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Frank Kohne

University of Hohenheim, fkoehne@uni-hohenheim.de

Mareike Schoop

University of Hohenheim, schoop@uni-hohenheim.de

Dirk Staskiewicz

University of Hohenheim, staskiew@uni-hohenheim.de

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AN EMPIRICAL INVESTIGATION OF THE ACCEPTANCE OF ELECTRONIC NEGOTIATION SUPPORT SYSTEM FEATURES

Frank Köhne, University of Hohenheim, Chair of Information Systems I (510 H),
70593 Stuttgart, Germany, fkoehne@uni-hohenheim.de

Mareike Schoop, University of Hohenheim, Chair of Information Systems I (510 H),
70593 Stuttgart, Germany, schoop@uni-hohenheim.de

Dirk Staskiewicz, University of Hohenheim, Chair of Information Systems I (510 H),
70593 Stuttgart, Germany, staskiew@uni-hohenheim.de

Abstract

Electronic negotiation support aims at enabling complex trade interactions through means of information technology. Present research in electronic negotiation support is limited to a large extent to the analytical decision support view. There is a lack of empirical evidence on the acceptance of the different types of support in the negotiation support portfolio and their value contribution. In this paper, the results of a laboratory experiment evaluating the communication support feature of a particular negotiation support system, namely the Negoisst system, is presented. It is concluded, that dedicated communication support is highly relevant in users' perception of usefulness.

Keywords: Negotiation Support, Communication Support, Decision Support, Technology Acceptance model (TAM).

MOTIVATION

As the differentiation of products and services progresses and electronic communication media mature, more parties are intensively involved in the process of specification and creation of value. Organisational boundaries begin to blur. Based on these developments, the support of business negotiations in electronic commerce is a field of growing importance, compared to the established shopping metaphor.

While the traditional perspective of support is that of decision support (e.g. Jarke et al. 1987, Jelassi and Foroughi 1989, Kersten 1985; Kersten and Noronha 1999b; Kersten 2002), it has been argued in recent years that there needs to be a different perspective of support, namely that of communication support (Kersten 2002, Schoop et al. 2003, Weigand et al. 2003). Electronic negotiations are a type of interorganisational communication and as such, they can be supported by means of information technology (IT) in different ways. The level of support can vary from providing communication features in negotiation support systems (NSSs) (Kersten and Noronha 1999b, Yuan et al. 1998) to a complete communication support (Schoop et al. 2003). Some approaches argue for the sole support of this perspective (Weigand et al. 2003, Yuan et al. 1998) while others aim to integrate the decision support perspective and the communication perspective (Schoop et al. 2004).

There are different negotiation support systems that all aim at supporting complex electronic negotiations such as WebNS (Yuan et al. 1998), Inspire (Kersten and Noronha 1999a), Negoisst (Schoop et al. 2003), and SmartSettle (www.smartsettle.com). WebNS is a process-driven web-based negotiation support system and offers dialogue windows that are used for exchange of natural language messages without a prescribed structure. A third party acting as a mediator can monitor the exchanges and can intervene or offer help. Inspire is an NSS grounded in the decision-theoretic analytical view but provides some communication features. Negotiations are conducted via structured exchanges of documents representing offers and counter-offers with the possibility of writing some free text messages to accompany the documents. Negoisst is grounded in the communication-theoretic perspective (Habermas 1985, Schoop 2002, Searle 1969) but integrates decision support (see section 3). While Inspire is a research and training tool, Negoisst is used to conduct real-life negotiations. SmartSettle is a commercial NSS focusing on analytical support for complex real-life negotiations.

Compared to the amount of negotiation systems, the ones described above represent a minority. The majority of approaches and systems in the field of electronic negotiations focuses on automation as a top-level goal and deals solely with highly structured negotiations in the form of auctions or artificial negotiation agents. Support for complex, less structured negotiations is currently underrepresented in empirical research. However the need for support in these cases is undeniable.

In this paper, we will introduce and discuss findings from empirical research on the acceptance of features of electronic negotiation support systems. As argued above, there is a need to carry out more research on communication support than on decision support. Therefore, we will present the results of a complex negotiation scenario conducted with the communication-centred NSS Negoisst. Firstly, the research questions and the underlying research models will be discussed (section 2). The empirical studies have been conducted with the negotiation support system Negoisst which will be introduced in section 3. The research setting will be described in section 4 before the results are analysed and interpreted in section 5. Finally, concluding remarks and an outlook to further work is provided in the last section of this paper.

