Measuring ENS Success: User Satisfaction, Technology Acceptance and Strategic Analysis ♦

Eva Chen and Gregory E. Kersten

John Molson School of Business, Concordia University
Montreal, Quebec, Canada

Abstract

Over the years there has been much debate over the assessment of information systems (IS) success. The two leading paradigms are user satisfaction and technology acceptance. However, for the field of e-commerce a strategic perspective must also be incorporated into the theories to explain behavior. This paper integrates two approaches by examining the relationships among the usefulness of system features, user satisfaction, intention to use and strategic analysis on performance. The proposed model is tested with an electronic negotiation system (Inspire) in an internet field experiment with over 5,000 participants in 53 different countries. The system features consist of analytical, communication and graphical tools.

Keywords: Electronic negotiation systems, information systems success, user satisfaction, technology acceptance model, strategic analysis, Inspire, system features.

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1. Introduction

The growth of e-commerce has engendered the digitalization of the activities surrounding the supply chain. One of the key activities in the electronic transactional life-cycle is negotiation [2]. In the context of e-procurement, e-negotiation is the dialogue of buyer(s) and seller(s) under conditions of interdependent decision-making with the goal or achieving a settlement for the purchase of a good or service over the internet.

Electronic negotiation systems (ENS) have been developed to assist e-market participants negotiate by providing communication and decision support aids [16]. Educational ENS (Inspire [13], eAgora [4], Negoisst [14], WebNS [26]) and commercial ENS (www.smartsettle.com) offer users with various features such as dialogue windows, utility analysis and graphical representations to enhance their performance. However, there is much debate over the usefulness of these features on ENS success [12, 14, 16, 23].

This paper aims to explore the effect of ENS features by combining three different perspectives of technology acceptance, user satisfaction and strategic analysis to measure performance. The next section describes Inspire, one of the earliest ENS (Section 2). The complementary perspectives on system success are then presented (Section 3). The research model and hypotheses are then defined (Section 4).

In the methodology section, the case and data collection methods are detailed (Section 5). The subsequent section presents the results and discussion (Section 6) followed by the conclusion and future directions (Section 7).

2. Inspire Negotiation System

Developed in 1995 to support multi-issue, bilateral bargaining, Inspire (http://interneg.org/inspire) allows participants to conduct negotiation in three phases: pre-negotiation, negotiation and post-settlement [13]. The decision-support consists of constructing an individual utility function based on conjoint analysis and discrete optimization. The communication aid involves a messaging feature that may or may not be accompanied by an offer.

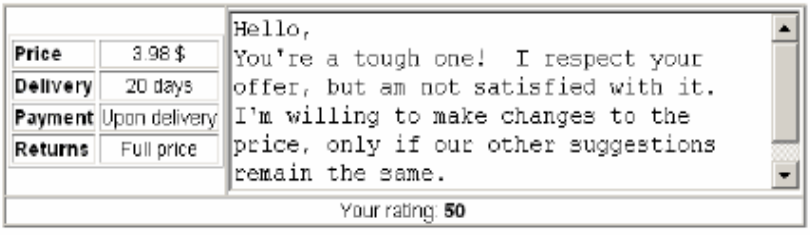

Figure 1. Offer, message and utility rating

In pre-negotiation, users' preferences for issues, which are the attributes in the negotiation, are elicited to define the choice set of a discrete utility function. During negotiation, offers are exchanged along with messages, which maybe employed by users as part of their strategy. For example, Figure 1 illustrates an offer comprising of four issues (purchase price, delivery period, payment method and return policy), a message and the individualized utility rating for the offer.

As an additional decision-aid, Inspire provides graphical representation of the negotiation dynamics based on the utility ratings of offers send and offers received versus time, as shown in Figure 2.

Negotiators can access their history graph throughout the negotiation process to help them strategize [10, 16]. In post-settlement, Inspire calculates the Pareto efficiency of the agreement and suggest improvement when possible. Negotiators are given the choice to jointly accept the suggestions recommended or to retain their initial agreement.

