Study explores how the elderly use smart speaker technology

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Researchers from Bentley University, in partnership with Waltham Council on Aging in Massachusetts, and as part of a study funded by the National Science Foundation, have been exploring how the elderly use

smart speakers at home. Waltham, a satellite city about eight miles west of Cambridge has a population of about 60,000, with about one in six being an elderly citizen. The purpose of the study was to understand how the elderly use the smart speaker technology at home. A smart speaker is a hardware device that is always-on. When a wake-word triggers the software contained in the device, the smart speaker listens to the command to provide a response or carry out the command (accessing resources on the internet as needed). News stories about smart speakers have often contemplated issues such as privacy but often lack actual usage data.

The researchers deployed smart speakers in seven homes with individuals or couples aging-at-home over several months to collect actual usage data. The study followed research protocols and was designed to ensure confidentiality. The time period ranged from 178 days (about 6 months) to 410 days (about a year and a month) for different users. The usage data was analyzed to characterize use patterns. The biggest finding was heterogeneity in use patterns. In general, mornings and afternoons were more active, uses such music and news were most prevalent, and most interactions were simple commands as opposed to longer conversations. Most participants did not demonstrate sustained use over a long period. As an example, one participant who used the smart speaker for more than a year had an enthusiastic start, followed by moderate use (listen to the 14-second sonification here —listen to how the early high notes give way to repeating low notes).

"Smart speaker technology has the potential to be more than a surveillance or shopping device particularly for population segments such as the aging-at-home. Our study shows that the elderly can use this voice-based technology more easily. Future research can develop specific voice skills aimed at this population segment," says Dr. Sandeep Purao, a professor of information and process management and one of the lead researchers. "The usage data streams provide several

opportunities for analysis that provide a window into how the elderly use the smart speaker technology," says Dr. Haijing Hao, a computer information systems professor who also participated in the study.

The results of this work are being published in the *Big Data Research* journal. The team will continue the work by developing software platforms for the elderly to manage health information and exploring the design of voice skills for the elderly.

The work is important. The US Census Bureau projects that by 2040, about one in five Americans will be age 65 or older, up from about one in eight in 2000. Our study shows that technologies such as smart speakers have the potential for sustained use by the elderly, and therefore, can be the basis for developing new solutions for this population segment.

More information: Sandeep Purao et al, The Use of Smart Home Speakers by the Elderly: Exploratory Analyses and Potential for Big Data, *Big Data Research* (2021). DOI: 10.1016/j.bdr.2021.100224

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