1 RESEARCH QUESTION AND MODELS

Existing studies on NSS utilisation are often rooted in the analytical, decision support paradigm and employ measures such as Pareto efficiency (Foroughi et al. 1995, Delany et al. 1997). Modern NSSs

provide analytical (decision) support as well as communication structuring and document management. These communicative features go beyond the mere provision of a communication channel in NSSs, as described by Lim and Benbasat (1993). The contribution of the features to the overall value of such systems is unclear. In this study, both paradigms of support, as implemented in the Negoisst system to be introduced in the next chapter, will be evaluated simultaneously using a subjective measure, namely technology acceptance. Explicit communication support is a novelty in research and practice. The main purpose of this study is to understand its usage and evaluate its contribution.

In general, technology acceptance studies take technology use as a dependent variable and try to find the drivers and barriers of that use. Davis (1989) argues that the behavioural intention of using a technology is determined by the attitude towards using it which in turn is additively determined by the perceived usefulness and the perceived ease of use of a technology. He introduces the technology acceptance model (TAM) which has been empirically supported by various investigations into the acceptance of technological approaches. Numerous extensions and specialisations have been published. Venkatesh et al. (2003) integrate the model with other successful approaches in acceptance research such as the Task-Technology fit model and have proposed a new, more universal model (UTAUT) recently. Here, a direct relationship between the evaluation of the system and the intention to use that system is proposed and validated, while in the original TAM study this relationship was proposed to be mediated by user's attitudes towards a system. A number of context variables has been integrated.

The acceptance of negotiation support technology has already been researched empirically (Lim et al. 2002, Vetschera et al. 2004). Lim et al. provide valuable field data on the NSS adoption intention of managers in the Asian area. They found the theory of planned behaviour (TPB) to provide significantly better predictions than the TAM, which is meant to explain acceptance after a brief exposure to the technology. It is yet unclear whether the approach could provide a concise perception of NSS by means of the fact-sheet delivered to the participants. Vetschera et al. (2004) extend and empirically support the TAM with constructs specific to negotiation support. Their empirical results further indicate that users of NSSs differentiate between analytical and communication components of such systems and evaluate them separately, in line with Lim, Benbasat (1993).

The purpose of this paper is to explore the role of advanced communication support in users' experiences and further, to inform the discussion of technology acceptance regarding decision support systems. Regarding complex negotiation cases and the application of NSSs we have the following hypotheses:

- (a) In line with TAM/UTAUT, overall performance and effort expectancy will significantly influence the users' intentions of using NSSs.
- (b) On a more detailed level, the users evaluate communication support and analytical support offered by an NSS separately.

These two have to be tested before further inferences can be made. They are the preconditions for the third hypothesis to follow. If either the TAM is not reasonably predicting usage intentions in our sample or if users have a holistic perception and evaluation regarding the different types of support features, testing specific features' contribution to the prediction would not be meaningful. If the hypotheses hold, the third hypothesis can be tested:

- (c) The perception of the usefulness of communication support features in NSSs will significantly determine users' overall performance expectancy and thereby their intentions of using NSSs.

The perception is operationalised as a share of or a specialisation of the performance expectancy construct from the Venkatesh et al. (2003) UTAUT model.

Figure 1 summarises this idea. All other elements of the original model (i.e. age, experience etc.) are disregarded here, because there is hardly any variance in the present context due to the controlled experimental environment.

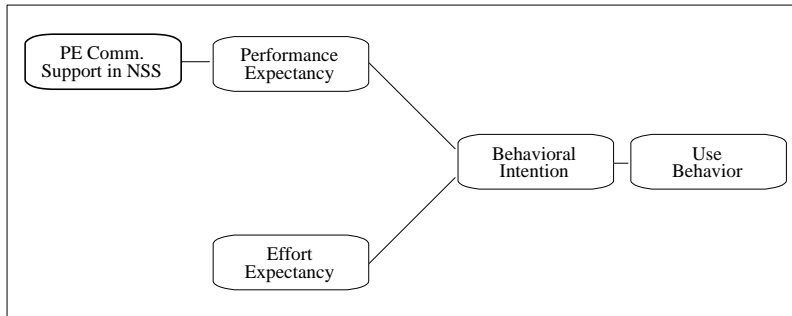


Figure 1. Extended part of the UTAUT model (Venkatesh et al. 2003)

Moreover, this paper is a first exploration of quantitative data collected with the Negoisst system and seeks to evaluate the system as a whole regarding its acceptance.

