AGING IN PLACE WITH GOOGLE AND AMAZON SMART SPEAKERS: PRIVACY AND SURVEILLANCE IMPLICATIONS FOR OLDER ADULTS

By
Jessica Percy Campbell
B.A., Concordia University, 2013
M.A., Concordia University, 2016

A Dissertation Submitted in Partial Fulfillment for the Requirements for the Degree of DOCTOR OF PHILOSOPHY in the Department of Political Science

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We acknowledge and respect the lək̓ʷəŋən peoples on whose traditional territory the university stands and the Songhees, Esquimalt and W̱SÁNEĆ peoples whose historical relationships with the land continue to this day.

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Supervisory Committee

Dr. Colin J. Bennett, Supervisor
Department of Political Science

Dr. Arthur Kroker, Departmental Member
Department of Political Science

Dr. Debra Sheets, Outside Member
Department of Nursing

Abstract

Commercial-grade smart home technologies (SHTs) such as Google and Amazon smart speakers are rising in popularity among older adults. Marketing materials claim that smart speakers can support older adults aging in place through emergency contact features, medication reminders, and digital companionship with voice assistants. As our aging population challenges strained health and senior care systems in Canada, SHTs are positioned to alleviate some of the pressure. At the same time, under surveillance capitalism, big tech companies and marketers stand to profit from collecting massive amounts of user data in attempts to predict, modify, and control behaviour through targeted advertisements. While Canadian private sector privacy legislation hinges on meaningful user consent for data collection, obtaining such consent can prove difficult for smart speaker users in general, especially for older adults with limited technological experience.

Further, little is known about the types of ads that follow older adults around the web through programmatic advertising. To better understand the dynamics between Google, Amazon, and older adult smart speaker users, this dissertation asks the following: How are smart speakers marketed to older adults and care partners, how are they used, and what are the implications for privacy, surveillance, and aging in place in Canada? A multi-methods approach is used to answer this question by including the voices of older adult smart speaker users alongside interviews with relevant experts in technology, privacy, and aging. This study also relies on a qualitative thematic analysis of marketing materials, documentary analyses of privacy policies and relevant legislation, and an algorithmic audit to further explore the relationship between older adults' privacy, autonomy, and targeted advertising. Alongside user education programs, it concludes with suggestions for user-centric design and data justice as a regulatory approach that supports user privacy and autonomy while challenging the potential for bias.

Keywords: AgeTech; older adults; privacy; surveillance; data justice; surveillance capitalism

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List of Abbreviations and Acronyms

AI	Artificial Intelligence
ICT	Information Communication Technology
IoT	Internet of Things
IPA	Intelligent Personal Assistant (e.g., Google Assistant/Amazon Alexa)
OIPC	Information and Privacy Commissioner for British Columbia
OPC	Office of the Privacy Commissioner of Canada
PIPA	Personal Information Protection Act
PIPEDA	Personal Information Protection and Electronic Documents Act
SHT	Smart Home Technology

Acknowledgements

It takes a village to make it out of grad school in one piece. At least for me, it did.

First and foremost, I express my sincerest gratitude to my supervisor Dr. Colin Bennett, who has been unbelievably supportive. He has gone above and beyond to mentor me by bringing me to surveillance conferences and by introducing me to some of the brightest minds in policy and academia. I appreciated his effective teaching style as he has a way of gently steering students in the right direction while giving them space to find their footing. He inspires critical and imaginative thought while bringing us back down to earth with practical solutions and periodic reminders: "it's not *all* doom and gloom!" Thank you for supporting me with funding and learning opportunities, and for giving me free reign to explore my interests while guiding me through the rough patches. I honestly could not have asked for a better Ph.D. supervisor.

My wonderful committee members deserve special thanks as well. I feel so lucky to have had the chance to share my ideas on the future of tech and aging with Dr. Arthur Kroker, a fantastic author and legendary communication and politics professor. Thanks for the always interesting conversations and for encouraging me to think outside the box. And to Dr. Debra Sheets, who does so much good for the aging community, you are a true inspiration. Thank you for your kindness and your thoughtful encouragement over the years.

Thank you to the lovely older adults who participated in my focus group; your insight into the world of smart homes has been invaluable. Your input was the heart and soul of my research. I also extend my gratitude to the expert interviewees for sharing thoughts on tough questions.

To my grad school colleagues in the UVic Political Science program: while it initially terrified me, your high-quality intellectual work and fierce activism have made me want to be a better person and scholar. I especially enjoyed the company of the brilliant Dr. Smith Oduro-Marfo, Jesse Gordon, Marta Kleiman, Stephanie Gruhlke, Katsistohkwiio Jacco, Stacie Swain, Mehdi Hashemi, Lynn Ng, and Dr. Phil Henderson. Thanks for your steady emotional support, help with navigating tough courses and exhausting comprehensive exams, and at times, the much-needed distractions. Thank you to my Concordia Sociology MA colleagues and professors for encouraging me to embark on this massive endeavor. You believed in me long before I believed in myself.

To Dr. Shehroz Khan and the University Health Network team: thank you for including me. I appreciated your openness in collaborating on new ideas and for allowing me to work on interdisciplinary projects that mattered to me at my own pace. An enormous thank you goes out to Dr. Sam Sandassie for introducing me to Shehroz and other AGE-WELL folks, and for all the behind-the-scenes help with my career.

Thank you for all the support from AGE-WELL NCE, including the award funding. I am honored to be part of such a dynamic research network that truly believes in supporting older adults' health and well-being. I am also grateful to the Big Data Surveillance Project, TELUS, the International Association of Privacy Professionals, and the Institute on Aging & Lifelong Health for further funding my work through fellowships and awards.

To the surveillance scholars whose radical ideas helped to inform so much of my thinking and whose friendly and inclusive approach to academia made in-person conferences so much fun: Lex Gill, Val Steeves, David Murakami Wood, Stephen Neville, Jacob Leon Kröger, Chris Parsons, Torin Monahan, Adam Molnar, and David Lyon. Thanks to the 2019 Surveillance Studies Summer Seminar crew for allowing me to float my early ideas in a safe and encouraging space, and for all the laughs.

I also express my gratitude to professors who quietly helped to guide me through the program, including Feng Xu, Lynn Hancock, Rita Dhamoon, Marlea Clarke and Matt James. Joanne Denton, Rosemary Barlow and Rachel Richmond, the glue that holds the department together, also deserve a special thank you. Their superhuman organizational skills and positive approach to admin work has a way of easing grad student anxiety, even on the most stressful days.

To my wonderful friends (especially Lindsay, Tanya, Lindz, Krystle, Caryn, Sus, and Devon) and family, who are now scattered across five cities across the country, I love you all. To my nan, who taught me the importance of fairness, you are the reason for all of this. Thanks to my mom, Sue Campbell, for inspiring my initial love for reading and writing and for the annual trips to Aruba. To my dad, who passed on his hard work ethic, I appreciate all you've done to support us. To my cousin, Dr. Alison Harvey, who trailblazed a path forward into higher academia, much to the amazement of us LaSalle folk, thanks for making lofty goals seem possible. I appreciate each of you for never doubting that I could do this. It meant more than you know.

Finally, to my loving partner Wes Paterson, who stayed up late engaging with my ramblings about surveillance on too many nights. I can't thank you enough for your unwavering support in my academic and personal life over the last 13 years. Whenever I'd rant about the latest scandal in big tech, you'd rush to write it down for the sci-fi comic book you're working on. Your passion for creativity is infectious, and I can't wait to see what you do next.

Dedication

For my nan, who taught me so much.

Chapter One: Introduction

As our aging population grows larger, so does the need for technological solutions to age and health-related issues. Throughout the COVID-19 pandemic, information communication technology (ICT) usage rates have increased among older adults in Canada (Sixsmith, 2022). Smart speakers, one example of ICTs, are Internet-enabled devices that respond to voice commands through intelligent personal assistants (IPAs) such as Amazon Alexa or Google Assistant. In 2019, 25% of Americans reported owning a smart speaker (Auxier, 2019), and 5.8 million Canadians reported interacting with a smart speaker at least once a month (Rody, 2019). As IPAs and connected devices continue to rise in popularity, marketers promote them as valuable tools for aging in place (e.g., Matthews, 2020). The collective claim is that smart speakers can allow older adults (65+) to stay independent in their homes through voice-activated emergency contact features, daily medication reminders, and digital companionship.

Smart home technologies (SHTs), wearables, and mobile health (mHealth) apps track user behaviour for various health and safety-related purposes (Jo et al., 2021; Wallace & Knoefel, 2022; Sixsmith, 2022). AgeTech is "the use of technology to support the health, independence, and well-being of older people" (Sixsmith, 2022, p.1) and can include devices designed in clinical settings for older people or consumer-grade SHTs repurposed for their care.

AgeTech can be used for home security, health monitoring, energy management, emergency contact, entertainment, and more (Kirchbuchner et al., 2015).

In terms of design, most digital technology is geared toward younger users and not specifically created for older adults, which poses accessibility challenges (Helbostad et al., 2017). Although Google and Amazon products are promoted to older adults, they are designed for the general population, and whether their respective intelligent personal assistants (IPAs), otherwise known as voice assistants, work to serve the needs of older users is underexplored (Chung et al., 2021), especially in Canada. Considering the potential for negative outcomes related to commodifying older adults' behavioural data also needs further analysis.

This interdisciplinary work contributes to the budding discussion on the ethical implications of commercial SHTs for older adults by bridging insights from relevant gerontechnology, privacy, and surveillance literature. It also adds to the debate by analyzing relevant marketing materials, Canadian and British Columbia private sector privacy legislation, Google and Amazon's privacy policies, and ads that follow users around the web. Insights from expert qualitative interviews and older adult focus group participants have helped to inform this work. The purpose of this study is to critically analyze a diverse set of privacy, surveillance, and aging-in-place implications highlighted by the rise of SHTs for older adults, particularly commercial smart speakers. I ask: how are Amazon and Google smart speakers marketed towards older adults, how are they used, and what are the implications for user privacy, surveillance, and aging in place in Canada? The remainder of this chapter provides background

context and subsequent research questions for each section: gerontechnology, privacy, and surveillance.

Gerontechnology: Aging in Place with Technology

The World Health Organization has predicted that by 2050, 16% of the world population will be 65 years old and over (Pirzada et al., 2022). In Canada and elsewhere, our aging population has strained senior care services that are inadequately funded, resulting in a great deal of stress on family members and private care workers (Strauss & Xu, 2018). In the spirit of technological solutionism, roboticists and computer scientists have explored ways to tackle this problem, including using Artificial Intelligence (AI). They have explored multiple avenues, from robots that can help lift older adults out of bed sensors that detect and record movement in the home, and lifelike robotic dolls designed for battling isolation and loneliness (Turkle, 2011). While motion sensors and cameras may improve older adults' quality of life (Fritz & Dermody, 2019; Jo et al., 2021), the most recent iteration of this trend involves voice-activated systems embedded with AI functionality (O'Brien et al., 2020; Slane et al., 2020), the results of which are currently unfolding.

Gerontechnology is "an interdisciplinary field linking existing and developing technologies to the aspirations and needs of aging and aged adults" (Chen, 2020, p. 2). Literature in this area often explores the causes of barriers to implementing new devices. Perceived ease of use, usefulness and cost are oft-cited factors in technology adoption levels (Dogruel et al., 2015; Jo et al., 2021; Pirzada et al., 2022), as are privacy concerns (Courtney,

2008; Fritz & Dermody, 2019). As Google and Amazon present lower-cost, user-friendly alternatives to other types of computers or smart home systems for older adults, they have the high potential for adoption among older people.

Preliminary work in Canada has suggested that older adults mainly use smart speakers for entertainment, such as listening to music, searching for information, or conversing with IPAs (Slane et al., 2020). As smart speaker use is expanding, further research is needed on marketing, older adults' privacy preferences, and usage patterns. Inquiring about privacy attitudes and awareness of surveillance capabilities allows for the assessment of whether meaningful consent for behavioural data collection is adequately obtained. Chapter Two consists of a literature review where I bring together gerontology, privacy, and surveillance research to explore how smart homes are used by older adults and to address how they may collect excessive user data in ways that could contribute to discriminatory outcomes. Chapter Three expands on how Google Home[1] and Amazon Echo (Alexa) devices are marketed to older adults by analyzing online marketing materials. In Chapter Four, the results of a focus group conversation with older adults helped to address the following questions:

- How are Google and Amazon smart speakers marketed online to older adults and caregivers?

[1] Google Home has recently rebranded many of its devices as "Google Nest" (e.g., the Google Home Mini is now called the Nest Mini). The original Google Home maintains its name while more advanced iterations with screens are called "Nest Hub" and "Nest Hub Max". Each device belongs to the Google Home family and so Google Nest/Google Home will be used interchangeably throughout this work.

- How do older adults use smart speakers in Canada? For example, are they used as medication reminders and digital companions or only for entertainment?
- What are older adults' perceptions of smart speakers? For example, are they cornered about privacy? To what extent are they aware that their interactions are recorded and used for targeted advertisements?

Privacy: Meaningful Consent for Data Collection, Use, and Disclosure

Collecting online behavioural data for advertising is standard practice in today's online world (Hwang, 2020; Zuboff, 2018). According to the Office of the Privacy Commissioner of Canada (OPC), behavioural data collection includes: "tracking consumers' online activities across sites and over time in order to deliver advertisements targeted to their inferred interests" (OPC, 2021a). In recent years, location tracking and behavioural data collection has become more extensive through the Internet of Things (IoT), including Internet-enabled security cameras, wearable devices such as Fitbit, smart speakers and more (OPC, 2016). Individual users are largely responsible for understanding and accepting data collection practices from their platforms for all Internet-enabled devices.

In the current climate of data brokers, targeted marketing, and a seemingly never-ending stream of data breaches, protecting sensitive user data is paramount. This is especially the case for those belonging to vulnerable populations such as children[2] and older adults who

[2] In Canada, PIPEDA applies to the data collection of users of all ages. The Privacy Commissioner of Canada recognizes that it is difficult if not impossible, to obtain meaningful consent from children under 13 and requires

may have lower confidence managing such technology. Over the last few years, user perception studies have consistently shown that smart speaker users of all ages are unaware that their voice interactions are stored and saved indefinitely by Google and Amazon (Lau et al., 2018; Malkin et al., 2019). Some users manage their privacy boundaries by managing setting preferences, unplugging their smart speakers, or keeping them out of certain rooms (Pridmore & Mols, 2020). Nevertheless, how knowledgeable are users who do not set up smart speakers for themselves or read the Terms of Use? When a smart speaker is set up for an entire household or someone else, who gets to decide the acceptable level of data collection?

One study has shown that 75% of older American adults do not set up or learn how to use their new devices independently. When older adults were asked: "When I get a new electronic device, I usually need someone else to set it up or show me how to use it," they self-reported that the statement described them very (48%) or somewhat (25%) well (Anderson & Perrin, 2017). The legality of consumer surveillance for behavioural advertising rests on the practice of individual consent, which is typically provided by tapping "I Agree" at the setup of any new app or device. If a smart speaker is purchased for an older relative, someone other than the primary may set up the account and tap "I Agree" on their behalf. As a result, many older users are likely unaware that all their interactions with the devices are recorded and stored indefinitely. Users may also be unaware of how such interactions are made valuable to

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that parents or guardians accept the terms of use (OPC, 2015). In the US, children under 13 have more robust privacy protections under the Children's Online Privacy Protection Act (COPPA).

third parties through ad profiling and targeting, a practice that both companies engage in, but that Amazon had previously denied publicly (Iqbal et al., 2022).

I conducted a documentary analysis and compared relevant privacy policies from Google and Amazon with Canada's *Personal Information and Electronic Documents Act* (PIPEDA) and B.C.'s *Personal Information Protection Act* (PIPA). I then conducted subsequent qualitative interviews with members of the broader privacy advocacy community and technology experts to answer the following questions:

- When one person sets up a smart speaker for an entire household or another user, how is the required meaningful consent to collect behavioural data expected to be obtained by Google or Amazon?
- Do Google Home or Amazon Echo products make some categories of sensitive data accessible to third parties?
    - If so, what are the privacy implications for older users? For example, following the Office of the Privacy Commissioner's guidelines for meaningful consent, what is the "risk of harm" (OPC, 2018/2021), especially for older adults?
- What are the appropriate regulatory responses to the issue of meaningful consent in the context of using SHTs for aging in place in Canada?

Surveillance: Social Sorting and Algorithmic Bias

In the related interdisciplinary fields of surveillance and data discrimination, researchers have long since warned that algorithmic outcomes can disadvantage some social categories over others (Lyon, 2003). In recent cases, Facebook has settled racial and gender discrimination lawsuits about their targeted ads (Blass, 2019). Google uses a similar machine learning system to place their ads (Blass, 2019) and has also been scrutinized for algorithmic discrimination pertaining to race and gender (Noble, 2018). Such data-driven decisions contribute to user profiling that excludes certain groups from accessing information that could benefit them (Noble, 2018, p. 28).

Consumer surveillance allows companies to target certain demographic categories with predatory loans or differential pricing. In the US, for instance, data brokers have clustered low-income African American and Latino consumers into category lists with labels like "Urban Scramble" to sell to advertisers. These practices have led to targeted advertisements from "companies specializing in high-cost loans or financially risky products who are looking to target populations likely to 'need quick cash'," including older adults (Kuempel, 2016, pp. 220-221). In Canada, Environics and Compusearch have organized consumers into similar categories. For example, one cluster labelled "Big City Stress" consists of "inner city urban neighborhoods with the second lowest average household income. Probably the most disadvantaged areas of the country…A significant but mixed 'ethnic' presence. Unemployment levels are very high" (Lyon, 2003, p.14). Combining various datasets, the results of social sorting are then used to decide

which consumers should gain access to special deals and services, and who should be excluded. The business of sorting Internet users based on perceived worth has been called "digital redlining" (Lyon, 2003, p.14; Noble, 2018). Whether from public or private actors, the negative socio-political implications of surveillance are too often disproportionately distributed to marginalized or low-income groups (Gilliom, 2001; Taylor, 2017).

In recent years, the influence of digital surveillance on various intersections of race, class, and gender has been established (e.g., Noble, 2018; O'Neil, 2016). However, the literature on children is most prominent regarding the implications of surveillance and age. For example, the negative impact of monitoring children with surveillance technologies such as video cameras, digital spy programs or RFID tags are well-known. Marx and Steeves (2010) have shown that excessive monitoring through technology can limit childhood development and the type of exploration that leads to autonomous decision-making skills. It can also contribute to *surveillance creep* where monitoring tools are eventually used for unintended purposes (Marx & Steeves, 2010, p. 218).

Even though commercial surveillance products are marketed through a similar lens of enhanced security and safety for older people (Pfender, 2018), the potential effects of digital surveillance and algorithmic decision-making on older adults are rarely discussed within the academic literature. Further, government reports on AI harms have hardly considered the potential for ageist bias (Chu et al., 2022). Older adults are a dynamic group with varying levels of technological ability, privacy attitudes, health statuses and so on, yet their propensity to be

categorized as vulnerable or disadvantaged by marketers (Kuempel, 2016), online scammers (FBI, 2021), or insurance companies (Carver & Mackinnon, 2020), makes them an important segment of the population to protect. In short, further analysis of how AI systems treat older adults in commercial datasets is needed.

SHTs can make in-depth personal information visible to private sector actors in previously impossible ways. As will be shown, smart speakers are promoted as home security devices, emergency contact tools, tools to help with memory loss, social isolation issues and more (see Chapter Three). Behavioural data collected on individuals with memory loss or declining cognitive faculties could be of great value to advertisers (Beherec, 2014). Moreover, Google has already started to prompt their advertising clients to target older adult users, who are increasingly online (Twohig, 2021). The types of content they are exposed to through such campaigns need further inquiry.

As smart speakers are still relatively new, little has been written about possible connections between their usage and ad profiling (Iqbal et al., 2022). Generally, consumer surveillance is collected on all Internet users resulting in targeted ads from various sources. Still, the surveillance of older adults is distinct in that it may result in ad companies and malicious actors targeting them with age or health-related products and content. To investigate this further, assessing how smart speaker usage determines the ads displayed on connected devices is needed. As Google and Amazon are two of the largest data collection companies and ad sellers (Zuboff, 2018), I analyze targeted advertisements aimed at older adults who use smart

speakers. I conducted an algorithmic audit using sock-puppet accounts to answer the following questions:

- What types of advertisements follow older adults around the web after engaging with Google Home or Amazon Echo?
- Do advertisers target smart speaker users with age or health-related content?
- Following the use of smart speakers, are older adults targeted with fraudulent or predatory content online? If so, to what extent?

Methodology

This research requires a multi methods approach consisting of documentary analysis, focus group research, qualitative expert interviews, and algorithmic auditing.

Documentary Analysis

The documentary analysis in Chapter Three consists of an analysis of materials from Google and Amazon and their affiliate marketers to assess how these devices have been promoted to older adults and their care partners. Three Google searches were conducted in August 2020: "Amazon Echo for seniors," "Google Home for seniors," and "Alexa for seniors." I saved the top 15 webpage links for each search and then disregarded the duplicates that showed up for more than one of the search terms. The web pages were then revisited in May 2021. While a couple of the sites were no longer in operation and removed from the dataset, two of them updated the articles to explain how smart speakers could be useful for older adults following COVID-19 isolation protocols. I used a thematic content analysis to tease out the most frequent patterns

in the articles using an inductive approach to coding, starting without a preconceived idea of what the data would demonstrate. To start the process, I read each article, coded the documents based on categories that appeared most often, and grouped them into themes. Three major themes emerged from the coded data: Entertainment/Information, Health, and Security. I then used a deductive approach to search for affiliate link disclosures and the word "privacy" before analyzing the contexts in which privacy was mentioned.

In Chapter Five, I analyze Google and Amazon's privacy policies in comparison with Canadian and B.C. private sector privacy regulations, PIPEDA and PIPA, respectively. According to Browne et al., (2018, p.3), interpretive policy analysis allows researchers to analyze the meaning of policies by asking: "how is the policy problem defined or constructed?" and "what assumptions underpin the problem framing?". Here, expert interviews (listed in Appendix 1) helped further supplement the documentary analyses that described what type of data Google and Amazon smart speakers collect on users and the meaningful consent requirements of PIPEDA and PIPA.

Focus Group

This project received ethics approval (protocol 20-0050) from the University of Victoria in 2020, which was renewed in 2021 and 2022. To facilitate the focus group component of this project, the AGE-WELL National Centre for Excellence and the Institute for Aging and Lifelong Health (IALH) at the University of Victoria helped to locate volunteer research participants through their research networks. Additionally, Dr. Teri Fisher broadcast the call for participants

on his Voice in Canada podcast. The call for participants invited Amazon Echo or Google Home users to participate in a Zoom focus group session. To participate, eligible applicants had to be 65 and over, own a smart speaker, and live in Canada. Interested applicants were instructed to reach out over email. I replied with further information about the project and attached ethics consent forms which they were to return and sign before our session. I also encouraged participants to let their friends know about the focus group. In total, 14 people sent emails expressing interest, although six could not participate. Finally, eight Amazon Echo (Alexa) participants met over Zoom for a one-hour conversation on November 24, 2021.

The focus group aimed to explore how older people use Amazon Alexa devices in Canada. The informal conversational setting allowed participants to share their understanding of privacy settings, Amazon's Terms of Use, and their daily uses and grievances about their devices. The casual setting also encouraged participants to respond to each other's comments and examples, even in instances where they did not agree.

At the start of the session, I introduced myself and explained the research questions and goals. Participants were informed that they could refuse to answer any question, could withdraw at any time, and that neither their video images nor real names would not be used in the publication of this dissertation chapter. They all consented to record the conversation by signing the ethics forms and again verbally at the start of the session. The session started with initial warm-up questions about how the participants use their Alexa devices. Participants were asked to raise their hands if they used their devices for certain functions (e.g., listening to

music, weather, smart home control, etc.). Each question was followed by an opportunity to go into further detail and to interact with each other's comments. We then moved on to the usefulness of Alexa devices for older people living alone. Finally, we discussed issues with terms of use, device setup, and access to privacy controls. The conversation was transcribed verbatim and then exported into NVivo software for coding and thematic analysis. Thematic analysis is useful for finding initial patterns in qualitative data by generating like-categories or themes. Once common themes are established, they are further analyzed to create deeper insights and broader conclusions (Braun & Clarke, 2008).

Following our conversation, participants filled out a short demographic survey. Of the eight participants, six were female and two were male. Ages ranged from 67-81 years old. Education levels were mixed: two participants held high school degrees; five reported post-secondary education levels; one preferred not to answer. Each participant used at least one Amazon Alexa-enabled smart speaker daily, and five had received their devices as gifts. Participants were in both rural and urban settings in British Columbia (3); Saskatchewan (1); Ontario (2); New Brunswick (2). All real names were changed to pseudonyms to preserve participant confidentiality.

Expert Interviews

Quotes and insights from expert interviews are interspersed throughout each chapter. Snowball sampling was used to locate 15 participants for qualitative interviews of one hour each. Participants included key informants and experts from various areas such as privacy law,

gerontology, surveillance, and voice technology in health sectors. Participants who agreed to be interviewed were asked if they knew anyone else who may also be interested in sharing their knowledge. Expert interviewees are listed in Appendix 1.

Algorithmic Audit

In Chapter Six, I conducted an algorithmic audit to compile a unique ad library of content geared toward older smart speaker users. Algorithms are data-driven decisions that categorize individuals and the content they are exposed to online. They are often considered trade secrets largely hidden from public view (Dixon & Gellman, 2014; Pasquale, 2015). Algorithmic auditing is a methodology that allows researchers to render these practices visible through field experimentation (Sandvig et al., 2014).

According to Metaxa and colleagues (2021, p. 288), an algorithmic audit is: "a method of repeatedly and systematically querying an algorithm with inputs and observing the corresponding outputs to draw inferences about its opaque inner workings." A lack of transparency in Artificial Intelligence (AI) systems has led to the rise of algorithmic auditing as a research method for making automated decisions more visible (Raji et al., 2020). In two popular examples, algorithmic audits have been used (1) to identify evidence errors with facial recognition systems that disproportionately misrecognized women and people of color (Buolamwini & Gebru, 2019) and (2) to show that search engine outputs can be negatively biased against those same groups as well (Noble, 2018). Others have used such methods to study the spread of health misinformation on social media and differential pricing on online

shopping platforms (Metaxa et al., 2021). In the wake of heightened levels of AI decision-making, algorithmic audits are becoming increasingly important as they can potentially affect real-world change in various industries (Metaxa et al., 2021). These external experiments have also raised public awareness regarding algorithmic bias. They have inspired researchers inside companies like Google to run internal algorithmic audits to avoid similar issues in the future (Raji et al., 2020).

Even as algorithmic audits gain traction as a research method in academia and investigative journalism, external audits are limited in terms of what data researchers can access. Trade secrets often protect the internal workings of such systems (Raji et al., 2020). However, sometimes outputs are enough to divulge important inner workings within AI systems. For example, Iqbal and colleagues' (2022) algorithmic audit on Amazon's use of user smart speaker activity for targeted ads resulted in a class action lawsuit against Amazon (*Gray v. Amazon.com,* 2022). To date, no such studies have focused specifically on older adults and targeted ads or older adults' use of smart speakers.

Following Sandvig et al.'s (2014) guide on conducting an algorithmic audit for data and discrimination research, I created four separate "sock puppet accounts": Gillian (female, age 82), Darlene (female, age 72), Ronald (male, age 66); and Eve (female, age 83). As smart speakers require a connection to a smartphone app, a Google Pixel smartphone was reserved strictly for this project to avoid cross-contamination of user profiles. Each time I created a new persona and connected the phone to the associated smart speaker, I reset the phone and smart

speaker to create a unique advertising ID that would not be cross contaminated with other accounts. Each sock-puppet account was also assigned its own Gmail account, another requirement for smart speaker setup. The Google Nest Hub experiment started in April 2022. Each profile engaged in different questions or activities with the smart speakers to test for variation within ads and ad profiles. Each account was used over different periods. Gillian, Darlene, and Ronald's accounts used Google Nest Hub, and only Eve's account used Amazon Echo Show 5.

Each of the accounts asked for different sets of age and health-related commands over a few weeks per account. While interacting with each device, I took note of any ad emanating from the smart speaker, YouTube Music, or Amazon Music Premium streaming services. Following interactions with the smart speaker, I would browse the top 2-3 headlines on CNN or CBC news websites on the connected smartphone associated with the account, both of which show ads by Google. I would also check Gmail for any ads in the promotions tab. The contents of each ad were then entered into an Excel sheet for further analysis. Periodically, I would also take note of each user's Google ad profile, which is a list of inferred interests that Google makes available to users. I also requested Eve's ad profile from Amazon, which was returned as a blank document.

Conclusion

Subsequent chapters unfold as follows. Chapter Two consists of a literature review broken down into three sections: gerontechnology, privacy, and surveillance. Gerontechnology

literature helps to situate smart speakers into the wider context of smart home technology for older people. Articles reviewed in this section also pertain to barriers to implementation and attitudes surrounding privacy perception. The next subsection reviews the relevant privacy literature. Here, I discuss the definition of privacy, the importance of meaningful choices and autonomy-supporting environments, and consent-based issues with privacy legislation that could be improved through a data justice framework. Finally, the surveillance section of the literature review summarizes some of the leading work on data and discrimination, thus exploring how demographic and behavioural data can lead to algorithmic decision-making. Here, the question of how life chances and life choices are affected by surveillance practices leads me to the question of how such techniques may negatively impact older adults. Taken as a whole, the combined literature allows for a multi-disciplinary approach to unravelling the implications of aging in place with SHTs.

In Chapter Three, I analyze Google and Amazon smart speaker marketing materials geared toward older adults and their care partners. Affiliate advertisers make various claims about what these devices can do for older adults, ranging from medication reminders to home security devices and digital companions. The benefits are framed in ways that perpetuate seductive surveillance (see Troullinou, 2017): a theoretical framework that explains how users are often encouraged to embrace the most invasive features of smart speakers while ignoring privacy risks. Beyond marketing claims, Chapter Four draws on original focus group data with older adults across Canada. This original research illuminates some of the ways older Canadians

use Amazon smart speakers and how they manage their privacy. Through documentary analysis and expert interviews, Chapter Five expands on Google and Amazon's privacy policies, Canada's private sector privacy legislation, The Personal Information Protection and Electronic Documents Act (PIPEDA), and B.C.'s provincial equivalent, Personal Information Protection Act (PIPA). Chapter Six explores results from a mini algorithmic audit conducted with Google Nest Hub and Amazon Echo Show 5 devices. An analysis of the types of ads directed toward older users questions the extent to which such content is finely attuned to individual accounts. However, Google and Amazon documents geared towards their marketing partners suggest that older adults are often excluded from targeted ads, but perhaps not for much longer. Chapter Seven then includes a summary of findings and suggestions for further research. It ends with insight into how user-centric design and data justice can ensure fair, equitable and human-centric approaches to support older adults aging in place.

