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Understanding Behavior and Perception of Negotiators from Their Strategies

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Abstract

An e-negotiation system allows the entire negotiation process and outcomes to be collected easily, in addition to collecting the negotiators' perceptions by questionnaire. This study clustered the data collected from an operational e-negotiation system (Inspire) based on the strategies used by negotiators: either their own strategies or their thoughts about those of their partners. This resulted in a division into cooperative and non-cooperative clusters. We found that those in the non-cooperative cluster push more by proposing more offers whilst providing fewer messages. However, these people consider that they have less control over the negotiation process. Those in the cooperative cluster consistently feel friendlier about the negotiation and more satisfied with the outcome and their performance. Further, there is interdependence not only between self-strategies and the thoughts about partners' strategies but also between strategies and final agreements. The proportion of negotiations reaching agreement is larger for the cooperative cluster than for the non-cooperative cluster.

1. Background and motivation

According to Lax and Sebenius [16], 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., 1, 8, 9, 13, 29] 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.

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 [29]. Collecting and analyzing all behavior data obtained during the negotiation process and about the negotiation result 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 [13, 29], proposing NSS frameworks [8, 18, 19], studying the impact of demographic backgrounds [28], and assessing the effects of different levels of e-negotiation support on negotiation behavior and outcomes [22]. Diverse research methods have been applied [3], including experiments [2], surveys [25], content analyses [10], and data mining [14]. 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 will be better for elucidating 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 [8]? Answers to these questions will shape a negotiator's strategy [4]. In other words, negotiation behavior is often described in terms of different strategies [20], and it is thought that a negotiator's strategy can be determined from his negotiation behavior. Many studies have investigated negotiation strategies [4, 6, 7, 8, 16, 26], but most have been theoretical or based on data obtained only from questionnaires. Inspire is an operational e-negotiation system since 1996. It has collected a large number of records of negotiation activities. Their analysis is included here to improve our understanding of the actual behavior of negotiators in a negotiation process.

2. Research purpose

During e-negotiation we can record any message and offers communicated between/among the negotiators and the time of these communications. Because negotiation behavior is derived from negotiator's 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 cases, 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. 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 [5]. 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 [15].

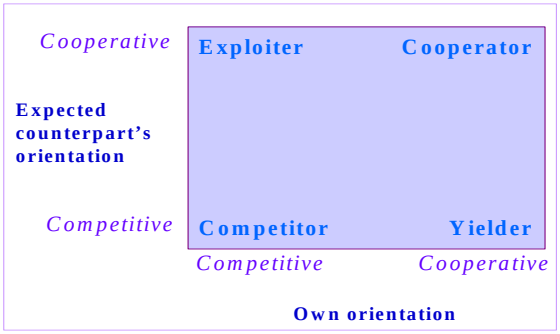

Figure 1. Dual negotiation orientations [15]

An interesting question is whether a negotiator has only one orientation or a mixture of two or more [15]. Kelley and Stahelski [12] suggest that negotiators are either collaborators or competitors, whereas others consider that negotiators can exhibit a mixture of these two orientations [17, 23]. The empirical results of the Thomas-Kilmann model indicate that negotiators may exhibit different mixtures of orientations [27]. This has lead to a dual-concerns model being proposed [15, 17, 24], 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 collaborator – based on whether the orientation of oneself and the expected counterpart's orientation are competitive or cooperative [15].

Pruitt and Carnevale [20] argued that negotiation behavior is often described in terms of different strategies. Holsapple et al. [8] also point out that the negotiation process involves a series of state changes resulting from the selection of strategies and movements, which Raiffa [21] 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.

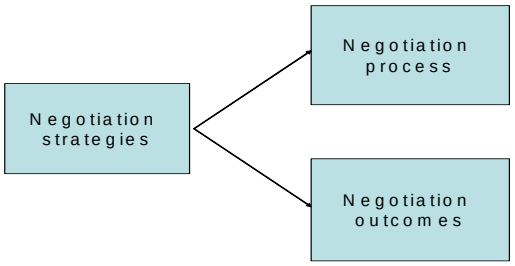

Figure 2. Conceptual research framework

4. Data Collection

4.1 Inspire System

The Inspire system implements a three phase-model of negotiations: pre-negotiation, negotiation, and post-negotiation. In the pre-negotiation 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 process and provides a negotiation history as well as a graphical visualization of the negotiation dynamics. It presents process information symmetrically to both parties in a manner where each party can see only their own ratings (utilities). After the parties agree upon a compromise, the post-negotiation phase is suggested if is compromise is inefficient. The system presents up to five more efficient alternatives, and the negotiators may continue their negotiation until they reach an efficient compromise.

