

# Design Guidelines for Negotiation Support Systems: An Expert Perspective Using Scenarios

Alina Pommeranz , Willem-Paul Brinkman, Pascal Wiggers, Joost Broekens, Catholijn M. Jonker

Section Man-Machine Interaction, Delft University of Technology  
Mekelweg 4, 2628CD, Delft,  
The Netherlands

{a.pommeranz, w.p.brinkman, p.wiggers, j.broekens, c.m.jonker}@tudelft.nl

## ABSTRACT

Negotiation support systems (NSS) can enhance humans' performance in negotiations. Much research in this area focuses on finding optimal bids. However, there is little research on human factors in technological negotiation support. We believe an in-depth analysis of the task involving experts and users is needed to build a new generation of NSS focusing on man-machine collaboration. We describe a scenario-based approach to gathering requirements for such a system. We wrote five scenarios containing part of the envisioned functionality in the most important use situations, e.g. face-to-face negotiation, on the phone, collaborative or mobile preparation. We used claims analysis to clarify our design decisions. To evaluate our claims we organized focus groups including six general and six job negotiation experts. The filmed scenarios were used together with two claims each to guide the discussion. Based on the data analysis we constructed 12 design guidelines for NSS.

## Keywords

Decision making and problem solving, Decision aiding, Human-system interaction, Design approaches.

## ACM Classification Keywords

H.4.2 [Types of Systems] *Decision support.*

## 1. INTRODUCTION

### 1.1 Background

Existing Negotiation Support Systems (NSS) can enhance the human performance in negotiations and increase the number of win-win outcomes if the negotiation space is well-understood [9, 10]. This is because computers are good at coping with the computational complexity involved in calculating offers. However, there are a number of issues inherent in real life negotiations that are difficult to deal with using classical Artificial Intelligence (AI) approaches alone. These issues

mostly relate to the interpretation of the social setting. Therefore, NSS are required that take into consideration the strengths of both the machine and the human.

Current research on technological negotiation support is carried out in different areas, primarily in management science, electronic commerce and Artificial Intelligence [1, 14, 21]. It is hard to find studies in this area that include human factors [11], which is surprising since NSS are a type of interactive systems that offer rich possibilities for researching and designing human-computer interaction. However, different problems such as reaching optimal solutions and bids, formal descriptions of negotiations, the extraction of user preferences or problem representations remain the major foci of research efforts.

As formulated in [2, 19], NSS research concentrates on technological solutions, but the social problems that they intend to solve are secondary or even completely neglected. More in particular Swaab and colleagues [19] argue for a careful analysis of social and psychological processes in order to design good NSS. They claim that the success of an NSS is not only dependent on technological feasibility but also on the understanding of the activity that the system will support. These authors attempt to inform the design process of NSS.

However, they primarily look at two aspects that influence the outcomes of negotiations positively, namely common (cultural) identity and shared cognition. In this sense NSS can help by providing information to the opposing parties to establish a common understanding of the problem and possible solutions. Their studies show that the nature and representation of the information can influence negotiation outcomes. Another effort to emphasize the importance of social and also emotional issues in negotiation and their consideration for NSS has been made by Bui [2]. In his article the author points out problems that evolve from the fact that empirical research focuses only on the rational aspects of negotiation. For instance, the negotiation models that are implemented in NSS assuming strict economic rationalization ignore that people also take decisions based on social acceptability of different means to achieve a deal. Adding reasoning based on ethical and social norms to negotiation models will allow them to better represent the real life negotiation processes. Bui explores socio-emotional aspects such as conflict awareness, thoughts, emotions, intentions, trust and norms and their impact on negotiation. He creates a general list of aspects that NSS should help users with, such as identifying controversy, clarifying issues/criteria, equalizing parties or finding solutions and simulating impacts of potential decision. These can be seen as more generic

guidelines for the functionality and design of NSS. Both cases [2, 19] refer to shared NSS used either collaboratively by all parties or as mediators. This is only one type of NSS with special requirements.

An interesting research area where social aspects are actually considered is group decision support [e.g. 13]. However, also in those cases the focus is on collaboration and verbal communication between the participants rather than aspects like thoughts, emotions, trust etc.

In this paper we focus on the challenges of developing a system that is used only by one party in the negotiation and takes into account the human factors occurring in negotiations. Our aim is to extract detailed guidelines for this negotiation setting that extend the generic guidelines presented in [1].

We explain our scenario-based approach for finding such design guidelines. The second section presents a thorough description of our qualitative method using scenarios, claims analysis, videos and expert focus groups. The data analysis is presented in the third section, followed by the results including the design guidelines in section four. Finally, we give a conclusion about our work in section five.

## 1.2 Research goals

Our project goal is to build an NSS that supports one party in a dyad negotiation through all phases of the process (preparation, begin, analysis, bidding, closure). Since all negotiations differ and the domain of the negotiation has a major influence on the process, our project focusses on two example application domains: housing and job negotiations.

