THE JOURNAL ON TECHNOLOGY AND PERSONS WITH DISABILITIES

Usability Study of Blind Foundation's Alexa Library Skill

Jarek Beksa
Media Design School

Philip Carter, Angela-Marie Desmarais, Mieke Terblanche
Auckland University of Technology, Blind & Low Vision NZ (formerly the Blind Foundation)

jarek@sonnar.nz; pcarter@aut.ac.nz; ang.desmarais@gmail.com; mieketerblanche98@gmail.com

Abstract

Developments in technology have the potential to improve the independence of people with disabilities (Darcy, Maxwell & Green, 2016). For people who are blind or have low vision who use these forms of adaptive technology, alternative assistive technology is often costly. However, Gill (2017) suggests that voice assistants such as Amazon Alexa are a low-cost solution to meeting their needs.

The Blind Foundation worked with Sonnar Interactive LTD to create a third-party library skill for the Amazon Alexa voice assistant to provide voice activated audio content access to its members as an alternative to current CDs and app solutions.

The Blind Foundation launched their Alexa Usability Study in June 2018 to investigate:

1. Whether Amazon Alexa virtual assistant appeals to Blind Foundation clients.
2. Whether the Blind Foundation Library Skill appeals to Blind Foundation clients as an audio book and magazine delivery service.
3. Whether the Amazon Alexa and Blind Foundation Library Skill can increase:
   a. Connectivity: feeling more connected to family, friends, and the community
   b. Access to Information: users' ability to access information
   c. Self-Reliance: more control in the hands of the reader, where they can choose what information they want to consume, where they want to consume it.

Keywords

Voice-assistants, Amazon Alexa, smart speakers, assistive technology, access to information

Introduction

The Blind Foundation Library Skill on Amazon's Alexa seeks to update the way blind and low vision people (BLVP) can access information provided by the Blind Foundation using accessible technology. Described by Desmond et al. (2018) as "an interface between the person and the life they would like to lead" (p. 2), assistive technology (AT) is any technology that enables access to content or services that would otherwise not be accessible. This technology has the potential to provide increased independence and autonomy.

Adaptive and assistive technology can be costly. Accessibility is also complicated (Ellcessor, 2015); people can feel disadvantaged (Desmond et al., 2018), and it is often considered reactive in design (Dobransky & Hargittai, 2006; Kim et al., 2016). In the case of older users, acceptance of new technologies can often be stressful (Dahler, Rasmussen, & Andersen, 2016).

However, Gill (2017) suggests that voice assistants such as Amazon Alexa are a low-cost solution to meeting their needs. Smart speakers can act as a 'gateway" to voice assistant software (Chung, Park and Lee, 2017; Hoy, 2018). There has been rapid market uptake. With predicted sales reaching 138 million by 2020 in the US market alone (Kinsella, 2017), smart speakers are unlikely to be a passing trend. New Zealand's Blind Foundation sought to explore the way voice assistants could change the way library services are delivered.

Currently, the Blind Foundation Library Service provides its clients with several library options, in formats and delivery channels, including the mobile/web Book Link application, DAISY Direct, and CDs. The Book Link application offers access to the Library Service's digital collections. The limitation is the requirement to wait for audio books to download before

listening, as well as the fact that data usage use must be considered when using 3G or 4G connection or roaming.

Digital Talking Books is primarily delivered through the CD service. The process is costly, both in time and resources. CDs are burned and sent to the clients through the national postal service. On completion, the client is required to return the CDs to the Blind Foundation to be destroyed in line with the Copyright Act 1994. Approximately 14,000 CDs are destroyed each month.

Without existing "off-the-shelf" solutions, the Blind Foundation worked with Sonnar Interactive LTD (Sonnar.nz, 2018) to research, design, and developed an Alexa skill to provide voice activated library access to their members as an alternate to current CD and app services. The project started in February 2018 and the skill was officially published in September 2018 (Amazon.com, 2018).

This study aims to investigate how the Amazon Alexa virtual assistant and Blind Foundation Library Skill appeal to Blind Foundation clients as an audiobook and magazine delivery service option, along with how Alexa can give Blind Foundation clients an increased sense of:

- **Connectivity**: feeling more connected to family, friends, and the community.
- **Access to Information**: users' ability to access information.
- **Self-Reliance**: customers are in control of choosing what information they want and when they want to consume it.