Chapter Two: Literature Review: Gerontechnology, Privacy, and Surveillance

Introduction

This chapter integrates and discusses literature from three areas of research: gerontechnology, privacy, and surveillance. Through a review of selected gerontology research, Section One focuses on user perception of SHTs with a focus on AgeTech, or any Internet-connected technology that helps older adults in their day-to-day lives. Section Two focuses on the value of privacy as a social good, and the need to protect the interests of individuals and groups against corporate imperatives. Section Three analyzes the surveillance literature to explore the types of social sorting and discriminatory impacts that come alongside pervasive surveillance practices. These three bodies of literature weave together a story about aging in place, privacy, and surveillance that can set the context for later chapters on the implications of older adults using commercial smart speakers.

Gerontechnology and User Perceptions of Age Tech

Traditionally, older adults have been late adopters of the online world compared to younger people. Still, research from Statistics Canada has shown that Internet usage has doubled from 32% to 68% among older adults and is expected to continue to grow (Davidson & Schimmele, 2019). As they are easy to use in comparison to other Internet-enabled technologies, smart speakers may help older adults with everyday tasks (O'Brien et al., 2020). Using technological resources to create and maintain healthy lifestyles is attractive to many (Helbostad et al., 2017). This is especially true in the context of underfunded care homes with

lengthy waiting lists and even more so in the wake of COVID-19 stay-at-home orders. Many healthcare researchers, private sector actors and other stakeholders are exploring how various technologies can assist older adults in maintaining healthy lifestyles at home (Wallace & Knoefel, 2022). Around the world, interest in the broad field of AgeTech, a term which has recently gained traction in interdisciplinary gerontechnology conversations (Venning, 2022), is increasing as the market demands tools that can improve health and wellness outcomes for older adults (Etkin, 2022; Sixsmith, 2022). To bridge the relationship between longevity and technology, AgeTech can include "information and communication technologies (ICTs), robotics, mobile technologies, artificial intelligence, ambient systems, and pervasive computing to drive technology-based innovation to benefit older adults" (Sixsmith, 2022, p.1). In Canada, for example, the AGE-WELL NCE research network focuses on technological solutions such as robotics for people living with dementia as well as AI-based smart homes (Robillard & Hoey, 2018).

Intelligent personal assistants such as Google Assistant and Amazon Alexa are gaining popularity among older users. The first published article on the topic demonstrated that staying connected with family, scheduling reminders, and controlling the home are oft-mentioned features by older adults in Amazon Echo user reviews (O'Brien et al., 2020). However, what makes Google or Amazon smart speakers attractive to older adults in the first place? Understanding the broader market context where Amazon and Google products are gaining popularity allows us to interrogate the ideological underpinnings of what technological

solutions are expected to achieve for older adults. From there, I will move on to related concerns regarding these tools' usefulness, effectiveness, and privacy safeguards.

The High Expectations of AgeTech

What sorts of problems are AgeTech devices intended to solve? SHTs can encompass many different technologies, such as WIFI-enabled cameras, smart speakers, wearable or environmental sensors, and more (Arthanat et al., 2020; Chung et al., 2021; Ghorayeb et al., 2021; Jo et al., 2021). They can be useful for various purposes related to limited mobility or emergency alerts and thus can be especially beneficial for older adults. In an early study, older smart home users reported: "vision loss, hearing impairment, loss of tactical senses, memory loss, loss of balance, difficulty reading the fine print, difficulty reading small buttons, difficulty processing information when displayed together with features perceived as distracting…and difficulty using [a] computer mouse" (Demiris et al., 2004, p. 92). Consequently, SHTs were used to respond to the difficulties of day-to-day living including mobility, memory, connectivity, and cognitive decline. They contained features related to emergency contact or alarm systems, fall detection and prevention, appointment reminders, temperature monitoring, and more (Demiris et al., 2004, p. 91). The underlying goal of these technologies is to create an environment where older adults living at home can rely on a network of Internet-connected devices to help them go about their daily business safely and securely.

AgeTech can also attempt to respond to issues of loneliness and isolation. Seminal work from Sherry Turkle's *Alone Together: Why We Expect More from Technology and Less from Each*

Other (2011) relies on original qualitative research to explore how older adults and children engage with social robots. Her team supplied interactive robots to participants over a prolonged period. In one study, care home residents were given a My Real Baby, a robotic doll that resembles a lifelike baby. The baby responded to touch and various phrases and alleviated participants' loneliness. Similar experiments were conducted with PARO, the popular robotic seal from Japan that can "understand" and respond to over five hundred words. To Turkle's surprise, although some participants were initially withdrawn, many became very attached to their robotic companions to the extent that they were reluctant to return the devices to the researchers at the end of the study. Surprisingly, participants reported sharing personal secrets and real companionship with the robots (Turkle, 2011).

Why did some participants have such an easy time connecting with robots at such an intimate level? Was it because the robots were "alive enough" to perform a relationship function or because the participants were starved for adequate human attention? In Japan, robots like Paro are routinely given to older adults with dementia to tackle loneliness and isolation issues. Ultimately, Turkle (2011) asks why humans would not be better suited to perform these tasks. Before opening the floodgates of technological solutionism, she argues that it is first useful to think about why older adults have been placed in situations of loneliness or neglect. As convincing as some robots may be while performing care functions, Turkle (2011) argues that relationships with them can never be truly reciprocal or authentic. Throughout this research, it is important to consider Turkle's perspective in returning to the following question:

where are the humans that should be performing care work for older adults, and is technology always the best solution? Indeed, some older adults enjoy a sense of security using SHTs such as sensors (Rogerson et al., 2020). Other users have considered older models of SHTs to be privacy-enhancing compared to the invasive physical surveillance they would have received in a care home (Van Hoof et al., 2011). Still, older adults have varying opinions and preferences about which types of SHTs are acceptable and are actively interested in controlling who gains access to their data (Choi et al., 2021; Kirchbuchner et al., 2015). As will be discussed in later sections, the extent to which privacy and autonomy are respected should be key considerations in whether technological solutionism is an appropriate response to age and health-related issues (Carver & Mackinnon, 2020).

The Age-Based Digital Divide: Older Adult Perceptions of Internet-Enabled Technologies

Under what conditions are older adults willing to adopt the Internet or smart tools for aging in place? Of course, whether older adults wish to accept Internet-enabled technologies is important in their implementation. In Canada, where older adults have been late adopters of the Internet, regular Internet usage rates are still growing (Davidson & Schimmele, 2019). Statistics Canada reported that in 2012, only 48% of older adults were online. By 2018, 71% of older adults reported regular Internet use, 53% of those users also own smartphones, and 35% use smart home devices (Canadian Internet Use Survey, 2019). Recent surveys have also shown that as many as 80% of older Canadians would be happy to accept new digital technologies if they could stay in their homes for longer, with 18% already using a smartwatch for health

purposes (AGE-WELL, 2019). Cultural factors likely impact acceptance levels. For example, in Switzerland in 2016, attitudes surrounding the usefulness of the Internet were still largely divided, with only 43% of older adults supporting the idea that the Internet could help them stay independent longer (Seifert & Schelling, 2016).

Much of the literature in this field revolves around perceived usefulness or ease of use as determining factors in older adults' attitudes toward Internet technologies (Chung et al., 2021; Dogruel et al., 2015). Demiris & Thompson (2011) concluded that older adults would consider using smart homes and health applications if they added meaningful information to their health records. One study on 47 low-income senior housing residents in the US found that Amazon smart speakers were perceived as potentially useful for listening to the news, daily living, social activity reminders, medication reminders, health tips, and safety features. However, older adults were worried about smart speakers' potential for behavioural monitoring, casual eavesdropping, and device affordability. Overall, participants expressed willingness to use smart speakers if they could receive assistance in "setting it up" (Chung et al. 2021, p.4). In this study, participants showed greater enthusiasm for smart speakers before using them, often expressing frustration upon gaining further experience (Chung et al., 2021).

Smart speakers are poorly implemented because they were not designed for older adults (Chung et al., 2021). Similarly, wearables and mobile health apps are potentially useful for older adults but can be difficult to use because they are most often designed for younger users (Helbostad et al., 2017). According to Helbostad and colleagues (2017, p. 4), older adults

would be more likely to use health apps and wearables if they represented “clear benefits” that “fit with their goals, expectations and lifestyles.” It follows that developers should do more to focus on “age-related functional decline” (Helbostad et al., 2017, pp. 9-10) in the design phases of these tools. Including older adults and nurses in the design phases can improve user perceptions and the efficacy of smart homes and AI for older adults (Fritz & Dermody, 2019).

As has been shown, much research has focused on barriers to age tech implementation, and this focus sometimes comes at the expense of evaluating the quality of smart home technologies. In a meta-analysis evaluating 21 studies in North America, Europe, and Australasia on smart homes for aging in place, Harris and Hunter (2016) conclude that studies are more often focused on feasibility and barriers to access. Further research on the quality of these systems is needed to avoid falling prey to non-evidence-based technological solutionism.

The quality of smart technology undoubtedly varies by system, by country, and even by individual. In one recent study, Liu et al. (2019) reviewed geriatric literature on six studies on smart homes and older adults in the US, Australia, Korea, Italy, and Denmark. They concluded that using smart homes had no significant effect on hospital admissions or emergency room visits. On the other hand, older adults with chronic conditions found smart homes useful for physical assistance and mental health issues such as depression (Liu et al., 2019). The authors call for further research on smart homes for older adults with chronic conditions with an added focus on security, economic effectiveness, and accessibility (Liu et al., 2019).

To better suit individual personalities, some researchers are working to improve emotional responses from AI systems for older adults. For example, Cognitive Orthosis for Assisting aCtivities in the Home (COACH) uses cameras, sensors, and audio recordings to guide older adults living with dementia in washing their hands, brushing their teeth, or cooking. This initiative has had mixed results. Through testing COACH in care facilities, researchers found that human assistance with these tasks was eventually no longer needed for some participants. Others were confused or irritated with the technology; a problem researchers hope to remedy by making the automated audio responses more emotionally intelligent in response to frustrated users (Robillard & Hoey, 2018).

As will be further discussed, AI continues to infiltrate technology daily, often raising alarms about biases embedded in the code (e.g., Eubanks, 2018; Noble, 2018). Chu et al. (2022) have noted a gap in the AI literature on ageism, defined by prejudicial or discriminatory attitudes or practices towards older adults and the policies that uphold them (Chu et al., 2022, pp. 947-948). The authors coin the term *digital ageism* to refer to such bias in AI and related technologies and call for further research: “In the literature examining biases in AI, age-related bias is seldom discussed in comparison to racial and gender biases. It is time to critically reflect on and consider the experience of ageism in AI: the process of growing old in an increasingly digital world that directly and insidiously reinforces social inequities, exclusion, and marginalization” (Chu et al., 2022, p. 949).

Following Crawford (2017), Chu et al. (2022) warn that algorithmic bias can lead to (1) harms of allocation, such as opportunities or resources and (2) harms of representation, in terms of how others view group members. A lack of inclusion of older adults in the design and use of new technologies has led to digital ageism and the age-based digital divide (Chu et al., 2022). Even as overall attitudes towards Internet-enabled devices may continue to shift as they become more ubiquitous, older adults are not a homogenous group, and so preferences will vary. Returning to Turkle (2011), the question remains whether constantly pushing toward technological solutions is the most appropriate response to care in all cases.

Maintaining Autonomy and Protecting Privacy

Without necessarily defining "privacy," gerontechnology literature often mentions the need for stronger privacy and security protocols for SHTs (e.g., Liu et al., 2019). Increasingly, older adults are already subject to many surveillance systems through the consumer versions of camera and sensor technologies through smart homes and IoT devices (Carver & Mackinnon 2020, p. 218). In one of the few studies that merge surveillance studies and gerontechnology research, a review of twenty gerontechnology articles through the lens of surveillance capitalism and the ageing enterprise revealed that for many, the idea of submitting to surveillance technology in the home to stay independent is an unacceptable trade-off (Carver and Mackinnon, 2020). Some older adults believe that submitting to surveillance to stay independent defeats the purpose, resulting in a further loss of autonomy (Epstein et al., 2016; Carver & Mackinnon, 2020). For example, one study equipped older adults experiencing early-

onset dementia with home monitoring systems. Participants later expressed their concerns with in-home monitoring as "an invasion of privacy, and said it made them feel controlled, stupid, and humiliated. They explained that being monitored was, at the very least, uncomfortable, or annoying, and some went so far as to say it was intrusive, threatening, and insulting" (Epstein et al., 2016, p.46 in Carver & Mackinnon, 2020, p.225). Earlier research has also raised concerns over threats to autonomy posed by surveillance systems. Older adults may feel limited in their ability to eat what they want if they are consistently monitored, for example. For this reason, researchers recommend that monitoring systems include opt-out features for flexible preference choices in various settings (Kang et al., 2010). As mentioned, in some instances, SHT-based monitoring is sometimes preferred to human monitoring, but user perceptions can differ substantially (Van Hoof et al., 2011).

Where privacy concerns are present, context and consent are key factors. Cameras, motion sensors and microphones, and the locations they are placed in, each carry different privacy implications for older adults. Through qualitative interviews and focus groups, Courtney (2008) explored the willingness of American older adults to use SHTs. As might be expected, many had strong privacy concerns with security cameras and motion sensors, while others were less concerned, describing themselves as "wide open" (Courtney, 2008, p. 79). In the same vein, Fritz and Dermody (2019) found that many older adults were ready to accept sensors that detect movement but felt uneasy about cameras and microphones in the home. Kang et al. (2010) reported that older adults were willing to give up some privacy if technology allowed

them to remain independent. However, authors warned that any recorded data should be meaningful and customized to the individual user, rather than a catch-all system that collects too much.

Some older adults are more willing to accept cameras and microphones in the home if they could control where they were placed. For example, devices placed in the living room and kitchen were perceived as more acceptable than in the bedroom or bathroom (Fritz & Dermody, 2019). In another study, American smart home users viewed the possibilities of digitized health information and medication reminders positively but reported concerns over data protection (Demiris & Thompson, 2011, p. 55). Within these texts, privacy is often flagged as a concern or a topic for further research, but few ask important questions such as where SHT data is stored, how long it is retained, who gets to access it, or how risks of harm are mitigated. For this reason, cross-disciplinary research that incorporates the further analysis of these questions is needed.

Alexa, Have I Taken My Medication Today?

Enter Google and Amazon. Apart from usability, the cost-effectiveness of smart home technology is an oft-cited barrier to implementation (Harris & Hunter, 2016). The fact that Google and Amazon smart speakers are low-cost and user-friendly (Kuntsman et al., 2019) might play to their strengths. For older adults living with disability or dementia, usability, and a lack of awareness of available tools are two key barriers to the implementation of AgeTech devices (Shahrestani, 2017, p. 29). Google and Amazon have high levels of brand recognition

and enormous marketing budgets. As a result, their products may be attractive alternatives to higher-cost options from smaller smart home manufacturers. Indeed, in the first-ever study on Intelligent Personal Assistants (IPAs) and older adults, product reviewers welcome Google Home and Amazon Echo as cheap and accessible alternatives to other AI technologies for older adults (O'Brien et al., 2020). O'Brien et al. (2020) frame voice-activated features as tools that can help older users overcome traditional barriers to care technology:

> The vast array of reported quality-of-life improvements that the VIPA (voice activated personal assistant) already provides (entertainment, companionship, control of the home, reminders, and emergency communication) are just the beginning for the limitless possibilities for companies to further develop this technology to improve the lives of older adults and their caregivers. (p. 4)

The authors identified 125 Amazon Echo reviews from 2015-2018 using keywords related to aging and health status, such as "health," "caregiver," "senior," "older adult," and "medical," revealing five recurring themes (O'Brien et al., 2020, p. 2). Reviewers often mentioned entertainment, companionship, home control, reminders, or emergency communication as useful features. According to Amazon reviews, lonely older adults appreciated being able to converse with Alexa as a conversation partner. In contrast, others with memory challenges enjoyed asking Alexa questions they felt would burden their caregivers. The most common complaints were not about privacy invasion but about Alexa misunderstanding their commands or giving ineffective responses to specific health queries.

Others were impressed with the "Ask My Buddy" function for contacting family but were dissatisfied that the device could not call 911 in an emergency (O'Brien et al., 2020, p. 3).

To further assess the benefits of these devices to support older adults in the home, O'Brien et al. (2020) call for additional research on how older adults use intelligent personal assistants (IPAs). They also call for research on how Google Home and Amazon Echo might be useful for older adults with health conditions such as "depression, Alzheimer, dementia, and Parkinson's disease" (O'Brien et al., 2020, p. 4). As it stands, evidence supporting the effectiveness of IPAs as care tools for older adults is scarce. The implications for privacy, surveillance, and commodified behavioural data should be prioritized, as demonstrated below.

As an eclectic group, older adults continue to demonstrate a range of attitudes around Internet-enabled technologies, smart home systems, and privacy protections. Throughout the gerontechnology literature, it is often noted that privacy and security are important to older adults. As businesses commodifying user data such as Google and Amazon begin to dominate the SHT market, confronting these issues is time sensitive. For example, Kuntsman et al. (2019, p. 13) argue that once Google and related third parties are involved with individualized healthcare through surveillance tools, doctor-patient confidentiality will become a "symbolic gesture from bygone days." As shown by Carver and Mackinnon (2020) personalized insurance rates are already reliant upon mobile health data in some cases in the U.S. As others have argued, AgeTech research should routinely question how technologies might infringe upon the private lives of older adults (Mortenson et al., 2015). These questions should be revisited at all

stages of the design process, as reflected in the Ethical by Design principles (Boger, 2022). Overall, researchers and designers in this field should work to ensure that those who embrace new care technologies are not disempowered in the process (Mortenson et al., 2015). Disempowerment can come through a lack of autonomy over choices surrounding the context over which technologies are employed or which data is shared. When data collection policies are not transparent or clear to users, disempowerment can also stem from a lack of privacy protection.

Privacy: Controlling Information That Pertains to Oneself

If AgeTech can empower older adults and improve their quality of life, how can we best ensure that privacy and autonomy are well respected? As Julie Cohen (2012, p. 149) says, "choices about privacy are choices about the scope for self-articulation. They are, therefore, choices about the room to pursue the (unattainable, yet vitally important) liberal ideals of autonomy and critical independence." The literature in this subsection further interrogates the tension between privacy and autonomy for older adults. I first discuss the social value of privacy and the importance of creating environments where meaningful choices can be made. Next, I review the literature on consent, where opting out of data collection is nearly impossible in today's digital landscape. The last section explores how smart speaker users negotiate their privacy boundaries. Taken as a whole, this section is meant to set the context for challenges older adults as a group may encounter with privacy invasive SHTs.

Defining Privacy

Privacy is often described as the ability to control information that pertains to oneself (Parent, 1983). In *Privacy and Freedom*, Alan Westin (1967, p. 5) defines privacy as "the claim of individuals, groups, or institutions to determine for themselves when, how, and to what extent information about them is communicated to others." While the inclusion of groups and institutions can be considered controversial, questions over group privacy rights factor in the shared interest of individuals in groups and the recognition that individual privacy decisions potentially affect others (Regan, 2002). Moreover, certain groups, especially those who are marginalized or vulnerable, tend to bear the brunt of the negative effects of surveillance (Lyon, 2003), and thus may assert claims to group privacy rights.

Control over personal information is necessarily bound together with autonomy, agency, and power (in)balances, and according to Simon Davies (2019, p.65): "privacy protection is one way of drawing the line at how far society can intrude into your affairs." Others have viewed privacy as an exercise in "boundary management" between self and society that allows for ongoing personal development (Cohen, 2012, p. 150). Privacy policies are instilled to restrain power by rendering data collection practices transparent and protecting sensitive categories of information (Bennett, 2011).

The ability to control one's privacy levels in various contexts relates to Westin's (1967) four states of privacy. The first state, solitude, is the absence of observation. The second, reserve, is the limiting of disclosure. The third state, anonymity, is the ability to be free from identification;

the fourth state, intimacy, is the retreat needed for closer interactions. Each state of privacy may be desired at different withdrawal levels according to culture and circumstance (Westin, 1967). To varying degrees, older adults aging in place with technology may need to access to any of these four states in different contexts. They may prefer to avoid being observed via smart speakers and related SHTs at certain times or in certain areas of the home; they may wish to avoid disclosing certain details of their daily behaviour to certain parties. They may also prefer to remain anonymous to the companies evaluating their personal information and require privacy for intimate interactions.

The Social Value of Privacy

However, "privacy as informational control" has also been criticized as "too narrow" to describe the complex world of online interactions. In the context of younger people, (Steeves & Regan, 2014, pp.300-301) argue:

> …privacy is an inherently social practice that enables social actors to navigate the boundary between self/other and between being closed/open to social interaction. We posit that the social negotiations that occur in fixing this privacy boundary in a particular context depend on individual preferences and abilities as well as the social meaning of the context.

In other words, managing privacy boundaries requires careful configuration and can vary depending on social contexts. For example, older SHT users may be less enthusiastic about sharing their certain data with family members but may be comfortable sharing it with healthcare providers (Ghorayeb et al., 2021). Navigating the boundary between self and others

necessarily depends on the context: whom is the data being shared with, for what purposes, and is the sharing consensual?

Regan (2011, pp. 498-499) has described privacy as a "common value, a public value, and a collective value," which generally protects individuals and groups from "social overreaching" (Regan, 1995). It is a common, universally shared value in that everyone generally desires privacy protections, albeit to varying degrees. The human need for privacy is represented in everything from building walls to encrypting digital communications (Bennett, 2008; Davies, 2019). Next, it is a public value because its benefits span beyond individuals to societal levels such as democratic systems. Correspondingly, Solove (2007) has argued that as a common value, privacy should be understood as a societal benefit that protects the individual. In this way, privacy strengthens individual rights and collective values of democratic society regarding civil liberties such as the freedom of association. In today's world of commerce and online affairs, it is also increasingly difficult to give some people privacy rights without giving them the same rights to all. This makes privacy a collective value, one that has benefits at the group and societal levels and not just at the individual level (Regan, 1995, p. 21). For example, as a collective value, older adults with health issues may wish to make claim to group privacy rights if they are targeted as a vulnerable group by marketers and online scammers (e.g., Kuempel, 2016; FBI, 2021).

The framing of privacy as a social good avoids the trap of trying to balance privacy as an individual right against mass surveillance, which is often seen as a social good for safety and

security. Legal privacy expert Teresa Scassa (2020) maintains that conceptions of privacy that only pertain to the individual are inadequate due to the ubiquity of mass surveillance. Public and private organizations have both benefited from systems of mass surveillance. Personal data collection has proven immensely profitable for digital platforms, data brokers, and marketers, and it has also proven useful for political parties and government agencies. The need for collective privacy rights lays the groundwork for a strong human rights-based approach to privacy legislation in the Western world. In this view, legislation must be centered around privacy as a human right in connection to dignity and autonomy as opposed to the interests of business, competition, and technological innovation (Austin, 2019; Floridi, 2016; Scassa, 2020).

In thinking through the social impacts of data-based surveillance, such as “monitoring, sorting, and influencing”, Linnet Taylor (2017, p.11) has proposed data justice as a broader framework that goes beyond human rights instruments for protecting privacy as a social value. Data justice is defined as: “fairness in the way people are made visible, represented and treated as a result of their production of digital data” (Taylor, 2017, p.1). It goes beyond individual privacy protection in recognizing the potential group harms associated with surveillance, such as the potential for discriminatory or biased outcomes. It simultaneously recognizes the potential for public good and social harm that can result from data-driven decisions. Data justice also recognizes that impacts of “big data'' through the “linking and merging of datasets” differ based on socio-economic positioning, gender and ethnicity and can involve both private and public sector surveillance which are increasingly difficult to distinguish (Taylor, pp. 2-3).

As such, the three pillars of data justice simultaneously focus on the beneficial and negative implications of data-based surveillance through (1) the need for privacy or visibility (2) the need to engage with such systems for certain purposes and or disengage with them for others, and (3) the right to challenge bias and "live free from data based discrimination" (2017, p.11). In the context of older adults using SHTs for aging in place, they may benefit from having certain behavioural patterns made visible to care partners or healthcare providers, should they consent to such monitoring. However, they may prefer to keep their daily routines invisible to private sector actors looking to commodify their behavioural data. If SHTs are beneficial to older people aging in place, is it also necessary that behavioural data is collected and stored for advertising purposes under surveillance capitalist business models? Here, both visibility and invisibility are simultaneously valuable and contextual. Engaging with technologies that promote well-being may be beneficial in some ways, but the choice to disengage in exchange for human support should also be available. Should data be used in ways that disadvantage older SHT users based on age or other group status identifiers, such usage should be prevented by default, and users should be able to challenge bias through stronger accountability and transparency measures. Data justice is a framework that can manage some of the complex issues of digital surveillance globally (Taylor, 2017), and can respond to the potential for ageist discrimination and privacy-invasive tendencies of SHTs.

Overall, in protecting older adults' personal and behavioural data, considering privacy as a social good is helpful. This is because even though older adults are not all one group with the

same needs and abilities, some older adults can have unique age-related needs. These may include a higher propensity towards declines in physical health, such as limited mobility, mental health issues relating to cognition or memory, lower levels of digital literacy or experience with digital technology, and so on (Anderson & Perrin, 2017; Davidson & Schimmele, 2019; Sixsmith, 2022; Slane et al., 2020). In comparison to younger people, older adults in Canada have self-reported higher privacy concerns and the least willingness to share their information in exchange for discounts or related benefits (OPC, 2021). Therefore, although older adults do not all share the same lived experiences or health profiles, aging in place with technology can come with certain challenges requiring stronger privacy protocols. In this sense, a society that recognizes the privacy interests of individuals and groups can legislate privacy in ways that better respect the dignity and autonomy of a certain class of people. Elsewhere, protecting group-level privacy has already been applied to children under 13 (Denham, n.d.), and thus could be extended to other groups.

Privacy-Enhancing Environments

Smart speaker users of all ages often show a limited understanding of the surveillance capabilities of their devices, including voice recordings and the use of their data for targeted ads (Lau et al., 2018; Malkin et al., 2019). This is compounded by user preferences being scarcely reflected in the smart speaker privacy controls available (Lau et al., 2018). Even as user perception studies are not often focused on older adults, smart speaker users of all ages have expressed concern over household data sharing (Furszyfer Del Rio et al., 2021), state

surveillance (Huang et al., 2020; Furszyfer Del Rio et al., 2021; Pridmore et al., 2019), and corporate surveillance or third-party data sharing (Furszyfer Del Rio et al., 2021; Lutz & Newlands, 2021). Some SHTs are perceived to enhance safety in ways that outweigh privacy concerns (Gazzawe & Lock, 2019). Internet users are often digitally resigned in today's surveillance environments (Draper & Turow, 2019; Lau et al., 2018), meaning that many have given up on trying to protect their data (Huang et al., 2020). This trend in user attitudes seems to have continued into the realm of SHTs where users are concerned about privacy but feel efforts to protect it are futile.

Social norms, such as generally accepted levels of surveillance dictate the ability of individuals to choose their levels of privacy in any given context (Austin, 2019). Lisa Austin suggests it is time to revisit Westin by thinking about privacy as the "ability of individuals to choose a state of privacy" (2019, p. 65). Here, the privacy interests of individuals or groups should be protected through strong regulatory measures and social norms that allow for meaningful choices to take place. Without environments that support meaningful privacy choices, we cannot meaningfully choose the terms under which information about us is shared with others. In other words:

> The meaningful choices of individuals can only be secured in the context of political and legal institutions that ensure an appropriate social balance of privacy. This, in turn, shifts us away from questions of individual choice to instead focus on the social norms, environmental conditions, and broader political and legal norms that influence whether a state of privacy is available to be chosen and whether an individual has the means to choose it. (Austin, 2019, pp. 65-66)

In short, legislating privacy as an individual value, as opposed to a social value, has had mixed results. As many privacy scholars have pointed out, the social norms of the online world do not prioritize privacy or autonomy. Platforms that monetize behavioural data, such as Google or Facebook, urge users to disclose personal information in exchange for using their services (Austin 2019, p. 70). Importantly, there are real "benefits and pleasures" to allowing surveillance practices, such as entertainment, discounts on goods, access to services, and in some cases, heightened social connection and status, thus making consent all the more "seductive" (Cohen, 2012, p.137). The false choice problem, or the impossibility or impracticability of opting out, has been heavily criticized (Bennett & Bayley, 2016; Pasquale, 2015) as individuals do not have real choices over giving up personal information in exchange for services. Without environmental conditions that allow for meaningful privacy choices, personal autonomy is thus limited. Debates over how to adequately protect personal data under the expansion of online surveillance practices are ongoing. Right now, corporate surveillance trends operate under the logic that if an individual does not agree to personal data collection in exchange for their services, their choice is to avoid using the service. This can result in the inability to connect with friends online, the inability to easily track health or fitness data, or the inability to get a discount on grocery or retail purchases (Bennett et al., 2014). In many instances, rejecting the app, service, or loyalty card, can make certain aspects of life difficult or inconvenient. Failure to follow these trends can lead to negative social, cultural, or financial consequences (Bennett et al., 2014).

As a result of the false choice issue, Austin (2019) likens our current privacy landscape to putting nutritional information on food items in a food desert. Those living in a food desert have little access to a diversity of healthy foods, but they can access nutritional information through food labels on various items. They may understand that eating highly processed junk food is not in their best interests. However, their current social environment gives them little choice to opt-out or make healthier decisions as junk food is often the cheapest, most accessible, or most convenient option. The same can be said for the current consent-based models of privacy protection. Many Internet users know that they are giving up access to their data in exchange for social connection, health monitoring, or financial gains. However, the environment does not support real choices (Austin, 2019, p. 55).