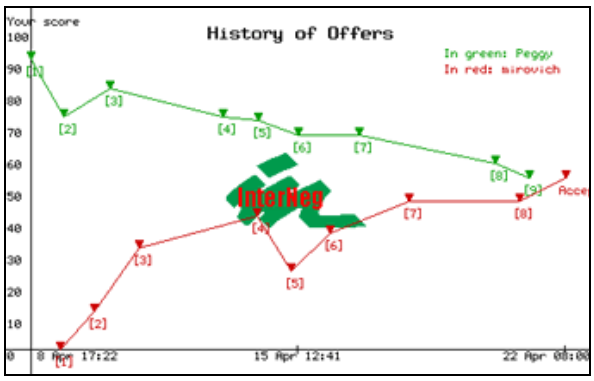

Figure 2. History graph representing offers and counter-offers

Vetschera et al. (2003) studied the utility rating and messaging features in order to determine their effect on system assessment, which is theorized to influence intention to use. The results of the study stressed the importance of examining ENS features separately, as opposed to looking at the system as a whole, because users evaluate the system differently based on dissimilar perceptions of the system features.

3. System success perspectives

Over the years, researchers in information technology (IT) have developed two main perspectives on appraising the business value realizable by the deployment of technology. On one hand, the focus is on usability as a measure of technology acceptance [5]. On the other hand, the emphasis is user satisfaction as a predictor not of system usage, but rather of IT value as benefits achieved through usage [19]. However, one important factor that is not measured in many empirical ENS studies [14, 15, 23, 24] is the strategic support by these e-market-based systems. Thus strategic analysis provides another perspective to assessing ENS success

3.1 Use perspective

Based on the theory of reasoned action [9], Davis (1989) developed the technology acceptance model (TAM) to predict user's behavior towards a technology introduced in an organizational setting. The key variables are:

Perceived usefulness is the degree to which the user believes that employing the system enhances his or her performance.

Perceived ease of use is the degree to which the person believes that using the system is free of effort.

Attitude towards usage is the psychological tendency expressed by the user as a positive or negative response to the system.

Intention to use is extent to which the person considers the possibility of using the system

The relationships among the variables of TAM are described in Figure 3.

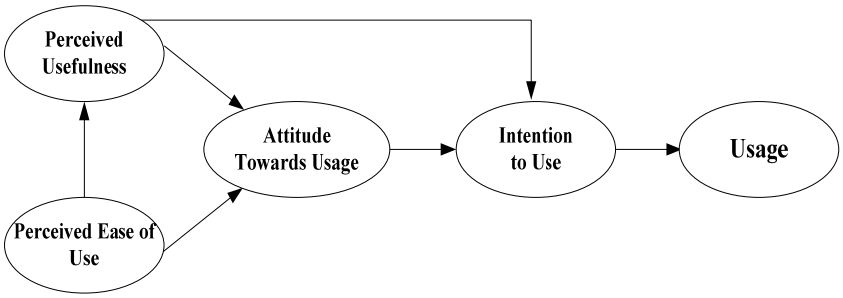

Figure 3. Technology acceptance model (reproduced from [5])

Regardless of the widespread research on TAM, many investigators argue that the model treats technology as a black box without examining the features of the system [25]. However, two studies [14, 24] using a modified model of TAM to include the communication and analytical features showed the importance of these features on explaining users' perception of ENS. On the other side of TAM, it is unclear as to the consequences of usage.

Trice and Treacy (1988), also influenced by the theory of reasoned action [9], contend that utilization is only an intervening variable because the true measure of system success is derived from an improvement in performance through the use of IT. As a result, utilization, which is affected by features of the system, ultimately impacts performance. Conversely, the notion of intention to use is derived from the perception of performance captured in the perceived usefulness of the system or to the extent its features. Therefore, the relationship between intention to use and performance appears to be reciprocal, where one's intention to use a system is dynamically reinforced by one's performance.

3.2 Satisfaction Perspective

User satisfaction has long been linked to usefulness [1, 8, 11], but the relationship between satisfaction and system success was only illuminated by the DeLone and McLean model proposed in 1992 [7].