To achieve a good interaction between our system and the user it is essential that both explicitly share a generic task model. In order to implement such a model, we need to find out what task we will support and understand that task in depth. Furthermore, as pointed out in the background it is important to consider social, psychological and emotional aspects in the design of NSS. However, only a few researchers [2, 19] investigated such aspects and they focussed on broad social science concepts and their implications on negotiation. Therefore, the design guidelines that can be extracted from their research are generic. We believe additional in-depth analysis of negotiations is necessary to create specific guidelines that will inform the design process of the next generation of NSS. In addition to studying theoretical research from negotiation and social science literature, it is important to explore negotiation practice in the real world. We used a scenario-based design approach [6] involving general negotiation experts and job negotiation experts. Our primary research goal is to construct a number of design guidelines for NSS considering real life practice from an expert perspective. To reach that goal we have a sub-goal of understanding the users' task in context, as well as their behaviours and needs.

## 2. SCENARIO-BASED APPROACH

Overall we follow a user-centered design approach within this project. Our target users are people with different negotiation skill levels. As shown in the literature [20] most people are not very good negotiators although it is an almost daily task. Whereas users might not be able to explain themselves, negotiation experts and trainers have a good grasp of the common practice, mistakes and support that is needed. As pointed out by other researchers, a participatory design

methodology making the user a co-designer from the beginning might not be sensible when the user knows little about the domain and is supposed to be taught about it by the software. We therefore adopted the informant design framework suggested by Scaife and his colleagues [15] that proposes to involve various participants at different stages in the design process. By this we can maximize their input and advance the development. The participants can be users as well as experts depending on the kind of data needed in certain design stages. At this early stage we will aim at gaining knowledge about negotiation from domain experts. In order to get a structured overview of the situations and the ways our NSS should support users, we decided to organize a number of focus groups with experts. As will be explained in more detail below focus groups offer an interesting way to discuss first ideas due to their dynamic group element.

To be able to gather useful data we decided to guide the group discussions by using filmed scenarios of use situations of an NSS. Not only did we want to show our ideas about parts of the envisioned functionality but also get feedback on possible use contexts. Use contexts are determined by the different phases of a negotiation as well as the situation and conditions in which the negotiation takes place. A first brainstorming session with seven researchers of our project group helped to envision related functionality and situations in which different phases of the negotiation take place. This group of researchers is interdisciplinary consisting of HCI researchers with foci on psychology, emotions and user-system interaction as well as researchers from the fields of computer science and Artificial Intelligence. All researchers are familiar with classical negotiation literature. A first selection of feasible ideas was written separately on post-it notes which we clustered. Based on those clusters we generated, in close collaboration with a negotiation coach, five distinct use contexts that together cover all negotiation phases and types of system use (e.g. open, hidden etc.). The contexts are: face-to-face negotiation, remote negotiation (phone, internet etc.), preparing collaboratively for an upcoming negotiation and preparing for a negotiation with time constraints while being mobile (e.g. on the train). Each of these situations offers characteristics that influence the acceptability as well as the functionality of the NSS.

### 2.1 Scenarios

Scenarios are useful in the design process since they capture the consequences and trade-offs of designs [5]. The narrative nature of scenarios enables users, experts as well as designers to imagine the use situations and contexts of new or existing technology. For each of the five use contexts we wrote a scenario presented here in summary. *Italic text is taken from the original texts of the scenarios.* We chose to write two scenarios illustrating a job negotiation, two with real estate content and one about buying a car. We included one scenario set outside of our application domains in order to investigate how a completely different domain can influence the devices' role and functionality. All scenarios were checked by a professional negotiation coach to make sure that they were sufficiently realistic. Each scenario is briefly discussed below.

**Mobile Preparation with Time Constraints.** Preparation is one of the negotiation phases stressed in the literature, e.g. [8]. In this scenario we describe a preparation situation with special constraints. The job applicant Martin is already on his way to the interview. Therefore he has limited time to prepare himself. In addition, the mobile setting constitutes another

constraint, namely limited resources. Both constraints require special regard when it comes to the functionality of the device. Just before getting on the train to the interview Martin has received a NSS on a pocket device. He uses the device's speed preparation function to prepare himself in the short time he has left. Among other functions the device allows him to receive knowledge about the job negotiation domain. *He wonders how much money he could ask for. He chooses 'expert opinion' on the interface and types in 'salary'. The PN suggests a website that has a forum where you can discuss current average salaries for IT consultants with an expert in the field. After reading through the forum Martin has a quite good idea what he can ask for with his kind of educational background and experience. With that knowledge he feels more secure and relieved.*

Later in the scenario Martin makes use of the training module of the NSS which enables him to go through a simulated interview. He receives on-the-fly advice about his and the opponents' actions. The scenario ends with a more relaxed applicant, who knows what to expect in the upcoming negotiation.

**Face-to-Face Negotiation, Secret Use.** The situation described in this scenario is a negotiation between an employee, Bianca, and her boss. Bianca is using a pocket device with a NSS. She is hiding the fact that she has such support by telling her boss he is using her device to take notes.