Within the privacy literature in general, there is a sense that current models of "notice and consent" rely too heavily on the individual choice to opt-out, rather than limiting the collection practices of the industry (Kuempel, 2016; Kuntsman et al., 2019). Much of this issue has been exacerbated over recent data collection practices of the big tech companies, and of course, the Internet of Things (IoT). According to the Office of the Privacy Commissioner of Canada (OPC), the ever-growing IoT and its general use of cloud computing only threaten to intensify the consequences of online privacy issues (OPC, 2011). Cloud computing erodes privacy protection because data are stored remotely by third parties, leaving the user with limited knowledge of who has access to their data and what they might use it for. Cloud computing may increase the risk of data breaches (OPC, 2011). In the same vein, when it comes

to IoT devices, Davies (2019) critiques the loss of user autonomy: "when your refrigerator becomes a data intermediary for processing and disclosure to your doctor or supermarket, I wonder at what point the data subject has a chance to be involved" (p. 111). We might ask the same question about using smart speakers to track and monitor health outcomes for older adults.

Privacy By Design

Although not necessarily an alternative to the problem of consent, some privacy experts suggest that Privacy by Design (PbD) is the path forward to data protection in our increasingly connected environments (Cavoukian, 2010; Davies 2019, p. 320). PbD implies that privacy features are built into the hardware or software of a product. It also supports the idea of building privacy protocols into the inner workings of "operational systems, work processes, management structures, physical spaces and networked infrastructure" (Cavoukian, 2010, as cited in Davies, 2019, p. 320). For instance, if smart speaker developers were to embrace PbD, users would have to give extra permission to companies like Google and Amazon to collect, store, and analyze their recordings for marketing purposes through opting in, while such data would be limited by default. Relatedly, Lau et al. (2018) challenge smart speaker developers to make crucial changes to the way privacy settings currently operate: "Rather than hiding privacy information in lengthy and ambiguous privacy policies or terms of service, smart speaker companies should leverage the main interaction capabilities of their products – voice – to integrate conversational privacy dialogues into the smart speaker user experience" (Lau et al.,

2018, p. 18). In this view, voice assistants should periodically prompt users to review and potentially change their settings through voice commands. Making privacy settings easy to access via voice command instead of buried within an app on an associated smartphone would be one step toward enhancing user autonomy, privacy, and consent (Lau et al., 2018, p. 19). Without PbD, individual users are left navigating a complicated legal landscape designed to mine their data. Regarding SHTs, we can imagine how this might be especially difficult for older adults who have difficulty configuring smartphone settings as is.

"OK Google, Stop Recording": Negotiating Privacy in the Home

According to Julie Cohen (2012, p. 142), the home is culturally understood as a place free from outside intrusion that "affords a freedom of movement that is both literal and metaphorical and that has physical, intellectual, and emotional dimensions." This is a space where personal development and subjectivity can be explored, free from observation from the outside world. The surveillance of digitally networked areas is a similar type of intrusion into "personal bubbles" results in rendering "intellectual, emotional, and relational" aspects of individuals transparent to outside actors (Cohen, 2012, p.143). This is compounded by the fact that online and physical space are increasingly intertwined and difficult to differentiate (Cohen, 2012). In this case, smart speakers serve as a gateway into the physical homes of older adults, as well as into their mindsets through search inquiries, emotional health through voice analysis, their behavioural habits through logging usage patterns for prediction and surrounding environments through recording background noise or capturing visuals.

Many smart speaker users are confused about the types of data collected by Amazon or Google or how that data is used (Javed et al., 2019; Lau et al., 2018; Lin & Parkin, 2020; Malkin et al, 2019). Although most of the available research has been conducted with younger adults, the results likely apply to users of all ages. In one study, interviews with 17 smart speaker users revealed that participants misunderstood privacy settings and related risks (Lau et al., 2018). For instance, some users were operating under false assumptions about how to mute the microphone. Rather than pressing the mute button or unplugging the device during private conversations, some users would ask Alexa or Google to "stop recording" (Lau et al., p. 16) which is not a supported voice command feature. Many users also reportedly trust companies like Google to manage their data responsibly. As a result, they kept their default privacy settings intact, allowing personal data collection to flow freely (Lau et al., 2018).

Due to their ability to record audio and video inside the home, smart speakers are "one of the most privacy sensitive IoT devices" (Malkin et al., 2019, p. 250). As with other digital communication technologies, most users are unlikely to agree to give up all their privacy all the time, but many are willing to give up some level of privacy in exchange for certain services. However, the extent to which these privacy choices are well-informed is, again, questionable. Smart speaker users are often uninformed about device recording and storing capabilities and privacy settings (Malkin et al., 2019). The authors conclude:

> Our results suggest that smart speaker owners are not fully informed about the behaviours and privacy features of their devices. Furthermore, while not many participants considered currently-stored data sensitive, there is a clear gap between

> people's preferences and the smart speakers' current retention defaults. (Maklin et al., 2019, p. 251)

Here, users were asked to install a web browser extension that monitored interactions with their smart speaker for one month. The authors found that almost half of the 116 participants were unaware that recordings were saved indefinitely. Most participants were also unaware that they could review and delete their interactions with their respective devices. Most used default privacy settings and were surprised at the recordings their devices had picked up once researchers played them back. They concluded that at least half of the stored recordings were considered unacceptable by smart speaker users, specifically in the context of children and guests (Malkin et al., 2019, pp. 256-257). However, the median participant age of 34 has limited these findings to younger, technologically literate smart speaker users in the United States. As their study had focused on primary users, the authors note that further research should also consider secondary or incidental users who do not control the device settings (Malkin et al., 2019, p. 253). Secondary users could also include older adults with smart speakers set up by someone else. This work is consistent with another U.S. survey demonstrating that only 36.28% of 113 Alexa users knew their voice recordings were collected and stored by Amazon, and only 16.8% were aware that they could delete their recordings (Javed et al., 2019). Similarly, in a U.K. study where the average study participant was 35 years old, only 40% of 100 surveyed users knew where to access such controls (Lin & Parkin, 2020).

Of course, smart speaker users vary in privacy attitudes, preferences, and digital literacy. Each user navigates their privacy in different ways. Through focus groups and qualitative interviews with young adults and university personnel from Germany and the Netherlands, researchers have demonstrated that context matters when negotiating privacy with smart speakers (Pridmore & Mols, 2020). Some participants unplugged their devices when discussing sensitive topics and avoided placing smart speakers in certain areas. Participants were concerned about privacy and chose not to ask voice assistants about certain sensitive topics. They also felt uncomfortable with attempts to manage their behaviour, thus implicating user autonomy. For example, Alexa responses may to try to direct online sales to Amazon or may steer user behaviour by advising users when to leave their homes as best to avoid traffic (Pridmore & Mols, 2020, pp. 79-80). Pridmore & Mols (2020) remain skeptical about whether voice assistants improve users' quality of life and call for further research.

In summary, privacy is a common value we all need (Regan, 1995), and a social value that could be especially useful to older adults with varying needs and abilities. If major tech companies continue to interpret the need for privacy in ways that solely benefit their profit margins, then the continued misuse of personal data is to be expected. Therefore, policymakers have a strong role in regulating data collection practices, where limiting sensitive data sharing should be the default option. Instead, what we see today is an impossibility of "opting out" of data collection, with limited privacy options buried deep in smartphone app settings. Such data sharing may be considered a trade-off by many (Draper & Turow, 2019); however, if thinking of

privacy as a human right (Scassa, 2020), it is important to remember that we do not typically "trade" rights for discounts or access to goods and services. While user-centric design can make devices and privacy controls more accessible, a data justice framework recognizes the need to limit group-based discrimination, and the need to be represented in certain datasets while disengaging from others (Taylor, 2017).

This section has explored important new research about IPA usage and user privacy negotiations. However, many of the articles reviewed here focus on younger users. Very little has been written about how older adults use IPAs in the home (O'Brien et al., 2020; Trajkova & Martin-Hammond, 2020). To ensure older adults' privacy and autonomy are respected through AgeTech developments, further research on the privacy and surveillance implications is required. Suppose we are to conceive of privacy as a social good. In that case, it should be conceptualized as a required value by people of all ages, particularly for certain groups, such as older adults aging in place with technology. As will be shown, older adults, especially those with health issues, have often been perceived and sorted in discriminatory ways by marketers, data brokers, and insurance agencies (Carver & Mackinnon, 2020; Kuempel, 2016), opening up the potential for harm. In what follows, surveillance researchers' focus on how data is used to categorize individuals and groups helps to emphasize the risks of sharing too much data.

Digital Surveillance and Discrimination

This section pertains to the surveillance literature related to targeted ads, categorical discrimination, and the surveillance of older adults who use SHTs. Although related to the

privacy literature, interdisciplinary surveillance studies touch on different questions. These pertain to surveillance for corporate imperatives that categorize individuals and groups in discriminatory ways that could have certain implications for older adults. As a central node to other SHTs, smart speakers can also serve as a gateway to a more advanced network of connected devices and apps, each with surveillance implications to consider. Examples include environmental sensors, WIFI connected cameras or doorbells, and other smart appliances that extract data which may be of interest to law enforcement, private sector actors and related third parties (Carver & Mackinnon, 2020; Maalsen & Sadowski, 2019; Murakami Wood & Steeves, 2021; Pridmore et al., 2019; Sadowski, 2020). Generally, the opaque nature of SHT surveillance capabilities should be of concern to users of any age (Sadowski, 2020), but especially for those engaging with them as care tools for sensitive purposes related to health and wellness outcomes. Unfortunately, SHTs may exacerbate marginalized experiences of health inequality (Carver & Mackinnon, 2020; Sixsmith, 2022).

To paraphrase David Lyon (2003), surveillance is the systematic monitoring of activity or personal information to influence behaviour. Gilliom and Monahan (2012) remind us that today, surveillance is a ubiquitous part of everyday life that is not inherently negative or positive. However, it is something that requires our critical attention. Surveillance comes from various public and private sources, but consumer surveillance that builds audiences for targeted ads is a key focus of this dissertation. Although consumer surveillance is nothing new (e.g., Delacourt, 2016; Lyon, 2003), the Internet and its growing network of connected devices have

amplified opportunities for advertisers to zero in on narrow audiences to influence behaviour. Personal shopping habits, online activity, and demographic information are compiled from various sources so that data brokers may profit from repackaging such information and reselling it to advertisers. Data buckets are then formed so that groups of consumers with similar attributes such as income bracket, lifestyle, education level or age, are sorted into like categories (Kuempel, 2016, p. 210). The Internet of Things (IoT) has further amplified this collection through self-tracking apps, wearables, online shopping, and other such trends (Pasquale, 2015).

Personalized data collection for "monitor-based marketing" contributes to unequal power dynamics (Andrejevic, 2012, p. 86). These dynamics make some Internet users privy to certain privileged information, such as housing or job opportunities, while targeting others for predatory loans (Sandvig et al., 2014). The discriminatory work of profiling individuals to manage their behaviour is also called social sorting (Gandy, 1993; Lyon 2003). Discrimination used to make inferences about individuals and groups can lead to rewards or punishments. In other words, data collection and analysis infer user information so that windows of opportunity are opened or closed. Social sorting can result in differing experiences with airport security screening, insurance rates, customs procedures, credit card applications, job applications, housing applications, and personalized online or mail advertisements. Such practices can determine everything from the types of spaces people can access, to credit and insurance rates, differential pricing, housing access, job offers, and more (Gandy, 1993; Lyon, 2003).

For many, a loss of personal or behavioural data can equate to losing control over one's life circumstances. For older adults, this can deepen pre-existing social vulnerabilities through surveillance creep, where technologies are used beyond their initial intent (Carver & Mackinnon, 2020). For example, data collected to improve health outcomes can result in hiked insurance rates or loss of services for older adults. As explained by Carver & Mackinnon (2020):

> The tendency for these data to be combined and repurposed is not only probable but already commonplace in some realms... when combined, these data can be treated as a "health report"—a health based credit report—used by insurers to assess the risks associated with applicants for travel health or other medical coverage... If the independent "health credit check" reveals atrial fibrillation or signs of dementia, it may result in discrimination by employers or insurance companies. The combination of traditional screening methods with new surveillance technologies leaves older adults vulnerable to exploitation and even the loss or termination of services. (p. 217)

Further, lacking technical experience can make older adults more vulnerable to fraud or informational insecurity. They are less likely to engage in data protection protocols than younger people (Carver & Mackinnon, 2020, p. 218). This is especially concerning if AgeTech is used to collect or infer sensitive information such as health data. Some IoT devices relying on Bluetooth and WIFI can "leak data", potentially making it accessible to unauthorized third parties (Carver & Mackinnon, 2020, p. 218). Put simply, further entrenching older adults onto Internet platforms could lead to discriminatory outcomes that are yet to be fully realized.

Algorithms of Oppression: Winners and Losers

The practices of watching and being watched have become commonplace in today's interconnected digital landscape (Lyon, 2018), which has varying consequences for Internet

users of all ages. However, a mainstream conversation on the implications for older adults who are also increasingly entering the world of online platforms that rely on digital surveillance systems is needed. Beyond a few texts which merge surveillance and gerontology studies (e.g., Mortenson et al., 2015), researchers have paid scant attention to the surveillance of older adults (Carver & Mackinnon, 2020, p. 217).

Data discrimination research has shown that the outcomes of social sorting often disproportionately affect marginalized communities, such as those with lower income backgrounds or visible minority status (Sandvig et al., 2014). It has recently come to light that people of colour often face racial discrimination through targeted advertisements and Google's top search algorithms. In *Algorithms of Oppression*, Noble (2018) warns against the loss of dignity experienced by some groups of users when algorithms mirror societal hierarchies, such as discriminatory results following certain search terms related to race and gender. There are clear winners and losers when online algorithms expel some users to "society's basement" while rewarding others with high-quality content (Hoffmann, 2019, p. 910). New research on racial discrimination through algorithmic bias is useful for general thinking about differential experiences online. While many older adults are not necessarily expelled to "society's basement," profiling based on varying income levels, health status, and age can likely lead to discriminatory outcomes. Overall, further research is needed to assess how algorithms to sort and deliver targeted online content to older adults. More specifically, the ways that sensitive

health-related data can be used to profile older adults for economic incentives require further inquiry.

What is known about how data brokers, the intermediaries between consumers and marketing companies, classify older people is unsettling. One report by the US Senate Commerce Committee showed that malicious actors targeted older adults after they had been placed in data buckets such as “X-tra Needy,” “Zero Mobility,” “Extremely Elderly,” “Reliant on Aid,” and “Retired Singles.” The 2013 report concluded that these categories, among others, were used to target financially vulnerable populations with predatory loans and fraudulent sweepstakes (Taube, 2013). InfoUSA, the largest data broker in the US, has also been scrutinized for similar predatory practices. In 2007, their data bucket categories, such as “Suffering Seniors” or “Elderly Opportunity Seekers” were used to then sell personal contact information to telemarketing companies that targeted older adults for financial scams (Kuempel, 2016, p. 221). In 2021, American older adults lost a collective $1.7 billion to online scams in 2021, a 74% increase in reported losses from the previous year (FBI, 2021).

These practices start with data collection through loyalty cards, sweepstakes, and digital surveillance through browsing history and social media data (CIPPIC, 2006). In Canada, data analytics companies such as Environics segment consumers into data buckets based on demographics and purchasing patterns as a service to third parties (Lyon, 2003). Some examples of segments include “Emptying Nests”: older middle-class suburban homeowners; “Grey Pride”: middle-income seniors living in the city; and “Silver Linings: low-income seniors

who are also single" (Vasilev, 2015). Ad space vendors such as Google and Amazon also widely profit from aggregating the user's personal information, and their policies claim that they are not accountable for the actions of third parties. Consumer surveillance and associated risks of harm have been amplified by the pervasive nature of the Internet, which today is largely mediated by platforms, some of which operate through SHTs.

Platform Surveillance

Platforms can include anything from hardware, software, or social networking websites. They are the "environments or foundations where computer processes are run" (Murakami Wood & Monahan, 2019, pg. 1). Amazon, Uber, Facebook, and Google are good examples of platforms. Platform surveillance is useful for assessing how data collection is monetized through exploiting users (Murakami Wood & Monahan, 2019). It is the practice of collecting information on users who engage in digital environments in ways that influence social relations by commodifying and exploiting everyday interactions (Murakami Wood & Monahan, 2019). Google and Amazon are each benefactor of platform surveillance; for example, Amazon conducts routine surveillance of its online shopping users to influence their purchasing patterns (West, 2019) and profiles Alexa users for targeted ads (Iqbal et al., 2022) as Google does (Zuboff, 2018). They work to normalize other forms of surveillance by popularizing products like Amazon Echo and Amazon Ring doorbell security cameras.

To some extent, the efficiency of Amazon's services relies on the company's ability to know its users' habits through monitoring shopping and browsing on Amazon's website and

through Alexa queries. According to West (2019, p. 31), this form of platform surveillance leads to a sense of intimacy, making Alexa a trusted partner inside private space. Similarly, others have referred to the promise of an interactive relationship with Alexa as a form of "seductive surveillance" that has the potential to "shape household relations and behaviours while subjecting users and home environments to invasive forms of dataveillance" (Neville, 2020b, p.17). In short, the extent to which Internet users trust Amazon can lead to more personalized outcomes for suggested purchases and Alexa's responses to their questions.

Taken together, these tools allow for more extensive data collection by extending consumer surveillance in and around the private space of the home (West, 2019). They can also encourage family members to monitor each other, which can contribute to uneven power dimensions (Neville, 2020b). Generally, platform surveillance aims to monitor behaviour to profit from everyday interactions between people and their digital devices (Murakami Wood & Monahan, 2019). To fully understand the outcomes of commodifying social relations through technology in the context of aging, further research is needed on how older adults interact with Alexa and other voice assistants. Trust levels in smart speaker developers will likely influence the quality and quantity of information users want to divulge.

Surveillance Capitalism

Platform surveillance also operates through what Zuboff (2015; 2019) refers to as surveillance capitalism. Here, surveillance is conducted by Google and Amazon to personalize experiences and ultimately predict and control behavioural outcomes. In this context, every

interaction with Google or Amazon can be used to drive profits because behavioural data has predictive value. Their respective digital assistants, Alexa and Google Assistant, are tools to extract more data from users by learning about their daily habits and using this information to recommend relevant goods and services. She points to the fact that Alexa-enabled devices are being embedded in new homes, household appliances, hotel rooms, and cars so that users can shop from Amazon from wherever they are. In Zuboff's (2018, pg. 15) words: "Disguised as engines of 'personalization', digital assistants operate as complex supply chains for continuous automatic extraction of behavioural surplus from human experience, its predictive value ultimately realized in markets for future behaviour." She argues that these data collection practices will continue to expand without strong regulatory restrictions due to their immense potential for profit (Zuboff, 2015, p. 79). Discrimination aside, the attempted control of behavioural outcomes through personal services can be considered an interference into user autonomy which is connected to older adults' dignity.

Google has become the number one advertising company on the Internet by organizing user activity from previously disregarded as "data exhaust" to sellable information for companies to use for marketing purposes (Fuchs, 2017; Zuboff, 2018). Likewise, companies of all kinds, from social media platforms to insurance brokers, have since followed Google's lead (Zuboff, 2018). On the other hand, Amazon has created a network of domestic surveillance technologies designed to capture information in the home (West, 2019). Through Amazon's large online shopping network, they can collect and analyze user purchase and search histories.

Comparing similar consumer preferences and behavioural profiles helps further enhance behavioural prediction and recommendations. Alexa adds to the equation through "eavesmining" abilities, which collect the content of voice interactions but also the cadence of the voice itself. The sound of a user's voice can divulge other useful data that can be further used for personalized recommendations, services, and targeted ads (Neville, 2020a, p. 353). Eavesmining can uncover sensitive information about anyone interacting with digital assistants, including guests and non-primary users (Malkin et al., 2019; Neville, 2020).

Inferring Health Data Through Voice Analysis

As it turns out, vocal cadence and tone can divulge much information about a person. For instance, speech patterns can be used to infer age and mood. Voice can be used to infer sensitive information including the following health issues: "Huntington's disease, Parkinson's disease, amyotrophic lateral sclerosis, asthma, Alzheimer's disease, and respiratory tract infections caused by the common cold and flu" (Kröger et al., 2020, p. 248). Voiceprints can also infer whether a person is on the autism spectrum, has depression, schizophrenia, or post-traumatic stress disorder (Kröger et al., 2020, p. 249). Indeed, inferring health data through biometric markers might be immensely valuable to the medical community. Still, it could also be advantageous to an online shopping service that dominates the market share of smart speakers, such as Amazon. Amazon has patented a system that analyzes voice interactions with Alexa to assess user health status and provide Amazon purchase recommendations such as cough medication (Jin & Wang, 2018). This patent also reveals Amazon's intent to cross

reference voice interactions with social media profiles, Internet browsing activity, and purchasing patterns (Jin & Wang, 2018; Kröger et al., 2020, p. 252). Taken as a whole, the growing surveillance capabilities of eavesmining platforms should raise alarms about what this means for older adults who use smart speakers.

Conclusion

Internet-enabled devices, including some AgeTech, have helped expand home surveillance. Personal data is collected from a variety of sources to further the goals of platform surveillance, where micro-transactions and behavioural data are routinely commodified (Murakami Wood & Monahan, 2019). Consumer surveillance is commonplace in a world where targeted ads and insurance rates rely on collecting personal information. Although little is known about how older adults use smart speakers, it is clear that related concerns over privacy, autonomy and data protection regarding other gerontechnology are relevant (Carver & Mackinnon, 2020). Even as it appears that perceptions of usefulness surrounding SHTs are shifting (AGE-WELL, 2019), studies on how older adults in Canada use Google and Amazon smart speakers are in their infancy and require further inquiry (Chung et al., 2021; O'Brien et al., 2020; Slane et al., 2020). As has been discussed, privacy and autonomy issues are linked. So, it can be especially challenging for older adults to access either or both in settings where technology is configured outside their control. In order to achieve increased autonomy in the home, they may be asked to give up certain levels of privacy with SHTs that collect and share data without their knowledge. In later chapters, I contribute to a small but growing body of

literature through focus group findings with older adults who use smart speakers. I examine their use of these devices and their privacy attitudes. This analysis is supplemented with qualitative interviews with AgeTech researchers, SHT developers, and relevant technology experts. The next chapter analyzes online marketing materials to further set the context of how commercial smart speakers are promoted to older adults and care partners, contributing to the cultural narrative of their benefits while downplaying the risks. Here, 30 web pages were analyzed to assess the framing patterns in the usefulness of smart speakers for older people as well as related privacy concerns.

Chapter Three: Marketing Smart Speakers to Older Adults and Care Partners

Introduction

How are smart speakers marketed to older adults and their care partners? In other words, what information do older adults and their care partners come across when they may research commercial SHT products online? Analyzing marketing pitches can be useful because they may perpetuate seductive surveillance (Troullinou, 2017), where the overarching narrative is that smart speakers are fun, helpful, safety-enhancing, as opposed to privacy-invasive, intrusive, and designed to collect user data for ad profiling purposes.

When consumers are curious about purchasing a new product, what do they usually do? They Google it. This chapter examines how Amazon and Google smart speakers are marketed online. To do so, I collected the top-ranking search results for the following phrases: "Amazon Echo for seniors," "Google Home for seniors" and "Alexa for seniors" and then conducted a content analysis (see methods in Chapter One). The results demonstrate that older adults are targeted with the same general messaging as everyday users of all ages: smart speakers are great entertainment tools for listening to music or the news. However, they are also framed as devices that can help older adults with unique needs related to aging and health concerns, such as forgetfulness, mobility issues, increased home security, emergency contact features, and loneliness or isolation. Finally, consistent with Neville's (2020b) findings on Amazon Echo unboxing videos on YouTube, meaningful discussions of privacy are largely absent.

The rest of the chapter is structured as follows. The background section explores the role of so-called influencer marketers, such as bloggers and vloggers, in adopting domestic technology, such as smart speakers. The discussion section starts with an overview of affiliate marketing disclosures within the dataset, and it then explores the most frequently recurring themes in the dataset: Entertainment, Health, and Security. I then move to an analysis of how privacy is typically framed or ignored in these materials. Finally, the conclusion section leads into Chapter Four, asking how older adults use smart speakers and how they think about their privacy.

Background: The Role of Influencer Marketing in Domestic Technology Adoption

Bloggers serve important roles in technology marketing because their content often rises to the top of search results when searching for information about a new device. It is likely the first set of results that older adults and care partners will encounter when researching the benefits of smart speakers online. The framing is often consistent across web pages, perhaps instilling a greater sense of confidence that smart speakers are, in fact, beneficial for older adults for a variety of purposes. Such marketing helps to perpetuate a cultural narrative around the usefulness of technology, which highlights the benefits while ignoring the downsides.

Although high-budget firms still secure an important role in product marketing, such as in producing TV ads, the advent of blogs and social media has recently shifted the consumer landscape in more participatory ways (Alves et al., 2016). With social networking sites, blogs, and online reviews, consumers now have ample opportunities to engage with each other about

products they are considering buying. They can also communicate with opinion leaders, or influencers, who act as middlemen between companies and consumers. An opinion leader may share their thoughts about a product or service online, sometimes receiving a flat rate or commission from the company (Neville, 2020b). Whether they communicate with their audience through a personal blog or on a social media channel like YouTube, consumers can discuss the product in the comment section and evaluate it themselves. With networked knowledge, consumers may feel more empowered in their purchasing decisions. This online environment can also benefit companies, as these discussions provide opportunities to boost brand trust and recognition (Alves et al., 2016). Although the impact can still be difficult to measure, the point is that many consumers conduct their online research on the technology they want to buy (Ellett, 2018; Turner & Rainie, 2020). Of course, just because an item is popular in online discussions, does not necessarily mean that all the shared information is reliable.

In contrast to news media articles that adhere to a certain level of journalistic standards and ethical integrity, blogs can be written by anyone with access to a website and are subject to little accountability for accuracy. However, blogs can often look as official as any other online source of information, with similar logos, design, and style. Lifestyle content offering advice for aging in place may include useful information. For example, The Helping Home has articles on safety tips, such as how best to set up soft lighting throughout the home for older adults with low vision. However, pages that review IoT technologies for older adults, including everything

from WIFI-enabled security cameras to Fitbits and smart speakers, may also gloss over important privacy and security issues.

Often, bloggers or vloggers (video bloggers) who promote IoT devices exclude any meaningful discussion on privacy or security (Neville, 2020b). Because they act as intermediaries between companies and potential consumers, they may be seen as trustworthy experts. Bakardjieva (2005) classifies this type of go-between actor as a "warm expert" (also see Neville, 2020b). These opinion leaders present themselves as knowledgeable guests that can offer their expertise on certain products or services to curious household members (Bakardjieva 2005; Neville, 2020b). However warm and friendly self-proclaimed online experts may appear, they still may have financial incentives to convince their audiences to purchase certain products. For example, bloggers may receive perks such as compensation through affiliate links if readers go on to buy the promoted items. The general tone and style of lifestyle blogs for older adults may make them appear as trusted authorities on all topics related to aging in place, whether or not they are receiving kickbacks from Amazon or Google. Regardless of whether influencers make a commission from product sales or how transparent they are about it, their endorsements for these products may influence public perception and individual consumer opinions on whether to adopt domestic technologies.

In a recent article about how Amazon Echo is marketed on YouTube, Neville (2020b, p.2) explains how they are presented by Bakardjieva's (2005) "online warm experts" (OWEs) in unboxing videos. Although these videos are geared towards the general public, the role of

vloggers is likely similar to the role senior care blogs play for those looking to explore domestic technologies. They both act as consumer guides. However, the same problem remains. Neville's (2020b) concern is that the lighthearted framing of Amazon Echo in YouTube unboxing videos serves surveillance capitalist imperatives more than they actively inform users about the benefits and risks of smart speakers. By neglecting serious conversations about privacy and advocating for the domestication of smart speakers by making them seem useful, convenient, and exciting, Neville (2020, p.6) argues that vloggers are encouraging Troullinou's (2017) theory of "seductive surveillance." They make "privacy-invasive" technologies seem desirable and fun while negating their data collection practices (Neville, 2020b, p. 6). By doing so, these trusted intermediaries are helping to promote surveillance capitalism and an uninformed user base (Neville, 2020b, p. 17). This finding is further reflected in my analysis of smart speaker marketing materials for older adults.

Findings: 10 Reasons Your Grandmother Needs Amazon Echo

The tables in this chapter describe the patterns identified in selected marketing materials by theme, description, example quote, and frequency of mentions. A full list of codes used to generate themes is available in Appendix 2. Of the 30 web pages that resulted from my Google search, 22 of the links came from blogger websites geared towards older adults and their caregivers. For example, websites like Daily Caring, The Helping Home, or Senior Safety Advice write advice articles for improving older adults' quality of life and well-being. Others, such as Nurse Next Door and Caring Senior Services, are websites that offer home care services

and produce blogs with tips for taking care of older adults. One website, Tech-Enhanced Life, specifically focused on technology reviews for older adults. This was the only source that based their assessment of smart speakers on discussions with older adults, whom they call "longevity explorers." Another website, Alexa for Seniors, is completely devoted to how Alexa can help older adults maintain independence. The remaining eight web sites contained results written for wider audiences, such as Love My Alexa, a blog about Alexa's features in general, One Good Thing, which is about housekeeping, and one from CNET, a technology review website. Regardless of the intended audiences, the overall content of each of the site maintained a repetitive tone, writing style, and framing of the topic.

Each web page was overwhelmingly optimistic about using smart speakers by older adults. Most were "listicles" or articles formatted as a list of features with a short paragraph following each list item. Those that included a disclosure regarding paid ad placements for Amazon or Google smart speakers were coded as Affiliate Links. Some authors also received a small commission if readers clicked the purchase links after reading. One disclaimer reads: "SeniorSafetyAdvice.com is a participant in the Amazon Services LLC Associates Program, an affiliate advertising program designed to provide a means for sites to earn advertising fees by advertising and linking to Amazon.com" (Kane, 2021). Of course, transparency on these types of arrangements is desirable for consumers. However, these disclosures are usually written in a grey fine print color somewhere toward the bottom of the page. Sometimes they are buried in the website's Privacy Policy on another page. In total, 12 of the 30 web pages contained

affiliate link disclosures. Note that a lack of disclosure does not necessarily mean authors are not receiving commissions for their promotions.

