Negotiators' Communication, Perception of Their Counterparts, and Performance in Dyadic E-negotiations

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Abstract

The aim of this study was to improve our understanding of negotiation strategies, behaviors, and outcomes, and the relationships between these factors based on data collected from questionnaires, actual behavior during the negotiation process implemented using e-negotiation system, and the negotiation outcomes. This study clustered the negotiators based on either the negotiators' own strategies or their thoughts about those of their partners. This resulted in a division into cooperative and noncooperative clusters. We found that the negotiators whose own strategies are less cooperative tend to submit more offers but fewer messages. However, these people consider that they have less control over the negotiation process compared with those who adopt a more cooperative strategy, who make fewer offers but send more messages. Those in the cooperative cluster consistently feel friendlier about the negotiation and more satisfied with the outcome and their performance. Further, there is a correlation not only between self-strategies and the thoughts about partners' strategies, but also between strategies and final agreements. Finally, the proportion of negotiations reaching agreement is larger for the cooperative cluster than for the noncooperative cluster.

Key words: e-negotiation, negotiation support systems, negotiation process, negotiation strategy, negotiation behavior

1. Background and Motivation

According to Lax and Sebenius (1986), an organization is a complex network of agreements among members and outside parties. Such networks have typically become much larger

and more complex with the growth of virtual organizations and extranets in the Internet age. This has resulted in an increase in the frequency of negotiation activities, and hence how to perform efficient and effective negotiations is becoming increasingly important. Traditionally, attempts to understand different aspects of negotiations have used many perspectives, such as game theory, psychology, political science, communication, labor relations, law, sociology, and anthropology.

The rapid development in e-commerce has also made the Internet an important and inevitable channel of trade and business communication, including in e-negotiations. Most studies into e-negotiation (e.g., Bichler et al. 2003; Holsapple et al. 1996, 1998; Kersten and Noronha 1999; Yuan et al. 2003) have focused on how information technology affects negotiations, including the effects of negotiation decision support and communication support. In addition, the development of negotiation support systems (NSSs) and the underlying theories and protocols are also receiving considerable attention (Bui and Shakun 1996; Holsapple et al. 1998; Kersten and Noronha 1999).

In addition to assisting communication and decision making, e-negotiation can be used to collect complete and detailed data on the negotiation process and the final result. This is impossible to achieve in traditional face-to-face negotiation unless the entire negotiation process is recorded (Yuan et al. 2003). Collecting and analyzing all behavior data obtained during the negotiation process and about the negotiation outcomes will provide us with a clearer understanding of negotiation behavior, and therefore enable an accurate theory of negotiation to be constructed.

Previous research on e-negotiation has included developing NSSs (Kersten and Noronha 1999; Yuan et al. 2003), proposing NSS frameworks (Holsapple et al. 1998; Lim 1999; Lim and Benbasat 1992), studying the impact of demographic backgrounds (Walters et al. 1988), and assessing the effects of different levels of e-negotiation support on negotiation behavior and outcomes (Robinson and Volkov 1998). Diverse research methods have been applied Carnevale et al. 2004), including experiments (Carnevale et al. 2005), surveys (Shi and Wright 2003), content analyses (Hopmann 2002), and data mining (Kersten and Zhang 2003). Although there have been several studies on the impact of information technology, most of these have been based on data collected from questionnaires only. In contrast, an e-negotiation system can be used to record 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 are more likely to elucidate the actual phenomena.

During a negotiation process, a negotiator may consider questions such as: What should be my bottom line? What is a reasonable expectation? On which issues should I remain firm and on which should I be more flexible? How rapidly should I be willing to make concessions? Should my first offer be reasonable or should it be extreme in order to provide greater space for adjustment (Holsapple et al. 1998)? Answers to these questions will shape a negotiator's strategy (Darling and Mumpower 1990). In other words, negotiation behavior is often described in terms of different strategies (Pruitt and Carnevale 1993), and it is thought that a negotiator's strategy can be conjectured from his/her negotiation behavior. Many studies have investigated negotiation strategies (Darling and Mumpower 1990; Fisher and Ury 1981; Gulliver 1979; Holsapple et al. 1998; Lax and Sebenius 1986; Thomas 1976),

but most have been theoretical or based on data obtained only from questionnaires. Inspire is an operational e-negotiation system that has been operational since 1996, since when it has collected countless records of negotiation activities. We used Inspire in an attempt to improve our understanding of the actual behavior of negotiators in a negotiation process.

2. Research Purpose

Information technology allows messages and offers communicated among negotiators and the times of these communications to be easily recorded during an e-negotiation session. Because negotiation behavior is derived from negotiators' strategies, this study explored the following issues by applying clustering analysis to the data collected during the negotiation process implemented using e-negotiation systems:

1. If negotiation strategies can be categorized into different clusters, what are the significant differences between these clusters?
2. Is there any relationship between the negotiation strategy and the negotiators' thoughts about the strategies of their partners?
3. Are negotiation strategies, behaviors, and outcomes interrelated, especially negotiation strategies and the final agreement?

The aim of these explorations was to provide a better understanding on how the strategy impacts the negotiation process and outcome.

The remainder of this paper is arranged as follows. A conceptual research framework is proposed first. This is followed by a description of how to collect data, including about the e-negotiation system, negotiation case, and the data set. The way to apply clustering technology is then described in detail. Based on the clustering results, we analyze how the negotiation strategy relates to the negotiation process and outcome and propose ten propositions based on the analysis results. Finally, we conclude our findings and propose several future research areas.

