Designing Behavioural Nudges to Encourage Financial Propriety of Older Adult Proxies

by

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Abstract

Older adults sometimes request or require assistance with financial management tasks from close family or friends, and many of these tasks are now being completed online. Due to a lack of better mechanisms for granting a delegate access to their bank accounts, older adults commonly share their online banking passwords with their close others, opening the older adult up to a greater risk of financial abuse or other security or privacy violations. Through my research, I have explored the impact and value of two techniques for mitigating these risks: behavioural nudges and proxy accounts. The former are interface elements that guide the user without limiting their agency, and the latter is an access mechanism that provides accountability for, and limitations on, the account data and financial actions available to a delegate.

To investigate these techniques I designed and implemented a high-fidelity online banking prototype and used it to run a user study (n=21) in which older adults and close others were asked to perform a series of tasks in the prototype before discussing their perceptions of both the proxy accounts and nudges. Overall, my findings suggest that both older adults and close others greatly approve of the implementation of proxy accounts as this mechanism provides increased transparency, accountability, and legitimacy for the activities of close other delegates. Attitudes towards behavioural nudges were more neutral on average, with a wide range of opinions on their efficacy and desirability, but the findings also indicate that there is more work that can be done to investigate their efficacy in other contexts.

Additionally I have identified a number of factors that should be considered when designing online banking systems to support delegation, with the goal of minimizing risk to older adults while still maintaining their agency and the level of support available to them. These findings, extensive literature review and synthesis, and my own design process were used to propose a design space for considering access mechanism and designing behavioural nudges in delegated banking contexts.

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Cliche as it may be, by family really has been the rock upon which I have built my sanity throughout this research. Mom, Dad, and Ry, you guys are the best, and I'm glad this journey brought me back home to you all. (Or that you brought me to this journey? Causality is still unclear.) I have felt so incredibly supported by you, and carry that with me always.

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Table of Contents

List of Figures

List of Tables

Chapter 1

Introduction

Many older adults are living out longer lives and are more likely to be living alone [1]. Technology and the support of a network of friends and family can help older adults age in place, but this is not without challenges [2]. Personally, I have witnessed and taken part in support systems for older family members as they navigate the important aspects of daily life through cognitive decline and other impairments. My father is an only child and was a primary source of support for his widowed mother while the two lived over 1600km apart. Witnessing the experience they had together left a very strong impression on me. Modern technologies enabled my dad to help my grandmother gain access to medical care, handle her finances, pay the fees for the care home that she lived in, have groceries delivered to her door, and assist with a myriad of tasks remotely over several years (and a global pandemic.) However, the process was anything but effortless for him and the burden of care had a significant impact on both his physical and mental health. My mother's parents are still entirely independent, but there are already questions about how they will receive support from their children when the need arises. My mom is one of 3 children who will be able to provide assistance, but only one of her siblings lives within 1000km of her parents. They will be more than willing to work together to help their parents when asked, but the sharing of that burden will involve a whole new set of considerations from those my father needed to

take into account as an only child and a sole caregiver. While it is clear that technology can play a role in these varied support dynamics, it is not clear that current systems do this well. This led me to investigate one of the most common yet least supported tasks that informal caregivers provide on behalf of older adults: assistance with managing their daily financial tasks.

Online banking services have become ubiquitous, and are currently being used by over 78% of Canadians [3]. The exact number of older adults (defined in this work as those ≥ 65 years of age) engaged in online banking worldwide is unknown. However, a 2022 survey in Canada showed 58% of adults aged 65+ used online banking [4]. It is even more prevalent elsewhere, such as in Italy where a 2023 survey showed 79% of adults aged 60+ banked online [5]. With the age of the Canadian population gradually increasing [6], over 25% of Canadians over the age of 15 now provide support to an older adult [7]. The term "close other", originally coined in the field of occupational therapy [8], refers to a family member, friend, paid caretaker, or other person who interacts directly with an older adult and provides support with a variety of activities of daily living. Management of finances is one of those important activities identified in Lawton's Instrumental Activities of Daily Living scale [9]. It has been shown that getting regular assistance with financial tasks can save an older adult money and reduce stress in the long term, allowing them to remain in their homes longer [10]. As of 2012, it is estimated that over three-quarters of older adults who receive care from close others receive assistance with banking and other financial tasks [11] and that 22% of Canadians over 55 [12] receive banking assistance overall as of 2018. Many close others are leveraging online banking to provide this assistance [13].