Table 1: Entertainment/Information Theme

Theme	Description	Example Quote	Frequency of Mentions
Entertainment/Info	Various entertainment features of smart speakers	"They can play music, change the TV channel, turn on a video, read the news, or tell jokes. For some seniors, one of the biggest challenges to remaining independent is loneliness; virtual assistants can help pass the time, but also keep them in touch with what's going on in the world" (Lisa, 2018).	122

The most frequently occurring theme, Entertainment/Information features, received 144 mentions across the total sample. Entertainment/Information features included listening to audiobooks (11 mentions), news (10 mentions), and music (18 mentions) (e.g., Claudius, n.d.; Mitroff, 2019; Alexa for Seniors, 2018). More specifically for older adults, third-party games were often promoted as ways to keep older adults' minds active. For example, an article from the Love My Alexa blog encourages older users to play Jeopardy: "Play Jeopardy with new challenges. Helps to keep senior's minds active and engaged" (Claudius, n.d.). The idea is that

third-party online games could help older users maintain and improve cognitive functioning, concentration, and memory frequently emerged (Claudius, n.d.; Mitroff, 2018; Voco, 2018). Two web pages mentioned "Price It Right," an Amazon Echo game where users guess the prices of Amazon items on their shopping platform (Lisa, 2018; Voco, 2018). After all, voice-activated online shopping is a feature mentioned 12 times throughout the sample. In short, Amazon and Google smart speakers are most often promoted for their entertainment and information features, constantly evolving with third party applications.

Table 2: Health Theme

Theme	**Description**	**Example Quote**	**Frequency of Mentions**
Health	Smart speakers are helpful for various health-related reasons.	"… setting up Google Home to notify and remind you of events on your calendar or just daily events such as medication reminders, when a TV show is on, doctor's appointments, etc. This feature works well for adults who are dealing with some cognitive decline issues such as mild dementia" (Kane, n.d.).	81

In addition to references to entertainment, health-related themes (coded as Health) were prevalent in the sample (81 mentions). Many of the articles and blogs encouraged the use of voice assistants to add to shopping lists or to-do lists (11) or general reminders (18), which could be useful for users of any age. However, these codes were added to the Health theme because reminders and lists were often framed as useful features for older adults with memory issues, Alzheimer's, or dementia, especially because Alexa or Google Assistant can prompt users to take their daily medication (19) (e.g., Nystul, 2018; Senior living, n.d; Kane, 2021). They suggest that voice assistants could relieve caregivers by repeatedly responding to the same question (Amazon Alexa for Seniors, 2020). Two sources touted My Life Story, a third-party app that plays back previously recorded memories for older adults with memory issues (Amazon Alexa for Seniors, 2020; Voco, 2018). Health-related themes were often linked to cognitive factors such as memory, although mobility issues were also mentioned.

For instance, using Alexa or Google Assistant to control other IoT devices in the home was listed as a popular selling point (27 mentions). Voice assistants are especially helpful for older adults with mobility issues, arthritis that makes touch screens difficult, impaired vision, MS, or Parkinson's (e.g., Amazon Echo for Dementia, n.d., Kane, 2021, Nurse Next Door, 2020). For these reasons, coded data related to home control were often related to health as well. According to one website, smart speakers can also be configured to check in on older adults by prompting them to answer questions after certain activities. For example, Google Home can be connected to motion sensors in the bathroom. If the sensor detected no movement in the

morning, Google Assistant would ask the user if they were all right. If the user did not respond, Google would alert emergency contacts (Yang, 2018).

In another example, marketing materials focus on Google and Alexa's connection to Mayo Clinic, a website and app that helps users self-diagnose and treat their ailments. Cheapism, a blog for discount shopping tips, encourages older adults to use this feature for "first aid related mishaps" (Lisa, 2018). Additionally, on Senior Safety Advice, Kane (2021) mentions the ability of Amazon Echo to answer medical questions in partnership with the National Health Service, the UK's healthcare system. As mentioned, but not elaborated on by the author, sharing sensitive health data with commercial smart speakers is controversial for privacy reasons (Kane, 2021).

Table 3: Security Theme

Theme	**Description**	**Sample Quote**	**Frequency of Mentions**
Security	The claim that smart speakers can be used as a home security device.	"Devices such as Echo, Google Home, and Cortana Invoke can be connected to motion detectors, security sensors, door locks, video doorbells, flood detectors, and security cameras, which can give older Americans a little bit more peace of mind" (Lisa, 2018).	38

Next, the Security (22) theme mainly include features meant to enhance users' sense of physical security. As stated by Lisa (2018): "Devices such as Echo, Google Home, and Cortana Invoke can be connected to motion detectors, security sensors, door locks, video doorbells, flood detectors, and security cameras, which can give older Americans a little bit more peace of mind." Voice-activated call abilities such as "Ask My Buddy" were often promoted in the event of an emergency, for example: "In the event your parent or grandparent needs help but cannot get to the phone, this can be a lifesaver" (Mitroff & Price, 2020; see also Nystul, 2018; Senior Living, n.d.). Amazon Echo users can also "drop in" on each other via video call without needing the receiving user to "accept" the call. Drop-In or other check-in features were referenced eight times and often presented as a useful feature for relatives who want to see how their family member is doing:

> A friend of mine is always worried about his mom. You see, his mother suffers from diabetes, and she has had a stroke in the past. Although she is able to live alone and functions well – she is still a high risk because of these medical conditions. She could faint or become dizzy due to a mini stroke or go into a diabetic coma. If that were to happen – her family could, with the help of this Drop In Skill, check in on her periodically throughout the day to make sure that she is okay (Kane, n.d.; see also Alexa for Seniors, 2018; Kane, 2020).

Four web pages also promoted security features by connecting smart speakers to apps, or Skills (4). For example, Alexa Guard alerts contacts at the sound of breaking glass (3) (Kane, n.d). Others mentioned connecting smart speakers to Amazon Ring doorbells (1) (Five Star Senior Living, 2020). In general, security features are framed aids to help older adults safely live at home in an emergency while reassuring care partners when they are not physically present.

Privacy: "Your Privacy Is Important to Us"

While privacy was not a major theme identified in the dataset, its absence is important to the focus of this dissertation. In places where privacy was mentioned, its context is also worth noting. I used the word frequency function in NVivo to scan the 30 web pages to search for the word "privacy" on its own. It appeared 17 times on 8 of the web pages. In general, where privacy was not completely ignored, authors usually deferred to links on other websites or downplayed it as not much of a problem in the first place. This is a concern because for users to consent to data collection practices meaningfully, they need to understand what privacy risks exist. Those who research smart speakers before purchasing them are unlikely to learn much about Amazon and Google's data collection practices from these sources.

While some sources did mention privacy as a potential concern, they sometimes redirected readers to other resources. After Kane's (2021) explanation of the National Help Service (NHS) app for Amazon Echo, for instance, the author goes on to explain that the NHS app is "controversial" due to privacy concerns, directing readers to an Express.co.uk article to learn more. The link leads to a brief interview with a security engineer who warns that data protection is a problem because Amazon will save voice queries, and how they will be used is unclear. It also includes a direct quote from Amazon, whose representatives reassure readers that users are in full control of their data as they can delete their recordings at any time (Snelling, 2019).

Table 4: Privacy Theme

Theme	Description	Sample Quote	Frequency of Mentions
Privacy	Mention of privacy	"Depending on the privacy settings of your account, your most common commands may be stored to help improve the experience you receive. This is much like Google will show you relevant advertisements based on your search history. If you don't want Alexa or Amazon to store your commands or your voice recordings, you can simply delete them from your profile at any time. Recent surveys have shown that many seniors are happy to keep their privacy settings open since it helps them to enjoy a much better, more personalized service" (Matthews, 2020).	17

Some authors noted they intrusive nature of smart speakers, reminding readers that they can review or delete activity from the Alexa app. They also urged caregivers not to track older adults' activities without permission because it is unethical (Nurse Next Door, 2020). Though it does not explain how users can delete the recordings, it links to a Wired article that does (Barrett, 2017). Here, the author explains that unless users delete their Amazon or Google voice recordings, they will stay stored in the cloud on a "far away server somewhere" (Barrett, 2017). Only one sampled article explained how users can delete voice recordings without

redirecting readers elsewhere (Sellers, 2020). Deleting voice recordings often is good practice as it may shield users from domestic surveillance situations between housemates or guests. However, it is an action that may be difficult for some to remember how to perform routinely.

In another framing of the privacy issue, the Love My Alexa blog (Claudius, n.d.) claims that digitally literate and less tech-savvy users express privacy concerns, but that they both ultimately agree to the trade-off of privacy for convenience:

> These are not unheard of [privacy] concerns as they've been expressed before by a majority of even the most tech-savvy Alexa users. And just like those tech-savvy users, seniors understand that this is amongst the growing trend of consumers trading data and privacy for the convenience that technology brings to their lives (e.g., using Google & Facebook). Thus, most are willing to overlook the "always-on" microphone in return for the convenient services and assistance Alexa provides (Claudius, n.d.).

Even though the Love My Alexa blog provides no evidence that "most are willing to overlook" privacy issues, this reasoning still might seem sound. After all, how many users blindly press "I accept" the terms and conditions of data collection on all types of intrusive platforms (Obar & Oeldorf-Hirsch, 2018)? Let's Say Thanks brushes off privacy concerns by explaining that Alexa only starts recording when the wake word (Alexa) is spoken, also mentioning that recordings can be deleted at any time. It is unclear what the author means by: "your most common commands *may* be stored to help improve the experience you receive. This is much like Google will show you relevant advertisements based on your search history" (Matthews, 2020, emphasis added). The explanation that only the most common commands "may" be stored may confuse users. All recordings are saved by default until a user deletes them (Alexa History:

See, hear, and delete your Alexa voice recordings, n.d.). More importantly, the privacy issue is further downplayed with the following statement: “Recent surveys have shown that many seniors are happy to keep their privacy settings open since it helps them to enjoy a much better, more personalized service” (Matthews, 2020). However, like Love my Alexa, Let’s Say Thanks cites no evidence about older adults being “happy” to give up their privacy. Conversely, focus group data from the Tech Enhanced Life (n.d.) cited privacy concerns as one of the reasons some older adults were critical of smart speakers.

In contrast to the idea that users are willing to accept this balance as part of a socially acceptable trade-off, the reality is more nuanced than that. One report on smart speakers and older adults mentioned that some research participants were anxious about privacy harms associated with IoT (Strengers et al., 2021) defined as “the network of everyday objects equipped in Internet connectivity” (Choi et al., 2021) like Google Home. Still, most users were “unaware” of the risks (Strengers et al., 2021, p.11). Due to the wide gap between users' privacy preferences and the choices made available to them (Malkin et al., 2019), Draper and Turow (2019) argue that many people, at least in the U.S., are feeling a sense of “digital resignation” that can sometimes lead to perceived tradeoffs. This sense of helplessness stems from the idea that consumer surveillance practices are now omnipresent. On the one hand, many users may be unaware of Google and Amazon’s data collection practices (Malkin et al., 2019); on the other hand, those that are aware may feel a sense of hopelessness in the face of ubiquitous online surveillance (Draper & Turow, 2019). In any case, users are not necessarily

given a choice to give meaningful consent over privacy controls that record and store all voice recordings by default.

Next, the link in the Let's Say Thanks quote about older adults being "happy to keep privacy settings open" (Matthews, 2020) leads to a U.S.A Today article titled 3 Essential Privacy Settings for Your Amazon Echo (Komando, 2017). Here, Komando (2017) urges users to turn off the Amazon Echo's cameras and mics when not in use and to turn off the Drop-in feature for most contacts. While these are good tips, nowhere in the article mentions older adults, and it does not reference any surveys claiming older users prefer to "keep their privacy settings open" as Matthews (2020) implied. Regardless, it may be true that some users prefer to keep privacy settings open for convenience sake. However, returning to Draper and Turow (2019), the question remains whether this is an informed preference or a set of behaviours stemming from a sense of powerlessness in contemporary surveillance environments.

Further, through limited privacy settings, according to Monahan (2016), companies often give consumers the illusion of control in ways that help to uphold power imbalances. In the realms of data collecting technologies, untrustworthiness on the company's part is not an anomaly, but it is actually the norm. Among other examples, on the surveillance capabilities of smartphones, Monahan (2016, p.230) explains: "They lend the outward appearance of having a single primary function and audience, but they have multiple hidden functions and audiences. Second, and related, especially in their hidden functionalities, these are surveillance systems." The marketing materials that ignore or brush off privacy concerns may add to this sense of user

control over their data. Only one indirectly mentioned the potential for targeted ads (Matthews, 2020). This is consistent with the branding of Alexa-enabled devices on the Amazon website, which assures users that “Alexa and Echo devices are designed to protect your privacy” (Amazon, 2019), citing the ability for users to mute the microphone or block the camera when not in use. Both smart speakers are in the business of collecting data for profit (Iqbal et al., 2022; Neville, 2020b; Pridmore et al., 2020; Zuboff, 2018), a practice which is hardly mitigated by muting the microphone or blocking the camera.

Finally, security concerns are largely ignored throughout the dataset as well. Not only do smart speakers often record conversations inadvertently when they mistakenly think they have heard the wake word such as Alexa, or OK Google (Clauser, 2019; Malkin et al., 2019), controversy erupted when both companies were exposed for having human staff listening in on voice-commands to improve user experience (Clauser, 2019). Amazon also knows when Echo users are home, what rooms they occupy, what items are added to their lists, and what other IoT devices are connected (Clauser, 2019; Pridmore & Mols, 2020). Could this data be valuable to outside intruders as well? Like other IoT devices, security researchers warn that commercial smart speakers are potentially vulnerable to attacks as they rely on Android systems (Zhang et al., 2018). Unsurprisingly, none of these issues are discussed in the most popular blogs and articles meant to help sell these products to older users. Nonetheless, these conversations should be relevant for consumers, especially older adults wishing to age in place with SHTs, to make informed decisions about who can access their behavioural data and for what purposes.

Conclusion

To summarize, Google searches for “Amazon Echo for seniors”, “Google Home for seniors,” and “Alexa for seniors” resulted in a sample of 30 top-ranking web pages that generally shared similar sentiments. Many of these highlighted features present older adults as vulnerable, unhealthy, lonely, or forgetful. According to Chu et al. (2022, p.950), marketing tech to older adults in this way may perpetuate stereotypes that older adults are unhealthy or in constant need of support: “the underlying assumption of this phenomenon is that older adults are unhealthy and that managing health conditions is the only reason that they may seek to use and benefit from technology.” Where entertainment features were mentioned, they were often presented to alleviate loneliness for older adults. The messaging that smart speakers are great for older adults for features related to entertainment, health, and security was consistent throughout. As has been shown, data protection discussions were largely absent or superficial. Overall, sources geared towards older adults and those catering to more general audiences were collectively optimistic about smart speakers.

Despite the ways that marketers have framed the potential of these devices, should potential users be persuaded? To date, there is little available evidence to support their claims. Further research is needed on the usefulness of smart speakers for older adults (O'Brien et al., 2020). Smart speakers might be able to respond to the same query repeatedly without getting frustrated, but do older adults want to have conversations with an AI robot or do they prefer human companionship? What do they think about Amazon’s Drop-In feature or Google’s ad

profiles? After all, many older adults from the Tech-Enhanced Life (n.d.) focus group were unimpressed with the technology, citing privacy concerns or the idea that voice-activated assistants might make them lazy. Some mentioned that smart speakers were of little use to them as many functions, such as checking news or weather were already available on the smartphone or computer (Tech-Enhanced Life, n.d.). While this type of study has been conducted with smart speaker users in the past (e.g., Malkin et al., 2019; Pridmore et al., 2019), beyond a few studies (e.g., Slane et al., 2020; Strengers et al., 2021), researchers have not typically focused on older users. The next chapter asks how older adults use these devices in Canada and further interrogates their attitudes around privacy.

Chapter Four: "I Keep Saying Our House Is Smarter Than We Are": A Focus Group with Older Amazon Alexa Users

> "...We will say '[Alexa] turn on the master light' and a certain lamp will come on in our bedroom, we can turn it on or off. And it took me a while to get on to it, I keep saying 'our house is smarter than we are'" - Gladice, Focus Group Participant

Introduction

Traditionally, older adults have been slow adapters to Internet-enabled technologies than younger people. Decreased levels of Internet access and the fact that digital technologies are "rarely developed with their [older adults] needs in mind" result in older adults being further "disadvantaged" by the digital divide (Chu et al., 2022, p.4). Regarding Internet access and smart home usage, the age-based digital divide is beginning to narrow in Canada, however slowly (Canadian Internet Use Survey, 2019). In part, this can be attributed to the fact that most older adults prefer to live at home for as long as possible, and many are willing to use technology that can help make everyday life easier (AGE-WELL, 2019). Additionally, as creative innovation thrives, technological solutions are increasingly positioned to meet older adults' unique needs such as those pertaining to memory, cognition, or mobility which can often correlate with age. The increased usage of smart devices that connect older adults with family, friends, caregivers, and healthcare professionals can also partly be attributed to stay-home recommendations throughout the COVID-19 pandemic (Kakulla, 2021). Smart home technology may continue to rise in popularity through user-friendly design, lowered prices, and marketing targeted at various age groups.

This chapter explores the ways that older smart speaker users engage with their devices regularly. Following Pridmore & Mols (2020), it also explores their privacy negotiating boundaries. Smart speaker users do not necessarily consent to the full surveillance capabilities of smart speakers but instead negotiate their privacy boundaries by unplugging them or keeping them out of certain areas (Pridmore et al., 2019; Pridmore & Mols, 2020). There are few recent studies on this topic, as privacy and security research has traditionally excluded older adults from their analyses (Frik et al., 2019). Where older adults have been included, smart speakers are considered less intrusive than video cameras for at-home monitoring, but privacy is still a key consideration in adoption (Choi et al., 2021). As smart speakers continue to develop new features while potentially capturing more extensive data flows, further research is needed on older users and their need for privacy protection. The focus group findings described in this chapter offer additional insight into how older Canadians use Alexa-enabled smart speakers and how they manage their privacy. Table 5 shows participants' demographic characteristics as well which devices they own, usage rates, whether they received their smart speakers as gifts, and whether they recommend smart speakers to other older adults.

Table 5: Demographic Profiles

Initial	Age	City	Gender	Device	Usage	Gift	Recommend 65+?	Education
B	67	Oliver, BC	M	Echo Dot (2)	Daily	N	Y	University
P	69	Toronto, ON	M	N/A	Daily	Y	Y	High School
G	77	Regina, SK	F	Amazon Echo Dot (2); Echo Show-5; Amazon Fire TV sticks (2); Smart Plugs (6); Google Nest	Daily	Y/N	Y	N/A
J	76	Mississauga, ON	F	Echo, Flex, smart plugs (2)	N/A	Y	Y	University
M	67	St. John, NB	F	Echo	Daily	Y	Y	Some post-secondary
E	75	Sidney, BC	F	Echo	Daily	Y	Y	University

Initial	Age	City	Gender	Device	Usage	Gift	Recommend 65+?	Education
JM	68	Quispamsis, NB	F	N/A	Daily	N	Y	University
S	81	Chilliwack, BC	F	Echo Show 8;5; Echo Flex; Echo Plus; Echo; Echo Dot; Fire Sticks (2)	Daily	Y	Y	Some post-secondary

The focus group interview was organized around three subtopics: general device usage, benefits for older people, and privacy and security controls. One research goal was to explore whether older people use Alexa products in the ways that marketing materials suggest (see Chapter Three). Asking about benefits for older people living alone was meant to tease out the perceived benefits of using Alexa for aging in place. Finally, the section on privacy controls was intended to help further explore the limits of current privacy policies and Terms of Use contracts in protecting older adults' data. Overall, the interview was meant to encourage group discussion on the benefits of using Alexa for older people, eventually leading to the topic of privacy concerns and behaviours. More detailed methods are available in Chapter One.

Findings: Alexa Does It All

First, participants reported using Alexa for entertainment, quick access to information, and home control. This is consistent with preliminary research on older adults that analyzed Amazon Echo user reviews that mentioned “seniors” and related terms (O'Brien et al., 2020), and focus groups in Canada funded by the OPC (Slane et al., 2020). All eight participants said they used their devices daily and for entertainment. We first discussed using Amazon Alexa for listening to music playlists on Spotify or other streaming services.

All participants enjoyed listening to music on their smart speakers. Gladice, age 77, said she listened to music less frequently than the others, but occasionally enjoyed certain music from her “happy past.” Emily, age 75, reported asking Alexa to play jazz music to remind herself of her late husband: “I listen to it fairly frequently, some of it is just some songs that are special to me. My late husband was a jazz pianist so it’s nice to listen to some jazz”. One woman mentioned that she uses Alexa with her grandson: “…I have a playlist as well that I use kind of often. Also, I use it with my grandson. It’s very easy to entertain children with it. They have music, lots of games they could play. And, he has some favourite songs, and it was so nice to say, ‘play this,’ and it came on” (Jill, age 76).

Others reported using it to check the weather or daily news, “...I do ask the temperature like is it going to snow today, that sort of thing” (Pete, age 69). For some, asking Alexa for news was a part of their morning routine: “I usually sit down and have a coffee and I end up just getting her to play the CBC newsflash and the BBC, and I usually connect with the Turkish

Middle East and European just for a quick newsflash" (Emily). Some participants were also using Alexa to relax, such as by meditating with "ocean wave sounds" in their recliner chair due to pain from "spinal issues" (Emily) or to help them fall asleep with "sleep sounds" (Jill). One group member also reported using Alexa to play Amazon's games: "You can play games on it, so I play one called 'Price it Right,' and they connect you to another person and you guess the price of certain things that are sold on Amazon strangely enough…I guess it's just more of an advertising for them because they'll describe the item, and you have to guess how much it would cost" (Jill). In short, participants reported using smart speakers for key functions designed for entertainment: listening to music, playing games, checking the weather, news, and so on.

Next, some participants were excited to share how they used their Alexa devices for home control. One man turned on his Alexa-connect light to demonstrate to the group: "...Alexa, turn on living room light!" said Pete, as his living room lights turned on. "All my lights, dining room, kitchen, living room, and entrance, are all controlled by Alexa through Globe. Globe is a WIFI bulb," he explained. Gladice, who had several Alexa devices installed by her sons, reported controlling the lights as well: "… we will say '[Alexa] turn on the master light' and a certain lamp will come on in our bedroom, we can turn it on or off. And it took me a while to get on to it; I keep saying 'our house is smarter than we are'." Others laughed and nodded in agreement.

Although some participants expressed uncertainty about how to reconfigure their smart speakers and connected devices if something were to go wrong, they generally showed much

enthusiasm for them. Beyond entertainment and home control, the group also reported using their smart speakers in ways that benefitted them as aging adults. Based on their own experiences, the group was asked to share ideas about how older adults living alone could benefit from using Alexa. The most popular themes that emerged from this conversation involved staying in touch, especially for safety purposes, using Alexa for memory-related tasks, and personal security. Table 6 displays the codes used to analyze focus group data alongside sample quotes and frequency of mentions.

Table 6: Focus Group Codes (Features)

Code	Sample Quote	Frequency of Mentions
Weather	E: "I asked her the other day: what's the weather for Sidney (BC)? And she gave me the weather for Sydney, Australia, and I was all confused" [a few people nod along].	**4**
Staying in touch	B: "…But now you can connect to the outside world in real time with somebody. So, it would take over the telephone eventually, which I think it mostly has already. So, I think some of that stuff is evolving and as a senior living alone, that could be an interesting tool."	**4**
Online Shopping	P: "Yep, I ordered another Echo for a friend."	**1**
Security	J: "I also have my outdoor security cameras hooked up to it. So, I could just say, like, 'show me the front door'."	**4**
Safety	S: "Plus, I sort of have a device in every room so if I fall or need help, because I have some medical conditions, I can call one of my kids or a neighbor, you know."	3

Code	Sample Quote	Frequency of Mentions
Memory	J: “Sometimes I even ask her what day it is because sometimes these days I don’t really remember.” [People nod in agreement and smile]. “I also have a tile device that connects with it so I can ask where my keys are or where my iPhone is and so that’s really nice.”	12
Health	P: “Living alone, I take 11 different pills at different times of the day, and I use Echo to remind me when I get up, set time, dinner, bedtime, and I also have an app that’s called Max Minder. And it tells me the same thing, but it alerts me on my phone.”	7
Home Control	“And we have her, we will say ‘turn on the master light’ and a certain lamp will come on in our bedroom, we can turn it on or off. And it took me a while to get on to it, I keep saying ‘our house is smarter than we are’” [all laugh].	5
Entertainment	E: “Yeah, I listen to it fairly frequently, some of it is just some songs that are special to me. My late husband was a jazz pianist so it’s nice to listen to some jazz. And I haven’t signed up for it because I’ve been very concerned about getting all the billings. I’ve had some recent things I’ve ordered that have backfired.”	10
Device setup	G: “My sons, one of them set up Alexa and then the younger son came, they both live in Ontario…then the other son came and set us up with two of ‘em, I guess you call them the Echo Dot, they’re two little different shapes, a little squattier…So that’s why I say our house is getting smarter than we are because [all laugh] these things turn on lamps and turn them off and you know all these wonderful things but if anything gets screwed up I’m sure I don’t know how to fix it!”	6

Code	Sample Quote	Frequency of Mentions
Companion	M: “But what I was thinking is J is a good friend of mine and I’ve teased her for years, ‘Alexa, your new best friend’ [all laugh]. But then, we got into this COVID nightmare, and she sent it to me, and she helped me set it up and I find it quite nice. I also have the question of the day. I ask what happened today in history and then ‘tell me a joke or a pun’ and I use that just kind of us as um, I kind of do it on purpose, just so I can get into that amused frame of mind and also you can even ask for compliments, and it never stops” [chuckles].	4
Targeted Ads	E: “I think it’s an exploitation of vulnerable people who might be bored, might just go shopping”. S: “I think we get enough of that over the Internet I sure hope they don’t do that” [3 nod in agreement]. P: “It’s an invasion, telling me what to do.”	8

Benefits for Older Adults: Keeping in Touch, Memory Aids, and Security

In terms of staying in touch, some participants noted that such devices could be beneficial as video call platforms as a replacement for older technologies such as the telephone: According to Bob (age 67): “now with that Amazon Glow [video call platform] kind of thing, now you’ve got video and voice so you can use it personally in your home… now you can connect to the outside world in real-time with somebody. So, it would take over the telephone eventually, which I think it mostly has already. I think some of that stuff is evolving, and as a senior living alone, that could be an interesting tool.” Julie (age 68) raised a similar point: “...if you’ve got someone living by themselves and you’ve got that set up for them to

make calls, all they have to do is just talk to it, they don't have to touch anything." Susan, age 81, explained how she relies on Alexa for staying in touch in an emergency: "I sort of have a device in every room so if I fall or need help, because I have some medical conditions, I can call one of my kids or a neighbor, you know...if something happens medically or whatever, I can just tell it Alexa call my daughter or call whoever. So, it's very handy that way." In short, Alexa devices were perceived as helpful for staying in touch with family, but especially for the peace of mind in the event of a medical emergency.

Tasks related to memory were among the most popular functions mentioned by participants. For example, asking Alexa to add items to their shopping lists or to-do lists, which were also connected to their smartphones (Bob; Jill) and appointment reminders (Emily). Some participants were eager to share their Alexa uses with the group, especially when they enabled novel features that others were unfamiliar with. For example, Jill explained that she liked to ask Alexa not only to remind her what day it was but also where she left her keys or phone using an Alexa-connected location tracking device:

> I also have a Tile device that connects with it [Amazon Echo] so I can ask where my keys are or where my iPhone is, and so that's really nice… it's a little square, and it's very simple to set up – it even set up with my iPhone without me having to do something… Aside from that, one of the other things that is very useful memory wise, I set up a list called 'where did I put it', and if it's something that I've changed its position, I can look up or ask Alexa or look at my iPhone. So, it's not just my keys, if I've reorganized or put something somewhere else, I'll put that on my list.

Following Jill's explanation, a few other participants mentioned wanting to set up a similar system for their misplaced items. Others shed further insight into their memory management

systems. Pete was very open with the group about how he uses Alexa in combination with phone apps and sticky notes to help him with memory issues:

> I am a person living with dementia, so I have cognitive and short-term memory. I set reminders when I turn the stove on for whatever time I want it because I have had a habit of leaving things on the burner. And I've melted pots and aluminum covers and all that sort of nice stuff…Living alone, I take 11 different pills at different times of the day, and I use Echo to remind me when I get up, lunch time, dinner, bedtime, and I also have an app that's called Max Minder. And it tells me the same thing, but it alerts me on my phone…Because of my memory issues, I have three or four different sets of reminders…So I use Echo, and I use Max Minder and then sticky notes.

Gladice mentioned that medication reminders could be useful to other older adults with memory issues: "I think anyone who takes a number of medications would find that this would help them make fewer mistakes with their medications less often," to which other participants agreed. Emily, on the other hand, mentioned not wanting to share medical data with Amazon due to a lack of trust:

> I'm concerned that if there was something that I'd put on a list regarding medications or medical information, that I'm a little skeptical and it's a bit of cynicism…that I have I wonder about the data going to insurance companies that then may use data for their benefit, that could disadvantage me. So, there are things like that I'm concerned about.

Emily was one of the most cautious participants regarding these issues and third-party data sharing. While it is logical to be wary about sharing health-related content with any commercial platform, the others seemed more interested in listing the benefits of Alexa as opposed to the potential drawbacks.

For some, Alexa was also seen as a digital companion. Jill, for example, shared how Alexa has helped her alleviate feelings of loneliness: "I actually find it kind of nice when I'm

feeling lonely. I know we're interacting with a device, but I appreciate the Question of the Day; I always start my day with that. I do a history quiz…Sometimes it will help, you know I'm doing something that I'm 'blah,' and it does help my mood a little bit to be able to connect to something." In fact, Jill was so impressed with her Alexa devices that she also gifted an Amazon smart speaker to her friend Maureen (age 67), who was also a participant in the focus group: "Jill is a good friend of mine, and I've teased her for years, 'Alexa, your new best friend'" she said, as the rest of the group laughed along, "but then, we got into this COVID nightmare and she sent it to me, and she helped me set it up, and I find it quite nice. I also have the Question of the Day. I ask what happened today in history and then "tell me a joke or a pun" and I use that…I kind of do it on purpose, just so I can get into that amused frame of mind, and also you can even ask for compliments, and it never stops [chuckles]." As previously discussed, this sentiment resonates with previous studies that demonstrated how robot technologies can sometimes alleviate loneliness for isolated individuals in certain contexts (Turkle, 2011).