At first, DeLone and McLean suggested a holistic model, which was both variance and process, based on an extensive review of measures in systems success [7]. Afterwards, DeLone and McLean clarified their position by suggesting a casual model for e-commerce system based on numerous studies examining the first model [6]. They emphasize on the following key variables:

> *System quality* is the user's object-based belief of the system, such as reliability, flexibility, integration, accessibility and timeliness.
>
> *Information quality* is the user's object-based belief of the information provided by the system, in terms of completeness, accuracy, format and currency.

Perceived usefulness is defined in the same manner as in TAM [5].

User satisfaction is user's subjective evaluation of the entire experience from using the system.

Net benefits is the impact realized by the user (i.e. performance achieved from using the system).

The relationships among these variables are illustrated in Figure 4.

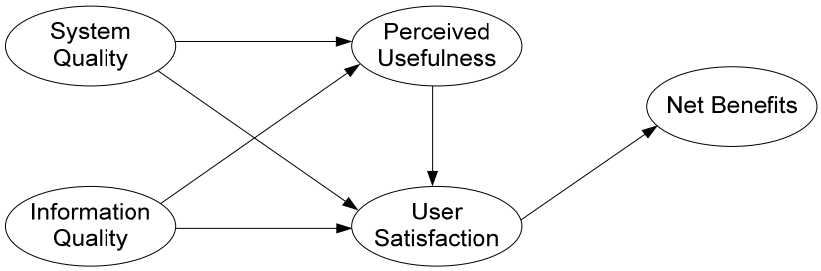

Figure 4. DeLone and McLean Model, Adapted from [6]

The intention of the satisfaction perspective is not to assess usage, which would explain its poor predictability of system usage, but rather to reflect an attitude on the outcome derived from using the system [6-8, 25]. User Satisfaction was shown to increase for ENS when a decision support tool such as a software agent was provided to assist users in complex (i.e. multi-issue) negotiations [4]. Moreover in the same study, satisfaction was highly correlated with negotiation performance, but the other features of ENS (communication and graphical representation) were not investigated

3.3 Strategy Perspective

Drawing from the field of economics, the strategic perspective is essential in the context of e-commerce negotiations because bargaining is an activity that involves interaction with a counter-part over the conditions for the exchange of a good or service. Therefore, the competitive environment must also be considered along with the internal processes leading to performance [17].

A primary objective of strategic analysis is to understand and predict the opponent in the marketplace [18, 20], thus Lim and Benbasat [16] strongly emphasized that ENS should provide this type of decision-support. Nevertheless for ENS, perceptions of strategic analysis have not been studied in terms of antecedents (such as system features providing strategic analysis) and successor (i.e. the effect of strategic analysis on negotiation performance).

4. Research Model

The purpose of this study is to examine the usefulness of system features (history graph, communication and utility rating) affecting the three perspectives of system success (in terms of intention to use, satisfaction with outcome and strategic analysis) as well as these perspectives' impact on performance, as the final dependent variable measuring ENS success. In order to accomplish this

goal, Figure 5 presents the research model illustrating the encompassing variables for consideration.

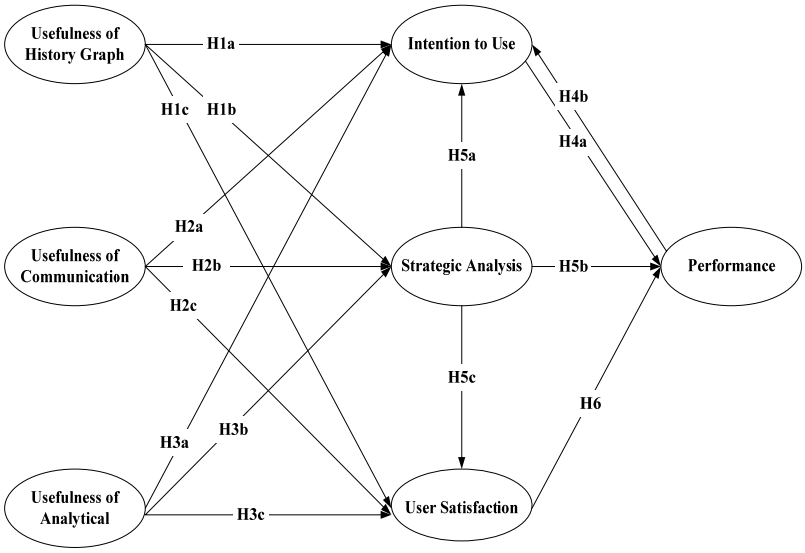

Figure 5. Research model

4.1 Independent variables

Independent variables consist of the usefulness of the main ENS features provided by Inspire to assist negotiators in decision-making and communication needs. The *usefulness of each feature* refers to the extent of which the user finds the feature helpful in conducting negotiation.