Currently, older adults can give their close others the ability to bank online on their behalf through a few methods such as password sharing and joint accounts [13]. Close others may also have financial Power of Attorney (POA) that provides the legal framework from which they perform banking activities on behalf of an older adult. Invoking a PoA may also impact the mechanisms a close other uses to perform those actions, as it may empower

them to create joint or trustee accounts. Proxy accounts, though not currently available in the Canadian banking context, allow a separate set of credentials that provide access to the primary account holder's assets and information, often with a limited set of permissions set by the primary account holder or the banking institution. Given that password sharing is an extremely dangerous activity [14], this research implements and explores proxy accounts with the goal of understanding the perceptions and experiences of older adults and close others as they use this mechanism.

Regardless of the access mechanism the older adult uses to provide access, it is important to consider that delegating access to one's assets increases risks of financial harm. *Financial abuse* is the misuse, misappropriation, theft of, or denial of access to the funds of an individual. Financial abuse differs from *financial fraud* in that abuse is perpetrated by someone known to the victim [15]. Unfortunately it is prevalent; a 2015 nation-wide survey showed that 2.6% of older adults in Canada are experiencing financial abuse [16]. This survey did not include older adults living in care homes or those with cognitive impairment, populations that may be particularly susceptible to abuse, and therefore may be a very conservative estimate. The sensitive nature of some of the caregiving relationships and familial traditions of financial entitlement may also contribute to under-reporting. Looking outside Canada, it has been estimated that at least 6.8% of older adults have experienced financial abuse globally [17].

One theory that has been used to explain some of the incidents of financial abuse of older adults is Routine Activity Theory (RAT) [18]. The theory is based on the principle that many criminal activities arise from normal, everyday behaviour and opportunities instead of explicit malicious intent [19]. An example of this could be a close other using an older adult's funds without permission to gas up their own car to compensate for all the driving that assisting the older adult may require. This could then escalate into greater liberties being taken as the volume of assistance requested increases over time. It seems likely that the sort of minor misdeeds fostered by routine activity may go unnoticed or under-reported

by older adults even as they might escalate into more pervasive abuse.

The complex relationships between older adults and their close others are important because the close others are often the older adults' main avenue for support, and are likely pivotal in helping the older adult access important services that are needed for daily living and as part of their systems of care. As mentioned before, these close others are often family members, friends, or other people who also fill important *social* relationships. I want to ensure that these relationships can remain trusting, positive, supportive, and honest while investigating technology-based solution that provide the older adults with as much protection from abuse as possible. In order to attempt to address the issue of financial misconduct in these contexts, I chose to investigate the use of *behavioural nudges*. These are a class of interface elements and associated interactions that can be used to encourage proper action by users [20]. They can take forms such as pop-up confirmation boxes, color coding options, and time delays [21], [22]. Behavioural nudge have been used in a wide variety of domains, but have not been used to nudge in the context of delegated banking. Doing so brings up the potential for novel issues such as negative impacts on the sense of trust between close others and older adults, or unintentionally increasing the burden of care. On the other hand, interaction with proxy accounts explored throughout this research may also impact the efficacy and perception of behavioural nudges in this context, while providing more layers of safety for older adults.

1.1 Research Questions

It is evident that there is a significant gap in the literature when it comes to how online banking interfaces can prevent financial abuse of older adults, and behavioural nudges and proxy accounts may be part of the solution. Ideally I would like to directly measure the impact that introducing new access mechanisms and interface elements could have in preventing actual instances of abuse in practice, but this would be extremely difficult to observe

and measure as it would involve the cooperation of potential abusers and a covert way of observing their behaviour. While this may be tractable for a longer-term project it was out of scope for this thesis. Instead, the focus became investigating how these techniques would be experienced by the vast majority of close others who are altruistically providing support for an older adult, as well as how older adults might feel about these techniques being used to influence close others acting as their banking delegates.

There are some ethical concerns about how the use of nudges might impact the relationships between older adults and their close others. If nudges erode trust or cause a close other to feel attacked or under suspicion this may degrade the social relationship between the older adult and the close other and impact the quality of support the older adult receives. Alternatively, nudges may lead to an *increase* in trust, encourage a broader base of support for the older adult, or have other potential positive effects. In order to pave the way for more detailed research on the impact of mitigating misconduct I chose to investigate those potential impacts to determine what sort of harm or benefit may be caused, as well as the factors that cause them. To this end, the research questions that guided me in this context of delegated banking support for older adults are as follows:

RQ1 How do behavioural nudges affect perceived trust within close other/older adult relationships?

RQ2 How are nudges perceived as possible deterrents of financial misconduct and how are perceptions affected by personalization of the nudges?

