

A WEB-BASED NEGOTIATION SUPPORT SYSTEM

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ABSTRACT

In this paper a Web-based Negotiation Support System CBSS is introduced. The system facilitates a structured on-line negotiation process. It is written in JAVA language and can be accessed easily through the Web. The system has been tested in comparison with face-to-face meetings in simulated labour union-management negotiations. The test shows that CBSS was viewed as a valid alternative to face-to-face negotiation, although bargaining processes supported by CBSS were perceived to be slower than face-to-face negotiation.

INTRODUCTION

The rapid growth of Internet and World Wide Web technology has created a great opportunity for conducting business electronically through telecommunication networks. Before the opening of the Internet to business, EDI was the major form of electronic commerce in which private or Value Added Networks (VANS) were used to facilitate electronic transaction processing between prearranged business partners without human intervention. The Internet and Web technology have extended electronic commerce from business-to-business to business-to-consumer activities. Customers can search for product information on the Web and make on-line purchases. However, the price or terms for goods and services are usually pre-specified by the seller or buyer (such as in on-line auction) and no negotiation is allowed or facilitated. When electronic commerce becomes more sophisticated, it should be able to handle complex, mutually determined deals or contracts electronically (such as making a deal for buying or selling a house, or signing a long term contract for co-operation between two companies). Supporting on-line negotiation through the network therefore is very much needed.

Negotiation is usually carried out in the form of face-to-face meetings. When negotiation has to be conducted from remote sites, two parties may communicate with each other through phone calls, fax, e-mail, or video conferencing. Phone calls and video conferencing provide real-time interaction but do not support working on detailed documents. Fax, email and file transfer can be used to exchange documents but lack real-time interaction. To support on-line negotiation, both real-time interaction and document exchange are needed. Recently several real-time Internet collaboration software products, such as Netscape Conference, Microsoft NetMeeting and VocalTec's Internet Con-

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ference Professional, have been developed. These products use whiteboards, application sharing, chart, and file transfer to facilitate collaboration over the Internet (Ozer, 1998). However, they are not specifically designed to support remote contracting and negotiation.

As one branch of Group Decision Support Systems, many Negotiation Support Systems (NSS) have been developed. They can be classified into two categories: solution-driven NSS and process support NSS. A solution-driven NSS provides solution alternatives or suggests possible agreements to the negotiating parties. These suggestions are derived from a number of different models such as Social Judgement Theory Models, Hypergame Decision Models, Bargaining Models, Multi-objective Linear Programming, and Expert Systems. A process support NSS does not provide any suggested solutions. It is designed to support the process of negotiation, from the preparation stage to the contract signing stage. A process support NSS addresses two dimensions that a solution-driven NSS does not: enriched communication channels and co-operative work (Carmel et al. 1993). Most existing NSS are solution-driven and are implemented in a group meeting environment. They do not support remote negotiation in a Web environment.

A Web-based negotiation support system INSS (Internet Negotiation Support System) was developed recently at Carleton University, Canada. (<http://www.business.carleton.ca/interneg/index.html>). The system contains a facility for specification and assessment of preferences, internal messaging system and graphical displays of the negotiation progress. This system can be categorised as a solution-driven NSS. It provides a method to construct a negotiator's utility functions for evaluating proposals. It also provides suggestions or solution alternatives in the sense of Pareto optimisation. Since it uses a rather simple communication channel, INSS does not provide full process support for negotiators to organise and negotiate complex issues.

Figure 1
Hot Line and Pre-Session

In this paper, a Web-based negotiation support system CBSS (Collective Bargaining Support System) is introduced. The system is intended to provide full process support in a Web environment. A prototype has been tested and compared with face-to-face negotiation. It has demonstrated some useful features for the future development of a more sophisticated negotiation support system.