Based on the TAM [5] and the DeLone and McLean model [7], where *perceived usefulness* leads to *intention to use* and *user satisfaction* respectively of the models. The *usefulness of each feature* is hypothesized to affect *intention to use* (the extent to which the negotiator considers the possibility of using ENS in the future) and *user satisfaction* (the subjective evaluation of the entire experience derived from using ENS). Furthermore, *strategic analysis*, which is the extent negotiators understand and are able to predict the counter-part, is also influenced by the *usefulness of each feature*.

Therefore, the following hypotheses are proposed:

H1a: Usefulness of history graph will have a positive direct effect on intention to use.

H2a: Usefulness of communication will have a positive direct effect on intention to use.

H3a: Usefulness of utility rating will have a positive direct effect on intention to use.

H1b: Usefulness of history graph will have a positive direct effect on strategic analysis.

H2b: Usefulness of communication will have a positive direct effect on strategic analysis.

H3b: Usefulness of utility rating will have a positive direct effect on strategic analysis.

H1c: Usefulness of history graph will have a positive direct effect on user satisfaction.

H2c: Usefulness of communication will have a positive direct effect on user satisfaction.

H3c: Usefulness of utility rating will have a positive direct effect on user satisfaction.

4.2 Intervening variables

Intervening variables are comprised of the leading variables in each of the three perspectives hypothesized to affect performance. Given that *intention to use* and *performance* assume a reciprocal relationship, the following hypotheses are suggested:

H4a: Intention to use will have a positive direct effect on performance.

H4b: performance will have a positive direct effect on intention to use.

Furthermore in theory, Strategic analysis enabled by ENS features allows users to achieve better negotiation outcome, such that they would be more satisfied with their outcome and express a desire to use the system in the future [16]. We conjecture the following relationships:

H5a: Strategic analysis will have a positive direct effect on intention to use.

H5b: Strategic analysis will have a positive direct effect on performance.

H5c: Strategic analysis will have a positive direct effect on satisfaction with outcome.

Following the DeLone and McLean Model [6], User satisfaction ensues in the subsequent manner:

H6: User satisfaction will have a positive direct effect on performance.

4.3 Dependent variable

Dependent variable is *performance*, which is the objective outcome negotiated by the user. Therefore, in line with other studies, performance is seen as the determinant for system success because users are able to achieve high results as it is intended by the system [6, 7, 16, 22].

5. Methodology

The research model is assessed using a field experiment over the Internet. Participants are first required to answer a pre-questionnaire over their background information and expectation about the negotiation. Then they are provided with a procurement case to negotiate bilaterally over the course of three weeks, followed by a non-compulsory post-questionnaire.

The participants are free to decide over their preferences, strategy and tactics in a negotiation concerning a bicycle part procurement case. The multi-issue discussion involves: the price of the bicycle component, the delivery period, the payment schedule and the return policy for defective parts.

The moment users are registered in Inspire, they are given access to the decision and communication features to help them bargain following the three phases of negotiation. They exchange offer packages

and messages with hopes of reaching and agreement, which can be further improved on by the optional post-settlement mechanism. Nevertheless, the negotiation session may also be terminated by either one party walking away from the table or after three weeks of talks.

The sample consists mostly of graduate and undergraduate students from 53 different countries in various areas of study: information systems, decision support systems, negotiations, law, international business, electronic commerce, tourism and hospitality and others.

Table 1 shows the 10 largest groups in the study. About 62% of the participants are male, 16% are knowledgeable in negotiation and only 10% is familiar with ENS. A total of 5,067 people participated in the experiment, but only 2,047 responses are usable to evaluate the survey instrument, resulting in a response rate of 40%. Moreover, only respondents who have used the three features (history graph, communication and utility rating) are employed in the analysis, which further limits our sample.

