Contextualizing Privacy for Older Adults in Canada: Work in Progress

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ABSTRACT

Aging in place is a strategy for healthy aging that centres on the need to support older adults in their own homes. As the Canadian population ages, the importance of properly supporting healthy aging in the home is becoming critical. Among other needs, the privacy concerns and considerations of older adults become important as they consider networked devices in the home (for health or any other reason), the presence of caregivers (whether family, friends, or paid support), and the challenges of managing their online presence. In this work in progress, we are conducting a survey of older adults in Canada, asking about how they access the internet, the activities that they undertake online, where they look for support, and their privacy perceptions and concerns. The results of our survey will be interpreted based on the Contextual Integrity Theory model of privacy and used to inform a deeper investigation of the privacy considerations of older adults in their home.

CCS CONCEPTS

• **Security and privacy → Human and societal aspects of security and privacy**.

KEYWORDS

privacy, older adults, contextual integrity

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1 INTRODUCTION

"Aging in place" is a strategy for healthy aging that centres on the need to support older adults in their own homes [22]. It is recommended as the best practice for older adults' mental, physical, and social health. Moreover, technological innovations such as smart home devices offer an opportunity for technology to support older adults as they age in place.

However, as more transactions, interactions, and services take place online, computer security and privacy become important concerns for seniors living at home. Older adults are asked to manage increasing interactions with technology for everyday tasks (such as bill payments), and to manage greater amounts of personal data online, creating a substantial privacy risk. In addition, aging in place may involve other contextual factors that affect privacy, such as the presence of paid or unpaid caregivers in the home.

Although older adults are often considered to be technologically inept, older adults use of technology continues to increase [5]. However, privacy concerns and lower self efficacy in privacy and security management is still one of the main reasons for older adults' lower acceptance and adoption of new technologies [17].

Defining privacy can be a challenging task. Many studies in computing and even legal policies often use a static binary definition: a piece of information is either sensitive and private, or non-sensitive and public [2, 10]. Yet, privacy is fluid and dependent on cultural standards, individual preferences, and context [10]. Sharing information that can be considered "sensitive" will only constitute a privacy violation if it follows an inappropriate information flow [10]. On the other hand, an appropriate flow occurs when contextual norms are met. Canada is well known for its multicultural population, so understanding its older adults' privacy contextual norms is essential in the development of assistive technologies to support aging in place.

In this work, we are following the Contextual Integrity theory model of privacy [13] to investigate the concerns and challenges affecting the Canadian population of older adults' privacy in the home. What kind of technologies are being used by these older adults, and for what purposes? Who are they turning to for help, and what are their primary concerns around privacy? What tools and strategies are they using to mitigate those concerns? In what

ways do contextual factors affect the privacy concerns of older adults? Lastly, what are their appropriate information flow norms and what constitutes privacy violations? Our goal is to help support successful and healthy aging in place.

2 BACKGROUND

Considering privacy in the context of aging in place brings together multiple threads of research on older adults technology use habits, their existing privacy concerns and mitigation strategies, and the specific interaction between the home context of use and these privacy concerns. In the following sections, we review research in each of these topics.

2.1 Older Adults' Technology Use

Older adults are often assumed to be technologically-illiterate and technology-adverse, making them prime targets for online scammers, and neglectful of their own security. However, the gap between internet use by seniors and non-seniors has been steadily declining over the past decade, with higher levels of internet use in the younger categories of older adults [5].

Although the gap is closing, a digital divide still exists between young and older Canadians: being a senior remains the strongest predictor of being a non-user or a basic-user of online activities [21]. This digital divide is the result of historical circumstances relating to developments of computer technology, changes in education, and evolving career roles (particularly for women [17]). The divide is not reflective of the aging process itself, whereby disabilities only account for 1% of Canadian seniors not using the internet, and the digital divide is lessening over time [5]. The expectation is that this trend will continue, and that coming generations of older Canadians will have access to more technological tools, and greater skills for using them.

