AN INVESTIGATION OF THE EFFECTS OF ANTHROPOMORPHISM IN COLLECTIVE HUMAN-MACHINE DECISION-MAKING

Extended Abstract

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1 Introduction

Anthropomorphism describes the attribution of human-like physical or non-physical features, behavior, emotions, characteristics and attributes to a non-human (Epley et al. 2007). The human tendency to humanize (socio-)technical systems can be used in the development of anthropomorphic information systems (IS) to reduce emotional distance to the IS and to create a natural connection between human beings and (socio-)technical systems or its components (Epley et al. 2007; Pfeuffer et al. 2018). In particular, new technologies make it possible to implement increasingly human-like features that further increase familiarization with IS. Increasing cognitive and emotional intelligence, contemporary and avant-garde interface design contribute to perceived human-likeness and anthropomorphism.

By enhancing IS with such complex anthropomorphic cues, it is also possible to develop increasingly advanced user assistance systems that adapt to the current context and the needs of their users. Advanced User Assistance Systems (AUAS; the acronym is used for both the singular and plural) are IS that support users in fulfilling a task by not only offering advice on a topic, but also referring to the user's current activities and environmental conditions in order to provide context-related recommendations and advance interaction between users and with the IS (Mädche et al. 2016). Based on this technological progress, we increasingly see groups of both humans and AUAS interacting in a collectively intelligent way (Gimpel 2015). In such collectively intelligent group decision-making settings, information and communication technologies increasingly do not only take the role of merely providing tools for humans to communicate and collaborate more effectively.

However, negative emotional responses can also occur if the IS have characteristics that are very similar to those of humans (e.g., “uncanny valley”, Mori (1970)). To ensure the acceptance of AUAS and thereby create successful assistance relationships, it is necessary to better understand how humans react to anthropomorphic cues and how they affect the collaboration with AUAS (Pfeuffer et al. 2018). Earlier research in the field of IS focused on technical implementation of anthropomorphic cues, such as designing the appearance and movements of robots (Duffy 2003; Walters et al. 2008) and virtual avatars. Researchers investigated the interaction between AUAS and humans, but results are often lim-

ited to supporting functions. Research to date has hardly addressed the impact of anthropomorphic cues of AUAS on the interaction in which AUAS act as intelligent social actors collaborating with human beings. It is unclear whether the positive effects of the use of anthropomorphic cues also leads to an improvement of decision quality made in the collaboration process. In particular, there is no integrated theory that allows to understand and to explain the dependencies between the anthropomorphic cues of AUAS and the decision quality that apply during collaboration.

Based on this background, our overarching research question is: *In the context of group decision-making under risk by collectives of humans and advanced user assistance systems, what are the effects of anthropomorphism on the quality of the decision, the satisfaction with the decision, and the personal responsibility for the decision?*

2 Research model

The present research bases on prior work, especially from the IS, human-computer interaction, (small) group decision-making, and social psychology literature. It builds on knowledge from research areas such as artificial intelligence, knowledge representation, reasoning techniques and formal computational modeling. Additionally, findings from the field of human-computer interaction, such as information presentation, interaction design and affective computing, are also used. This knowledge is combined with findings from the field of group decision-making, which examines the different forms of collaboration in (human) groups with two or more. Figure 1 sketches the research model. Conceptualizations and reasoning behind the hypothesis are presented in the full paper that is available from the corresponding author upon request.

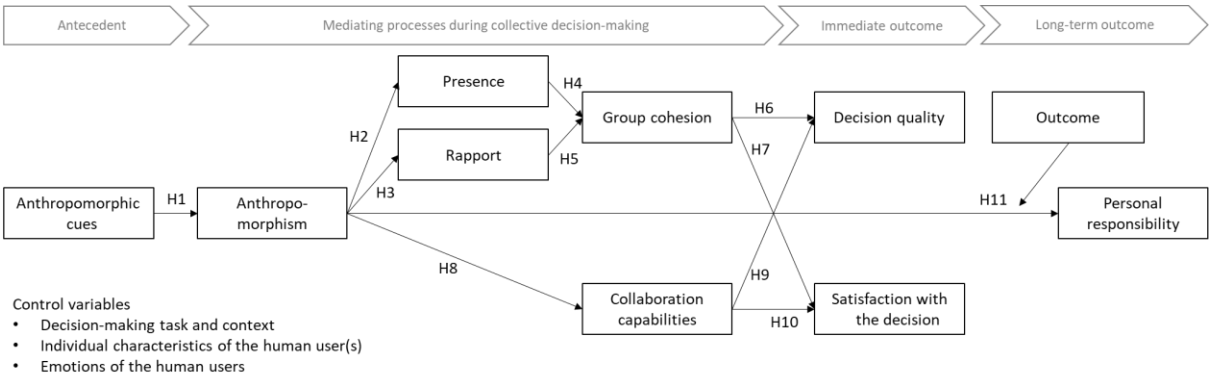

Figure 1: Research model.

3 Sketch of a potential experiment

For a first empirical test of our hypotheses, we aim to conduct a laboratory experiment in which we confront human participants with a complex decision-making problem under risk. We plan to first start with "very small group decision-making" involving groups of two participants: one human participant, one AUAS. This extreme case of group decision-making falls within the larger context of collective human-machine decision-making as described above. Having only dyadic interactions increases experimental control as compared to larger groups.

Three experimental treatments are planned in a between-participant design. In each of these treatments, an individual participant collaborates with an AUAS to solve a complex decision-making problem under risk. The intensity of anthropomorphic cues is the treatment variable. To compare the experimental groups in terms of decision quality, it is important that the advisors in different treatments each have identical cognitive abilities, as otherwise it is not possible to distinguish whether a potential effect can only be attributed to the degree of anthropomorphism or is caused by the improvement of cognitive abilities. Therefore, we will focus on the appearance and visual behavior of the advisor (facial expression, gestures) and relational cues like self-disclosure, empathy, humor and meta talk.

The results should help in refining the research model. Eventually, larger groups and other experimental tasks can be studied.

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