*Bianca has been working for a big telecommunication company in The Hague for 2 years now. Today her annual evaluation with her boss is due. Her boss is known as a quite friendly person, who hardly ever becomes aggressive or ill-tempered. However, he is very worried about his department's performance and likes to know exactly what his employees are doing. Bianca wants to take this meeting as an opportunity to re-negotiate some parts of her contract. Since her husband got a new job in another city, they decided to move further away. Therefore she wants to discuss with her boss about opportunities to handle the new situation. She knows that she worked hard and well in the last year and should get what she wants, but she does not consider herself a good negotiator. Therefore, she recently got the NSS and prepared herself for this negotiation with the device.*

Throughout the negotiation described in the scenario Bianca receives help from the device. Several functions are described in this scenario including e.g. affect management, generating new options, and giving behavioral advice.

*Bianca presses the button 'opponent concerned'. The NSS advises her to uncover the reasons for Mr. Smith's worries and show sympathy. Bianca asks: "May I ask you what your concern is?" Mr. Smith replies: "We always have a lot of spontaneous meetings to decide on how to proceed, which you will be missing if you were not here and since you are one of the main developers I think you should attend such meetings." "I really understand your worries, Mr. Smith. However, the welfare of my family is very important to me. But I am sure we can find a solution that considers both our concerns." The scenario ends with a deal in which both parties gain something and are satisfied with.*

**Collaborative Preparation.** Negotiation involves a lot of emotions on both sides of the bargaining table, but also within a party, e.g. between a couple buying a house together. In this

case the first step is to merge the demands and preferences of both partners before starting a negotiation with the opponent side. Our scenario describes a couple that is planning to buy a house together and uses the NSS during the preparation to sort out their preferences and to download domain knowledge about real estate. *They both sit close to each other on the sofa and look at the screen together. Mary starts the NSS and a virtual agent (VA) welcomes her. "What would you like to do?" he asks. Mary types in 'merge my partner's preferences with mine'. The 'collaborative preparation' module starts up. After a short introduction the NSS asks each of them to put in their preferences for a house separately. Since they also have the NSS software installed on their laptop they put in their preferences in parallel. From both preference profiles the NSS creates a matching profile and shows the clashes of their preferences. It advises the couple discussing the clashes and trying to find trade-offs between them that suit both. During this process of compromising the couple gets into a quarrel in which both insist on their own wishes without even communicating the underlying reasons in detail. In this case our device takes on a proactive role and interrupts the couple to give advice on how to handle the conflict. The NSS senses the noise and the angry voices in the room and assumes an argument. On the screen the VA appears and says "it became very loud in the room. Are you arguing?" Since the device does not get any attention a red LED starts blinking and a beep sounds. Both Mary and Piet stop talking and look at the NSS. Mary answers the NSS's question with yes. The NSS suggests calming down [...and...] prompts them to put in an emotional value on a scale from 'I don't care at all' to 'I would die for this' for each variable they have different preferences on."*

After having sorted out all their preferences they start looking for houses. In the last scene of the scenario the couple visits a house and takes advantage of the NSS's feature of taking pictures and storing them together with other information about the house in a database.

**Negotiation on the phone.** A negotiation in which both parties are not situated in a face-to-face setting, but are distant from each other offers different design challenges for a NSS. First of all one party does not see the other party and therefore the use of a NSS can take place without each others' notice. Especially in real estate situations, e.g. when buying a house another aspect to consider is that the negotiation is split into a number of phone calls. This gives the user time in between the calls to use the system in each step of the negotiation. In our scenario a couple has decided to buy a house. Before the wife starts the negotiations with the real estate agent of the seller, the couple decides on a price. They use the NSS to download information about prices of similar objects in the same region to know what to expect. *Furthermore, the PN has downloaded housing domain knowledge, such as contracts and legal issues and the prices of similar houses in the neighborhood to take into account. Before Mary came to work this morning she had decided with Piet to set a first bid around 450.000 Euro.*

At work Mary calls the agent and starts negotiating. Before and during the phone calls she uses the NSS on her laptop to receive advice about different steps in the negotiation, e.g. *the NSS advises her to not start the negotiation with offering a price, but instead talk about other issues and options...*

The bidding goes on for a while and the NSS shows a visualization of the bids in the outcome space based on the preferences of Piet and Mary and the estimated preferences of the agent. After a while the NSS detects that the bidding is not reaching a win-win situation. After finding new variables to include in the negotiation to reach an agreement that suits both parties they finally close a deal.

**Face-to-Face Negotiation, Open Use.** We decided to include another scenario that has a face-to-face setting, but showing an open usage of the NSS. This scenario is about a couple buying a car. Our belief is that the car dealer's setting enables people to use the NSS more openly. When buying a car it is usually not necessary to stick to one specific car dealer. No long-term relationships need to be considered. Therefore, the couple in the scenario openly states that it will be using the device and explains what they can do with it. The focus of the scenario lies in the advice of time-outs at strategic points during the negotiation. During the process of looking at cars and refining their preferences for the new car, they enter information about the state of the negotiation into the NSS. They receive strategic advice on how to proceed and when to take the time to recapitulate.