2 THE NEGOISST APPROACH TO NEGOTIATION SUPPORT

In this section, the Negoisst system used in the experiment will be introduced. Negoisst integrates multiple views of negotiations in order to provide holistic support in case of complex negotiations: a communication view, a document view, and a decision-theoretic view.

All interactions with the system are web-based. Negotiators communicate in an asynchronous, bilateral manner via semi-structured messages. Each message consists of a content expressed in natural language and a message type representing the speaker's intention. The message types are classified into four categories according to Searle's illocutionary points (Searle 1969): assertives representing facts (message type *information* in Negoisst), commissives representing a speaker's intention to carry out the action described (message types *offer* and *counter-offer* in Negoisst), directives representing a speaker's intention of getting the hearer to carry out the action described in the message content (message types *request* and *clarification* in Negoisst), and declaratives representing a speaker's wish and ability to declare new facts (message types *accept* and *reject* in Negoisst).

In order to avoid unwanted ambiguity of natural language messages which is a common communication problem in negotiations (e.g. LaRocco 2004) and written interactions in general, a semantic enrichment process is provided. The negotiators annotate parts of the message content using a set of pre-defined terms, e.g. taken from a taxonomy or an ontology. There is also the possibility for the negotiators to dynamically extend the list of terms in order to represent their current negotiation context. These features are shown in figure 2. Furthermore, there are two separate negotiation areas. Figure 2 shows the formal negotiation area. For informal questions and clarification, a separate area is provided where the negotiators can interact without any resulting obligations. Through these means of enrichment, Negoisst provides not only a communication medium but actively facilitates communication clarity in negotiations.

