

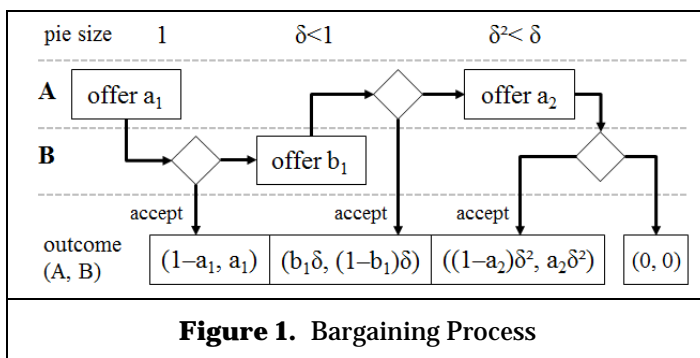
# Emotions in Dynamic Bargaining with Humans and Computer Agents

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Bargaining is prevalent in daily business life. Managers negotiate with employees about wages and bonuses, buyers and sellers haggle over prices and conditions. At that, management decisions today are taken by human beings, not by robots. Consequently, these decisions, and respective humans too, are affected by their emotions. Hence, considerations about one's negotiation partner's intentions, fairness and reciprocity may be as relevant as the bare economic facts and figures. Therefore, we argue that IS research should build on the advances in cognitive neuroscience and harness the potential of NeuroIS tools in the field of economic decision making and management, in particular, negotiation support.

In our study, we investigate the emotions of participants in a structured 3-period alternating offer bargaining process (cf. Rubinstein, 1982) and their impact on economic decision-making. The goal of the negotiation is to find an agreement about the division of a shrinking pie. The study is structured along two dimensions: 1) the type of negotiation partner (human or computerized), and 2) the discount rate at which the underlying pie decreases each round if no agreement is made ( $\delta = 10\%$  or  $90\%$ ). Participants were assigned the role of making the initial offer (A) or responding to the initial offer their negotiation partner made (B). Information about roles and discount factor was common knowledge for both negotiation partners. Figure 1 schematically depicts the bargaining process.



Using NeuroIS methodology as described in Dimoka et al. (2010), we measure skin conductance response (SCR), heart rate (HR), and heart rate variability (HRV) of the participants during the entire negotiation process. The physiological measures serve as proxies for emotions and are combined with the negotiation results in order to provide insight into the interplay of decision-making and emotions—particularly arousal—during the

process and at discrete events, such as submitting or receiving an offer, and facing an accepting or rejecting answer.

The experiment was conducted at the Karlsruhe Institute of Technology (KIT) in Karlsruhe, Germany in December 2012. In total 216 subjects participated in the experiment. The experiment consisted of two treatments, a computer negotiant (CN) and a human negotiant (HN) treatment. Subjects knew which treatment they were in. Each subject participated in 24 subsequent negotiation processes. After each of these processes, the participants were anonymously and randomly re-matched with another human participant or computer agent, respectively.

Our preliminary results indicate that subjects tend to systematically offer a smaller share of the pie in the first and in the second bargaining round when they face computerized negotiants. This share, however, deviates considerably from the subgame perfect equilibrium and is shifted towards a more equitable allocation. The emotional responses, measured by SCR, are lower when facing computer rather than human counterparts. The physiological reactions appear to be stronger for the discount factor  $\delta = 10\%$ , which represents a more harmful threat in terms of welfare destruction.

The results have important implications for the broader IS community and in particular for the understanding of situations in which both humans and automated agents interact. Our daily life will increasingly be permeated with interactions in human only, machine only, and mixed participant environments. We show that there are distinct differences in the behavior of human participants depending on the type of situation they face. These differences have an impact on bargaining behavior, allocations, and emotional responses. One could imagine more complex interactions and more dynamic market settings. Focusing on a controlled and straightforward setting, our results present a first step towards understanding the interplay of emotions and actions in dynamic bargaining processes.

## REFERENCES

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- ❖ Rubinstein, A. (1982). Perfect Equilibrium in a Bargaining Model. *Econometrica*, 50(1), 97–109.