*He [the car dealer] shows them a range of more sporty looking family cars and the couple chooses their favorite. They enter that into the NSS. The NSS advises them to take a time-out and check whether they have considered all their preferences and whether all the information they need has been disclosed.*

After they have found an interesting car the bidding starts in the car salesman's office. The NSS assists the couple by comparing prices with similar cars online. They disclose to the salesman that the market price is lower than his offer. The salesman drops his price. They negotiate about a few extras and finally leave with a new car and a deal they are satisfied with.

## 2.2 Storyboards and Videos

Due to their illustrative strength scenarios are a good means to communicate design ideas within the project team as well as to users or experts in the field. In order to exploit that strength even more we decided to visualize the scenarios. First we created a storyboard for each of the scenarios. For the collaborative preparation scenario see Figure 1. These storyboards then served as a basis for the shooting and editing of short (about two to three minutes) videos (for an example video see <http://mmi.tudelft.nl/video/scenario2/>). Using videos we were able to present the use contexts of our NSS very well. Much of the functionality of the NSS was kept open for interpretation to avoid limiting the discussion about the functionality. The videos were used in the design process as described in the focus group section. In the future they will

also be used alongside a questionnaire on users' acceptability of an NSS in different use contexts.

## 2.3 Claims Analysis

Due to the scenarios' narrative nature many things are left implicit. Often causal facts and relations underlying the actions described are not revealed. Therefore it is useful to enumerate such causal relations separately. This can be done through claims analysis [5]. Each claim underlying a certain action or design feature in the scenario is listed together with its trade-offs. We used the claims slightly different, as proposed by Neerinx [12], namely in order to test our hypothesis about functionality and use contexts in the focus groups discussions with the experts. We wrote down four to six claims per scenario based on our hypothesis. Due to space limitations we cannot list all the claims here, but only give examples. The first claim was written for the face-to-face scenario and the second for the negotiation on the phone scenario:

**Advice claim:** the NSS gives generic advice for different negotiation phases in a text-based form (e.g. ask for reason of concern, be sympathetic, and maintain the relationship).

+ Even though the user might know of such things due to a good preparation, the NSS's advice serves as a reminder during the negotiation process.

- The user might not be able to put the advice to practice or the way he tries to do so is not effective.

**Graphical representation claim:** the NSS shows the current status of the negotiation graphically including all variables etc.

+ The variables and their influences on the negotiation process are shown, so that the user can understand the process better.

+ The user can recapitulate and learn for future negotiations by looking at the current status and the influences of the variables.

- The number of variables and influences is high and the user finds it hard to learn from the graphical representation.

- The graphical representation is not understood by every type of user.

## 2.4 Focus Groups

Focus groups [16] have been widely used in marketing to exploit the dynamics of group discussions in order to receive attitudes towards ideas or products. Bruseberg and McDonagh-Philp [3] have shown that focus groups are also useful during the design process of new technologies. They help the participants to articulate their ideas and provide the researcher with inspiration for the design process. Lately, HCI researchers have adopted the method and refined the techniques used to stimulate the discussion. As for instance, Goodman and

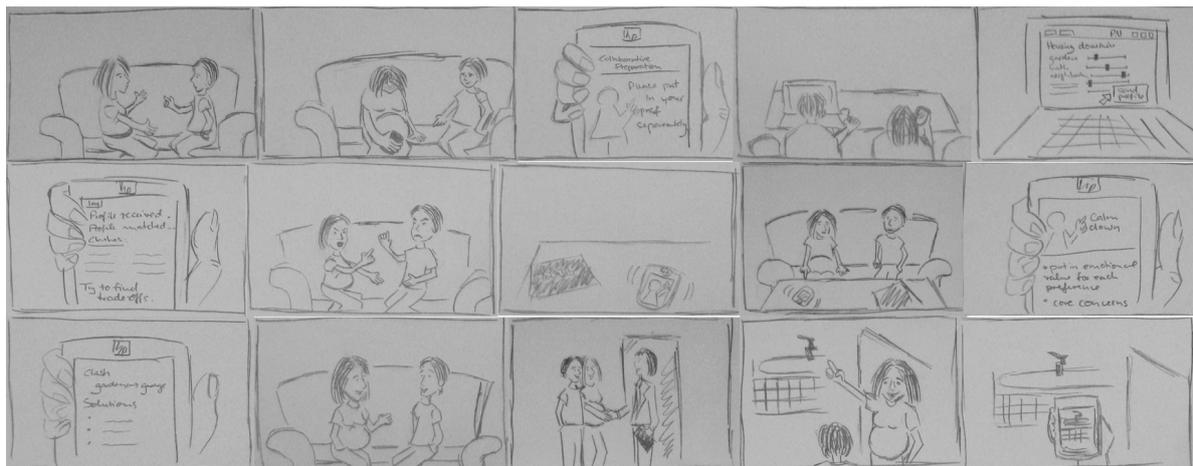


Fig. 1. Collaborative preparation scenario

colleagues [7] found out, it is profitable to use visual help such as pictures and also scenarios in focus groups. Furthermore, tasks can start up a discussion. Based on these findings we used the previously described scenarios in form of videos in the focus groups.