Discussion

Participant Demographics

The study involved 40 participants: 13 males (32.5%) and 27 females (67.5%). The table below depicts users' age: the youngest participant was 23 and the oldest was 93.

Table 1. Age distribution of Usability Study Participants. Source: Blind Foundation, 2018.

Age	Participants
Under 20	0
21-30	5
31-40	6
41-50	9
51-60	8
61-70	6
71-80	4
81-90	1
Over 90	1

The tables below depict users' level of vision according to the USABA (2018) guidelines:

Table 2. Levels of Vision of Participants. Source: Blind Foundation, 2018.

Level of Vision	Participants
B1	12
B2	11
B3	9
B4	5
B5	3

Table 3. Levels of Vision Criteria. Source: USABA, 2018.

Level of Vision	Criteria
B1	Blindness or near-Blindness. No light perception in either eye, up to some light perception and an inability to recognize the shape of a hand at any distance or in any direction.
B2	Profound visual impairment. From the ability to recognize the shape of a hand up to visual acuity of 2/60 and/or a visual field of less than 5 degrees in the best eye with the best practical eye correction.

Level of Vision	Criteria
B3	Severe visual impairment. From visual acuity above 2/60 up to visual acuity of 6/60 and/or a visual field of less than 20 degrees and more than 5 degrees in the best eye with the best practical eye correction.
B4	Moderate impairment. From visual acuity above 6/60 and up to visual acuity of 6/24 and a visual field larger than 20 degrees in the best eye with the best practical eye correction.
B5	Normal or near-normal vision. Up to visual acuity of 6/24.

Structure

The usability study was designed as a situated co-inquiry (SCI). This method of inquiry benefits from a cooperative working relationship between the user, a facilitator, and a logger (Carter, 2007). As a result of the cooperative nature of SCI interviews, an accurate and precise understanding of user behaviour and feedback is established.

Phase one of the study was demonstration and observation. Staff members demonstrated the basic use of the smart speaker. Users were provided with instructions and time to familiarise themselves with the device. The interview revealed initial reaction to Alexa and the Blind Foundation Skill.

The follow-up interview took place one to two weeks after the demonstration. The purpose of the interview was to assess users' progress with both the device and the skill. The interview covered Alexa usage, overall impressions, and revealed participants' views towards increased connectivity, access to information, and self-reliance.

A survey was conducted over the phone four weeks after initial demonstration. 35 of the 40 participants responded to the survey. Part one of the survey included 31 statements covering technology, Amazon Alexa and the Library Skill. Users were asked to choose a value between one and five; one meant the participants "strongly disagreed" and five indicated that the participants "strongly agreed". The second part consisted of questions related to the usage of

Alexa and the Skill. Part three gave the participants an opportunity share thoughts or recommendations of how to improve the Skill (out of scope for the publication).

Results from demonstration and orientation

Most participants reacted positively to Alexa after initial demonstration, with a large majority of participants agreeing that learning to use the Blind Foundation skill was easy and agreeing that learning to use Alexa was easy, particularly in comparison to other technology.

"I didn't have to push and find buttons and go back and say delete that. It was just the sheer simplicity and convenience of it."

"Oh, way better, extremely, like a thousand percent better! Like I don't have to swipe, swipe, swipe, I'm just really not good at the screen reader stuff… It's just so much easier".

The verbal qualitative feedbacks suggested users being comfortable with technology after using the Alexa, since it was "very human-like", "more intuitive", and "being easy to think of a little person in there". This presents a low entrance barrier and increases access to technology. Independently of their interactions with Alexa, several participants expressed appreciation towards the simplicity and ease of use of the Blind Foundation Library Skill itself.

"With a phone, you do have to scroll through, there are things at the top, and things at the bottom, so you have to scroll through an awful lot of information, [...] whereas with Alexa you just say something else and she'll go looking straight away! So yeah it's far more natural".

Results from Second Interview

Connectivity

Participants expressed that due to the isolation that people with vision loss may experience, Alexa has the potential to be a valuable companion.

"I can't really get out, and their days are really long. I can't watch TV, because I can't see, so the audio/books give me company."

One of the participants compared isolation with depression, which gives insight into the seriousness thereof. The fact that Alexa can act as a companion is significant. Participants also expressed an improved connection with family and friends through Alexa.