3. Research Framework

The early perspective on conflict management through negotiation was defined by two orientations: cooperation and competition (Deutsch 1949). In a cooperative orientation, a negotiator is concerned about not only self-benefit but also benefiting others, whereas a competitive orientation only involves self-benefit. These two orientations play a particularly important role in negotiations in that they provide the basis for the best approaches to use (Kersten 2005).

An interesting question is whether a negotiator has only one orientation or a mixture of two or more (Kersten 2005). Kelley and Stahelski (1970) suggest that negotiators are either cooperators or competitors, whereas others consider that negotiators can exhibit a mixture of these two orientations (Lewicki et al. 1999; Rubin and Brown 1975). The empirical results
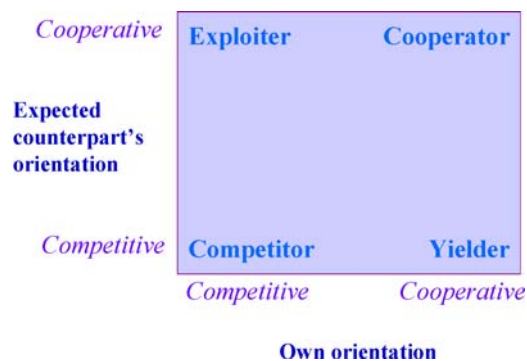
Figure 1. Dual negotiation orientations (Kersten 2005).

of the Thomas-Kilmann model indicate that negotiators may exhibit different mixtures of orientations (Thomas and Kilmann 1974). This led to a dual-concerns model being proposed (Kersten 2005; Lewicki et al. 1999; Rubin et al. 1994), in which five strategies – distributing, avoiding, accommodating, integrating, and compromising – are proposed based on the degree of concern about one's own outcome and those of others. Figure 1 shows another four proposed strategies – exploiter, competitor, yielder, and cooperator – based on whether the orientation of oneself and the expected counterpart's orientation are competitive or cooperative (Kersten 2005).

Pruitt and Carnevale (1993) argue that negotiation behavior is often described in terms of different strategies. Holsapple et al. (1998) also point out that the negotiation process involves a series of state changes resulting from the selection of strategies and movements, which Raiffa (1982) refers to as the "negotiation dance." As we mentioned in Section 1, the Inspire system has collected countless data on negotiation activities. In addition to questionnaires, these include offers, messages, setting and modifying the ratings of issues, and clicking on graphics. These actions represent the realization of negotiators' strategies.

The negotiation outcomes include the final agreement and how satisfied or confident the negotiators are with the result and with their own performance. Based on the research purpose and above discussion, the conceptual research framework shown in Figure 2 is proposed. We first attempted to find clusters that adopt different strategies, and then explored how the strategies affect the negotiation process and outcomes.

4. Data Collection

Data were collected from the Web-based Inspire NSS, which has been used for both teaching and research since becoming operational in 1996 (Kersten et al. 1999). So far, it has collected more than 1500 pairs of negotiation activities associated with Itex–Cypress negotiation. This section introduces the Inspire system, the negotiation case considered here, and the collected data set.
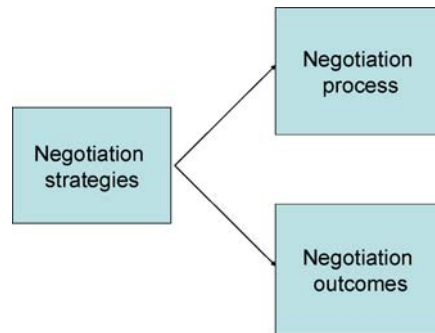
Figure 2. Conceptual research framework.

4.1. Inspire system

The Inspire system implements a three-phase model of negotiations: prenegotiation, negotiation, and postsettlement. In the prenegotiation phase the users analyze the case and specify their preferences. Based on hybrid conjoint measurements, the system constructs a utility function for each user. During the negotiation phase the system provides utility values of decision alternatives considered by the user and offers submitted by both parties. Inspire users can attach text messages to offers or exchange messages without offers (see Figure 3). This enriched communication not only makes the negotiation process more realistic, but also acts as a negotiation framework for both parties.

The system records the entire negotiation process and provides a negotiation history as well as a graphical visualization of the negotiation dynamics. It presents information on the negotiation process symmetrically to both parties in a manner where each party can see only their own ratings (utilities). The user can modify the issue, option, and package ratings during the negotiation phase. After the parties agree upon a compromise, the system

Figure 3. Offer formulation in the inspire system.

suggests a postsettlement phase if it finds that the compromise is inefficient. The system presents up to five more-efficient alternatives. The users can decide to reject the suggested alternatives or continue their negotiation until they reach an efficient compromise.

4.2. Negotiation case

The case study considered here describes negotiations between two companies: Itex Manufacturing, a producer of bicycle components, and Cypress Cycles, a builder of bicycles. There are four issues that both sides have to discuss: (1) the price of the components, (2) delivery times, (3) payment arrangements, and (4) terms for the return of defective parts. Both parties are presented with their side of the case, representing Itex and Cypress, and are told that their companies are interested in achieving a compromise. They are also informed that there are other suppliers and buyers so that a breakdown in negotiations is not catastrophic if they cannot reach a good deal. There is no further specification as to what indicates a good deal. The negotiators have to decide the issue priorities and the specific trade-off values between issues. For each issue there is a given set of options (i.e., issue values). Negotiations are conducted over 3 weeks with an imposed deadline, and the user may terminate the negotiation at any time.