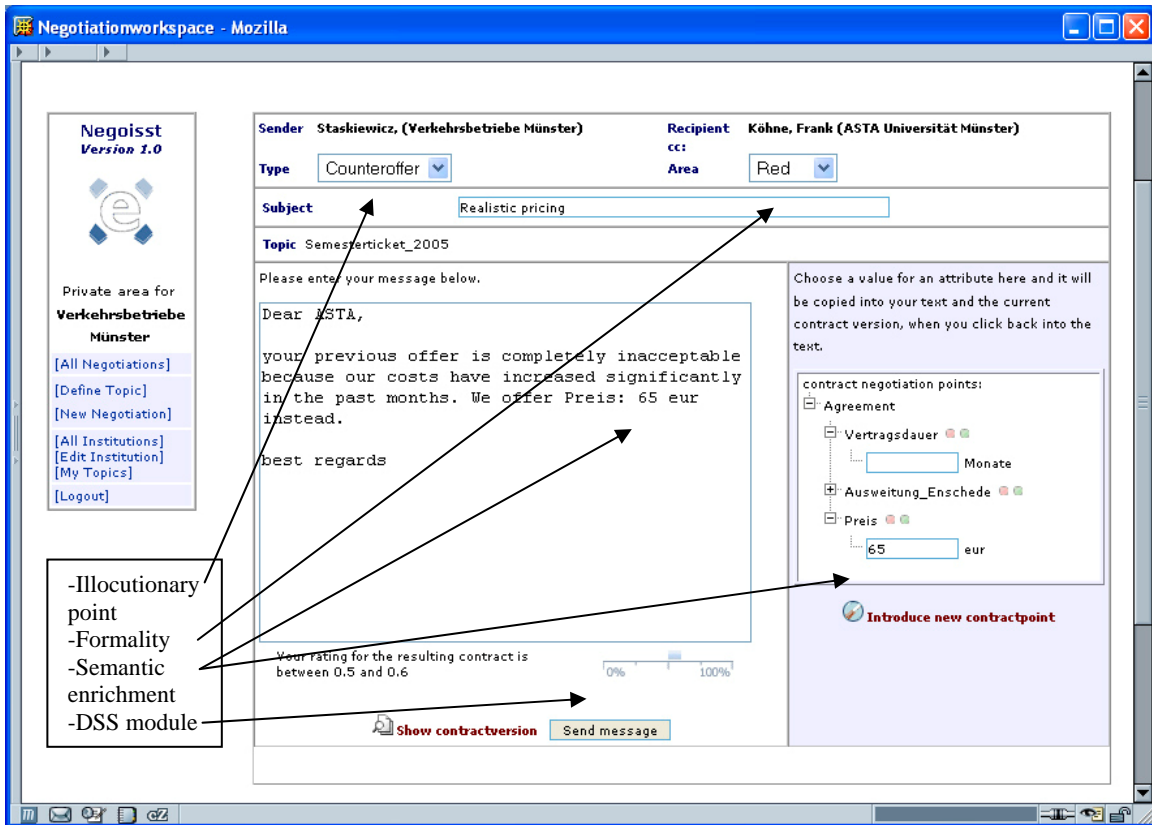


Figure 2. Message exchange in Negoisst.

The communication features are important for the document view representing another important negotiation element, namely the business contract as the result of a successful negotiation. Such a contract evolves during the negotiation process in that each message leads to a new contract version. Negoisst uses the message annotations together with the message type, the negotiators involved and their role (i.e. buyer or seller) to deduce the resulting contract version automatically which includes explicit obligations for both negotiators.

Old contract versions are automatically archived and interlinked within the message history. Therefore, it is possible to show the single message in which a current value of a particular contract element has been defined and hence to show the reasons and arguments that led to the choice of that value. Negoisst thus provides document management facilities and integrates communication support and document support as shown in figure 3.

