Leveraging Design Research Mixed Methods to Develop Social Robots for Older Adults

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As robots increasingly enter social spaces, we need to better understand their implications and leverage and teach design research methodologies, including qualitative and quantitative methods, to support our investigations of robots in people's everyday lives. (Ostrowski et al., 2020). For the ICSR Workshop on Enriching HRI Research with Qualitative Methods, we will discuss how to leverage design research in human-robot interaction through mixed method approaches. The talk will describe a year-long co-design process that generated guidelines for how older adults want social robots to be designed. The co-design process was designed to foster idea generation around social robots through convergent and divergent thinking including qualitative and quantitative methodologies, often through mixed method approaches. The co-design process included semi-structured interviews, art-based image making, a lived-experience with a social robot, reflection sessions, robot rapid-prototyping, and group ideation. This talk will explore the 7-stage design process and end results achieved through the collection of mixed-method data. We will discuss the value of providing multiple and diverse sets of mixed method tools for users to express their thoughts, ideas, hopes, and concerns, stressing the importance for allowing people to engage and express using different modalities. For example, art-based image making provided a different methodology to explore people's perceived relationship to robots compared to participants engaging in an interview around their experiences with robots. Both produced qualitative data, however, the art-based image making allowed for more emotional reflection then compared to the reflections shared in the interview. We will also elaborate on how the diversity of methods allowed for a richer, more thorough dataset and more robust design guidelines. By gathering data including images, artwork, transcripts, written responses, post-its, and video, we were able to conduct analysis on multiple levels, capturing differing perspectives that we could record over the course of the study and people's experiences with the robot. Lastly, we will emphasize key points for engaging in qualitative research with communities, including

the importance of building rapport, mitigating power differentials, knowledge building, and time scale considerations. Overall, our co-design study resulted in design guidelines that emphasize that older adults support social robots for social connection and lifelong learning, and the robot having a personality. Qualitative analysis also revealed areas for further investigations and collaborations including privacy, security, autonomy, and transparency. We are applying these results to future studies and the next iteration of robot designs in the project. The strengths of our study are the connections built with our older adult community and the mixed methods that support engagement, exploration, curiosity, and knowledge sharing with older adults.

References

Ostrowski, A.K., Breazeal, C., & Park, H.W. (2020). Design research in HRI: Roboticists, design features, and users as co- designers. *IEEE International Conference on Robot & Human Interactive Communication 2021 Workshop on Designerly HRI Knowledge.*