"Woe is me:" Examining Older Adults' Perceptions of Privacy

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ABSTRACT

We conducted a study of $n = 20$ older adults to better understand their mental models for what the term 'privacy' means to them in both digital and non-digital contexts. Participants were asked to diagrammatically represent this information and describe their drawings in a semi-structured interview setting. Preliminary coding analysis revealed participants' frustrations with available methods for addressing privacy violations. While some asserted that there are both good and bad uses of private data, others avoided technology as a whole out of privacy fears or ambivalence towards using web-based banking and social media services. Some participants described fighting back against privacy attacks, while others felt resigned altogether. Our study provides initial steps towards illuminating privacy perceptions of older adults and can have impacts on training and tailor design for this important demographic.

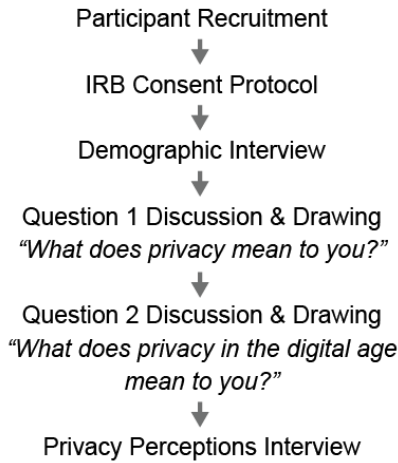## KEYWORDS

Usable privacy; Older adults; Mental models;

Participant Recruitment
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IRB Consent Protocol
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Demographic Interview
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Question 1 Discussion & Drawing
"What does privacy mean to you?"
↓
Question 2 Discussion & Drawing
"What does privacy in the digital age mean to you?"
↓
Privacy Perceptions Interview

Figure 1: Study procedure

Part. No.	Age	Gender	Disabilities	IT Background
1	73	Female	No	Yes
2	60	Male	No	Yes
3	58	Male	Psych. Issues	Yes
4	67	Male	No	Yes
5	68	Male	No	Yes
6	69	Male	No	No
7	67	Male	No	No
8	70	Female	No	No
9	61	Female	High BP	No
10	74	Male	Hip Replaced	No
11	65	Female	No	No
12	83	Female	No	Yes
13	66	Female	No	Yes
14	65	Male	No	No
15	64	Female	No	Yes
16	71	Female	Depression	Yes
17	71	Female	No	Yes
18	70	Female	Vision Problem	No
19	72	Male	Dyslexia	Yes
20	80	Male	No	Yes

Table 1: Demographic Information

INTRODUCTION

Perceived privacy deals with the degree to which an individual believes that they control their own private information, even after the information has been disclosed to others [1]. The term "privacy" is often associated with protection of data. However, it can also refer to an individual's personal space. Older adults may contribute to and gain from technological advancement, but are often more disconnected than other age groups from information and communication technologies [12]. While fraud against older adults does not appear to occur at higher rates [10], prevalent age-related cognitive, psychological, and physical correlates to fraud and privacy attacks make older adults a vulnerable target, and widespread privacy attacks occur [3].

Researchers have examined mental models of privacy among individuals of varying ages [7]. However, there has been limited focus specifically on the perceptions of older adults who may have had differing levels of exposure to or education with technology compared to studies undertaken with younger demographics. As a population, older adults are less likely to be well-informed and aware of the various privacy violation possibilities and the measures they can take to protect themselves from attacks [4]. Privacy threats and violations come in various forms. While one may consider personal details being stolen as a privacy threat, others may think of phone scammers and email spammers. To further understand their mindset and cast a broader net to encompass a variety of privacy threats, we inquired on how they perceive the concept of privacy, following a protocol adapted from [7].

We present our preliminary results, including three main findings and seven axial codes, which encompass the beliefs, opinions and fears carried by older adults about privacy attacks and measures against them. Our findings include:

- Although understood to be essential to individual autonomy, privacy may sometimes need to be balanced with valid societal interventions (e.g. health and law enforcement protections).
- Either fear of privacy attacks or a lack of interest altogether results in shying away from using technology, online services and social engagement, and personal devices.
- The perceived vulnerability of private information leaves many older adults feeling either fearful, frustrated, or resigned.