In Canada, smartphones are now the most common method by which older adults access the internet [1], with 60% owning a smartphone in 2018 [4]. Longitudinal studies from the Canadian Internet Registration Authority [1] show that while the use of mobile phones as a device for accessing the internet leveled off in 2019 for most age ranges, it continued to rise for adults 55 and over. Additionally, online access via connected home devices (such as televisions) is continuing to increase [1].

The growth of online services (particularly following the COVID-19 pandemic), has pushed the overall population to increase their technology use for day to day tasks [16]. Technology adoption was a significant mitigation strategy for social isolation, especially for older adults who faced a higher health risk in contracting the virus [7, 8]. Haase et al. [7] found that 90% of their 65+ respondents in Canada were aware of technologies for social connection, 56% had changed their use due to the pandemic, and 55% had adopted new technologies to help them stay socially connected and access general services. The increase in technology adoption among older adults following the pandemic is an example of how it can assist aging in place.

It is important to note that although the digital divide has been decreasing, older adults' adoption (or non adoption) of technologies is influenced by factors such as education, income, health and social aspects [6, 7, 16]. Financial conditions, lack of knowledge (or support to learn), and physical barriers can be determinants in older adults' interest, decision, and success in using new technologies. Social aspects seem to often serve as the primary catalyst for older adults' adoption and use of technology.

2.1.1 Social Influences on Technology Use. Older adults' technology use is strongly influenced by their social context [11, 20]. Family members, for example, often introduce seniors to new technologies and support them in learning how to use it [20]. Older adults will also engage in games and new applications to interact with their grandchildren and other family members [6, 11, 20]

Friends and romantic partners, on the other hand, are often companions for new experiences. The technology used within the context of this group is based on the desire to interact, explore new activities and ideas, or expand social networks by engaging with social platforms and dating websites [6, 11, 20].

Older adults are also using technology to connect with hobbies and interest-based groups, and use technology as a facilitation tool to share knowledge and information [11, 20]. Finally, location-based and shared-identity groups promote emotional connection to their communities. Technologies in this context can be used as channels to provide and receive support [11, 20].

2.2 Privacy and Older Adults

The full potential of technologies for aging in place can only be reached if they are accepted and adopted by their intended users, making an understanding of older adults' privacy needs essential. Such technologies vary in their nature and can collect a variety of different types of data. For example, wearables can collect orientation, movement, and vital signs; context-aware systems use sensors, image capture, computer vision, and Artificial Intelligence (AI) to monitor activities and detect anomalies; dynamic care robots can make use of sensors and cameras. Moreover, most of these technologies are connected through Wi-fi, Zigbee, or similar protocols, which are integrated with context-aware sensors in a larger ecosystem, resulting in the possibility of extensive monitoring and surveillance [6].

Although there is a growth in technology use by seniors, one of the main reasons for the low acceptance and adoption of technologies for aging in place is the lack of trust and perceived privacy violations that these technologies represent to older adults [17]. Additionally, security and privacy practices are often viewed by older adults as complicated, unnecessary, and a source of anxiety and stress, leading them to either neglect privacy and security behaviors, or delegate their responsibilities to others [12, 15, 18].

Moreover, according to Schomakers and Ziefle [17], older adults show more caution and less acceptance of being monitored through technologies in comparison to younger adults. Even though older adults are willing to accept privacy trade-offs if it means more autonomy and independence, they still feel strongly about the importance of having control over their personal information.

2.3 Privacy Concerns

A 2019 study by Frik et al. [6] suggests the main privacy concerns of older adults when interacting with technology can be classified within Solove's taxonomy [9]: "Information Collection" (concerns regarding the lack of transparency of technology's data collection);

"Information Processing" (concerns with "user profiling," spams, and fraud), "Information Dissemination" (concerns with their data being sold for profit or disclosed for malicious purposes), and "Privacy Invasion" (concerns with victimization based on information sharing).

Similarly, Quan-Haase and Ho [14] observed that older adults' privacy concerns online could be categorized as "social concerns" (fear of losing control of personal information flow and desire to keep the details of their lives private), "institutional concerns" (concerns with how private and governmental organizations can use their personal information, such as selling it to third parties, intrusive marketing, unauthorized use of their credit card numbers), and "security-privacy concerns" (fear of threats to their safety, such as hacking, identity theft, and scams).