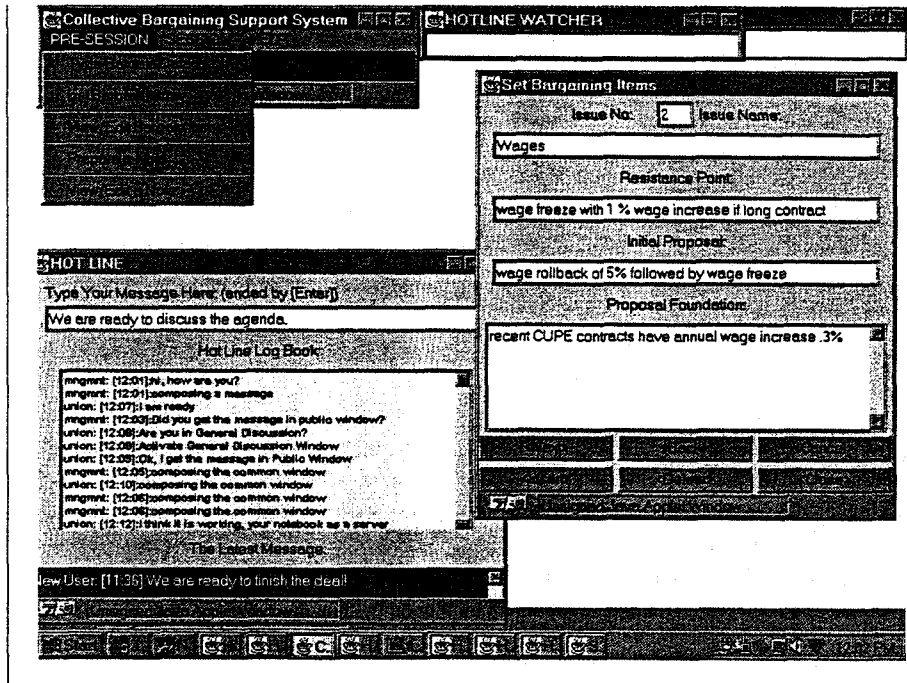
THE OBJECTIVES AND THE STRUCTURE OF CBSS

The main objectives of CBSS are the following:

- 1) Easy access through the Web. Two parties anywhere in the world should be able to negotiate by accessing CBSS through the Web.
- 2) Real-time communication and interaction. Negotiators should be able to communicate with each other in real-time and interact in a variety of ways such as hot-line co-ordination, message exchange, and working on common documents.
- 3) Structured negotiation process. Negotiation should be organised in a well-structured process including preparation, setting agenda, issue discussion, and making the final agreement.
- 4) Automatic documentation. The entire negotiation is automatically documented. Negotiators should be able to review any issues that have been discussed and any agreements that have been reached.
- 5) Security and privacy. The system should be able to recover from system or communication failure. Each party should have its private and shared documents. All information that has been exchanged cannot be altered by either party.

Based on the above objectives, the CBSS is constructed in the following way.

- 1) CBSS is written in JAVA and implemented in a Client/Server environment. CBSS is installed on a Web server. Ne-



gotiation parties can register and log on to the CBSS Web page as clients. The CBSS server will automatically download the CBSS client part (as JAVA applets) to the client sides and the parties can start negotiation right away.

- 2) A Hot Line dialogue window (see Figure 1) is created immediately after log on to facilitate co-ordination between the two negotiation parties. Hot Line allows two parties to send and receive short messages in order to co-ordinate with each other, e.g. start negotiation or change issues for discussion. It has a simple monitoring window to automatically notify the other side of activities such as opening an issue window, preparing a message, etc. so actions of the two parties can be synchronised during the session.
- 3) The main menu of CBSS consists of three parts: Pre-Session, Session, and Help. The Pre-Session part supports the negotiation preparations including setting up negotiation items and preparing notes that can be used during the negotiation. The Session part consists of general discussion, issue discussion and completing the agreement sessions that support the negotiation process. The Help part provides on-line help.