Table 1. Ten largest groups in the experiment

Country	Percent	Country	Percent
Canada	26.6	Ecuador	4.7
USA	14.2	Austria	3.2
India	8.8	Russia	2.8
Germany	7.2	Taiwan	2.6
Finland	4.9	Hong Kong	1.6

The questionnaires were not developed for the intent of this study, but rather as a general measure of the e-negotiation process and Inspire. However, items (see Table 3 in the appendix) relating to those defined in the three perspectives of system success are extracted and examined with factor analysis. In addition, low range items (e.g. those that measured with Likert-3 and binary scales) are handled as categorical values in the analysis.

Based on the results of the factor analysis, structural equation modeling is performed with the EQS 6.0 modeling software to verify the research model [3]. Due to the fact that not every participant is able to achieve an agreement (i.e. *performance* is measured objectively based on the utility of the agreement) and that not every user employed the three features studied, only 784 records are used to test the nomological network, which is computed by means of maximum likelihood estimation.

6. Results

Even though the experiment provides a general sample of 2,047 suitable responses to assess the subjective measures, only a group of 784 responses within the sample could be used to analyze both the subjective and objective constructs of the research model. First, factor analysis is performed to determine the appropriateness of the measurement model. This is calculated for both the general sample and the group, but the results reported are for the group as these concur with the general findings. Then, structural equation modeling is conducted to analyze the entire model using only values from the group.

6.1 Factor Analysis

Factor analysis serves to investigate the validity of the constructs reflected by more than one item. Table 2 conveys the factor loadings and reliability values, as well as the univariate statistics. The internal consistency is indicated by the Cronbach's alpha and the reliability coefficient Rho, which is a composite measure that is more suitable for unequal reliability of items, as in this study.

The convergent validity is shown by related items loading highly to a similar factor. For this exploratory study, the findings in Table 2 show that constructs are consistent (reliabilities close to 0.7) and capture a simple concept (loadings above 0.5) [3]. The discriminant validity of instruments is reflected in Table 4 in the appendix, where the correlations among related items are higher than with unrelated items.

Table 2. Units for Magnetic Properties

Items	Mean	Std. Dev	Factor loadings	Cronbach's alpha	Composite reliability Rho
UGrap1	2.144	.588	0.752	0.754	0.797
UGrap2	2.079	.605	0.806		
UCom	5.407	1.255	1.000	NA	NA
URate	5.731	1.292	1.000	NA	NA
SA1	3.486	0.885	0.570	0.675	0.743
SA2	3.304	0.947	0.758		
Sat1	5.131	1.226	0.696	0.697	0.697
Sat2	4.741	1.394	0.581		
Sat3	5.124	1.191	0.719		
IU1	1.640	0.480	0.790	0.686	0.701
IU2	1.876	0.330	0.806		
IU3	1.792	0.406	0.939		
Utility	63.73	18.53	1.000	NA	NA

Although the questionnaires were not constructed to measure the perceptions of the users for this specific study, the factor analysis indicate that distinct concepts can be assessed by the items provided. Moreover, face validity is tested by asking three researchers in the area of e-negotiation to categorize the items to each factor. Their categorization matched the findings from the factor analysis.

6.2 Structural Equation Modeling

The test of the structural model consists of estimates of the path coefficients, which specify the strength of the relationship among independent, intervening and dependent variables, and the variance explained (R^2), which indicates the amount of variance the antecedent variables can explain. Figure 6 shows the results of the significant relationships and R^2 of the hypothesized model. In addition, Table 3 reports the fit indices for the overall model estimated by maximum likelihood.