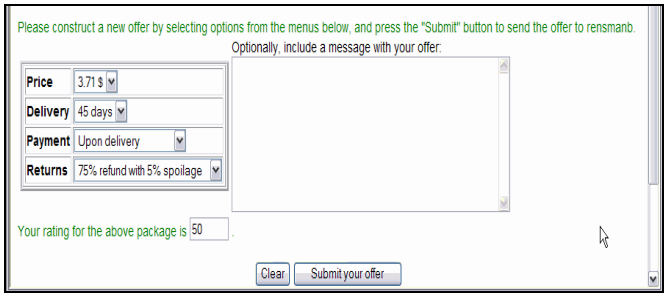

Figure 3. Offer formulation in the Inspire system

4.2 Negotiation Case

This case study 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, respectively, and 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. At any point in time, the user may terminate the negotiation.

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 pre-negotiation questionnaires, negotiation processes, and post-negotiation questionnaires.

The pre-negotiation questionnaire is used to collect data on the negotiator's basic demographic data, negotiation experience, and thoughts and expectations about the negotiation.

The post-negotiation questionnaire contain questions regarding the negotiators' perceptions of their counterparts, the process and the outcomes they achieved, the strategies they used, their observations regarding their counterparts' strategies. This questionnaire also collects data about and negotiators' satisfaction with the system functions.

In addition to pre- and post-negotiation questionnaires, we also collected data on the negotiation behavior during the negotiation process, such as offers, messages, graphics clicks, final agreement, and

utilities. The profile of all the subjects is displayed in Table 1.

Table 1. Demographic statistics of all subjects

		Subjects	
		Number	**Percent**
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
	Europe/others	723	52.16
Used an NSS before	No	1234	89.03
	Yes	152	10.97

5. Data Analysis

5.1 Clustering Result

There are two categories for the subjective assessment of the negotiation strategies available in the post-negotiation questionnaire:

(i) Asking the negotiators' about the strategy they used; and

(ii) Asking the negotiators' for their opinion of the strategy used by their counterparts.

Each of these two categories has five assessment items: informative, persuasive, honest, accommodating, and cooperative.

A negotiation is an interactive activity in which a negotiator's strategy may depend on his partner's strategy [8]. Therefore, clustering analysis was implemented based on two data items:

(i) The negotiators' own strategies (Q11 in the post questionnaire), and

(ii) The negotiators' perceptions of their counterparts' strategies (Q18 in the post questionnaire).

Furthermore, in addition to applying clustering analysis to the total set of data, we also applied it to the successful data set that comprised agreed negotiations only. The four types of clustering analyses are summarized as Table 2.

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	
III	Q11: Negotiators' own strategies	Successful data set
IV	Q18: Negotiators' thoughts about their partners' strategies	

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 [11].

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 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 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.

Table 4. ANOVA results from applying clustering analysis

Data Set	Strategy variables for clustering	Non-cooperative	Cooperative	df	Mean square	*F*
		Mean	Mean			
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***

Note: 1. means in blue ones are significantly larger; 2. *** $P<0.001$

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 post-negotiation questionnaire, 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 post-negotiation questionnaire. 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 when examining the negotiation out-

come.

(1) 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 noncooperative cluster has more offers without messages than does 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 may imply 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, 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 people in the noncooperative cluster try to get as much as possible. 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 outcome and initial expectation and feel friendlier about the negotiation and more satisfied with their performance.

