus, Harsanyi (1967-1968) introduced the incomplete information approach in a bargaining game. The many applications of these ideas to the bargaining problem appear in Harsanyi and Selton (1972), Cramton (1984), Chatterjee and Samuelson (1983), and Myerson (1984). Incomplete information in bargaining is modeled by following assumption: Each party knows his own reservation price, but is uncertain about his opponent's reservation price. Numerous economic models with incomplete information support the conclusion that incomplete information leads to bargaining inefficiency. Thus, the incomplete information situation provides an explanation of bargaining behavior that appears to occur often in practice.

2.4 Trends of NSS Research

More general trends of NSS research are:

1. Managers and professionals are becoming sophisticated users of decision support systems that embody many of the above methods and techniques.
2. E-Commerce, globalization of markets, and electronic communication lead to virtual negotiations.
3. Time pressure, vast amounts of data, and increasing problem complexity create new pressures that may have partially relief from the use of NSS.

4. And increasing user friendliness of NSS, which includes the employment of the data visualization and multimedia techniques as well as integration with other systems, encourages the multidisciplinary negotiation studies.

The challenges of negotiation and the cognitive limitations of human negotiators have led researchers to pursue computer support of negotiations in the form of NSS. By incorporating computer-based decision tools to assist negotiating parties reach an agreement, NSS offers the potential to enhance the analytically complex problem-solving process and help alleviate cognitive and socio-emotional stumbling blocks to successful negotiation (Jelassi & Foroughi, 1989). Lim and Benbasat (1992-1993) and Rangaswamy and Shell (1997) provided comprehensive surveys of NSS empirical research literature.

Empirical research in NSS has indicated that NSS effectiveness is likely moderated by the type of negotiation situation or the amount of conflict between the negotiators. In particular, Jones (1988), Foroughi, et al. (1995) and Delaney, et al. (1997) showed that in integrative negotiations, compared to dyads with no computer support, NSS-supported dyads achieved higher joint outcomes and better contract balances (fairer outcomes). However, in distributive bargaining situations, Jones found comparable joint outcomes for both groups. Thus, NSS may not be particularly useful in distributive negotiation situations where negotiating parties tend to “split the difference” in arriving at a reasonably efficient and fair settlement by using a satisficing strategy (Raiffa, 1982). Rangaswamy and Shell also showed that negotiators using NSS achieved better outcomes than those using an e-mail messaging facility for negotiation.

Many studies have also investigated negotiation strategies (Darling & Mumpower, 1990; Fisher & Ury, 1981; Gulliver, 1979; Holsapple et al., 1998), but most are

theoretical or based on data obtained only from questionnaires. Exact analyses of the actual behaviors of negotiators are a requirement for eliciting the actual strategies and behavioral regularities in negotiation phenomena.

2.5 Electronic Negotiation Agents

Although powerful and effective, NSS still requires near-constant human input and communications. Recent studies of autonomous software agents in distributed artificial intelligence and evolutionary computations disciplines have revealed exciting possibilities for automated negotiation (Guttman, May, 1998; Oliver, 1997; Sandholm, 1999) in e-commerce whereby electronic bargaining agents (EBA) perform the negotiation roles of human buyers and sellers. Unlike NSS supporting human negotiators, EBA negotiation involves two or more EBA (employing artificial intelligence techniques) in a virtual environment governed by computational rules. Examples of computational techniques include a concession model that hard-codes a general strategy of concession in multiple-issue negotiations (Matwin et al., 1991), case-based reasoning for planning and support of negotiations (Sycara, 1990), and artificial adaptive agents using algorithm-based learning techniques (Oliver, 1997).

2.6 Existing Negotiation Support Systems

Many existing NSSs have explicitly or implicitly relied on some of the concepts of negotiation analysis as a basis for their design. Jelassi and Faroughi (1989)

summarized several of these systems. NSS may be classified as: (1) preparation and evaluation systems that operate away from the bargaining table to help individuals privately organize information, develop preference representations, refine prenegotiation strategies, or evaluate midnegotiation offers, and (2) process support systems that operate at or in lieu of a bargaining table. These systems restructure the dynamics and procedures of the negotiation process in order to make salient the possible gains from integrative bargaining (Thiessen et al., 1998). Thus, process support systems designs not only to assist parties in gaining a subjective representation of the negotiation situation, but also assist negotiators' moves toward more integrative settlements.

Examples of preparation systems include NEGOPLAN (Kersten et al., 1991), NEGOTEX (Rangaswamy et al., 1989), and GMCR (Fang et al., 1993). In addition to these formal preparation systems, generic decision analysis and spreadsheet software packages also aid preparing for both negotiation and mediation (Nagel & Mills, 1990). Process support systems may be further subdivided into two types: mediation systems and interactive bargaining systems. In mediation systems, a computer model substitutes for or assists a human mediator to prompt the parties toward jointly optimal agreements. Communications among parties using a mediation system filter through the computer or a human mediator, although the parties remain in control of the outcome. Interactive bargaining systems simultaneously support the negotiation processes of all the parties, and enable the parties to communicate directly with each other over computer networks. Interactive systems may also contain a function for computer-assisted mediation. Examples of process support systems include PERSUADER (Sycara, 1990, 1991), and the proposed NA system.

Other NSS classification, presented by Bellucci and Zeleznikow (2005), are Template-based NSS and Artificial Intelligence techniques. Template-based NSS, which represents the status of negotiations at some point in time, is that the majority of traditional NSS have been restricted to informing parties of past and present preferences and on the progress made within the negotiation. Examples of such NSS include Negotiator Pro, The Art Of Negotiating (Eidelman, 1993) and DEUS (Zeleznikow et al., 1995). Web-enabled NSS include Smartsettle (Thiessen & McMahon, 2000), INSPIRE (Kersten, 1997) and CBSS (Yuan et al., 1998). Early decision-support negotiation systems primarily used Artificial Intelligence techniques to model negotiation. Examples include LDS (Peterson & Waterman, 1985), SAL (Waterman et al., 1986), NEGOPLAN (Matwin et al., 1991), Mediator (Kolodner & Simpson, 1989), PERSUADER (Sycara, 1993) and Family_Negotiator (Bellucci & Zeleznikow, 1997).

2.7 Characteristics of Existing NSSs

Discussion of different types of software for negotiation appears in Section 2.6. Using focuses, models, methodology, applications and key functions undertaken by the software, a comparison of the systems discussed in Section 2.6 in Table 2-2.

Table 2-2: Software for Support and Conduct Negotiation

NSSs	Focus	Models/ Methodology	Support, Application and Key activities
NEGOPLAN	Pre-negotiation	Generic Model, Artificial Intelligence	<ul style="list-style-type: none"> • Spreadsheet software packages • Labor contract negotiation • Multi-issues, representation of the user's preferences and requirements
NEGOTEX	Pre-negotiation	Rule-based model	<ul style="list-style-type: none"> • Spreadsheet software packages • Cultural difference identification • Knowledge-based systems include negotiations involving complex problems
GMCR	Pre-negotiation	Graph Model	<ul style="list-style-type: none"> • Strategic decisions and forecast compromise solutions • Water resource management problems • To permit practitioners to conveniently apply the graph model for conflict resolution to practical conflict problems
PERSUADER	Process	Artificial Intelligence	<ul style="list-style-type: none"> • Case-Base reasoning and Multi-Attribute Utility Theory • Labor management, United States' industrial disputes • Acting as a mediator, facilitates the disputants' problem solving so that a mutually agreed upon settlement can be achieved.
Negotiator Pro	Process, solution	Artificial Intelligence	<ul style="list-style-type: none"> • Template-based NSS, on-line negotiation • Develop and organize a negotiation plan and a profile of the other party prior to negotiation • Improving manager's negotiating expertise
Art Of Negotiating	Pre-negotiation	Past and present preference	<ul style="list-style-type: none"> • Template-based NSS and on-line negotiation • A large business transaction and a labor contract • Asked questions from disputants to help in assessing the extent of agreement and differences
DEUS	Pre-negotiation	Build goals by negotiators' beliefs	<ul style="list-style-type: none"> • Template-based NSS and on-line negotiation • Family law property negotiation • The goals and beliefs of parties are set on screen side by side • To reduce the difference between goal to nil
SmartSettle	Process, solution, advice	Phase model, problem model, acceptable set, value function	<ul style="list-style-type: none"> • Template-based NSS and on-line negotiation • Multiple issues and quantify negotiators' level of satisfaction with possible options or outcomes. • Graphically develop "Packages" that combine different options on each issue, and evaluate those packages based on negotiators' priorities and preferences.
Inspire	Process, solution	Phase model, value function	<ul style="list-style-type: none"> • Provides utility values to graph offers, and web-based system • Efficient direction and compromise efficiency • Teaching and training tool for negotiation
CBSS	Process	Phase model	<ul style="list-style-type: none"> • Web-based NSS • Tested in comparison with face-to-face meetings in simulated labor union-management negotiations

Table 2-2: Software for Support and Conduct Negotiation (continued)

NSSs	Focus	Models/ Methodology	Support, Application and Key activities
LDS	Solution	Rule-based reasoning	<ul style="list-style-type: none"> • Assist legal experts • Represent the first steps in recognizing the value of settlement-oriented decision support system
SAL	Solution	Rule-based reasoning	<ul style="list-style-type: none"> • Help insurance claims • Also represent the first steps in recognizing the value of settlement-oriented decision support system
Mediator	Solution	Case retrieval and adaptation	<ul style="list-style-type: none"> • Propose solutions to international disputes • A new problem is solved in a way that is analogous to a previous similar problem
Family_ Negotiator	Solution	A hybrid rule-base and case-base,	<ul style="list-style-type: none"> • Provides disputants with suggestive advice as how best to resolve the issues in dispute • Implemented in Family Law • Did not provide in-depth solutions expected from real-life negotiations

Chapter 3

RESEARCH FRAMEWORK

Chapter 2 reviews the relevant negotiation studies for this research. Accordingly, the negotiation research fields are numerous and concentrating on several negotiation contexts at a same time is impossible. Thus, Section 3.1 introduces the scope and Section 3.2 introduces negotiation context of this research. Section 3.3 introduces the first task of this research, and the necessity of distributive negotiation in life. Details of experimental, negotiation, game scenario for this research appear in Section 3.3.1. In Section 3.4, the design and structure of electronic negotiation tool is identified as the second task of this research.

3.1 Research Scope

Without doubt, previous research (Section 2.1.1) into experimental negotiation games provides theoretical and empirical tools for investigating interactive decision making. These tools validate methods for negotiation theories, as well as information on empirical behavioral regularities in negotiation. These established negotiation theories and information of empirical behavioral regularities through negotiation games have potential values for real-world decision makers.

However, most NSS engineers and researchers have overlooked these facts, motioned in previous paragraph, and focused more on the delegation of negotiation

processes complexity and design of e- negotiation system environments than negotiation behaviors in negotiation processes. These phenomena in NSS research became a motivation for an interdisciplinary perspective for research. To combine the gap between social sciences and engineers in NSS research, an electronic negotiation environment and a typical negotiation situation context to conduct empirical tests are vital considerations. Through empirical tests and literature review in behavioral study, this research suggests a process model and a prototype for a negotiation support system.

3.2 Negotiation Context

The research conducted by this student aims to develop a working prototype for negotiation support systems. Through previous literature review, the negotiation contexts are numerous and flexible depending on the entity, issue, information, and so on. Solutions for a specific negotiation context also existed in various negotiation research.

For the present context of negotiation for research, negotiation contexts are varied in number of parties, issues and rules of negotiation (Holsapple et al., 1998). The importance of distributive negotiation context is the focus of discussion in Section 2.3. This study can not cover all negotiation contexts, and instead concentrates on the two-party, distributive (single-issue) negotiation with incomplete information. Approaches to the study of two-party negotiation behaviors and outcomes has perspectives from many disciplines, notably sociology, psychology, organizational behavior, economic game theory, information systems for NSS, and computer science (distributed artificial intelligence, evolutionary computation) because two-party play with opposing roles such

as buyer and seller, is the subject of a great deal more empirical research than multiparty cases.

Descriptive theories of negotiation in sociology, psychology, and organizational behavior have mostly emphasized contextual characteristics of negotiation and the negotiator's cognitive and interaction processes. These descriptive theories of negotiation examine the influence of individual difference, situational determinants and cognitive process on judgment, behavior, and outcomes. In evaluating the outcome of negotiations, descriptive negotiation theorists measure elements of social perception such as negotiators' perceptions of the bargaining situation, of the bargaining opponent, and of themselves. Given the increasing zero-sum nature of imperfect competitive markets on the Internet, this study's primary interest is in the magnitude of conflict in business negotiations.

Distributive bargaining is also important because some disputes cannot be solved in any other way than pure conflict and competition. Distributive bargaining and integrative bargaining are not mutually exclusive negotiation strategies. Even in cooperative negotiation, distributive bargaining will come into play.

Uncertainty of decision outcomes is an important issue which needs consideration in every decision problem, including negotiations. With the exception of the participants having a different opinion about uncertainty, uncertainty of decision outcomes is an issue that is inherent to the problem and not subject to negotiation. In addition, information is the key to gaining a strategic advantage in a distributive negotiation. Participants' reservation prices play an important role in deciding a negotiated, agreed price (Galinsky

& Mussweiler, 2001). Most negotiation research has traditionally taken a reservation price approach and shown that reservation prices are predictive of outcomes.

In this section, the scope of this study and negotiation context is defined as two-party, distributive with incomplete information. The next section provides the necessity for distributive negotiation and details of distributive negotiation situations.

3.3 Problem Statement for Negotiation Situation

In market-based economic systems, buyers and sellers determine values of all products, private properties and commodities. For example, market models assert that market-price drives outcomes; these prices are the equilibrium between the aggregate of buyers' and sellers' price preferences within a market (Scherer, 1980). Economists refer to this market as a perfect, competitive market. In game theoretic bargaining models, the offers of buyers or sellers are the overlap between the specific buyer's and the specific seller's reservation prices, called the bargaining zone or zone of possible agreement (Nash, 1950; Raiffa et al., 2002; Walton & McKersie, 1965). These models usually predict settlement at the midpoint of the bargaining zone. This prediction has as its basis in the notion that "rational" expectations would lead bargainers to conclude that the solution leading to equivalent gains for the two parties (by splitting the bargaining zone surplus in half) is the most reasonable and "fair." Raiffa, et al. (2002) endorsed this as a first approximation of final agreement.

However, perfectly competitive markets or game-theoretic bargaining models cannot decide the price of all goods because perfectly competitive markets do not exist

for all goods. The game-theoretic bargaining model is insufficient to decide the prices of the remaining goods for which perfect markets do not decide a price. Some prices of goods are decided by other ways. One of the other ways to fix prices is through negotiation between buyers and sellers. This is one of main reasons for the existence of negotiation in the world.

Most game-theoretic literature on bargaining assumed that the participants possess complete information about the negotiation, such as the negotiation participants knowing their opponents' reservation prices. However, the incomplete information in two-party negotiation means that the parties only know their own reservation prices and are uncertain about the opponent's reservation price. This leads to bargaining inefficiency which increases as preferences become more uncertain (Cramton, 1984). Uncertainty of decision outcomes is an important issue which needs consideration in every decision problem, including negotiations. Even though the equilibrium price is the average price for which comparable goods have recently sold in an incomplete information bargaining situation, Cramton (1984) referred to this as the prevailing market price. But some bargaining situation cases could not be satisfied by the prevailing market price mechanism, such as bargaining for an Internet domain name, patent, building, house, used car, and so forth. Thus, the bargainers participate in bargaining markets and negotiate with other parties with only their own reservation price information and a lack of market information for the goods and services.

Previous sections examined the importance of distributive negotiation (see also Section 2.3.2), two-party negotiation and incomplete information. In the next section

describes a negotiation game situation, which is a two-party and distributive with incomplete information used for this research.

3.3.1 Description of Negotiation Game Situation

3.3.1.1 Summary of Public Information

The negotiation scenario involves the sale of the Internet domain name “Grays.com.” The present owner of the name is Chris Gray, proprietor and chef of Gray’s Restaurant and Catering, located in a mid-west college town. The prospective buyer is the new major league baseball club, the Washington Grays. Kelly Kaplan, one of the partners that own the team, represents the Washington Grays.

Kelly recently telephoned Chris saying that the Washington Grays might be interested in buying the Grays.com name. The call was unsolicited: Chris had not put the name on the market. Chris asked for time to think about it. The parties agreed they would talk again within a few of days.

This is a one-time bargaining situation. A single issue, price, is in contention and any agreement must be reported in terms of price only. An agreement should be treated as legally binding and final. Either side can terminate negotiations and can refuse to make an agreement if either thinks that is what is best. Chris and Kelly have never previously had dealings, nor do they anticipate future business or social interaction. Public information also includes several details of Internet domain names, of the Washington Grays and of Gray’s Restaurant and Catering.

This completes the public information (See, Appendix A.1) given to both bargainers. The private information refines uncertainties of public information concerning the bargainers' situations, what they know about each other or about the object being negotiated. The private information does not introduce new issues.

3.3.1.2 Chris Gray's Private Information

Chris Gray has had the "Grays.com" domain name since the business is beginning about five years ago. While the web site has proven valuable, the business is now well known in what is, after all, a small town. Gray does not redirecting local restaurant and catering customers to a new web site would be difficult. Moreover, records show that almost all out-of-town hits to the site come through the hotel's web site, and changing the hotel's site to link to a new domain name is easy. Still, advertising expenses associated with a change exist, and estimates for these are \$15,000.

The profit from any deal made to sell Grays.com, then, is

Negotiated price - \$15,000

Chris Gray's job is to maximize the profit from the negotiation, given that the profit will be \$0 if the deal is incomplete (taking less than \$15,000 for the domain name is not an option).

As regarding the Washington Grays, some searching on the web revealed that a number of similar sounding web sites already exist (ex., GoGrays.com). These belong to intermediary businesses which intend to sell tickets to the games. These sites might become confused with the official Washington Grays site (Also discovered is that the

margins in the middle-man ticket business are generally small, and so these companies rarely buy domain names at premium prices; i.e., they buy whatever name they can get for \$35 or less). Beyond this, you have no further information than the public information given above.

3.3.1.3 Kelly Kaplan's Private Information

If Kelly Kaplan cannot obtain "Grays.com" domain name, the best alternative is to accept WashingtonGrays.com which is not yet registered to anyone, and is available for a \$10 registration fee. The concern, however, is that this longer name will not be as easy to market as would Grays.com. The importance is for fans to recognize the name of the *official* team web site since many similarly named, existing web sites (ex., GoGrays.com) wish to resell tickets. Due to the middle-man mark-up, second hand tickets are generally more expensive than the tickets sold directly, and this in turn might depress business. (The margins in the middle man ticket business are generally small and so the companies rarely buy domain names at premium prices; i.e., they buy whatever name they can get for \$35 or less).

Kaplan estimates that using WashingtonGrays.com, instead of Grays.com, would cost the team 1% of ticket sales in the first year. This creates an expected cost of about \$550,000 and becomes the upper limit for obtaining Grays.com. You think that the costs beyond the first year will be far less substantial, and so accounting for them is not necessary.

The profit from any deal made with Gray's Restaurant and Catering, then, is

\$550,000 - negotiated price

The task, then, is to maximize profit from the negotiation, given that the profit will be \$0 if the deal does not occur. Paying more than \$550,000 is not an option since this would give result in negative profit.

Concerning Gray's Restaurant and Catering, no further public information is available to Kaplan.

3.3.1.4 Discussion of the Gray.com Negotiation

The Gray.com negotiation is in a context of two-party, distributive with incomplete information. The reasons are:

- **Distributive:** The single issue is a distributive negotiation type for deciding the price of Gray.com. No previous dealings have taken place nor do the parties anticipate future business or social interaction because this is a one-time bargaining situation.
- **Two-Party:** There are two role players: role buyer (Chris) and role seller (Kelly).
- **Incomplete information:** All parties know their own reservation prices from private information, but are uncertain about the opponent's reservation price. The profit for the seller (Chris) is the difference between a negotiated price to a given reservation price (\$15,000) and the profit for the buyer (Kelly) is calculated by the difference between a given reservation price (\$550,000) and a

negotiated price. Each player's task is to maximize profit from the negotiation.

If they do not make a deal, their individual profits will be zero.

3.4 Rationale for Designing Electronic Negotiation Tool

Most traditional negotiations occur in face-to-face meetings. When negotiation has to be conducted from remote sites, the two parties may communicate with each other through phone calls, fax, email or mail. Phone calls provide real-time interaction but do not support working on detailed documents. Fax and email enhances to exchange of documents but lack real-time interaction are difficult to manage, are time consuming, and prone to foster misunderstanding (Thompson, 2001).