Finally, we discussed ways that Alexa-enabled devices could be useful for security purposes. Julie reported hooking up Amazon Echo Show to outdoor security cameras: "I could just say… "[Alexa] show me the front door." Another mentioned wanting to set up smart locks in the near future: "I am eventually going to get a door lock through Amazon that I'll be able to control because I do forget to lock it when I'm inside, or I forget whether I've locked it when I'm leaving so, because of the memory issues, Alexa is very, very helpful" (Pete). While home security was mentioned a number of times, interestingly, data security or privacy was scarcely

mentioned by group members until prompted by the privacy discussion at the end. The distinction is interesting in that participants seemed preoccupied with the ways that smart speakers could help to secure their physical environments while generally unconcerned with the ways that their behavioural data may be accessed by others in the process.

To recap, the group had no shortage of examples of ways that Alexa-enabled devices could benefit older adults living alone. Staying in touch; having Alexa contact a family member in the event of an emergency; aiding with memory through automated lists and reminders; using Alexa as a digital companion to alleviate loneliness; and home security, were the most frequently mentioned beneficial features. Further, as a result of perceived benefits, all eight participants stated that they would recommend Alexa devices to other older adults.

Navigating Privacy Boundaries

It has been long established that users of any platform or service usually disregard Terms of Use contracts which explain how data will be collected, used, and shared (Obar & Oeldorf-Hirsch, 2020). As mentioned, user consent is required so that companies like Amazon can collect personal information on Canadian users. However, half of the group had their devices set up by family members and were not involved in the process of reading or accepting the Terms of Use. For the other half of the group who had reported setting up the device themselves, I asked whether anyone had read through the Terms of Use. No one had. The rest of the group then chimed in to explain why. Some claimed that their lives were not exciting enough to worry about data protection:

Susan: “I don’t have an interesting life so they can drop in on anything they want, boring!”

[Participants laugh].

Others reported trying to read the Terms but gave up because they were too “boring”, or rendered it a futile activity because they were probably too long and complicated to understand in the first place:

Jill: “I usually start reading it just to be good, but I never complete it, I get too bored…and you sort of get to a point where you get older like ‘mehhh’ so, what can they find out about me?” [laughs].

Gladice: “Most of those things are written in what we would call during my work life, legalese, and not regular day-to-day conversation, so, if I read it, I probably wouldn’t understand all of it so…”

I then went on to ask about privacy controls. Beyond physically muting the mic or blocking the camera, the main privacy controls allow for reviewing and managing the voice recordings stored in their profile. Alexa-enabled devices allow users to listen to their individual recorded interactions and see the transcripts. Users can also select “delete all” without listening to or reading through any of them. However, the controls are only accessible on the users’ smartphone app or online profile, which may not be obvious to most users. I asked whether anyone was reviewing their recorded interactions with Alexa or deleting them. Only Susan and Jill reported having done so, but the others seemed interested in learning more about the process:

Susan: “Yeah, I go in on my phone and delete it.”

JPC: “You do that every so often?”

Susan: “Yeah, I do that about every couple of weeks.”

JPC: “Ever find anything surprising in there?”

Susan: “No, like I said, boring!”

Table 7: Focus Group Codes (Privacy)

Code	Sample Quote	Frequency of Mentions
Privacy	S: “I don’t have an interesting life so they can drop in on anything they want, Boring!” [people laugh] J: "and you sort of get to a point where you get older like “mehhh” so, what can they find out about me?” [laughs] P: (on the Drop In feature): “that’s scary!”	**19**

[All laugh].

JPC: “Anyone ever go and listen back to their recordings and delete them?”

Susan: “I don’t get any audio with mine. Tells you to delete from certain dates, and I just have ‘em delete everything.”

JPC: “So, you just see what’s been transcribed, right?”

Susan: “No... if it’s there, I’ve never seen it. It just asks you if you want to delete all from whatever date and that’s what I do.”

Pete: “I gotta check that out!”

Jill: “I’ve done it, not on a regular basis.”

Emily: “I haven’t got that far with that one, I better check that out.”

Gladice: “This is educational, I didn’t even know you could do it, so I better find out how, and do it.”

As the participants seemed interested in learning more, I explained that there is more than one way to delete voice recordings. One is through the app or online profile, and the other is via voice command. However, when I explained to the group that they could try saying, “Alexa, delete everything I said today,” a few participants’ devices went off in the background due to the vocalized wake word “Alexa” and command. “Sorry, that feature has not been configured yet,” a few Alexa devices chimed in unison as the group laughed. To be able to delete voice recordings with this voice command, users need to go into their profile and set it up in advance. The ability to delete recordings via voice command is a good improvement from previous versions of Alexa, where this feature was not available. However, the same problem remains not all users know how or where to access their profile settings in the first place. Therefore, this feature is less useful for users of any age who may not know it exists, let alone how to configure it.

Next, I asked whether everyone was comfortable with Amazon using their voice-recorded interactions for personalized shopping recommendations. Some participants seemed surprised and expressed some concern about this possibility:

> Emily: "I think it's an exploitation of vulnerable people who might be bored, might just go shopping."
>
> Susan: "I think we get enough of that over the Internet. I sure hope they don't do that!"
>
> [Three people nod along in agreement].
>
> Pete: "It's an invasion, telling me what to do… there might be subliminal messages in that. They'll say, go out and buy yourself a car…You know and, you go buy a car; why did I do that?"

Conversely, in our group, some mentioned the benefits of automated recommendations, such as through Netflix, Spotify, or audiobook platforms:

> Jill: I think another perspective is sometimes when, well, I don't think It's come from Alexa, but when those advertisements are generated online, for me, I have found interesting things that I didn't even know existed. For example, if we were talking about the audiobooks, there may be some that I would like … but that's also a benefit to me if I see more options, I guess.

Bob chimed in to add some further examples:

> Yeah, that's similar to Spotify, if you listen to a certain genre of music, Spotify will try to come back and create playlists for you based on what your listening preferences are and oftentimes think about or even suggest 'have you thought about listening to this kind of music' and offer some alternatives. For me, that's a diversification that I'm interested in and a push of information rather than a pull that I think is quite helpful.

It seemed as though Alexa shopping recommendations or ads were generally considered invasive, but entertainment recommendations such as songs or audiobooks were not. Even as the group held conflicting views on whether targeted recommendations in certain contexts were desirable, they seemed to agree that the choice should be up to the user.

> JPC: "Sure, but does anyone think that it should be a choice, like you'd need to say, 'yes' or 'no' for these recommendations?"
>
> [Everyone nods along].
>
> Susan: "That's a good idea."

Perhaps personalized shopping recommendations were perceived as less relevant to this group, as only one participant reported using Alexa for online shopping. Only one participant, Pete, said he had used Alexa to shop online when he purchased another Amazon smart speaker for a friend. However, he had also expressed reservations about sharing any banking details with Alexa: "I won't use Echo for anything, it's just general information. I do all my banking on my phone. It's very secure. I will not ask her [Alexa] to give me my account balance or anything. She will not access any of my personal information simply because of privacy." Emily expressed being cautious with online shopping since she had recently been mischarged $300 in recurring fees that were apparently hidden in the fine print for an online service. Even though this negative experience had happened elsewhere on the Internet and not with Amazon or through her smart speaker, she expressed the most concern about sharing

financial details due to potential hidden costs. Julie echoed similar concerns about hidden subscription costs for premium services associated with smart speakers as well: "I've come across this with their music, if I ask for a song that I don't have, they ask me, without telling me that it's going to cost me more – would you like to sign on to whatever…that's one thing that I would like to see different" [a few nod in agreement].

Webcam Worries

Next, we turned to issues related to smart speaker webcams. Amazon's Drop In feature allows selected contacts to "drop in" to a video chat through the smart speaker's webcam. As explained in an earlier chapter, this feature is heavily promoted within the marketing materials because the recipient would not need to accept the call. This means that caregivers and family could theoretically drop in on an older person and check in on them in their home at any time. The idea is that it could be easy to remotely reach an older person if they had not gotten out of bed or if they could not hear their phone or doorbell ringing.

The youngest participant, Bob, reported using the Drop In feature to check in on his wife and the house while travelling. Most of the others had not heard of this feature. Once I further explained to the group how the feature worked, participants expressed various concerns:

> JPC: "Let's say if Julie and I were [pre-approved] contacts, I could just say: "Alexa, drop in on Julie," let me see what she's up to, and I could just drop in and start looking at what's going on at your house [through the camera]."

Pete: “Woops! I don’t like that!”

Maureen: “That’s dangerous!”

Pete: “Yeah!”

Susan: “I turned that feature off!”

Pete: [laughs] “Good thing”.

[Others nod along in agreement].

Julie: “If your camera’s turned off, you can’t do it. So, you gotta keep your camera off”.

JPC: “That’s true, do people turn their cameras off?”

Susan: “Yeah, I keep mine off”.

Bob: “Yeah”.

The group seemed to generally consider the Drop In feature as a risk, and most seemed to agree that cameras should be turned off when not in use. This finding is in line with previous research where older adults perceived cameras as one of the most intrusive features of Ambient Assistive Living systems (Kirchbuchner et al., 2015), and were more comfortable with the idea of adopting other SHTs such as smart speakers for health-related purposes (Choi, et al., 2021). Understandably, unauthorized camera access is a major concern. Following this discussion, Emily was candid about why she is now more cautious about where her smart speaker is placed in the home:

> I wasn't turning mine off and anytime I was saying anything, the screen [camera] would keep tracking me, you know, it would swivel around and that was really weird because… I had Alexa set up at my kitchen counter because it was convenient for, you know, recipes and other things, and it was close to the living room. And um, but it was also looking towards the bathroom, so if I was getting out of the shower, she'd swing around and look into my bathroom, and I thought if I was 50 pounds lighter, I might not mind, but right now…[laughs]…it felt like a really major privacy intrusion.

Key Takeaways

As has been discussed, once prompted, participants expressed a range of privacy concerns over various smart speaker features. While the general sentiment around reading Terms of Use contracts was complacency and although the "nothing to hide" attitude was initially prevalent, participants still indicated an interest in other privacy-preserving behaviours. One participant referred to our session as "education," while another said: "Because there's things that people have mentioned that I wasn't aware of… I should be turning off my Alexa machine more often." As mentioned above, those who were previously unaware expressed interest in accessing and deleting their voice recordings once they learned about that possibility. They did not like the prospect of Amazon using their voice recordings for personalized shopping recommendations, even though they found personal benefit in algorithms that recommended more of the content they enjoyed on Spotify, Netflix, Audible, or similar entertainment media platforms. In general, they agreed that behavioural data collection for targeted ads or shopping recommendations should be a clearer choice. They also collectively took issue with the intrusive nature of Amazon's Drop-In feature and even viewed it as "scary". All agreed that turning cameras off when not in use was good security practice.

Finally, although I did not inquire about health status, as mentioned by one participant, there was a “bit of cynicism” toward the idea of using Amazon for health purposes such as medication reminders, because of the fear of insurance companies gaining access. However, two others mentioned that they personally found medication reminders useful, and one mentioned that they could imagine how such features could benefit another older person with memory issues.

Discussion: Digital Literacy and Privacy-Preserving Behaviour for Older Adults

Even with limited access to privacy controls, participants shared their own strategies for mitigating privacy, such as turning off the cameras or avoiding sharing certain types of information with Alexa. It is important to note that a lack of knowledge about smart speaker privacy settings and data retention is quite common and does not exclusively pertain to older adults. Privacy controls can be difficult to access for users of all ages (Javed et al., 2019; Malkin et al., 2019; Lin & Parkin, 2020). Moreover, digital literacy can sometimes be extra challenging for older adults due to less frequent exposure to new forms of technology. Related work has shown that older people were least confident in their privacy efficacy and thus shared the least amount of personal data with smart speakers compared to their younger counterparts (Kang & Oh, 2021). A recent report on AI perceptions in Canada also found that older people (55+) were least likely to self-report as “familiar” with AI (Government of Canada, 2021). When asked about the data collection flows of smart devices, Frik and colleagues (2019, p. 31) found that “many older adults lack a nuanced understanding of newer technologies and the data they

collect, leaving them especially vulnerable to privacy and security violations". Some believed that their data was completely out of their control because their personal information was inevitably collected and shared to such a degree that it would lead to "fatalism or resignation" (Frik et al., 2019, p. 29). A few participants incorrectly assumed that smart speakers do not connect to the Internet, or that smartphones were not capturing their data. In part, these misconceptions were shown to be correlated with lower socio-economic status, as well as a general lack of experience with digital technology (Frik et al., 2019).

The fact is that because privacy settings are buried on an associated device or profile, smart speaker privacy controls are difficult to access for the average user. Basic digital literacy skills may protect users to a certain extent. However, as AI technologies continue to develop, it is unrealistic to expect users to be able to imagine all of the potential (mis)uses of their data moving forward. This issue is potentially more serious if older adults are using smart speakers for health and wellness purposes and are unaware that they are being recorded. They may also be unaware that others may have access to sensitive voice interactions which in some instances, may have been recorded by accident when the wake word (Alexa) was not commanded.

Further, even if users are careful about regulating the content of their recordings, research from the U.K. has shown that most people are generally unaware of the power of voice and speech analysis to infer sensitive personal information such as health status (Kröger et al., 2022). Prem Nataraja, Vice President of Alexa AI has previously mentioned their intent to

be able to infer “mood, sentiment, feeling as expressed in your speech” (Nataraja, 2018 in Neville, 2020, p. 348). This is to say that even if users engage in privacy-preserving behaviour through reading the Terms, limiting their privacy settings, deleting their recordings periodically, and avoiding using third-party Skills; Amazon *still* may be able to infer their sensitive health information through speech analysis either presently or in the near future.

How can older users using smart speakers as care tools be better protected? Should it be their responsibility to stay informed on all the newest surveillance capabilities of their devices? While I did not inquire about my focus group participants' income statuses, Carver and Mackinnon (2020, p. 218) have argued, older adults with lower socioeconomic status are considered more vulnerable to the harms associated with surveillance capitalism, through individualized insurance pricing (presumably in the United States) and targeted advertising:

> A heterogenous group, digital seniors, while no longer ‘sitting ducks’ (Fox, 2006), may still have limited agency in technological adoption due to their lack of knowledge and/or understanding of the underlying surveillance and targeted advertising compared to more ‘digital natives’.

If the point of AgeTech is to increase older adults’ safety and agency, policy and design solutions should further consider how to protect older user privacy adequately. Potential solutions will be discussed in subsequent chapters.

Older Adults and the Privacy Paradox

For most of us, privacy attitudes and behaviours can be complicated, nuanced, and sometimes inconsistent. People might say one thing and do another, often referred to as a

privacy paradox (Draper & Turow, 2019). In our case, participants demonstrated concern about privacy once we got into the topic of voice recordings and targeted shopping recommendations based on their Alexa interactions. On the other hand, they were eager to allow certain platforms such as Netflix, Audible, or Spotify to recommend suggested media content based on previous behaviour. Similarly, among older people who are willing to accept smart home systems for safety purposes, fewer are willing to share such data with commercial parties (Garg et al., 2014; Kirchbuchner et al., 2015). Another U.S. study on older adults found that at least one participant was wary of having their smart speaker data used for unsolicited marketing from pharmaceutical companies (Choi et al., 2021, p. 18). In our group, this sentiment was also expressed by Emily: "I wonder about the data going to insurance companies that then may use data for their benefit that could disadvantage me."

This is also consistent with older users' concerns with Information Communications Technology (ICT) surveillance in general. They have demonstrated apprehension about their personal information being used for marketing purposes and would consider it a violation of their privacy (Frik et al., 2019). In some domestic settings, there are good reasons not to wish to share data with certain household members as well (EFF interview data, 2020). In short, regardless of age, most smart speaker users do not wish to shield all of their information from everyone all of the time, but instead negotiate privacy boundaries in ways that suit their needs. However, for this strategy to be fully effective, users must be well informed and continually updated on what data is collected, how it is used, and to whom it is disclosed. They also need

access to meaningful choices through settings that are easy to find and control. Alternatively, there could be stronger limits on what types of data are available to developers and third parties for commercial purposes in the first place. Although they are managing their privacy boundaries to a certain extent, it appears that older adults are using smart speakers for aging in place without the full picture of where their data is going or how best to manage it.

Conclusion

People of all ages use smart speakers, ignore the Terms of Use, and struggle with privacy controls (e.g., Malkin et al., 2019), so why focus on older adults specifically? Following O'Brien et al. (2020) and Slane et al. (2020), these focus group findings have further confirmed that some older adults use smart speakers beyond basic entertainment purposes such as music and weather, but also for more sensitive purposes relating to independent aging such as increased home security, memory aids, and emergency contact tools. Unlike other AgeTech that is primarily designed for older adult care and rehabilitation, however, Amazon Echo and related SHT devices are not initially designed for older adults. These are not qualitatively the same as AgeTech devices designed by healthcare practitioners and biomedical engineers to age in place with input from older adults. The purpose of those technologies is to help improve older adults' and rehab outpatients' quality of life (Wallace & Knoefel, 2022). Instead, these are commercial-grade devices designed to mine biometric and behavioural data to feed into to advertising profiles and subscription services (Pridmore et al., 2019; Neville, 2020; West, 2019; Zuboff, 2018). Amazon and Google still collect and commodify data on older adults aging in

place and using their devices as AgeTech for care purposes in the same way they would for an 18-year-old user who bought a smart speaker exclusively for entertainment purposes. Instead of sharing user information with caregivers and healthcare professionals, user data is collected for commercial purposes and shared with associated developers of third-party applications (Neville, 2020a; Zuboff, 2018).

Participants in this focus group enjoyed using Alexa devices for multiple purposes from entertainment to care and were more likely to negotiate privacy boundaries by using hard controls such as turning the camera off than they were to manage their privacy settings. Consistent with Lau et al. (2018), privacy controls were either inaccessible or were limited in their ability to meet user needs. Relatedly, after reading my research poster based on this chapter, a 2022 AGE-WELL conference participant and smart speaker user asked me "How do I turn these damn things off?". In this case, their behaviour was potentially visible to developers and third parties outside of their control. Another conference participant told me that she had a "complicated relationship with Alexa," which she used to remind her to take her daily medication. When I asked if she had deleted her voice interactions, she asked me to help her find out how to do that on her smartphone. The issue is that asking users to manage their own privacy avoids placing responsibility on the manufacturers and third parties who are collecting sensitive data in the first place. To better protect user data, policymakers should further consider how older adults may use these and similar devices as care tools such as emergency contact devices or medication reminders. As will be recommended in Chapter Seven, designers

may consider consulting older adults about a caregiver mode that restricts data sharing. In the next chapter, I analyze Amazon and Google privacy policies and the federal and provincial private sector privacy legislation regulating smart speaker users' surveillance.

Chapter Five: Reading Privacy Policies and Consenting to the Terms of Use

"(1) People do not read privacy policies, (2) if people read them, they do not understand them; (3) if people read and understand them, they often lack enough background knowledge to make an informed choice; and (4) if people read them, understand them, and can make an informed choice, their choice might be skewed by various decision-making difficulties."
- Solove (2013, p.1888).

Introduction

The previous chapters established that commercial smart speakers are marketed to older adults and their care partners in unique ways and that smart speakers may be useful for entertainment, social connection, home control, home security, medication reminders, and more. If they are used as emergency contact tools, medication reminders, or other age-related concerns, smart speakers developed for the general population are then repurposed as AgeTech. The broad definition of AgeTech is any technology meant to increase well-being by making older adults' everyday lives easier (Sixsmith et al., 2020). As previously mentioned, one key selling point is that some older adults find smart speakers more accessible than smartphones or desktop computers, because they do not require the use of keyboards, small buttons, or the need to learn a complicated operating system.

On the other hand, what if smart speakers are accessible to older people in terms of usability but not in terms of privacy self-management? Recall that privacy, or in this case, control over information that pertains to oneself (Parent, 1983, p. 272), is an important component in the ability to "age in place and with dignity" (Carver & Mackinnon, 2020, p. 219). Consent-based privacy legislation such as Canada's *Personal Information Protection and*

Electronic Documents Act (PIPEDA) and British Columbia's *Personal Information Protection Act* (*PIPA)* are designed to allow individual users to make decisions about their own privacy self-management "so people can decide for themselves how to weigh the costs and benefits of the collection, use or disclosure of their information" (Solove, 2013, p. 1880). Under current privacy legislation, do older adults have the opportunity to control their own personal information in meaningful ways? This chapter seeks to address the following questions:

1) How is meaningful consent obtained if the primary user has not read (or understood) the Terms of Use or managed their own privacy settings?

2) What types of data are older adults unknowingly giving up by agreeing to Google or Amazon's Terms of Use Agreements to use their smart speakers?

The first section is devoted to the *Personal Information Protection and Electronic Documents Act (PIPEDA)* as it relates to private sector actors such as Google and Amazon. It explains how obtaining meaningful consent is deemed necessary to collect personal data in Canada. The next section delves into British Columbia's "substantially equivalent" provincial legislation, the *Personal Information Protection Act* (*PIPA)*. The following section reviews Google Assistant and Amazon Alexa's privacy policies and the associated FAQs regarding user data collection. This chapter is further informed by interview data with Misha Rykov, an associate researcher at the Mozilla Foundation who has helped to develop the Privacy Not Included Guide (2021). The guide is designed to inform the public on the surveillance capabilities of smart speakers and other IoT devices. The chapter also relies on supplemental

data from an interview with Caitlin Lemiski, director of policy for the Office of the Information and Privacy Commissioner of British Columbia (OIPC BC), as well as an interview with Jodi Baxter, the Vice President of 5G and IoT Connectivity at TELUS Communications.

The information presented here supports the argument that Canadian and British Columbian consent-based private sector privacy regimes are limited in protecting older adults' smart speaker data. The notice and consent model otherwise referred to as the privacy self-management approach to data protection (Solove, 2013), puts too much onus on individual users to manage their privacy; federal and provincial privacy legislation takes no special consideration of the unique needs of older adults who may be vulnerable or less technologically literate; and as a result, Google and Amazon are likely capable of collecting excessive sensitive personal, biometric, and behavioural data on users without their knowledge. In short, if older adults turn to smart speakers or other SHTs to live independently, regulatory reform could help further safeguard their privacy rights.

Consent Under PIPEDA

In Canada, most private-sector organizations must abide by the *Personal Information Protection and Electronic Documents Act* (PIPEDA). Established in 2001, *PIPEDA* sets the rules around collecting and managing personal information by private-sector organizations engaged in commercial activity. The Office of the Privacy Commissioner of Canada (OPC) is responsible for investigating claims on behalf of Canadians and making best practice recommendations for private sector actors. *PIPEDA* is premised on the idea that personal information should never be

used beyond the purposes for which it was originally collected without consent (OPC, 2019). Examples of what counts as personal information include:

> Age, name, ID numbers, income, ethnic origin, or blood type; opinions, evaluations, comments, social status, or disciplinary actions; and employee files, credit records, loan records, medical records, existence of a dispute between a consumer or merchant, intentions for example to acquire goods or services, or change jobs (OPC, 2019).

To ensure that private sector actors treat personal information responsibly and fairly, PIPEDA relies on the ten fair information principles: "Accountability; Identifying Purposes; Consent; Limiting Collection; Limiting Use, Disclosure, and Retention; Accuracy; Safeguards; Openness; Individual Access and Challenging Compliance." According to Principle 2 (Identifying Purposes), businesses must identify the purpose for which they collect user data. This process typically occurs upon device setup and configuration, such as after reading the Terms of Use. Providing the user has understood and consented to the Terms of Use Agreement, Principle 3 (Consent) can be obtained to collect, use, and disclose personal information. For consent to be considered valid, it also has to be "meaningful"; the OPC (2018/2021) has seven guiding principles for obtaining meaningful consent: "emphasize key elements,"; "allow individuals to control the level of detail they get and when"; "provide individuals with clear options to say 'yes' or 'no'"; "be innovative and creative"; "consider the consumer's perspective"; "make consent a dynamic and ongoing process"; "be accountable: stand ready to demonstrate compliance."

Organizations are encouraged to make privacy policies more accessible to the general public as "key elements" should be "emphasized" to users. Organizations should be clear about

what personal data is collected, which third parties can access, the purposes of collection, use and disclosure, and the relevant risk of harm or consequences (OPC, 2018/2021). Individuals with varying preferences should be able to access this information quickly through short-form policies. If they would like to go more in-depth, they should be able to access longer documents in more detail (OPC, 2018/2021). As consent is considered an ongoing process, they should also have the option to opt-in or out of data collection at any time.

Regarding Principle 5, consumer perspectives should be considered, meaning their consent process should be accessible and user-friendly. The OPC's (2018/2021) guidelines suggest that organizations get creative with ways of explaining to users what is being collected, used, and disclosed: "...presenting them [privacy policies] to users at initial sign-up, and then again periodically as 'refreshers'), videos explaining key concepts, and/or infographics and similar visual tools". While the guide does not refer to older adults in particular, if implemented, this approach could benefit older smart speaker users.

Under PIPEDA, there are also distinct differences between implied and express consent. The OPC states that "implied or opt-out" consent for online behavioral advertising can be implicit unless the data is considered sensitive (OPC, 2014). Sensitive information can be difficult to discern because combined datasets can reveal sensitive information about individuals, even when using non-sensitive information. Generally, sensitive information consists of financial or health data, ethnicity, race, political opinions, religious beliefs, sexual orientation, or genetic and biometric data (OPC, 2014). These categories are considered

sensitive due to the "specific risks to individuals when said information is collected, used or disclosed" (OPC, 2021). This implies that smart speaker companies should not target users with ads based on any of the sensitive categories mentioned above without express consent. In a related example, when Google was targeting users around the web sleep apnea ads, the OPC found that Google was not in compliance with *PIPEDA* because online behavioural advertising should not be based on sensitive data such as personal health information without express consent under Principle 4.3.6 (OPC, 2014). Other situations requiring express consent include instances where "the collection, use or disclosure is outside of the reasonable expectations of the individual" or where a "meaningful residual risk of significant harm" is present.

Whether express or implied consent is required is also determined by an individual's "reasonable expectations" of how their data might be used or disclosed under a given circumstance; in other words, a reasonable person should not be surprised about what is happening with their data (OPC, 2020), such as voice recordings for targeted ads. This also applies to related third-party sharing. What third-party applications or Skills are doing with smart speaker data and whether users would consider this reasonable is unclear. Many third parties undermine Amazon and Google policies or do not have privacy policies of their own (Cheng et al., 2020; Young et al., 2022).

For Amazon, Google, and related third parties, consent can only be legitimate if the user adequately understands the purposes and potential consequences of data collection: "under PIPEDA, for consent to be valid, it must be reasonable to expect that individuals understand the

consequences of the collection, use or disclosure to which they are consenting" (OPC, 2018/2021). While meaningful consent is important, are most older Canadians reasonably likely to understand what they consent to when using commercial-grade smart speakers and third-party applications? The OPC has also said they have "not examined Google/Amazon devices in the context of older adults" (OPC, personal correspondence, 2022). Their current approach to raising older adults' awareness of the OPC and general privacy-enhancing strategies is to place informational pamphlets into library books and host workshops (OPC, personal correspondence, 2022). A recent survey by the OPC showed that one in four Canadians say they have a poor (19%) or very poor (8%) understanding of how to protect their privacy rights (OPC, 2021), not to mention older adults with lower levels of online experience. Canadians over 55 years old are the most likely age group to be "extremely concerned" with their privacy (38%) and the least confident age group in their ability to assess privacy risks of new technologies (49%) (OPC, 2021). As a result, older adults are left concerned about privacy without adequate knowledge of the legal tools at their disposal. It is up to individual users to file a complaint about data collection practices they may be unaware of. Finally, contacting a privacy commissioner might resolve a personal issue, such as having one user's account information deleted, but is less likely to result in greater institutional change for users at the group level.

British Columbia's PIPA

B.C.'s *Personal Information Protection Act* (PIPA) is a substantially equivalent provincial act which falls under the responsibility of the Office of the Information and Privacy

Commissioner of British Columbia (OIPC). While there are some issues of overlapping jurisdiction, one key difference is that the OIPC has order-making power, and the OPC does not. Similarly to *PIPEDA*, barring extenuating circumstances such as medical emergencies 12(1)(b), *PIPA* says that an organization must not collect, use, or disclose personal information about an individual unless consent is obtained (PIPA, 2021). Under "Provision of Consent" 7 (2), "an organization must not, as a condition of supplying a product or service, require an individual to consent to the collection, use or disclosure of personal information beyond what is necessary to provide the product or service." Whether Google or Amazon must collect excess behavioural and biometric voice data to provide their services is an open question.

As with *PIPEDA, PIPA* differentiates between implicit and explicit consent. Express consent is also required for sensitive data collection. Consent to collect, use or disclose personal information can be considered implicit if "(a) the purpose would be considered to be obvious to a reasonable person, and (b) the individual voluntarily provides the personal information to the organization for that purpose." Section 8(3)(a) stipulates that:

> An organization may collect, use, or disclose personal information about an individual for specified purposes if the organization provides the individual with a notice, in a form the individual can reasonably be considered to understand, that it intends to collect, use, or disclose the individual's personal information for those purposes. (PIPA, 2021)

Further, individuals should be allowed to decline such data collection 3(b). However, rejecting the Terms often results in losing access to services and may be an unrealistic option for those needing the conveniences smart home devices can afford.

For individuals unable to make their own decisions, users can legally defer their consent to a guardian with power of attorney. According to section 2(1)(c) of *PIPA*, there are some cases where an individual can consent for someone else who cannot consent for themselves. For example, representatives can consent for someone else if they have the power of attorney 2(1)(b) or are acting as litigation guardians (2)(1)(c). *PIPA* goes on to explain that legal guardians may represent a minor (usually under the age of 12 or 13) (2)(b), and 3(c) "give or refuse consent to the collection, use and disclosure of personal information of the individual under the *Act*" (PIPA, 2021). While some people may have power of attorney over an older relative who uses a smart speaker, this will not be the case for everyone. This is relevant because smart speaker data can only be collected for targeted ads or shopping recommendations if user consent is properly obtained. How would such details be obvious to someone who had never read the Terms? Relevant user settings are not available on the devices themselves but are instead buried in privacy policies accessible only via online user profiles or associated smartphone apps.

