Older Adults' Perceptions of Intelligent Voice Assistant Privacy, Transparency, and Online Privacy Guidelines

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Abstract

The significant increase in the availability of intelligent virtual assistants (IVA) such as Amazon Alexa or Google Home provides a potential array of benefits to the daily life of older adult consumers; however, this increased consumption has also given rise to fears concerning privacy and security thereby limiting use by some groups. Our investigation explores older adults' experiences and understanding of intelligent voice assistants. In a pilot study, we conducted semi-structured interviews with seven older adults to identify their understanding of IVAs and any concerns. We found that knowledge of IVA privacy practices, data use and management are key concerns for older adults. Additionally, while online privacy guidelines exist to help mitigate user concerns and address questions, many older adults in our study were unaware that these resources exist and felt that while useful they needed improvement to help older adults better navigate privacy control. Our findings suggest that to aid adoption, it is important to address older adults' concerns about privacy, data management, and how IVAs work. Therefore, our findings have the potential to inform the design and presentation privacy guidelines in the future.

Author Keywords

Intelligent Virtual Assistants, Privacy, Data Management, Transparency

1. Introduction

The adoption of intelligent virtual assistants (IVAs) are growing rapidly. IVA allows users to complete everyday tasks using their voice. It is estimated that the number of people using digital assistants is projected to reach, "*1.8 billion by 2021*" [16]. Typical uses of IVAs include setting reminders for appointments or alarms, playing music, and finding answers to miscellaneous questions [1, 11]. Therefore, the flexibility of these assistants has led to a peaked interest in utilization for aiding independence among older adults [7]. At that same time, privacy remains a concern among many groups of IVA users including older adults [2, 8, 11, 12, 15]. For example, researchers have found that older adults are concerned about whether IVAs listen to conversations and how they store information [8, 11, 13]. Studies also suggest that older adults also have concerns about IVA privacy and how the IVA might use their data [11]. These privacy concerns have been a deterrent for older adult use of digital assistants [11]. Therefore, some researchers are suggesting the need for more studies that examine trust in conversational interface research [6].

In this paper, we present preliminary findings with seven older adults who purchased or used an IVA in the last year. We conducted semi-structured interviews with participants to understand their experiences with their IVA and any concerns they had about the device, privacy, and how their data was used by the device. We also explored participants' awareness of privacy, security, and data confidentiality guides online that could assist them in their search for answers. We found that all participants had privacy concerns that emerged overtime due to questionable interactions with their IVA, rumors they heard, or lack of understanding of how the IVA works. We also found that despite their interest in learning more about their IVA device, all participants were not aware of online guides provided by the IVA devices' companies and when asked, felt that the information needed improvement especially in regard to helping older adults complete steps to carry out privacy controls. Our findings suggest a need to explore better ways of presenting information about privacy, security, and data policies to older adults, and to aid adoption, older adults' concerns must be better addressed. Our findings can be also useful to inform the design and presentation of privacy guides in the future.

2. Related Work

Much of the intelligent voice assistant research that focuses on older adults examines reasons for use or non-use of the devices, accessibility challenges encountered, or interactions with the device [10, 11, 16]. Despite its controversy [3],

there is also emerging research on IVAs to support older adults with their health [7, 12, 13]. While research on older adults' perceptions of IVAs is growing and more studies are examining IVA uses for aging, it has been noted that research that involves older adults is limited [15].

However, privacy concerns and trust are significant barriers for IVA use [6, 8] including among older adults [11, 13]. Researchers have found that users often cite general privacy concerns when discussing IVAs [6, 8]. For example, most IVAs indicate that information is only recorded when a wake word is uttered, and at any other moment the device is in sleep mode waiting for a user to interact. However recent studies suggest that users are still wary of IVAs listening to their conversations [8, 9, 11]. Emerging research on IVA use by older adults suggests that older users have similar privacy concerns but are less tolerant of privacy violation than other groups that have been studied leading them to stop using their device [11].