- 4) The Session part supports a structured negotiation process parallel to Gulliver's [1979] negotiation process stages except step 1 (Find the Arena) which deals with the location for negotiation. General Discussion supports step 2 (Agenda Setting) and step 3 (Explore the Field) where parties discuss the collective bargaining agenda until they agree on the issues to be negotiated, the time allocated to each issue, and the trade-offs and the limits of the issues in dispute. Issue Discussion supports step 4 (Narrowing the Difference), step 5 (Preliminaries to Final bargaining), and partially step 6 (Final Bargaining), where parties negotiate and search for solutions to a particular issue. Completing the Agreement supports step 6 (Final Bargaining) and step 7 (Ritual Affirmation), by providing a communication channel for proposal exchange and the documentation of the final agreement.
- 5) In each Session discussion (general discussion, issue discussion, and completing agreement), a discussion window is created (see Figure 2). It consists of three sub-windows: Our Window, Their Window and the Common Window. Our Window (on the upper right) is

used to display the negotiator's own proposal or response. Their Window (on the upper left) is used to display the opposite party negotiator's own proposal or response. Each message has a head to indicate the time the message was sent. The Common Window (on the lower left) is used to display the agreement reached for this specific issue. There is also a panel of buttons (on the lower right) associated with each discussion window, for composing and posting messages.

- 6) To compose a message (such as proposals and count-proposals, arguments, explanations, etc.), a small dialogue window called the Comment Editor can be activated by a Compose a Message button. It is used for preparing messages privately before sending them out to the public. Once a message is sent to public, it is shown in the opposite party's Their Window and their own party's Our Window. The agreement can be composed and modified by each party in a similar way by using a Compose Common Window button and posted in both parties' Common Window.
- 7) During the negotiation process, all the messages exchanged are saved automatically in different files at the CBSS server. With a registered user name and password, a user can view all the negotiation documents shown in corresponding windows but cannot make any changes to existing contents.
- 8) All the negotiation documents are saved at the server site rather than the client site. The negotiation service may be provided by a third party trustee organisation. A negotiation process may be interrupted due to communication failure, but it can be resumed without the loss of data because all data are saved at the server site.

PERFORMANCE EVALUATION

An experiment was conducted to evaluate and compare CBSS with face-to-face negotiation. Sixty six subjects voluntarily participated in the experiment. They were students enrolled in an upper-level undergraduate Collective Bargaining course. Some of the participants were part-time students who worked in industry. The students were divided into 22 teams (3 members each) participating in 11 simulated negotiation settings. Each setting involved a management team and a union team. The teams were selected randomly to be in the negotiation settings. The experiment was performed in two rounds. In the first round of the experiment, 5 pairs of teams (management team and union team) were assigned to use CBSS and 6 pairs of teams were assigned to use face-to-face (FTF) negotiation. In the second round, the bargaining format changed – the pairs using CBSS in the first round used FTF in the second round, and vice versa. The roles of the teams in each pair were also rotated in the second round, such that management teams in the first round became union teams in the second round, and vice versa.

Two sets of simulated negotiation issues (bargaining tasks) were given to the ne-

gotiation dyads: one set for the first round, and the other set for the second round. The first round simulated the negotiation of a first collective agreement and included four issues: wages, contract duration, call-in provision and union security. The second round involved a renewal collective agreement and covered three issues: seniority, layoffs, and union representation. Case materials were given to the students several weeks prior to conducting the simulations to allow them sufficient time to research the issues. The experiment was a three-factor 2 x 2 x 2 (two bargaining formats, two negotiating roles, and two bargaining tasks) design.

Two questionnaires were used to collect user preferences. The first was used to collect user views on CBSS, which was distributed to the groups who used CBSS first. The second was used to collect user views on comparisons between CBSS and face-to-face negotiation, which was distributed to all the groups who used CBSS and face-to-face negotiation. The answers were recorded on a Likert scale ranging from 1 to 5, where 1=strongly disagree, 2=disagree, 3=neutral/undecided, 4=agree, and 5=strongly agree. One-tail Wilcoxon Signed Rank test was used to analyse the data. We use M to indicate

