Exploring Family Use of Amazon Echo Devices

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Abstract
Parents receive conflicting opinions on the benefits and burdens of children's technology use, especially novel technologies such as digital home assistants. To understand parents' views, we analyzed digital assistant product reviews posted to Amazon.com. This case study explores parents' perceptions of the devices with regards to their children and families, in terms of attributes such as burdens, benefits, and reasons for use. This study contributes an empirical, family-centered understanding of and design opportunities for whole home personal assistants in support of a diversity of families.

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voice assistant; family; Amazon reviews

ACM Classification Keywords
H.5.m [Information interfaces and presentation]: Human computer interaction (HCI)

Introduction
Siri, Alexa, Google Now, and Cortana are becoming everyday friends (cite bff paper) for some and a source of confusion for others. But, voice assistant technologies continue to advance and update, bringing many consumers along for the ride, and many others in the dark. Voice is considered a preferable method for information seeking and controlling

entertainment when your body or hands are occupied (i.e. driving, exercising, biking, cooking, crafting). Hence, voice interfaces are an ever growing area that is increases the size of the opportunity gap for American children who don't have the opportunities to ask Alexa homework questions or understand cutting-edge technologies like the Google Now.

We began our investigation into parents' perceptions of digital home assistants with a qualitative analysis of online product reviews from a popular shopping site, *Amazon.com*, for several digital home assistants. Since a search on Amazon's site for *Google Home* returns results of Amazon Echo products, we were limited to reviews of the Amazon family of Echo devices for analysis.

HCI researchers show that many families are incorporating digital home assistants in their family living environment at a young. Several commercial products have been developed for consumers by Amazon, such as the Echo, Echo Dot, Echo Show, Echo Plus, Echo Dot for Kids, and Echo Spot and by Google, including the Google Home and Home Mini.

In this paper, we analyze a repository of online user reviews of Amazon Echo home assistants, examining parents' perceptions of the devices with regards to their children and families, in terms of attributes such as burdens, benefits, and reasons for use. We outline themes from 207 Amazon product reviews. Finally, we synthesize design recommendations for digital home assistants and discuss broader implications for the design of home technologies.

The design space for voice assistants for families is still relatively under-explored to meet their unique needs. The goal of this work is to answer two research questions: 1) What burdens and benefits do parents perceive of their Echo device(s) ? and 2) How can digital home assistants be better designed?. Using a foundation of existing bodies of work, we began to address this research problem by conducting an interview study to gain insights into the adoption and use of digital home assistants in low-to-middle income families and a product content analysis

As data analysis continues for the larger study, I will discuss preliminary findings for both research projects covered this summer.

Related Work

The popularity of devices like the Amazon Echo provides new opportunities to study how people use and perceive conversational agents. Researchers have examined children's perception of intelligent personal assistants with respect to intelligence, abilities and trust, including Amazon Echo and Google Home [2]. Luger et al. studied user expectations of conversational agents, including Siri, Google, and Alexa, and found user expectations far more complex than the rather simple, operation of the systems, particularly regarding known machine intelligence, system capability and goals [3].

Several researchers have leveraged Amazon Echo reviews to gain insights into user perceptions and use of the devices, but the parent perspective is still under-explored. Purington et al. studied the way that users personified their Echo device in Amazon reviews, and concluded that users who personify their Echo device are more likely to be generally satisfied with it [6]. Pradhan et al. examined the accessibility of digital home assistants off-the-shelf and studied how voice-based intelligent personal assistants are being used by people with disabilities, by analyzing Amazon Echo reviews by users with disabilities and interviewing disabled users of the Amazon Echo [5]. The researchers found that, although there are accessibility challenges, con-

sumers with varying disabilities are using the Amazon Echo for speech therapy and to support their family and friend caregivers.

Researchers have worked to understand child and parent-child interaction with internet connected toys in the lab setting. Several parent perspectives of the toys were confirmed in our Amazon review content analysis as they wished for more parental controls and were concerned for jokes that weren't age-appropriate [4]. Druga et al. studied how 26 children interacted with and perceived their compared intelligence to several digital home assistants and smart toys, and found that differing modes of interaction can affect this level of intelligence [2].