4.3. Data set

After filtering more than 1500 pairs of Itex–Cypress negotiations that have involved the Inspire system since 1996, we obtained 693 pairs of complete and valid negotiation data that included prenegotiation questionnaires, negotiation processes, and postnegotiation questionnaires. Prenegotiation questionnaires include the negotiator's basic demographic data, negotiation experience, and thoughts and expectations about the negotiation. Postnegotiation questionnaires include the negotiation perception, strategies, observations on partner's strategies, and satisfaction with the system functions and the negotiation outcome. In addition to pre- and postnegotiation questionnaires, we also collected data on the negotiation behavior during the negotiation process, such as offers, messages, graphics clicks, final agreement, and utilities. All of the subjects involved in the negotiations are profiled in Table 1.

The 1386 subjects comprised 823 males and 563 females, with 966 students and 393 employed subjects. Further, 581 subjects were from the USA and Canada, and 723 subjects were from other areas, such as Europe, South America, and Central America. Most of the subjects had not used an NSS or decision support system previously.

5. Data analysis

5.1. Clustering results

There are two categories for measuring negotiation strategies in the postnegotiation questionnaires: (i) asking the negotiator's own strategy and (ii) asking the negotiator for his/her

Table 1. Demographic statistics of all subjects.

		Subjects	
		Number	Percentage
Gender	Female	563	40.62%
	Male	823	59.38%
Occupation	Student	966	69.70%
	Employed	393	28.35%
	None	27	1.95%
Residence	Taiwan/Hong Kong	82	5.92%
	USA/Canada	581	41.92%
	Other	723	52.16%
Used an NSS	No	1234	89.03%
or DSS before	Yes	152	10.97%

Note. DSS, decision support system.

opinions of his/her partner's strategies. Each category includes five assessment items: informative, persuasive, honest, accommodating, and cooperative. Because negotiation is an interactive activity in which a negotiator's strategy may depend on his/her partner's strategy (Holsapple et al. 1998), clustering analysis was implemented based on two data parts: (i) the negotiators' own strategies (Q11 in the postnegotiation questionnaire) and (ii) their thoughts about their partners' strategies (Q18 in the postnegotiation questionnaire). Furthermore, we applied clustering analysis to the total set of data, as well as to the successful data set that comprised agreed negotiations only, in order to determine if there is any particular phenomenon of agreed negotiations. The four types of clustering analyses are summarized as Table 2.

Table 3 lists the results of the clustering analysis, and indicates that two clusters provide the best results irrespective of the data set and variables used to implement clustering analysis because they have the largest average silhouette width in all types of analysis (Kaufman and Rousseeuw 1990). In addition, Table 4 indicates that every strategy variable used for clustering analysis differs significantly between the two clusters irrespective of the type of clustering analysis. Comparing the mean values of strategy variables between the two clusters, one cluster is consistently larger than the other except for "accommodating" in Types I and III. Therefore, the larger one is defined as the "cooperative" cluster, while the other one is defined as the "noncooperative" cluster. Types I and III indicate that subjects

Table 2. Four methods of applying clustering analysis.

Type	Variable for clustering analysis	Data set
I	Q11: Negotiators' own strategies	Total data set
II	Q18: Negotiators' thoughts about their partners' strategies	Total data set
III	Q11: Negotiators' own strategies	Successful data set
IV	Q18: Negotiators' thoughts about their partners' strategies	Successful data set

Table 3. Average silhouette width for different numbers of clusters.

	Two clusters	Three clusters	Four clusters	Five clusters	Six clusters
Total data set: negotiators' own strategies	0.228	0.196	0.195	0.207	0.179
Total data set: thoughts about partners' strategies	0.297	0.199	0.188	0.201	0.190
Successful data set: negotiators' own strategies	0.222	0.197	0.191	0.189	0.197
Successful data set: thoughts about partners' strategies	0.278	0.196	0.184	0.207	0.194

Table 4. ANOVA results from applying clustering analysis.

Data set	Strategy variables for clustering	Noncooperative mean	Cooperative mean	df	Mean square	F
Type I (total data set)	Self: informative	3.453	4.061	1	123.639	207.423***
	Self: persuasive	3.342	3.784	1	65.626	95.415***
	Self: honest	3.396	4.465	1	382.334	727.400***
	Self: accommodating	3.101	2.753	1	40.565	51.884***
	Self: cooperative	2.735	4.194	1	712.574	1535.223***
Type II (total data set)	Partner: informative	2.654	3.904	1	525.633	798.874***
	Partner: persuasive	2.770	3.589	1	225.659	353.307***
	Partner: honest	2.875	4.125	1	525.503	1016.620***
	Partner: accommodating	2.800	3.254	1	69.351	84.218***
	Partner: cooperative	2.405	4.049	1	909.461	1422.878***
Type III (successful data set)	Self: informative	3.477	4.074	1	104.111	175.060***
	Self: persuasive	3.416	3.773	1	37.141	54.338***
	Self: honest	3.414	4.495	1	340.785	677.273***
	Self: accommodating	3.087	2.749	1	33.352	41.859***
	Self: cooperative	2.793	4.215	1	588.942	1282.103***
Type IV (successful data set)	Partner: informative	2.789	3.961	1	401.184	651.232***
	Partner: persuasive	2.855	3.635	1	177.567	283.558***
	Partner: honest	3.008	4.196	1	412.373	909.807***
	Partner: accommodating	2.915	3.268	1	36.304	45.364***
	Partner: cooperative	2.660	4.099	1	604.837	949.913***

Notes. 1. Means in grey are significantly larger; 2. *** $P < 0.001$.

belonging to the cooperative cluster adopt a more cooperative strategy. On the other hand, Types II and IV indicate that subjects in the cooperative cluster consider that their partners adopt a more cooperative strategy.