Information technology's effects on negotiations are not limited to the use of electronic communication. Information technology changes the representation of a negotiation problem and its negotiation process structure. The use of Internet-based information systems allows for many activities typically undertaken in negotiations, including: (1) efficient matching of potential negotiators (2) exchange comparison and categorization of rich data (3) the use of tools for data collection, (4) problem structuring and analysis, and (5) interpretation of offers.

Section 2.4 presents the trends of NSS research but lacks activities for strategic behavior negotiation. Many studies have also investigated negotiation strategies (Darling & Mumpower, 1990; Fisher & Ury, 1981; Gulliver, 1979; Holsapple et al., 1998), but most have been theoretical or based on data obtained only from questionnaires. In contrast, an e-negotiations system records the entire negotiation process, which would

provide data on the actual behavior of negotiators rather than only on their subjective thoughts. Moreover, analyses of the actual behavior of negotiators will be better for elucidating the actual phenomena. In addition, collecting and analyzing all behavior data obtained during the negotiation process and about the negotiation result will provide a clearer understanding of negotiation behavior. Therefore, one can then enable the construction of an accurate theory and strategy of negotiation. Based on these reasons, this study's objective requires an electronic negotiation tool to collect human behavioral data.

3.4.1 Designing an Electronic Negotiation Tool for Empirical Tests

Conceptually, the effects of an NSS are essentially brought about by its two components: (1) the individual DSSs, and (2) the networked electronic communication channel. A schematic model of the two-party negotiation with NSS appears in Figure 3-1. The computer-supported DSS component helps to refine negotiators' objectives, and at the same time, provides a tactful forum for expressing them (Bui, 1992). It supports the analysis of subjective preference and/or external objective data. The computer-supported DSS also provide modeling techniques (i.e., based on regression analysis, multi-criteria decision making, and game theory) to generate integrative solutions or viable strategies (Anson & Jelassi, 1990; Jelassi & Foroughi, 1989). This information processing capability and capacity, as well as the identification of potential settlements, enhance easy interpretation and objective evaluation of issues and outcomes.

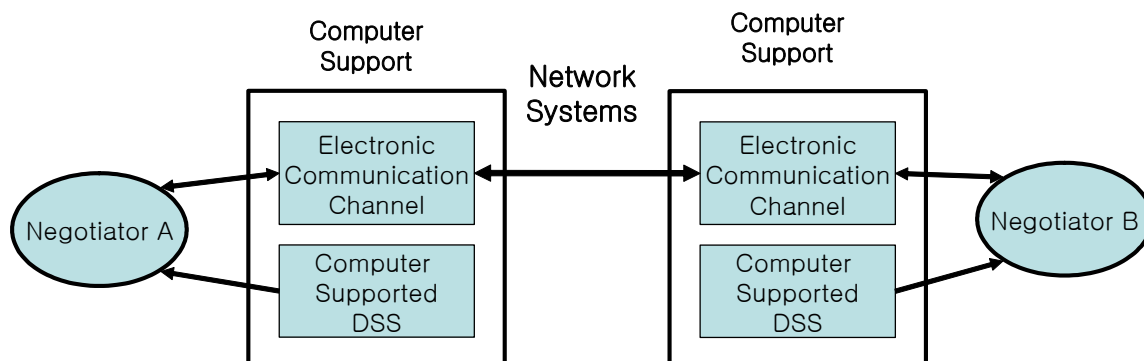


Figure 3-1: A schematic model of the two-party negotiation with NSS

For an electronic negotiation tool design, an electronic communication channel includes as the function of synchronous and collocated communication and uses the path: “negotiator A – computer – web server – computer – negotiator B.” The purpose of this electronic negotiation tool in research is to collect all behavior data during the negotiation process and provide a location for electronic negotiation. Thus, information control functions are only considerations for the design of an electronic negotiation tool.

Communication between parties through an electronic communication channel requires keyboarding skills for sequential and/or concurrent inputting. Only information control functions such as offers/messages storage, retrieval and display of previous offers and messages are included. This is due to this tools’ being a prototype for an electronic negotiation tool. The analysis and reasoning aids for supporting the performance of problem-specific reasoning processes based on a certain representation of a decision problem (i.e., knowledge-based systems and mathematical programming) are outside the scope of this research project.

3.4.2 Building an Electronic Negotiation Web Site

The main functions of the *Negotiation Site* are the following: 1) Easy access through the Web so that two parties anywhere in the world can negotiate by accessing the *Negotiation Site* through the Web. 2) Real-time communication and interaction so that negotiators can communicate with each other in real-time. 3) Offers and Messages storage in order to review any offers and messages that have been sent or received. 4) Security and privacy so that the system should be able to recover from system or communication failure. Each party should have its private and shared offers and messages. All information should be stored in a database on a server machine.

Based on above functions, the *Negotiation Site*, written in JAVA Language (such as JAVA applets and JSPs), is designed for the Internet and can be easily accessed through popular web browsers such as Microsoft Internet Explore or Mozilla Firefox. In the *Negotiation Site*, the paired participants negotiate only through text-based, electronic offer and messaging facilities. The *Negotiation Site* program runs on a computer with the Microsoft Windows based operating system with a standard keyboard and a mouse. To facilitate the *Negotiation Site*, Tomcat is the web server and MySQL version 4.1 is the database server.

The structure of the *Negotiation Site* appears in Figure 3-2. The *Negotiation Site* consists of three main web pages such as *Negotiation Home*, *Negotiation Table* and *Summary of Negotiation*. Through the *Negotiation Home*, participants move to the registration web page. Once a participant completes registration, the participant can move to the *Negotiation Table*. In *Negotiation Table* page, the paired subjects receive or send

their offers or messages each other. When they complete negotiation, the subjects' *Negotiation Table* pages change to a *Summary of Negotiation* page. The summary of results such as roles and negotiated prices appear on the *Summary of Negotiation*.

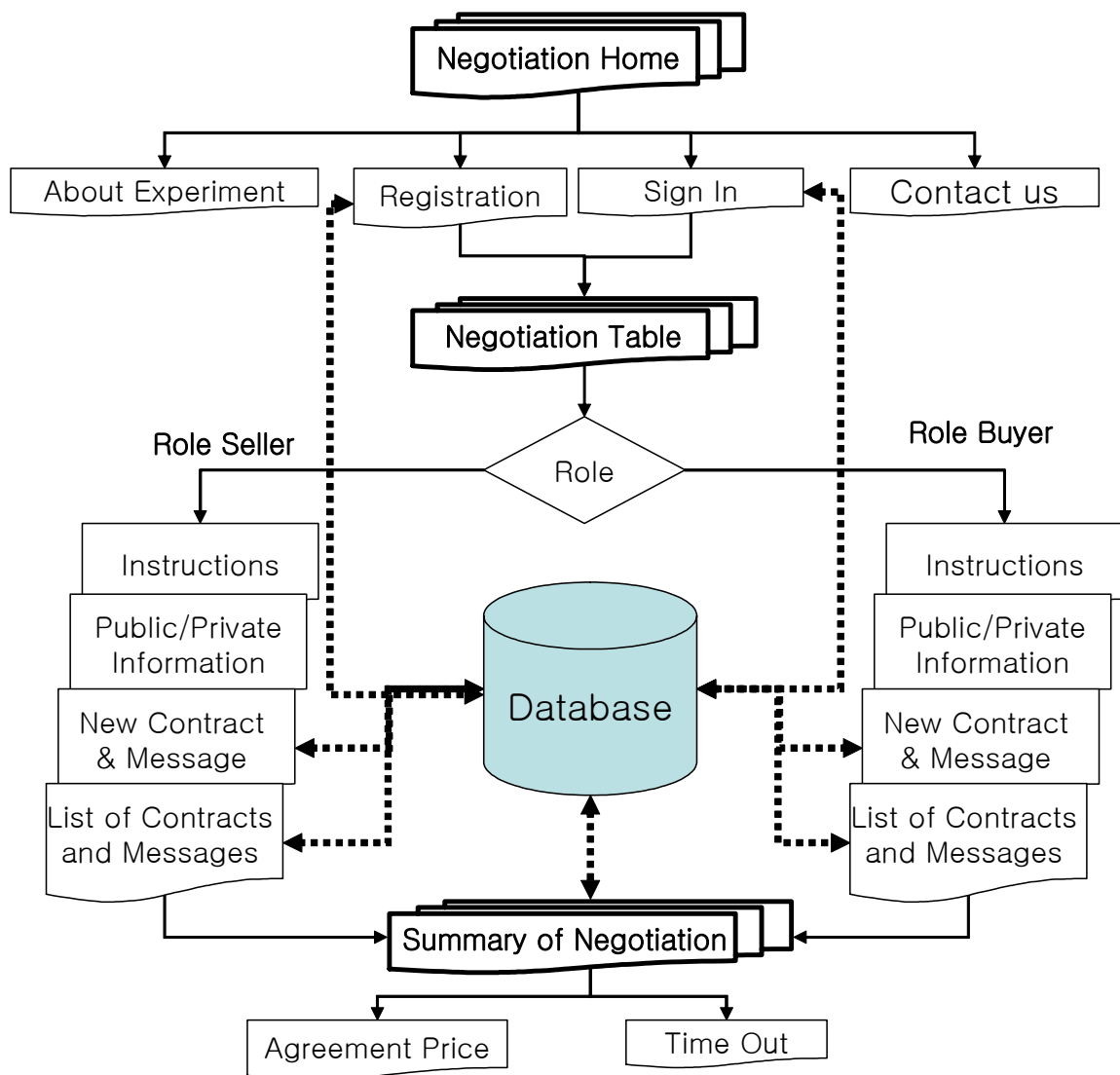


Figure 3-2: Structure of *Negotiation Site*

Chapter 4

NEGOTIATION PROCESS MODEL

Previously, Chapter 3 describes the negotiation context, situation and purpose of electronic negotiation tool design. This chapter presents a negotiation process model. Section 4.1 defines the negotiation process model. The negotiation process model consists of preparation and the actual conducting of negotiation phases. With presenting the preparation negotiation phase, core concepts such as BATNA, reservation price and ZOPA in negotiation are also introduced in Section 4.1.1. Section 4.1.2 is the actual conducting phase of the negotiation process with the anchoring effects of the negotiation process.

4.1 Negotiation Process Model

Designing negotiation processes and associated e-negotiation media has become an important issue for electronic commerce. Although, many scientific approaches for analyzing and designing certain negotiation processes and related decision support components have had consideration, a solid engineering practice for e-negotiation media has not yet emerged. In practice, the development of e-negotiation media is still more of an art than a science, and depends largely on the creativity and know-how of a given engineer. Little knowledge exists about what to consider during the analysis, which protocols are suitable for a certain negotiation situation and how to evaluate the outcome

of a negotiation (Bichler et al., 2003). In spite of uncertain circumstances of the negotiation process, most process models agree to include at least some form of (1) negotiation preparation, (2) actual conducting of the negotiations and (3) implementation of the results, sometimes including renegotiation (Gulliver, 1979; Kersten & Noronha, 1999).

Perspectives of behavioral researchers (Buelens & Van Poucke, 2004; Galinsky & Mussweiler, 2001; Van Poucke & Buelens, 2002) have emphasized the first offer effects on a process of negotiation. Without an opponent's reservation price information, the negotiator's decisions have an inclination toward the opponent's first offer, called anchoring effect. Based on the perspectives of behavioral negotiation studies, a negotiation process model for research can be defined such that: (1) preparation phase (how to neutralize the first offer's anchoring effect), (2) first offer phase (how to make first offer), (3) concessions phase (how to make concession), and (4) outcome phase (see Figure 4-1).

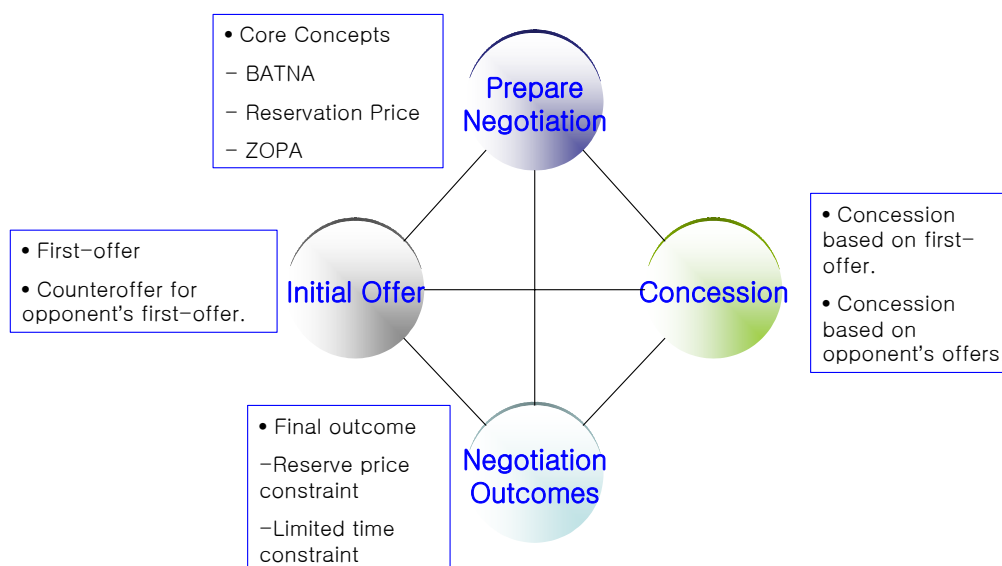


Figure 4-1: Negotiation process model

4.1.1 Preparation of Negotiation

Negotiation analysis (NA) integrates decision analysis and game theory in order to provide formal and meaningful support. The goal of negotiation analysis is to bridge the gap between descriptive, qualitative models and normative, game-theoretic models of bargaining. NA adopts a number of behavioral concepts (reservation values, BATNA, and integrative/distributive negotiations and principled negotiations) and incorporates them in quantitative models. This way NA significantly extends the expressiveness of the models and their capability of describing various negotiation situations. NA also allows analysts and advisors to conduct formal analysis of negotiations and to provide support.

Negotiation analysis tends to downplay the application of game-theoretic solution concepts or efforts to find unique equilibrium outcomes. Instead, negotiation analysts

generally focus on changes in perceptions in the zone of possible agreement and distribution of possible negotiated outcomes, conditional to various actions (Clyman, 1995; Sebenius, 1992).

To mitigate the first offer anchoring effect in preparation phases, negotiation analysts have emphasized the following factors:

4.1.1.1 Interest

What kind of information should one focus on to overcome the anchoring influence of a first offer made by one's opponent? One possibility is to make thorough use of the information one has available about the opponent's bargaining position. One suggestion is that one impediment to achieving favorable outcomes in a negotiation is lack of preparation (Fisher et al., 1991). In particular, negotiators often fail to understand adequately the perspectives of their opponents. Misunderstanding the interests of one's negotiation opponent can lead to erroneous attributions (Morris et al., 1999), failure to maximize joint gain (Thompson & Hrebec, 1996), and impasse (Thompson, 1990). In addition, not understanding the other side's sources of power may lead to unwise strategies that can produce adverse outcomes. Thus, wisdom dictates to not only understand one's own interests, but also to spend time detailing one's opponent's interests and alternatives in this negotiation.

4.1.1.2 BATNA

BATNA is the acronym for Best Alternative to a Negotiated Agreement. It is a term coined by Fisher and Ury in their bestseller, *Getting to Yes: Negotiating Without Giving In* (1981). BATNAs are critical to negotiation because a negotiator cannot make a wise decision about whether to accept a negotiated agreement unless the negotiator knows what the negotiator's alternatives are, "Your BATNA is the only standard which can protect you both from accepting terms that are too unfavorable and from rejecting terms it would be in your interests to accept" (Fisher & Ury, 1981). If a negotiator considers the simplest standpoint, the negotiator's BATNA is the choice the negotiator can make if the negotiator concludes that negotiating with a particular party is not likely to yield a favorable result. The negotiator can walk away from a negotiation if the negotiator's BATNA is better than the likely outcome of that negotiation.

Having a good BATNA increases negotiating power. Therefore, a negotiator attempts to improve a BATNA whenever possible. Good negotiators know when their opponent is desperate for an agreement. When that occurs, they will demand much more, knowing their opponent will have to accept. If the opponent, apparently, has many options outside the negotiating table, a negotiator is making BATNA as strong as possible before negotiating, and then makes those BATNAs known to the opponent, and thus, strengthens the negotiating position.

When the other side makes the first offer, not only might it be overly optimistic about alternatives, but also it may increase one's own pessimism, leading to counteroffers influenced by the initial anchor (Liebert et al., 1968). Information on the opponent's

BATNA can neutralize the anchoring effect of the opponent's first offer (Galinsky & Mussweiler, 2001).

4.1.1.3 Reservation Price (Walk-Away Price)

In microeconomics, the reservation price or reserve price is the maximum price a buyer is willing to accept for a good or service, or the minimum price a seller is willing to accept for good or service (Raiffa, 1982). Reservation prices vary for the buyer according to disposable income, desire for the good, and the prices of, and information about substitute goods. Walton and Mckersie (1965) described the process of a distributive negotiation as trying to ascertain the opponent's walk-away point (i.e., reservation price) without revealing one's own reservation price, the point of preferring impasse to agreement. White and Neale (1991) considered the reservation price to be similar to a BATNA, with the difference stemming from possible transaction costs of moving to one's BATNA. By focusing on the opponent's reservation price, the very minimum (for the seller) or maximum (for the buyer) that person is willing to accept, the negotiator should make accessible information that is inconsistent with the implications of the opponent's first offer and, thus, reduce the anchoring effect of the opponent's first offer. Pruitt and Carnevale (1993) saw a relationship between reservation price and initial offers: Higher reservation prices lead to higher initial offers.

4.1.1.4 Zone of Possible Agreement (ZOPA)

A fundamental concept in negotiations research is the bargaining zone model, outlined by Walton and Mckersie (1965) and Raiffa (1982). In the bargaining zone model, each party in a negotiation has a reservation price. The reservation price is the price beyond which the negotiator would prefer impasse over agreement (Raiffa, 1982). Thus, a reservation price for a seller is that price below which the seller would prefer impasse over selling the good. For the buyer, it is the price above which the buyer would prefer impasse over buying the good. By definition, parties will not enter into agreements that are worse than their least acceptable outcomes. Any overlap between the parties' reservation prices constitutes the zone of possible agreement (Raiffa, 1982).

The nature of the zone of possible agreement (ZOPA) depends on the type of negotiation. In a distributive negotiation, in which the participants are trying to divide a "fixed pie," it is more difficult to find mutually acceptable solutions as both sides want to claim as much of the pie as possible. Distributive negotiations over a single issue tend to be zero-sum. In this situation no overlap of interests exists between the parties; therefore, no mutually beneficial agreement is possible. The ZOPA model applies in data analysis. The terms of ZOPA and the ZOPA of distributive negotiation appear in Figure 4-2.

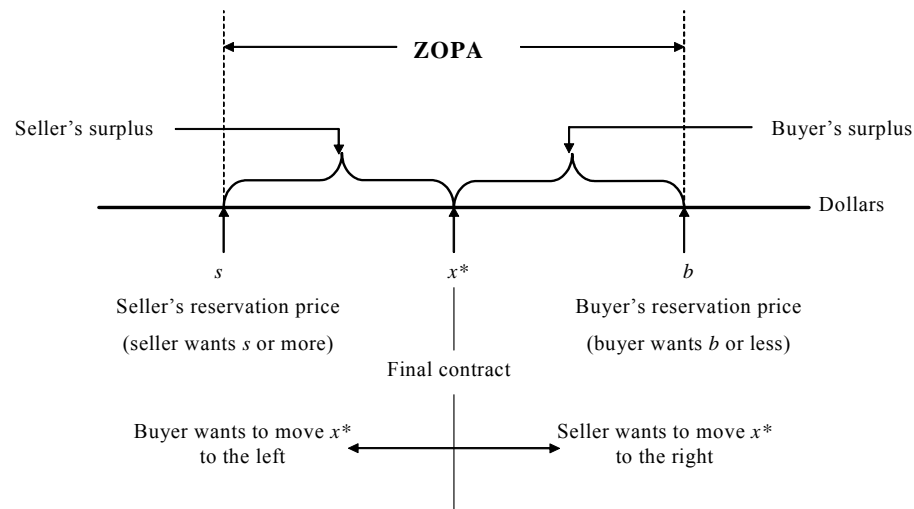


Figure 4-2: Geometry of distribution negotiation (Raiffa et al., 2002).

Reservation Values:

- s : a seller's reservation price that represents the very minimum acceptable settlement.
- b : a buyer's reservation price that represents the very maximum acceptable settlement.
- x^* : any final-contract value, x^* , that is less than s represents a situation for the seller that is worse than no agreement.