2.3.1 Contextual Factors. Older adults' privacy concerns are affected by different contextual factors, including social relationships, health conditions, and a sense of personal responsibility.

Mcneill et al. [11] studied older adults' sharing preferences according to their social groups. They found that older adults' preferences to share information with others were more influenced by their individual relationship with the information recipient rather than the social group the recipient belongs. In other words, the main privacy concerns and possible violations were not related to strangers finding information about the user but the risk of close family and friends discovering the information they were not meant to learn. These findings are echoed by Shankar et al. [18] 's finding that older adults may be willing to share data with some family members but not others.

Mcneill et al. [11] studied older adults' willingness to share health and mood information with others. They found that older adults were generally concerned about sharing mood information that would cause others to feel obliged to respond or provide support immediately [11]. They did not want to cause unnecessary alarm to their loved ones and wanted autonomy and privacy to deal with their negative emotions alone. However, same older adults perceived general health information as less sensitive than mood information [11]. Talking about health conditions with peers was seen as a way to cope with the situation and/or receive and provide support.

Health information is still considered a delicate topic around family members (especially adult children) [18]. Nevertheless, older adults are generally more open to sharing their health information with healthcare providers [6], as the perceived benefits from doing so are higher than not sharing, and the information follows the expected flow.

2.4 Mitigation Strategies

Some older adults exhibit a generally pessimistic attitude toward their ability to mitigate privacy risks, and attribute their lack of ability to their age [6]. Their solution is either to "live with it" or avoid using technology altogether [6, 12, 17]. Others, however, are active towards protecting their data and demonstrate both passive mitigation strategies (choosing services and devices based on good reputation and brand image), and active mitigation strategies (configuring privacy and authentication settings, adopting protective software and services, or refusing to provide personal information) [6, 14].

Regardless of the strategy, most older adults demonstrate a lack of knowledge about the effectiveness of their mitigation strategies. This can result in seniors not knowing the effectiveness of what they are doing to protect themselves, or feeling overly confident due to lack of knowledge [6, 12]. When they are not very concerned about privacy due to a belief that they have "nothing to hide," older adults overlook potential material and financial damage that goes beyond the damage to their reputation [6]. Moreover, they show misconceptions of the extent of data deletion as they are not aware that deleted files can be recovered after deletion. These misconceptions are often related to older technologies, with beliefs that the "data is overwritten" or "recorded on top of old data" [6].

2.5 Contextual Privacy Trade-offs

Privacy concerns can vary within older adults' social groups contexts. Mcneill et al. [11] noticed that older adults can have different privacy concerns when sharing information with two individuals from the same group. These concerns are often related to the nature of their individual relationship and personality characteristics, instead of the group itself.

The context of use is also the main factor for the privacy trade-offs. Older adults who are willing to trade off their privacy the most, are the ones with more fragile health and in need of more frequent healthcare support [6, 17]. For example, seniors living in assistive facilities often report anxiety and annoyance regarding the "care surveillance," but believe that this is a necessary trade-off and are resigned to giving up their privacy in exchange for safety [6]. Older adults who are aging in place also show similar attitudes towards the balance of privacy and the benefits of care surveillance [6].

Schomakers and Ziefle [17] studied the difference between the perceived acceptance of technologies for aging in place by younger adults (when imagining their future selves) and older adults. They found that younger adults were more willing to trade off their privacy for the benefits of such technologies. In contrast, older adults showed more caution and self-determination in not accepting these technologies. It is unknown if this is related to a generational difference (as younger adults are more accustomed to their privacy), or if older adults are generally more sensitive to feeling "monitored" and "taken care of" by others. However, the older adults' perceived acceptance was higher if perceived autonomy was associated with the technology [17]. This result corroborates Townsend et al. [19], who observed that older adults are more willing to trade off their privacy for autonomy and independence.

3 SURVEY STUDY

As a first step towards understanding older Canadians' technology use and how it intersects with privacy concerns while aging in place, we are conducting a survey study. Our survey is designed to explore respondents' experiences with technology, their privacy concerns, and the social and contextual norms that may play a role in these experiences and concerns.

