Exploratory Analysis of Success Determinants of Web-based Negotiation Support Systems*

Rudolf Vetschera [1], Gregory Kersten [2] and Sabine Köszegi [1]

[1] University of Vienna, Vienna, Austria
[2] Concordia University, Montreal, Canada

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Abstract

The experimental negotiation support system INSPIRE has been used by over 2000 negotiators worldwide in experimental negotiations. In a survey conducted among those users, their reaction to that system and Internet-based negotiation support in general has been highly positive. This paper presents results of an exploratory study using an extension of the Technology Acceptance Model to identify factors that influence user's perception of Internet-based negotiation support systems. Our results indicate that both individual factors and negotiation outcomes might be important factors influencing users' attitudes toward such systems.

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1 Introduction

The Internet has the potential to dramatically change the way in which business negotiations are conducted. It allows users to enter into negotiations with partners located anywhere in the world in synchronous or asynchronous modes at almost negligible communication costs. Asynchronous communication is especially important for negotiation as it removes some of the time pressure involved in face-to-face negotiations and helps negotiators to better consider offers and their implications and feel less pressured or threatened. Further, electronic negotiations allow for the broad introduction of support tools.

Internet-based negotiations are becoming one of the forms of business communication. Recently, several web sites have been constructed to provide business organizations with an "electronic negotiation table", (for example, http://www.tradeaccess.com, http://www.biosgroup.com, http://www.frictionlesscommerce.com and http://moa.com). The present focus in these web sites is on providing a virtual space to seek for potential partners, exchanging information between parties, keeping negotiation records and providing on-line documentation.

There are many issues concerning the design, implementation and use of systems supporting Internet-based or 'virtual' negotiations, including the type of support, the use of quantitative methods, the relationship between the support, the negotiators and the decision problem, the cultural and professional issues, and the richness of the communication channels. Because this type of negotiations has only recently been introduced there has been no experimental research that studies these issues.

In order to exploit the potential benefits of Internet-based negotiation support, developers of such systems need to better understand the factors that influence the acceptance of such systems in general, and particularly of novel features they might provide beyond conventional, face-to-face negotiations. Lack of research in this area might lead system developers to forego the potential for innovative solutions. In an attempt to make the environment as friendly as possible to users they may provide only familiar capabilities which are present in face-to-face negotiations. The majority of studies so far have focused on the use of support tools in negotiations

In this paper we consider user acceptance of Internet-based negotiation support systems and their satisfaction with these systems. We use the results from negotiation experiments, which

we have conducted on the Web since 1996 using the INSPIRE negotiation support system (http://interneg.org/inspire).

The INSPIRE system, is an experimental negotiation support system available on the Internet. It combines elements of traditional negotiations (i.e., possibility of exchanging messages and offers between parties) and analytical negotiation support tools. Over the last years, over two thousands negotiations have been carried out using INSPIRE, involving students, managers and engineers from different countries. This offers a unique opportunity to study the acceptance of internet-based negotiation tools using a large number of users.

The data collected so far seems to indicate an astonishingly high level of satisfaction and willingness to use Internet-based negotiation support in the future. In this paper we present an exploratory analysis of factors that lead to this observed attitude. Our study is based on a modified version of the technology acceptance model (TAM) developed by Davis (1989). The TAM model was developed for system assessment in the context of introducing a new information system in a well-defined organizational environment. The organizational environment in the INSPIRE experiments is not specified, with the exception of the roles that the users play in business negotiation. Our experiments involved a large number of users who negotiated for self-learning purpose or as a part of a course requirement. Inasmuch as possible they simulated realistic negotiation environment on the Web. To this extent the proposed modification may provide a framework for ex post studies of Internet-based systems.

In Section 2 we give a brief overview of the INSPIRE system, its history and the way negotiations are supported in that system as well as the user population. Section 3 introduces the modified TAM model used in this study. In Section 4 the empirical results are presented and in Section 5 we discuss topics for ongoing and future research.

2 INSPIRE negotiations

2.1 Negotiation topic and process

Negotiations through INSPIRE are bilateral. To obtain adequate data for statistically valid comparisons, the system provides negotiators with a case of business negotiations. The negotiators represent two companies: Itex Manufacturing, a producer of bicycle parts, and Cypress Cycles that builds bicycles. The case has been designed to evoke a negotiation situation with which users from almost any country are familiar and therefore extended contextual explanation is not necessary. As the predominantly international users' proficiency

in English is not easily predictable, the description of the case is fairly simple and it fits within one and a half pages.

The sides negotiate over four issues: the price of the bicycle components, delivery schedules, payment arrangements, and terms for the return of defective parts. For each issue there is a pre-specified set of options, i.e., issue values. Altogether, there are 180 complete and different potential offers (alternatives) in which values of all four issues are specified.

Each side is given a clear indication as to the desirability of the options (issue values) but only in terms of the direction and not specific trade-off values. For example, it is stated in Itex's case description that a higher price is better for Itex, the seller. Similar indications are given with respect to other issues.

Negotiators exchange offers consisting of values for all four issues involved in the problem. They can also attach plain text messages, or exchange messages without offers. Negotiators are only informed about their (and their opponent's) role in the Cypress-Itex case and they make own decisions about the preferences, strategy and tactics. The negotiation is conducted anonymously, although users are not prevented from revealing their identity or other personal information. During negotiations, the parties are in contact only with each other, the experimenters have no contact with the negotiators (i.e., INSPIRE users). Negotiations are conducted over three weeks with an imposed deadline. Upon request from both negotiators the deadline may be extended.

2.2 Negotiation analysis and support in INSPIRE

The INSPIRE system has its roots in negotiation analysis and such negotiation support systems as Nego (Kersten 1985) and Negotiation Assistant (Rangaswamy and Shell 1997). One research goal in its development was to study the use of decision analytic methods in the practice of negotiations. The system uses hybrid conjoint measurement for utility construction and discrete optimization (Green and Wind 1973; Angur, Lotfi et al. 1996). Conjoint analysis is simple, does not impose major requirements on the users, and does not require linearity assumptions (Green and Wind 1973). The ease of use and simple informational requirements are—in our view— necessary features for systems used by people with very different educational, professional and cultural backgrounds.