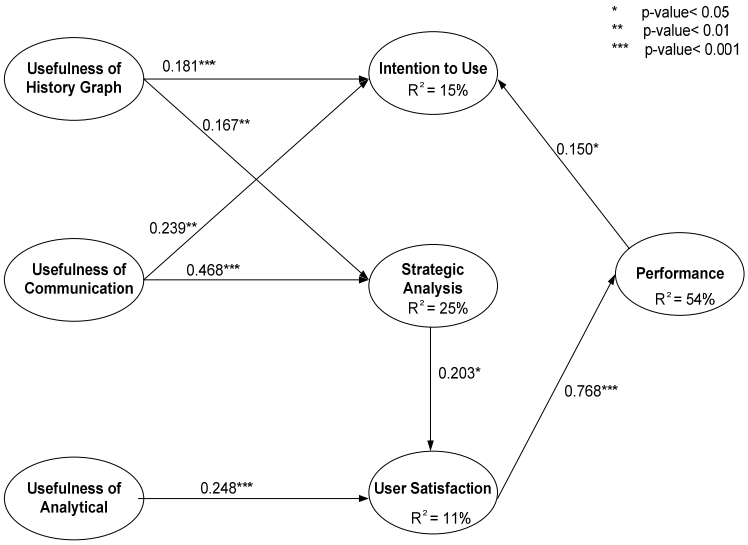

Figure 6. Research model results.

The i*ntention to use* from TAM is affected by the u*sefulness of history graph* and *usefulness of communication* features, and not by the *usefulness of utility rating*. Since *intention to use* in TAM is influenced directly by attitude towards usage and indirectly by ease of use, we can only account for 15% of its variance by simply measuring *usefulness of history graph* and *usefulness of communication* features. *Intention to use* is also not affected by s*trategic analysis* that is consistent with the TAM; conversely it is influenced by p*erformance* and not vice versa.

Table 3. Fit indices

BENTLER-BONETT NORMED FIT INDEX	.918
BENTLER-BONETT NON-NORMED FIT INDEX	.903
COMPARATIVE FIT INDEX (CFI)	.939
BOLLEN (IFI) FIT INDEX	.940
MCDONALD (MFI) FIT INDEX	.895
LISREL GFI FIT INDEX	.957
LISREL AGFI FIT INDEX	.919
ROOT MEAN-SQUARE RESIDUAL (RMR)	.058
STANDARDIZED RMR	.058
ROOT MEAN-SQUARE ERROR OF APPROXIMATION (RMSEA)	.067

Strategic analysis is a variable borrowed from game theory to assess ENS given the nature of the systems. It is also affected by the *usefulness of history graph* and *usefulness of communication* features, and not by the *usefulness of utility rating*. The R^2 for *strategic analysis* is 25% based on the usefulness of these two features.

User satisfaction, which is taken form the DeLone and McLean model, is influenced by *usefulness of the utility rating* and *strategic analysis*. The variables explain 11% of the variance of *satisfaction with*

outcome.

Interestingly, *performance* is impacted only by *satisfaction with outcome*, which explains 54% of this dependent variable.

6.3 Discussion

The results of this exploratory study grant us with a model, which is based on use, satisfaction and strategic perspectives, to assess ENS with performance as a final dependent variable.

The model opens up the system to expose the core features and integrates these to the three perspectives. Moreover, if performance is the measure of success, then the model unites the concepts of usage and satisfaction showing that they are very dissimilarly linked to *performance*.

In essence, the attitude conjured from the entire negotiation experience (*user satisfaction*) impacts *performance*, which along with the *usefulness of history graph* and *usefulness of communication*, influences the user's *intention to use* the ENS.

By examining the usefulness of ENS features, a better understanding of which features affect perception regarding usage, satisfaction and strategy is achieved. The history graph allows users to visualize the negotiation process in a way that directly influences their assessment of the counter-part (*strategic analysis*) and their intention to engage in future use of the system (*intention to use*), and indirectly affect their satisfaction with the agreement negotiated (*user satisfaction*).

Similarly, the communication tool permits users to send messages that also directly impacts on *strategic analysis* and *intention to use*, and indirectly on *user satisfaction*. Furthermore, this effect of usefulness of the communication tool on *intention to use* coincides with the findings by Kohne et al. [14].

The *usefulness of utility rating* appears to only influence the *user satisfaction* and not the other intervening variables. This maybe explained by the fact that utility rating is an abstract concept of multi-criteria decision aid that is designed with focus on achieving a high outcome. It is often difficult for novice user to express their utility on issues or to strategize based on utility rating of offers.