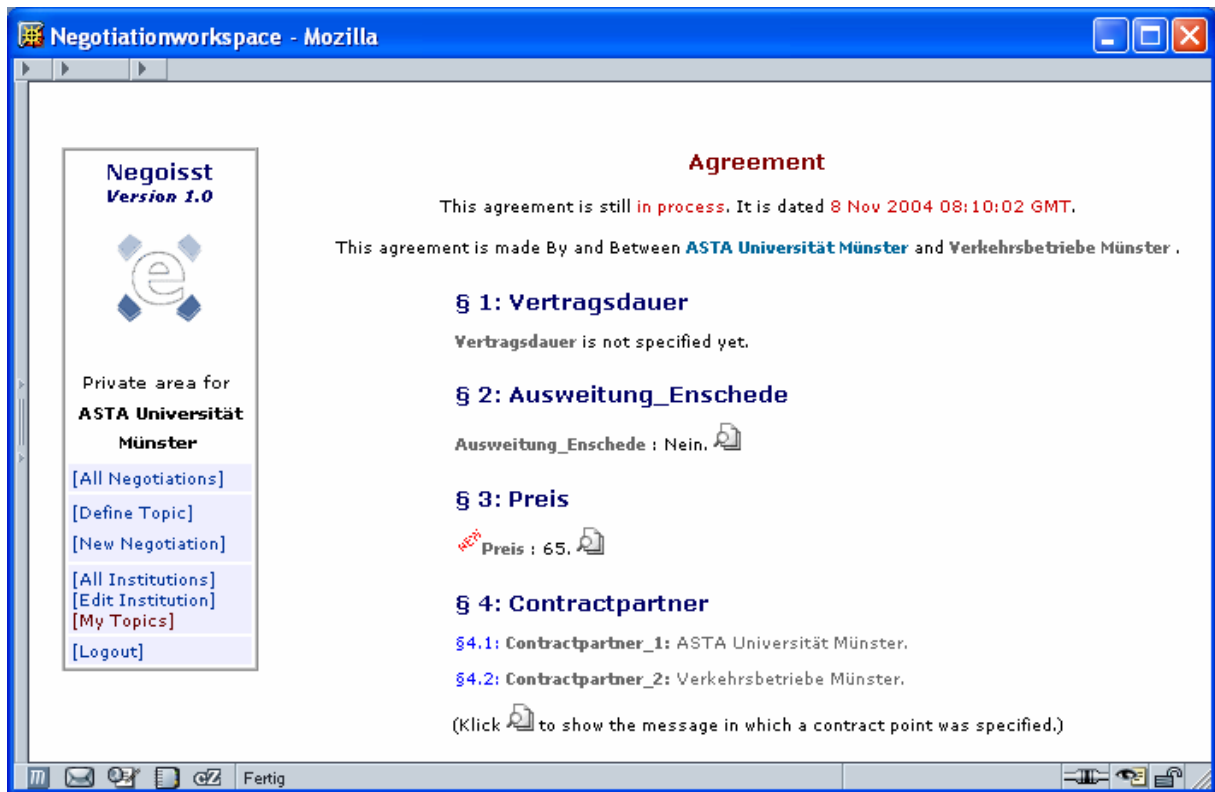


Figure 3. Document management in Negoisst

Furthermore, Negoisst supports the decision view by providing an integrated decision support module. The module implemented in the system is based on mechanisms that were successfully used in other systems such as Inspire. Negoisst uses the hybrid conjoint method (Green 1984) in order to generate additive utility functions covering categorical as well as numerical attributes. These are then used to evaluate all offers made in order to visualise the pattern of concessions (see figure 2). The user can add new attributes to his/her utility function dynamically. Negoisst allows sending messages with incomplete agreements. Then a best-case / worst-case utility range can be estimated only. The interested reader is referred to (Schoop et al. 2003, 2004) for a more detailed description of the system.

3 EXPERIMENTAL SETTING AND METHODOLOGY

In this section, the experimental setting will be discussed as well as the methodology used. The aim of the present study is to present findings from an empirical study on the acceptance of features of electronic negotiation support systems. In particular, we will focus on communication support rather than on decision support since there is hardly any research on the former type of support. The experiment is done with Negoisst which integrates communication support and decision support. Before presenting the details of the study content, we will briefly describe the organisational setting.

The experiment was conducted in one week of January 2004. In prior experiments, it had been decided to provide participants a textual training case in order to familiarise them with the system. This proved to be insufficient because a lot of variance in the experiment could be attributed to the extent of preparation the participants had, blurring more interesting effects. Therefore, it was decided not to disclose any information in advance and all groups were trained during a 30 minute presentation of the system and its features and were provided with additional support during the set-up phase of the negotiation. The participants were asked to continue negotiations at home during the following week.

	Attributes in the case
I. Payment	Price, time and possible splitting of payment, management of exceptions, a new recompensation rule
II. Ticket	Entrainment of bicycles in trains and busses, possible extension of the validity area
III. General	Term of the new contract

Table 1. List of attributes negotiated in the case (not binding for participants)

All participants received a case description including the random assignment of a negotiation partner within the same group. In line with the methodological recommendations of Teich et al. (2000) for dyadic multiple issue negotiations the experiment was designed to be contextually relevant to the subjects and without imposing an artificial preference structure (Clyman and Tripp 2000) on them. They were asked to role play a complex dyadic negotiation that German students can easily identify with: the negotiation of a contract between the ASTA (student union) and the Municipal Transport Services (ÖPNV), regarding a discounted semester ticket for a fixed fee that all students have to pay. This kind of agreements has become common practice at many German universities; however the conditions vary and are renegotiated regularly on an annual schedule. The case is a typical example for a complex negotiation that is unsuited for auctioning due to the idiosyncrasy of the negotiators.

No confidential, i.e. side-specific information or preference structure was provided to the test persons; some public background information (i.e. the number of students to be expected) was included however. Participants were encouraged to improvise if necessary and the case structure summarised in Table 1 was therefore not binding.

The 87 participants of the experiment were mostly male (87.2%) students of Information Systems from a thematically-related course. Participation was voluntary and rewarded with a 5% bonus on class exercise points. From a pre-negotiation questionnaire we learned that they had little experience with formal negotiations, either offline or via an electronic medium. They were however familiar with electronic communication in general. The average age of the participants was 22 years with a standard error of 1.75; there were no systematic differences regarding prior experiences and the understanding of the case material between groups. Sampling can therefore be considered purposeful; it provides homogeneity on a number of independent variables, making the constructs of interest easy to analyse but trading off representativeness.