Buyer's and Seller's Surpluses:

- $x^* - s$: the seller's surplus if x^* is greater than s .
- $b - x^*$: the buyer's surplus if x^* is less than b .

Zone of Possible Agreement (ZOPA)

- $b < s$: if the maximum price the buyer will accept is lower than the minimum price the seller will accept; no zone of possible agreement exists.
- $s < b$: the zone of possible agreement (that is, the range of possible solutions for the final contract x^*) is the interval from s to b . Suppose that the final agreement is some value x^* , where x^* is between s and b .
- $b - s$: the sum of the surplus values which is independent of the intervening x^* value.

4.1.2 Actual Negotiation Conduct

Negotiation research has been tried to identify factors determining the negotiated outcome (Pruitt & Carnevale, 1993). Researchers and negotiators are eager to explain, predict and influence the negotiated results which are the ultimate dependent variable (Zartman, 1994). In spite of an impressive cumulative research effort, the negotiator's curiosity about how to predict the outcome of a specific negotiation is remains unsatisfied. To what extent one can predict the result of a specific negotiation and what factors must be taken into account is difficult to know.

4.1.2.1 First Offers, Concession and Outcome

The most frequent questions in negotiation are who should make the first offer, and how will making or not making the first offer influence the negotiation process and

the outcome? These questions are certainly not trivial. The decision situation of the first offer causes great uncertainty and anxiety among parties. This is especially true when parties lack reliable information about each other, as they are then unsure about what offer that party will accept and what offer is likely to cause the other party to walk away from the negotiation. Furthermore, the possibility exists that the other party could deliberately respond with misleading information to gain a negotiation advantage. A first offer thus provides valuable information about a party's negotiating position and gives an indication of what type of agreement would be acceptable.

4.1.2.2 Anchoring in Negotiation

Research has established that the way negotiators perceive the value of any offer made in a negotiation strongly correlates to any relevant number related to that offer. Given that numbers related to an offer tend to have a magnetic effect on the judgment of negotiators, these numbers are referred to as anchors. Anchoring effect (Tversky & Kahneman, 1974) is one of the classic judgmental biases that could affect negotiators' decision behaviors.

First offers have a strong anchoring effect in situations of great fluidity and uncertainty (Galinsky & Mussweiler, 2001), as in the case with many negotiations. First offers maintain a strong influence throughout the negotiation. This influence is so strong that even negotiators who are aware of the magnetic effect of anchors in terms of their judgment are often unable to resist this influence. Therefore, their valuations of a first offer seldom escape the field of influence of such anchors.

4.1.2.3 Relation between Anchoring and Initial Offers

The use of anchors has been shown to influence not only the first offers that are made in a negotiation, but also their final outcomes (Northcraft & Neale, 1987). Ochs and Roth's (1989) experimental study of sequential bargaining produced support for a first-mover advantage. Huber and Neale(1986) also demonstrated that anchors can influence the type of first offers negotiators make in a negotiation. Furthermore, an opponent's first offer has been shown to influence the type of counteroffers and outcomes in negotiations (Benton et al., 1972; Chertkoff & Conley, 1967; Liebert et al., 1968). Generally, more extreme first offers in one's favor result in more beneficial outcomes for oneself. Some researchers (Bartos, 1974; Donohue, 1981; Pruitt & Carnevale, 1993) suggested that "Firm" negotiations obtain better results: a firm negotiator is a negotiator with high goals, making high initial demands and resisting concessions (Pruitt & Carnevale, 1993).

In addition, first offers are better predictors of final settlement price as subsequent concessionary behavior (Yukl, 1974), which could be interpreted as an anchoring effect of the first offers. Research on first offers has focused on the relationship between first offers and final results, and has consistently revealed a positive correlation between them (Benton et al., 1972; Chertkoff & Conley, 1967; Galinsky & Mussweiler, 2001; Yukl, 1974). These studies provide some initial evidence suggesting that anchoring effects may be influential in negotiations.

Chapter 5

EXPERIMENT FOR NEGOTIATION SUPPORT CONTENTS (NSCs) MODEL

Previous chapter present the negotiation context, electronic negotiation tools and negotiation process model. In efforts to define negotiation process model, Chapter 4 introduces many negotiation strategies and behavioral theories. However, these strategies and theories should be validated to define the negotiation support contents model in some situations. Thus, Section 5.1.1 presents the purpose and reasons for the symmetrical descriptive negotiation (SDN) experiment. The following sections discuss methods, design, hypotheses and results of experiments. Based on these, the design of negotiation support contents (NSCs) model appears in Section 5.2.

5.1 Symmetrical Descriptive Negotiation (SDN) Experiment

5.1.1 Purpose of Experiment

In Section 4.1, research focused on the relationship between first offers and outcomes. Fundamental questions might be relevant for this study: Could previous empirical regularities and theories be applied for this study's negotiation context? Which strategy or which theory has application for this study's negotiation support contexts? Because most of the aforementioned research in Section 4.1 adopted a classic

communication channel such as face-to-face, (e)mail or message transfer between subjects in laboratory environments. Most studies employed varied negotiation contexts depending on research interests. Thus, conducting an SDN experiment validates the previous behavioral theories and regularities in the negotiation context, as defined in Section 3.3.1.

5.1.2 Methods of Experiment

Participants

The experiment was a class activity at the University of Magdeburg and Pennsylvania State University (PSU). The total participants were 37 pairs of 74 participants. The 17 pairs of 34 participants were undergraduate students or graduate students of the University of Magdeburg in Germany and 20 pairs of 40 participants were MBA students at PSU.

Procedure

This experiment's design was for one class activity at both Universities, and took 60 minutes to complete. Each participant randomly received a UserID and a Password, which assigned each participant to one role (Buyer or Seller) and matched with the other role player for the entire session. The instructor read the public information (see Appendix A.1) and participants read private information (see Appendix A.2 and Appendix A.3) by themselves. The instructor explained a manual for the Negotiation Web Site. After completing these procedures the participants registered and began

negotiation to maximize their profit with a matched participant. The experiment procedure appears in Figure 5-1. A database of the e-negotiation tool collected all participants' personal information and their negotiation activities (i.e., offers and messages) during this experiment. All communication required the Internet use and participants kept their own negotiation case secure from everyone else.

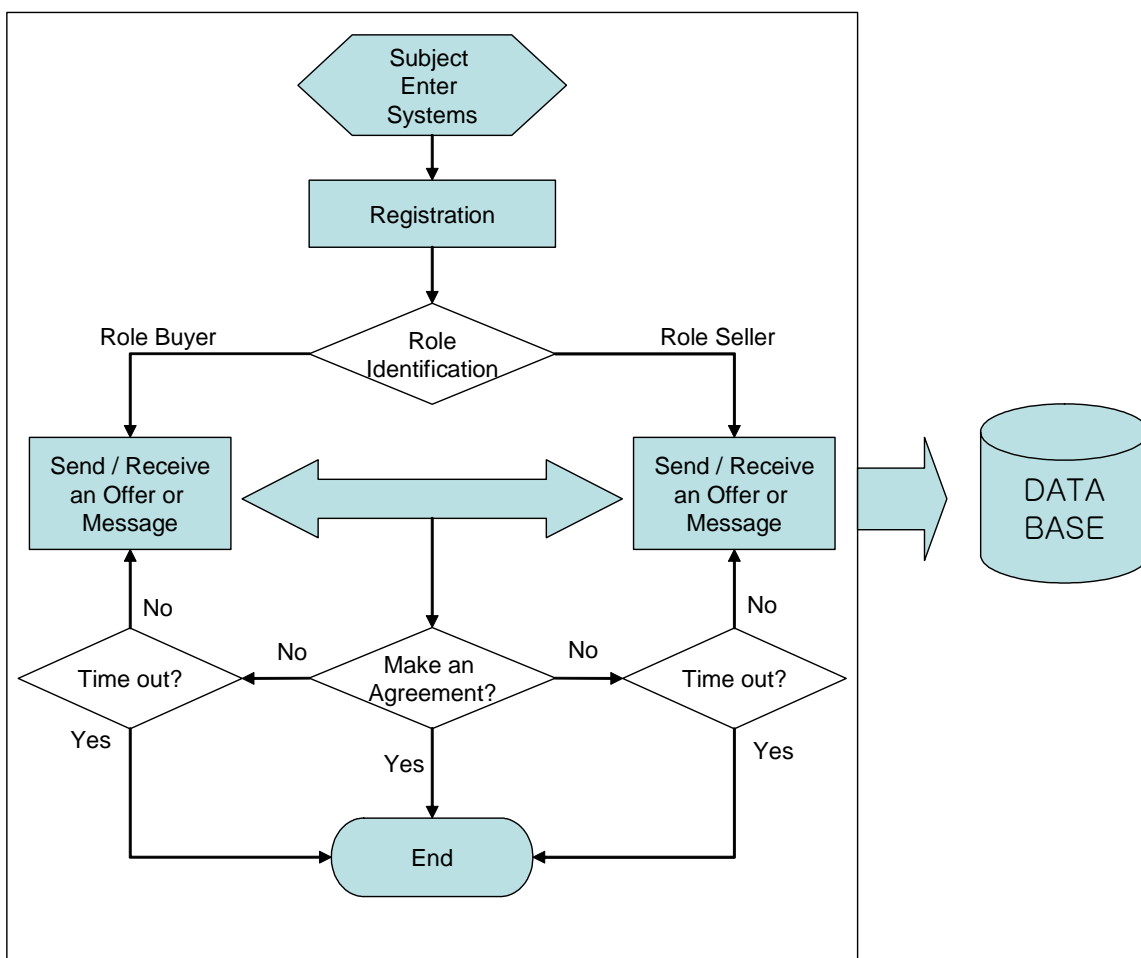


Figure 5-1: Experiment procedure

5.1.3 Hypotheses for Experiment

Eight hypotheses answer the primary question for the SDN experiment which examines three central variables: first offers, initial counteroffers, and final agreement price. Answering the proposed hypotheses validates the previous behavioral theories and regularities in the negotiation context, as defined in Section 3.3.1.

To examine parties' estimation of ZOPA and bargaining power between buyer and seller in the negotiation context, Hypothesis 1.1 and Hypothesis 1.2 are proposed.

- Hypothesis 1.1: Role seller's first offer is higher than role buyer's first offer.
- Hypothesis 1.2: Bargaining power between buyer and seller is symmetric in the negotiation context for this study.

First offers have a strong anchoring effect in situations of great fluidity and uncertainty (Galinsky & Mussweiler, 2001). To examine a first-mover advantage (Ochs & Roth, 1989) and the influences of first offer to initial counteroffer and final price, Hypothesis 1.3 and Hypothesis 1.4 are proposed.

- Hypothesis 1.3: Making first offer provides negotiation advantage in terms of final price.
- Hypothesis 1.4: The first offer affects the initial counteroffer and final price.

Several researchers introduced first offer strategy (see Section 4.1.2.3).

Hypothesis 1.5 is proposed to examine first offer strategy, and Hypothesis 1.6 is proposed to examine first offers' regularity for final price estimation.

- Hypothesis 1.5: More extreme first offers in ones' favor result in more beneficial outcomes for oneself (Benton et al., 1972; Chertkoff & Conley, 1967; Liebert et al., 1968).
- Hypothesis 1.6: The midpoint of both role players' initial offers can be a predictor of negotiated final price.

Hypothesis 1.7 is proposed for asymmetrical prescriptive/descriptive tests. If final profits are different between buyers and sellers, supports for negotiation will be provided for the less gain role players in the asymmetrical prescriptive/descriptive experiment.

- Hypothesis 1.7: The average final profits for both role players are not different.

Pruitt and Carneval (1993) suggest concession strategy. To examine the effect of concession change for final price, Hypothesis 1.8 is proposed.

- Hypothesis 1.8: Concession change strategies affect the final price.

5.1.4 Results of Experiment

First offers

Twenty-four buyers (role Kelly) of the 37 pairs made the first offer. Only 13 sellers (role Chris) of 37 pairs made first offers. The average first offer made by buyers was significantly different from the average first offer made by sellers (122,215 vs. 443,615, $p=0.003$, two-tailed MWU test). The average differences between first offers

and reservation prices were not significantly different between buyers and sellers (427,785 vs. 428,615, $p=0.993$, two-tailed MWU test).

- *Result 1: The first offer results indicate that both participant groups had, on average, a similar estimated regarding the ZOPA. The first offer results showed that a significant difference between the average first offer made by sellers and buyers. Perhaps, both participant groups underestimated the range of ZOPA.*

Initial Counteroffers

The average initial counteroffers made by buyers were significantly lower than the average initial counteroffers made by sellers (83,442 vs. 451,458, $p=0.001$, two-tailed MWU test). The average difference between buyers' first offers and sellers' initial counteroffers were not significantly different from the average difference between sellers' first offer and buyers' initial counteroffer (329,243 vs. 360,173, $p=0.798$, two-tailed MWU test). The sellers initial offers, which could be either an opening offer (13 cases) or an initial counteroffer (24 cases), were not significantly different (443,615 vs. 451,458, $p=0.954$, two-tailed MWU test). The buyers' initial offers, which could be either an opening offer (24 cases) or an initial counter offer (13 cases), were not significantly different (122,215 vs. 83,442, $p=0.318$, two-tailed MWU test).

- *Result 2: The first offer and initial counteroffer results indicate that buyers' and sellers' bargaining power are symmetric in the designed negotiation context for this study.*

Final Price

The average final price that resulted when buyers made the first offer and the average final price that resulted when sellers made the first offer was not significantly different (260,208 vs. 162,517, $p=0.085$, two-tailed MWU test). As a result, buyers' and sellers' average profits were not significantly influenced by whether buyer or seller made the first offer ($p=0.085$, two-tailed MWU test).

- *Result 3: The final price results show that no advantage for making the first offer in terms of final profit.*

Correlation and Regression between First Offer and Final Price

- Buyer: Significantly positive correlations appear between buyer's first offer and seller's initial counteroffer (Spearman's $\rho=0.542$, $p=0.006$) and between buyer's first offer and the final price (Spearman's $\rho=0.800$, $p=0.000$).
- Seller: No significant positive correlation appears between seller's first offer and buyer's initial counter offer (Spearman's $\rho=0.363$, $p=0.222$). However, a significantly positive correlation appears between seller's first offer and the final price (Spearman's $\rho=0.901$, $p=0.000$).
- *Result 4: Both role players' first offer affects the final price, but the role seller's first offer does not significantly affect the role buyer's initial counteroffer.*

The regression results indicate that a negotiator's more extreme first offer predicts higher final price with higher variance of success, as in Figure 5-2 . The final price was significantly higher when sellers made initial offers (either first offer or initial

counteroffer) above the buyers' reservation prices (Out-ZOPA, 11 cases) than when sellers made initial offers below the buyers' reservation prices (In-ZOPA, 26 cases, $F(1,35)=14.887$, $p=0.000$, see Figure 5-3-A). Similarly, final prices were significantly higher when buyers made initial offers above the sellers' reservation prices (In-ZOPA, 28 cases) than when buyers made initial offers below the sellers' reservation prices (Out-ZOPA, 9 cases, $F(1,35)=13.915$, $p=0.001$, see Figure 5-3-B).

- *Result 5: Making a first offer (or initial counteroffer) aggressively within reason, results in a change for a higher final price.*

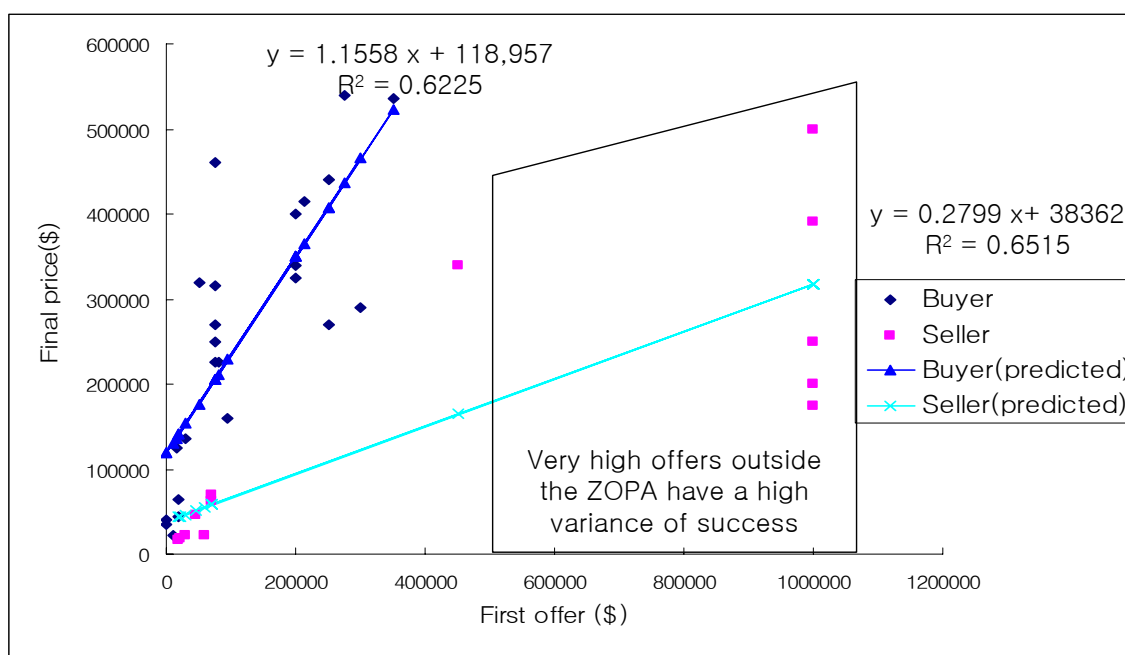
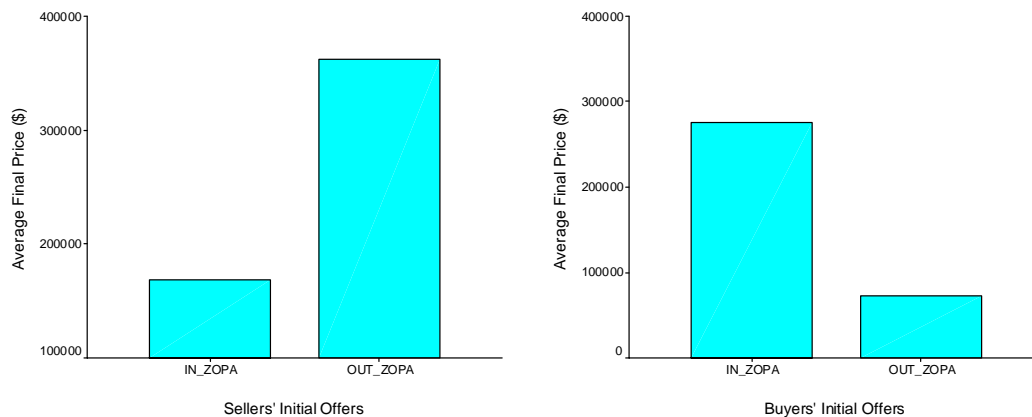


Figure 5-2: First offer vs. final price



A. Sellers' initial offers on ZOPA vs. Final Prices B. Buyers' initial offers on ZOPA vs. Final Prices

Figure 5-3: Average final price by participants' initial offers on ZOPA

Relationship of Final Price and Mid-point of First Offer and Initial Counteroffer

The paired samples t-test results between average mid-point of two initial offers and the average final price shows that the mid-point of two negotiators' initial offers is a good predictor of final price (278,647 vs. 225,884; $t(36)=2.440$, $p=0.020$, Paired Sample t-test). For example, if the mid-point of two negotiators' initial offers is high (low), the final price is also high (low) (Correlation coefficient: $\rho=0.818$, $p=0.000$), and the mid-point of two negotiators' initial offers could be an estimator of final price.

- *Result 6: Mid-point of two parties' first offers and initial counteroffers are good predictors of final price.*

Which Role Player Has Higher Profit?

The between-subjects results shows that the average profits of buyers is significantly higher than the average profits of sellers (324,115 vs. 210,884; $F(1,72)=8.751, p=0.004$, see Figure 5-4).