5.2. Differences between cooperative and noncooperative clusters

5.2.1. Negotiation process and outcomes
We now examine the results of four types of clustering analyses. For the negotiation process, the examined data include days spent on negotiation, number of offers, number of messages, number of rating modifications, number of times graphics were clicked,

difference between the first offer and the expected offer, difference between the first offer and the reserve offer, and control over the negotiation process. Except for "control over the negotiation process," which was collected by postnegotiation questionnaires, all the other behavior was collected from the electronic record of the negotiation process. The negotiation outcome includes assessments of the equivalence between the outcome and initial thoughts, friendliness of negotiation, and satisfaction with performance, all of which were collected from the postnegotiation questionnaires. For the successful data set, this also includes the difference between the first offer and the final agreement in examining the negotiation process, the utility of the final agreement, and the satisfaction with the agreement in examining the negotiation outcome.

Type I: Total data set clustered by negotiators' own strategies
Table 5 lists the results of *t*-tests examining the differences between the two clusters according to the negotiators' own strategies. For the negotiation process, the only significant difference is that the number of offers without messages is higher for the noncooperative cluster than for the cooperative cluster. For the other factors, although there are no significant differences, we can see that the noncooperative cluster tends to have more offers while the cooperative cluster tends to have more messages. Does this imply that those in the noncooperative cluster propose offers more often to push their partners, and that those in the cooperative cluster send more messages to persuade their partners? The significantly higher number of offers without messages in the noncooperative cluster suggests that those in this cluster do not have the patience to persuade their partners by sending offers only. On the other hand, the cooperative cluster sends more messages without offers. Furthermore,

Table 5. Results of *t*-tests on the negotiation process and outcomes of Type I clusters.

| | | Noncooperative | | Cooperative | | | |
		Mean	SD	Mean	SD	*t*	*P*
Negotiation process	Negotiation time (days)	12.265	5.946	12.224	6.001	− 0.127	0.899
	Number of offers without messages (a)	0.446	1.120	0.272	0.810	− 3.173	0.002**
	Number of offers with messages (b)	4.014	1.953	4.110	1.888	0.912	0.362
	Number of messages without offers (c)	1.864	2.593	1.926	2.561	0.441	0.660
	Total number of offers (a+ b)	4.460	1.944	4.381	1.865	− 0.761	0.447
	Total number of messages (b+ c)	5.878	3.625	6.035	3.409	0.823	0.410
	Total number of exchanges (a+ b+ c)	6.324	3.585	6.307	3.441	− 0.089	0.929
	Number of rating modifications	1.542	1.344	1.580	1.446	0.497	0.619
	Number of graphics clicks	7.496	7.721	7.311	7.685	− 0.440	0.660
	Difference between first and expected offers	2.961	2.198	2.724	2.300	− 1.923	0.055
	Difference between first and reserve offers	4.947	2.815	4.909	2.668	− 0.256	0.798
	Control over negotiation process	4.800	1.141	5.019	1.180	3.449	0.001**
Negotiation outcome	Match between outcome and initial thoughts	4.228	1.612	4.706	1.589	5.473	0.000***
	Friendliness of negotiation	4.996	1.442	5.798	1.248	10.734	0.000***
	Satisfied with performance	4.804	1.303	5.330	1.202	7.742	0.000***

Notes. 1. Means in grey are significantly larger; 2. ** $P < 0.01$, *** $P < 0.001$

the noncooperative cluster tends to exhibit a larger gap between their first offer and their expected offer or reserve offer, although this difference is not significant. It appears that those in the noncooperative cluster are more focused on getting as much as possible, which they achieve by starting with an offer that is much better than their expected offer or reserve offer. However, they consider that they have less control over the negotiation process. For the outcome, those in the cooperative cluster consistently exhibit a smaller gap between their outcomes and initial expectations, and feel friendlier about the negotiation and more satisfied with their performance.

Type II: Total data set clustered by the negotiators' thoughts about their partners' strategies
Table 6 lists the results of *t*-tests examining the differences between the two clusters according to the negotiators' thoughts about their partners' strategies. For the offer and message exchanges, only the total number of exchanges is significant. Except for the difference between the first and reserve offers and the control over the negotiation process, the other negotiation process behavior of the noncooperative cluster tends to outnumber that of the cooperative cluster, although none of the differences are significant. Those in the noncooperative cluster consider their partners to be less cooperative; does this imply that they try to send more offers and/or messages, modify ratings, and check the graphics more often in order to get what they want? On the other hand, it is interesting that those in the cooperative cluster – who consider their partners to be more cooperative – send fewer offers and/or messages, but feel that they have significantly more control over the negotiation process. Different from the analysis result of Type I clustering, those in the cooperative cluster tend to have a larger gap between their first offer and their expected offer or reserve offer, although the difference is not significant. This suggests that those

Table 6. Results of *t*-tests on the negotiation process and outcomes of Type II clusters.