INSPIRE is used to support some of the activities conducted in each of the three phases of negotiation: pre-negotiation, negotiation, and post-settlement (Kersten and Noronha 1999). In the pre-negotiation phase the system is used to analyze the scenario and evaluate feasible

alternatives (possible offers). In this phase each user also specifies his/her preferences and the system constructs the utility function.

During the negotiation phase the system provides utility values of decision alternatives considered by the user and of the offers submitted by both users. The system also records the process and provides negotiation history to the users. It also provides graphical visualization of the negotiation's dynamics.

After the parties agree upon a compromise the system determines whether the achieved compromise is non-dominated (efficient). If the compromise is inefficient the system suggests the post-settlement phase. This phase begins with the computation of efficient alternatives which dominate the achieved compromise. Several alternatives are then selected and displayed. The parties may then continue negotiation until they reach an efficient compromise.

In order to keep the process simple, we have decided not to provide support for other types of analysis including the specification of BATNA and reservation prices, the analysis of the opponent's strategies and tactics, or assessment of the contract curve. We use only one type of graph, clearly define the negotiation issues, and provide users with several salient options for each issue. Users are not required to base their exchanges on the utility values, nor are they forced to make concessions or achieve a compromise. The tabularized history of negotiation and graphs provide rich representation of the process without indicating the good or preferred alternatives or strategies. The system provides this type of support in an identical way to both parties.

2.3 The users

Results reported in this paper were obtained from the analysis of 1102 negotiation dyads (2204 negotiators) on which data was extracted from the system log files. Users from 53 different countries are represented in this data set. The 10 largest groups are indicated in Table 1.

Table 1. INSPIRE users.

Country	Number	Percent	Country	Number	Percent
CA	696	31.6	HK	89	4.0
US	348	15.8	AT	77	3.5
IN	216	9.8	DE	76	3.5
EC	158	7.2	TW	58	2.6
FI	144	6.5	Other	242	11.0
RU	103	4.7			

The structure of the user population is as follows: 49.18% male and 34.57% female. The remaining 16.24% did not disclose their gender. Over 60% of all users were students, about 15% identified themselves as “professionals”, and 25% represent various small groups.

Apart from the data logged by the system, much of our knowledge about the users of the INSPIRE system comes from two questionnaires administered by the system during and after the negotiation.

3 Research focus and model

3.1 Research background

The present study was motivated by the overwhelmingly positive attitude towards INSPIRE expressed by users in the post-negotiation questionnaire. This questionnaire is voluntary and the users were asked to fill it in after completing negotiations. It was filled in by 1200 out of the 2204 negotiators, giving the response rate of 54%. The answers to three questions indicating users’ willingness to use a system similar to INSPIRE are given in Table 2.

Table 2. User willingness to use Internet-based negotiation support.

Use a system similar to INSPIRE to:	**Percent**
- practice negotiation	88.2
- prepare for actual negotiations	81.3
- conduct actual negotiations	61.3

These results per se constitute a convincing argument for the viability and acceptance of Internet-based negotiation support. An important question refers to the particular factors that lead to the observed level of acceptance of this new technology.

Users’ satisfaction and their willingness to use an information system are important concepts in information systems evaluation (Benbasat and Nault 1990; Guimaraes, Igbaria et al. 1992). Both concepts are often used to measure the 'Success' of implementing an information system. Other models use these concepts to explain such measures of IS success as actual or reported system use (DeLone and McLean 1992; Szajna 1993; Bergeron, Raymond et al. 1995).

The technology acceptance model (TAM) is one of the models most often used to explain users’ willingness to actually use an information system (Davis 1989). The TAM was extensively tested empirically (Mathieson 1991; Taylor 1995; Straub, Keil et al. 1997;

Agarwal and Prasad 1998; Doll, Hendrickson et al. 1998) and several extensions have been proposed (Dishaw and Strong 1991; Moore and Benbasat 1991; Taylor 1995; Szajna 1996; Jackson, Chow et al. 1997; Al-Khaldi 1999). The basic structure of the TAM model is shown in Figure 1.

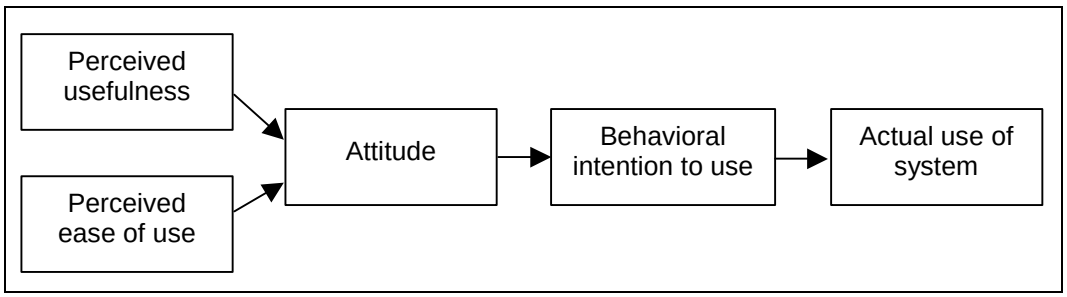

Figure 1. The technology acceptance model (TAM) (Jackson, Chow et al. 1997, p. 363).

The actual use of a system is—according to the TAM model—determined by the behavioral intention to use a system. This intention depends on the attitude which, in turn, depends on two subjective factors: the perceived usefulness and the perceived ease of use of the system.

3.2 Framework of analysis

There are several differences between the situation described in the TAM model and our study. The main differences are:

1. Users assess the specific technologies which are embedded in the system rather than the complete technological solution.

2. Users employ the system to solve the complete problem and they are exposed to the system for several weeks rather than for a short period.

3. Users' evaluation is oriented on the system's effectiveness in supporting and facilitating problem solving rather than it's efficiency.

4. The type of the task, which the users perform, and its characteristics allow them to control the length of use of the system.

5. User population is not uniform; users have different individual characteristics which may influence their experiences with the system.

The results shown in Table 2 could be interpreted as the "behavioral intention" to use a system in the TAM framework. This intention, however, is not directed towards the system with

which the users have gained experience. Instead, it is directed towards the generic class of negotiation support systems that could be deployed on the Internet. The three questions listed in Table 2 do not refer to users' willingness to use INSPIRE but to a system similar to INSPIRE. This is because INSPIRE is a system designed for research experiments and for training and therefore it has limitations making its use in real-life negotiations impossible.