- *Result 7: Buyers' average profits are higher than sellers' average profits.*

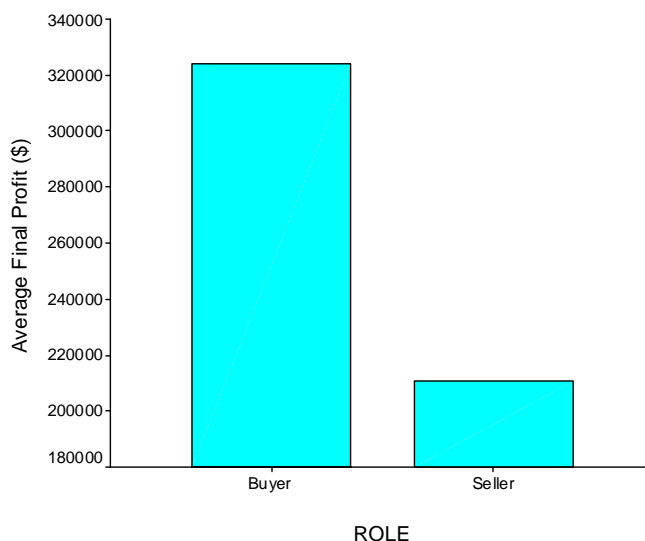


Figure 5-4: Average final profits by role player

Concession

The definition of the range of concession could be one's first offer to an opponent's initial counteroffer. For example, if a buyer makes a first offer of \$200,000 and if the matched seller makes an initial counteroffer of \$300,000, then the range of concession is between \$200,000 and \$300,000 and the size of the concession is \$100,000. If the assumption is that the size of the concession between two parties is 1.00, the

average of sellers' concession changes is 0.39, and the average of buyers' concession changes is 0.61. When the sellers' initial offers divide into two groups, as In-ZOPA and Out-ZOPA, the concession change is significantly different between the In-ZOPA (26 sellers) and Out-ZOPA (11 sellers) groups ($F(1,35)=13,291$, $p=0.01$). The average concession change appears in Figure 5-5. However the average final price of the Out-ZOPA group is significantly higher than that of the In-ZOPA group (see Figure 5-3-A).

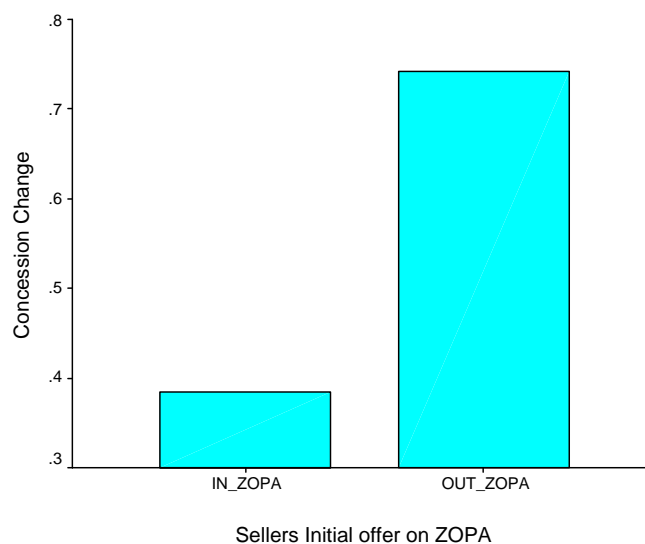


Figure 5-5: Average concession changes by sellers' initial offers

These results indicate a higher (lower) initial offer coincides with a larger (smaller) concession change in negotiation, and the concession change does not significantly affect the final price because the final price is affected by the amount of the initial offer not by the amount of change in the concession range.

- *Result 8: Concession strategy does not significantly affect the final price compared the affect of the first offer.*

5.2 Design of Negotiation Support Contents (NSCs)

Section 4.1 defines the negotiation process model through four phases: 1) preparation, 2) first offer, 3) concession and 4) outcomes. To examine the relationship among the first offer, initial counteroffer and final price in the negotiation context for research, the conducted SDN test and statistical results derived. Section 5.1.4 details these findings.

In the results of Section 5.1.4, the role sellers' average final profits are significantly lower than that of role buyers. Thus, the NSCs' designed is for role sellers in next experiments. Also, the initial offers (first offer and initial counteroffer) of negotiators are important factors to predict the negotiation outcomes. However, the concession factor has no statistically significant effect on the final price when compared to the initial offers. Thus, the design for NSCs includes the Preparation Phase and Initial Offer Phase to support negotiator decision making. An example of NSCs model for sellers appears in Appendix B.2.

- Preparation Phase includes the core concepts of Interest, BATNA, Reservation price and ZOPA for role sellers. To mitigate the first offer anchoring effects, these factors were emphasized in previous negotiation research (see Section 4.1.1). In the preparation negotiation phase, these core concepts provide role sellers an opportunity consider the opponent's interest, BATNA and reservation price.

- Initial offer phase includes the most frequent questions about initial offers and answers which are based on the results of the SDN experiment. Initial offer phase followed Q and A format for negotiators (role seller).

Chapter 6

METHODS FOR EMPIRICAL STUDY

Previously Chapter 5 presents the NSCs model which is needed to evaluate the objective of this research. To evaluate the NSCs model, this study utilizes the methods of negotiation analysis approaches for experiment design. Section 2.1.2 introduces the three types of negotiation analysis approaches were introduced in the reasons for the need descriptive and prescriptive approaches to evaluated support models appear in Section 6.1. All methods for the two types of experiments such as design of experiments, participants, procedures and so on, are in Section 6.2.

6.1 Rationale for Descriptive and Prescriptive Approach

Descriptive models try to carefully describe what actually happens; whereas, prescriptive models are normative in the sense that they prescribe what negotiators should do to achieve the desired result.

Kersten and Cray (1996) offered some guidelines that recommend the appropriate role in negotiation support for both kinds of models. Any negotiation supporting method should, first of all, have its basis in a descriptive model that analyzes and explains the cognitive perspectives and behaviors of the participants without making unrealistic assumptions about their rationality. Only after describing this cognitive level is useful predictive and prescriptive support provided at the instrumental level. Negotiation

support should allow development of contrasting descriptive representations. Then generation of predictions and prescriptions can have their basis in an analysis of the needs of the opponent, the specifics of the situations, and decision-making conditions. Instead of trying to predict outcomes, often, only the decision options for the various participants need identification. The participants then make the actual decisions based on their interpretation of rich, albeit informal, context knowledge.

Based on the aforementioned reasons, two types of negotiation evaluate NSCs Model. The Type 1 experiment is a symmetrical descriptive negotiation experiment; both role players join the experiment without the NSCs model. The Type 2 experiment is asymmetrical prescriptive/descriptive negotiation; only role sellers join the experiment with the NSCs model, but role buyer does not have the NSCs model.

6.2 Symmetrical Descriptive and Asymmetrical Prescriptive/Descriptive Experiments

6.2.1 Participants

The Laboratory for Economics and Management Auctions (LEMA) provided the experimental research location and the venue for students at the Pennsylvania State University. Recruiting subjects was through advertising the four sessions of negotiation experiments by a posting on the LEMA recruiting website. Students, interested in these experiments, could register and join one of sessions. Through this, a total of 80 students participated in these experiments. All subjects were full-time undergraduate or graduate students in the Pennsylvania State University.

6.2.2 Design of Experiments

The design of two types (Type 1 and Type 2) of experiments evaluated the NSCs model. Each experiment type was two sessions due to the limitations of capacity and the number of available computers in laboratory. Each forty subject group participated in each experiment which required 90 minutes to complete a session. Each experiment has two types of role players; one was a role buyer and the other was a role seller. At the beginning of the session, each participant randomly received a UserID and a Password. Based on those, each participant was assigned to one of aforementioned roles and matched with the other role player, remaining a pair until end of the experiment. Both parties negotiated without the NSCs model in Type 1 experiment. In Type 2 experiment, however, only role sellers had the NSCs model and negotiated with role buyers. The structure of the two types of experiments appears in Figure 6-1.

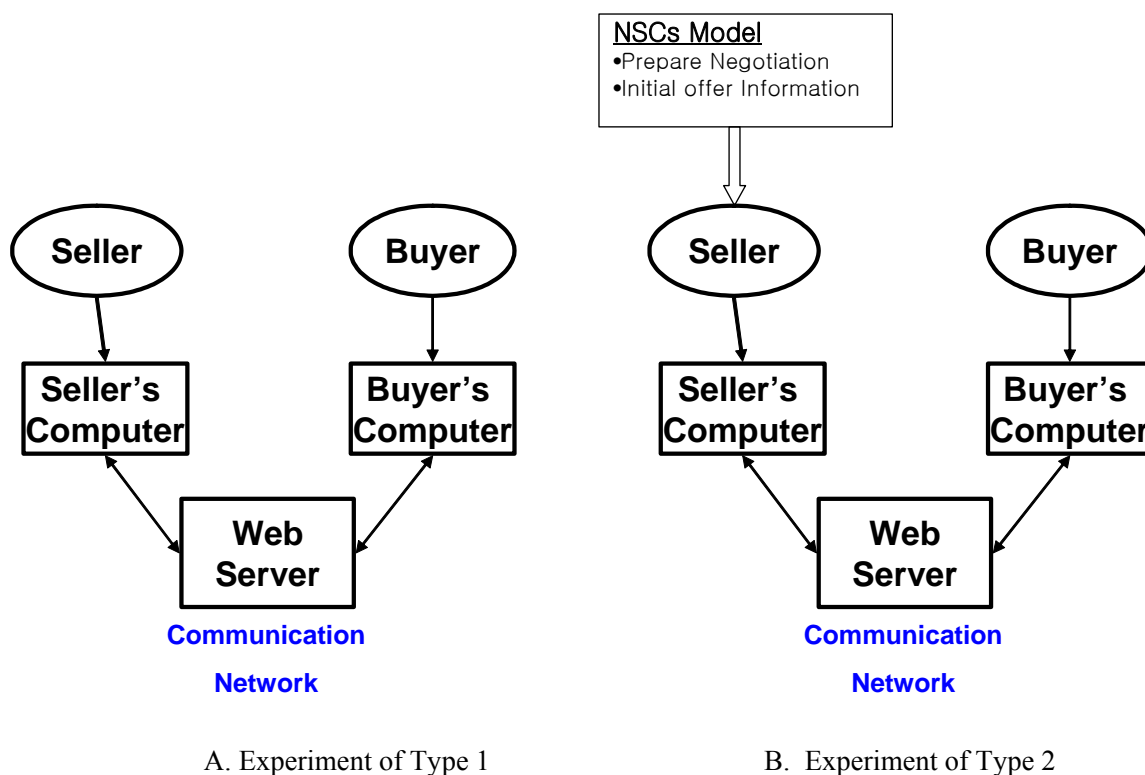


Figure 6-1: Design of experiments

6.2.3 Protocol of Experiments

6.2.3.1 Type 1: Symmetrical Descriptive Experiment

Allocation of Materials: Participants receive instruction to conduct a two-party negotiation via the *Negotiation Table* web page where the paired participants send or receive offers or messages. Each participant receives a six-page packet of materials that contains experiment protocol, public information (see Appendix A.1) and private information (see Appendix A.2 and A.3). In addition, a UserID and a Password to

register for the *Negotiation Table* web page are already in participant's possession. One side of the computer room has buyers and the other side has sellers.

Reading Instructions: After all participants occupy their assigned desks, an experiment monitor reads the public information and the experiment protocol (see Appendix B.1) out loud. Simultaneously all participants read the private information by themselves, because the public information is identical for both role players, but the private information is different for role buyers and role sellers. The private information, for instance, includes one's reservation price and a role player's negotiation tasks.

Registration: After participants finish the reading of private information, they open a browser (i.e., Internet Explorer) on their computers. In the URL box, they input <http://siegel.smeal.psu.edu> (See Figure 6-2) and press the "Enter" key to connect to the *Negotiation Home* web page.



Figure 6-2: To connect the negotiation server

When a participant clicks the *Registration* hyperlink (See Figure 6-3-A) on the *Negotiation Home* web page, the participant sees the *Negotiation Registration* web page. The participant types the personal information (name, gender and email address), the required UserID and Password, and complete the "Consent Form" (See Figure 6-3-B). Clicking the "I Agree" button completes registration for the session and each participant

receives a matching role player. The paired participants negotiate through the *Negotiation Table* web page until the end of the session.



A. Negotiation Home page

B. Registration Page

Figure 6-3: Registration for negotiation session

6.2.3.2 Type 2: Asymmetrical Prescriptive/Descriptive Experiment

The only difference between Type 1 experiment and Type 2 experiment is that sellers in the Type 2 experiment receive the negotiation support contents (NSCs) model. The experiment monitor completes reading of experiment protocol and public information to all participants. Like instruction the previous information reading in the Type 1 experiment, participants should read to themselves. Then the monitor reads the

negotiation support document only to role sellers. After completing all instructions reading, all participants process the next registration steps. The procedures after registration follow the same procedures as the Type 1 experiment.

6.2.3.3 Negotiation Table for Experiments

The overall structure of *Negotiation Site* appears in Figure 3-2. This section focuses on the *Negotiation Table* design and structure. The Negotiation Table's design is for two role players – Kelly (a buyer role) and Chris (a seller role). The web server for negotiation experiments identifies each participant's role by UserID and Password before registration. The identified participants move to the Negotiation Table site and the negotiation experiment begins with matched opponents.

The Negotiation Table is the location for a participant to send offers/messages and receives an opponent's offers/messages. The structure of the Negotiation Table consists of three sub-frames: 1) *Menu for Negotiation*, 2) *Information and Contract & Message* and 3) *List of Contracts and Messages* (see Figure 6-4).

1. Menu for Negotiation

2. Information And Contract & Message

3. List of Contract and Message

Figure 6-4: Structure of negotiation table

1. Sub-frame of *Menu for Negotiation* (see Figure 6-5)



Figure 6-5: Menu for negotiation

When subjects click the hyperlinks on Menu:

- Home: LEMA home page pops up in a new window.
- Instructions: Manual for Negotiation Table appears in a new window.
- All Information: Public and Private Information appear in the sub-frame of *Information and Contract & Message*.
- Public Information: Public information appears in the sub-frame of *Information and Contract & Message*. (Chris and Kelly will have same information.)
- Private Information: Private information appears in the sub-frame of *Information and Contract &*

Message (Chris and Kelly will have their own information).

- New Contract & Message: Participant can make a new contract or message in the “New Contract & Message” frame.
- The refresh button for Contract and Message: Contract List and Message List automatically update every 10 seconds. However, clicking this option updates List of Contract and Message immediately.

2. Sub-frame of *Information and Contract & Message* (see Figure 6-6)

- **All Information Frame:** When a participant clicks “All Information” on *Menu for Negotiation*, the participant sees the All Information- public information and private information- on the sub-frame of *Information and Contract & Message*.
- **Public Information Frame:** When a participant clicks “Public Information” on *Menu for Negotiation*, the participant sees the Public Information on the sub-frame of *Information & Contract or Message* (see Figure 6-6-A).
- **Private Information Frame:** When a participant clicks “Private Information” in the Menu, the participant sees the Private Information on the sub-frame of *Information and Contract & Message* (see Figure 6-6-B).
- **New Contract & Message Frame:** When a participant clicks the “New Contract & Message” in the Menu, the participant sees the “New Contract & Message frame” shown in Figure 6-6-B. The Participant can type a new contract or message in this frame.

Grays.com – With confidential information for Chris Gray

The first section of this case is public information available to all parties. The second section contains private information available only to your role. The case is patterned after an actual negotiation although names and some facts have been changed.

Public information available to both bargainers

The negotiation involves the sale of the Internet domain name 'Grays.com'. The present owner of the name is Chris Gray, proprietor and chef of Gray's Restaurant and Catering, located in a mid-west college town. The prospective buyer is the new major league baseball club, the Washington Grays. The Washington Grays are represented by Kelly Kaplan, one of the partners that own the team.

A. Public Information

Private information for Chris Gray only

You have had the 'Grays.com' domain name since you began your business about five years ago. While the web site has proven valuable, you are now well known in what is, after all, a small town. You don't think it would be hard to redirect your local restaurant and catering customers to a new web site. Moreover, you know from records that almost all out-of-town hits to the site come through the hotel's web site and it would be no problem getting the hotel to link to a new domain name. Still, there are advertising expenses associated with a change. You estimate these at \$15,000.

The profit from any deal you make to sell Grays.com, then, is

Negotiated price - \$15,000

Your job is to maximize your profit from the negotiation, given that your profit will be 0 if you do not make a deal (so you would

B. Private Information

New Contract: \$

* Type only numbers (i.e., 10000), other characters are not allowed in "New Contract" field such as commas, \$ and decimals (i.e., \$10,000.00)

Message:

C. New Contract and Message

Figure 6-6: Sub-frame of *Information and Contract & Message*

When a participant types a new contract and message and clicks the “Submit” button, the participant’s new contract and message updates in “Contract List” and “Message Box.” And the contract and message goes to the opponent’s “Contract List” and “Message Box.” Figure 6-6-C shows the example as “New Contract: \$2000000” and

“Message: This is my first Contract” typed by a participant. The updated results appear in Figure 6-7.

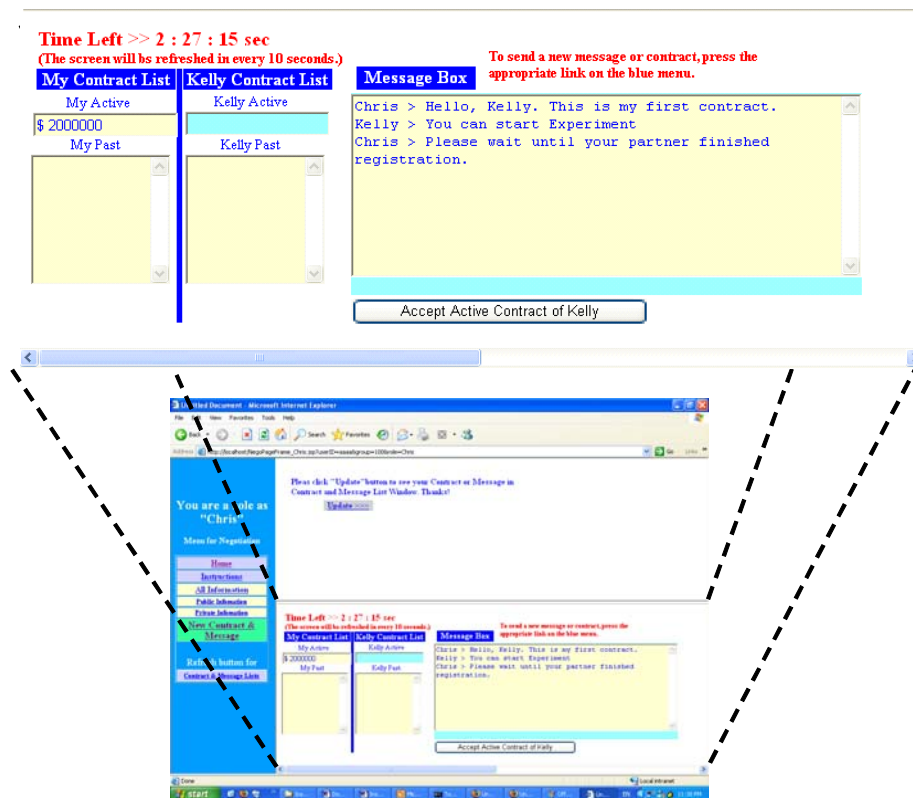


Figure 6-7: Example of updating *Contract and Message List*

3. Sub-frame of *Contract and Message List* (see Figure 6-8)

- **Time Left:** This shows the available time for negotiation between a participant and the paired opponent (i.e., 2 hour 22minute 13 second left).

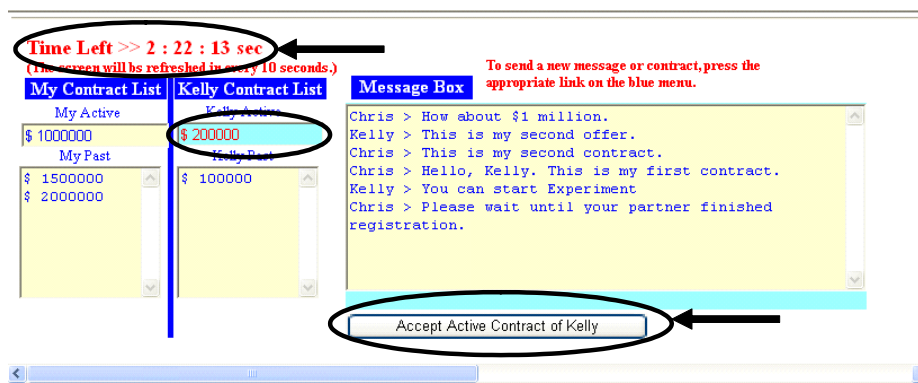


Figure 6-8: Sub-frame of *Contract and Message List*

- **Accept Last Offer:** When a participant clicks “Accept Active Contract of Kelly (Role buyer)” button, the participant sees the “Confirm page” shown in Figure 6-9, as an agreement \$200000 example. And when the participant clicks the “Yes, I do,” the participant sees “Summary of outcome page” shown in Figure 6-10. Otherwise (Click the “No, I don’t), the participant can go back to “Negotiation site” and continuously negotiate with the opponent.



Summary of Result

Your Role:	Chris
Acceptor:	You accept his/her offer
Final Agreement:	200000

You finished the Online Negotiation.
Thanks for your participation.