"It helps my son go to sleep because instead of talking, it's someone else talking and he just listens and drifts off to sleep".

"My husband and I do the crossword together, and he reads them, and I try to guess. But if we're not sure of a spelling I just ask Alexa. As long as it understands my accent, she tells us how to spell a word".

"We [participant and daughter] listened to [Alexa], put it on for half an hour, set a sleep timer and listened to the book. So, we do that every night".

Whilst connection may not have been an explicit goal of Alexa, it was mentioned several times throughout the study.

Access to Information

Another hypothesis is that Alexa could improve accessibility to information. The qualitative responses support this hypothesis.

"It opens up a whole method of communicating to people, and you get tremendous amounts of information from it".

"You feel like you're connected to the world really".

Participants also mention access to "tremendous amounts of information", and access to books of their choice. This supports the hypothesis that Alexa will improve access to information and connection.

Beyond the original scope, some participants also expressed Alexa's potential in improving accessibility for people with other accessibility issues, including one participant commenting on how Alexa may lessen the "frustrations" of a friend who could no longer use his phone and the associated functions because he lost sensitivity with his fingers. Although this report does not directly discuss accessibility issues beyond blindness and low vision, commentary on applications outside of the blindness community provides scope for further research.

Self-Reliance

Besides the focussed accessibility to audio books, participants mentioned the usefulness of Alexa for everyday tasks.

"It's just once again having everything at our fingertips, or at our voice prompt. Things like the time. Sometimes I don't have, if I have a watch near me it's analogue so it can be a little bit inaccurate, and sometimes the phone or the clock or whatever is just not close enough, so I just ask her the time and she has it there [...] those little things are making a difference".

"I've always been independent, and to ask for help all the time really gets up my nose, I'd like to just regain my independence, and not have to ask someone to help me all the time [...] just for me to be able to do things on my own, I mean that's huge for me, that's massively huge".

Overall, participants responded positively to the whole experience of Alexa, even saying that it has the possibility to change lives.

"When you talk about blind people, we fall over and hurt ourselves a bit. You want to be able to ring 111. That's no bloody good if you've fallen over here and you can't get to the phone over there".

"It puts us on a level of our sort of sighted peers".

This broad, positive impact on participants' lives suggests Alexa could greatly improve quality of life for people with vision loss.

Results from Survey

Significant findings around participant's over-all experience with Alexa include:

- 77% agreed that learning to use Alexa was easy.
- 77% agreed that they found it easier to learn how to use Alexa compared to smartphones or computers.
- 92% agreed that they enjoyed using Alexa.
- 77% agreed that they now use Alexa as a part of their everyday routine.

More than half (63%) of participants agreed or strongly agreed that Alexa increased independence and self-reliance. It was also hypothesized that the voice interface would present a low entry barrier to technology. This was supported by 77% of participants either agreeing or strongly agreeing that learning to use Alexa is easy, and half of the participants agreeing that the commands were intuitive. More than half (51%) of the participants agreed that Alexa also improved their attitudes to and acceptance of technology.

When participants were asked about their overall experience with the Blind Foundation Library skills, it was found that:

- 66% agreed that it was easy to navigate within the Skill.
- 83% agreed that it was easy to learn how to use the Skill.
- 51% agreed that the Skill commands were intuitive and easy to remember.

These responses again affirm the low entrance barrier of voice-enabled interface. 42% of participants agreed that they preferred using the Blind Foundation Library Skill to search for books compared to how they used to.

Frequency of use responses revealed that 29 of the 35 participants reported using Alexa at least daily. When asked how often the Library Skill was accessed, responses revealed that 9 used it daily, 9 used it 4-6 times a week, 11 used it 1-3 times a week, 4 hardly ever used it, and 2 stated that they did not access it at all.

The combined results support the initial hypotheses regarding Alexa's ability to improve connectivity, self-reliance, and increase access to information for Blind Foundation clients.

Hoy (2018) suggests that voice assistants will change the way that libraries deliver services. The positive responses towards the Blind Foundation Library skill and Alexa supports this view.

A recent Alexa usability study (Mizak et al., 2017) investigated the use of Alexa with the elderly in age care homes, which found that the Amazon Alexa has "tremendous potential in facilitating the independence and wellbeing of older adults" (p. 18). This is comparable to the results of this usability study, suggesting that there is scope to expand the research to specifically consider people with mobility issues.

