Mediation support with mediation expert systems and robotic tele-presence

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Abstract. This study investigates the effects of using a mediation expert system under various support conditions in a laboratory setting. Information is provided to the system and advice retrieved either by the participants themselves, via a human mediator or via a tele-operated robot. We study the effects of these different ways of providing mediation support and communicating with the participants on negotiation outcomes, trust and technology acceptance. Though there are no significant differences in trust and technology acceptance measures conditions with the mediation support system achieve better result than the control group and conditions with robotic tele-presence better outcomes than those without. The gender of the mediator or operator does not influence negotiation outcomes.

Keywords: negotiation, mediation, mediation support, expert system, VienNA, de-merger, experiment, fair proxy, Telenoid

1 Introduction

In the early years of the field of decision support experts gathered information about problem and preferences of the people and institutions they aided in decision making, entered this data in models and systems and interpreted and explained the derived results for their clients. Later years witness the emergence of a novel area of decision support systems with improved user interfaces they directly support users without other agents in the loop. Reasons behind this development are manifold, besides the further development of decision support models and information and communication technology, which builds the necessary basis, receiving decision support can be facilitated as no other humans, except the user herself, need to be involved. Decision support in conflict situations, like negotiation support or mediation, raises the issue of

neutrality and trust in a third party involved. Computer systems might be trusted more as unbiased agents, which facilitates truthful revelation of preferences and thereby guarantees the input quality necessary for credible outcomes of decision models and advice. However, the usability and the correct interpretation of results and advice can be challenging for the inexperienced user – the reason support was necessary in the first place – and thereby their effective implementation in the conflict situation. Robotic tele-presence could solve this problem by providing fair proxy communication [1], in reducing social cues and concealing the person of the operator.

We hypothesize that negotiations with mediation support by expert systems and tele-presence achieve better result than negotiations without such support. Furthermore it is assumed that perceived fairness of the mediation is highest for a mediation system alone, followed by robotic tele-presence and mediation by humans. Technology acceptance is expected to increase on the other hand if the negotiators do not have to use a mediation expert system by themselves but are supported in person or via tele-presence in data elicitation and result interpretation.

2 Material and Methods

To investigate the hypotheses a negotiation experiment was developed and conducted. The experimental conditions realize the different forms of mediation support the mediation expert system VienNA and the tele-operated robot Telenoid^{TM} are applied. This section explains these systems the negotiation case and the experimental procedure.

2.1 VienNA

The study makes use of the mediation expert system VienNA – a further development of the system negotiator assistant - is an adapted and updated version of negotiator assistant [2,3,4]. The system gathers data about the current state of the negotiation by questionnaires on the most important issue (in our study the patent issue) and the negotiation process. It then calculates and displays flexibility values for both negotiators to show how flexible they are to move from their current position towards an agreement. It also provides advice – based on the answers in the questionnaires that demonstrate low flexibility – on how to conduct the negotiations to reach an agreement.

2.2 TelenoidTM

The Telenoid^{TM} (Figure 1) is a tele-operated android robot developed 2010 by Hiroshi Ishiguro from Osaka University and the Advanced Telecommunication Research Institute International. The robot has height of 80 cm, weights 5 kg, and has a silicone-ruber surface all of which allows for direct interaction e.g. in social robotics. For tele-presence it is equipped with an eye-camera and an mouth-speaker – remote

control functions via a headset and software. Head, mouth and arms have limited movement possibilities.

Fig. 1. The Telenoid^{TM} tele-operated robot for robotic tele-presence

2.3 Case and Procedure

In the negotiation experiments we use a demerger case. The two founders (one female and one male – participants were assigned to roles with matching gender) of a medium sized health technology company decide to split due to strategic friction of the otherwise successful company. Participants represent the conflict parties in the negotiation case. Five issues (patent ownership, further employment of employees, further use of facilities, further use of equipment, responsibility for past liabilities), need to be resolved. The case is designed to be very distributive and conflicting due to opposite preferences and high weight of the most important issue (the patent for the key technology of the company) for both parties. However, the private – not the public – information of the course indicate a potential investor that allows to overcome conflicts without splitting the company. This integrative solution can only be found by information exchange and revelation of interests and priorities.

A visual overview over the six – the conditions with operators or mediators are split into conditions with female and male operators and mediators respectively to control for gender effects – is provided in Figure 2. The "control" group has no mediation support but only a 15 minutes reflection break between the two negotiation sessions. The condition "system" makes use of the VienNA system only, the participants have to watch an instruction video to learn the functions of the system before actual use. In the human mediator conditions either a female (f_human) or a male (m_human) facilitator uses the system in asking the participants questions and interpreting the advice the mediation expert system returns. In the TelenoidTM conditions this is done via the remote-controlled robot by female (f_telenoid) or male (m_telenoid) operators. Human facilitators and operators in the last four conditions are identical persons which all received the same negotiation and mediation training to interact identically with the participants to reduce variance in the experiment.