Methods

Deployment Study

We conducted 10 initial and 10 final semi-structured interviews with 10 families that have children at home. This research was approved by the university's Institutional Review Board (IRB). The interview participants were found through a request put to a university affiliated research page and social media pages targeting parents in the surrounding area. The eligible participants that reached out were screened for eligibility and then the research team conducted an initial home interview

This summer, I transcribed the audio recordings of half of our 10 participating families' interactions with Alexa and use of their Echo Dot, over the month that they used the device in their home. I helped conduct 7 of the 20 total interviews.

For each initial and final interview, the interaction was recorded and later transcribed. To thank the interview participants for their time and effort, we provided each family with a gift cards.

The goal of the initial interview was to gain insights into their current understanding of voice assistants and their expectations of the device, and also understand how the challenges that families face in the set up process.

All interview recordings were transcribed to facilitate analysis. To ensure the confidentiality of participants, unique identifiers were assigned to each interviewee. Data analysis is ongoing and I will continue to collaborate.

Data Collection and Content Analysis

All Amazon.com reviews posted before July 2018 (cite the proper review pages in the table) were scraped and filtered. Although Alexa is growing to be a feature on a number of new devices, such as the Echo Fire TV Cube, a hands-free streaming media player, and Amazon Tap, a portable Bluetooth speaker, as well as several third-party devices and products, we limited ourselves to the Echo family of devices *(see Table 1)*.

We first excluded reviews with less than 100 characters due to their nature. We then filtered the reviews for relevance to our research by including only reviews with one or more of the following words: kid, child, grand, daughter, son, family, and year old. We manually deleted and excluded reviews irrelevant to our research such as *(#1089- "I bought the Echo for my 83 year old Mother and she loves it")*. Finally, we compiled the relevant reviews, assigned a random decimal to each of the 7,200 reviews and randomized the list of reviews. After analysis began, we stopped once we felt we reached data saturation, which was 205 reviews. Our analysis includes the following devices:

We hit data saturation and the code book consisted of the following:

Table 1: Reviews from Devices Used in Content Analysis

Amazon Echo Product	Total*	Total Applicable*
Refurbished Echo *Gen. 1*	48,900	806
Echo *Gen. 2*	22,563	813
Refurbished Echo Dot	2,259	31
Echo Dot [1]	113,200	4,425
Echo Plus	2,863	92
Echo Look	73	1
Echo Spot	4125	172
Echo Show	11,628	758
Echo Dot for Kids	228	174

* *As of June 27, 2018*

Table 2: Codebook for Benefits and Burdens of Voice Assistant Use in Families

Theme	Burden, Benefit or Both
Autonomy	Benefit
Experience	Benefit
Information	Benefit
Social	Benefit
Financial	Both
Physical	Both
Usage	Both
Time	Both
Privacy	Burden

Discussion

Home Echo Deployment Study

Data collection for the study is ongoing and data analysis has recently begun. The followings are preliminary insights from the data we have collected so far.

In the initial interview, families share an understanding of the device obtained mainly from conversations with coworkers, family and friends, as well as commercials on TV, radio and the internet. In the setup process, the light rings on the device are particularly confusing for families. Although Amazon provides little information on how to set up the device and the process relies mostly on existing knowledge of technology set up processes, families take advantage of the opportunity to be guided by Amazon. They pay rapt attention to the video about their new Echo in the set up process and take advantage of the small pamphlet that comes in the box.

Data is still being analyzed from their use of the devices but the final interview data shows that families generally used the devices less often than expected. Many use it mostly for entertainment and there are language barriers for several bilingual families.

Amazon Review Content Analysis

These findings reveal emergent parental perspectives of Amazon's Echo device family and Alexa, but their generalizability is limited by the sample of users who chose to review the products, as their opinions may differ those who did not post reviews. However, the findings of this exploratory study offer insight into how families use Echo devices in their homes and what parents perceive as benefits and burdens of the Echo devices.

Contributions

This study contributes an empirical, family-centered understanding of and design opportunities for whole home personal assistants in support of a diversity of families. Dig-

ital home assistants do have the potential to reduce the width of the opportunity gap for low-to-middle income children and families, especially if the design recommendations that we will share are considered, as a result of our user research.

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