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

		Noncooperative		**Cooperative**		***t***	***P***
		Mean	**SD**	**Mean**	**SD**		
Process	Negotiation time (days)	12.265	5.946	12.224	6.001	-0.127	0.899
	Number of offers without message (a)	0.446	1.120	0.272	0.810	-3.173	0.002**
	Number of offers with message (b)	4.014	1.953	4.110	1.888	0.912	0.362
	Number of messages without offer (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 clicked	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
Outcome	Control over negotiation process	4.800	1.141	5.019	1.180	3.449	0.001**
	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***

Note: 1. means in blue ones are significantly larger; 2. ** $P<0.01$, *** $P<0.001$

(2) 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 offer and the control over the negotiation process, the other 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? 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. Similarly, those in the noncooperative 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 may imply that people in the noncooperative cluster try to get as much as possible. For the outcome, there is a consistently smaller gap for those in the cooperative cluster between their outcome and initial expectation, and that they feel friendlier about the negotiation activity and more satisfied with their performance.

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

		Noncooperative		**Cooperative**		***t***	***P***
		Mean	**SD**	**Mean**	**SD**		
Process	Negotiation time (days)	12.508	6.280	12.052	5.748	1.379	0.168
	Number of offers without message (a)	0.398	0.907	0.303	0.982	1.855	0.064
	Number of offers with message (b)	4.122	2.092	4.035	1.779	0.813	0.416
	Number of messages without offer (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 clicked	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
Outcomes	Control over negotiation process	4.518	1.262	5.222	1.001	-11.121	0.000***
	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***

Note: 1. means in blue ones are significantly larger; 2. * $P<0.05$, *** $P<0.001$

(3) 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. Similarly to Type I, the only significant difference is that the noncooperative cluster has more offers without messages than does 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?

People in the noncooperative cluster modify the ratings and check graphics more often. In addition, the noncooperative cluster tends to have a larger gap between the first and expected or reserve offers, although the difference is not significant. This implies that people in the noncooperative cluster try to get 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 with their performance. However, the noncooperative cluster tends to have higher utility of the final agreement, although the difference is not significant. Overall, two clusters in Types I and III are very similar.

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

		Non-cooperative		Cooperative		t	P
		Mean	SD	Mean	SD		
Process	Negotiation time (days)	12.083	6.061	11.976	6.041	0.302	0.763
	Number of offers without message (a)	0.432	1.145	0.278	0.835	2.559	0.011*
	Number of offers with message (b)	4.144	1.977	4.129	1.864	0.134	0.894
	Number of messages without offer (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 clicked	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
Outcomes	Control over negotiation process	4.939	1.069	5.109	1.151	-2.599	0.009**
	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***

Note: 1. means in blue ones are significantly larger; 2.* $P<0.05$, ** $P<0.01$, *** $P<0.001$

(4) 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 similar to those of Type II, in that the numbers of offers and/or messages, rating modifications, and graphics clicks are larger in the non-cooperative cluster. A unique phenomenon that differs from the above results is that almost all the behaviors differ significantly between the two clusters, except for the number of offers without message and rating modifications. Those in the non-cooperative 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?

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

		Noncooperative		Cooperative		t	P
		Mean	SD	Mean	SD		
Process	Negotiation time (days)	12.247	6.458	11.860	5.741	1.072	0.284
	Number of offers without message (a)	0.372	0.900	0.319	1.026	0.936	0.349
	Number of offers without message (b)	4.272	2.084	4.039	1.774	2.022	0.043*
	Number of messages without offer (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
Outcomes	Control over negotiation process	4.698	1.234	5.279	0.966	-8.782	0.000***
	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***

Note: 1. means in blue ones are significantly larger; 2. * $P<0.05$, ** $P<0.01$, *** $P<0.001$

Another unique phenomenon is that those in the cooperative cluster tend to have a larger gap between their first offers and their expected offers or reserve offers, although the difference is not significant. Again, it is interesting that people 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 consistently have a higher utility, more satisfaction with the agreement and performance, a smaller gap between their outcome and initial expectation, and feel friendlier and more satisfied with their performance.

5.2.2 Interrelated negotiators' own strategies and their counterparts' strategies

Table 9 lists the results of *t*-tests examining the strategies of the two clusters. Those in the cooperative cluster always intend to be more cooperative, with all the differences except for "accommodating" being significant. For Types I and III, because the clusters are clustered by the negotiators' own strategies, the *t*-test results in Table 9 indicate if there are significant differences in the negotiators' thoughts about their partners' strategies. For both types, those in the cooperative cluster consider their partners' significantly more cooperative. For Types II and IV, the clusters are divided by negotiators' thoughts about their partners' strategies. For both types, people in the cooperative cluster also themselves adopt a more cooperative strategy. Comparing Tables 4 and 9 reveals that the negotiators' own strategies and their partners' strategies are highly correlated.