This difference is especially important given that a considerable fraction of INSPIRE users are students, many of whom have some kind of education in information systems. While many of them might be using some kind of Internet-based negotiation tool in their future work, and they are probably quite aware of this fact, this is still a rather distant perspective. Given the rapid development of Internet technology, which is highly visible and can easily be extrapolated into the future by this student population, it is obvious that the systems they will be using will be quite different from today's INSPIRE.

The experiments in which the TAM was used and the INSPIRE experiments also differ in the subjects' exposure to the system. In the TAM framework, empirical evidence suggests that perceptions of usefulness and ease of use as measured by the standard TAM instruments are developed after a brief exposure to the system (Doll, Hendrickson et al. 1998). When they fill in the post-negotiation questionnaire, INSPIRE users have already completed negotiations supported by the system which often lasted for several weeks.

The framework of the TAM model is oriented towards system's efficiency: the subjects are asked whether they think that the system under study would allow them to perform their tasks more efficiently. In contrast INSPIRE users evaluate the technology's capability in the negotiation process and its effectiveness. Because users provide their assessment after a prolonged exposure to the system, we expect that they have good understanding of its features and capabilities. In considering the usefulness of the system, we thus replace users' perceived usefulness with their actual experience regarding the usefulness of the system.

Another difference is related to the "ease of use" construct. In contrast to the situation usually considered in the TAM model, the ease of use of INSPIRE is assessed based on the users' considerable experience with the system. Although fully functional the system is a scaled-down prototype, therefore the users are asked to evaluate the ease of use of the elements of the interface, and decision support and communication tools. The assumption is that these concepts will be present in future negotiation support systems. Thus we have to assess the perceived ease of use differently than in the TAM model.

The last main difference involves the type of the task the users perform. The users controlled the length of time they were using the system in each session and during the whole experiment. In order to complete negotiations the only requirements are to perform the analysis phase (this includes preference elicitation and utility construction activities) and either accept the first offer or terminate negotiations. 81.9% of INSPIRE users who evaluated the system (i.e., filled in the post-negotiation questionnaire) sent two or more offers and 70% sent messages which were not accompanied with offers. Each user sent on average 3.4 and 1.6 messages without offers. This implies that the users were interested in using the system. Even if the users were students using the system as part of their study they controlled the use because from the outset they knew that the experimenters do not provide instructors with the usage data.

We know that the users' intention to use systems similar to INSPIRE is high. Presumably this is the result of their positive evaluation of the whole system. The holistic assessment may depend on the perceived usefulness of the system and its ease of use. The ability to evaluate the system may, in turn, depend on the users' experience with the system. Furthermore, characteristics of users and the task at hand may influence these experiences.

The resulting assessment model of Internet-based NSS is depicted in Figure 2. To account for the Internet technology and the type of the system used in the experiments the user population and the nature of the experiment's *perceived* usefulness and ease of use are replaced with *experienced* usefulness and ease of use. Furthermore, *factors influencing* the users' experiences like *user and task characteristics*, and the actual use of the system are explicitly considered. Finally, *attitude* towards the system is replaced with system's *holistic assessment* because of users' extensive experience with a concrete system.

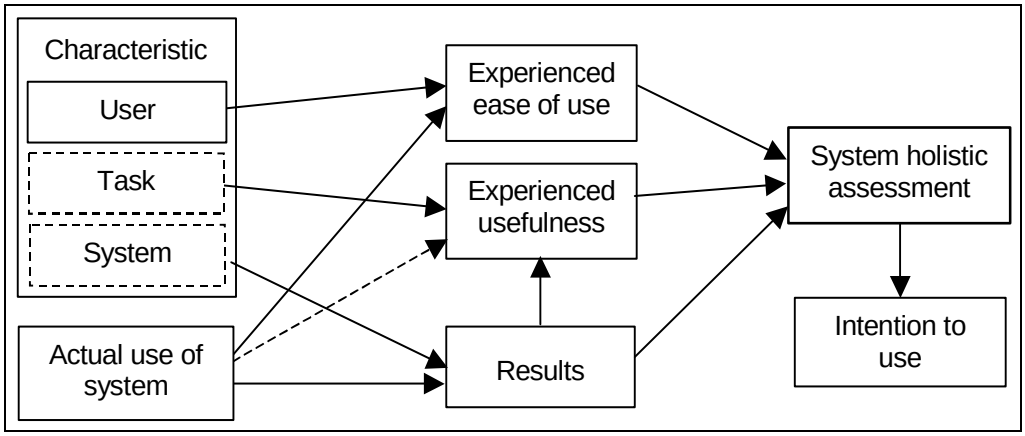

Figure 2. Assessment model of Internet-based NSS.

3.3 Hypotheses

The assessment model of Internet-based NSS assumes the existence of several relationships which need to be verified. We formulate eight hypotheses describing the relationships. These hypotheses, discussed below, are based on both earlier theoretical discussions and empirical results.

H1: *Experienced usefulness and experienced ease of use are influenced by user characteristics.*

User characteristics, such as experience, education and culture, comprise an important set of variables in behavioral IS research. Perhaps due to the fact that many studies involved a uniform group, the impact of this variable has not been extensively studied in the context of the TAM. This led Taylor et al. (1995) to consider the context factors (e.g., influence from superiors) and user characteristics in the TPB model (Theory of Planned Behavior). The application of the TPB model, which is an extension of the TAM model, predicted system usage better than the original TAM model. One should note, however, that the improvement in fit was rather small. Concerning the ease of use Agarwal (1999) found that the level of education and previous experience positively influence it.

Some authors studied direct relationships between user characteristics and system assessment rather than the use of perceived (or experienced) usefulness or ease of use as intermediate variables. Yaverbaum (1989) reports significant relationships between demographic characteristics of IS users and the "motivating potential score", which is related to users' willingness to use a system. Guimaraes (1992) found a weak influence of decision maker characteristics (e.g., experience) on satisfaction with DSS, with such factors as task characteristics and the implementation process having strong influence. Udo (1994) also reports positive relationship between user experience and overall satisfaction with a DSS. Considering actual use as the dependent variable, Bergeron (1995) reports positive influence of experience.