From this study, we aim to contribute towards a deeper understanding of the perceptions of older adults relating to the general concept of privacy and how this has impacted their interactions both with technology and with the world. Implications arising from the work include addressing concerns through design of products and systems, along with the use of tailoring. Older adults are known to struggle more with personal devices [12], managing personal data [8], and authentication [6] than other age groups, and their struggles can be seen as valuable and unique concerns [5] to be integrated in future designs.
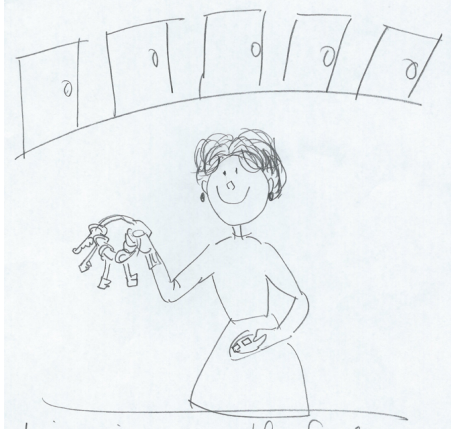
Figure 2: p01's drawing of their sense of personal privacy, including barriers (locked doors) to control access. Captioned, "I imagine a world of doors to allow me to open/close with keys I possess."

RELATED WORK

A range of studies have been conducted to examine privacy perceptions and behaviors among multiple age groups [4, 9, 11, 13]. For example, Wu et al. [13] explored mental models of encryption, focusing on how it works, and how it impacts daily lives. Schomakers et al. [11] elicited mental models of internet users for privacy protection. While these studies implement mental models to understand various technical aspects of security and private data, we endeavour to determine how individuals perceive the concept of "privacy" itself, using similar mental model methods.

We designed our study to replicate the methodology of the study by Oates et al. [7]. The researchers aimed to classify and categorize mental models on the basis of various metaphors, contexts, and comparisons to real-life applications, thus shedding light on how perceptions of privacy can be mapped to be real issues. While Oates et al. studied participants from various age groups and established their findings using mental models, our study focuses *specifically* on older adults and their specific mindset with respect to the concept of privacy. Older adults appear to be a target for scams and other privacy attacks. Cognitive and physical decline [6] and their lack of exposure to the saturation of technology and social media leaves them isolated from appropriate security measures, which would otherwise keep their private information safe [8]. Perceived barrages of scam calls, spam emails, phishing and identify theft overwhelm them and leaves them vulnerable. By studying older adults, we gain insight into how they feel about this enigmatic concept of privacy and their level of awareness.

METHODOLOGY

An illustration highlighting the steps taken to conduct the study is shown in Figure 1. Once posed with the question of "what does privacy mean to you" in digital and non-digital contexts, participants were asked to diagrammatically represent these concepts, and label their two drawings as they saw fit. The thoughts of an individual may be internalized and may not be conscious. Mental models can act as a lens through which an individual sees an object or a concept. A combination of verbal and graphical techniques which involves asking the participant to draw their thoughts allows for a more holistic presentation [2]. If the participants were not comfortable with drawing, they were asked to explain what they envisioned to the researcher, who would in turn illustrate concepts based on the participant's behalf. The participants were then asked to explain the drawings to the researcher. The explanations were annotated on the drawing with a differently colored pen. Obviously participants' artistic skills varied, producing some disparity in the level of visual detail in the captured mental models. Investigator help with drawing and follow-up discussion were intended to alleviate potential misunderstanding about drawn content.The follow-up interview questions asked about their experience with the Web, confidence in maintaining privacy in digital and non-digital contexts, their thoughts about maintaining privacy for different age groups, and past experiences involving privacy violations.

Figure 3: p01's drawing of their sense of digital privacy, captioned, "Woe is me in a digital privacy sense." It depicts her beset by privacy threats (e.g. criminals, her own vulnerable data, technology companies, etc.).
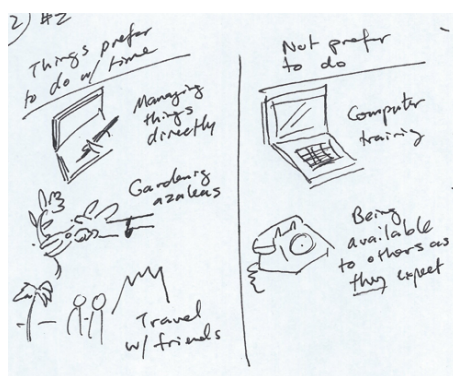

Figure 4: p12's drawing of their sense of personal privacy, showing, at left, the interests they prefer (managing a checkbook, gardening, travel) separated from, at right, tasks they wish to avoid (learning technology and answering sales calls).

Twenty older adults (60 years or older), described in Table 1, were recruited from a local Senior Center in a suburban area known for its diversity in both ethnicity and socio-economic status. Recruitment flyers were used to advertise the study. Interviews lasted between 20-45 minutes.

PRELIMINARY ANALYSIS AND DISCUSSION

Our analysis method required two coders to perform inductive thematic coding on the drawings, focusing firstly on the terms and visual constructs used by participants. Those lengthy lists of highly literal codes were then progressively refined by each coder to describe the drawings' meanings and thematic content. These lists were then compared and de-duplicated to agree upon a set of five axial codes for drawing content. The codes are intended to be mutually exclusive conceptually, but it was common to have multiple codes apply to one drawing.