RQ3 How do older adults and close others experience the proxy account as a mechanism for close others to provide banking support to older adults?

1.2 Methodology

In order to research the above questions I initially sketched out a prototype of an online banking interface that supported proxy accounts while maintaining the look and feel of

existing Canadian banking interfaces. Then I sketched out behavioural nudge designs aimed at steering close others towards maintaining financial propriety while banking as a delegate to get a feel for the types of nudges that seemed most promising. I combined the results of those design exercises and developed a high-fidelity, fully-interactive online banking system prototype that incorporated the most promising nudge designs in order to allow us to gather feedback on them. That feedback was gathered through a qualitatively-driven study that consisted of three parts. The first part was an open interview that aimed to establish rapport and gain an understanding of the participants' current use of online banking and any informal care relationships they are a part of. In the second part, participants took part in a think-aloud interaction component during which they were asked to complete a predefined set of banking tasks using the prototype to expose them to the nudge designs. Finally, a semi-structured interview was conducted to allow the participants the opportunity to provide feedback on the nudges and the proxy account mechanism.

Overall, the study was conducted with 21 participants. 4 participants were adults under 65 years of age who provided banking support for an older adults, 6 participants were older adults who neither provided or received banking support. 10 were older adults who provided banking support for another older adult, and 1 was a bank employee. Audio recordings were manually transcribed and then analyzed using content analysis to gain insight into both the general opinions of the participants as well as to highlight outlying perspectives.

After the user study was complete and the data were analyzed I determined that there was an opportunity to create a design space to codify some of my findings and make them more generalizable. I did this by revisiting my original design process for the prototype, which had initially involved creating a matrix to determine which of the nudges were appropriate and potentially effective. Participant responses from the user study were used to help identify and group factors I had taken into account during my design process into a few themes that became the axes of this new design space. These axes were explored individually to provide more clarity about how they defined the space as well as to highlight ways that designs could

be evaluated and positioned along each axis. Following the definition, I provided concrete examples of how to leverage the space to inform design based on both hypothetical scenarios as well as empirical data from my own user study.

1.3 Contributions

There are four primary contributions that have come from my research:

1. A functional high-fidelity prototype of an online banking system that leverages proxy accounts and behavioural nudges to support older adults and their delegates. The code for the prototype and a running instance for exploration have been made publicly available so it can be leveraged for future research and design.

2. Empirical evidence that shows that proxy accounts are a highly desirable and useful mechanism that both older adults and close others would make significant use of if implemented by their financial institutions. Results show that proxy accounts are seen by users as providing security, transparency, legitimacy, and accountability.

3. Empirical evidence demonstrating that behavioural nudges can be selected and designed to enhance and preserve trust, and can support delegates as they bank on behalf of older adults through mechanisms. Participant feedback also shows that personalization can be effective at improving the ability of nudges at preventing financial misconduct by honest delegates.

4. A design space for the consideration of behavioural nudges in various financial delegation contexts based on the interactions between types of behavioural nudges, delegated access mechanism, and caregiving trust dynamics. The space can help guide designers towards behavioural nudges that maximize efficacy while minimizing harmful impacts. It is accompanied by an evaluation using the insights gained from my own participants

during the user study, as well as other usage examples, to further help guide designers and increase utility.

As a result of all of this work I was invited to several conference workshops where I was able to leverage my experiences in this domain as part of discussions related to improving data management for older adults and increasing accessibility in financial technologies. The user study work was published in, and presented to, the Graphics Interface '24 conference in Halifax [23]. A paper describing the financial delegation design space is currently in-progress.

1.4 Reflexivity Statement

In order to provide the reader with some of the context surrounding this research, I would like to briefly outline my background and personal experience regarding caregiving for older adults. As the time of writing, I am a 31-year-old Caucasian male who comes from a Euro-Western culture of caregiving. I have never been a primary close other but, as mentioned previously, I have been very close to those who have. My own parents are beginning to consider what care they may want in the future, and I fully expect to take a significant role in their support system. Specifically, it is very likely that I will become the primary close other when it comes to financial matters and performing banking tasks.

Those who invest time and effort in supporting older adults towards the goal of allowing them to age gracefully, happily, and comfortably are filling essential social roles and I believe they deserve respect and support from both personal and technological standpoints. In an attempt to recognize the impact this stance has on the research presented here, I attempted to take a postpositivist approach by acknowledging my positionality as a lens that has shaped the way I developed the prototype, designed the study, gathered data, and interpreted results.