		Noncooperative		Cooperative			
		Mean	SD	Mean	SD	*t*	*P*
Negotiation process	Negotiation time (days)	12.508	6.280	12.052	5.748	1.379	0.168
	Number of offers without messages (a)	0.398	0.907	0.303	0.982	1.855	0.064
	Number of offers with messages (b)	4.122	2.092	4.035	1.779	0.813	0.416
	Number of messages without offers (c)	2.043	2.700	1.799	2.476	1.744	0.081
	Total number of offers (a+ b)	4.520	2.062	4.338	1.770	1.717	0.086
	Total number of messages (b+ c)	6.165	3.808	5.834	3.256	1.695	0.090
	Total number of exchanges (a+ b+ c)	6.563	3.818	6.137	3.245	2.179	0.030[*]
	Number of rating modifications	1.603	1.472	1.536	1.355	0.876	0.381
	Number of graphics clicks	7.704	8.130	7.160	7.371	1.297	0.195
	Difference between first and expected offers	2.805	2.342	2.831	2.203	− 0.212	0.832
	Difference between first and reserve offers	4.908	2.873	4.936	2.622	− 0.190	0.850
	Control over negotiation process	4.518	1.262	5.222	1.001	− 11.121	0.000[***]
Negotiation outcome	Match between outcome and initial thoughts	3.929	1.709	4.925	1.407	− 11.488	0.000[***]
	Friendliness of negotiation	4.670	1.422	6.039	1.037	− 19.683	0.000[***]
	Satisfied with performance	4.656	1.358	5.441	1.094	− 11.484	0.000[***]

Notes. 1. Means in grey are significantly larger; 2. [*] *P* < 0.05, [***] *P* < 0.001.

who consider their partners to be more cooperative are more focused on getting as much as possible. For the outcome, those in the cooperative cluster consistently exhibit a smaller gap between their outcomes and initial expectations, and feel friendlier about the overall negotiation activity and more satisfied with their performance.

Type III: Successful data set clustered by the negotiators' own strategies
Table 7 lists the results of *t*-tests examining the differences between the two clusters according to the negotiators' own strategies, but including agreed negotiations only. For the negotiation process, similarly to Type I, the only significant difference is that the number of submitted offers without messages is higher for the noncooperative cluster than for the cooperative cluster. Furthermore, although the difference is not significant, the noncooperative cluster tends to have more offers while the cooperative cluster tends to have more messages. Does this also imply that those in the noncooperative cluster propose offers more often to push their partner, and that those in the cooperative cluster send more messages to persuade their partners?

Those in the noncooperative cluster modify the ratings and check graphics more often. In addition, similar to Type I, the noncooperative cluster tends to have a larger gap between the first and expected or reserve offers, although the difference is not significant. This suggests that those in the noncooperative cluster are more focused on getting as much as possible. For the outcome, those in the cooperative cluster consistently exhibit a smaller gap between their outcomes and initial expectations, and feel friendlier and more satisfied

Table 7. Results of *t*-tests on the negotiation process and outcome of Type III clusters.

		Noncooperative		Cooperative			
		Mean	SD	Mean	SD	*t*	*P*
Negotiation process	Negotiation time (days)	12.083	6.061	11.976	6.041	0.302	0.763
	Number of offers without messages (a)	0.432	1.145	0.278	0.835	2.559	0.011*
	Number of offers with messages (b)	4.144	1.977	4.129	1.864	0.134	0.894
	Number of messages without offers (c)	1.809	2.655	1.937	2.645	−0.822	0.411
	Total number of offers (a+ b)	4.576	1.960	4.407	1.837	1.531	0.126
	Total number of messages (b+ c)	5.953	3.729	6.066	3.506	−0.534	0.593
	Total number of exchanges (a+ b+ c)	6.385	3.672	6.344	3.540	0.198	0.843
	Number of rating modifications	1.606	1.461	1.581	1.471	0.301	0.764
	Number of graphics clicks	7.732	8.000	7.397	7.805	0.726	0.468
	Difference between first and expected offers	2.905	2.256	2.694	2.335	1.560	0.119
	Difference between first and reserve offers	4.884	2.898	4.858	2.720	0.159	0.874
	Difference between first and final agreements	3.635	2.007	3.665	1.902	−0.262	0.793
	Control over negotiation process	4.939	1.069	5.109	1.151	−2.599	0.009**
Negotiation outcome	Utility	67.259	17.832	66.809	19.262	0.409	0.682
	Satisfied with agreement	5.006	1.261	5.385	1.220	−5.215	0.000***
	Match between outcome and initial thoughts	4.562	1.404	4.903	1.447	−4.077	0.000***
	Friendliness of negotiation	5.209	1.343	5.978	1.086	−10.545	0.000***
	Satisfied with performance	4.970	1.229	5.407	1.165	−6.265	0.000***

Notes. 1. Means in grey are significantly larger; 2. * $P <$ 0.05, ** $P <$ 0.01, *** $P <$ 0.001.

with their performance. However, the noncooperative cluster tends to have higher utility of the final agreement, although the difference is not significant. Overall, the two clusters in Types I and III are very similar.

Type IV: Successful data set clustered by negotiators' thoughts about their partners' strategies

Table 8 lists the result of *t*-tests examining the differences between the two clusters according to the negotiators' thoughts about their partners' strategies, but including agreed negotiations only. The differences between the two clusters are almost similar to those of Type II. For the negotiation process, except for those in the cooperative cluster, who exhibit a significantly smaller gap between their first offer and their expected or reserve offer, and consider that they have more control over the negotiation process, all the other items are larger in the noncooperative cluster. However, in addition to the significant difference in the total number of exchanges, as in Type II, Type IV clusters exhibit significant differences in the number of offers without messages, number of messages without offers, total number of offers, total number of messages, and number of graphics clicks.