The low R^2 for each intervening variable can be attributed with having merely usefulness of ENS features as the independent variables. Both TAM and DeLone and McLean model proposed that other variables (ease of use, attitude towards usage, information quality, system quality, etc) influence the respective intervening variables examined.

In term of integrating three perspectives, the findings suggest that *strategic analysis* affect *user satisfaction* as inferred by Lim and Benbasat [16]. However, the perspective on system usage differs from the other perspectives. Because the concept measured is *user satisfaction*, this study does not contradict that by Wixon and Todd [25], which looks at information satisfaction and system satisfaction. The analysis of *user satisfaction* is more inline with the objectives of the DeLone and McLean model.

The strong relationship between *user satisfaction* and *performance* is expected given that they both assess outcome, but the difference can be explained by the fact that perception of the entire negotiation experience diverge from actuality outcome [21].

7. Conclusions

In this study, a research model is proposed to integrate the three perspectives of system success through examining the usefulness of ENS features (history graph, communication and utility rating). The findings suggest that the various features affect the variables *intention to use*, *strategic analysis* and *user satisfaction* differently. Moreover, *strategic analysis* is seen to influence *user satisfaction*, which affects *performance*, but it in turn impacts *intention to use*.

A major limitation in this study is that the survey instruments were not designed for the purpose of verifying the research model. Therefore, two constructs were measured using a single item. Another drawback is that not every participant reached a negotiation agreement or used all three features, such that solely records indicating that the features were used and that an agreement was reach served to test the model.

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Appendix

Table 1. Description of Constructs and Items.

Construct	Items	Instrument	Scal[1]
Usefulness of Graph	UGrap1	Did you find the history graph influence your assessment of your opponent's actions?	L3
	UGrap2	Did you find the history graph influence your actions?	L3
Usefulness of Com.	UComm	Were the messages helpful?	L7
Usefulness of Utility Rating	URate	Did you find the rating displayed with your and your partner's offers useful?	L7
Satisfaction with Outcome	Sat1	How satisfied are you with the agreement?	L7
	Sat2	Did the outcome of the negotiation match what you thought it would be before you began exchanging offers?	L7
	Sat3	How satisfied are you with your performance as a negotiator in the exercise?	L7
Strategic Analysis	SA1	Did you feel that you understood the priorities of your partner in the negotiation?	L5
	SA2	Were you able to learn enough about your partner to be able to predict his/her next offer?	L5
Intention to Use	IU1	Would you use the negotiation support system again to conduct an actual negotiation with another party?	B
	IU2	Would you use the negotiation support system again to practice your negotiation skills?	B
	IU3	Would you use the negotiation support system again to prepare for a negotiation?	B
Performance	Utility	Calculated based on individual utility achieved from negotiated agreement	Int

[1] L3, L5 and L7 are Likert scales (with respectively, 3, 5 and 7 categories). B is binary scale and Int is an integer between 0 and 100. L3 and binary scales were handled as categorical values in structural equation modeling.

Table 4. Correlation Matrix of Items.

	UGrap1	UGrap2	UCom	URate	Sat1	Sat2	Sat3	SA1	SA2	IU1	IU2	IU3	Utility
UGrap1	1.00												
UGrap2	.606	1.00											

UCom	.005	.028	1.00										
URate	.030	.046	.296	1.00									
Sat1	.023	.050	.157	.176	1.00								
Sat2	.129	.153	.140	.105	.402	1.00							
Sat3	.070	.005	.191	.160	.505	.412	1.00						
SA1	.091	.053	.160	.132	.125	.126	.128	1.00					
SA2	.137	.081	.240	.137	.142	.175	.171	.432	1.00				
IU1	.151	.216	.066	.160	.092	.099	.090	.116	.166	1.00			
IU2	.064	.151	.234	.166	.133	.084	.106	.152	.166	.640	1.00		
IU3	.172	.201	.214	.175	.109	.144	.117	.162	.194	.742	.756	1.00	
Utility	.058	.051	-.015	.166	.367	.182	.246	.027	.071	.029	.043	.052	1.00