Figure 6-10: Summary of outcome page

6.2.4 Data Collection

To collect all participants' negotiation behavioral data through experiments for this study, MySQL Server version 4.1 was the database system. The structure of the database appears in Figure 6-11. Three created tables capture the negotiation data. Four information fields of the Temp_info table experimenter designed in advance of the experiments. Paired participants in experiments receive UserIDs and Passwords. When

they register to access the *Negotiation Site*, participants complete the information fields of the Personal_info table and the time of registration. All offers, messages, accepted offer and outcomes store in the Offer table. The UserID field, in every table, operates the as primary key for data storage.

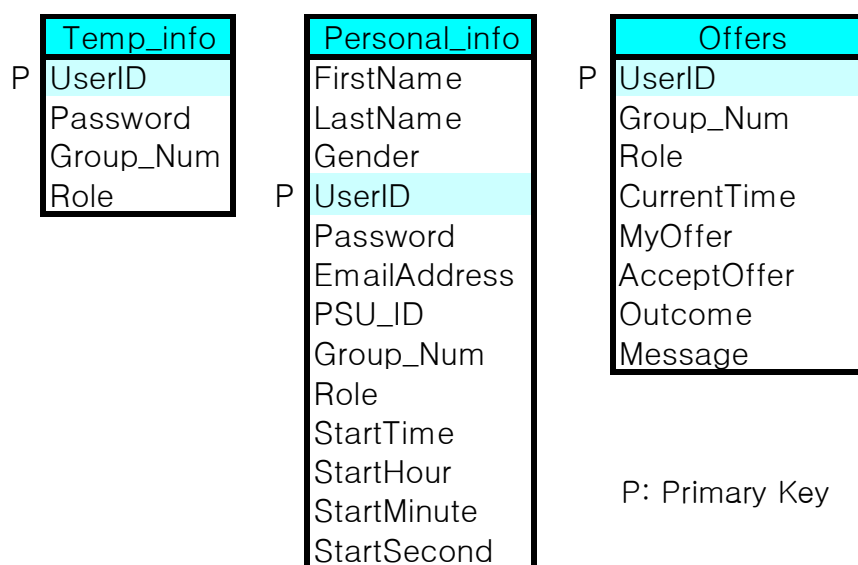


Figure 6-11: Database structure

6.2.5 Participant Payment

The negotiation proceeds in a single round during 90 minutes. Each buyer matches one seller for negotiation. During the experiment, a participant negotiates the price of the Internet domain name “Grays.com” with a matched participant; paired participants reach a deal at the end of experiment by agreeing to a price. If a participant agrees to a price, the price translates to US dollars as earnings, and the agreement price is also the other participant’s earnings. Earnings are a percentage of the “scenario” dollars

of the experiment (see Figure 6-12 and Table 6-1). Participants receive these earnings plus a \$5 show-up fee at the end of experiment. If a participant does not make a price agreement with the matched participant, they receive only a \$5 show-up fee. The negotiation results and payments they make are confidential.

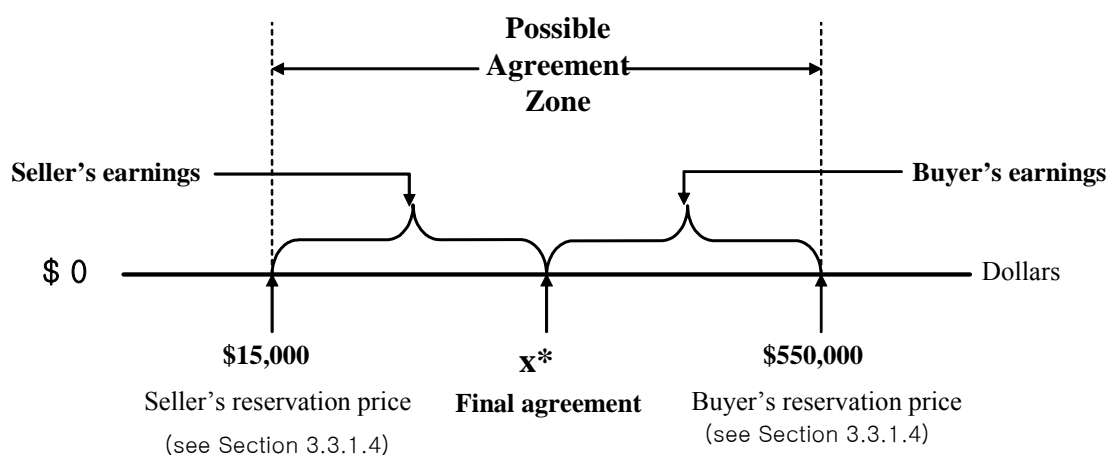


Figure 6-12: ZOPA for “Grays.com” domain name

Table 6-1: Payment Based on Agreement Price

Seller (Chris)	Buyer (Kelly)	Agreement (x^*)
\$5	\$25	$122000 \geq x^*$
\$10	\$20	$122001 \leq x^* \leq 229000$
\$15	\$15	$229001 \leq x^* \leq 336000$
\$20	\$10	$336001 \leq x^* \leq 443000$
\$25	\$5	$x^* \geq 443001$

Chapter 7

RESULTS AND DISCUSSION OF EXPERIMENTS

Chapter 6 details two types of experiments to evaluate the NSCs model. This chapter focuses on data analysis. Section 7.1 introduces the data analysis plan which has as its basis three sets of hypotheses, presented in Section 7.2. The results, analysis and discussion of the two types of experiments follow.

7.1 Plan of Data Analysis

Conducting two types of empirical tests evaluate the NSCs model. The Type 1 experiment design is a symmetrical descriptive test of what actually happens between buyers and sellers, the Type 2 experiment design is an asymmetrical prescriptive/descriptive test of how participants' negotiation behaviors are different from those of the Type 1 participants. Actually, the role seller had NSCs and the role buyer did not have NSCs in the Type 2 experiment.

Empirical tests examine three central variables: the first offers (independent variable), the initial counteroffers (dependent variable), and the final agreement price (dependent variable). A schematic data analysis plan appears in Table 7-1. Interesting points revealed from the empirical tests are:

- The nature of the difference between negotiators making initial offers (first offers, initial counteroffers) and the affect of these offers on final prices in Type 1 and Type 2 experiments.
- The nature of the difference between negotiators' initial offers and final prices in Type 2 experiment and those of the negotiators in Type 1 experiments.

Table 7-1: Schematic Data Analysis Plan

Experiment Type	Who makes first offer?		Seller vs. Buyer
	Role Seller	Role Buyer	
Type 1 (20 pairs)	Seller_1 (8)	Buyer_1 (12)	<ul style="list-style-type: none"> •First offer •Difference between first offer and reserve price •Counteroffer •Difference between counteroffer and first offer •Final price and profit
Type 2 (20 pairs)	Seller_2 (6)	Buyer_2 (14)	<ul style="list-style-type: none"> •First offer •Difference between first offer and reserve price •Counteroffer •Difference between counteroffer and first offer •Final price and profit
Type 1 vs. Type 2	Seller_1 vs. Seller_2	Buyer_1 vs. Buyer_2	<ul style="list-style-type: none"> •First offer •Difference between first offer and reserve price •Counteroffer •Difference between counteroffer and first offer •Final price and profit

7.2 Hypotheses for Two Types of Experiments

7.2.1 Hypotheses for Type 1 Experiments

Six hypotheses were formulated to answer the questions for Type 1 experiments. The six proposed hypotheses were also examined in Chapter 5 SDN test. However, the Type 1 experiment's protocol and participant groups are different from those of the SDN test in Chapter 5. Therefore, reinvestigations of the six proposed hypotheses are required for Type 1 experiments.

- Hypothesis 2.1: Role seller's first offer is higher than role buyer's first offer.
- Hypothesis 2.2: Role seller's initial counteroffer is higher than role buyer's initial counteroffer.
- Hypothesis 2.3: Bargaining power between buyer and seller is symmetrical in the negotiation context for this study.
- Hypothesis 2.4: Making first offer provides negotiation advantage in terms of final price.
- Hypothesis 2.5: The final profit of role buyer is higher than that of role seller.
- Hypothesis 2.6: The midpoint of both role players' initial offers can be a predictor of final negotiated price.

7.2.2 Hypotheses for Type 2 Experiments

Six hypotheses were formulated to answer the questions for Type 2 experiments. The difference between Type 1 experiment and Type 2 experiment is that sellers in the

Type 2 experiment receive the negotiation support contents (NSCs) model. To compare the differences between Type 1 experiment results and Type 2 experiment results, the Type 2 experiments' hypotheses followed the same format of Type 1 experiments' hypotheses.

- Hypothesis 3.1: Role seller's first offer is higher than role buyer's first offer.
- Hypothesis 3.2: Role seller's initial counteroffer is higher than role buyer's initial counteroffer.
- Hypothesis 3.3: Bargaining power between buyer and seller is symmetrical in the negotiation context for this study.
- Hypothesis 3.4: Making first offer provides negotiation advantage in terms of final price.
- Hypothesis 3.5: The final profit of role buyer is higher than that of role seller.
- Hypothesis 3.6: The midpoint of both role players' initial offers can be a predictor of final negotiated price.

7.2.3 Hypotheses for Comparison of Type 1 and Type 2 Experiments

Six hypotheses were formulated to answer the questions for comparison of Type 1 and Type 2 experiments. Answering the proposed hypotheses, in terms of three main variables: the first offers, the initial counteroffers and the final prices, validates the effectiveness of the phased NSCs model.

- Hypothesis 4.1: Role seller's first offer in the Type 2 experiment is higher than role seller's first offer in the Type 1 experiment.

- Hypothesis 4.2: Role buyer's first offer in the Type 2 experiment is not different from role buyer's first offer in the Type 1 experiment.
- Hypothesis 4.3: Role seller's initial counteroffer in the Type 2 experiment is higher than role seller's initial counteroffer in the Type 1 experiment.
- Hypothesis 4.4: Role buyer's initial counteroffer in the Type 2 experiment is not different from role buyer's initial counteroffer in the Type 1 experiment.
- Hypothesis 4.5: The final price of the Type 2 experiment is higher than the final price of the Type 1 experiment.
- Hypothesis 4.6: The seller's initial offer does not influenced by the buyer's initial offer in Type 2 experiment.

7.3 Results of Symmetrical Descriptive (Type 1) Experiments

No impasses occurred and all twenty negotiating pairs (40 participants) reached agreements. In twenty pairs, twelve buyers (role Kelly) made first offers. Only eight first offers were made by sellers (role Chris). The summary results of the Mann Whitney U test appear in Table 7-2.

Table 7-2: Summary of MWU Test in Type 1 Experiments

(1) Who made first offer?			(3) Average Final Price		(5) Average difference between first offer and final price	
n=20	Average	Two-tailed MWU test	By who made first offer	Two-tailed MWU test	By who made first offer	Two-tailed MWU test
8 Sellers	\$269,375	p=0.055	\$114,825	p=0.179	\$154,550	p=0.480
12 Buyers	\$86,668		\$182,668		\$96,020	
(2) Who made initial counteroffer?			(4) Average Final Price		(6) Average difference between initial counteroffer and final price	
n=20	Average	Two-tailed MWU test	By who made initial counteroffer	Two-tailed MWU test	By who made initial counteroffer	Two-tailed MWU test
12 Sellers	\$235,558	p=0.003	\$182,668	p=0.179	\$52,895	p=0.949
8 Buyers	\$59,813		\$114,825		\$55,012	

First Offers in Type 1 Experiments

- The average first offers made by sellers are (weakly) significantly different from the average first offer made by buyers (see result (1) in Table 7-2).
- The average differences between first offers and own reservation prices are (weakly) significantly different between sellers and buyers (\$254,375 vs. \$463,332, $p=0.071$, two-tailed MWU test).

These results show that role sellers underestimated the buyer's reservation price compared with sellers' estimations of buyers' reservation price and both subject groups who made first offer, possibly underestimated the range of ZOPA (see Figure 7-1).

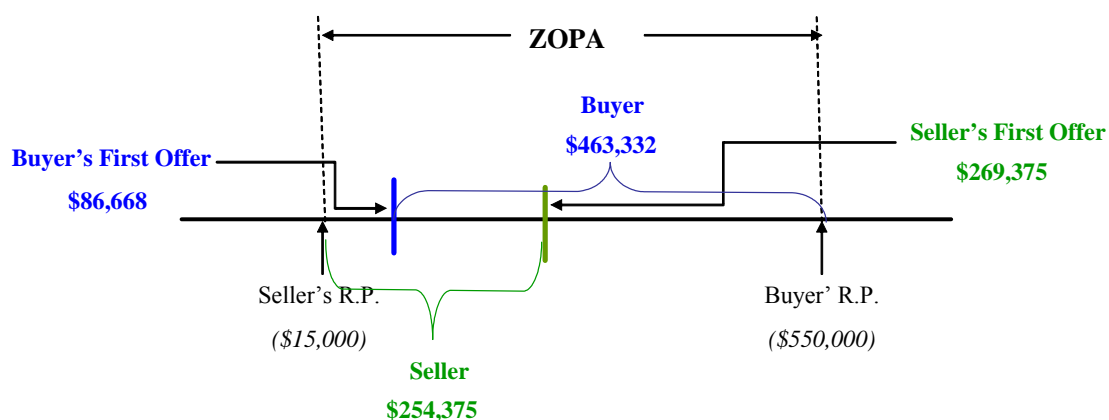


Figure 7-1: First offers of Type 1 experiments in ZOPA

Initial Counteroffers in Type 1 Experiments

- The average initial counteroffers made by sellers are significantly different from the average initial offers made by buyers (see result (2) in Table 7-2).
- The average difference between sellers' first offers and buyers' initial counteroffers are not significantly different from the average differences between buyers' first offers and sellers' initial counteroffers (\$209,562 vs. \$148,915, $p=0.568$, two-tailed MWU test).
- Test of Between-subjects results show that sellers' initial offers are not significantly different between when they are first offers and when they are initial counteroffer (\$269,375 vs. 235,583, $F(1,18)=0.086$, $p=0.773$), and buyers' initial offers are not significantly different between when they are first offers and when they are initial counteroffers (\$86,668 vs. \$59,813, $F(1,18)=0.443$, $p=0.514$).

These results indicate that sellers' and buyers' bargaining power is symmetrical (see Figure 7-2).

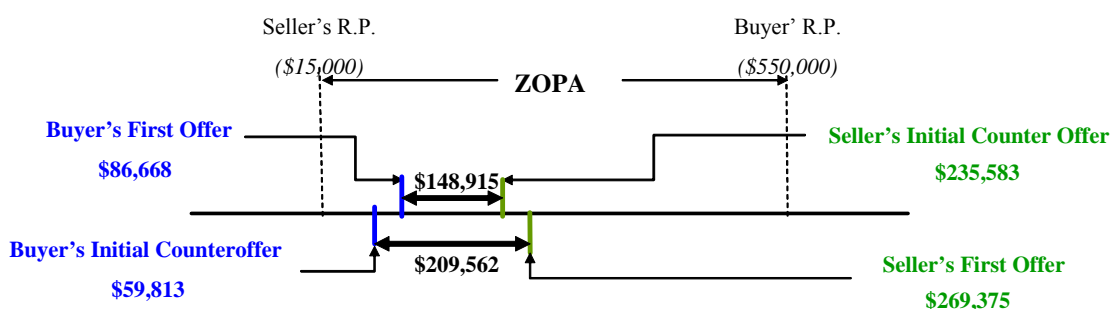


Figure 7-2: Initial counteroffers of Type 1 experiments in ZOPA

Final Price in Type 1 Experiments

- The average final price when sellers made the first offers are not significantly different from the average final price when buyers made the first offers (see result (3) in Table 7-2). Thus, average final prices, when buyers made initial counteroffers are not significantly different from the average final prices when sellers made the initial counteroffer (see result (4) in Table 7-2).
- The difference between final prices when sellers made first offers and the sellers' first offers are not significantly different from the difference between the final prices when buyers made first offers, and buyers' first offers (see result (5) in Table 7-2).
- The difference between the final prices when sellers made initial counteroffers and sellers' initial counteroffers are not significantly different from the difference

between the final prices when buyers made initial counteroffers and buyers' initial counteroffers (see result (6) in Table 7-2).

The results show that making the first offer does not create an advantage.

Profit (Difference between Final Prices and Own Reservation Prices)

A significant difference occurs between profits of sellers and profits of buyers (\$140,543 vs. 394,457, $p=0.000$, two-tailed MWU test). In terms of final profits, the role buyers' average profits are higher than sellers' average profits in the Type 1 experiments.

Final Price vs. Mid-point of First Offers and Initial Counteroffers

The results of paired sample test show that the average final price of the Type 1 experiment is \$155,543; the average mid-point of first offers and initial counteroffers is \$162,513 with $p=0.699$. The correlation result between the final prices and the mid-points (of first offers and initial counteroffers) show a strong relationship ($r=0.848$, and $p=0.000$). This result shows that the mid-point of first offer and counteroffer could be an estimator for a negotiated final price.

7.4 Results of Asymmetrical Prescriptive/Descriptive (Type 2) Experiments

No impasses occurred in Type 2 negotiation experiments, and all twenty negotiating pairs reached agreements. Among the twenty pairs, fourteen buyers (Kelly) made first offers. Only six sellers (Chris) made first offers, and one of six sellers made a first offer of \$300,000,000. Thus, this value would be excluded as sellers' first offer related data analyses. The summary of Mann Whitney U test appears in Table 7-3.

Table 7-3: Summary of MWU Test in Type 2 Experiments

(1) Who made first offer?			(3) Average Final Price		(5) Average difference between first offer and final price	
n=19	Average	Two-tailed MWU test	By who made first offer	Two-tailed MWU test	By who made first offer	Two-tailed MWU test
5 Sellers	\$580,000	p=0.000	\$323,217	p=0.346	\$262,140	p=0.606
14 Buyers	\$43,214		\$258,232		\$215,018	
(2) Who made initial counteroffer?			(4) Average Final Price		(6) Average difference between initial counteroffer and final price	
n=20	Average	Two-tailed MWU test	By who made initial counteroffer	Two-tailed MWU test	By who made initial counteroffer	Two-tailed MWU test
14 Sellers	\$571,071	p=0.056	\$258,232	p=0.346	\$186,550	p=0.597
6 Buyers	\$136,667		\$323,217		\$312,839	

First Offers in Type 2 Experiments

- The average first offer made by sellers is significantly different from the average first offer made by buyers (see result (1) in Table 7-3).
- The average differences between first offers and own reservation prices are not significantly different between sellers and buyers (565,000 vs. 506,785, $p=0.585$, two-tailed MWU test).

Results show a significant difference between the average first offer made by sellers and buyers. Both role player groups in Type 2 experiments had a similar estimation of ZOPA. The buyers possibly underestimated and the seller possibly overestimated the range of ZOPA (see Figure 7-3).

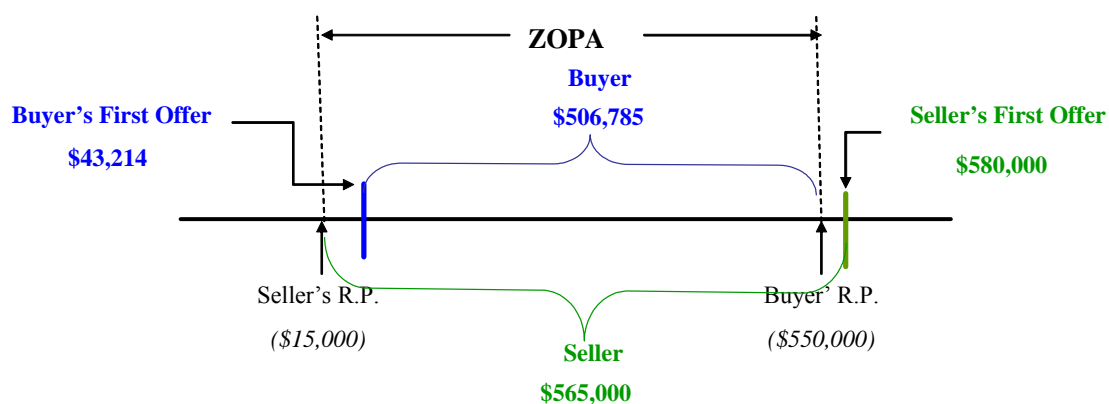


Figure 7-3: First offers of Type 2 experiments in ZOPA

Initial Counteroffers in Type 2 Experiments

- The average initial counteroffers made by sellers are (weakly) significantly different from the average initial counteroffers made by buyers (see result (2) in Table 7-3).
- The average difference between sellers' first offers and buyers' initial counteroffers is not significantly different from the average difference between buyers' first offers and sellers' initial counteroffers (\$418,000 vs. \$527,857, $p=0.585$, two-tailed MWU test).
- Test of Between-subjects results show that sellers' initial offers are not significantly different between when they were first offers and when they are initial counteroffers (\$580,000 vs. \$571,071; $F(1,17)=0.001$; $p=0.977$) and buyers' initial offers are not significantly different between when they were first offers and when they were initial counteroffers (\$43,214 vs. 136,667; $F(1,18)=3.353$; $p=0.084$).