In total we had a number of 12 experts divided into three focus groups. We divided the experts into different focus groups according to their expertise. As explained by a number of researchers, e.g. [16], the homogeneity of the group plays an important role. The more similar the group members are the more likely they are to voice their opinions. Therefore, we formed one group with general negotiation experts, such as negotiation trainers, lawyers, a judge etc., and two with job negotiation experts, such as human resource employees and labour union representatives. In the beginning participants were introduced to each other and the project was described. Every participant received a questionnaire that contained two claims from the claims analysis (see previous section) per video. The claims, however, were reformulated into statements that allowed the experts to specify their level of agreement with. The two claims named in the previous section were presented as the following statements:

**Statement:** *General tips and strategic advice [e.g. try small talk, show sympathy for your opponents concerns] is more useful for the user than specific behavior- and decision-advice.*

**Statement:** *The NSS should focus on helping the user to understand the bidding process [e.g. graphical representation of the bidding including history of bidding] rather than proposing the next bid.*

After watching each video the participants individually specified their level of agreement on a 7-point Likert scale, and provided comments. We chose this method to give everyone a chance to think about their own attitudes and opinions in silence. As pointed out by e.g. Carey [4] less confident members may be encouraged to disclose more when having written down their views in advance. Once every member finished writing the moderator started a group discussion, by asking the participants in turn to react to the claims and discuss their ideas with the others. The moderator stimulated the discussion without enforcing any existing views from the project team. The discussion was taped for later analysis. In addition, two researchers in every group took notes. Taking notes is important since simple audio-recording cannot always capture what is happening between the members of the group.

### 3. DATA ANALYSIS

Our approach results in two types of data, i.e., data from the notes and data from the questionnaires. To analyze the questionnaire data (values on a Likert scale) we used a standard mean value calculation. Figure 2 presents the average level of agreement of the experts with the claims that were presented in the questionnaire. Considering the 95% confidence interval and the value four as the middle of the scale the results suggest that the majority of the experts leaned towards agreeing with the claims: 1) open use of the device when buying a car benefits the outcome; 2) device should help the user to understand the bidding rather than giving the next

bid; 3) general tips are more useful than specific advice; 5) in preference elicitation ask for core concerns (instead of specific values); 6) short training and simulation enhances negotiation skills; and 7) short preparation contribution positively to negotiation outcomes. The qualitative data explains the rationale behind these positions and provides additional ideas.

Focus groups provide large amounts of qualitative data, due to the dynamic nature of the group and the contextual setting. As discussed in detail in [4, 16] the data analysis of focus group data is delicate. Researchers have to be aware that focus groups are not meant to find consensus within the group and that empirical generalization from the data is not possible. However, according to Sim [16], the data from focus group can provide theoretical insights with sufficient level of universality to be projected to comparable contexts.

For the analysis of our data we used a method similar to interpretative phenomenological analysis [17], which is a bottom-up method often used in psychological qualitative research. The idea is to go through the data from one focus group to gather emerging themes from the text. Themes can be recurring ideas, thoughts or feelings from the participants. These themes are then clustered together and superordinate concepts might emerge. This process is repeated for the other focus groups and finally, the superordinate themes are compared and converged to final themes or theories, i.e. in our case transformed into design guidelines.

We analyzed the sessions separately on the basis of the notes by at least two researchers. The recordings from the sessions were only used in case the notes were not clear enough or incomplete. Every idea or attitude was written on a post-it note. Repeated ideas were not written down again, as we were not trying to get empirical generality and furthermore, in groups people tend to agree with or repeat thoughts and ideas.

To define the general themes that can be transformed into design guidelines four researchers independently clustered the post-it notes. We intentionally included one researcher unrelated to the project. Therefore, we could compare unbiased data with the data from the project researchers. Themes thus identified were then compared across all focus groups. This revealed that researchers used two arguments to categorize the themes. Either they considered the system's functionality or they looked at the phases in negotiations process. The system's functionality perspective led to four categories, namely negotiation tactics, usage of an NSS, information the NSS should provide, adaptivity of the NSS to the user, and the interaction with the interface. The negotiation perspective extracted categories for all negotiation phases, such as training, extracting preferences, context analysis, interaction with the opponent, and analysis of the bidding process. In particular, the participants emphasized that the device should motivate the user to prepare, as even a short preparation will be beneficial for the negotiation outcome. Furthermore, they expressed that the device should help people understand the bidding process instead of just proposing next bids. Note, that although the discussions were triggered by the statements and the filmed scenarios, they also gave insights that cannot be directly linked to the statements. New themes arose, e.g., the importance of context and the adaptivity of the system to the user. All themes fall into the categories resulting from the clustering.