The experiment focused on the acceptance and user perceptions of communication support in electronic negotiation support systems. Since communication support is a basic constituting property of the Negoisst system, it cannot be 'switched off' in order to apply a full experimental design for group comparison. The emphasis of the experiment described is therefore on a correlation analysis of questionnaire data regarding the communication support features. However, we collect and explore group comparison data on the DSS component along the way.

The instrument used is based on the items given in Venkatesh et al. (2003) for performance and effort expectancy (a translated and extended version), as far as the questions were suitable for the experimental setting. Table 2 includes the questions used. The remaining questions originally used by Venkatesh et al. (2003) were unsuitable for experimental prototypes because they implied that participants had ongoing access to the technology under discussion ('I plan to use ...').

The intention to use construct is addressed by one measure only: the number of scenarios which participants consider suitable for the form of support demonstrated, namely practicing, preparing, or actually conducting negotiations. The participants evaluated whether Negoisst is suitable to use in each scenario via yes/no questions. The number of positive answers is used as a measure for the participant's overall intention to use the system.

Before and after the experiment, web based questionnaires were used to collect data, mostly using a 7-point semantic differential scale like Davis (1989) and simple yes/no questions as well as free text comments.

Although preference information is collected as part of the negotiation process, it is not part of the analysis due to the limitations of experiments with artificial preferences (Teich et al. 2000, Clyman and Tripp 2000). However, to allow for the comparison of group means in the questionnaire data, participants were randomly assigned to one of two groups: a treatment group with communication and decision support and a control group with communication support but without decision support.

4 RESULTS

Because all data was collected and checked electronically on the fly, there were no missing data and no outliers to be dealt with. 14 datasets are removed from the analysis of the DSS component because subjects did not actively use the component (therefore n=73). Further, no systematic differences between the test groups with identical system features were found. A confirmatory factor analysis including a varimax rotation was performed on the UTAUT items and lead to the following factor loadings.

		Factors		Alpha
Performance Expectancy	Using the system enables me to accomplish tasks more quickly.	.199	.924	0.879
	Using the system increases my productivity.	.164	.929	
Effort Expectancy	My interaction with the system would be clear and understandable.	.928	.110	0.848
	It would be easy for me to become skilful at using the system.	.925	.182	
	I would find the system easy to use.	.761	.226	

Table 2. Questions and factor analysis on UTAUT items

As expected, two factors (performance expectancy and effort expectancy) were identified. All items load on their respective factors with loadings of 0.76 and higher. In the next step of analysis reliability checks were performed on the UTAUT constructs using Cronbach's Alpha measure, as it is commonly applied to Likert scale attitude instruments. Reliability is acceptable (Alpha > 0.8, see table 2) for all constructs.

Using the two factors a linear regression model was fitted and yielded an R² value of 0.412, which means that they explain a considerable share of the variance in usage intentions. This is in line with the UTAUT. Overall intention of using a system like the one tested in the experiment was surprisingly strong throughout all groups. While 56% (n=87) stated that they would use the system again in a real negotiation, acceptance of the system for preparation and training purposes was higher (61% and 63% respectively). But which features of the system contribute to the performance and effort expectancy of the participants and do participants have separate evaluations of the features? For data reduction, the 4 features mentioned in Table 3 are combined to a single factor labelled communication support, which is moderately reliable and can be understood as a specialised construct for performance expectancy. The same is true for the control question regarding the usefulness of the analytical support provided, namely the rating of all offers made.

Please evaluate the usefulness of the following features:			Alpha
Communication support specific performance expectancy	Problem representation.	.698	0.683
	Offer exchange mechanism.	.677	
	Integration of messages and offer making.	.689	
	Links between messages and changes of contract points.	.797	

Table 3. Questions and factor analysis for communication support features

First of all, participants evaluate the two types of support, namely communicative and analytical, separately. Their respective evaluations of usefulness correlate with a Spearman's Rho of 0.124 on a significance level of 0.446 only. Further, a Mann-Whitney-U test showed that the evaluation of the communicative support factor does not systematically differ between the DSS and non-DSS groups (sig. 0.459).

Regarding the factors performance expectancy for communication support and overall performance expectancy, we find these closely related. They correlate with a Spearman's Rho of 0.355 on a significance level of 0.002.