Another important user characteristic in an international context is the user's national culture. Kersten et al. (1999) found a significant impact of the user's country of origin on several variables related to the INSPIRE negotiation process. Cultural differences in GDSS-supported group processes were also identified in controlled experiment in a local setting by Watson et al. (1994).

The perceived system usefulness and its ease of use are not explicitly taken into account in the second group of studies. We consider them an important indication of the system success. Therefore, and also because of the wide variety of the user population, hypothesis H1 concerns these two intermediate variables.

H2: *Results are influenced by user characteristics.*

Several empirical studies link user characteristics to results achieved by using a system. Udo and Davis (1992) found that experience was positively related to cost effectiveness, but negatively to other outcome dimensions. In another series of experiments a positive relationship of user experience to both the increased productivity and cost effectiveness was reported (Udo and Guimaraes 1994).

H3: *Experienced usefulness and experienced ease of use are positively influenced by actual use of the system.*

The relationship between actual use and perception variables has been extensively studied in the IS evaluation literature, although in most studies system use was seen as a consequence of perceptions. An exception is the study by Bajaj and Nidumolu (1998), who combined influences in both directions in a feedback model. They found a positive relationship between attitude and usage, where perceived ease of use was positively influenced by previous usage.

Karahanna (1999) found a positive relationship between perceived usefulness and actual use of an e-mail system, while the relationship was weaker for ease of use. Parthasarathy and Bhattacherjee (1998) confirm these results. They obtained a significant influence of perceived usefulness on the decision to continue or discontinue the use of online service, while ease of use had no significant influence. Downing (1999) and Bergeron (1995) also established positive relationship between actual use and user attitude.

Results of these studies should to be interpreted carefuly, especially in light of the results reported by Szajna (1993; 1996) and Collopy (1996). They found significant differences between actual and self-reported system use and showed that results depend heavily on the concept of "use" employed.

H4: *Results are positively influenced by actual use of the system.*

The assumption that using a support system improves performance underlies most of the approaches to support decision and negotiation processes. Consequently, many empirical studies are devoted to this question. Only few of them, however, deal explicitly with

negotiation support. Studies related to (group) decision support are surveyed by Benbasat (1990) and Pinsonneault (1989), who conducted surveys of respectively DSS and GDSS. Pinsonneault (1989) reports performance improvements caused by the GDSS usage. The results for individual DSS reported by Benbasat (1990) are mixed. These mixed results are also present in more recent studies. Igbaria et al. (1997) report a positive relationship between system use and individual impact while Gelderman (1998) found no significant relationship between system use and performance. In a group setting, Galegher (1994) also found no significant performance difference between face-to-face and computer communication teams in collaborative writing experiment. Similarly, Jain (2000) did not establish significant impact of system use on the assessment of GDSS/NSS.

H5: *System assessment is influenced by experienced usefulness and ease of use.*

Few studies relate perception variables to the overall assessment of a system. (Taylor 1995), found a significant influence of perceived usefulness on attitude, the effect of ease of use was not significant.

There are, however, many studies regarding the relationship between (1) the experience of system use and the overall assessment of the system, and (2) the decision-making process and decisions supported with a DSS. Downing (1999) reports about a positive relationship between system usage and user satisfaction. In many laboratory studies surveyed by Benbasat and Nault (1990), the confidence in making decisions was higher for DSS users than those who did not use them. Igbaria and Tan (1997) found a positive relationship between satisfaction and DSS use. Similar results, both in terms of confidence in the decision as well as satisfaction with the group process, are reported in many of the empirical studies on GDSS surveyed by Pinsonneault and Kraemer (1989). One should note, however, that these authors are rather skeptical about the validity of those studies.

There is also evidence of a negative influence between system use and user satisfaction. In a study conducted by Galegher (1994), users of a computerized communication system were less satisfied than teams using face-to-face interaction in a collaborative task. Collopy (1996) reports a significant negative relationship between assessment and actual system use, but no significant relationship between self-reported use and assessment.

With regard to the ease of use and usefulness, empirical studies on the TAM model report different findings about the relative importance of those two constructs. Some authors report a significant influence of the ease of use on attitude, but none of usefulness (Jackson, Chow et

al. 1997) and a positive influence of the ease of use on performance (Etezadi-Amoli and Farhoomand 1996). Others found a stronger influence of usefulness on attitude than the influence of ease of use on attitude (Dishaw and Strong 1991; Taylor 1995; Parthasarathy and Bhattacherjee 1998).

Differences in the importance of the ease of use and usefulness, which have been found in different studies, may be caused by the experience of users with the system. However, there is also conflicting evidence if experience makes ease of use and usefulness more important over time. Davis (1989) noted an increase in the importance of usefulness. Agarwal et al. (1999) argue that, because of expected timesaving, ease of use positively influences perceived usefulness. However, the influence decreases over time. This is because more experienced users base their evaluation of usefulness more on the system features which they discover over time. Given this conflicting evidence, we hypothesize that both ease of use and usefulness are important in forming a holistic assessment of the system.

H6: *Experienced usefulness is positively influenced by results.*

Venkatesh and Davis (2000), and also Lederer et al. (2000) who studied web applications, argue for the existence of a positive relationship between information (system output) quality and the perceived usefulness. These findings provide the basis for hypothesis H6.

H7: *Holistic assessment is positively influenced by actual results.*

The relationship between results and system assessment was confirmed in an earlier study of the INSPIRE system, which used a smaller number of observations in a controlled environment (Kersten, Köszegi. et al. 1999). In an earlier study Igbaria and Tan (1997) reported a positive relationship between satisfaction and individual impact. A significant correlation between user satisfaction and performance was also found (Gelderman 1998). In this study performance was measured by user productivity.

H8: *There is a positive relationship between system assessment and intentions for future use.*

This hypothesis goes beyond the framework of the traditional TAM model. System assessment refers to the INSPIRE system with which the users have gained experience, while their intentions for future use refer to NSS in general. This hypothesis thus describes the users' ability (and willingness) to generalize their experiences with the system onto future negotiation support systems they may encounter later on. To our knowledge, this relationship has not been studied previously.