Axial codes for drawing content. The seven axial codes (see Figure 5) focused mainly on drawn depictions of fear and frustration towards perceived privacy invasions, such as constant telemarketing phone calls and spam emails that were generally deemed suspicious and manipulative. This included either their personal feelings of fear or anger towards privacy invasions (code 5, n=18, see Figure 3), their perception of the general amount of privacy risk (code 6, n=7), or their methods for protecting themselves. Those protective methods included self-imposed restrictions for using technology (code 4, n=12), or barriers for privacy protection (code 3, n=27). Participants also described avoiding technology as much as possible (code 2, n=3). Other codes involve the equivocation felt regarding privacy issues, such as identifying both legitimate or exploitative privacy invasions by society (code 1, n=6) or the positive and negative privacy implications of online family interactions (code 7, n=6).

Visual constructs. A number of visual constructs were used by participants when expressing the seven identified axial codes. These included different types of barriers for protecting their privacy, such as castle walls, padlocks, and bathroom stalls, and messaging devices for warning away interlopers such as stop signs. Participants also drew shredders and delete buttons obfuscating their personal data, and drew piles of documents to show their preference towards paper-based record keeping over untrusted online practices. They also vividly depicted the activities they preferred to being occupied online, such as trimming azalea bushes in their garden (Figure 4).

Code features. One important distinction was whether drawings were meant to describe the personal feelings or experiences of participants, versus their view of how privacy functions in society generally. Perceptions of both of these features were mostly, but not exclusively, negative. Participant 12 described her aversion to using web services for financial transactions, fearing she "might hit the wrong button and not be able to undo." Similarly, Participant 06 stated, "Lord knows what they have [personal data held by third parties]... who knows how they got it." In contrast, a small minority described positive feelings towards facets of online interaction, noting easier family communication (n=5) and access to

1. *Society has good and bad uses or private data* (n=6). Drawn portrayal of society's positive uses (lawful health and security interventions) and bad uses (scams and exploitation) of private data.

2. *Avoid technology engagement* (n=3). Portrayal of personally avoiding technology because of fear or complacency/disinterest.

3. *Barriers for maintaining privacy control* (n=27). Portrayal of methods for maintaining privacy, including use of barriers (e.g. walls, doors, and locks) to protect privacy.

4. *Restrictions for maintaining privacy control* (n=12). Portrayal of restrictions on behavior or technology use (e.g. limiting time online or information sharing, using fake profiles, and using paper records).

5. *Feeling personally targeted/frustrated by privacy invasion* (n=18). Portrayal of personal feelings towards privacy threats including fear, resignation, and anger.

6. *Feeling private data is generally vulnerable online* (n=7). Portrayal that online personal data is vulnerable, producing feelings of fear and resignation.

7. *Family interaction* (n=6). Portrayal of family interaction, viewed either positively (as help with technology or motivation to engage online), or negatively (wanting to avoid burdening others).

Figure 5: Preliminary axial coding of visual content of participants' drawings

information. p19 contrasted the "joy" he felt when he first accessed online libraries, with his "sense of real fear" that his personal information could be compromised online.

Related findings. In comparison to the related work of Oates et al. [7], we see a number of closely related concepts. Participants of both studies often featured descriptions of privacy as control of personal data. This included imagery conveying that privacy is unobtainable and 'hopeless.' Both also often showed a 'public and private divide' separated by similar representations of barriers that control private data flow, such as walls and doors (see Figure 2). Our participants did frequently show either entry barriers or out-of-control in-flows of spam or telemarketing phone calls. This may be a facet of our cohorts' older demographic, which often described feeling especially targeted because of their age, and in some cases feared becoming more vulnerable to fraud with cognitive decline. However, the authors ([7]) looked more towards distinguishing mental models which contained visual symbols, privacy contexts and privacy metaphors, rather than specific indications of fears and/or frustrations felt by targeted individuals. This included locks, cameras, hearts (indicating love), context codes such as family indicating closeness and intimacy, or a crowd indicating lack of privacy. Moreover, their paper showed results leaning towards the fact that most participants are more worried about privacy depicted as an individual, rather than a collective concept, as opposed to our findings which show that this specific age group also shows concern for how society uses private data. While some of our findings are similar to that of Oates et al., we aim to extend their work *specifically* featuring older adults' concerns about private data usage.