Additionally, I have a background in the fields of privacy and security that has influenced the analysis and conclusions in my work. Professionally I have worked in thread monitoring, analysis, and response, in enterprise data security and vulnerability management, and in

the development of access management systems. I believe that we should be improving both inherent security of the systems we provide to users as well as improving the security awareness and control available to those same users. These experiences are of particular relevance to this work in the interpretation of participant security postures and the analysis of the security and privacy characteristics of banking systems and delegation mechanisms.

Chapter 2

Background

The work in this thesis touches on four distinct concepts from outside of the field of HCI: the Canadian financial systems, financial management practices of older adults, the ideas presented by Routine Activity Theory (adapted from criminology), and the sociological concept of a "good carer" narrative presented by close others.

2.1 Older Adults Banking in Canada

The Canadian banking system is considered one of the most stable in the world by both economic historians and by the country's residents [24], [25]. This system is dominated by 5 nationwide banks: Royal Bank of Canada (RBC), Toronto-Dominion Bank (TD), Bank of Montreal (BMO), Bank of Nova Scotia (Scotiabank), and Canadian Imperial Bank of Commerce (CIBC). Each of these institutions ranks in the 100 largest banks globally according to S&P Global [26]. Additionally, there are numerous credit unions that are well represented locally. All Canadian banks are highly regulated under the Federal Bank Act and the Office of the Superintendent of Financial Institutions (OSFI). This combination of structure, protections, and oversight have allowed for a long period of stability for Canadian banks, including during the 2008 financial crisis in the US [24] (a very close economic partner of Canada.) From the perspective of a bank client, the additional protections of-

fered by the Canada Deposit Insurance Corporation (CDIC) are extremely valuable. The CDIC provides deposit insurance of up to $100,000 CAD for individuals in the case that a given bank fails, greatly increasing a person's trust in the security of their assets. This circumstance in which a small number of banks serve a majority of Canadians under very strong regulations provides the Canadian financial system with great stability, but doesn't incentivize innovation [27].

2.2 Older Adults and Financial Management

As of 2022, 78% of Canadians bank online, an increase of 6% from 4 years prior. For older adults the percentage who bank online has increased more rapidly, from 44% to 58% over the same period [4]. This means that as of 2022 a *majority of older adult Canadians were banking online*.

Financial management assistance by close others is a valuable component of informal care that can allow older adults to age in place for longer [10], and is a component of Lawton's Instrumental Activities of Daily Living scale [9]. Older adults in Canada who receive banking help are doing so every 2-3 weeks on average, primarily with less than 3 total hours of time invested by their close others per month [7]. Unsurprisingly, older adults who are experiencing cognitive impairment such as Alzheimer's Disease or dementia receive more frequent assistance, however *they do not receive more total assistance* than those not experiencing such conditions [28]. Management of finances has been shown to become more difficult for older adults as they age [29], [30]. This is certainly due in part to the impacts of cognitive decline, but can also involve other factors such as the financial planning related to retirement, the differences in the way that finances are managed post-retirement, or the impact of unforeseen expenses related to aging [30].

These difficulties, combined with limited technological comfort of some older adults and increasing technology requirements can lead older adults to seek help from close others [31].

In its simplest form, this may be a family member assisting the older adult in person by walking through the required interactions in the online banking system with them. On the opposite end of the spectrum this can involve adding a close other as a joint account holder to allow them to bank on the older adult's behalf independently through an app or web browser. In fact, over 25% of adult Canadians use online banking to support an older adult, with 46% spending less than an hour and 44% spending up to 3 hours a week doing so (see Figure 2.1 [7]).