4 Analysis

4.1 Concepts and variables

INSPIRE provides a considerable amount of information for analysis; both in the form of the process logs, which are automatically generated during the negotiations, and in the form of the questionnaires the users fill in at the beginning and the end of the exercise. Originally, these questionnaires were not developed specifically to assess the users' attitudes towards technology adoption, but to provide some background information about their experiences during the exercise. Nevertheless, they provide data that we think is relevant to the assessment of the system. Our study thus has exploratory character in attempting to determine the underlying reasons for these responses. It is motivated ex post by the surprisingly positive reactions from users and we mine the available data. Having an experience with just a simple case and a somewhat inflexible system a strong majority of users indicated their willingness to use an NSS deployed on the Internet based.

Table 3 lists variables from the pre- and post-negotiation questionnaires as well as from the negotiation logs which are used to operationalize the constructs discussed in Section 3 and illustrated in Figure 2. Since user characteristics are at the focus of this study paper, and the variables describing users represent a heterogeneous spectrum of attributes, these variables were considered separately in the analysis. The other variables measure rather homogenous concepts; as can be seen from the values of the Cronbach alpha coefficient for the real-valued variables given in Table 3.

For exploratory research like our study, an alpha value of 0.6 is considered sufficient (see Hair, Anderson et al. 1998 p. 118). This value is achieved by the construct EASE. ACTUAL and ASSESS even exceed the limit of 0.7, which is the recommended threshold for non-exploratory studies. We thus can use these constructs for our further analysis.

Table 3: Variables and their measurement

Concept	Variable	Type	Description
User characteristics	YOFB	real	Year of birth
	Gender	categorical	User's gender
	OCCUPATN	categorical	User's occupation
	Creside	categorical	User's country of residence
	IACC	Likert scale	Present internet access
	NEXP	Likert scale	Negotiation experience
	NSSBEFOR	categorical	Used negotiation support system before
Actual use	OFR	real	Number of offers sent
	OFRWMSG	real	Number of offers sent by user (post-settlement inclusive) that included written messages.
	MSG	real	Number of written message sent by user besides offers
Ease of Use	CASEUND	Likert scale	Ease to understand case
	WTGISSUE	Likert scale	Ease of weighting issues
	WTGOPTIO	Likert scale	Ease of weighting options
	INEASY	Likert scale	Ease of using the system
	INSTRUCT	Likert scale	Clarity of the system instructions
Usefulness	MSGHELPF	Likert scale	Messages helpful/detrimental to negotiations
	UTILITYV	Likert scale	Usefulness of the rating displayed with offers
Results	SCORE	real	User's utility rating of the compromise
	AGR	binary	Indicates whether an agreement was reached at all
	OPT	binary	Indicates whether agreement (if any) was pareto-optimal
Assessment	AGRSAT	Likert scale	User's satisfaction with agreement
	METE	Likert scale	Did negotiations meet the user's prior expectations
	CONTROL	Likert scale	User's level of perceived control
	FRNDLY	Likert scale	Were the negotiations friendly?
	PERF	Likert scale	User's assessment of own performance

Table 4: Cronbach Alphas for constructs

Concept	Cronbach alpha
Ease of use (EASE)	0.6734
Usefulness	0.4293; r = 0.2733
Actual use (ACTUAL)	0.7213
Assessment (ASSESS)	0.7958

The value for usefulness clearly indicates that the two items “Helpfulness of Messages” and “Usefulness of Utility Evaluation” do not measure a single underlying construct. This is also confirmed by the low correlation between these two variables. It seems that (1) the users perceived the communication features of the system (i.e. the possibility to exchange messages with their opponent), and (2) the analytical, decision-oriented features of the system used to evaluate offers and graph evaluations as rather distinct components, each having a usefulness of its own. Based on this result, we considered the two items separately in the following analysis.

4.2 Results

We present results in three sections. In Section 4.3, we concentrate on the first two hypotheses, which link user characteristics to perceptions and results. These hypotheses are discussed separately, because user characteristics are not part of the usual TAM framework and, due to their diversity, are not integrated into one construct in our model. Results related to hypotheses H3-H7 are presented in Section 4.4. These hypotheses refer to the aggregate constructs of our model and are based mostly on the TAM model. Section 4.5 discusses intentions for future use, which are the topic of hypothesis H8 and which were the original motivation for this study.

4.2.1 Impact of user characteristics

Our research framework, led us to expect that users’ characteristics influence their perceptions of usefulness and ease of use (hypothesis H1), as well as the outcomes of negotiation (hypothesis H2). Based on the results of construct validation (see Table 3) we separated usefulness into usefulness of communication components and usefulness of analytical components.

To test hypotheses H1 and H2, we used linear regression of the outcome variables on user characteristics. The results are presented in Table 5. In this and the following tables, results significant at the 5% level are printed in *italics*, and results significant at the 1% level in boldface.

Almost none of the user characteristics had significant effects on the perception variables. The only consistent effect that could be observed was from the user's country of residence, which can be interpreted as a proxy of culture. Negotiation experience and previous use of NSS also had weak influence on perceived ease of use and none on the measures of usefulness.

Concerning outcomes of the negotiations, only three user variables had a significant impact: the user's country of residence, gender, and negotiation experience (at 9% significance level). The cultural impact confirms earlier results obtained from a smaller sample (Kersten, Köszegi. et al. 1999) and therefore we do not discuss this issue further.

Table 5. Regression of perceived ease of use, usefulness, and score on user characteristics.