Again, it is interesting that those in the cooperative cluster send fewer offers and/or messages, but consider that they have significantly more control over the negotiation process. For the outcome, those in the cooperative cluster – who considering their partners to be more cooperative – have a higher utility, more satisfaction with the agreement and their performance, a smaller gap between their outcomes and initial expectations, and feel friendlier about the overall negotiation activity.

Table 8. Results of *t*-tests on the negotiation process and outcome of Type IV clusters.

		Noncooperative		Cooperative			
		Mean	SD	Mean	SD	*t*	*P*
Negotiation process	Negotiation time (days)	12.247	6.458	11.860	5.741	1.072	0.284
	Number of offers without messages (a)	0.372	0.900	0.319	1.026	0.936	0.349
	Number of offers with messages (b)	4.272	2.084	4.039	1.774	2.022	0.043*
	Number of messages without offers (c)	2.076	3.082	1.750	2.290	2.107	0.035*
	Total number of offers (a+ b)	4.644	2.038	4.358	1.770	2.527	0.012*
	Total number of messages (b+ c)	6.348	4.160	5.790	3.126	2.532	0.012*
	Total number of exchanges (a+ b+ c)	6.720	4.153	6.109	3.121	2.779	0.006**
	Number of rating modifications	1.656	1.566	1.546	1.391	1.258	0.209
	Number of graphics clicks	8.187	8.569	7.076	7.337	2.349	0.019*
	Difference between first and expected offers	2.742	2.397	2.807	2.239	− 0.477	0.634
	Difference between first and reserve offers	4.805	2.911	4.914	2.708	− 0.668	0.504
	Difference between first and final agreements	3.702	2.047	3.618	1.871	0.742	0.458
	Control over negotiation process	4.698	1.234	5.279	0.966	− 8.782	0.000***
Negotiation outcome	Utility	65.061	19.158	68.348	18.236	− 3.008	0.003**
	Satisfied with agreement	4.775	1.363	5.548	1.055	− 10.577	0.000***
	Match between outcome and initial thoughts	4.419	1.493	5.006	1.349	− 6.994	0.000***
	Friendliness of negotiation	4.988	1.309	6.137	0.968	− 16.635	0.000***
	Satisfied with performance	4.793	1.315	5.533	1.027	− 10.506	0.000***

Notes: 1. Means in grey are significantly larger; 2. * *P* < 0.05, ** *P* < 0.01, *** *P* < 0.001

Overall discussion

The analysis results as described above indicate that Types I and III are very similar, as are Types II and IV. Table 9 summarizes the similarities and dissimilarities among the results for the four types of clustering. It indicates, for each examined variable, the cluster that has the larger value in each type.

Table 9 indicates that there are several interesting and consistent phenomena among the results of the four types of clustering, although not all of them are statistically significant. A consistent result is that those in the noncooperative clusters (i.e., negotiators who either adopt a less cooperative strategy or consider their partners to be less cooperative) exhibit a longer negotiation time and a larger number of offers without messages, a larger total number of offers, a larger total number of exchanges, and a larger number of graphics clicks. Another phenomenon is that Types I and III exhibit consistent results, whereas those of Types II and IV consistently exhibit reverse results. For example, those in the cooperative cluster of Types I and III have a larger number of messages without offers and a larger total number of messages, whereas Types II and IV exhibit the reverse result. On the other hand, those in the noncooperative cluster of Types I and III tend to have a larger gap between their first offer and their expected offer or reverse offer, but for Types II and IV, those in the cooperative cluster tend to have a larger gap. It would be worthwhile to explore if this implies that negotiators who adopt a less cooperative strategy tend to push their partners by submitting more offers without messages and, on the other hand, if this also implies that negotiators who adopt a more cooperative strategy tend to attempt to persuade their partners by sending more messages without offers.

Finally, another important and consistent phenomenon in the four types of clustering is that those in the cooperative cluster not only consider that they have more control over the negotiation process but also have a higher utility, more satisfaction with the agreement and performance, a smaller gap between their outcomes and initial expectations, and feel friendlier about the overall negotiation activity. The above discussion leads to the following seven propositions:

Proposition 1: Negotiators whose own strategies are less cooperative tend to submit more offers without messages.

Proposition 2: Negotiators whose own strategies are more cooperative tend to send more messages without offers.

Proposition 3: Negotiators who either adopt a more cooperative strategy or consider their partners to be more cooperative consider that they have more control over the negotiation process.

Proposition 4: Negotiators who either adopt a more cooperative strategy or consider their partners to be more cooperative have a smaller gap between their outcome and initial expectation.

Table 9. Comparative results of *t*-tests on the negotiation process and outcomes among the four types of clustering.