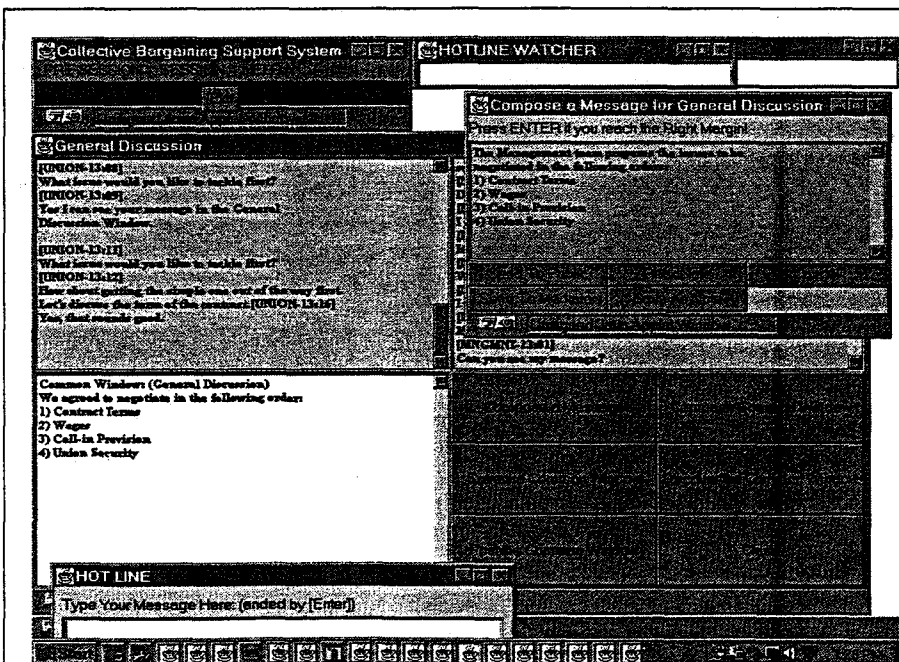


Figure 2
Discussion Window
and Composing Window

FOCUS THEME

Question	N	M	W	P
CBSS made the negotiation process easy to organise.	23	3.5	207.5	0.018 (*)
CBSS is user-friendly computer software	24	4	293	0.000(**)
CBSS may be used for real bargaining situations.	24	4	238	0.004(**)
I prefer to use CBSS if an FTF meeting is not possible.	44	4	945	0.000(**)
The process with CBSS was more efficient in time usage than the FTF process.	48	2	215	0.000(**)

Table 1 Testing Results

N: Number of responses
M: The median score of responses
W: Wilcoxon signed rank score
P: Significance level of one-tail Wilcoxon signed rank test (reject Ho: M=3)

the estimated sample median responses to a question. The null hypothesis for the question is $M = 3$, and the alternate hypothesis is either $M > 3$, or $M < 3$, depending on the question.

Some of the important test results are listed in Table 1. The first three questions were selected from the first questionnaire and the remaining two questions were selected from the second questionnaire. The results show that CBSS was viewed as a valid alternative to face-to-face negotiation, although the bargaining process supported by CBSS was perceived to be slower than face-to-face negotiation. More detailed test results can be found in Suarga et al. [1998].

The written comments collected from the subjects immediately after the experiments are listed in Table 2. These comments are grouped into three categories: 1) satisfied, 2) frustrated, and 3) mixed. Typical comments are quoted in their original form, which may provide the best explanation of our test results.

Category of Responses Number of responses Sample Comments Quoted in Their Original Form