	YOFB	**IACC**	**NEXP**	**NSSBEFOR**	**GENDER**	**CRESIDE**
EASE (aggregate construct ease of use, **H1**)						
Parameter	-0,0171	0,1315	*0,2879*	-0,4970	-0,1195	
F value	1,2200	2,2700	*8,3500*	2,9900	1,2500	**1,9000**
Pr>F	0,2690	0,1322	*0,0039*	0,0838	0,2856	**0,0008**
MSGHELPF (Helpfulness of messages, **H1**)						
Parameter	0,0129	0,0112	0,0325	0,0521	0,1932	
F value	3,5800	0,0800	0,5600	0,1700	1,6100	*1,5600*
Pr>F	0,0587	0,7710	0,4563	0,6827	0,2011	*0,0161*
UTILITYV (Helpfulness of analytical tools, **H1**)						
Parameter	-0,0025	0,0062	-0,0286	-0,0348	-0,1820	
F value	0,1400	0,0300	0,4500	0,0800	0,8900	**1,7200**
Pr>F	0,7097	0,8683	0,5044	0,7777	0,4094	**0,0044**
SCORE (Individual outcome of negotiation, **H2**)						
Parameter	-0,0134	-0,3237	-1,1528	1,4133	*-2,9914*	
F value	0,0100	0,2700	2,8000	0,5300	*4,3200*	**4,5100**
Pr>F	0,9121	0,6062	0,0947	0,4659	*0,0380*	**0,0001**

Because of the scaling of variables used, the negative parameter value for negotiation experience indicates that more experienced negotiators were indeed able to achieve a higher score. It should be noted, however, that in our study negotiation experience is a self-reported variable; participants were asked to rank themselves as experienced vs. inexperienced. Objective data (e.g. on the number of negotiations a subject has previously performed) were not collected. Thus it is possible that this rating is also influenced by cultural factors.

The results shown in Table 5 are also interesting because they are one of the few cases in which users' gender had a significant impact; male users achieved on average a higher score (AV = 67.77, SD = 22.39) than female users (AV = 64.06, SD = 23.45).

4.2.2 The aggregate model

We used correlation analysis to verify the aggregate model introduced in Section 3.2. The results are presented Figure 3. The two different aspects of usefulness (analytical and

communication usefulness) are considered separately. In the preceding section we discussed user characteristics, in the next section we present users' intention to use the technology. Therefore, these two constructs are not depicted in Figure 3.

In interpreting the results, it should be noted that the scales used for "actual use" and "results" are different from those used for the other variables. Therefore, the negative signs in the correlation coefficients with those two variables actually represent positive relationships.

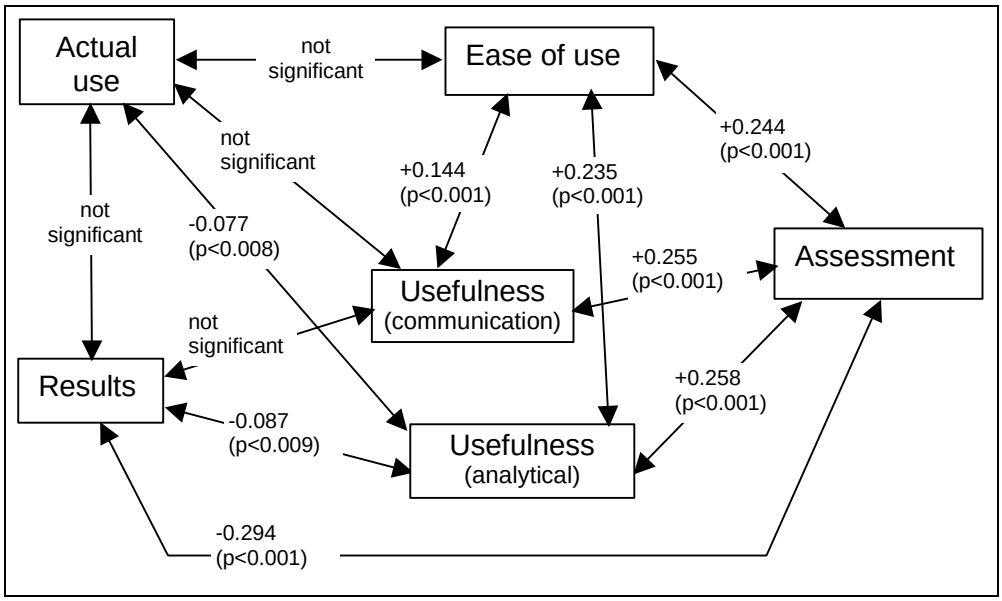

Figure 4. Overview of results.

The effects of system use on the two perception variables (hypothesis **H3**) was weaker than expected, a significant correlation exists only between "actual use" and the "usefulness of analytical features". Interestingly, there is no significant relationship between "actual use" and "usefulness of communication features" which one would consider as most important in negotiation. Perhaps users considered these features as obvious for any system deployed on the Internet.

No significant relationship could also be found between actual system use and results (hypothesis **H4**). Empirical studies on GDSS or NSS (Pinsonneault and Kraemer 1989; Gray, Vogel et al. 1990) often define "system use" as the binary variable indicating whether the system was used or not. In our study "system use" does not indicate if the system was used at all, because all negotiations analyzed here were carried out using INSPIRE. Here system use is a quantitative concept that measures the extent to which various features of the system were used. The negative results indicate that more extensive use of system features in INSPIRE has no direct effect on the score achieved.

Hypothesis **H5** is fully confirmed. Furthermore, the impact of ease of use and usability on assessment are rather similar. The similar impact of these two constructs contradicts previous studies based on the TAM model, which either found a stronger effect of ease of use (Jackson, Chow et al. 1997) or of perceived usefulness (Davis 1989; Dishaw and Strong 1991). Following the argument of Agarwal (1999), this can be attributed to a transitory stage. The basis for users' evaluation remains, in this stage, timesaving and user friendliness. However, at this stage users also begin to discover more complex benefits of system use (perhaps related to analytical functions). This means that they become influenced by usefulness as well as usability considerations.

Hypothesis **H6**, which linked perceived usefulness to the results obtained by using the system, is partially confirmed. Here the distinction between analytical and communication components of the system becomes relevant. Better results are related to a more favorable perception of the analytical components of the system, but not of the communication component.

Table 6: Influence of results on assessment items

	SCORE	**AGR**	**OPT**
AGRSAT (satisfaction with agreement)			
Parameter	**-0,0184**	0,0212	-0,0725
F value	**78,2500**	0,0200	0,5800
Pr>F	**0,0001**	0,8969	0,4452
METE (results met expectations)			
Parameter	**-0,0093**	0,0227	0,0542
F value	**15,0600**	0,0100	0,2500
Pr>F	**0,0001**	0,9043	0,6195
CONTROL (perceived control)			
Parameter	**-0,0077**	-0,0032	-0,1452
F value	**18,1200**	0,0000	3,1100
Pr>F	**0,0001**	0,9823	0,0780
FRNDLY (perceived friendliness)			
Parameter	**-0,0047**	0,1939	-0,1121
F value	**4,7800**	1,3100	1,3100
Pr>F	**0,0292**	0,2524	0,2530
PERF (satisfaction with one's own performance in negotiations)			
Parameter	**-0,0088**	-0,0620	-0,1469
F value	**19,6300**	0,1600	2,6000
Pr>F	**0,0001**	0,6935	0,1070

Hypothesis **H7**, which links results to holistic assessment, is also clearly confirmed. Table 6 shows consistent impact of the score obtained on various items that are contained in the

aggregate satisfaction construct. On the other hand, the fact whether an agreement was reached at all (variable AGR) or whether the agreement was Pareto optimal (variable OPT) had no significant impact on assessment.