	Cluster with the larger value:	Type I	Type II	Type III	Type IV
Negotiation process	Negotiation time (days)	Noncooperative	Noncooperative	Noncooperative	Noncooperative
	Number of offers without messages (a)	Noncooperative**	Noncooperative	Noncooperative*	Noncooperative
	Number of offers with messages (b)	Cooperative	Noncooperative	Noncooperative	Noncooperative*
	Number of messages without offers (c)	Cooperative	Noncooperative	Cooperative	Noncooperative*
	Total number of offers (a+b)	Noncooperative	Noncooperative	Noncooperative	Noncooperative*
	Total number of messages (b+c)	Cooperative	Noncooperative	Cooperative	Noncooperative*
	Total number of exchanges (a+b+c)	Noncooperative	Noncooperative*	Noncooperative	Noncooperative**
	Number of rating modifications	Cooperative	Noncooperative	Noncooperative	Noncooperative
	Number of graphics clicks	Noncooperative	Noncooperative	Noncooperative	Noncooperative*
	Difference between first and expected offers	Noncooperative	Cooperative	Noncooperative	Cooperative
	Difference between first and reserve offers	Noncooperative	Cooperative	Noncooperative	Cooperative
	Difference between first and final agreements	Nil	Nil	Cooperative	Noncooperative
	Control over negotiation process	Cooperative**	Cooperative***	Cooperative**	Cooperative***
Negotiation outcome	Utility	Nil	Nil	Noncooperative	Cooperative**
	Satisfied with agreement	Nil	Nil	Cooperative***	Cooperative***
	Match between outcome and initial thoughts	Cooperative***	Cooperative***	Cooperative***	Cooperative***
	Friendliness of negotiation	Cooperative***	Cooperative***	Cooperative***	Cooperative***
	Satisfied with performance	Cooperative***	Cooperative***	Cooperative***	Cooperative***

Notes. 1. Means in grey are significantly larger; 2. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Proposition 5: Negotiators who either adopt a more cooperative strategy or consider their partners to be more cooperative feel that the negotiation is friendlier.

Proposition 6: Negotiators who either adopt a more cooperative strategy or consider their partners to be more cooperative are more satisfied with their performance.

Proposition 7: Negotiators who have reached an agreement and who either adopt a more cooperative strategy or consider their partners to be more cooperative are more satisfied with the final agreement.

5.2.2. Interrelated negotiators' own strategies and their partners' strategies

Table 10 lists the results of *t*-tests examining the strategies of the two clusters. For Types I and III, because the clusters are partitioned by the negotiators' own strategies, the *t*-test results indicate whether there are significant differences in the negotiators' thoughts about their partners' strategies. For both types, those in the cooperative cluster consider their partners to be significantly more cooperative. For Types II and IV, the clusters are divided by the negotiators' thoughts about their partners' strategies. For both types, those in the cooperative cluster also tend to adopt a more cooperative strategy themselves. Comparing Tables 4 and 10 reveals the presence of a high correlation between the strategies of negotiators and their partners. Those in the cooperative cluster who adopt a more cooperative strategy tend to consider that their partners also adopt a more cooperative strategy, and vice versa.

Table 11 is the cross-table of different clusters resulting from Type I and Type II clustering. Because Type I clusters are divided by negotiators' own strategies while Type II clusters are divided by the negotiators' thoughts about their partners' strategies, the table is similar to the dual-negotiation orientations model shown in Figure 1. Therefore, each grid can be defined as in Figure 1. The Pearson chi-square is 77.994, and $P = 0.000$, which demonstrates that there is a significant correlation between negotiators' own strategies and their thoughts about their partners' strategies. Similarly, Table 12 is the cross-table of different clusters resulting from Type III and Type IV clustering. The Pearson chi-square is 71.09, and $P = 0.000$, which demonstrates that for negotiations reaching agreement, the negotiators' own strategies are significantly correlated with their thoughts about their partners' strategies. In both cases, dual orientations to cooperative strategies are the most popular, especially in agreed negotiations.

The above findings lead to the following two propositions:

Proposition 8: Negotiators' own strategies and their thoughts about their partners' strategies are correlated.

Proposition 9: Negotiators' own strategies and their partners' own strategies are correlated.

5.2.3. Negotiation strategies and final agreements

The reason for adopting particular negotiation strategies is generally to reach the desired agreement irrespective of whether the negotiators are concerned with their own or others'

Table 10. Results of *t*-tests on strategies of two clusters resulting from the four types of clustering.

Type	Examined variable		Noncooperative		Cooperative		*t*	*P*
			Mean	SD	Mean	SD		
I	Q18: Thoughts about	Partner: informative	3.154	0.964	3.544	1.025	7.222	0.000***
	partners' strategies	Partner: persuasive	3.073	0.814	3.371	0.928	6.342	0.000***
		Partner: honest	3.358	0.901	3.777	0.940	8.306	0.000***
		Partner: accommodating	3.058	0.839	3.071	0.995	0.247	0.805
		Partner: cooperative	3.062	1.049	3.577	1.150	8.639	0.000***
II	Q11: Negotiators'	Self: informative	3.638	0.876	3.937	0.768	− 6.580	0.000***
	own strategies	Self: persuasive	3.454	0.890	3.710	0.817	− 5.464	0.000***
		Self: honest	3.798	0.938	4.194	0.826	− 8.120	0.000***
		Self: accommodating	2.892	0.828	2.896	0.949	− 0.089	0.929
		Self: cooperative	3.367	0.982	3.763	0.961	− 7.467	0.000***
III	Q18: Thoughts about	Partner: informative	3.243	0.920	3.640	0.978	− 7.085	0.000***
	partners' strategies	Partner: persuasive	3.134	0.803	3.438	0.908	− 6.117	0.000***
		Partner: honest	3.450	0.843	3.884	0.882	− 8.540	0.000***
		Partner: accommodating	3.108	0.808	3.133	0.976	− 0.499	0.618
		Partner: cooperative	3.213	0.986	3.708	1.074	− 8.138	0.000***
IV	Q11: Negotiators'	Self: informative	3.640	0.848	3.963	0.782	− 6.732	0.000***
	own strategies	Self: persuasive	3.473	0.852	3.735	0.824	− 5.362	0.000***
		Self: honest	3.789	0.915	4.238	0.817	− 8.777	0.000***
		Self: accommodating	2.871	0.815	2.898	0.967	− 0.528	0.598
		Self: cooperative	3.404	0.965	3.794	0.948	− 6.954	0.000***

Notes. 1. Means in grey are significantly larger; 2. *** $P < 0.001$.