Further, Lemiski (interview data, 2021) notes that the OIPC does not receive many calls about smart speakers. This may be because users are unaware that their interactions are being recorded or that their data may be used for purposes beyond their initial expectations. Under both *PIPA* and *PIPEDA*, the Notice and Consent model assumes a general level of understanding among all potential users above 13. To reiterate, to collect smart speaker data, user consent must be meaningful, and the purposes of the collection must be reasonably understood. This

poses a problem as it has been well established that technological literacy, or the ability to use and understand various digital tools, tends to negatively correlate with age (Tsai et al., 2017). As older adults are increasingly connected to SHT devices as care tools, they may also have unique privacy needs.

The ways private sector actors collect, use, and disclose personal information have intensified greatly since *PIPEDA* and PIPA were established at the turn of the century. This makes managing SHT user privacy difficult, especially for devices that rely on artificial intelligence as Amazon and Google do, a fact which has been acknowledged by the OPC (2020): "it is essential to state that in 2020, privacy protection cannot hinge on consent alone". As further explained in Chapter Seven, user-centric design combined with data justice as a regulatory framework that highlights fairness in data representation and visibility can help to address this gap.

Tapping "I Accept": Google and Amazon Terms of Use and Privacy Policies

Some users may read the initial Terms of Use upon setup, but as smart speaker features are updated, privacy policies change and thus require frequent monitoring. What remains constant, however, is that users of both systems are incentivized to save their interactions with voice assistants to optimize their personalized experiences (Google Nest Help, 2021). Unlike Amazon, which retains audio recordings by default (Personalize Your Alexa Privacy Settings, 2021), Google has recently changed their policy to allow users to opt-in to save audio recordings (Google Nest Help, 2021). Regardless, individuals are encouraged to save their

recordings to access enhanced services “to make Google speech products more helpful to you and better for everyone” (Google Nest Help, 2021). Amazon also encourages users to keep their voice interactions saved to keep services “accurate and convenient” or to create a “voice profile for enhanced personalization” (Personalize Your Alexa Privacy Settings, 2021).

Voice profiles detect users by the sound of their voice, which allows for personalized news or music, enables messaging and calls, links to the calendar, connects to email, allows for online shopping via voice command as well as personalized access to third-party apps known as Skills (Help and Customer Service, 2021). Google smart speakers also connect users to Gmail, Google calendar, and third-party apps and services, although creating a voice profile is possible but not necessary (Google Nest Help, 2021). Users can replay or delete their voice recordings using their online profile or connected smartphone app for both systems. Google users can configure devices to automatically delete their voice interactions after a certain period or can choose to delete their them by saying: “Hey, Google, delete what I said this week” (Google Nest Help, 2021). Amazon recordings can also be deleted via voice command, but only if the settings are configured in advance (Personalize Your Alexa Privacy Settings, 2021). In either case, users must know about these functions to use them.

Regarding personalized ads, Google explains that while there is an opt-out feature, audio recordings are transcribed to enhance user ad profiles or to “inform your interests for ad personalization” (Google Safety Center, 2021). Even though ads are not necessarily delivered through the smart speaker itself, except through third-party services such as YouTube or

Spotify, smart speaker data can target people with ads across other devices, platforms, websites, and apps such as Gmail, etc. Amazon says data shared with Alexa is only used to perform services, personalize experiences and "build[ing] a more inclusive Alexa," such as by helping Alexa to recognize various accents (Top Customer Questions, 2021). By "inclusive," Amazon appears to mean they are working to make their voice products more inclusive to non-native English speakers who can afford smartphones, smart speakers, high-speed Internet connections, etc. Among other things, the vague wording of "personalizing experiences" can be further interpreted to mean targeted shopping recommendations, which will be further explored in the next section.

Beyond voice commands and basic account information (e.g., email address, birthday, location, gender) required to set up profiles, smart speakers can collect various biometric and environmental information. Google Nest, one of the Google Home devices, can detect highly specific information, including sounds of user coughing and snoring. It can also retain video recordings, including facial recognition, motion detection, the temperature of the home, and more (FAQs on Privacy: Google Nest, 2021). As previously discussed, any biometric data, such as the sound of a user's voice, can be used to infer a wide variety of sensitive information about health (Kröger et al., 2020). However, Google maintains that voice data will not be used to build user ad profiles, although the transcriptions of such recordings are (FAQs on Privacy, 2021). Amazon Echo also collects information from connected IoT devices such as security cameras

and thermostats (Manage Your Alexa Privacy Settings, 2021). However, they are less transparent about how that data may be used.

The examples mentioned above speak to Amazon and Google's intrusive surveillance practices. As demonstrated in the previous chapter and has been shown in related studies (Malkin et al., 2019; Lau et al., 2028), reasonable people were surprised about the fact that biometric data (voice recordings) were routinely captured even though they or someone else technically "agreed" upon device setup. Recall that express, meaningful consent is required for sensitive data collection such as biometric or personal health information. For users who are uninformed about what data is being collected or for what purposes, meaningful consent has not been properly obtained.

Excess Onus of Responsibility on the User

As explained by Rykov (interview data, 2021), researchers and legal professionals with expertise in privacy law always cannot understand the details of privacy policies, so how can everyday users be expected to? To make matters more confusing, in the case of Google and Amazon, their policies are not in any particular document but through a series of links that lead the individual down information rabbit holes. Part of the allure of the accessibility of smart speakers for older people—the fact that users can easily speak out commands and receive audible answers without needing finger dexterity for small buttons or sharp eyesight for reading text on a computer screen—is also part of its downfall in terms of privacy self-management. This is because the privacy settings are not "on" the smart speaker itself but

located elsewhere, such as on a smartphone app or an online profile which can only be accessed on a computer or tablet. As a result, older adults with lower levels of technological literacy may find privacy settings difficult to locate or manage. Those who have not set up the smart speaker themselves also may not have proper access to the account login information. Some may also be unaware of an associated user profile.

Referring to Solove's quote at the start of the chapter, in the unlikely event that users read and understand the Terms, rejecting them means losing access to the service, limiting informed decision-making. Denying themselves access to services is unrealistic if smart speakers can help them stay independent longer. Further, deleting Internet browser history may be good practice for protecting data from household members or others with device access. Still, it does not absolve the content from further analysis and commodification. For example, according to the Mozilla Foundation's (2021) Privacy Not Included guide, the Amazon Echo Show is one of the least privacy-friendly smart gadgets. This is partly because Amazon still commodifies voice interactions even after they are deleted: "...Amazon says when you delete your voice recordings, they still can keep data of the interactions those recordings triggered… That record of the purchase is data they have on you going forward and may use to target you with ads for more stuff" (Privacy Not Included, 2021). As explained by Rykov (interview data, 2021), even when users delete their recordings, Amazon keeps Alexa's response, which can be used to further commodify personalized behavioural data: "... if you delete voice recordings or even transcripts, it is largely impractical because the company still has the information of what

they did after you did this voice command…I asked [Amazon] if they use this for ads, and they didn't answer "no"; they told me that "you know you can opt out of ad personalization if you want."

Moreover, deleting recordings does nothing to remove data already collected by third-party Amazon Skills which have even less robust privacy policies and higher risks of security vulnerabilities (Privacy Not Included, 2021). In Rykov's words, this is yet another area where the ability for users to manage their privacy falls short:

> I think the metric was that only around 20% of them [third-party Skills] had actual privacy policies and the risk here is that once you share your data with the third-party Skill, Amazon privacy policy does not apply anymore. It's written in the Alexa FAQ. When it comes to what kind of data can be shared with Skills, we don't see a lot of clarity on this question, so we assume that it could be pretty much anything. They only write somewhere that they don't share the voice recordings with Alexa Skills (but may share the transcripts) …. what I find to be disturbing is that even if you delete your voice recordings, deleting your voice recordings does not delete any information retained by the developer of that Skill.

Further, vague wording in these policies can confuse users. In the Alexa example, saving voice recordings to "personalize experiences" can mean many things, including targeted ads. Some users might be happy to share their personal information with Amazon, Google, or any third party for convenience, but many others may not.

Security Issues

Other potential privacy-related issues pertain to security vulnerabilities. For instance, research has shown the insecure nature of these systems—particularly Amazon Alexa (e.g.,

Zhang et al., 2018). According to a scoping literature review on privacy and security issues with these devices, user data is quite valuable and can include: audio clips/transcripts; user account data (location, mobile number, email address, name, device address, payment information, and shopping lists); interaction with Skills (who may ask users to provide other sensitive data such as birthdate or blood type); interactions between smart home devices; behavioural data used to predict usage patterns, interests, and sleep patterns; inferred personal well-being, financial wellbeing; etc. (Edu et al., 2020). When devices sometimes record audio by mistake, malicious actors could access such information through weak authorization protocols or if such data were leaked (Edu et al., 2020). Further, users living in the same home may be able to access each other's data or order shopping items using the primary user's account without their consent (Edu et al., 2020).

In one example, insecure Amazon Ring security cameras—which connect to other Alexa devices such as the Echo—made headlines and sparked multiple lawsuits when hackers watched people in their homes through the Internet-connected cameras, using the inbuilt microphone to transmit threatening messages (Paul, 2020). According to Rykov (interview data, 2021), while there are risks of security breaches with any SHT, in the case of Google and Amazon smart speakers, the real risks come with using third-party Skills, which are only loosely monitored. As seen with focus group participants, users enjoyed using a variety of third-party Skills, from everything from playing games to accessing recipes and listening to sleep sounds. Would it be reasonable for each user to be aware of their Skills' privacy policies, which are not

located on the device itself, and some may be non-existent? These are the privacy and security implications that come with the issue of using commercial-grade smart speakers.

Conclusion

This chapter has discussed how *PIPEDA* and *PIPA* apply to smart speaker data collection. Essentially, under each *Act*, for private sector actors to be able to collect personal data on users, meaningful consent must be obtained. Under *PIPEDA* and *PIPA*, the key issue to consider is that users are not necessarily consenting to such data collection and are not fully informed about where their data is going and for what purposes. This becomes especially concerning when smart speakers are used for features beyond entertainment, seeping into the realm of AgeTech for older adults' care and health purposes. The devices also collect sensitive biometric data, which should rightfully require high levels of meaningful consent and security. According to Jodi Baxter (Interview data, 2023): "...It maybe goes to using consumer-grade environments in a health environment becomes really risky if we don't take those consumer-grade devices and apply a health-grade security metric on them." The current privacy regimes are asking older people, potentially with lower levels of technological literacy, to fully understand what they consent to at the time of device configuration and forever after, which is unrealistic. The current strategy of informing older adults through privacy guides and brochures is limited in scope. Guides aimed at the general population make security recommendations such as placing IoT devices on a guest WIFI network (OPC, 2020) which are likely overly technical and too

difficult for the average user to implement, let alone older adults with less technology experience.

Google and Amazon can collect everything from nightly sleep routines to audio inquiries about health ailments and private interactions with third-party apps (or Skills) of all kinds. Depending on which features are used, smart speakers can infer a vast array of information about users, all of which is possible so long as "I Agree" has been selected. Solove (2013, p. 1881) reminds us that through the privacy-self management approach, it is "virtually impossible" for individuals to accurately weigh the potential benefits and risks of using any service without a full "understanding of the potential downstream uses" of their data. In any case, rejecting the Terms results in a loss of services altogether. These are services that older people living at home may benefit greatly, as expressed by focus group participants. As Chapter Three mentions, many marketing materials either avoid discussing these important topics or actively encourage users to keep privacy settings open for enhanced personalized service. Overall, the Notice and Consent policies discussed here place too much responsibility on the individual user to manage their privacy settings which are difficult to find and have limited controls.

Finally, others have pointed to the broader societal implications of embedding Internet connectivity into every home appliance imaginable. As Murakami Wood and Steeves (2021) suggested, the interconnection of Amazon SHTs within households and throughout neighbourhoods seeps through communities like a virus, creating a culture of distrust and

surveillance between neighbours (e.g., Amazon Ring doorbells which connect to Alexa) and family members. In the U.S., law enforcement officers have obtained warrants for Amazon Alexa audio recordings for evidence in domestic violence and murder investigations (Epstein, 2019; Lutz & Newlands, 2021). Amazon Ring video and audio recordings, which can be captured from 25 feet away (Guariglia, 2022), have also been routinely accessed by police through warrants (Epstein, 2019), but also through Amazon partnerships with 2161 U.S. law enforcement agencies that allow for unwarranted data access (Reuters, 2022). Individual Amazon Ring accounts have also been hacked, and customer data breached, including video footage inside the home (Quintin & Budington, 2019). While similar Canadian examples are yet to be seen, requests for smart speaker data will likely be treated the same as cell phones or computers (Nordal, 2020), which may be surprising to many older adults using such devices for aging in place. Overall, whether through regulatory reform or user-informed policy and design (e.g., see Costanza-Chock, 2018), there are several important privacy and security issues to address before aging individuals should welcome Alexa or Google Assistant into their homes with open arms. Due to the difficulties in obtaining meaningful consent, the current approach is limited in protecting sensitive health or biometric data from commercial datasets.

Chapter Six: OK Google, Are These Ads Targeted?

> "There's a tendency to be like, 'well of course they have a mind control ray' because that's kind of the most dramatic thing to be fighting. Whereas I think we should be asking… 'in a world where that stuff doesn't even work, is there still reason not to want what they're doing'?"- Tim Hwang in Marx (2020).

Introduction

As the underlying economic model for most online platforms, ads are big business. For example, 87% of Google's total revenue came from online advertising in 2017 (Hwang, 2020). In 2019, Google reported $134.8 billion (USD) in online ad revenue alone (Eliot & Murakami Wood, 2022). Following Google and Facebook, Amazon is the third largest advertising network in the U.S., reporting $31 billion (USD) in 2021 ad revenue. Ads are based not only on location or demographic information but also on inferences made about lifestyle preferences where users are grouped into segments based on similar characteristics. Behavioural data collection fuels online advertising by profiling users based on perceived interests and activities (Hwang, 2020). Advertisers show their personalized content to individual Internet users through Real Time Bidding (RTB), a speedy process whereby behavioural data is collected, and the highest bidder wins ad space at the very last moment (Hwang, 2020). This means that online ads are not static but are highly differentiated for each user, quickly fleeting, and dependent on a variety of factors. These qualities make them notoriously difficult to study.

Google funnels smart speaker data into their larger ecosystem of Google Search, Gmail, YouTube, and other online services to profile users to deliver targeted ads across the web

(Pridmore et al., 2019). Previously, researchers thought that Amazon was focused on data collection for personalized shopping recommendations on their shopping platform (Pridmore et al., 2019). However, Amazon's policies had always been unclear about whether Alexa interactions influenced ads across the web, despite Amazon representatives stating to the New York Times and Washington Post that Alexa interactions were not used for advertising purposes (Turow, Interview data, 2020; Iqbal et al., 2022). As it turns out, an experiment with Amazon smart speakers has revealed that Alexa interactions are not only used for personalized shopping recommendations, but also for targeting users around the web as Google does (Iqbal et al., 2022). As a relatively new technology, little has been written about the dynamic relationship between smart speakers and targeted ads. In part, this may be because the relationship is in its infancy.

There is also limited research available on older adults and targeted ads in general. According to Carver & Mackinnon (2020), under the ever expanding "aging enterprise", which includes smart homes and wearables, further research on the intersection between older adults and surveillance capitalism is needed (Carver & Mackinnon, 2020, p. 277). We know that older adults engage with ads at least to some extent (Hwang, 2020), and we also know that bad actors are interested in exploiting this age group (FBI, 2021; Kuempel, 2016). One 2013 study on over one million Internet users concluded that online ads had "little to no effect" on the 20-40 years old age group (Hwang, 2020, p. 80). Users over 65, however, were responsible for over 40 percent of the total effect observed as a result of the advertising", despite only making up

5% of study participants (Hwang, 2020, p.81). Previous work has also shown that consumer profiling by data brokers can negatively affect older people, especially those with lower income or health issues who are subsequently subject to fraudulent sales pitches from telemarketers (Kuempel, 2016). The potential for taking advantage of older adults through targeted ads, differential pricing, and hiked insurance rates are further reasons to call for higher levels of transparency and accountability from big tech companies including smart home manufacturers. Further, the economic imperatives that drive IoT companies to render users more visible to better predict and modify their behaviour may have implications for autonomy as well (Zuboff, 2018, p.8).

The following research questions guide this chapter:

- Do older smart speaker users receive ads and personalized shopping recommendations through their smart speakers or around the web?
- If so, what types of advertisements are they exposed to, and how relevant are they? Are age or health related issues reflected in the ads?

This chapter addresses these questions through an overview of the existing literature and marketing materials, followed by an experiment using smart speakers and a collection of the subsequent ads. Subsequent expert interview data is included to further supplement my analysis.

Interviews with key informants with expertise in relevant areas have benefitted this chapter. The first is Dr. Joseph Turow, a professor in Media Systems & Industries at the

Annenberg School for Communication. He is also the author of *The Voice Catchers: How Marketers Listen in to Exploit Your Emotions, Your Privacy, and Your Wallet* (2021). To further explain how online advertising works, I have also included interview data from an anonymous Electronic Frontier Foundation (EFF) computer science researcher. As requested, this EFF employee's identity will remain anonymous. To better understand the developer perspective, this chapter also draws on interview data from Kelly Ann Quinn, a Communications professor at the University of Illinois who has recently developed two Google Home Actions for older people. Finally, the chapter draws from interview data with Umar Iqbal, a computer science and engineering postdoctoral researcher at the University of Washington, who has recently published "Your Echos are Heard", consisting of an algorithmic audit experiment with Amazon Echo (Iqbal et al., 2022).

The rest of this chapter is organized as follows. I begin by outlining some of the issues with ad profiling followed by an explanation of what is currently known about smart speakers and targeted ads. Next, the methods section outlines the smart speaker experiment conducted for this chapter, followed by a description and analysis of the findings. Overall, the purpose of this chapter is to contribute to the academic discussion on what Hwang (2020) refers to as programmatic advertising, primarily in terms of how smart home data collection is implicated and whether older users are routinely targeted. The conclusion ends with the recommendation that rather than having ad personalization as a default feature that users can "opt out" of, the

commodification of smart speaker data for ads should be an “opt in” choice for all users, particularly those using such devices for care purposes relating to health or independent aging.

The Problem with Profiling

As explained in Chapter Two, surveillance researchers have long argued that profiling consumers can be a discriminatory practice that has adverse implications for various groups of people (Lyon, 2003). Segmenting consumers into demographic and psychographic categories tends to negatively affect life chances and life choices of lower-income groups and people of color, for example (Gandy, 2010). As will be discussed, older adults can disproportionately experience some of the more harmful effects of surveillance capitalism as well, which may result in higher insurance pricing, or even a loss of services (Carver & Mackinnon, 2020). Additionally, previous work has shown predatory debt-relief companies may target older adults (Keumpel, 2016). While older adults are not necessarily victimized by online scams more often than other age groups, age-associated health difficulties such as mild cognitive impairment can leave some people vulnerable and more often targeted for campaigns of that nature (Burnes et al., 2017). On the other hand, ads targeted towards older adults can be beneficial. For instance, Finding Balance B.C. has targeted Facebook ads towards older adults as part of a fall-prevention education campaign (Bruin et al., 2018).

Ad targeting is not new. In fact, socio-demographic information has been used to make inferences about lifestyles and individuals are then placed into categories or “data buckets” with others with similar characteristics for decades (Delacourt, 2016; Lyon, 2003). As noted by

Pasquale (2015), traditional lifestyle segmentation based on purchasing and demographic data has allowed companies to infer sensitive characteristics about people, such as whether they are overweight. However, in addition to perceived lifestyle data collected from consumer loyalty cards, magazine subscriptions and neighborhood characteristics in the traditional sense, advertisers have since moved into the online realm of browser history, smartphone location data, wearables, and smart home data. The value lies within the connection between devices and their data-rich user profiles. For example, a Google Nest thermostat can connect to Google smart speakers, as well as smart cars, kitchen appliances, wearable fitness trackers, smart beds, and so on (Zuboff, 2018, p. 6).

Smart speakers are the central nodes of smart homes as they can be used to control most other connected appliances. Using smart speaker data collection for advertising purposes is potentially more intrusive than traditional forms of data collection because voice data and real-time data collected from within the home environment can be used to infer sensitive details about users including mood and mental health status (Kröger et al., 2020). According to Jodi Baxter (interview data, 2023), targeting ads on health-related data is a more pressing issue than hacking: "…those are the bigger data privacy issues that we need to address. Somebody hacking into a Google Home and getting somebody's health information, not as relevant. Somebody talking about their blood pressure and then all of a sudden there are blood pressure pill ads on their Facebook page is a bigger issue." Smart speakers can also be connected to environmental sensors for wearable heart rate monitors for further data extraction and

analysis, painting a more comprehensive picture of the user's daily habits, physiological state, or home environment. For instance, the Amazon Alexa-connected Halo Band is a wearable which measures user body fat percentage levels and is also designed to monitor the tone of users' voices to give daily feedback on social interactions (Fowler & Kelly, 2020; System for Assessing Vocal Presentation, 2019; Turow interview data, 2020). Such companies need higher levels of transparency, as biometric data can provide deep insights into users' personal lives in ways that may be surprising to users (Pasquale, 2021).

Further, the risk of surveillance creep is always a concern. In addition to the thousands of smart home devices that already work with Alexa (Eberhardt, 2022), Amazon recently announced their intent to acquire Roomba, an Alexa-connected vacuum cleaner company valued at $1.7 billion which would give them access to the layout of millions of users' home environments (Johnson, 2022). Data breaches due to human error are also an issue. Images of one Roomba user sitting on the toilet were captured by the device and then shared on an employee message board, which were then widely distributed online (Guo, 2022). While companies are interested in such data for advertising or insurance purposes (Maalsen & Sadowski, 2019), the normalization of smart homes and wearables can further blur the boundaries between public and private data collection, meaning that data which is originally collected for marketing purposes can be used for secondary purposes such as law enforcement access (Murakami Wood & Steeves, 2021; Ng, 2022). While surveillance creep can be concerning for the general population, older adults living in care homes have also been subject

to increasingly high levels of surveillance as new technologies have emerged (Carver & Mackinnon, 2020; Mortenson et al., 2015).

Finally, even as the programmatic ad market is generally opaque (Hwang, 2020), smart home technology may further muddy the waters. For example, some users are skeptical about sharing sensitive information with smart speakers due to privacy concerns (Huang et al. 2020), yet other connected appliances are often seen as less intrusive, such as smart lights or motion sensors since they do not record audio or visual content. However, they can be used to infer user behaviour such as sleep patterns or when users are home (Zheng et al., 2018), which of course, are valuable data for advertisers as well (Sadowski, 2020). There is some speculation over the extent to which targeted advertising works, or whether the programmatic ad market is a bubble that will soon burst (Hwang, 2020). Whether or not it will burst is difficult for anyone to accurately predict, in the meantime, it appears that smart home manufacturers are well positioned to further fuel the multi-billion-dollar ad industry with smart speaker voice interactions, behavioural data from home environments, and more. As smart speakers and associated IoT devices rise in popularity among older adults wishing to age in place (O'Brien et al., 2020), what do we know about the extent to which their data is commodified?

Older Adults in the Online Ad Market

Google has collected unprecedented levels of information about Internet users over the last two decades (Zuboff, 2018). From location data from Google Maps, to Google search history, Fitbit wearable data, YouTube watch history and now Google Home, the company has

an extensive database of user information which can be used to fuel real-time bidding (RTB). Marketers can select or exclude audiences depending on demographic information pertaining to age, gender, income levels, and parental status (About Demographic Targeting, n.d.). More detailed segments such as education levels and home ownership are also available (Add Demographic Targeting, n.d.). Certain groups may be considered more valuable than others, and thus will be worth a higher bid from advertisers (EFF interview data, 2020). For instance, as shown by Iqbal et al. (2022, p. 10), Amazon smart speaker users who expressed interest in categories like pets and animals, religion and spirituality, or wine and beverages were subject to ads at higher bid values than personas with other interests. Google Ads Help (About Demographic Targeting, n.d.) gives the following example as to why a company would want to increase their bid in terms of reaching middle-aged adults as opposed to older people:

> Marc is advertising for a financial institution, and he wants to market different products to seniors versus college students. He uses demographics to show different ads to each group of customers and adjusts his bids for demographic groups that may be more likely to spend more. Marc finds that middle-aged customers tend to have the largest initial deposits and increases his bid for people ages 35 to 54.

Google offers ads through multiple avenues, including display campaigns through "35 million websites and apps, and on Google-owned properties (YouTube and Gmail)" which use machine learning for "optimized" targeting and ad bidding (About Display Ads, n.d.). They also offer discovery ad campaigns, search campaigns, and video campaigns, (About Demographic Targeting, n.d.). The U.K. Information Commissioner's Office has noted the lack of transparency

and difficulty of obtaining meaningful consent with RTB, and the importance of protecting vulnerable populations such as gamblers or children (ICO, 2019). They commissioned a survey that revealed that only 36% of respondents (n = 2300) were comfortable with their data being used for such purposes (ICO, 2019). RTB is the most concerning part of Google's ad ecosystem, as ads loaded onto webpages serve to collect further data about the users who see them without consent (EFF interview data, 2020). These types of ads are loaded up everywhere, including some IoT devices, game consoles like Xboxes, Roku smart TVs and home appliances such as smart fridges: "any device that can serve an ad probably does some version of real-time bidding," the researcher explained (EFF interview data, 2020). In terms of how RTB may generate harm, the interviewee went on to say:

> …it makes discrimination and targeting vulnerable people with misinformation or misleading messages or targeting people with bad credit for payday loans and that kind of thing – it makes all kinds of sketchy advertising much easier to pull off. And, it also makes it much harder for regulators to detect those kinds of things and police them because if you want to reach a group of people who live in a certain area, and are of a certain race, or gender, or age range, or a certain income bracket, with a specific message, it's much less likely that the advertising regulator is going to happen upon those ads, realize what's happening and penalize (them) for it because you might only run an ad that reaches 1000 people who you have specified ahead of time. You can upload lists of emails or phone numbers and only target ads at those people and only for a short period of time, so by the time the harm is done you can just pull your ad campaign or change your ad campaign or move to a different business so it's very hard to get a sense of the problem or even begin to stop it. (EFF interview data, 2020)

To date, smart speaker audio ads are mainly delivered through third-party platforms such as music or video streaming services such as YouTube and Spotify, or "flash briefings" in

the case of Amazon products (Park et al., 2022). While the ad-free version of YouTube Premium is available with a subscription fee, the ad-based version of YouTube Music is free for Google Home users and comes as the default platform for listening to music. Users listening to YouTube Music, Amazon Music or Spotify may hear an ad through their smart speaker in the same way they would on their phone or computer.

Dr. Joseph Turow, who had recently interviewed 45 relevant industry experts for his recent book, explained that even as ads are not yet *fully* incorporated into smart speakers, they are soon expected to be:

> Advertisers are really anxious to get into Alexa much more, and Google Assistant. They want to actually use voice for marketing purposes that Amazon and Google so far haven't and they're actually preparing ways for how to do this…This is something that people expect will happen in the advertising industry. (Turow, Interview Data, 2020)

He also expects voice assistants to be further incorporated into cars, schools, hotels, and new buildings in general. "For children being born into Alexa-enabled home environments" he says, "it has already become 'the normal'" (Turow, Interview Data, 2020).

According to recent marketing materials, what may differentiate smart speaker ads from TV, radio, or smartphone ads is their potential for interactivity, where users can interact with the audio content (Park et al., 2022). For example, in an experiment (Park et al., 2022, p. 11) programmers created a scenario where if a user were to ask for a recipe, Google Assistant or Amazon Alexa could then introduce an ad "...by the way, here is the cooking oven from Bosch" and following up with a prompt for the user to say "tell me more" if they are interested.

In this context, voice interactions would be considered beneficial to advertisers because they would reveal more detailed information about users through biometric voice data, background sounds coming within the environment, and can provide real-time suggestions depending on the context. It does appear, however, that these types of interactive ads are in their early stages of development.

Interactive ads may become more common as Amazon is looking to help developers further monetize their Skills, which can be thought of as third-party apps that work with Amazon smart speakers, such as the Echo. In 2021 for example, in-Skill purchasing was introduced in the US and Canada which includes subscriptions and one-time purchases. Such features are now becoming further integrated (Alexa Developers, 2022). Developers will now be able to increase revenue streams by placing ads for Amazon products directly into their Skills (Alexa Developers, 2022). For example, while using a meditation Skill, users may be urged to purchase a health and wellness book through voice command and prompted to “add to cart” or “buy now” (The Alexa Shopping Kit, 2022). As the popularity of ordering devices online using voice commands, otherwise known as “voice shopping,” is on the rise, Amazon is looking to further capitalize on impulse shopping through their Alexa-enabled devices. While only 8% of US adult consumers had tried voice shopping in 2018, by 2021 the number had reached 17.5% (Alexa Developers, 2022), with Alexa’s internal reports showing that voice activated shopping has increased sixfold over the last few years. According to the survey, “instantly taking

advantage of an ongoing offer" was an oft-cited reason for the shift to voice shopping (Alexa Developers, 2022).

Amazon's marketing materials already promote interactive audio ads through their smart speakers to potential clients. Interestingly, according to one document, only adults *under* age 64 fall within their key target demographic categories of "tech-savvy…younger adults, parents, and opinion leaders" (Diving Deep with Amazon, 2021., p. 7). This exclusion of users over age 65 is consistent with Turow's (2020) comments:

> In terms of older people, you know, historically older people don't count to advertisers. There's a whole interesting history of older people and advertising. And what 'older' means. 'Old' is migrating upwards to some extent because Baby Boomers like me are still doing OK and spending a lot of money…it used to be if you were over 50, you fell off a cliff. The Nielsen Paradigm of target viewers is still basically 18-49, but really today 65-year-olds are still of some importance to advertisers. Not nearly as much as say 40-year-olds are, but if you're over 80, forget it! Nobody cares. So, it may be that they're interested in selling you machines for various health reasons, but people who are beyond a certain age – marketers have less and less interest in.

According to Amazon's demographic research, the abovementioned targeted group of younger users is twice as likely than the average "Connected Consumer" to pay attention to smart speaker ads (Diving Deep with Amazon, 2021, p. 10). In another document, Audio Marketing and Advertising Explained, Amazon cites a 2021 US Connected Consumer Study in saying that "38% of Amazon Alexa users" paid the most attention to ads coming from smart devices as opposed to ads delivered elsewhere (Diving Deep with Amazon, 2021). It is important to take

marketing statistics with a grain of salt, however, as big tech companies are known for substantially inflating these numbers (Hwang, 2020).