4.2.3 Assessment and intentions for future use

Intentions to use future NSS were measured by three categorical (yes/no) variables, where users indicated whether they would in future be willing to use an NSS to practice negotiations, to prepare for real negotiations or to use the system in actual negotiations. A probit analysis was used to determine the impact of the aggregate construct assessment on these three concepts, and Table 7 below shows the results of these analyses.

Table 7: Assessment and intentions

	ASSESS
PRACTICE (Use for practice)	
Parameter	**0,0223**
Chi value	**4,9378**
Pr>Chi	**0,0263**
PREPARE (Use to prepare for actual negotiations)	
Parameter	**0,0331**
Chi value	**13,8639**
Pr>Chi	**0,0002**
NEGO (Use in actual negotiations)	
Parameter	**0,0307**
Chi value	**14,7974**
Pr>Chi	**0,0001**

Assessment of the INSPIRE system had indeed a significantly positive impact on users' willingness to use NSS in the future. Thus hypothesis **H8** is confirmed. The significance of the effect increases when moving from the simple task of practicing negotiations to the more realistic task of use in actual negotiations. It should be noted that fewer users were willing to perform the more demanding tasks via an NSS, however the probit analysis shows that this behavior is more strongly dependent on the assessment of INSPIRE than on the type of the task.

5 Discussion and conclusions

To determine the users' very positive assessment the technology exemplified with the INSPIRE system we modified the TAM model. The proposed assessment model of Internet-based NSS required verification of eight hypotheses. The summary of the results is presented in Table 8. It follows from the statistical analysis of the available data that only hypothesis H4 must be rejected. The relationship hypothesized in H3 is weak. The remaining hypotheses can be accepted. This indicates that the proposed extensions of the TAM model allow for additional insights in explaining user attitudes and their assessments.

Table 8: Summary of results

Hypothesis	Dependent variables	Independent variables	Result
H1	Perceived usefulness and ease of use	User characteristics	Consistent effect of culture, effect of negotiation experience on perceived ease of use
H2	Outcomes	User characteristics	Accepted, significant effects of culture, gender and negotiation experience
H3	Perceived usefulness and ease of use	Actual use	Only weak effect for usefulness of analytical features
H4	Outcomes	Actual use	Rejected
H5	System assessment of INSPIRE	Perceives usefulness and ease of use	Accepted, better perceived usefulness and perceived ease of use lead to better assessment
H6	Perceived usefulness	Outcomes	Accepted for usefulness of analytical components, rejected for communication
H7	System assessment of INSPIRE	Outcomes	Accepted, users who achieved better results evaluate the system as better
H8	Intention to use future NSS	Assessment of INSPIRE	Accepted, better assessment leads to greater willingness to use NSS in the future

Internet-based systems and in particular systems which are used to support individuals and groups can be used by people from different countries. Localized assessment based on a small uniform user group does not allow for a justified system evaluation. The model proposed here is not specific to NSS; it is an assessment model of Internet-based support (AMIS) that can possibly be used to study individual and group decision support systems deployed on the Internet. Clearly, further verification of the model is necessary, however, we believe that the

two key constructs, which we propose, will find its place in future assessment models. These two constructs are: user characteristics and user experience with the system.

We took into account user characteristics and among those most prominently the user's culture. This is a novel factor arising in the context of information systems used for cross-cultural applications like international negotiations. However, culture needs to be considered in the assessment of Internet-based systems used for making individual decisions, for example systems used for product comparison (see, for example, http://personalogic.com).

Culture has already been shown to have a strong influence on the negotiation process (Kersten, Köszegi. et al. 1999). This study indicates that culture is also a factor that has to be taken into account in determining a user's perception of and attitudes towards an information system. Cultural aspects thus need to be taken into account when developing support systems that are to be used by an international audience via the Internet.

Besides culture, our research identified experience as another personal factor influencing user perceptions and attitudes. This result is consistent with previous studies (Guimaraes, Igbaria et al. 1992; Udo and Guimaraes 1994). If user characteristics have an impact on assessment and willingness to use future systems, this is probably mainly due to their impact on results which a user is able to achieve with the system.

Obtaining good results by using the system turned out to be an important factor, much stronger than mere experience gained from using the system. This result can be seen both as a confirmation as well as extension of previous research using the TAM model. To a certain extent, it confirms those studies which found an influence of perceived usefulness on attitudes towards a system (Parthasarathy and Bhattacherjee 1998; Karahanna and Straub 1999). But it also goes beyond the notion of perceived usefulness as it is used in the TAM framework, where users are asked questions about how they expect the system to increase their productivity in the future. Our results show that actually experiencing a positive outcome is a strong factor for creating a positive attitude towards a negotiation support system.

This study is based on a significantly larger sample than in other similar studies. However, it has some drawbacks, which will need to be addressed in future work. INSPIRE is an open system, so we cannot control the user population which forms the basis of our analysis. This might introduce unknown biases through user characteristics, which are neither controlled nor measured in our analysis. Another potential weakness is the use of non-standard instruments in assessing perceived usefulness and perceived ease of use. The standard instruments developed

in the TAM framework are not applicable in this context. Verification of the proposed assessment model of Internet-based support (AMIS) requires, among others, further standardization and validation of instruments so that results comparable across multiple studies can be obtained. Controlled, inasmuch as possible given the Web environment, experimental design is also necessary.

References

Agarwal, R. and J. Prasad (1998). "The Antecedents and Consequents of User Perceptions in Information Technology Adoption." Decision Support Systems **22**(1): 15-29.