IMPLICATIONS, CONTRIBUTIONS AND FUTURE WORK

Our preliminary analysis indicates older adults feel that privacy attacks are a threat impacting their digital activities. They described numerous privacy fears and protective measures they have adopted. These measures include using barriers for both protection and of control of personal data. Conversely, others felt overwhelmed and incapable of fighting back against by privacy attacks. They expressed their fear of scams and frustration with suspicious emails. Besides individual privacy concern, they also feared misuse of private data by society as well.

Discovering these fears carried by older adults' brings into question the level of transparency of various applications and social media networking sites. Clarifying transparency in an intuitive and user-friendly approach could help alleviate some concerns held by older adults. Some misconceptions about privacy which reside in their perception of privacy leads us to believe that awareness could be increased by training older adults in the benefits and importance of using privacy measures. Certain applications, which may more commonly be used by older adults (e.g., Medicare), may require trust from its users. Encouraging users to use stronger passwords and ensuring that their privacy is safe may help users build trust with the application.

The approach of diagrammatically representing perceptions of privacy proved to be fruitful, leading to rich information which could then be coded. An additional round of coding is being performed upon the discussion portion of the interviews that occurred while the drawings were made. These observations should provide useful points of comparison to the drawing-related axial codes and conclusions from related researchFurther work will also be conducted contrasting perceptions with those of younger adults with limited knowledge of data security/privacy, with a view to identifying the ways that implications should be formulated to support multiple user groups.

REFERENCES

[1] IGI Global. 2018. What is Perceived Privacy. https://www.igi-global.com/dictionary/perceived-privacy/53721. (2018). Accessed: 2018-12-24.

[2] Robin S Grenier and Dana Dudzinska-Przesmitzki. 2015. A conceptual model for eliciting mental models using a composite methodology. *Human Resource Development Review* 14, 2 (2015), 163–184.

[3] Bryan D James, Patricia A Boyle, and David A Bennett. 2014. Correlates of susceptibility to scams in older adults without dementia. *Journal of Elder Abuse & Neglect* 26, 2 (2014), 107–122.

[4] Ruogu Kang, Laura Dabbish, Nathaniel Fruchter, and Sara Kiesler. 2015. "My data just goes everywhere:" user mental models of the internet and implications for privacy and security. In *Symposium on Usable Privacy and Security (SOUPS)*. USENIX Association Berkeley, CA, 39–52.

[5] Andrew McNeill, Pam Briggs, Jake Pywell, and Lynne Coventry. 2017. Functional privacy concerns of older adults about pervasive health-monitoring systems. In *Proceedings of the 10th International Conference on Pervasive Technologies Related to Assistive Environments (PETRA '17)*. 96–102. http://doi.acm.org.proxy-bc.researchport.umd.edu/10.1145/3056540.3056559

[6] James Nicholson, Lynne Coventry, and Pam Briggs. 2013. Age-related performance issues for PIN and face-based authentication systems. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*. 323–332. http://doi.acm.org.proxy-bc.researchport.umd.edu/10.1145/2470654.2470701

[7] Maggie Oates, Yama Ahmadullah, Abigail Marsh, Chelse Swoopes, Shikun Zhang, Rebecca Balebako, and Lorrie Faith Cranor. 2018. Turtles, locks, and bathrooms: Understanding mental models of privacy through illustration. *In Proceedings on Privacy Enhancing Technologies* 2018, 4 (2018), 5–32.

[8] Anabel Quan-Haase and Isioma Elueze. 2018. Revisiting the privacy paradox: Concerns and protection strategies in the social media experiences of older adults. In *Proceedings of the 9th International Conference on Social Media and Society (SMSociety '18)*. 150–159. http://doi.acm.org.proxy-bc.researchport.umd.edu/10.1145/3217804.3217907

[9] Karen Renaud, Melanie Volkamer, and Arne Renkema-Padmos. 2014. Why doesn't Jane protect her privacy?. In *International Symposium on Privacy Enhancing Technologies Symposium*. Springer, 244–262.

[10] Michael Ross, Igor Grossmann, and Emily Schryer. 2014. Contrary to psychological and popular opinion, there is no compelling evidence that older adults are disproportionately victimized by consumer fraud. *Perspectives on Psychological Science* 9, 4 (2014), 427–442.

[11] Eva-Maria Schomakers, Chantal Lidynia, and Martina Ziefle. 2018. Hidden within a Group of People-Mental Models of Privacy Protection.. In *Internet of Things, Big Data and Security*. 85–94.

[12] Neil Selwyn. 2004. The information aged: A qualitative study of older adults' use of information and communications technology. *Journal of Aging Studies* 18, 4 (2004), 369–384.

[13] Justin Wu and Daniel Zappala. 2018. When is a tree really a truck? Exploring mental models of encryption. In *Fourteenth Symposium on Usable Privacy and Security (SOUPS)*. USENIX Association Berkeley, CA.