Table 2
CBSS User Comments

Satisfied	41	"I liked the fact that the information we discussed was at our finger tips if we needed to see it again. Moreover, it gave us a chance as a group to collectively discuss our responses, basically letting us think before we talked. Furthermore, the system went smoothly without any problems. On the whole I liked it much better than the face-to-face bargaining."
		"I liked the computer bargaining because it allowed our team to discuss issues and analyse their position without feeling intimidated by opposing members. Also we could see the entire communications at any time, which made it helpful for when we forgot some positions or items. Good system !!!"
Frustrated	14	"I would rather perform face-to-face bargaining than CBSS. CBSS is more frustrating and stressful. CBSS is too time consuming."
		"Frustratingly slow process, long wait for responses, couldn't read reactions from bargaining partners. Unsure if arguments were received. Unclear response, couldn't tell if other parties understood communication. Very difficult to move and use flexibility in complex arguments, because of slow response time (because info had to be typed). Other party didn't have many arguments on disk, took a long time to think of responses and then type them in."
Mixed	9	"I think CBSS focus on the problem more if only tool used. I felt because I had FTF with other party I was already aware of personality issues. I believe that CBSS provides better documentation regarding analysis of negotiation strategies. I found that there was a disadvantage because you could not provide supporting document to help in swaying the opponent. Process slower because waiting for response also unaware if arguments received."
		"With using CBSS, we had time to discuss the issue with the group which was not possible in the face-to-face negotiations. It took longer using CBSS because of computer troubles, and in face-to-face it was much quicker."

FURTHER IMPROVEMENTS TO CBSS

CBSS was our first attempt to build a Web-based negotiation Support System. Although it was tested in the context of collective bargaining between management and labour unions, it could also be useful for negotiating commercial contracts. We see the need to further improve CBSS in the following ways:

- 1) Currently CBSS is mainly text based. Voice communication can be added, for instance, to the Hot-Line dialogue. However, there could be a tendency for two parties to do negotiation simply through voice channels only. Although voice can be recorded, it is difficult to document the negotiation process and to trace back what was discussed at any particular moment.
- 2) Multimedia (such as graphics, video) and multi-format (such as spreadsheets and wordprocessing) document exchange should be added to support argument and background information

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exchange during the negotiation process. Since CBSS is built in the Web environment, it would be easy to add this function into the CBSS menu.

- 3) To make a negotiation document legal, digital signatures for agreement authorisation should be added once the two parties have reached agreement.
- 4) So far, CBSS supports only one negotiation setting at a time. It should be extended to support concurrent multi-negotiation settings. We plan to build multiple virtual meeting rooms in CBSS so that negotiation parties can book rooms for different negotiation settings with their own private documents maintained and saved separately.
- 5) There was already a third-party mediator component built into CBSS but we have not tested it yet. It is important to find out how instant online consulting during negotiation process could significantly improve the negotiation results.

NEGOTIATION AND CONTRACT THROUGH E-MAIL

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INTRODUCTION

This paper describes aspects of electronic contracting and Negotiating in South Korea. Since South Korea is a developing country, its national IT infrastructure is not well developed to support all aspects of Electronic Commerce unlike developed countries such as the USA. Nevertheless, there are many new companies which are trying to do business in the cyberspace in South Korea. Firstly, this paper introduces the IT environment of South Korea and other developing nations and suggests that in developing countries, there are several problems that should be solved prior to the full development of electronic commerce when compared to a developed country like the US. Secondly, by presenting an episode of negotiation which happened between the firm and the customer over the price and quantity of the prod-

uct, we show that negotiation involves complex items and suggest that e-mail can act as a rich medium for negotiation. However, in order to have negotiation done automatically, we need an intelligent negotiation support system which understands the natural language of e-mail messages. We propose a framework of such a system. Lastly, contracting can also be done in e-mails or in web sites. But in a developing country such as Korea, there

is a strong need for third party registry to promote trust and non-repudiation. We propose that third party registry should be run by an agency of the government. The reason for choosing the government is mainly cultural. Similar schemes have been introduced in Japan and the US.

NATIONAL IT INFRASTRUCTURE AND ELECTRONIC COMMERCE

We can easily suggest that doing an e-commerce business in a developed country should be different from doing it in a less-developed country; here "development" refers mainly to the level of national IT infrastructure development. National IT infrastructure can be defined as the vision of broadband communication that is interoperable as if it is a single network, which is easily accessible and widely distributed to all groups within society bringing business, education, and government services directly to households and facilitating peer to peer communication throughout society (Kraemer, et al., 1996). But this idealistic vision is hard to achieve for countries with less economic resources.

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