However, even though older adults may be excluded from Amazon's key targeting demographic, it appears that the company is also looking to incorporate older users into the Alexa eco-system further. According to Dave Limp, Senior Vice President of Amazon Devices and services, Alexa devices are built to be intuitive for all ages: "...you shouldn't have to learn it, there's no manual, it's beautifully easy to use. It works just as well for my 80-year-old dad as it does for a teenager and it isn't hidden behind some lock screen" (Alexa Developers, 2022b, 1m17s- 1m36s). In July 2022, Amazon announced their new Aging and Engaging contest for the best new Skills for adults over age 55, with $45 000 in prizes available to winning developers (Schwartz, 2022). Recognizing that older adults have varying needs; the Aging and Engaging contest is about integrating older adults at different stages of life into the platform. Amazon says: "Think about creating Alexa experiences for the fitness-focused and life explorers; solo agers and those with family; those still in the workforce and those searching for their next chapter; and those who are cared for, or who are family caregivers themselves" (Amazon Alexa Skills Challenge, 2022). Amazon is encouraging the development of Skills in four categories: the Keep Moving category calls for new fitness Skills for older adults such as chair exercises or yoga, for example; Stay Sharp calls for new Skills related to cognitive health such as riddles or games; Be Supported asks for new Skills that make daily chores or home maintenance easier for older people; and Let's Connect invites developers to create new Skills that facilitate social

connection through “family news” or “friends nights out” for older adults (Amazon Alexa Skills Challenge, 2022). This push to get more aging-focused Skills on the platform may result in more time spent with Alexa, furthering user familiarity with the platform. This may also lead to ads or personalized shopping recommendations for older users.

In another example, Amazon has released “Alexa Together” a $19.99 per month subscription service for elder care (Perez, 2021). It will allow family members and caregivers to “keep an eye” on the older adults in their lives and includes enhanced features such as “call for help” and fall detection capabilities (Perez, 2021). Interestingly, it appears as though both the caregiver and older user must “opt-in” to consent together upon setup (Perez, 2021), which could also be a useful addition to regular Amazon Alexa account configurations. It remains unclear as to whether data collected on older users and caregivers using that plan will be commodified or not. On the question of whether we should expect to see older adults further incorporated into the marketing world through smart speakers, Turow (interview data, 2020) responded:

> ...they may, and if they find that an 80-year-old is able to go and, it makes it easier to buy if you can talk directly to a speaker, it’ll be really interesting to see whether that becomes problematical…these are going to cause some interesting tensions. And we’ll see.

Google is already thinking of ways to reach the 55+ age group. One “Think with Google” article encourages advertising clients not to discount what they call “digital seniors,” a highly engaged segment of older adults who love using the Internet to access YouTube and other

platforms (Twohig, 2021). Citing a study conducted by Google and Known Market Research on 4415 adults aged 55+, they claim that 86% of "online seniors" spend a minimum of 6 hours a day online and own at least 5 Internet-connected devices on average (Twohig, 2021). "Staying in touch," "organizing finances," and "improving health and wellness" are the top 3 reported reasons for online usage, leading Google to encourage marketers to stop relying on "outmoded assumptions and hunches" about older adults and to start "meeting users where they're at". The report goes on to say: "these are sophisticated, engaged consumers… 82% use their smartphone every day…" (Twohig, 2021). While smart speakers were not directly mentioned in the report, YouTube is connected to Google Home devices, and is the default platform for streaming music and videos, ads included. It follows that marketers would be interested in meeting users "where they're at" through smart speaker interactions as well.

Transparency, Accountability, and Autonomy

While older adults may find great value in smart speakers, concerns may stem from the fact that data collection practices are not transparent, and consent is difficult to meaningfully obtain from older people who typically do not set up their own devices (Quinn, Interview data, 2020). Further, third-party applications that violate Google and Amazon privacy policies are often approved (Cheng et al., 2020; Young et al., 2022). For instance, researchers intentionally submitted dangerous Amazon Alexa Skills and Google Home Actions for certification. They were able to get all 234 (100%) content and privacy policy-violating Skills through Amazon's certification process, as well as 148 (39%) policy-violating Google Home Actions (Cheng et al.,

2020). In another study, researchers identified 6,079 policy-violating Alexa Skills and 175 policy-violating Google Home Actions (Young et al., 2022). As mentioned, many third-party Skills do not include privacy policies at all (Rykov, interview data, 2021).

Finally, according to Kelly Ann Quinn, who has developed Google Home Actions for older adults to increase physical activity or encourage mindfulness, even if well-intentioned developers themselves have limited access to individual user data, Google itself "sees everything". According to Quinn: "On the developer side, I cannot see individual data, I can only see aggregate data…if I was Google, I'd be able to get everything at the individual level. I'm pretty sure they're capturing that, but I don't have access to that…I think they can see everything" (Interview data, 2020). Rendering user data visible may be about selling ads, premium subscriptions to services, or personalized insurance rates, but shaping user behaviour is at the crux of it all (Zuboff, 2018).

Moreover, the erosion of user autonomy may also be an important factor to consider in terms of smart speaker ads. It appears that smart speaker manufacturers are looking beyond the content of what users say to profile individuals more effectively. In one example, Dave Limp explains that the goal is to have users interact with Alexa less to allow Alexa to act on inferences or "hunches" (Alexa Developers, 2022b). Hunches are meant to perform on a user's behalf based on behavioural inferences measured throughout the home. For example, Alexa Hunches turn off the lights or turn down the thermostat when it detects nobody is home (Eberhardt, 2022). Patents also reveal that both Amazon and Google are interested in collecting

audio data for other behavioural prompts or automated actions, which sometimes involve purchasing items via voice commands (Fadell et al. 2016; Jin & Wang, 2018). Like Amazon's patent for delivering cough medication to smart speaker users with scratchy throats (Jin & Wang, 2018), an Alphabet patent describes Google Nest Hub monitoring environmental sounds and analyzing the sound of a user's voice to make relevant user suggestions. For example, it may detect the sound of running water to assess whether it is coming from a sink or a toilet to monitor for abnormal behaviour in the home. It may use the sound of a user's voice to infer emotional status. According to the patent, Fig. 37: "is a flow diagram illustrating a process for detecting emotions, in accordance with an embodiment; or underlying medical conditions" and Fig. 41 is a "flow diagram illustrating a process for monitoring medical symptoms, in accordance with an embodiment" (Fadell et al., 2016, p.2). Emotional recognition via voice has also been patented by Spotify, which works through both Google and Amazon smart speakers. The intent is to recommend songs based on user emotion, which is inferred through voice analysis (Walker, 2022). Regardless of whether inferred emotional or health statuses are commodified, potential disruptions in smart home user autonomy are always important considerations for older adults and caregivers (Mortenson et al., 2015). Nudges suggesting that users should read certain articles, install certain third-party apps, or make certain recipes are already present on smart speaker displays, and are likely sponsored slots. These can all be considered as potential disruptions of user autonomy.

While there are still many unknown details in regards to the relationship between smart speakers, older adults, and targeted ads, the above sections highlight three important points: (1) Smart speaker manufacturers are actively engaged in attempting to bring older people into their networks, which are funded by ad dollars; (2) smart speaker manufacturers are looking for new ways to incorporate user data into ads to further encourage third party product monetization, this can have implications for user privacy and autonomy; (3) beyond the content of voice interactions, these companies are also looking to incorporate audio data into user profiles, such as using vocal tone to assess health or sentiment analysis. To further explore the connection between smart speakers and targeted ads towards older adults, the rest of this chapter outlines an experiment with Google Nest Hub and Amazon Echo Show.

Results From a (Mini) Algorithmic Audit

A detailed explanation of methods for this experiment are available in Chapter One (pg. 26-29). Four sock puppet accounts, or personas, were created for the purpose of analyzing the types of ads that followed older smart speaker users around the web. Figure 1 shows the total ads shown on news sites and Gmail for all four accounts (Appendix 3). Starting with the first persona, nicknamed Gillian, this account was used to frequently ask Google Assistant questions such as:

- What are some games for seniors?
- What are some activities for seniors?
- Where can I get an electric scooter?

- What can I do about essential tremor?
- What are some tips for keeping memory fresh after 65?

On the smart speaker itself, few ads were shown. The only examples of ads popping up after an inquiry to Google Assistant followed questions about memory. For example, following the question for “keeping memory fresh” on May 6th, a sponsored Mayo Clinic article would pop up on the smart speaker screen. In the following session on May 10th, the same Mayo Clinic ad came up after asking “what are some tips for improving memory for seniors?”. Additionally, on May 14th, after asking for “tips for cognitive decline in older people” an ad from Alzheimer.ca followed about mild cognitive impairment. An ad from Us Against Alzheimer's (.org) which was an article titled Prevent Cognitive Decline: Optimize Your Brain Health, also popped up after asking about “tips for people with dementia.” Finally, on July 19th, a Mayo Clinic ad followed the question of “what are some memory tips for seniors” once more.

The account was also used to play games, listen to the news, and YouTube music. Gillian received prompts to purchase premium subscriptions ($6.99) to Jeopardy after playing the game. While Playing Who Wants to Be a Millionaire, a prompt to purchase extra lifelines (15 for $9.99) also came up. Finally, premium paid subscription ads for the Economist and Planet Money podcasts were played after listening to the news. In terms of YouTube streaming, the most consistent ads came from YouTube premium, Canadian Tire, SportChek, Specsavers prescription glasses and Kia Forte cars.

Following smart speaker activity, the most consistent Gmail ads were from Capital One credit cards and Hello Fresh meal prep services. One-time ads from TELUS smart home security, with free Amazon Echo Show 5 included, as well as Match.com dating, and the Noom weight loss app were also presented, among others. News site ads were only checked once for this account. Browsing on CNN.com resulted in ads from Hope Street property management, Shell premium gasoline, and a few others.

Next, Darlene's account showed similar Gmail ads before any smart speaker activity was conducted with this account. For example, Match.com dating, Hello Fresh meal prep, and TELUS smart home security were all present. The account was then only used to interact with five of the most popular third-party actions selected from Google's health and fitness category, skipping over those that were designed for childcare and taking care of infants. Healthy Life, Help Me Sleep, Web MD, Calm meditation and Bravo Tango, an action that was designed by National Geographic for veterans: "The goal of this application is to ease the transition home after deployment, and minimize barriers for veterans who want to work on their own mental health" (Bravo Tango, n.d.).

Interestingly, TELUS smart home security and Capital One ads continued to be shown after smart speaker activity as well. Two ads for The Pacific by Grosvenor homes "starting at $999 000" were also presented. CNN and CBC websites were visited twice after smart speaker activity, resulting in four ads for Tourism Whistler; three for Lumos IT services, two for Equifax

credit reporting, two for Toyota trucks, and single ads for Nissan cars, Brightspark by world studies: “show students the world” and Fortis energy, among others.

Next, Ronald’s account was used for similar purposes as Darlene’s, except subsequent actions were added to the original 5 top health and fitness actions. Using an AI generated male voice,[3] Ronald interacted with Calm meditation, Web MD; Bravo Tango; Help Me Sleep; American Cancer Society; Healthy Life; Meditation Guide; Home Remedies Doctor, and Nutrition Facts. Gmail ads were generally consistent with the Gillian and Darlene’s, featuring promotions from Capital One, Hello Fresh, and The Pacific by Grosvenor luxury homes. While there were some consistencies such as three ads for Whistler Tourism, Ronald’s news site ads were slightly different from Gillian and Darlene’s. For example, Ronald was presented with one CBC ad for Roots and Wings, an artisan spirits distillery in BC, two for Pasqua wine, as well as five ads for Raid bug spray. ON CNN, an infographic for “how to reduce your tummy at any age” was also unique. Finally, an ad shown from familyandpets.com, a link to an article titled: “Missing WWII Submarine Found with 80 Bodies'' appeared twice.

Most notably, Ronald’s was the only account to be shown ads for senior housing, one reading “Senior Living apartments at $405 month: rent in these provinces from $405/month on CBC; and another reading “Senior living apartments $300/month (rent in these states from under $300) on CNN. This particular finding is interesting because of a recent lawsuit where Facebook was sued by the U.S. Department of Housing and Urban Development over

[3] Free Voice Over Generator: https://www.voicebooking.com/en/free-voice-over-generator

discriminatory housing ads (Cox, 2020), Google has recently forbidden targeted advertising for housing based on age in Canada and the US:

> To further improve access to housing, employment, and credit opportunities, we are introducing a new personalized advertising policy for certain types of ads. This policy will prohibit impacted employment, housing, and credit advertisers from targeting or excluding ads based on gender, age, parental status, marital status, or ZIP Code, in addition to our longstanding policies prohibiting personalization based on sensitive categories like race, religion, ethnicity, sexual orientation, national origin or disability (Spencer, 2020).

Unless ads for "senior living apartments" are shown to users of all ages, this ad targeted to a 66-year old's account may have breached Google's ad policy.

Finally, Eve, the only account connected to Amazon Echo Show 5, was used for asking Alexa questions such as: "what are some activities for seniors in my area;" "how can I improve my memory as a senior;" streaming the suggested "oldies" music on Amazon Music, listening to the news, and interacting with third party Skills such as WebMD and Price it Right and Trivia Battle games. Later, the account began to interact with some of the top health and fitness Skills from Amazon's website, such as Voice PT (physiotherapy), Meditation Sounds, 5 Minute Workout and YouVersion Rest (a bible-reading Skill).

Listening to music from the free version of Amazon music most frequently resulted in ads from their premium ad-free service: Amazon Music Unlimited. The only others were ads promoting the use of Alexa to learn new languages. On the other hand, Iqbal and colleagues (2022) received Amazon music ads from the following brands: Geico insurance, Squarespace

website building, Indeed job hunting resources, IMDB movie reviews, and more. In their experiment, across personas, only 16.61% of ads were geared towards Amazon Music Unlimited (Iqbal et al., 2022, pp. 9-10). While it is unclear why Eve did not receive any ads beyond Amazon Music Unlimited and Alexa Languages, potential reasons include the lesser number of hours spent streaming music, limited information available to infer user interests, age range, or the fact that Amazon may have different ad protocols in Canada than they do in the US, where Iqbal and colleagues (2022) conducted their experiment. Their experiment also did not test for ads related to user age, as their sock puppet accounts were each based on interest categories (Iqbal et al., 2022).

The most frequently occurring ads on news sites such as CNN and CBC were for Mintlist, a service for selling used cars that was presented eight times. Consistent with the other sock puppet accounts, real-estate related ads were common. For example, this account was served with four ads for Symphonia luxury condos, two ads for Hope Street property management, and single ads for other properties such as Stirling or Square Phillips, among others. Beyond real estate, other examples included two ads for Intel Pro laptops, Dayquil medicine, Equifax credit reporting, a lottery contest encouraging readers to “Win your share of 1 million for 1 dollar”, and an insurance brokerage ad. Following questions to Alexa, no ads were served on the device itself, although a premium version of the Trivia Battle game was promoted at $2.99.

While it appears that there are some similarities between ads served between accounts, such as Capital One credit cards and luxury properties, the reasons for such patterns

are difficult to discern. Discrepancies or commonalities between ads shown between each account could be based on a variety of factors such as smart speaker user activity, time of day, types of news articles that made the headlines each day, location, gender, and more. Although Ronald was the only user in their 60's (age 66), this was unlikely to be a factor as Google ad profile placed all four accounts under "65+". Without the technical abilities of a team of computer scientists to test for bidding amounts as Iqbal et al. (2022) had done in their experiment, it is not possible to see whether any of the sock-puppet accounts were worth more to certain advertisers than others. Even as the accounts often asked questions related to memory or cognition, engaged with third-party health related applications for anxiety such as Calm, or interacted with WebMD related information, ads seemed generally unrelated to health. As mentioned, the only definitive ads came from Mayo Clinic, Us Against Alzheimer's and Alzheimers.org following questions pertaining to memory or a decline in cognition, which were contextually related.

One potential reason for this could be due to previous recommendations from the OPC that Google stop targeting ads based on health-related inferences (OPC, 2014), at least not without explicit consent. Finally, Google has certain criteria for which types of healthcare and medicine related ads are allowed to be promoted in various countries (Advertising Policies Help, n.d.), which may have had an effect as well. It may also be that older adults are still excluded from marketing campaigns, or that health related content was outbid by real estate and credit card companies vying for older users' attention.

User Ad Profiles

While the types of ads shown did not appear to directly correlate with smart speaker activity for the most part, the ad profiles displayed notable changes over time. Darlene's Google ad profile displayed changes from when the account was created and after the smart speaker experiment was completed. The ad profile now included far fewer categories than the original. For example, while Darlene was still placed in categories such as "65+" "education status: high school graduate," "household income: lower middle" and "homeowner status: homeowner," inferred interests such as "charity and philanthropy" and "classical music" had since been removed. Gillian's account saw a similar shift, where after two weeks of inactivity, the user ad profile had kept basic categories such as "65+," "education status: secondary school leaver"; "household income, upper middle," and then removed categories such as: ""retirement and pension," and "music and audio," among others. New categories were also added, including: "celebrities and entertainment news," "football," "jazz," and more.

Ronald's Google ad profile was in action since the first day the account was created, with categories such as "65 years old+," "male," "homeownership status: homeowner," "marital status: married" and "parental status: not a parent" staying constant, among others. However, after three days of smart speaker user and news site browsing, the following categories were added: "convertibles," "education status: bachelor's degree"; "household income: high,"; "home improvement," "financial planning and management" and "soccer," and more. It is unclear how Google calculates income levels, education level and homeowner status

based on the limited interactions performed with any of the accounts. Taken together, these examples suggest that ad profiles are constantly changing. While the ad profiles may start by inferring interest categories based on similar users' preferences, such interests may be removed if the user does not engage with related content after a certain period.

During the same period of inactivity, it is also unclear why new interest categories are added, unless other users' interests under the same WIFI connection are also considered. For example, "DJ resources and equipment" and "pet food and pet care supplies" are frequent searches from other household members on their own devices that were not involved in this experiment. Upstairs neighbours share the same WIFI connection and may have expressed interest in "soccer". These inferred interests had no relation to sock-puppet smart speaker interactions or news browsing and thus seemed out of place. When asked why other household members' interests were showing up in these users' ad profiles, Iqbal responded that there are two potential reasons. The first is that household members, friends and family interests are being inferred due to a shared WIFI connection, and the other is that Google's ad ecosystem may not be very accurate (Iqbal, Interview data, 2022). However, even if the ads are inaccurate and seemingly unrelated to user activity, this is not to say that targeting capabilities could not increase in the future.

Although the ads shown to each account were generally similar and did not seem related to smart speaker activity, each ad profile was different and continued to shift over time. There remain several questions in regard to why the results unfolded as they did. While Google

users' ad profiles was easily accessible, the request for Eve's Amazon ad profile returned as an empty file, perhaps suggesting that people over 65 are not being profiled in the same way as younger adult users, which is consistent with Amazon's marketing materials on "connected users" being most interested in users 64 and under (Diving Deep with Amazon, 2021).

Overall, further research is needed to make definitive claims. Even if ads are generally ineffective as has been proposed by Hwang (2020), and even if it may be that older adults are currently of little interest to online advertisers (Turow interview data, 2020), there are still good reasons for further inquiry into the subject. As mentioned, marketing materials from Google show an interest in delivering ads to "digital seniors" (Twohig, 2021) and Amazon's recent Aging and Engaging contest shows their commitment to connecting more older adults to Alexa devices. If older adults are further incorporated into the burgeoning smart speaker ad ecosystem, a lack of transparency in terms of how smart speaker data are used for targeted ads is problematic. As explained by Eliot & Murakami Wood (2022), Google is changing its ad strategy to one of "federated learning", where user data is processed on their own device such as a smart speaker as opposed to in the cloud. Although such a strategy is designed to keep identifiable information on individual users private through sharing only the cohort ID with Google and advertisers (Eliot & Murakami Wood, 2022) the discriminatory nature of group segmentation for marketing purposes has been heavily criticized for its ability to exacerbate unequal power relations (Kuempel, 2016; Lyon, 2003). Further, current private sector privacy regulations are also limited in their capacity to protect groups (Eliot & Murakami Wood, 2022).

Subsequent research is required to fully understand how segments of older adult users with similar interests in features such as medication reminders, health symptom checkers, meditation apps, emergency contact, and using Alexa as a companion to alleviate loneliness may be of interest to advertisers. Who is most interested in targeting these cohorts with targeted messaging, and with what content? It is difficult to assess the impact of targeted ads and AI generated nudges towards suggested behaviour that interfere with human autonomy. Individual users, or now group cohorts, receive differing information in real time and smart speaker companies are not transparent about why certain decisions were made or not made, why certain users are included or excluded from accessing certain content, or what level of value each cohort holds to various advertisers.

Conclusion

In conclusion, this experiment represents a snapshot of the types of content potentially targeting older adults. However, one major limit of such a small experiment is that it is not possible to see patterns at scale. While ad libraries may have helped to make election campaign ads more transparent (e.g., see Bennett & Gordon, 2020), no such resources exist for other targeted ads. Without a bird's eye view of the larger patterns at play, it is difficult to assess the potential impacts. To further uncover the relationship between smart speakers, older users, and ads, following Iqbal et al. (2022), a more extensive algorithmic audit should be conducted in which advertiser bid amounts are analyzed in conjunction with age-related activities. This could help to reveal what types of smart speaker activities performed by older adults are of the

highest value to advertisers. Rendering such processes more visible could help to inform federal or provincial privacy regulations in ways that best reflect older adults' online experiences.

Generally, increased levels of transparency and accountability are essential because surveillance capitalism thrives on the invasion of user privacy and the erosion of autonomy (Zuboff, 2018). The current marketing economy incentivizes digital platforms "to continuously manipulate user behaviour in ways that may be harmful to mental health and personal development" (Hwang, 2020, p. 114), or in ways that serve to standardize human interactions to make them more legible to advertisers. For these reasons, encouraging alternatives to the business models of surveillance capitalism could help pave the way for more ethical business models that consider the needs of various types of smart home users (Hwang, 2020, p. 118). This may be especially important for commercial smart home users repurposing their devices as care tools for rehabilitation or independent aging (see also Fang, 2019). At the very least, ad personalization could be an "opt-in" choice by default, as opposed to the current "opt-out" function, which is not easily accessible on either Google or Amazon smart speakers. This would leave users with less responsibility to sift through lengthy privacy notices to understand how their data is used. The following conclusion chapter summarizes findings from previous chapters and ends with recommendations for user-centric design and a data justice regulatory framework to better support older adults aging in place with smart home technology.

Chapter Seven: Implications for Privacy, Surveillance, and Aging in Place

> "Existentially, we can characterize the 'home' as a kind of power base for an aging person, where they can control access, choose what is visible to the outside, and create their own personal domains. Technology becomes intrusive when it compromises these basic affordances of a place and undermines personal agency."
> – Sixsmith (2022, pp. 2-3).

Introduction

To recap, AgeTech can have many potential benefits in helping older adults live independently by supporting users cognitively, physically, emotionally, or socially (Wallace & Knoefel, 2022). Commercial-grade devices marketed or superficially repurposed as AgeTech, like smart speakers can be frustrating to use for some due to a lack of design inclusivity. However, new users are generally enthused about their potential for making everyday tasks easier and supporting independent aging (Chung et al., 2021; O'Brien et al., 2020). In Canada, older adults use smart speakers for listening to music, searching for information, playing games, or having conversations with intelligent personal assistants (Slane et al., 2020). Additionally, as demonstrated by focus group participants (Chapter Four), they are also used for age-related or health purposes through medication reminders and emergency contact features. As older adults' technological abilities improve with each passing generation, they may become increasingly comfortable with Internet-connected devices and SHTs that continue to rise in popularity (Chen, 2020).

Telecommunications companies and SHT manufacturers are pondering their roles in Canadian health and aging sectors where staffing issues have become catastrophic (TELUS,

personal correspondence, 2022). Despite their positive effects, the use of SHTs for health and care purposes requires further consideration for issues related to privacy, autonomy, and the potential for data-based discrimination. The challenge will be to develop and employ SHTs for older adults equitably and ethically, including across low-income and rural areas for those who wish to adopt them at all (Wallace & Knoefel, 2022). Throughout this dissertation, I have explored the following question(s): how are Amazon and Google smart speakers marketed towards older adults, how are they used, and what are the implications for user privacy, surveillance, and aging in place in Canada? This chapter provides an overview of findings before concluding with recommendations for user education programs alongside user-centric design and data justice as a regulatory framework.

Summary of Findings: The Home as a Power Base for Older Adults

How are Smart Speakers Marketed and Used?

Chapter Three addressed the ways that smart speakers are marketed to older adults and caregivers online. Beyond entertainment and home control, older adults are also encouraged to use smart speakers and related SHTs in ways that are directly related to aging and health, such as medication reminders, doctor's appointment reminders, home security enhancement, battling isolation and loneliness, aiding with memory-related tasks, and so on (e.g., Kane, n.d.; Lisa, 2018; see Chapter Three).

The overall sentiments behind such claims are overwhelmingly positive in ways that perpetuate seductive surveillance (Draper & Turow, 2019; Neville, 2020b; Troullinou, 2017),

which encourages users to ignore privacy and security risks (e.g., see Matthews, 2020) in exchange for embracing entertainment features. The marketing materials analyzed in Chapter Three demonstrate many smart speaker features for older adults, presenting them as attractive or even necessary components of an independent aging person's home. In that sense, the benefits are alluring, and the surveillance perpetuated through back-and-forth conversation with voice assistants, for example, is presented as a way to alleviate loneliness. The promoted safety benefits provided by having relatives connect through the "Drop In" feature are another case in point. Alexa and Google Assistant are presented as fun voice assistants that are not only interactive, but also useful for daily tasks, and security-enhancing. According to Draper and Turow (2019, p. 1834), such framing helps to "divert attention from activities that may cause concern."

Seductive surveillance is further reflected in Terms of Service or FAQ documents that encourage users to optimize or enhance their personalized experiences by keeping privacy settings unrestricted, or to keep recordings turned on to help Alexa learn various accents and dialects (Top Customer Questions, 2021). "If you'd like to help improve our audio recognition technology for everyone, you can choose to have your audio recordings securely retained and made available to our speech improvement systems," says Google (Google Safety Center, 2021). Help "everyone" by keeping your settings unrestricted. The general tone of such materials is consistent with other so-called influencer marketing trends such as YouTube videos (Neville, 2020b) where again, users are guided to avoiding engaging with Terms of Use

agreements and keep privacy controls open to fully embrace the entertainment features smart speakers can provide. In the case of older adults aging in place with smart speakers, seductive surveillance can create the overall impression that SHTs are more socially accepted and less intrusive than they actually are. Uninformed users then share unexpected data with commercial entities looking to commodify, predict and control user behaviour (Zuboff, 2018).

Consistent with marketing claims, Chapter Four demonstrated that smart speakers are used in myriad ways. In fact, participants used smart speakers for a wide variety of purposes including: entertainment and information (listening to music from the "happy past", games e.g. Price it Right); home control (smart lights); reminders or memory aids (medication, appointments, timers, locating missing items); quick access to information (news, weather); staying in touch (connecting with family through hands-free calling); emergency contact (alert others in the case of a fall or medical emergency); digital companionship (compliments, jokes, loneliness); home security (connected security cameras; smart locks), and more. While such devices are generally viewed as helpful for everyday living, implications related to older adults' autonomy in the home as a powerbase require further attention.

Implications for Aging in Place

Even as some cultures encourage live-in caregiving, the related healthcare systems that facilitate such arrangements are currently under strain in Canada. Care work in the home is generally not covered by public healthcare insurance, causing those who cannot afford privatized services to rely on unpaid labour from family (Strauss & Xu, 2018). The hope is that

SHTs can alleviate some of the pressure on healthcare institutions as well as combat "caregiver burnout" (Wallace & Knoefel, interview data, 2022). In this context, the idea of living independently with the use of SHTs may be an attractive alternative. However, to maintain autonomy by living alone, users must also give up their privacy by potentially allowing SHT developers, third-parties, caregivers, and healthcare providers to monitor their data. The result is that older adults wishing to age in place may be being pulled in conflicting directions: seductive surveillance from developers and marketers on the one hand, and the struggle to maintain autonomy on the other.

To preserve the home as a power base from outside intrusion, older adults need access to autonomy to make their own decisions regarding which technologies they use (Sixsmith, 2022, p.2). This cannot happen without an informed user base or data collection practices that are limited by default. The fact that focus group participants were generally unaware of what data were collected through their smart speakers and for what purposes, is concerning. Although younger age groups also tend to be uninformed (Lau et al., 2019; Malkin et al., 2018), older adults may use their devices in unique ways that span beyond superficial entertainment features and thus have more sensitive data at stake, such as health-related information.

In this case, even if the aim is to increase independence levels in the home, both privacy and autonomy can be jeopardized. This further shifts the power balance away from users and towards the big tech companies. As shown in Chapter Three, SHTs be promoted as tools to enhance older people's autonomy. However, big tech companies' economic imperatives may

undermine the home as a “power base,” as Sixsmith (2022) calls it. Both Google and Amazon have an active interest in managing user activity. Alexa Hunches, for example, analyze and predict user behaviour to detect anomalies and respond accordingly (Help and Customer Service, n.d.). As previously mentioned, Google smart speakers can detect changes in movement patterns, alerting family members if someone is not responding to Google Assistant’s questions (Yang, 2018). Patents demonstrate the intent to further monitor and intervene in user behaviour. Examples include Google’s ability to alert parents when children misbehave, to award users who keep their smart thermostats turned down low (Fadell et al., 2016), or Amazon’s ability to promote online orders for over-the-counter medication based on the sound of a user’s voice (Jin & Wang, 2018).

This type of behavioural prompting and automated intervention may make older adults overly dependent on technology, challenging autonomous decision-making in terms of when it is time to leave the house, when to eat, when to go to bed, or what to buy. Further, sensors that automatically alert family members of behavioural anomalies can ultimately restrict movement, where older adults avoid engaging in certain activities out of fear of worrying caregivers or triggering a false alarm. If not carefully applied, these systems can limit user autonomy in various ways (Mortenson et al., 2015; Sixsmith, 2022; Wallace & Knoefel, 2022). The issues presented here are not only about what Amazon or Google can do today but also their potential future capabilities and intentions as well as those of similar companies, which

are sometimes demonstrated through patents. In short, there is a contradiction at play: age in place with technology to preserve autonomy while giving up power to big tech.