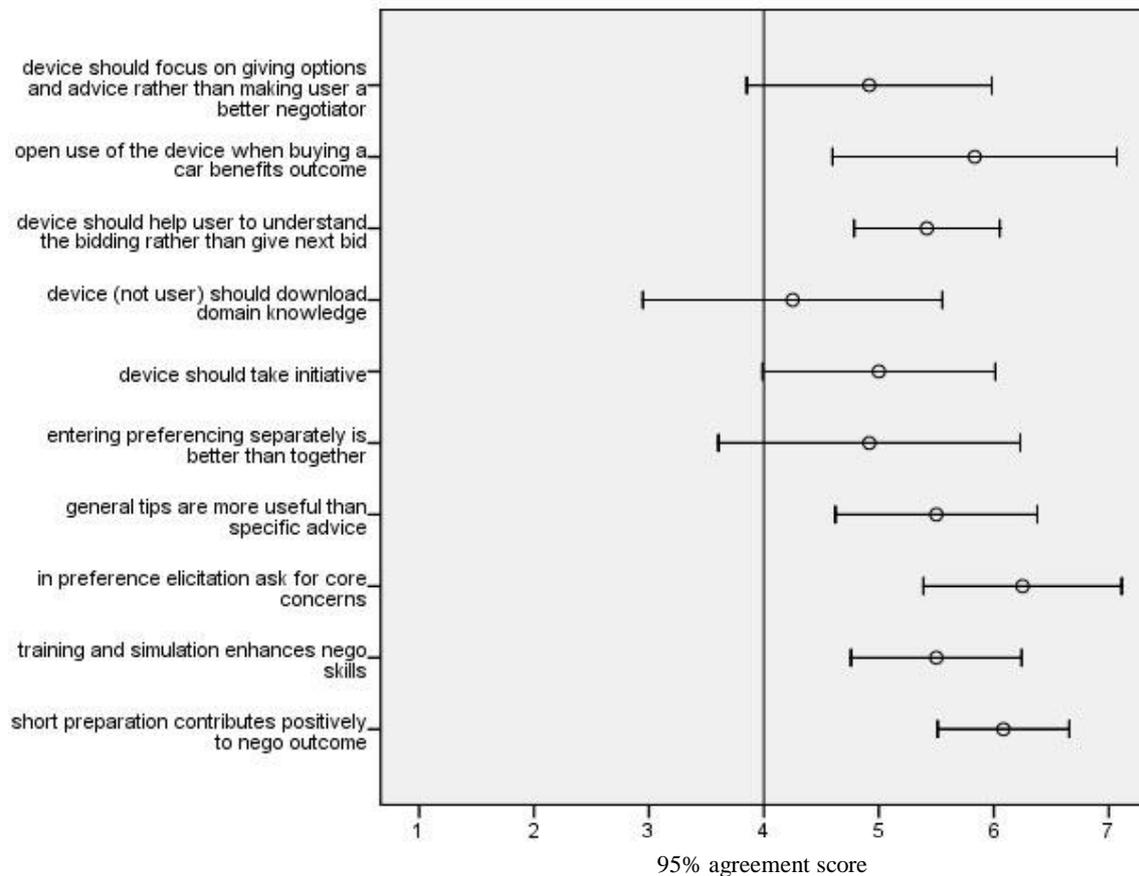


Fig. 2. Mean values of agreement with claims (1=strongly disagree, 7=strongly agree) including 95% confidence interval.

#### 4. FROM THEMES TO GUIDELINES

In the following we elaborate on the themes and construct eight design guidelines from the themes. Themes are presented in bold and guidelines in italics.

**An NSS device adds higher value in the preparation and training phase than during a negotiation. Training needs to be interactive and the NSS needs to react intelligently.**

All experts across the groups agreed on the fact that any preparation for a negotiation is useful. However, some experts mentioned that a technical device should add more value to the preparation than just reading a book on negotiation. They emphasized the importance of training and simulation and pointed out that the system needs to be able to respond to the user in an intelligent way. In detail, one idea that was mentioned was that the system needs to make people aware of what they can negotiate about. In addition, the system needs to ask questions to the user similar to the ones asked in job negotiations. In one group it was mentioned that multiple short sessions of preparation might be better than one long one.

*1) An NSS should support interactive preparation sessions of different lengths.*

*2) The preparation module should have a simulation mode in which the user interacts with an intelligent negotiation agent.*

**In a face-to-face situation it is hard for the user to focus both on the device and the opponent.**

Most experts were of the opinion that an NSS should not be used in face-to-face negotiations. Especially the job negotiation experts mentioned that the way the applicant or employee presents him/herself is important as well as focusing on the negotiation partner. While using a device the interaction with the opponent becomes awkward and might be embarrassing. Furthermore, the experts were concerned that understanding and processing the device's information and advice takes too much time and is too much cognitive load for the user in a face-to-face situation.