Information about how IVA devices address privacy and data management are generally kept in long document style pages on websites. For example, users can visit the website to find answers to their question about both Google Home and Amazon Alexa. However, it is questionable about the impact these guides have and whether the presentation style might hinder users' efforts in understanding how their information is being processed and used. In this paper, we present results from an interview with older adults to explore their experiences with IVA devices, their concerns about privacy and data confidentiality, and their awareness of resources available to them to answer their questions.

3. Methods

We conducted seven semi-structured interviews with older adults to better understand data and privacy concerns in regard to IVAs. Interviews lasted between 30 minutes to 1 hour. Our study was approved by the Institutional Review Board at Indiana University before data collection began. All participants were at least 60 years of age or older and had used or purchased an IVA in the last year. The goal of the interviews was to better understand participants' experiences and concerns with IVAs and their awareness of resources about the privacy, security, and data confidentiality measures employed by the devices.

Participants were first asked to complete a demographic survey that included questions about their use of IVA devices. During interviews, we asked participants questions about how they came to own their device, their reason for purchase, their experiences with the device, concerns about privacy and data confidentiality, their awareness of online privacy guides, and their perception of the usefulness of the guides and improvements. Throughout the interview, participants described how they had obtained their virtual assistants, and most had received their IVA as a gift from

family members who believed it would aid them during the day. Only one participant had purchased her assistant out of her own personal volition. Out of the seven participants, five users had an Alexa while the other two participants had Google Home. Two of the seven participants used their IVAs to help them with their daily health tasks. Two participants purchased their IVAs for games and to search the Internet. Three participants used for basic questions and tasks such as checking the weather.
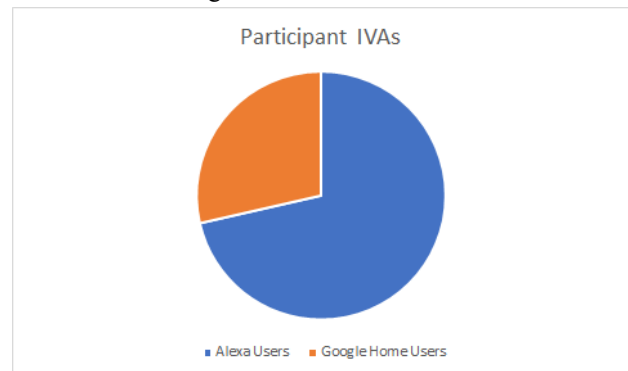

Figure 1. Distribution of IVAs used by participants.

Each interview was recorded and then transcribed. Qualitative data was analyzed using Atlas.ti. Two researchers reviewed the transcripts and performed iterative coding [5] to identify common themes. We report our findings related to privacy and participants' perceptions of resources available.

4. Preliminary Findings

Our preliminary findings suggest that after a period of IVA use older adults developed privacy concerns for three reasons: questionable personal experiences, rumors, and lack of understanding about how the device works. Despite their concerns, we also found that most participants were not aware of where to find existing privacy, security, and data confidentiality information about their device.

4.1. Privacy Concerns: Experiences, Rumors, and Lack of Understanding

Privacy was the most mentioned concern of participants. All seven participants made reference to concerns about privacy when describing their experiences with IVA devices. Several interviewees mentioned how they found interactions with their assistant to be strange or uncomfortable at times leading to privacy concerns. One participant shared:

"And there were four or five of us there [in the room] and she [Alexa] says, 'What was that question?' Because somebody asked somebody a question... 'Would you repeat that?' It was just too freaky to me. Freaky.", P2

Participants described situations where their IVA would respond or speak out of turn when not invoked which made them begin to question whether their device was listening to their conversations. Participants also shared that some of their concerns about privacy of their IVA device grew as

they began to hear rumors about the device listening and recording conversations. For three participants, this led to fears that their digital assistants might being hacked and worries about how that information would be used:

"But then I started hearing stories about people hacking into it [the IVA] and getting personal information and codes and that type of stuff. And you hear the horror stories, so I was real reluctant but I assumed it was all just hooked to the Wi-Fi and pulling all the information from that and then all your security stuff is in there with the passcodes and stuff.", P1

One participant shared that she had heard rumors about Alexa and was concerned about privacy but felt that there could be some benefits; she was not sure if it was worth the money given her concerns. She stated:

"Like I said, Amazon has gotten in a lot of trouble over that, being in that kid's bedroom. It was on the news that Amazon employees can hear conversations through Alexa, and so it makes you wary. I think it would be good, if you had Alzheimer's, even though you wouldn't be living by yourself, to remind you of things. Did you lock the door, did you take your medicine, you have a doctor's appointment today? I could see that but is it worth that kind of money to be reminded rather than writing it down in a calendar.", P2

Participants' privacy concerns also emerged from a lack of understanding of how their assistants worked which led them to have less trust in the device. All seven participants were not fully aware of how companies utilized the user data they collected, whether it would be used for advertising, or even if they were allowed to delete recordings from company-affiliated applications. One participant shared that her privacy concerns emerged because she did not "*know enough*" to trust the device, leading her to eventually stop using it. She shared:

"I care about...I don't know. It's just too new to me, it's just too new. It would take a lot more for me to be able to trust what they're doing [the companies] and all the information

4.2. Awareness of Privacy, Security, and Data Confidentiality Guides

While all participants noted privacy concerns, we found that all seven participants were also not aware of where to find information about their devices or the companies' privacy, security, and data confidentiality policies. Throughout interviews participants shared that they wish they knew more about the device. One participant shared:

"I think down the road it would be very helpful, if I understood more about it [the IVA].", P2

Another participant shared similar concern, sharing that while she had a vague idea about how things worked, she wished she knew more about the functionality overall. When asked what she wanted to know about, she stated:

"Probably all the function(s). Like, instead of having a vague idea, I wish I had a better understanding of the whole thing [the IVA].", P3

Some of participants questions emerged due to questionable experiences, for example, a participant discussed that out of turn responses, led her to begin asking questions about where her information was going. She stated:

"I kind of wondered what's happening to this information. Where is it going and all that? Because we wouldn't realize that it [the IVA] was on or whatever and it would pick up conversations sometimes, and not whole conversations, but it might spit out a response every now and again.", P1

Another participant shared that while she had questions, she was not sure where to find answers, and because she was not familiar with using the Internet, she asked her daughter who directed her to "Google it". She discussed:

"Well, yeah, because I wasn't used to the Internet. She [my daughter] put the Internet there [her tablet], so I had to call and asked her how to do that [something with the voice assistant]. And so, she told me, she said, "Well Mom, if you want to find out something, just go to Google and type it in and Google will come up and tell you what you want to know.", P7

However, despite their open questions and attempts to find information, when asked about whether they were aware that privacy, security, and data privacy policies that were available online, all seven participants stated they were not aware.

4.3. Perceptions of Available Privacy, Security, and Data Confidentiality Online Guidelines

To better understand the potential usefulness of online guidelines for addressing participants' concerns about privacy, we shared the online guides for Google Home and Amazon Alexa to get initial perceptions about the information. All seven participants felt that after reviewing the information that it could potentially address some of their questions and concerns about their device. However, after asking interviewees of the effectiveness of the page, they admitted that typically when they come across things like terms and conditions or privacy pages, they skim them or agree to the conditions and move on. Participants also felt that more could be done to improve their presentation and understanding of the information including making it more useful for older adults. One participant advised that it would be useful to provide a concise and simple method to explain the functionality of assistants once purchased:

"[It would be useful to know more about] the whole setup process and just like when your phone has too much data on how to clear it, stuff like that. It just seems like I'm constantly having to do that and it's just ... how do I do that? You go a little further and you get rid of stuff stored somewhere and I run across things by accident like, cache, I

don't know how to get to that, and I got to it accidently and it cleared a lot of stuff out. But I don't know how to get back into that and do it all again. Just still like that I am also just like navigating things [with my assistant] ... And then [some]people just know this stuff. People grow up with this technology and they just know but we [seniors] don't.", P3

Another participant agreed that finding better ways to educate people about how to protect themselves upfront would be useful. She stated:

"So I think it [the IVA] does have amazing potential, but I think they need to figure out a way to educate people better, or when you buy it maybe have a class or something to make people understand it better and all the precautions you need to take to protect yourself.", P1

Furthermore, while participants generally understood some of the information contained within the guideline's pages, another challenge participants faced was understanding some of the language and technical jargon used. One participant explained when referencing the privacy guides that she was not sure what "crash reports" were, what they contain, and what that means in terms of an IVA crashing.

"And see, like this [information in the online guide]. What data does Google collect, when I allow Google to use crash reports? Well, what if it crashes? Can it crash like a computer?", P2

Participants also mentioned that it was important to understand how their devices work and they were not inclined to spend a hefty amount of time reading the lengthy pages included within privacy guidelines to figure that out. Participants felt that in addition to providing information about how privacy and data are handled, that guidelines would benefit from linking information with actional steps for mitigating concerns. For that reason, one participant shared that she felt that visual, step-by-step instructions on how to implement privacy and data controls would be useful.

"Visual would be nice because it would be more interesting. You could actually see and go through the steps than to have somebody talking or reading. I hate to read, I do. My eyes are bad, so that's one reason. I think visual would be great and would keep your attention better. Showing step by step is easy to talk, but you can't visualize.", P2

Another participant agreed that information to clarify how to set up some of the privacy controls would be useful.

"I think if on a website it would also have troubleshooting or how do I do this type of thing, I think that would be real helpful, because like I said, setting it up is a major part of it.", P1

Participants felt that linking steps or troubleshooting information to explain in detail would be beneficial especially for seniors. One participant shared that in her

experience, this was a common shortfall for most technologies. She shared her experience with troubleshooting her phone.

"I wish there was something that would explain things better for seniors. And a lot of things don't come... My phone and all that didn't come with good instructions for troubleshooting, or how to do this function, or even what functions that that phone has. That would be good.", P3

5. Conclusion and Future Work

We conducted interviews with seven older adults to understand their experiences and concerns with voice assistant privacy and data confidentiality. We found that a combination of fear for the safety of their information and lack of understanding about privacy and data practices were the principal reasons for concerns given by participants. Overall, participants felt that information about their IVA device was not transparent and had many questions about how the device works. Further, participants were unaware of online privacy, security, and data confidentiality guides that explain the policies that relate to their device. When these policies were shared with participants during our studies, they gave feedback that they often equated the guides to lengthy terms of agreement in which they would scan quickly. However, participants did see some value in the online guides and felt they could be useful in answering some of their questions though they felt that the presentation of the information could be improved, especially for older adults. Participants noted they felt that better educational materials provided upfront would be helpful for them especially in the step-up `process to mitigate concerns. Participants also mention that they were not familiar with some of the technical jargon and felt that the guide could benefit from closer linkages between explanation of policies and actionable steps that help them carrying out privacy and data confidentiality controls. Therefore, understanding how to mitigate these problems in a manner that is catered towards older adults is essential.

We would like to conduct more interviews with older adults as a continuation of this study to observe if there are any differing opinions. We will also follow-up to understand changes users would want to see implemented into privacy guides to make them easier to navigate and find. In the future, we would also like to observe whether there are disparities in finding and understanding of IVA information between younger and older users and how that affects utilization of digital assistants. We will use this data to develop ideas of prototypes that improve the transparency of IVA device policies.

6. Acknowledgements

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