These results indicate that sellers' and buyers' bargaining power is symmetrical (see Figure 7-4).

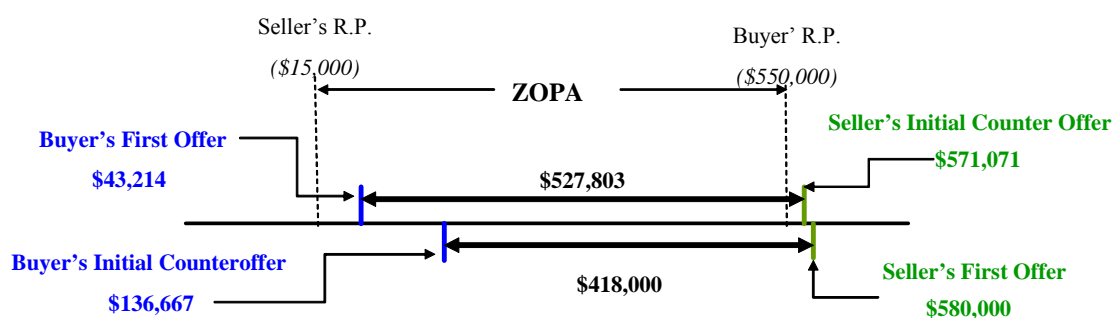


Figure 7-4: Initial counteroffers of Type 2 experiments in ZOPA

Final Price in Type 2 Experiments

- The average final price when sellers made first offers is not significantly different from the average final price when buyers made the first offer (see result (3) in Table 7-3). Also, the average final price when buyers made initial counteroffers is not significantly different from the average final price when sellers made initial counteroffers (see result (4) in Table 7-3).
- The difference between the final price when a seller made the first offer and the seller's first offer is not significantly different from the difference between the final price when a buyer made the first offer and the buyer's first offer (see result (5) in Table 7-3).
- The difference between the final price when a seller made an initial counteroffer and the seller's initial counter is not significantly different from the difference

between the final price when a buyer made the initial counteroffer and the buyer's initial counteroffer (see result (6) in Table 7-3).

The results show that making the first offer does not create an advantage.

Profit (Difference between Final Prices and Own Reservation Prices)

No significant difference appears between the profits of sellers and the profits of buyers (\$262,727 vs. 272,283, $p=0.827$, two-tailed MWU test). In terms of final profit, the role buyers' average profit is not significantly different from sellers' average profit in Type 2 negotiation.

Final Price vs. Mid-point of First Offer and Initial Counteroffer

The results of paired sample test show that the average final price of Type 2 experiment is \$273,924; the average mid-point of first offers and initial counteroffers is \$323,947 with $p=0.284$. The correlation result of the final price and the mid-point of first offers and initial counteroffers show a strong relationship ($r=0.788$ and $p=0.000$). This result shows that the mid-point of the first offers and counteroffers is an estimator of a final price.

7.5 Comparison of Type 1 and Type 2

Two types of experiments were conducted for this study. Design of Type 1 experiments is from a symmetrical descriptive perspective, and design of Type 2 experiments is from an asymmetrical prescriptive/descriptive perspective. In Type 1, a

participant negotiates with a matched opponent without NSCs for both role players.

However, in Type 2, the role sellers could use NSCs but the role buyers could not use it.

Initial offers: Type 1 Experiments vs. Type 2 Experiments

A participant's initial offer could be either a first offer or an initial counteroffer in the two types of experiments. The buyers' and sellers' average initial offers in Type 1 and Type 2 appear in Figure 7-5. The results of a 2 (type: Type 1 vs. Type 2) x 2 (role: buyer vs. seller) analysis of variance (ANOVA) show significant difference in between types of experiments ($F(1,75)^1=5.281, p=0.024$) and role ($F(1,75)=23.576, p=0.000$).

¹ In Type 2 experiments, one of the role sellers made a first offer of \$300,000,000. This value is also excluded for first offers related to data analyses for this section.

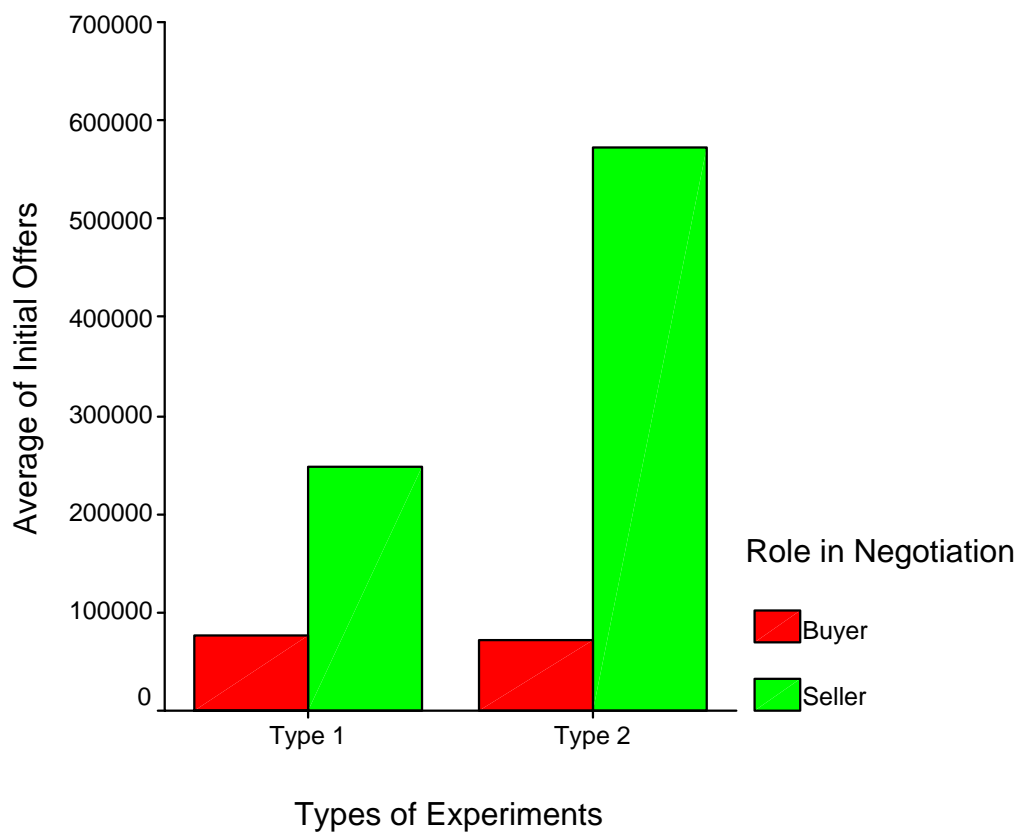


Figure 7-5: Average of initial offers between Type 1 and Type 2 experiments

First Offers: Type 1 Experiments vs. Type 2 Experiments

Who made the first offers and how many first offers did each role player make appears in Table 7-4 which also includes the results of MWU test between the first offers in Type 1 experiments and the first offers in Type 2 experiments.

Table 7-4: MWU Test Results of First Offers: Type 1 vs. Type 2

First offer in Type 1 vs. First offer in Type 2	Type 1 Experiment	Type 2 Experiment	One-tailed MWU test p value
Role	Seller	Seller	0.089
Number of sellers who made first offers	8	5	
(1) Average of first offers	\$269,375	\$580,000	
Role	Buyer	Buyer	0.073
Number of buyers who made first offers	12	14	
(2) Average of first offers	\$86,668	\$43,214	

- The average of sellers' first offers in Type 1 experiments is not significantly different from the average of sellers' first offers in Type 2 experiments (see result (1) in Table 7-4).
- The average of buyers' first offers in Type 1 is not significantly different from the average of buyers' first offers in Type 2 (see result (2) in Table 7-4).

Results show that both role buyers and role sellers in Type 2 experiments estimate the size of ZOPA better than both role players in Type 1 experiments.

Initial Counteroffers: Type 1 Experiments vs. Type 2 Experiments

Table 7-5 includes who made initial counteroffers in each experiment and the results of MWU test between initial counteroffers in the two different types of experiments.

Table 7-5: MWU Test Results of Initial Counteroffers: Type 1 vs. Type 2

Initial counteroffer in Type 1 vs. Initial counteroffer in Type 2	Type 1 Experiment	Type 2 Experiment	One-tailed MWU test p value
Role	Seller	Seller	
Number of sellers who made initial counteroffers	12	14	
(1) Average of Initial counteroffers	\$235,583	\$571,071	0.04
Role	Buyer	Buyer	
Number of buyers who made initial counteroffers	8	6	
(2) Average of Initial counteroffers	\$59,813	\$136,667	0.151

- The average of sellers' initial counteroffers in Type 1 experiments is significantly different from the average of sellers' initial counteroffers in Type 2 experiments (see result (1) in Table 7-5).
- The average of buyers' initial counteroffers in Type 1 experiments is not significantly different from the average of buyers' initial counteroffers in Type 2 experiments (see result (2) in Table 7-5).

Results show that the counteroffers of the sellers in Type 2 experiments are significantly different from the counteroffers of the sellers in Type 1 experiments.

Final Prices: Type 1 Experiments vs. Type 2 Experiments

Table 7-6 show the MWU test results between the final prices in Type 1 experiments and the final prices in Type 2 experiments.

Table 7-6: MWU Test of Final Prices: Type 1 vs. Type 2

Type 1 Final Price vs. Type 2 Final Price	Type 1 Experiment	Type 2 Experiment	One-tailed MWU test p value
Role	Seller	Seller	
Number of sellers who made first offers	8	5	
(1) Average of final prices	\$114,825	\$323,217	0.007
(2) Difference between first offers and final prices	\$154,550	\$262,140	0.238
Role	Seller	Seller	
Number of sellers who made initial counteroffers	12	14	
(3) Difference between initial counteroffers and final prices	\$55,013	\$186,550	0.028
Role	Buyer	Buyer	
Number of buyers who made first offers	12	14	
(4) Average of final prices	\$182,587	\$258,232	0.057
(5) Difference between first offers and final prices	\$96,020	\$215,018	0.010
Role	Buyer	Buyer	
Number of buyers who made initial counteroffers	8	6	
(6) Difference between initial counteroffer and final prices	\$52,896	\$312,839	0.053
(7) Final Price Type 1 vs. Final Price Type 2	\$155,543	\$277,728	0.002

- The average of final prices when the sellers in Type 1 experiments made first offers is significantly different from the average of final prices of the sellers who made first offers in Type 2 experiments (see result (1) in Table 7-6).

- The difference between the first offer of the sellers in Type 1 experiments and the final prices is not significantly different from that of the sellers in Type 2 experiments (see result (2) in Table 7-6).
- The average of final prices when the sellers in Type 1 experiments made initial counteroffers is significantly different from the average of final prices of the sellers who made initial counteroffers in Type 2 experiments (see result (3) in Table 7-6).
- The average of final prices when the buyers in Type 1 experiments made first offers is not significantly different from the average of final prices of the buyers who made first offers in Type 2 experiments (see result (4) in Table 7-6).
- The difference between the first offers of the buyers in Type 1 experiments to the final prices is significantly different from that of the sellers in Type 2 experiments (see result (5) in Table 7-6).
- The average of final prices when the buyers in Type 1 experiments made initial counteroffers is not significantly different from the average of final prices of the buyers who made initial counteroffers in Type 2 experiments (see result (6) in Table 7-6).
- The average of final prices of Type 1 experiments is significantly different from that of Type 2 experiments (see result (7) in Table 7-6 and Figure 7-6).

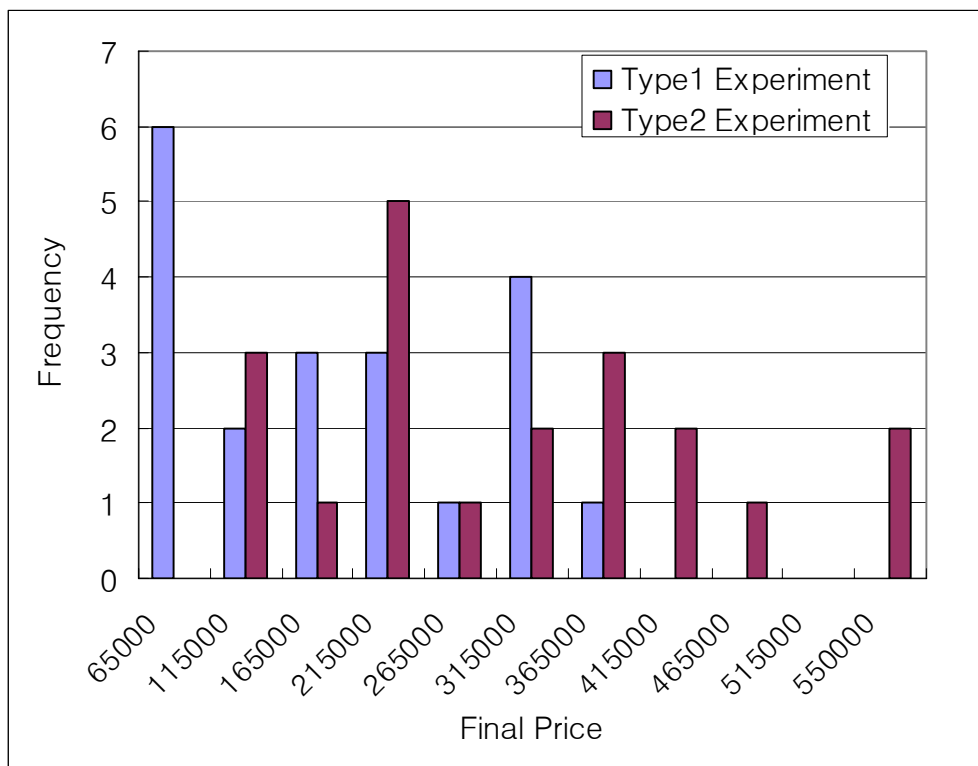


Figure 7-6: Final price histogram between Type 1 and Type 2 experiments

Regression models: Type 1 experiments vs. Type 2 experiments

The linear regression models of sellers and buyers in Type 1 and Type 2 experiments appear in Figure 7-7 and Figure 7-8. The results show that if the sellers make very high offers, above ZOPA, the final price has a high variance for success. In the opposite case, if the buyers make very low offers, below ZOPA, the final price has a high variance for success.

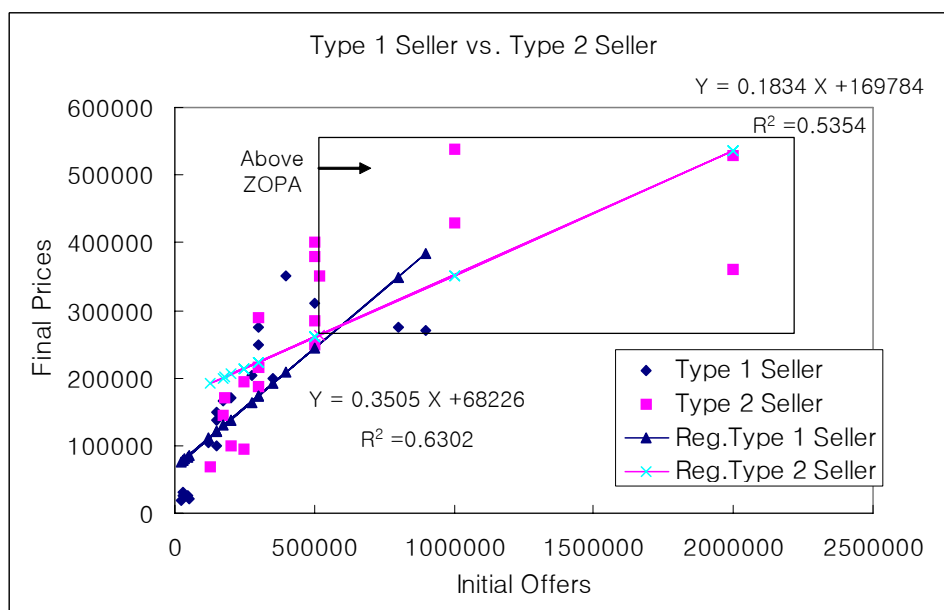


Figure 7-7: Regression models between sellers' initial offers and final prices

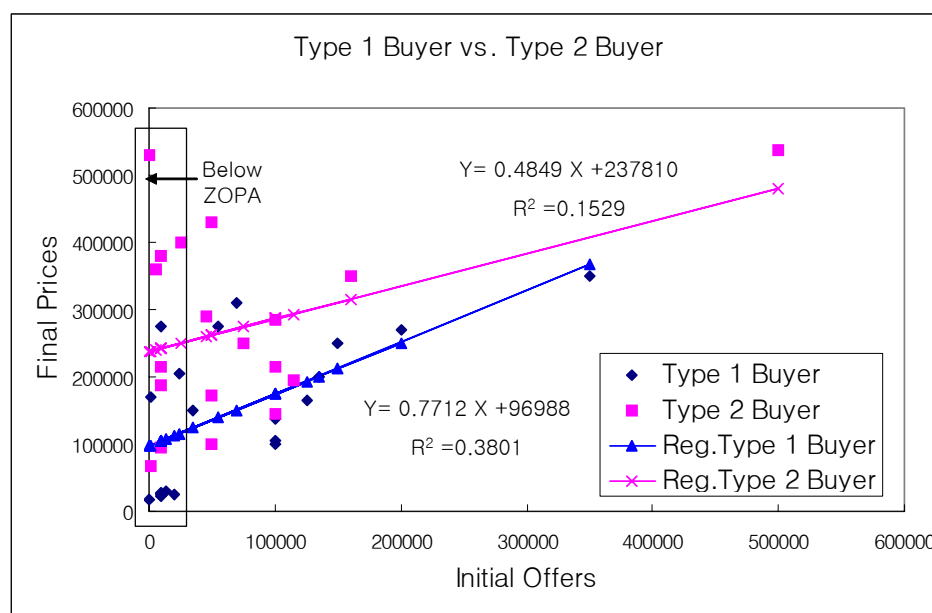


Figure 7-8: Regression models between buyers' initial offers and final prices

Correlation: Type 1 vs. Type 2

The correlation results of Type 1 and Type 2 experiments appear in Table 7-7. The results of Type 1 experiment correlation indicate that the buyers' initial counteroffers are not significantly influenced by the sellers' first offers. However, the sellers' initial counteroffers are significantly influenced by the buyers' first offers. In Type 2 experiments, the results indicate that the initial counteroffers of buyers and sellers are not influenced by first offers of opponents.

Table 7-7: Correlation Results of Type 1 and Type 2 Experiments

Type 1 Experiment		Correlation (Spearman)
Sellers' first offers	Buyers' initial counteroffers	$r(8)= 0.482, p=0.226$
Seller's first offers	Final Prices	$r(8)=0.738, p=0.037$
Buyers' first offers	Sellers' initial counteroffers	$r(12)= 0.625, p=0.030$
Buyers' first offers	Final Prices	$r(12)= 0.550, p=0.064$
Sellers' initial offers	Buyers' initial offers	$r(20)= 0.563, p=0.010$
Sellers' initial offers	Final Prices	$r(20)= 0.937, p=0.000$
Buyers' initial offers	Final Prices	$r(20)= 0.556, p=0.011$
Type 2 Experiment		Correlation (Spearman)
Sellers' first offers	Buyers' initial counteroffers	$r(5)=0.516, p=0.373$
Sellers' first offers	Final Prices	$r(5)=0.872, p=0.054$
Buyers' first offers	Sellers' initial counteroffers	$r(14)= -0.300, p=0.222$
Buyers' first offers	Final Prices	$r(14)= -0.220, p=0.450$
Sellers' initial offers	Buyers' initial offers	$r(19)= -0.035, p=0.888$
Sellers' initial offers	Final Prices	$r(19)= 0.732, p=0.000$
Buyers' initial offers	Final Prices	$r(19)= 0.050, p=0.838$

In addition, the initial offers (either first offers or initial counteroffers) of negotiators (either buyers or sellers) strongly correlate with the negotiated final prices in Type 1 experiments. However, the initial offers of buyers do not strongly correlate with

the negotiated final prices, but the initial offers of sellers strongly correlate with the negotiated final prices in Type 2 experiments.