Table 11. Cross-table of different clusters resulting from Type I and Type II clustering.

		Type II- Clustered by thoughts about partners' strategies	
		Noncooperative	Cooperative
Type I- Clustered by self-strategies	Noncooperative	314 (22.66%) (*competitor*)	251 (18.11%) (*exploiter*)
	Cooperative	261 (18.83%) (*yielder*)	560 (40.40%) (*cooperator*)

Pearson chi-square $= 77.994$, asymp. sig. (two-sided) $= 0.000$***.

benefits. Is there a strategy that makes it easier to reach agreement? In order to answer this, the clustering method was applied to the total data sets for Types I and II, which includes nonagreed and agreed negotiations. Table 13 is the cross-table of Type I clusters and negotiation outcomes. The proportion test was applied in order to determine if there was any correlation between strategies and final agreements: the results were $z = 3.188$ and $P = 0.001$. Table 13 implies that the proportion of negotiations reaching agreement is larger for the cooperative cluster than for the noncooperative cluster.

Similarly, Table 14 is the cross-table of Type II clusters and negotiation outcomes. The results of the proportion test were $z = 9.194$ and $P = 0.000$. Therefore, Table 14 also implies that the proportion of negotiations reaching agreement is larger for the cooperative cluster than for the noncooperative cluster.

Table 12. Cross-table of different clusters resulting from Type III and Type IV clustering.

		Type IV- Clustered by thoughts about partners' strategies	
		Noncooperative	Cooperative
Type III- Clustered by self-strategies	Noncooperative	274 (27.87%) (*competitor*)	219 (22.28%) (*exploiter*)
	Cooperative	223 (18.49%) (*yielder*)	490 (49.85%) (*cooperator*)

Pearson chi-square = 71.09, asymp. sig. (two-sided) = 0.000***.

Table 13. Type I clusters*agreement cross-tabulation.

	Agreement					
	Failure		Success		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Noncooperative	93	16.46%	472	83.54%	565	40.76%
Cooperative	87	10.60%	734	89.40%	821	59.24%
Total	180	12.99%	1206	87.01%	1386	100.00%

Table 14. Type II clustering*agreement cross-tabulation.

	Agreement					
	Failure		Success		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Noncooperative	137	23.83%	438	76.17%	575	41.49%
Cooperative	43	5.30%	768	94.70%	811	58.51%
Total	180	12.98%	1206	87.01%	1386	100%

Overall, the results in Tables 13 and 14 are consistent with the findings in Section 5.2.1 that those in the cooperative cluster always consider that they have more control over the negotiation process. This lead to the following proposition:

Proposition 10: The proportion of negotiations reaching agreement is greater for the cooperative cluster than for the noncooperative cluster irrespective of whether they are clustered by negotiators' own strategies or by thoughts about their partners' strategies.

6. Conclusions

The aim of this study was to improve our understanding of negotiation strategies, behaviors, and outcomes, and the relationships between these factors based on data collected from questionnaires and the actual behavior observed during a negotiation process implemented using an e-negotiation system, and the negotiation outcomes. We first used clustering to

divide negotiators into two clusters: cooperative and noncooperative. Based on the clustering results, we analyzed how the negotiation strategy relates to the negotiation process and outcomes. We found that negotiators whose own strategies are less cooperative tend to submit more offers but fewer messages. However, it turns out that these people consider that they have less control over the negotiation process compared with those who adopt a more cooperative strategy, who make fewer offers but send more messages. Those in the cooperative cluster always feel friendlier about the negotiation and more satisfied with the outcome and their performance. We also found a correlation between the negotiators' own strategies and their thoughts about their partners' strategies. Such a correlation also exists between negotiation strategies and the final agreement. Moreover, the proportion of negotiations that reach agreement is higher for those in the cooperative cluster who either adopt cooperative strategies or consider their partners to be more cooperative. Ten propositions have been proposed based on these findings.

Future studies should attempt to elucidate the negotiation dance from the sequence and pace of all offers and messages. The empirical results of the Thomas-Kilmann model indicate that negotiators may exhibit different mixtures of orientations based on the degree of concern about their own outcome and those of others. How and why negotiators change their strategies during the negotiation process is a very interesting and important research issue, which could be addressed by using content analysis to examine the messages and offers exchanged between negotiators during the negotiation process. Bui et al. (1997–1998) have proposed a structuring language, ARBAS, that incorporates an argumentation scheme for presenting ideas and allows users to defend their interests and take actions. If such a structuring language can be embedded into an e-negotiation, this may allow us to easily understand the transitions between different strategies during the negotiation process. This would reveal more about how negotiators determine their strategies and how the strategies are transferred into actions. Finally, how the negotiation dance can contribute to the final agreement is another interesting issue for future work.

Acknowledgements

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