*3) The cognitive load of the information representation provided by the NSS during a face-to-face negotiation should be minimized.*

**The context including atmosphere, non-verbal communication and emotions plays a major role for the negotiation process.**

In two focus groups it was emphasized that especially in job negotiations the non-verbal communication and the atmosphere in the room play an important role. Furthermore, emotions influence the decision-making process and the course of negotiation. This means that the system needs to be able to obtain this context information and take it into account when reasoning about next steps. People are generally better at interpreting emotions, non-verbal communication and atmosphere than computers. One way of enabling the system to understand the context is to build a context model within the system and let the user enter information about the context

during the negotiation. To reduce the data that the user needs to feed into the system other techniques like emotion recognition or using (e.g. sound) sensors might be a solution.

4) *In the training module the user should be trained on being aware of the context.*

5) *Advice from an NSS should consider information about the context of the negotiation.*

**The NSS is strong in the rational part of a negotiation, by offering new options and for storing and managing data. It should provide domain knowledge in terms of facts that the user can use to persuade.**

Most experts agreed that the strength of a device would lie in handling the rational part of a negotiation. It can store and manage vast amounts of data, deal with the computational complexity during the bidding and offer new options to the user. Furthermore, domain knowledge should also include mainly facts, such as prices or salaries, which the user can use to persuade his/her opponent.

6) *An NSS should support the user by calculating bids and offering new options to negotiate on.*

7) *It should have a data storing and managing function that gives the user easy access to the information needed at a certain point in time.*

**Both generic and specific advice is useful but needs to be applied carefully.**

One of our claims was that generic advice is more useful than specific advice. The attitude towards this claim differed between the experts. Many of them saw a danger in specific advice because if the system cannot sense the context specific advice is often inappropriate. Generally both generic and specific advice could be useful but is dependent on the negotiation phase and the capabilities of system and user.

8) *An NSS should generally provide the user with more generic advice that the user can apply to the situation he/she is in.*

**The NSS needs to adapt to the user's behavior and his knowledge or experience.**

At several points in the discussion it was mentioned that the system advice or reactions need to be adapted to the experience of the user and his/her behavior. Regarding advice given by the system it was mentioned that novice users who are not good negotiators should get more specific advice whereas more advanced users are able to apply more generic advice. During the bidding the system should adapt its behavior to that of the user and recalculate the next bids in case the user changed his/her strategy.

9) *An NSS should be able to adapt to the user's skill level and experience and more in specific to the user's bidding behavior.*

10) *System advice should be based on the capabilities of the user to apply them in practice.*

**Interruptions are seen controversial. Time-outs, however, are good.**

The majority of the experts thought that active interruptions by the system through vibrating and beeping during a tense situation are not useful. The users would either ignore the system or become more upset. However, most experts agreed

that time-outs are very useful for reflection of the negotiation process. As the user is not always aware of when to take a time-out the system should suggest it.

11) *An NSS should suggest time-outs at appropriate stages in the negotiation process.*

**Preferences of collaborating partner's should be put in separately.**

Across the focus groups there was a consensus that in the process of generating a preference profile for collaborating partner's, e.g. couples, they should put in their preferences separately. That avoids that one partner is more dominant than another. In our scenario we proposed that the system then merges the preferences and shows the clashes to the users. The experts did not agree on doing it this way. They pointed out that showing those clashes triggers arguments between the partners instead of a discussion about underlying values. It is more important that the partners talk about such values and come to a conclusion. The system could also directly suggest solutions. It was also proposed that a user indicates the importance of every preference.

12) *Partners should put in their preferences separately and assign an (emotional) value to each preference.*

## 5. CONCLUSION

Overall these guidelines boil down to the following insight: the preparation phase of a negotiation and the actual negotiation with an opponent require different interaction styles. In the preparation phase NSS should provide a negotiation training that is rich, content-full and contextual. Preferably it should make use of an adaptive scenario including socially intelligent opponents to provide a real setting. During the negotiation with an opponent, on the contrary, the system should provide concrete, personalized advice regarding offers and generic advice regarding the negotiation process with easy interpretable hints. The interaction style in this case should be as little interrupting as possible.

The major implication of these guidelines is that NSS need to have intelligence and reasoning capabilities in order to process the information entered by the users and give personalized output. Furthermore, the system needs to possess an accurate user model that is updated during the interaction to be able to adapt to the user. Furthermore, the interaction styles need to be carefully selected for each phase of the negotiation.

With regard to our approach we learned that the addition of video material as stimuli in focus groups facilitates idea generation and discussion within the group. Participants were able to directly reflect upon the potential usage of the NSS. The discussion was vivid and constructive. During the focus groups we got a detailed account of real life negotiations from the viewpoint of negotiation experts such as negotiation trainers, judges, labor union representatives and human resource employees. This enabled us to understand the task negotiators are facing and the mistakes people make. We learned what kind of support an NSS should give to its users and in which form.