7.6 Discussion

Through comparison of the results of the two types of experiments, the initial offer strongly affects the final price in both types. The compared results between Type 1 sellers' average first offers and Type 2 sellers' average first offers showed that no significantly difference. However, the results between Type 1 sellers' average initial counteroffers and Type 2 sellers' average initial counteroffers are significantly different. In another words, Type 2 sellers' average initial counteroffers are significantly higher than those of Type 1 sellers. The higher Type 2 sellers' initial counteroffers affect the higher final price in Type 2 experiments' final prices.

In Type 2 experiments, fourteen sellers of the twenty made initial counteroffers as their initial offer. Through the preparation phase, considering an opponent's reservation price and BATNA eliminates the powerful effect of buyers' first offers. Through the initial offer phase, the role sellers made aggressive initial counteroffers without the anchoring effect of first offer. These statistical results support the NSCs model's assisting a negotiator's decision making through the preparation phase and initial offer phase.

In addition, the correlation results between final price and mid-point of two initial offers still strongly correlates in both Type 1 and Type 2 experiments, and the regression model of first offers (independent variable) and final prices (dependent variable) in Type 2 experiments show that higher initial offers lead to higher final prices. These results

show that although the negotiators' initial offer behaviors differ between Type 1 and Type 2 no change accrues to the regularities of negotiation.

These compared results between Type 1 experiments and Type 2 experiments indicate the NSCs model could be a tool for aiding a negotiator who is neither an expert nor negotiation analyst. This value is due to NSCs' including the answers for the most frequent questions in negotiation, such as: Who should make first offer? How much to include in an initial offer? And, how can one avoid the opponent's first offer anchoring effect. Through these questions and answers in the NSCs model, the NSCs model could aid and assist Type 2 sellers and Type 2 sellers' performances are more profitable than those of sellers in Type 1 in terms of final prices and initial offers.

Chapter 8

SUMMARY AND CONCLUSION

This chapter concludes and summarizes the dissertation and discusses its contributions. Possible further research is suggested along with the summary of research in Section 8.1. Section 8.2 presents contributions, classification of developed prototype of NSS and conclusions drawn.

8.1 Research Summary

The objective of this paper is to build a prototype of negotiation support systems which can and should integrate various results from all the fields of negotiation research. Not all developments in negotiation and negotiation support research have consideration in this study. Similarly, not all approaches to modeling and representation for NSSs are discussed because the complexity of negotiation affects the interests common to various research fields.

As a starting point for multidisciplinary research efforts, this study introduces a basic negotiation framework (see Section 2.2) of common negotiation terms (i.e., negotiation and NSS definitions) and concepts (i.e., BATNA, reservation price and ZOPA) which facilitate incorporation of results from multiple disciplines and especially from behavioral studies into an engineering context. Based on the proposed terms and concepts, many suggestions for the integration of relevant approaches to negotiation

representations are argued and numerous references to existing works from many different fields of studies are given.

The phenomenal growth in computer science and information systems led to the design of models and systems that apply little behavioral and economic knowledge. Computer science and information systems researchers argued the several difficulties of incorporating negotiation approaches of social and economic sciences to electronic negotiation support systems. First, game theory has two fundamental assumptions: common knowledge and perfect computational rationality. These assumptions do not necessarily hold for real-world negotiation, and therefore, creates difficulty in applying game theory in practice. For example, neither side in a two-party negotiation is stipulated to act in accord with the precepts of game-theoretic rationality. Rather, the expectations is that both sides conduct themselves based on their subjective assessments of each other in the light of the usual imperfect information actually available (Rangaswamy & Shell, 1997). Second, important contributions have been made by Raiffa (1982) on decision-theoretic issues, Fisher and Ury (1981) on how to use win-win strategies, and Mastenbroek (1989) on emotional aspects, among others. However, these theories do not sufficiently meet the need for an applied business negotiation theory usable for a basis of negotiation support systems (De Moor & Weigand, 2004). These arguments cause many negotiation support systems to have not been used in practice negotiation situations. The lack of interest arises because most, not all, NSSs have insufficient concern for the users' needs and expectations, particularly those of a qualitative nature, and their cognitive capabilities and limitations (Bichler et al., 2003). In addition, empirical evidence is lacking for how and in what situation NSSs can be beneficial (Foroughi & Jelassi, 1990).

Based on these observations, Sebenius (1992) provided the basis for negotiation analysis with weakened rationality assumption. Negotiation analysis integrates decision analysis and game theory in order to provide formal and meaningful support. The goal of negotiation analysis is to bridge the gap between descriptive qualitative models and normative game-theoretic models of bargaining. Negotiation analysis adopts a number of behavioral concepts (e.g., reservation values and BATNA) and incorporates them in quantitative models.

Thus, this study focuses on the empirical behavioral study in negotiation to develop a prototype for negotiation support systems in an electronic negotiation environment to support and assist negotiators.

To integrate the behavioral studies into an engineering approach, the perspectives of game theory on negotiation and negotiation analysis also are introduced in a literature review. Several questions arise in this context: Which assumptions are valid of negotiators, both in terms of rationality and computational capabilities? When do these issues need to be taken into account? These issues certainly play an important role in many real-world negotiations.

Through the previous behavioral research review, the remaining truth is that experimental negotiation games provide theories and behavioral regularities which have potential value for negotiators' decision making in practice negotiation situations. Based on this fact, a negotiation situation which is a two-party distributive negotiation with incomplete information was designed in an electronic negotiation situation. By conducting a SDN test in Chapter 5, and using the previous research review to define a negotiation process model in Chapter 4, for this study, the initial offer becomes a crucial

aspect in the process of most negotiations. Many researchers' central question concerns decisions about initial offers. As research results for this question show, negotiator's initial offer is also influenced by BATNA and reservation price (Galinsky & Mussweiler, 2001), although this occurs when the negotiators do not know the other party's alternative. These theories and behavioral regularities became a foundation for the design of the NSCs model for role sellers.

Through the statistical comparison two types of experiments were designed by negotiation analysis perspectives: the Type 1 experiment is a symmetric descriptive orientation, and the Type 2 experiment is an asymmetric prescriptive/descriptive orientation. The Type 1 experiment carefully tries to describe what actually happens between parties, but the role sellers in the Type 2 experiment use the NSCs which include information of what negotiators should do to achieve the desired result. The comparison results in Section 6.4 show that the NSCs model could assist sellers' decision making to gain more profit in the Type 2 experiment.

8.2 Contribution and Conclusion

8.2.1 Contribution

The contributions of this research relate to integration of both engineering and social science research by:

1. Providing a methodology to satisfy the desire of an interdisciplinary perspective in NSS study.

2. Completing empirical tests to evaluate the possibility that empirical-study based behavioral regularities and strategies can support negotiator's decision making.
3. Providing a prototype NSS model based on the process model and the NSCs model.

In more detail, this study suggests a methodology to satisfy the desire for the interdisciplinary perspectives in NSS study. A negotiation process model, introduced from the previous behavioral studies, including prepare phase, actual conducting phase and outcome phase (see Section 4.1), incorporates the current e-negotiation context and system structure, adopted from previous electronic negotiation studies. The results of an SDN test under the electronic negotiation environment provide the validated theories and behavioral regularities in the two-party, distributive, incomplete information negotiation. This information becomes part of the design of NSCs model. The two empirical tests, designed from the negotiation analysis perspective evaluate the NSCs model. The procedures of interdisciplinary methodology appear in Figure 8.1.

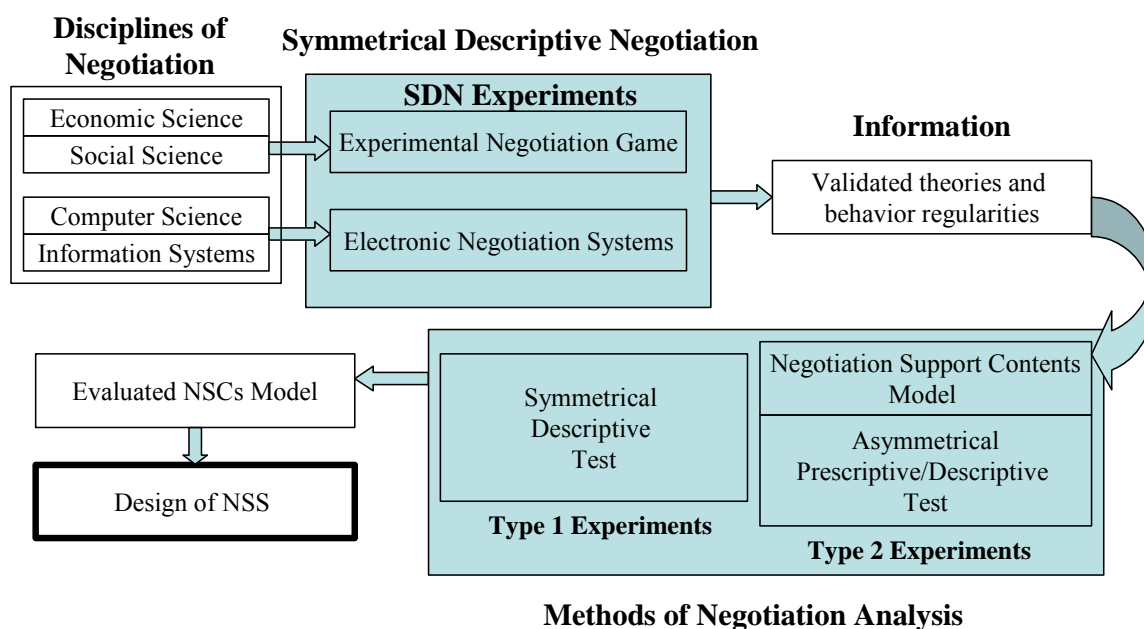


Figure 8.1: Proposed interdisciplinary methodology for NSS design

Second, recent developments create an opportunity for mutual fertilization of research studies and approaches, and for integration of different perspectives of negotiation into an interdisciplinary research effort to develop an engineering approach to electronic negotiations. For example, system or process engineering brings together the findings of negotiators and negotiation processes from different research areas (Bichler et al., 2003). Thus a strong need emerges to consider the many results of economic and social sciences for the design and development of negotiation media and systems. This study introduces the shortcomings of behavioral studies to design and implement NSS. To compensate for the insufficiencies of behavioral studies, several experiments were conducted with the process model and the NSCs model. The results of empirical tests also show the possibility of the NSCs model as an aiding tool for negotiators. Through

the negotiation preparation phase, the NSCs model provides the chance to consider the opponent's alternatives and helps to choose better strategies for making initial offers.

Finally, this study suggests the possibility that behavioral study perspectives could apply to the design of NSS research (see Figure 8-2). Many previous NSS researchers focused on the design and implementation of NSS that often have application little to behavioral and economic knowledge and have little use in practice. The major focus of these systems has been on providing information analysis during negotiation and supporting individuals participating in negotiation without providing structure to negotiation processes or dealing with participant's cognitive and socio-emotional biases (Foroughi & Jelassi, 1990). Thus, many NSSs have been disregarded by negotiators who are not experts or negotiation analysts. In the other side, much study in social economic sciences has focused on theories, models, and processes of negotiations themselves. Insufficient evidence existed for application their research into the design and implementation for electronic negotiation or NSSs.

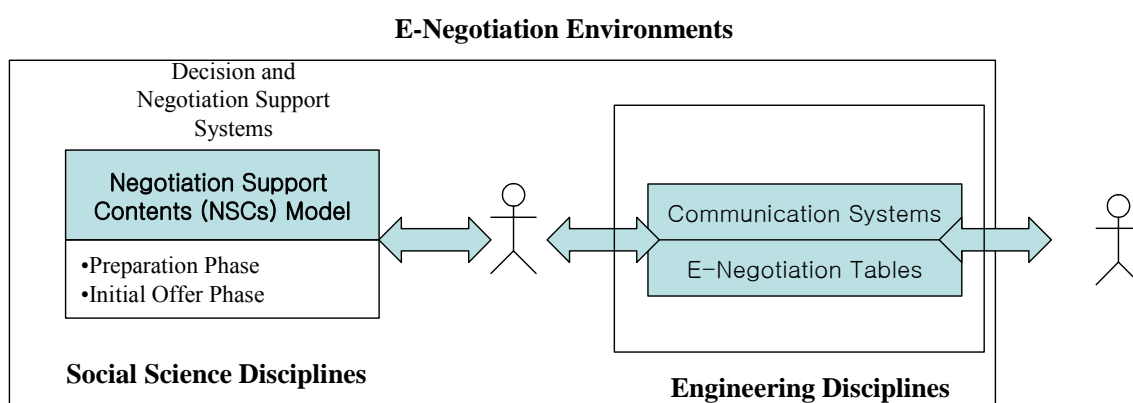


Figure 8-2: Behavioral study based prototype of NSS

8.2.2 Characteristics of the Developed Prototype NSS

Table 2-2 introduces the characteristics of existing NSSs. This research provides a prototype of an NSS which can be also characterized by the same methods for the Table 2-2.

The developed prototype NSS:

- focuses on the preparation phase and the initial offer phase,
- adopts phased NSCs model, which consists of a different strategic assistance for system users at various phases of negotiation process, promote more effective performance,
- provides empirically validated strategic information for system users to mitigate negotiation bias and promote better final prices,
- can be applied for a distributive type of business negotiation (i.e., Internet domain name, a patent, a used car, and so on) and
- embodies e-negotiation media such as on-line communication tool and web-based systems. Therefore, the developed prototype NSS can perform as an e-negotiation support system (ENSS).

8.2.3 Conclusion

NSSs are neither stand-alone systems that require analytical and technical knowledge of the user nor a significant effort to solve a particular decision problem. Instead, they are now flexible tools that can be used in different configurations and applied to different problems. A new generation of negotiation support systems may be a

collection of tools, based on decision and negotiation analyses, and easily configured by users to reflect their approaches to negotiation, as well as organizational, strategic, cultural, and other conditions. For example, users may select different preference elicitation schemes, conduct mock negotiations with themselves, use reservation prices, the best alternative to the negotiated agreement (BATNA), or aspiration levels. Users may select tools that monitor the progress of negotiations, measured by the number of offers, the level of concessions, type of argumentation, etc. These tools may facilitate adoption of an NSS to the specific organizational and individual culture and facilitate communication between different organizations.

Under these human environments, this research provides one of components or configurations for NSSs. Human behavior-based process model and strategic NSCs model will provide an option to NSS engineers for more realistic and practical NSS design among many different NSS models which are candidates for practical NSSs design. An example of ideal NSSs appears in Figure 8-3.

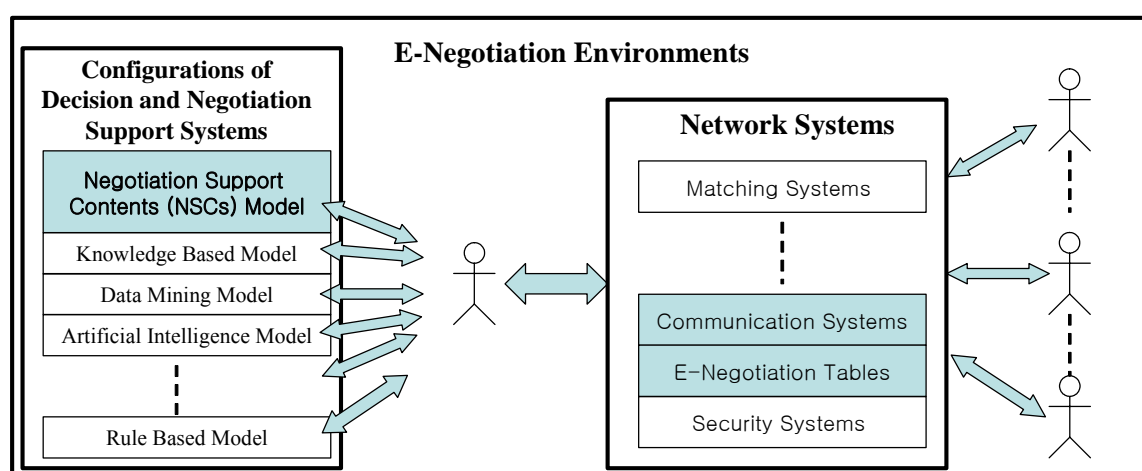


Figure 8-3: Example of ideal NSSs

8.2.4 Further Research

A strategy for further research appears in Figure 8-4. First, the negotiation process model was presented in Figure 4-1 and the results of a SDN test was a foundation of NSCs model. The concession phase is not considered in the design for the NSCs model based on the statistical results. However, the concession in the negotiation process is also an important factor affecting the outcome of negotiation. Research suggested regularity for the concession strategy, for example, one who has a small rate of concession will have more gain in negotiation. In the next study, the concession phase will be included in the NSCs model and a more systematical analysis will be provided, such as which phase of information more affects the outcome of negotiation: preparation, initial offer or concession. This approach will provide the more systematic results for a negotiation process model and help design of NSS.

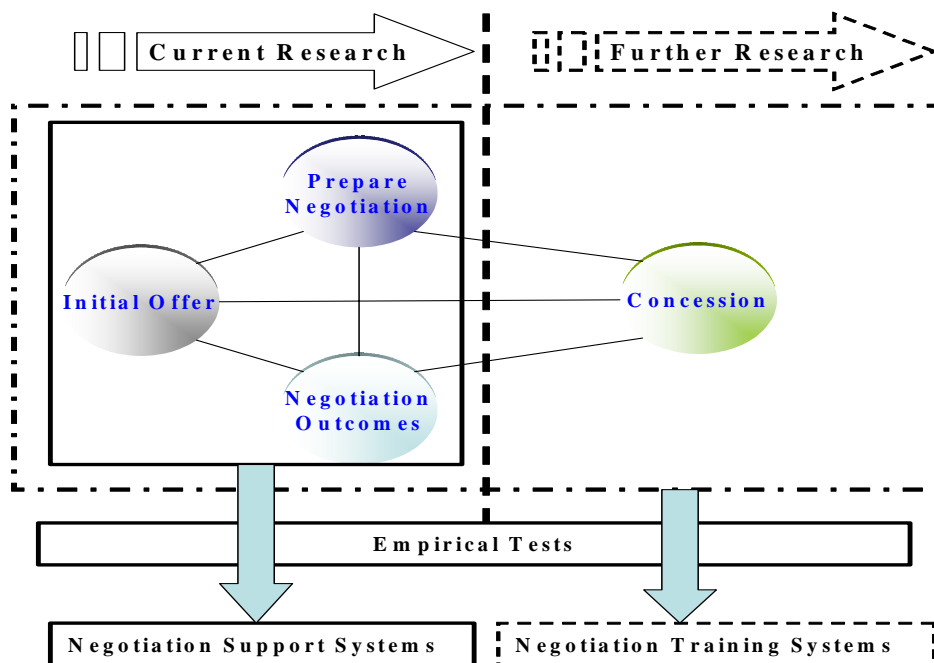


Figure 8-4: Strategy for further research

Second, this research shows that the NSCs model can support human negotiator's decision making. An additional research question remains: Is the NSCs model a training tool for negotiators or not? Future research answers this question through empirical tests.

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Appendix A

INFORMATION FOR PARTICIPANTS

A.1 Public Information for Both Parties

Grays.com – With confidential information

The first section of this case is public information available to all parties. The second section contains private information available only to your role. The case is patterned after an actual negotiation although names and some facts have been changed.

Public information available to both bargainers

The negotiation involves the sale of the Internet domain name ‘Grays.com’. The present owner of the name is Chris Gray, proprietor and chef of Gray’s Restaurant and Catering, located in a mid-west college town. The prospective buyer is the new major league baseball club, the Washington Grays. The Washington Grays are represented by Kelly Kaplan, one of the partners that own the team.

About Internet domain names

All Internet locations have a numerical, or IP, address to identify them to networked computers. IP addresses are difficult for most people to remember, and so the domain name system was created to provide more intuitive, less numeric addressing. Rights to domain names are governed by the Internet Corporation for Assigned Names and Numbers (ICANN), an international nonprofit group chartered for “preserving the operational stability of the Internet.” ICANN runs, or finds companies to run, the 13 “root server” computers that contain the IP addresses for all top-level domains (.com, .org, .de, etc.) used in the world. The .com domain is run by the Verisign company. Domain names are registered through third party companies that Verisign

licenses. These companies charge \$9 to \$35 a year to register a domain name, paying \$6 of the fee to Verisign. Once a name is registered, it remains the property of the registrant so long as the annual renewal fee is paid. The registrant is free to sell the name to another party if they so choose. Resale of this sort is not unusual; in fact, there are several Internet markets that specialize in private domain name transactions. Domain names are often bought speculatively, in anticipation that they will have market value in the future.

Snappy, easy to remember domain names are highly sought by business, since names that are difficult to remember can lead to a loss of trade. (Search engines ease this problem some, but to the extent that there are similar names used by different companies, there can still be confusion.) The market value of domain names varies widely, ranging from the cost of registration fee up to the most ever paid, \$7.5 million, for 'business.com'. To cut down on customer confusion, some businesses take multiple domain names for their web site. This comes at a cost, however; the consultant Gartner Group estimates that managing a new domain name can cost \$75,000 for marketing and legal expenses.