Since 77% of participants agreed that they found it easier to learn how to use Alexa compared to smartphones or computers it is recommended to conduct a larger study with BLVP who do not use technology often, as Alexa might be their first device that will connect them to Internet.

A limitation of the study is that only 2 of the 40 participants were over the age of 80, whereas 48% of Blind Foundation clients (and the group that experiences highest prevalence of vision loss) fall into this age bracket. Further research would be needed for a more representative view of those with vision loss.

Conclusion

The Blind Foundation's Amazon Alexa usability study aimed to assess the appeal of Amazon Alexa and the Blind Foundation skill to its clients and whether it has the potential to increase their connection to society, self-reliance, and access to information. Furthermore, the study also aimed to assess the appeal of Alexa to clients both as a virtual assistant and as an audio book/magazine reader.

A situated co-inquiry method was used to encourage clients' narrative discussion of their experience with Alexa. After the initial introduction and demonstration (interview 1), Alexa was left with the participant in their home. A second, follow up interview was conducted to ascertain clients' responses to Alexa. During these interviews, numerous participants mentioned an increase in connection to society, friends and family, an increase in access to information, and increased independence.

The survey completed in the final phase of the study, revealed that 94% of participants agreed that it was easy to learn to read audio books with the Blind Foundation Library Skill, 42% of participants agreed that they prefer using the Blind Foundation skill to previous methods of listening to audiobooks, 83% stated that they used Alexa daily, and 94% of participants would recommend Amazon Alexa to friends and family. Therefore, it is fair to assume that the Alexa was received positively and there is scope for future research and development in this area.

Works Cited

Amazon.com (2018). Blind Foundation. [online] Available at: https://www.amazon.com/Blind-Foundation-New-Zealand/dp/B07J6HVVTV [Accessed 5 Nov. 2018].

Blind Foundation. (2018a). Latest Statistics - Blind Foundation. [online] Available at: https://blindfoundation.org.nz/eye-info/latest-statistics/ [Accessed 30 Oct. 2018].

Blind Foundation. (2018b). DAISY player - Blind Foundation. [online] Available at: https://blindfoundation.org.nz/how-we-can-help/library/daisy-player/ [Accessed 30 Oct. 2018].

Blind Foundation. (2018c). Telephone Information Service - Blind Foundation. [online] Available at: https://blindfoundation.org.nz/how-we-can-help/daily-life/telephone-information-service/ [Accessed 30 Oct. 2018].

Blind Foundation. (2018d). Formats Offered by the Library - Blind Foundation. [online] Available at: https://blindfoundation.org.nz/how-we-can-help/library/whats-available/formats-offered-by-the-library/ [Accessed 30 Oct. 2018].

Bridges, J. (Director). (29 October 2018). The Project NZ [Television broadcast]. Auckland: Mediaworks.

Carter, P. (2007). Liberating usability testing. Interactions, 14(2), 18-22.

Cheng, A. (2018). What Amazon Is Doing to Keep Alexa In the Lead. [online] Forbes. Available at: https://www.forbes.com/sites/andriacheng/2018/07/26/what-amazon-is-doing-to-keep-alexa-in-the-lead/#76a977a27fc6 [Accessed 30 Oct. 2018].

Chung, H., Park, J., & Lee, S. (2017). Digital forensic approaches for Amazon Alexa ecosystem. Digital Investigation, 22, S15-S25.

Dahler, A. M., Rasmussen, D. M., & Andersen, P. T. (2016). Meanings and experiences of assistive technologies in everyday lives of older citizens: a meta-interpretive review. Disability and Rehabilitation: Assistive Technology, 11(8), 619-629.

Darcy, S., Maxwell, H., & Green, J. (2016). Disability citizenship and independence through mobile technology? A study exploring adoption and use of a mobile technology platform. Disability & Society, 31(4), 497-519.

Desmond, D., Layton, N., Bentley, J., Boot, F. H., Borg, J., Dhungana, B. M., ... & Mavrou, K. (2018). Assistive technology and people: a position paper from the first global research, innovation and education on assistive technology (GREAT) summit. Disability and Rehabilitation: Assistive Technology, 1-8.

Dobransky, K., & Hargittai, E. (2006). The disability divide in Internet access and use. Information, Communication & Society, 9(3), 313-334.