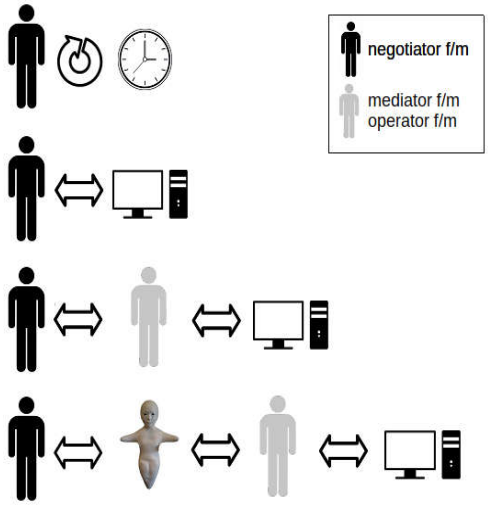

Fig. 2. Experimental conditions visualized

The participants in the experiment were recruited from the participant pool of Aarhus University's experimentation facilities and double-blind assigned to experimental conditions. After filling in a pre-questionnaire about demographic data and negotiation experience participants received the negotiation case to prepare for the negotiations. Negotiations were conducted in two 15 min sessions interrupted by an intervention of mediation support or reflection break to implement the experiment conditions described above. After the second negotiations phase participants fill ed in a questionnaire about their satisfaction with the process and outcome, perceived fairness of process and outcome, technology acceptance (for the mediation expert system conditions, i.e. all except the "control" group) and their attitudes towards robots (for the Telenoid mediator conditions only).

3 Results

A total of 286 participants in 143 dyads participated in the experiment, 18 dyads with 36 participants had to be excluded from the analyses as the ended negotiations before the mediation, i.e. the experimental intervention. Participants come from the participant pool of the Cognition and Behaviour Lab, BSS, Aarhus University, where the experiments took place, which consists of both Danish and international present and former student of Aarhus University. Participants receive monetary compensation for the time spent on the experiment.

The distribution of participants over the conditions (random assignment) is depicted in Table 1 which also shows the outcomes of negotiation dyads.

Table 1. Participants and outcomes in the experiment conditions.

condition	dyads (participants)	agreements (% of total)	distributive (% of agreement)	integrative (% of agreement)
control	19 (38)	12 (63.2 %)	11 (91.7 %)	1 (8.3 %)
screen	22 (44)	18 (81.8 %)	16 (88.9 %)	2 (11.1 %)
f_human	22 (44)	17 (77.3 %)	14 (82.4 %)	3 (17.6 %)
m_human	20 (40)	15 (75.0 %)	11 (73.3 %)	4 (26.7 %)
f_telenoid	19 (38)	17 (89.5 %)	10 (58.8 %)	7 (41.2 %)
m_telenoid	22 (44)	20 (90.9 %)	13 (65.0 %)	7 (35.0 %)

Though no significant differences were found in perceived fairness and technology acceptance metrics obtained from the post-questionnaires the results vary across conditions in terms of agreement rate and share of integrative agreements as shown in Table 1 and Figure 3. Conditions using the mediation support system achieve better result both in terms of number of agreements – i.e. agreement rate - and agreement quality – i.e. distributive vs. integrative agreements - than the control group. The same holds true for conditions with robotic tele-presence compared to those without. However, the gender of the mediator or operator hat no effect on outcomes in the conditions that used different gender mediators or operators.

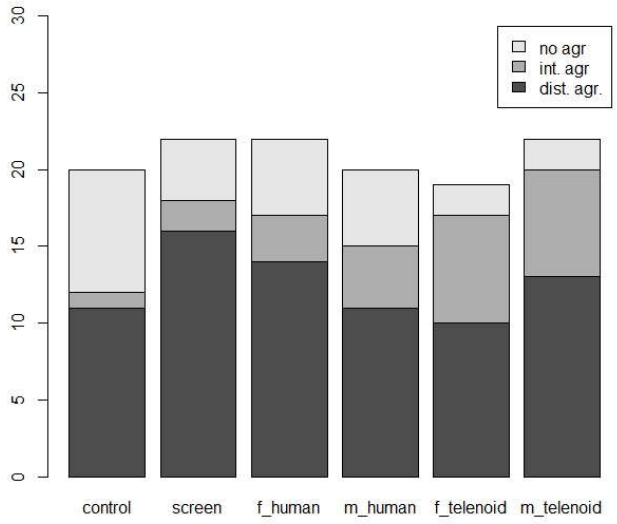

Fig. 3. Overview of outcomes in the experimental conditions

These first experimental results are promising for the use robot technology in effective mediation support, but limited by the fact that the majority of participants in this laboratory experiment were students, for which a higher technology affinity compared to other demographic groups can be assumed.

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