Agarwal, R. and J. Prasad (1999). "Are Individual Differences Germane to the Acceptance of New Information Technologies?" Decision Sciences **30**(2): 361-391.

Al-Khaldi, M. A. (1999). "The Influence of Attitudes on Personal Computer Utilization among Knowledge Workers, The Case of Saudi Arabia." Information and Management **36**(4): 185-204.

Angur, M. G., V. Lotfi, et al. (1996). "A Hybrid Conjoint Measurement and Bi-criteria Model for a Two Group Negotiation Problem." Socio-Economic Planning Sciences **30**(3): 195 - 206.

Bajaj, A. and S. R. Nidumolu (1998). "A Feedback Model to Understand Information System Usage." Information and Management **33**: 213-224.

Benbasat, I. and B. R. Nault (1990). "An Evaluation of Empirical Research in Managerial Support Systems." Decision Support Systems **6**(3): 203-226.

Bergeron, F., L. Raymond, et al. (1995). "Determinants of EIS use: Testing a behavioral model." Decision Support Systems **14**: 131-146.

Collopy, F. (1996). "Biases in Retrospective Self-reports of Time Use: An Empirical Study of Computer Users." Management Science **42**(5): 758-767.

Davis, F. D. (1989). "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology." MIS Quarterly **13**: 318-340.

DeLone, W. H. and E. R. McLean (1992). "Information Systems Success: The Quest for the Dependent Variable." Information Systems Research **3**: 60-95.

Dishaw, M. T. and D. M. Strong (1991). "Extending the technology acceptance model with task-technology fit constructs." Information and Management **36**(1): 9-21.

Doll, W. J., A. Hendrickson, et al. (1998). "Using Davis's Perceived Usefulness and Ease-of-use Instruments for Decision Making: A Confirmatory and Multigroup Invariance Analysis." Decision Sciences **29**(4): 839-869.

Downing, C. E. (1999). "System Usage Behavior as a Proxy for User Satisfaction: An Empirical Investigation." Information and Management **35**(4): 203-216.

Etezadi-Amoli, J. and A. F. Farhoomand (1996). "A Structural Model of End User Computing Satisfaction and User Performance." Information and Management **30**: 65-73.

Galegher, J. and R. E. Kraut (1994). "Computer-mediated Communication for Intellectual Teamwork: An Experiment in Group Writing." Information Systems Research **5**(2): 110-138.

Gelderman, M. (1998). "The relation between user satisfaction, usage of information systems and performance." Information and Management **34**(1): 11-18.

Gray, P., D. Vogel, et al. (1990). "Assessing GDSS empirical research." European Journal of Operational Research **46**: 162-176.

Green, P. E. and Y. Wind (1973). Multiattribute Decisions in Marketing: A measurement Approach. Hinsdale, IL, The Dryden Press.

Guimaraes, T., M. Igbaria, et al. (1992). "The Determinants of DSS Success: An Integrated Model." Decision Sciences **23**: 409-430.

Hair, J. F., R. E. Anderson, et al. (1998). Multivariate Data Analysis. Upper Saddle River, NJ, Prentice Hall.

Igbaria, M. and M. Tan (1997). "The consequences of information technology acceptance on subsequent individual performance." Information and Management **32**: 113-121.

Jackson, C. M., S. Chow, et al. (1997). "Toward an Understanding of the Behavioral Intention to Use an Information System." Decision Sciences **28**(2): 357-389.

Jain, B. A. and J. S. Solomon (2000). "The effect of task complexity and conflict handling styles on computer-supported negotiations." Information and Management **37**(4): 161-168.

Karahanna, E. and D. W. Straub (1999). "The psychological origins of perceived usefulness and ease-of-use." Information and Management **35**(4): 237-250.

Kersten, G. E. (1985). "NEGO - Group Decision Support System." Information and Management **8**(5): 237-246.

Kersten, G. E., S. Köszegi., et al. (1999). The Effects of Culture in Anonymous Negotiations. A Four Countries Experiment.

Kersten, G. E. and S. J. Noronha (1999). "WWW-based Negotiation Support: Design, Implementation, and Use." Decision Support Systems **25**: 135-154.

Lederer, A. L., D. J. Maupin, et al. (2000). "The technology acceptance model and the World Wide Web." Decision Support Systems **29**(3): 269-282.

Mathieson, K. A. (1991). "Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior." Information System Research **3** : 173-191.

Moore, G. C. and I. Benbasat (1991). "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation." Information System Research **3** : 192-222.

Parthasarathy, M. and A. Bhattacherjee (1998). "Understanding Post-Adoption Behavior in the Context of Online Services." Information Systems Research **9**(4): 362-379.

Pinsonneault, A. and K. L. Kraemer (1989). "The Impact of Technological Support on Groups: An Assessment of the Empirical Research." Decision Support Systems **5**(2): 197-216.

Rangaswamy, A. and G. R. Shell (1997). "Using Computers to Realize Joint Gains in Negotiations: Toward an "Electronic Bargaining Table." Management Science **43**(8): 1147-1163.

Straub, D., M. Keil, et al. (1997). "Testing the technology acceptance model across cultures: A three country study." Information and Management **33**: 1-11.

Szajna, B. (1993). "Determining information system usage: Some issues and exapmles." Information & Management **25**: 147-154.

Szajna, B. (1996). "Empirical Evaluation of the Revised Technology Acceptance Model." Management Science **42**(1): 85-92.

Taylor, S. and P.A. Todd (1995). "Understanding Information Technology Usage: A Test of Competing Models." Information Sytems Resarch **6**(2): 144-176.

Udo, G. J. and J. S. Davis (1992). "Factors affecting decision support system benefits." Information & Management **23**: 359-371.

Udo, G. J. and T. Guimaraes (1994). "Empirically assessing factors related to DSS benefits." European Journal of Information Systems **3**(3): 218-227.

Venkatesh, V. and F. D. Davis (2000). "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies." Management Science **46**(2): 186-204.

Watson, R. T., T. H. Ho, et al. (1994). "Culture - A Fourth Dimension of Group Support Systems." Communications of the ACM **37**(10): 45-55.

Yaverbaum, G. J. (1989). "Critical Factors in the User Environment: An Experimental Study of Users, Organizations and Tasks." MIS Quarterly **13**: 74-88.