Dobransky, K., & Hargittai, E. (2016). Unrealized potential: Exploring the digital disability divide. Poetics, 58, 18-28.

Ellcessor, E. (2015). Blurred lines: Accessibility, disability, and definitional limitations. First Monday, 20(9).

Feather, J., Carter, P., Koziol McLain, J., & Parry, D. (2014). Situated Co-Inquiry: a method of Usability Testing to Closely Appreciate User Experiences of an Artifact in terms of Health Needs and Opportunities. Presentation, Maui: Medicine 2.0 Conference Hawaii.

Fowler, F. J. (2009). Applied Social Research Methods: Survey research methods (4th ed.). Thousand Oaks, CA: SAGE Publications, Inc. doi: 10.4135/9781452230184

Gill, M. (2017). Adaptability and affordances in new media: Literate technologies, communicative techniques. Journal of Pragmatics, 116, 104-108.

Griffin, P. (2018). The best smart speakers on the NZ market. [online] Noted. Available at: https://www.noted.co.nz/tech/google-home-amazon-echo-smart-speaker-best-options-nz/ [Accessed 30 Oct. 2018].

Hoy, M. B. (2018). Alexa, Siri, Cortana, and More: An Introduction to Voice Assistants. Medical reference services quarterly, 37(1), 81-88.

Kim, H. K., Han, S. H., Park, J., & Park, J. (2016). The interaction experiences of visually impaired people with assistive technology: A case study of smartphones. International Journal of Industrial Ergonomics, 55, 22-33.

Kinsella, B. (2017). Gartner Predicts 75% of US Households Will Have Smart Speakers by 2020 - Voicebot. [online] Voicebot. Available at: https://voicebot.ai/2017/04/14/gartner-predicts-75-us-households-will-smart-speakers-2020/ [Accessed 5 Nov. 2018].

Lopatovska, I., Rink, K., Knight, I., Raines, K., Cosenza, K., Williams, H., ... & Martinez, A. (2018) . Talk to me: Exploring user interactions with the Amazon Alexa. Journal of Librarianship and Information Science, 0961000618759414.

Mizak, A., Park, M., Park, D. and Olsen, K. (2017). Amazon "Alexa" Pilot Analysis Report. [online] Front Porch Center for Innovation and Wellbeing. Available at: http://fpciw.org/wp-content/uploads/sites/15/2017/12/FINAL-DRAFT-Amazon-Alexa-Analysis-Report.pdf [Accessed 30 Oct. 2018].

Noda, K. (2017). Google Home: smart speaker as environmental control unit. Disability and Rehabilitation: Assistive Technology, 1-2.

Slabbert, B. (2018). Amazon reveals Echo NZ prices and Alexa's Kiwi jokes. [online] Stuff. Available at: https://www.stuff.co.nz/technology/gadgets/100667451/amazon-reveals-echo-nz-prices-and-alexas-kiwi-jokes [Accessed 30 Oct. 2018].

Sonnar.nz. (2018). Blind Foundation. [online] Available at: http://sonnar.nz/portfolio/blind-foundation/ [Accessed 30 Oct. 2018].

USABA (2018). Visual Classifications - United States Association of Blind Athletes. [online] Available at: https://www.usaba.org/membership/visual-classifications/ [Accessed 3 Nov. 2018].

Voicebot.ai. (2018). Smart Speaker Consumer Adoption Report, March 2018. Retrieved from https://voicebot.ai/wp-content/uploads/2018/03/smart_speaker_consumer_adoption_report_2018.pdf

Watkins, D. (2018). Global Smart Speaker Vendor & OS Shipment and Installed Base Market Share by Region: Q4 2017. Retrieved from https://www.strategyanalytics.com/access-services/devices/connected-home/smart-speakers/market-data/report-detail/global-smart-speaker-vendor-os-shipment-and-installed-base-market-share-by-region-q4-2017#.Wwtw3kiFOUk

Watkins, D., & Branca, J. (2016). Strategy Analytics: Amazon, Google to Ship Nearly 3 Million Digital Voice Assistant Devices in 2017. Retrieved from https://www.strategyanalytics.com/strategy-analytics/news/strategy-analytics-press-releases/strategy-analytics-press-release/2016/10/05/strategy-analytics-amazon-google-to-ship-nearly-3-million-digital-voice-assistant-devices-in-2017#.WwtwU0iFOUk