Table 9. Results of *t*-tests on strategies of two clusters resulting from the four types of clustering

Type			Noncooperative		Cooperative		t	P
			Mean	SD	Mean	SD		
I	Q18: Thoughts about partners' strategies	Partner: informative	3.154	0.964	3.544	1.025	7.222	0.000***
		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' own strategies	Self: informative	3.638	0.876	3.937	0.768	-6.580	0.000***
		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 partners' strategies	Partner: informative	3.243	0.920	3.640	0.978	-7.085	0.000***
		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' own strategies	Self: informative	3.640	0.848	3.963	0.782	-6.732	0.000***
		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***

Note: 1. means in blue ones are significantly larger; 2. *** $P<0.001$

Table 10 is the cross-table of different clusters resulting from Type I and Type II clustering. Because Type I clusters are clustered by negotiators' own strategies while Type II clusters are clustered by the negotiators' thoughts about 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 the negotiators' own strategies are dependent on their thoughts about partners' strategies. Similarly, Table 11 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 also dependent on their thoughts about partners' strategies. In both cases, dual orientations to cooperative strategies are the most popular, especially in agreed negotiations.

Table 10. Cross-table of different clusters resulting from Type I and Type II clustering

	Type II	Clustered by thoughts about partners' strategies	
	Type I	Noncooperative	Cooperative
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***

Table 11. Cross-table of different clusters resulting from Type III and Type IV clustering

	Type IV	**Clustered by thoughts about partners' strategies**	
	Type III	**Noncooperative**	**Cooperative**
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***

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' benefits. Is there a strategy that makes it easier to reach agreement? In order to answer this, the clustering technology was applied to the total data sets for Types I and II, which includes non-agreed and agreed negotiations. We attempted to determine if there was any relation between strategies and final agreements. Table 12 is the cross-table of strategy clusters of Type I and negotiation outcomes. The following hypothesis was examined by the proportion test:

Ha1: The proportion of negotiations reaching agreement is not greater for the cooperative cluster than for the noncooperative cluster when the two clusters are clustered by negotiators' own strategies.

The results were z=3.188 and P=0.001, and hence hypothesis Ha1 is rejected. That is, the proportion of negotiations reaching agreement is larger for the cooperative cluster than for the noncooperative cluster. Similarly, Table 13 is the cross-table between strategy clusters of Type II and negotiation outcomes. The following hypothesis was examined by the proportion test:

Ha2: The proportion of negotiations reaching agreement is not greater for the cooperative cluster than for the noncooperative cluster when the two clusters are clustered by what negotiators think about their partners' strategies.

The results are z=9.194 and P=0.000, and hence hypothesis Ha2 is also rejected. That is, the proportion of negotiations reaching agreement is larger for the cooperative cluster than for the noncooperative cluster. Overall, both results are consistent with the findings in Section 5.2.1 that people in the cooperative cluster always consider that they have more control over the negotiation process.

Table 12. Type I clusters*agreement cross-tabulation

	Agreement				**Total**	
	Failure		**Success**			
	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 13. Type II clustering*agreement cross-tabulation

	Agreement				**Total**	
	Failure		**Success**			
	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%

6. Conclusions

The aim of this study was to improve our understanding of negotiation strategies, behaviors, and outcomes, and the relationships between these factors. We first used clustering to divide negotiators into two clusters: cooperative and non-cooperative. We found that people in the non-cooperative cluster push more by proposing more offers but whilst using fewer messages. However, it turns out that these people consider that they have less control over the negotiation process compared with those in the cooperative cluster, 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 an interdependence between the negotiators' own strategies and their thoughts

about their partners' strategies. Such an interdependence also exists between larger strategies and the final agreement. Moreover, the proportion of negotiations that reach agreement is higher for the cooperative cluster.

Future studies should attempt to elucidate the negotiation dance from the sequence and pace of all offers and messages. This will reveal more about how the strategies to be transferred into actions and how to determine the strategies of a negotiator from his actions. In addition, how the negotiation dance can contribute to the final agreement is another interesting issue for future work.

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