A major drawback of making concrete stimulus material is that several experts also commented on and discussed particular implementations, while these were only included in the videos as examples and not as intended functionality. This happened even though experts were explicitly instructed not to pay

attention to these details. We conclude that careful weighing is necessary regarding the amount of detail put into concrete stimulus material in order for a focus group to react upon the right level of abstraction.

In the future we will test users' acceptability of NSS in the different use contexts and conduct field studies in order to get a grasp of negotiation practice from a users' point of view.

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## 7. REFERENCES

- [1] Bellucci, E., Lodder, A. R., and Zeleznikow, J. 2004 Integrating artificial intelligence, argumentation and game theory to develop an online dispute resolution environment. *Proceedings of the 16th IEEE International Conference on Tools with Artificial Intelligence*. pp. 749-754.
- [2] Bui, T. 1994 Evaluating Negotiation Support Systems: A Conceptualization. In: *27th Annual Hawaii International Conference on System Sciences*, pp. 316—324. IEEE Press, Hawaii.
- [3] Bruseberg, A. and McDonagh-Philp, D. 2002 Focus groups to support the industrial/product designer: a review based on current literature and designers' feedback. *Applied Ergonomics* 33 (1), 27—38
- [4] Carey M.A. 1995 Comment: concerns in the analysis of focus group data. *Qualitative Health Research* 5, 487—495.
- [5] Carroll, J. M. 2000 *Making Use: Scenario-based Design of Human-Computer Interactions*. MIT Press, Cambridge.
- [6] Carroll, J. M. 2000 Five reasons for scenario-based design. *Interacting with Computers* 13, pp. 43—60.
- [7] Goodman, J., Dickinson, A., and Syme, A. 2004 Gathering Requirements for Mobile Devices using Focus Groups with Older People. To appear in *Designing a More Inclusive World*, *Proceedings of the 2nd Cambridge Workshop on Universal Access and Assistive Technology (CWUAAT)*, Springer
- [8] *Harvard Business Essentials: Negotiation*. Harvard Business School Publishing Corporation, Boston 2003
- [9] Hindriks, K.V. and Jonker C.M. 2008 Creating Human-Machine Synergy in Negotiation Support Systems: Towards the Pocket Negotiator. In: *HuCom*, pp. 47—55. Delft.
- [10] Kersten, G. E. and Lo, G. 2003 Aspire: an integrated negotiation support system and software agents for e-business negotiation, *International Journal of Internet and Enterprise Management* 1 (3) pp. 293 – 315.
- [11] Lee K.C., Kang I. and J.S. Kim, J.S. 2007 Exploring the user interface of negotiation support systems from the user acceptance perspective. *Computers in Human Behavior* 23(1) pp.220—239.
- [12] Neerincx, M.A. 2003 Cognitive task load design: model, methods and examples. In: E. Hollnagel (ed.), *Handbook of Cognitive Task Design*. Chapter 13. Mahwah, NJ: Lawrence Erlbaum Associates, pp. 283–305.
- [13] Nunamaker, J. F., Briggs, R. O. , Mittleman, D.D. (1996). *Lessons from a Decade of Group Support Systems*. *Proceedings of the 29th Hawaii International Conference on System Sciences Volume 3: Collaboration Systems and Technology*, IEEE Computer Society.
- [14] Rangaswamy, A., and Shell, G. R. 1997 Using Computers to Realize Joint Gains in Negotiations: Toward an Electronic Bargaining Table. *Management Science* 43 (8), pp. 1147—1163.
- [15] Scaife, M., Rogers, Y., Aldrich, F., and Davies, M. 1997 Designing for or designing with? Informant design for interactive learning environments. In: *Proceedings of CHI97: Human Factors in Computing Systems*, pp. 343--350. ACM, New York
- [16] Sim, J. 2001 Collecting and analysing qualitative data: issues raised by the focus group. *Journal of Advanced Nursing* 28 (2), 345—352.
- [17] Smith, J.A. and Osborn, M. (2003) *Interpretative phenomenological analysis*. In J.A. Smith (Ed.), *Qualitative Psychology: A Practical Guide to Methods*. London: Sage.
- [18] Stewart, D. and Shamdasani, P. 1990 *Focus Groups: Theory and Practice*. Sage
- [19] Swaab, R., Postmes, T., and Neijens P. 2004 Negotiation Support Systems: Communication and Information as Antecedents of Negotiation Settlement. *International Negotiation* 9, pp. 59—78
- [20] Thompson, L. L. 2005 *The Heart and Mind of the Negotiator*. Pearson Prentice Hall, New Jersey
- [21] Vetschera, R., Kersten, G. and Koeszegi, S. 2006 User Assessment of Internet-Based Negotiation Support Systems: An exploratory Study. *Journal of Organizational Computing and Electronic Commerce* 16 (2), pp. 123—148.