Of course, not all older adults wish to age in place at home, or to have their daily activities managed by technological means. As an older adult and dementia advocate shared with me at the 2022 AGE-WELL conference, researchers and technology enthusiasts should avoid the assumption that if an older person is not willing to age in place with technology, or if they express the desire to move into an assisted living facility instead, that they are "giving up". To preserve older adults' autonomy, individual preferences for the level of technological interventions they are willing to accept must be heard and respected. For those who choose to engage with SHTs, user-centric design and privacy regulations that take meaningful consent seriously are required in order to preserve the home as a power base.

Privacy Implications

Meaningful Consent

As discussed in Chapter Five, meaningful consent for data collection is a necessary component of private sector privacy legislation both in B.C. (PIPA) and Canada (PIPEDA). According to PIPEDA Fair Information Principle 3, Consent: "To make consent meaningful, people must understand what they are consenting to". The underlying intent is to allow individuals to make meaningful choices about how private sector actors collect, use, and disclose their personal data. However, it appears that the meaningful consent required to collect smart speaker data is not often properly obtained. As demonstrated by focus group

participants, understanding what data are collected and where privacy settings are located has proven difficult. The OPC has recognized the difficulty that older adults can have in managing their privacy and security, so they have organized workshops and uploaded how-to pages on their website (Tips to Help Protect your Privacy, 2022). The Office also reaches out to older adults by placing educational pamphlets in library books (OPC, personal correspondence 2022). Online brochures from the OIPC and the Office of the Seniors Advocate of B.C. also describe ways to protect privacy online (OIPC BC, 2020). These user education initiatives should be expanded upon. However, despite recognizing that older adults need extra support, the burden of responsibility is still placed on the individual user to educate themselves. Neither Office has recommended extra protections for older adults at the regulatory level.

In the examples provided in Chapter Four, focus group participants had not read the Terms of Use, half had their devices configured by someone else, and most were unaware that their interactions were being recorded, or that they could be deleted. In the words of Gladice, a participant whose son installed her speakers: “our house is smarter than we are.” Initially, participants displayed attitudes of indifference or privacy resignation, or that their lives were too uninteresting to care about potential surveillance. The culturally prevalent idea that ordinary people have “nothing to hide” has been flagged as dangerous within the privacy literature as it helps to perpetuate an invasive culture of surveillance that undermines democratic values (Solove, 2007). However, even resigned participants still negotiated their privacy boundaries through various means. They mentioned the importance of turning the

microphone off, unplugging the device, keeping the camera off, and rejecting certain features such as Drop In. This contrasts with the marketing materials, many of which had touted the Drop In feature as a major asset to older adults and caregivers. Further, one participant (Emily) moved her smart speaker equipped away from the washroom out of fear of being filmed coming out of the shower. She also stated that although it would be convenient to link her health records to Alexa, it was a risk that could potentially result in her being disadvantaged by insurance companies. Once learning more about voice recordings for targeted ads, the others were quick to reject these surveillance capabilities as well.

Consistent with Slane et al. (2020), these findings support that older smart speaker users care about the potential for eavesdropping, data sharing, or exploitation, even if they do not always know how to protect their data. The difficulty in obtaining consent may be compounded as older adults are less experienced with technology (Davidson & Schimmele, 2019), often have their settings configured by someone else (Anderson & Perrin, 2017), and are the most likely age group to be “extremely concerned” about online privacy protection (OPC, 2021). Moreover, ongoing consent may be even trickier to maintain if memory-related diseases are involved or develop over time. Related work has shown that older adults sometimes forget why SHT devices were installed, or what data they collect (Ghorayeb et al., 2021; Rogerson et al., 2020). Although the focus group represents a small sample of users, further research could test these findings among larger populations of older adults in Canada to better inform policy and design.

In response to inquiries about the difficulty in obtaining consent from older adults, OPC staff have recommended the following: “Individuals should read privacy policies. If they are less familiar with smart devices and their related apps, they could ask help from a relative” (OPC personal correspondence, November 24, 2022). This recommendation ignores the fact that caregivers or family members may be uninformed as well (Parzen et al., 2021), that not all older adults have relatives to help them in the first place, or that they may not know what to ask. As it stands, not only are older adults treated as a homogenous group, privacy regulation in Canada groups older adults together with everyone else over the age of 13, where all users are assumed to have the same general levels of technological ability or tech-savvy relatives to make meaningful consent decisions for them. Older adults display varying levels of technological experience that tend to decline with age (Davidson & Schimmele, 2019). Some older people experience issues with cognitive impairment, even under the age of 65, while others are perfectly healthy well into their 90s (Chang et al., 2015). Age is not necessarily indicative of health status or lower levels of digital literacy, but both tend to correlate with aging (Anderson & Perrin 2017; Chang et al., 2015; Davidson & Schimmele, 2019). It is therefore unrealistic to expect everyone over the age of 13 to have the same level of ability to manage their privacy controls in the current landscape. In other words, too much responsibility is put on users or relatives to understand not only what is collected and how, but also the potential future implications of complex and opaque ad ecosystems related to commercial-grade SHTs.

A more robust private sector privacy law could choose to value the human right to privacy over the economic incentives of private sector actors (Centre for Digital Rights, 2022; Scassa, 2020; Steeves, 2015). Canada's recent Bill C-27 was an opportunity to address such issues. Bill C-27 is an attempt to modernize PIPEDA through the Consumer Privacy Protection Act (CPPA) in conjunction with the new Artificial Intelligence and Data Act, and the Personal Information and Data Protection Tribunal Act (PIDPTA) (Centre for Digital Rights, 2022). The Bill has been criticized for combining the issues of privacy protection and Artificial Intelligence (AI) and for avoiding public consultation (Centre for Digital Rights, 2022; Geist, 2022). The Centre for Digital Rights (2022) also suggests the CPPA should recognize the privacy rights of groups, that individual consent requirements be reinstated and that stronger OPC powers should bolster higher levels of industry accountability (Centre for Digital Rights, 2022). The details of which components of Bill C-27 are to be enacted into law are yet to be determined, however, it appears that older adults' SHT usage for health purposes will not be taken into special consideration.

As it stands, consumer privacy in Canada is treated as a transactional deal between individuals and businesses, with an emphasis on private sector economic interests. This challenge is further complicated by targeting users categorized into groups, otherwise referred to as segments or cohorts (Eliot & Murakami Wood, 2022). In the case of older adults aging in place with SHTs for health and care purposes, the current approach facilitates the corporate exploitation of vulnerable group members and is limited in its capacity to protect them. As will

be discussed in the conclusion section, data justice is a framework that can go beyond narrow individual privacy rights to address fairness in visibility, the right to engagement, and challenging bias (Taylor, 2017).

Differentiating Health Data

Another privacy issue is that health data can be inferred through commercial SHT products (Kröger et al., 2020; Pasquale, 2021). Although the OPC has yet to consider the ways that health data can be inferred through smart speakers (OPC personal correspondence, 2022), Canadian AgeTech developers have expressed the difficulty in navigating the boundaries between health and medical data when sensors are set up for home security. For example, when SHT data are later are used for "measures of wellbeing" such as bathroom activity, sleep apnea, heart rate and so on, Wallace & Knoefel (2022, pp. 12-13) ask: "'When does AgeTech data become health/medical data?" The issue of collecting older adults' health-related data with commercial-grade devices has also been flagged as a risk by industry representatives (Baxter, interview data, 2023). The fact that SHTs can be used to infer health data, even if not collected in healthcare settings, is an ongoing issue that requires further consideration.

SHT developers and related applications are working towards analyzing biometric data for more detailed user profiling. Voice-activated devices can infer mental and physical health data through voice analysis alone (Kröger et al., 2018). Through voice analysis, do smart speaker developers and third-party applications such as Spotify need to know whether a user has depression or any other mood disorder to deliver services? Combined with other datasets,

how might that sensitive information be used to target older users with specific content? As voice-activated technology gains popularity, commercial actors intend to further profit from voice analysis and sentiment in various ways (Turow, interview data, 2021). It follows that regulators should take a special interest in the ways that commercial-grade SHTs and wearables can be used to infer sensitive health data outside of medical facilities.

Surveillance Implications

As explored throughout previous chapters, marginalized or vulnerable groups or individuals tend to experience the most detrimental effects of surveillance systems (see Eubanks, 2018; Gilliom, 2001; Noble, 2018; Pasquale, 2021). In terms of age, the protection of children from corporate surveillance has been critically analyzed (Marx & Steeves, 2010) and is now regulated in the U.K. (Denham, n.d.), and California (Singer, 2022). Relatedly, Amazon has recently faced a class action lawsuit for collecting children's data without consent through Alexa devices (Rubin, 2019). However, beyond a few reports on the data broker industry that demonstrate discriminatory marketing practices toward older adults, further research is required. While not all older adults are vulnerable, those who are can be categorized by data brokers and marketers as "X-tra Needy" (Taube, 2013), "Suffering Seniors," and so on (Kuempel, 2016). Moreover, the discriminatory effects of ageism on older adults, in AI-decision making, for example, have yet to be thoroughly explored (Chu et al., 2022).

Chapter Six aimed to address this gap by analyzing the types of ads shown to older smart speaker users across the web. Through the creation of sock puppet accounts, ads

targeted at four user personas were analyzed to gain further insight into the types of advertisements that older smart speaker users are exposed to. Few ads were shown on the smart speakers themselves, beyond advertisements from Mayo Clinic, Alzheimer.ca, and Us Against Alzheimer's, each following inquiries about memory issues. YouTube Music or Amazon Music ads played on the smart speakers but did not appear targeted based on age, except for perhaps Specsavers prescription glasses on YouTube. Ads for paid subscription services to YouTube Music and Amazon Music, Canadian Tire, SportChek, and Kia Forte cars, seemed largely irrelevant to user activity or age.

However, TELUS Home security with a free Amazon Echo may have been targeted at older adults or smart speaker users. High-end real estate investment opportunities were the most prominent type of ads across accounts, which may have resulted from user age or the fact that users were profiled as middle-class or higher. On news sites, ads seemed relatively generic. For example, users received ads for Toyota trucks, Nissan cars, Equifax credit reporting, and Tourism Whistler. Eve was shown unique ads for Intel Pro laptops, Dayquil medicine, a lottery contest, and an insurance brokerage company. As the only male sock puppet account, Ronald's account showed unique results, such as for an alcohol distillery, Raid bug spray, "reducing belly fat" and an article for a missing WWII submarine. That account was also the only one to be shown obvious age-based ads for "senior living apartments," which is interesting because Google has banned housing ads based on age (Spencer, 2020).

Google ad profiles changed daily and consisted of various assumptions about user household income, education levels, marital status, interest, etc. Due to the complexities of RTB, the extent to which smart speaker data was used to create these profiles or deliver ads is difficult to discern, yet the accounts were only used for smart speaker activity and browsing the top news stories of popular news sites. These findings contrast with Iqbal et al. (2022)'s more extensive study where interest-based ads in various categories were promoted on Amazon Music and accounts were assigned varying bidding values by marketers.

Suppose older users or their online behaviours are still of little interest to advertisers as Turow suggested (interview data, 2020). This may soon change as older adults become further entrenched in the realm of SHTs (Twohig, 2021). Amazon is also pushing the development of Skills for older adults and Skills that enable targeted ads and voice-activated purchasing (Alexa Developers, 2022). Although experiment results were generally inconclusive as I did not have the resources for assessing marketing bids, further studies of this type should explore how older adults are valued by marketers on a large scale, especially those categorized under health and lifestyle interests.

Security Issues: Unexpected Data Recipients

As SHT data can infer sensitive information about users and their environments (Kröger, 2018; Sadowski, 2020; Zuboff, 2018), third-party Skills or Actions raise further security concerns (Edu et al., 2020; Cheng et al., 202; Iqbal et al., 2022; Rykov interview data, 2021; Young et al., 2022). This is concerning because without higher levels of transparency and accountability, it is

unclear how third parties exploit user data or for what purposes. It also raises concerns about data flows between private and public bodies. Both may have active interests in environmental and behavioural data from inside or around the home (Murakami Wood & Steeves, 2020). The home, the people in it, surrounding areas, and even cars all hold the potential for "smart" connection, video, audio, and sensor data recording, and with that, the potential for user data that may become accessible to law enforcement. Should older adults aging in place with SHTs also expect that third parties may use such data for unknown purposes by law enforcement in criminal investigations? Such downstream effects may not be fully considered by users or care partners. Although focus group participants mentioned the importance of keeping banking and medical data separate from their smart speaker accounts, the potential for smart speakers to share data with unexpected recipients may have negative implications for independent aging.

Conclusion: User-Centric Design and Data Justice

In conclusion, preliminary findings show that some community-dwelling older adults use smart speakers for health, care, companionship, and home security, all related to aging. Participants shared ways of navigating privacy boundaries and expressed concern over voice recordings and targeted ads. Online, smart speakers are also marketed in unique ways pertaining to aging and health, highlighting benefits while ignoring privacy and security risks. An informed user base is required because even if SHTs are used for care or health purposes, users are still subject to surveillance capitalism. Targeted education programs can help users become more informed in this area. While Terms of Use documents and privacy policies are generally

ignored (Obar & Oeldorf-Hirsch, 2020), devices configured by someone else may result in a lack of meaningful consent over data collection, use, and sharing. Due to the black-box nature of algorithmic decision-making and the complexities of RTB, the types of programmatic advertising that older adults receive online are still largely unknown. Overall, SHTs may help older adults age independently, but ethical issues related to privacy, autonomy, security, and discriminatory outputs require further consideration. Alongside user education programs, the following proposes two recommendations, user-centric design and a data justice approach to privacy regulation in the realm of older adults and SHTs.

User-Centric Design

Like most digital technology, commercial-grade SHTs are not specifically designed for older adults (Etkin, 2021), despite being marketed toward them. The broader definition of AgeTech, "the use of technology to support the health, independence and wellbeing of older people" (Sixsmith, 2022, p.1), may be less helpful here. Google and Amazon products may help support older people's health, independence and well-being in some ways but hinder autonomy and privacy in others. There is a difference between AgeTech funded by AGE-WELL, for example, which requires the inclusion of older adults in design (Sixsmith interview data, 2022) and commercial-grade devices built by companies with other goals. The former aims to improve the lives of older people. On the other hand, SHTs that are superficially repurposed or framed through marketing materials as AgeTech adjacent may collect and share more data than users expect. A more suitable definition of AgeTech could require an inclusive design

component, where older adults are involved in developing the smart technology they use, ideally making it more equitable, accessible and empowering.

However, despite their intrusiveness and inaccessible privacy controls, smart speakers may still be desirable due to their constantly upgrading features and extensive AI capabilities for back-and-forth conversations with voice assistants. Because Google and Amazon have access to massive user datasets to train their AI models, it would be difficult for a privacy-centric competitor to emerge while boasting comparable quality. Put simply; there is a growing market for government funded research that generates inclusive AgeTech to improve older people's lives (Kutney & Wilson, 2019). However, such projects are unlikely to have the financial or technological resources to compete with Google and Amazon at scale. Older adults may be faced with a difficult choice: to implement technology designed for them that collects and shares less data with commercial bodies or to select technology with more extensive features at the expense of their privacy and autonomy.

Big tech companies could implement user-centric design to help address some of the abovementioned issues. As has been outlined by Costanza Chock (2018), Winner (1980) and Sadowski (2020), design choices have varying political implications for groups of different intersections of identity. Too often, older adults are excluded from technology design, instead focusing on younger and more experienced users (Chu et al., 2022; Etkin, 2021; Helbostad et al., 2017). If the consideration of older users were included in all phases of the design processes of commercial-grade SHTs, including Terms of Use and privacy controls, overall accessibility

would likely be improved. Inclusive design practices could also help to ensure that such systems are not inadvertently excluding or disadvantaging older people through discriminatory outputs. Otherwise, SHT developers are likely to continue producing devices with inaccessible privacy controls and, in turn, undermining user autonomy. Developers should be incentivized to make SHTs more accessible to older adults, as privacy concerns are known barriers to adoption. Put simply, equitable and user-centric design could be good for business and good for users.

The current privacy choices for smart speaker users are limited or inaccessible. As suggested elsewhere (see Lau et al., 2018), nudging users to review privacy controls via voice command would be beneficial. Amazon offers such a feature that users can say, “Alexa delete my recordings” (Amazon Help and Customer Service, n.d.). However, this feature must be pre-configured in advance, which requires awareness of its existence and the knowledge that voice interactions are recorded. Further, even though deleting recordings can help protect user data from other household members, interaction responses still may be used to build user ad profiles (Rykov, interview data 2021). A more user-friendly set of design choices would not retain voice recordings by default, would offer periodic voice prompts in managing settings, and would restrict the commodification of user data for those using SHTs for care or health. An even more user-friendly set of choices would cease data collection for ads altogether.

Older adults could be consulted on their views about a caregiver mode that restricts the use of data for certain purposes. A caregiver mode could be embedded into the setup protocol

of any commercial-grade SHT. This way, whoever configures the device could be prompted with a question such as:

> Are you setting this device up for yourself or an aging adult for health care or home monitoring purposes? If so, enabling caregiver mode can automatically delete voice data and restrict the collection of data used for targeted advertising or personalized shopping recommendations.

This way, older adults would experience the benefits of using such systems while avoiding excess commercial profiling. Certain third-party Amazon Skills are already HIPPAA-compliant in the US (Kinsella, 2022), meaning user data is off-limits to commodification. However, most health-related skills do not fall under this protected category. Should a caregiver setting that ensures the highest standards of privacy and security be deemed unnecessary at a later date, the decision to enable it could always be revisited by older adults and care partners.

Data Justice: Invisibility, Disengagement, Anti-discrimination

Linnet Taylor's (2017) three pillars of data justice are instrumental in thinking through the abovementioned issues from a regulatory perspective. Data justice involves fairness in both visibility and representation regarding the outputs of digital data production (Taylor, 2017, p.1). Taylor argues that a strong visibility framework should involve the right to informational privacy, including risks of profiling for groups and socially marginalized people (Taylor, 2017, p.9). This includes meaningful user choices regarding representation, including the right to remain visible through data when it is beneficial to them and invisible when it is not (Taylor, 2017). For instance, users may be comfortable sharing smart speaker data with care partners or

healthcare providers but unwilling to share with commercial bodies. As shown by focus group participants in Chapter Four, algorithmic decisions based on behavioural cues may be acceptable, such as through Netflix content recommendations, but not in terms of targeted advertisements. A nuanced perspective would give users autonomy over when they want to be visible and to whom.

Taylor's (2019, p.9) second pillar, disengagement with technology, depends on two factors: "sharing in data's benefits" and "autonomy in technology choices." She notes the importance of having the freedom "not to use particular technologies" or to not "become part of commercial databases" (Taylor, 2019, p. 10). The point is that the ability of a user to engage or disengage with technology on their terms is essential to ensuring that SHTs are empowering older adults through enhancing autonomy. This recognizes the potential for SHTs to aid older adults at home or in other care settings but respects users' rights to engage with such technology on their terms. Viable and easily accessible alternatives should be provided for older adults who decide against disclosing certain types of information. Those who choose against using SHTs for aging in place should be presented with realistic and affordable caregiving alternatives.

The last pillar of Taylor's data justice framework, anti-discrimination, requires (1) "the power to identify and challenge bias in data use" and (2) "the freedom not to be discriminated against" (Taylor, 2019, p.9). This signals that companies must engage in more transparent data collection practices, particularly regarding data sharing, profiling, and the potential for bias. It is

difficult to assess the algorithms that sort and profile users from the outside (Pasquale, 2015), making it especially challenging and resource-intensive to hold companies to account. When researchers and regulators cannot directly access the types of ads certain groups of users see online, how can bias be assessed, challenged, or proactively prevented? User profiling can lead to discrimination geared toward older people (Carver & Mackinnon, 2020; Kuempel, 2016), who are already at an increased risk of harm from online scams (FBI, 2021). The potential for such biases should be preemptively avoided through an open and transparent dataset of targeted ads shown to older adults across the web, which would allow users, researchers, and regulators to assess and challenge discrimination in a preventative manner. It would also ensure that algorithmically driven content for older users is not exploiting vulnerable group members. This approach avoids the pitfalls of data protection regulation that require visible harms to be addressed individually and recognizes the implications that surveillance can have on groups (Leslie et al., 2022).

Regarding voice technology, "we are at point zero in time," (Turow, interview data, 2020). If so, education programs alongside user-centric design and a data justice framework could be the preventative measures needed to manage AI platforms in ways that prioritize the needs of aging adults over private sector monetary incentives. Data justice recognizes that certain groups experience varying benefits and harms of data-driven decisions, expanding beyond the narrow focus of the individual right to privacy. According to Lyon (2022, p.13), data justice and other such proposals, are essential because they "inform policy and regulation, as

well as public opinion, at a time when older policy concepts such as privacy and data protection (Puri, 2020) require careful overhaul". New and innovative thinking on this topic is important as AI capabilities are rapidly expanding and infiltrating various facets of everyday life.

Finally, while SHTs continue to gain in popularity among older adults and their ethical implications become more clearly defined, it is likely necessary to "make smart things strange and troubling again" (Murakami Wood & Steeves, 2020, p. 150) in the public imagination. As AI capabilities continue to unfold, we might find, as Turkle (2011) did, that we are asking too much from technology. Asking more from humans will require adequate funding and resources to undertake the high level of care needed for our expanding aging population. Whether Google and Amazon remain part of the equation, older adults deserve access to privacy-centric, autonomy-preserving and equitable technology. Without that, we are building a society that further empowers big tech companies at the expense of older adults' autonomy in their own homes. To that prospect, let us collectively say: "Alexa, that's enough."

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Appendix 1
Table 8: List of Expert Interviewees

Name	Role	Interview Date
Dr. Terri Fisher	Physician and Clinical Professor University of British Columbia; Founder of Voice in Canada and co-author of Voice Technology in Health Care.	June 18, 2022
Anonymous Electronic Frontier Foundation (EFF) employee	Cyber security and privacy researcher.	July 10, 2022
Dr. Kelly Ann Quinn	Communications professor at the University of Illinois who has recently developed two Google Home Actions for older people.	December 3, 2020
Dr. Joseph Turow	Robert Lewis Shayon Professor of Media Systems & Industries at the Annenberg School for Communication. Author of *The Voice Catchers: How Marketers Listen in to Exploit Your Emotions, Your Privacy, and Your Wallet* (2021).	December 14, 2020
Caitlin Lemiski	Senior Policy Analyst with the British Columbia Office of the Information and Privacy Commissioner (OIPC).	August 12, 2021
Misha Rykov	Mozilla Foundation: Privacy Not Included Guide researcher.	December 1, 2021
Jennifer Quaid	Law professor at Ottawa University; expert in technology and competition policy.	August 2, 2022
Anonymous legal expert	Canadian legal professional and competition policy expert.	August 15, 2022
Robin Shaban	Competition expert and former fellow at the Canadian Centre for Policy Alternatives and an officer at Canada's Competition Bureau.	August 10, 2022
Jenna Roddick	Manager of Operations for the	August 29,

Name	Role	Interview Date
	Advancing Policies and Practices in Technology and Aging (APPTA) research hub at AGE-WELL.	2022
Dr. Umar Iqbal	Postdoctoral Scholar at the Paul G. Allen School of Computer Science & Engineering University of Washington.	August 30, 2022
Dr. Frank Knoefel	Bruyère Memory Program; Senior Investigator; Ottawa University Faculty of Medicine Professor; Physician. Co-founder of the AGE-WELL National Innovation Hub on Sensors and Analytics for Monitoring Mobility and Memory (SAM3).	August 31, 2022
Dr. Bruce Wallace	Biomedical engineer; Adjunct Research Professor Carleton University and Affiliated Researcher; Bruyère Research Institute. SAM3 co-founder.	August 31, 2022
Dr. Andrew Sixsmith	Gerontology Professor at Simon Fraser University and Associate Director of AGE-WELL National Centre for Excellence.	September 1, 2022
Jodi Baxter	Vice President of 5G and IoT Connectivity at TELUS.	January 31, 2023
Matthew Holland	TELUS Senior Privacy Manager of Digital Health.	February 2, 2023

Appendix 2
Table 9: Marketing Themes and Codes

Theme	**Codes**
Affiliate Link	Affiliate link
Entertainment/Info	Audio book, games, jokes, music, news, videos, search engine, online shopping, Skills, traffic, weather, spirituality, or religion
Security	Call for help, drop in and check in features, Amazon Ring, nightlight, security features
Health/Wellbeing	COVID, medication reminder, positive affirmations, give caregivers a break, health, dementia and Alzheimer's, digital companion, exercise, meditation, stay independent
IoT/Home Control	Find your phone, home control, ride share, start your car
Organization/Reminders	Lists, manage calendar, other reminders, timers, routines, time, and date
Communication codes	Intercom, stay in touch
Privacy	Privacy mentions
Other	Cost, reviews from older adults, potential scam, device setup

Table 10: Marketing Themes

Themes	Description	Example Quote	Frequency of Mentions
Affiliate links	Commission gained when readers click the link to buy Amazon or Google products	"LetsSayThanks.com is a participant in the Amazon Services LLC Associates Program, an affiliate advertising program designed to provide a means for sites to earn advertising fees by advertising and linking to Amazon.com" (Matthews, 2020).	12
Entertainment /Information	Various entertainment or information uses for smart speakers	"They can play music, change the TV channel, turn on a video, read the news, or tell jokes. For some seniors, one of the biggest challenges to remaining independent is loneliness; virtual assistants can help pass the time, but also keep them in touch with what's going on in the world" (Lisa, 2018).	122
Health	Smart speakers could be helpful for various health-related reasons	"A great feature for anyone (but especially for seniors) is setting up Google Home to notify and remind you of events on your calendar or just daily events such as medication reminders, when a TV show is on, doctor's appointments, etc. This feature works well for adults who are dealing with some cognitive decline issues such as mild dementia" (Kane, n.d.).	81

Themes	Description	Example Quote	Frequency of Mentions
Security	The claim that smart speakers can be used as a home security device	"One of the best advances in home automation, particularly for seniors, is home security. Devices such as Echo, Google Home, and Cortana Invoke can be connected to motion detectors, security sensors, door locks, video doorbells, flood detectors, and security cameras, which can give older Americans a little bit more peace of mind" (Lisa, 2018).	38
Privacy	Mention of privacy	"Depending on the privacy settings of your account, your most common commands may be stored to help improve the experience you receive. This is much like Google will show you relevant advertisements based on your search history. If you don't want Alexa or Amazon to store your commands or your voice recordings, you can simply delete them from your profile at any time. Recent surveys have shown that many seniors are happy to keep their privacy settings open since it helps them to enjoy a much better, more personalized service" (Matthews, 2020).	17

Table 11: Marketing Codes

Code	Theme	Description	Web Pages	Mentions
Home Control	IoT/Home Control	Control Roomba/smart lights/air purifier/ Amazon Fire TV stick/ Google Nest thermostat/ home security systems etc.	18	27
Stay in touch	Communication	Send texts/make calls etc (Mastermind skill)	16	27
Health	Health/Wellbeing	Limited mobility due to Parkinson's, impaired vision, etc.	15	24
Call for Help	Security	Ask My Buddy skill (emergency)	16	22
Medication Reminder	Health/Wellbeing	Medication reminder	16	19
Music	Entertainment/Info	Spotify/YouTube	15	18
Other Reminders	Organization/Reminders	Walk the dog/appointments/alarms	14	18
Skills	Entertainment/Info	Third-party skills (not by Amazon or Google)	9	17
Privacy	Privacy	Any mentions of privacy	8	17
Weather	Entertainment/Info	Ask weather	12	15
Reviews from Older Adults	Other	Articles that include reviews from older adults who use smart speakers	4	14
Affiliate Link	Affiliate Link	Websites that explicitly disclose that they gain a commission when readers click link to	12	12

Code	Theme	Description	Web Pages	Mentions
		buy Amazon or Google products		
Online Shopping	Entertainment/Info	Amazon shopping	10	12
Audiobook	Entertainment/Info	Listen to audiobook	10	11
Lists	Organization/Reminders	To-do, shopping, gift lists etc	10	11
Games	Entertainment/Info	Trivia, jeopardy, etc.	7	10
Jokes	Entertainment/Info	Ask for jokes	10	10
News	Entertainment/Info	Daily news	9	10
Digital Companion	Health/Wellbeing	For people who are lonely or who often repeat the same question (they never get bored or annoyed).	8	10
Search Engine	Entertainment/Info	Find information using Bing or Google	9	9
Drop In/Check In	Security	Sends an email when user gets home safely	7	8
Dementia and Alzheimer's	Health/Wellbeing	Reminders	5	7
Find your Phone	Organization/Reminders	Find lost items	5	6
Rideshare	IoT/Home Control	Order Uber/Lyft	5	6
Traffic	Entertainment/Info	Traffic conditions	5	6
Cost	Other	Cost of device	5	5
Intercom	Communication	Use multiple devices to communicate to family in other rooms of the house	4	5
Manage Calendar	Organization/Reminders	Add events to calendar	4	5
Time and Date	Organization/Reminders	Ask for time/date	4	5
Exercise	Health/Wellbeing	Follow exercise program	3	5
Stay Independent	Health/Wellbeing	Claims that smart speakers can help	5	5

Code	Theme	Description	Web Pages	Mentions
		older adults stay independent		
COVID	Health/Wellbeing	Ask for updates	3	4
Nightlight	Security	Ask Alexa to light up so you can find your way to the bathroom	3	4
Routines	Organization/Reminders	Morning routine (e.g., turn on lights, news/weather/ reminders)	4	4
Security Features	Security	Third-party apps (alert loved ones if the sound of breaking glass, play “dog barking” to deter robbers, etc.)	3	4
Videos	Entertainment/Info	YouTube	2	3
Meditation	Health/Wellbeing	Guided meditation	2	3
Device Setup	Other	How to Install	2	3
Positive Affirmations	Health/Wellbeing	Daily dose of encouragement from Daily Morning Affirmations skill, etc.	1	2
Caregivers Break	Health/Wellbeing	Give caregivers a break	2	2
Amazon Ring	Security	Security cam/doorbell	1	1
Timers	Organization/Reminders	Cooking	1	1
Start Your Car	IoT/Home Control	Automatic starter	1	1
Potential Scam	Other	The potential for Alexa to connect users to a scammer instead of actual business	1	1
Spirituality/Religion	Entertainment/Info	Apps for reading the bible, etc.	1	1

Appendix 3

Figure 1: Targeted Ads