The survey is divided into five sections: demographics, activities of daily living, technology use, support for technology, and security and privacy. We asked about older adults' security and privacy

concerns, but also their technology use to get a sense of potential privacy violations being overlooked by participants (for example, in data leakage from IoT devices).

Since our interest is in understanding the contextual factors affecting privacy, we asked questions to understand what kind of activities older adults use technology for, who supports them, and the purpose of their use. In addition, we asked about the type of home they live in, their current occupation, their education, health status, and linguistic and cultural background.

For technology use, we asked questions about what types of devices are used, and where people access the internet. We also asked about smart home and IoT devices, and about changes in technology use following the COVID-19 pandemic. Regarding privacy, we asked questions around people's concerns about online threats, and the types of data recipients (individuals vs institutions) that concern users. Additionally, we asked questions about different types of data, and privacy considerations relating to them.

Since we know that people can have a multiple simultaneous practices, and conflicting privacy habits and concerns, we designed our questions to try to capture multiple responses. The majority of our questions are asked as Likert scales of frequency rather than yes/no questions to allow participants to express the complexity of their situations as much as possible.

3.1 Methodology

Our survey will be distributed online on Qualtrics. For any participants who are interested in participating but do not wish to take the survey online, we offer the option to schedule a phone call with the researchers and have the survey questions asked out loud to them. The survey will take about 15 minutes to complete, and respondents will be paid 5 CAD gift card to a coffee shop of their choice.

3.2 Participants

We plan to recruit Canadian adults aged 65+ who are not living in assisted living facilities. Our goal is to survey adults across Canada, starting in the Ottawa, Waterloo, and Fredericton regions, and expanding outward from there. In the next phase of the study, we will translate our questionnaire into French in order to reach the francophone population.

We will recruit participants with notices posted to online community groups, as well as in-person community centres, seniors centres, and libraries. We will also use a snowball sampling technique to ask respondents to send the survey link to any of their contacts who might be willing to participate.

3.3 Analysis Plan

In addition to descriptive analysis, our intention is to analyze our data to look for correlations between contextual factors and privacy concerns. We plan to investigate the correlation between various study elements, such as demographics and privacy concerns, contextual factors and concerns regarding data sharing, and technology use and privacy concerns.

4 CONCLUSION AND FUTURE WORK

In general, the literature suggests that privacy concerns of older adults are impacted by age, socioeconomic factors, and health indicators. Older adults either do not engage in privacy-managing behaviors out of anxiety and stress or delegate such tasks to others. They also express concerns over monitoring, access, and information sharing, which can be somewhat alleviated due to context (via privacy trade-offs). Practices, concerns, and mitigation strategies are similarly dependent on socioeconomic concerns and connected to community and culture. Yet, issues that older adults face might not always match their perceptions of the problem.

Although different contextual characteristics are often mentioned in the literature as important aspects of privacy concerns and attitudes among older adults, there is still a lack of studies grounded in contextual privacy concerns for this demographic. Privacy is not a static behavior, and a simple set of contextual characteristics are not enough to describe it [2].

Additionally, cultural contexts and social norms of privacy have yet to be studied in the Canadian population of older adults [10]. Canada is known for its multicultural population characteristics and high rates of immigration, both current and historical. The 1931 census showed that 22% of the Canadian population at the time were foreign-born [3], and the 2021 census showed that 23% of the population had immigrated to Canada [3]. With such a diverse cultural background, it is important to consider the impacts to privacy concerns, attitudes and experiences of seniors living in Canada.

We believe Contextual Integrity theory [13] can offer a more applicable privacy model to understand older adults' privacy and information flow norms. Using this theory to interpret the results of our survey, we hope to better understand how assistive technologies can fit into older adults' private lives in order to support them in aging in place.

Finally, this study will help us understand older adults' privacy concerns within the context of aging in place. By understanding these concerns, we can develop strategies to address them effectively. Following on the survey study described here, we plan use our results to frame future qualitative work investigating more detailed questions about what constitutes privacy for older adults, and how we can support older adults in ensuring that their information follows appropriate flow for their context of aging.

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