If we use the factor of performance expectancy for communication support instead of the general performance expectancy as a predictor for the intention to use similar systems (summed over scenarios as described) in a linear model (summarised in table 4), we find R^2 decreased to 0.210, because a more focussed view is applied and we disregard more general perceptions of the overall system and their contribution to acceptance. Interestingly, the participants' performance evaluation of the systems communication support features predicts their usage intentions very good compared to the full TAM model (R^2 see above) and its influence is highly significant.

	Std. Coeff.	T	Sig.
Communication support evaluation on usage intention	-0.503	-4.349	0.000

Table 4. Linear regression models predicting usage intention from feature evaluation

Nevertheless, analytical support is also perceived as valuable by the participants. The rating feature was mentioned multiple times as the feature most liked, along with the integration of messages and offers and the links between messages and contract versions in the free text part of the questionnaire. Because we can not assume normality of our variables, we used a Wilcoxon-Mann-Whitney test to analyse systematic differences between the DSS and no DSS groups. The results are listed in table 5 below.

	Intention sum	More Productive with the system	Satisfaction with result
Mann-Whitney-U	503.000	492.000	582.500
Wilcoxon-W	1133.000	1195.000	1285,500
Z	-1.867	-1.806	-0.346
Asympt. sig.	0.062	0.060	0.729

Table 5. Comparison of means between DSS / no DSS groups

DSS and no DSS groups differ systematically, however not highly significant, with respect to the participants' intentions of using a similar system in different scenarios and their expectations regarding their overall productivity in these cases. Both are higher in the DSS groups. Another finding in the group comparison is that the analytical support induces no differences regarding the participants' satisfaction with the agreements reached.

To summarise, our three hypotheses were not rejected. We support Vetschera et al. (2004) and Benbasat, Lim (1993) in their argument that communication features and analytical features of an NSS are perceived and evaluated separately (b). This perception seems to be selective even though both features are intertwined in the system used. We find the TAM/UTAUT to provide good predictions for the participants' intentions to use NSSs (a) in contrast to Lim et al (2002). Further, the predictive ability of the model is mainly given through the participants' evaluation of the communication support features offered (c).

Considering group comparison DSS vs. no DSS, decision support does not influence users' satisfaction with the outcomes negotiated. In our sample, analytical support is perceived as a productivity tool and, therefore, also influences the participants' usage intentions. This result may be attributed to distortions caused by the small and homogeneous sample, by an insufficient implementation of the analytical features, or by an inappropriate case where analytical support might not offer much benefit.

The overall evaluation of the system was surprisingly positive in general, although some critical remarks regarding technical details of the implementation were also present.

5 CONCLUSIONS

In this paper, the results of an empirical investigation into the acceptance of features of electronic negotiation support systems were presented. While there are many electronic negotiation systems focusing on well-structured negotiation scenarios using automation of the negotiation processes, the focus of this paper was on complex negotiation contexts that exist in real-life situations: negotiators do not pre-structure all interactions nor all intentions and sometimes add or remove negotiation elements based on the dynamics of current exchanges. The negotiation support system Negoisst can support such contexts and was, therefore, chosen as the system basis.

Negoisst provides an integrated perspective on electronic negotiations including a communication view, a document view, and an analytic view. Thus, it is suitable to be used for an empirical investigation of different system features and their effects on user acceptance and performance which is important research that is largely missing in research area of electronic negotiations.

Results confirmed the importance of a strong communication perspective that is rooted in theory and intuitively presented to negotiators and the UTAUT argumentation. Our findings confirm that efficient communication support is highly relevant in negotiators perception of an NSS and its opportunities and risks should be carefully evaluated.

Follow up experiments are currently undergoing qualitative analysis, in order to harden the evidence found. Our current research concerns the effects of NSS features' utilisation on negotiations in comparison to more traditional ways of conducting negotiations electronically, such as electronic mail. Changes in communication style, argumentation and concession patterns can be expected. It will then be possible to provide a well-grounded thorough basis for acceptable and usable negotiation support systems including a pool of modularised system features with known effects on performance and quality of negotiation processes, which can be assembled in different ways to optimally support different negotiation scenarios.

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