About the Washington Grays

The Grays are getting ready for, what will be, the first major league baseball season played in Washington in several decades. Prior to the upcoming season, the Grays played in Vancouver, Canada, as the 'Bobcats'. The Vancouver team struggled, however, with low ticket sales. Washington lured the team by agreeing to finance and build a new \$440 million stadium that it will rent to the team for an average of \$5.5 million per year. The city expects average attendance to be 30,000 people per game. The average ticket price will be \$21.43. The Grays are scheduled to play 86 home games this season. (Information of this sort is easily obtained on the Internet.)

The name 'Grays' was chosen to commemorate the 'Homestead Grays', a team that played in the Negro Baseball League during the first half of the twentieth century, at a time when African American players were not permitted in the major leagues. The

name was announced to the public soon after the decision to move to Washington was taken for the purpose of generating publicity, and prior to checking domain name availability. Baseball teams sell tickets directly through their web sites. The sites are also used to promote the team and associated merchandise.

About Gray's Restaurant and Catering

Gray's Restaurant and Catering is located in a college town of about 120,000 people in a scenic area, several hundred miles from Washington. The business is housed in an upscale hotel of about 100 rooms. The hotel is busy year round, with lodgers coming for university events (ex., sporting events, professional conferences, etc.), as well as for the regular entertainment events hosted by the local arena.

'Grays.com' promotes both restaurant and catering businesses (the hotel keeps a separate web site which links with Grays.com). The restaurant's menu, suitable for an upscale hotel, is prominently displayed, complete with this week's special offerings, as are directions to the restaurants. The site advises diners to make reservations and provides the phone number to do so. Catering menus and suggestions are also posted. Catering customers are invited to call to schedule an event.

About the negotiation

Kelly recently telephoned Chris saying that the Washington Grays might be interested in buying the Grays.com name. The call was unsolicited: Chris had not put the name on the market. Chris asked for time to think about it. The parties agreed they would talk again within a few of days.

This is a one-time bargaining situation. There is a single issue under contention: Price, and any agreement must be reported in terms of price only. An agreement should be treated as legally binding and final. Both sides are permitted to break off negotiations and can refuse to make an agreement if they think that is what is best for them. Chris and

Kelly have never previously had dealings nor do they anticipate future business or social interaction.

This completes the public information given to both bargainers. The private information refines uncertainties in the public information concerning the bargainer's situation, what he knows about the other parties to the negotiation or about the object being negotiated. The private information does *not* introduce new issues.

A.2 Private Information for Sellers (Role Chris Gray) Only

You have had the 'Grays.com' domain name since you began your business about five years ago. While the web site has proven valuable, you are now well known in what is, after all, a small town. You don't think it would be hard to redirect your local restaurant and catering customers to a new web site. Moreover, you know from records that almost all out-of-town hits to the site come through the hotel's web site and it would be no problem getting the hotel to link to a new domain name. Still, there are advertising expenses associated with a change. You estimate these at \$15,000.

The profit from any deal you make to sell Grays.com, then, is

Negotiated price - \$15,000

Your job is to maximize your profit from the negotiation, given that your profit will be 0 if you do not make a deal (so you would never take less than \$15,000 for the domain name).

As to the Washington Grays, you did some searching on the web and found that there are already a number of similar sounding web sites (ex., GoGrays.com) that have been registered by businesses that intend to sell tickets to the games second hand. These sights might be confused with the official Washington Grays site (you also discovered that the margins in the middle man ticket business are generally small and so the

companies rarely buy domain names at premium prices; i.e., they buy whatever name they can get for \$35 or less). Beyond this, you have no further information than the public information given above.

A.3 Private Information for Buyers (Role Kelly Kaplan) Only

If you cannot get Grays.com, your best alternative is to take WashingtonGrays.com which is not yet registered to anyone, and is available for a \$10 registration fee. You are concerned, however, because this longer name will not be as easy to market as would 'Grays.com'. It is important that fans recognize the name of the *official* team web site since there will be plenty of similarly named web sites out there (ex., GoGrays.com) looking to sell tickets second hand. Due to the middle man mark-up, second hand tickets will generally be more expensive than the tickets you sell and this in turn might depress business. (The margins in the middle man ticket business are generally small and so the companies rarely buy domain names at premium prices; i.e., they buy whatever name they can get for \$35 or less).

You estimate that using WashingtonGrays.com, instead of Grays.com, would cost the team 1% of ticket sales in the first year. This works out to an expected cost of about \$550,000. You would not want to pay more than this to obtain Grays.com. You think that the costs beyond the first year will be far less substantial, and so it is not necessary to take account of them.

The profit from any deal you make with Gray's Restaurant and Catering, then, is

\$550,000 - negotiated price

Your job is to maximize your profit from the negotiation, given that your profit will be 0 if you do not make a deal. You would never pay more than \$550,000 since this would give you negative profit.

As to Gray's Restaurant and Catering, you have no further information than the public information given above.

Appendix B

MATERIALS FOR EXPERIMENTS

B.1 Protocol for Negotiation Experiments

Negotiation Experiment:

Subjects are seated randomly. One side of the room will be buyers and the other side will be sellers.

Monitor: Thank you for coming today. On your desk you'll find a set of instructions. Now I would like to read the instructions out loud, to be sure we are all on the same page.

Start of instructions:

General. The purpose of this session is to study how people make decisions in negotiation situation. If at any time you have questions, raise your hand and a monitor will happily assist you. From now until the end of the session, unauthorized communication of any nature with other participants is prohibited.

The negotiation proceeds in a **single round**. Each buyer is matched with one seller to negotiate. During the session you will **negotiate the price of Internet domain name 'Grays.com'** with another participant, you will make a deal at the end of session by agreeing to a price. If you make an agreement price, the price will be translated to US dollars for your earnings and the other participant's earning would also be based on this agreement price. You will be paid these earnings plus a \$5 show-up fee at the end of this session. If you do not make an agreement price with your matched participant, you will

be paid only a \$5 show-up fee. The negotiation results and payments you make will be treated as confidential.

Description of the negotiation. There are two types of role players. One is a role “**Buyer (Kelly)**” and the other is a role “**Seller (Chris)**”. At the beginning of the session, each participant will receive a *UserID* and a *Password*. Based on those, each participant will be assigned one of aforementioned roles and matched with one role player until end of the session. Your job is to **maximize your profit from the negotiation** with your matched participant. If you are a **role seller (Chris)**, you should make an agreement price of Internet domain name ‘Grays.com’ **as high as possible** from your reserve price. If you are a **role buyer (Kelly)**, you should make an agreement price of Internet domain name ‘Grays.com’ **as low as possible**.

Please follow these steps

Step1- *Registration*: Open a browser (i.e., Internet Explore) on your computer. In the URL address box, input <http://siegel.smeal.psu.edu> (See Figure 2) and hit the “Enter (↵)” key to connect the “Negotiation Home” page.



Figure 2. To connect the Negotiation server

When you click the “Registration” hyperlink (See Figure 3.A.) on the Negotiation home page, you will see the Negotiation Registration page. Please input required personal information and given UserID and Password and read the “Consent Form” (See Figure 3.B.). When you click the “I Agree” button, you can successfully finish the registration of the negotiation session.

A. Negotiation Home Page

Microsoft Internet Explorer window showing the URL <http://siegel.smeal.psu.edu>. The page displays the PENNSTATE logo and the text "PENNSTATE SM Laboratory for Economic Management and Auctions Online". A navigation menu on the left includes "About Experiment", "Registration", "Sign In", and "Contact US". The "Registration" button is highlighted with a black arrow. The main content area says "Welcome" and "Please do 'Register' if you had already registered. Thanks."

B. Negotiation Registration Page

The registration page is titled "PENNSTATE Smeal College of Business Laboratory for Economic Management and Auctions Online Negotiation". It includes a navigation menu on the left with "About Experiment", "Registration", "Sign In", and "Contact US". The "Registration" button is highlighted. The main content area says "Already finished registration? [Sign In](#)". Below this is a form with the following fields:

- *First Name: Sungsoon
- *Last Name: Park
- *Gender: Male Female
- *User ID: asaa (Type your given User ID. ID may contain numbers and letters) - highlighted with a black arrow
- *Password: **** (Type your given password. Four characters) - highlighted with a black arrow
- *Re-type Password: ****
- *E-mail Address: sup115@psu.edu
- *PSU Student ID #: 91526171

 Below the form is a "Consent Form" section with the following text:

Office for Research Protections
Approval Date: 09/19/05 JKG
Expiration Date: 09/01/06 JKG
Social Science Institutional Review Board

Informed Consent Form for Social Science Research
The Pennsylvania State University

Title of Project: Investigating Negotiation Protocol

By clicking "I Agree" you agree and consent to "Online Negotiation Experiment".
If you have any question, [contact us](#).

 The "I Agree" button is highlighted with a black arrow.

Figure 3. Registration for Negotiation Session

Step 2- Before Starting Negotiation: If you successfully complete the registration, you will see the "Negotiation Experiment" page (Figure 4) on your computer screen. On the left side of the screen, you will see your role (Chris (Seller) or Kelly (Buyer)) and a "Menu for Negotiation" (See Figure 4). The "Menu for Negotiation" includes "Public Information" and "Private Information". Before starting negotiation, you should read these two types of information. The "Instructions" hyperlink will show how to exchange contracts (offers) and messages with your matched participant.

The screenshot displays a web application interface for a negotiation menu. On the left, a blue sidebar contains the text "You are a role as 'Chris'" and "Menu for Negotiation". Below this is a navigation menu with items: Home, Instructions, All Information, Public Information, Private Information, and New Contract & Message. A "Refresh button for Contract & Message Lists" is located at the bottom of the sidebar. Two callout boxes, "Your Role" and "Information", point to the "Chris" role and the "All Information" menu item, respectively. To the right of the sidebar, the main content area shows the title "Grays.com - With co" and a paragraph of text. Below this is a section titled "Public information available" with another paragraph. At the bottom right, a timer displays "Time Left >> 2 : 57 : 48 sec" and a note "(The screen will be refreshed in every 10 seconds)". Below the timer are two columns: "My Contract List" and "Kelly Contract List", each with sub-sections for "My Active", "My Past", "Kelly Active", and "Kelly Past".

Figure 4. Menu for Negotiation

B.2 Negotiation Support Contents (NSCs) Model for Role Selles

Please read the following carefully before beginning the negotiation. The information provided, and the questions to consider, are intended to help you achieve a better negotiation outcome.

Negotiation Preparation Phase

Prior to negotiation, you want to consider carefully, four critical concepts that will help you understand your own position as well as that of the other side.

- **Interests** are the underlying reasons that each party has for wanting to reach a negotiated agreement.
 - You (Chris) are interested in selling the website “Grays.com” for the most cash possible. The amount must be high enough to cover any damage to your restaurant and catering business.
 - From what you know presently, what would you say Kelly’s interest is? Give your best guess.

- A bargainer’s interests tell something about the **best alternative to a negotiated agreement (BATNA)**, what will be done if no settlement is reached in the negotiation. In turn, BATNA helps understand the **walk-away** value, the price below or above which a bargainer is no longer interested in an agreement.
 - Your (Chris’s) BATNA is to keep your website as is. The walk-away value you attribute to this option is the replacement value of the site, \$15,000.
 - What is your best guess of Kelly’s BATNA? From this BATNA, estimate Kelly’s walk-away.

- Together, Chris and Kelly’s walk-aways define the zone of possible agreement (ZOPA). Each point inside the ZOPA (Figure 1) represents a settlement at which both parties would find it profitable to make an agreement.

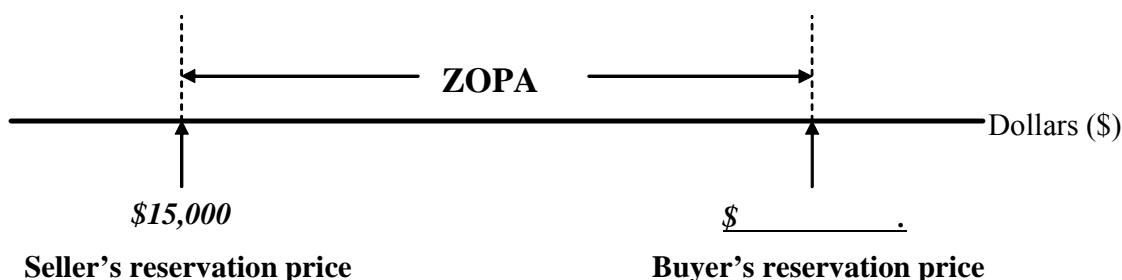


Figure 1: Zone of possible agreement

During the negotiation, and particularly at the beginning of the negotiation, ask questions to test if your understanding of Kelly's interests is correct. Your goal, as Chris, is to obtain a price at the higher end of the ZOPA, while Kelly can be expected to work to obtain a price at the lower end.

Initial Offers

After you have discussed interests with the opponent, at some point, one or both of you will make an initial offer. **The data suggests that initial offers are the most important predictors of the bargaining settlement.** The following information is provided to make a better initial offer. Here are answers based on data from previous studies in negotiation, to frequently asked questions about initial offers:

- **How aggressive should my initial offer be?**
 - The data suggests that bargainers do best when their initial offers are *aggressive within reason*. A good first offer is one that appeals to the opponent's interests but stretches the other bargainer's ability to meet you demand. Usually, this means that the offer is in the neighborhood of the walk-away value of the other bargainer.

- **Is it better to put my initial offer on the table first or after the other bargainer?**

- The data suggests that, on average, no advantage or disadvantage accrues to going first (or going second).
- One word of caution, if you put your initial offer on the table second: People who go second have a tendency to be influenced by the initial offer first put on the table. The higher (lower) the first offer, the higher (lower) the initial counteroffer tends to be. If you make the initial counteroffer, do not be unduly influenced by the first offer.

■ **How should I respond if the other bargainer makes an unreasonable first offer?**

- An unreasonable first offer is one that does not satisfy, under any conditions, your interests. If you receive a first offer like this, you should explain to the opponent that it is not acceptable for this reason, and throw it back to him or her for a more acceptable initial counteroffer. *Under no conditions, should you respond with a counteroffer.* Doing so, will only validate the unreasonable offer in the mind of the other bargainer.

■ **Given the two initial offers, what is the most likely settlement given the two initial offers?**

- If the initial offers differ, as they probably will, one or both sides will have to make concessions in order to arrive at an agreement. The data suggests that the most likely outcome is half way between the two initial offers (Figure 2). This is the reason for the importance for **your first offer to be aggressive within reason**, and why, if you go second, you should not be unduly influenced by the other bargainer's first offer.
- The illustration in Figure 2 however, is average behavior. Ways exist to shade the concession stage of bargaining in your direction.

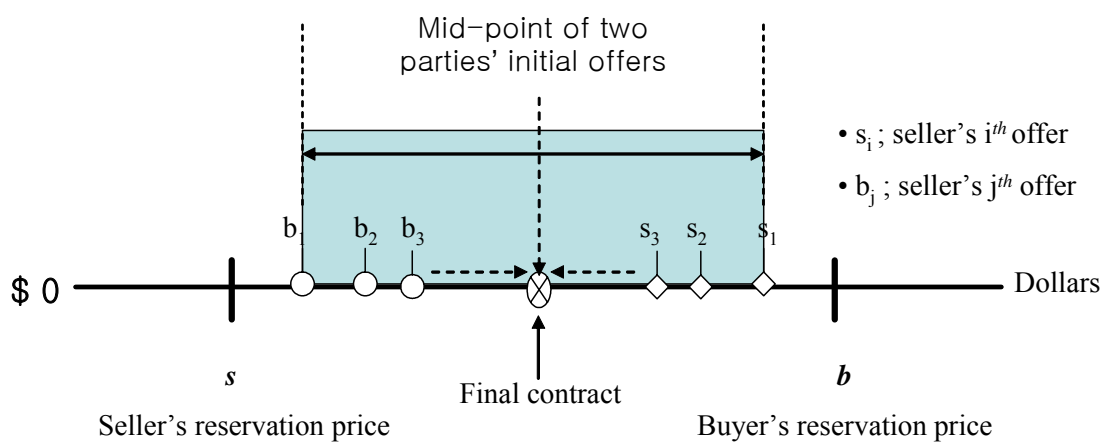


Figure 2: Mid-point of two parties' initial offers

Appendix C

INFORMED CONSENT FORM

Informed Consent Form for Social Science Research

The Pennsylvania State University

Title of Project: Investigating Negotiation Protocol

Principal Investigator: Dr. Gary Bolton
334 Business Building,
University Park, PA 16802
(814) 865-0611; gbolton@psu.edu

ORP USE ONLY: IRB#21539 Doc.#1 The Pennsylvania State University Office for Research Protections Approval Date: 09/19/05 JKG Expiration Date: 09/01/06 JKG Social Science Institutional Review Board

ORP USE ONLY: IRB#21539 Doc.#1 The Pennsylvania State University Office for Research Protections Approval Date: 09/20/06 JKG Expiration Date: 09/14/07 JKG Social Science Institutional Review Board

1. Purpose of the Study: The study in which you will be participating is part of research intended to assess how people make decisions in simple economic situations. By conducting this study, we hope to improve our understanding of how economic institutions do and can work.
2. Procedures to be followed: If you agree to take part in this research, you will participate in a series of economic games. Your partner(s) in these games will be unknown to you, and you will be unknown to them. Neither your identity nor the identities of your partner(s) will be revealed to anyone but the researchers. A more detailed description of the games you will play is included on a separate instructions sheet. Please examine this sheet now, if you have not already done so.
3. Discomforts and Risks: There are no risks in participating in this research beyond those experienced in everyday life. Some of the questions are personal and might cause discomfort.
4. Benefits: You might learn more about yourself by participating in this study. You might have a better understanding of how to make decisions. This research might provide a better understanding of how people make decisions in economic situations. This information could help plan programs, make student services better. This information might help to draw conclusions about how people exercise their options in economic situations.
5. Duration: It will take about 90 minutes to complete the session.
6. Statement of Confidentiality: Only the person in charge, and his/her assistants, will know your identity. If this research is published, no information that would identify you will be written. The data will be stored on Dr. Bolton's password protected computer, with no personal identifiers attached. The Office for Research Protections and the Social Science Institutional Review Board may review records related to this project.
7. Right to Ask Questions: You can ask questions about the research. The person in charge will answer your questions. Contact Gary Bolton at (814) 865-0611 with questions. If you have questions about

your rights as a research participant, contact Penn State's Office for Research Protections at (814) 865-1775.

8. Compensation: In return for your participation, you will receive \$5 plus any earnings from the games you participate in. It is possible to earn up to a total of \$25.
9. Voluntary Participation: You do not have to participate in this research. You can end your participation at any time by telling the person in charge. You do not have to answer any questions you do not want to answer.

You must be 18 years of age or older to consent to participate in this research study. If you consent to participate in this research study and to the terms above, please sign your name and indicate the date below.

You will be given a copy of this consent form to keep for your records.

Participant Signature

Date

Investigator Signature

Date

VITA

Sungsoon Park

EDUCATION

- Ph.D. Industrial Engineering, Penn State University, University Park, PA, 2007
- M.S. Industrial Engineering, Arizona State University, Tempe, AZ, 2001
- B.S. Industrial Engineering, SungKyunKwan University, Suwon, Gyeonggi-do, South Korea, 1999

RESEARCH EXPERIENCE

- Doctoral dissertation: “Towards Interdisciplinary Perspective of Electronic Negotiation Support Systems”
- Research Assistant in HPAM Lab, 2002 ~2007, Penn State University, Project: “Experimental Design for National Missile Defense”,
- Research Assistant in LEMA, 2004 ~2006, Penn State University, Project: National Science Foundation, “Electronic feedback mechanisms and indirect reciprocity”

PUBLICATION

- Park, S., Rothrock, L. (2006) Systematic Analysis of Framing Bias in Missile Defense: Implications toward Visualization Design. *European Journal of Operational Research* (In press).
- Rothrock, L., Park, S., Barnes, M., McDermott, P., Hutchins, S., & Gillan, D. (2003). Systematic Analysis of Risk Visualization Strategies for Homeland Defense. Paper presented at the IEEE International Conference on Systems, Man & Cybernetics, Washington, D.C.
- Rothrock, L., Ventura, J., & Park, S. (2003). An Optimization Methodology to Investigate Operator Impact on Quality of Service. Paper presented at the Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC), Orlando, FL.

HONORS AND ACTIVITIES

- Departmental Academic Commendation, Arizona State University, 2001
- Student Member of Institute of Industrial Engineers (IIE)
- Student Member of Institute of Electrical and Electronics Engineers (IEEE)