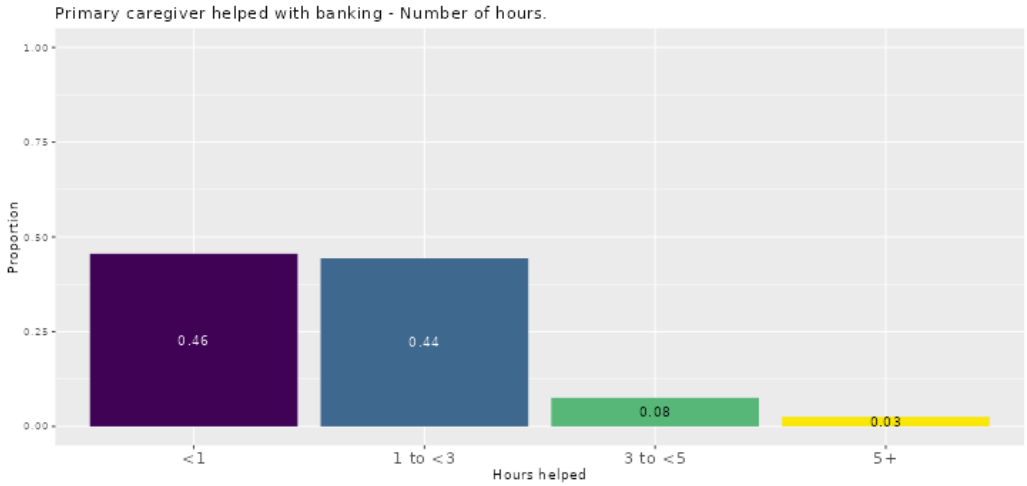


Figure 2.1: Time Spent Providing Banking Assistance. Values are hours of banking assistance per week, and proportions are in decimal percentages. Data is sourced from the Statistics Canada 2018 General Social Survey on Caregiving and Care Receiving (Cycle 32) [7], and is graphed as part of a data dashboard written in R.

In general, research has shown that banking technologies do not support older adults well, especially those who sometimes delegate banking tasks to close others, and that these technologies do not explicitly support the close others acting as delegates [32]–[34].

2.3 The Financial Misconduct Spectrum

The vast majority of close others who support older adults with financial matters via online banking are simply there to provide a valuable service, but the reality is that not all close others act appropriately and some may take advantage of their position to commit harm-

ful financial acts. The World Health Organization defines financial *abuse* as "any misuse, misappropriation, damage to, or inappropriate control of financial assets by a trusted individual" [35]. It is important to differentiate financial *abuse* from financial *fraud*. They are both instances of financial damages caused intentionally by the perpetrator, but abuse is perpetrated by known individuals who are trusted by the older adult while fraud is committed by individuals unknown to the victim [15], [36]. It has been estimated that at least 6.8% of older adults globally have suffered from financial abuse [17]. Prior research shows that older adults tend to over-estimate the risk of fraud perpetrated by strangers and under-estimate the risk of financial abuse perpetrated by close others [37].

Given the sensitive and personal nature of financial abuse, and the fact that older adults may be dependent on the perpetrator, it is likely that financial abuse goes under-reported [38]. Under-reporting may also be due to the fact that "financial abuse" is a very strong term that usually has a connotation of serious, intentional, pervasive or recurring harm. Conduct that meets a rigid definition might not feel like "abuse" to an older adult within context either. For example, an older adult may be aware that an only child is taking small sums of money from the older adult's accounts at regular intervals without permission, but may also not consider it to be a problem if the close other is a sole heir who stands to inherit the money regardless. Some older adults may see this as a breach of trust, while other might see it as appropriate entitlement. Regardless of context, these harms exist along a subjective spectrum of severity: the harms may not be intentional, and may be relatively minor when compared to things such as pervasive abuse. To that end I have chosen to call minor harms *financial misconduct*, not being entirely separate but living on the opposite end of the same spectrum as abuse.

2.4 Routine Activity Theory

Financial misconduct by delegates can be unintentional, or can start in very small, seemingly innocent ways, and a delegate may not even be aware that their actions qualify as financial misconduct. This aligns with Setterlund, Tilse, Wilson, *et al.*'s Routine Access Theory framing in which these behaviours evolve over time [18]. Routine Activity Theory (RAT) is a theory from criminology that posits that many criminal trends are born from non-malicious behaviour that an individual partakes in frequently. It has been applied to describe the origin of financial and cybercrimes, among others [18]. For example, RAT was used to explain the prevalence of identity theft against people using online banking in networks with limited security [39]. Notably, Setterlund, Tilse, Wilson, *et al.* have proposed RAT as an explanation for the connection between financial misconduct and informal care [18]. They explain that routine access to an older adult's online bank account could provide the exposure that might lead to close others engaging in initially minor financial improprieties. Close others might self-rationalize these improprieties as compensation for the burden of informal care they take on, and/or as familial entitlements. Over time, if not detected, these improprieties could devolve into more serious and serial forms of financial abuse. Prevention or early mitigation of small improprieties could also avoid impact those acts could have on the caregiving relationship itself, such as a loss of trust that could degrade the quality of the relationship. RAT suggests that an important mitigating factor is the participation of a "guardian", or a secondary actor that provides oversight and monitoring of the primary actor's behaviour [18].

Figure 2.2 delineates the types of financial violations an older adult may experience, demonstrates that financial misconduct by a delegate may occur on a spectrum from very minor misconduct to very serious financial abuse, and highlights Routine Activity Theory as an entry point to the misconduct spectrum.

As mentioned previously, canonical example of a liberty that may be taken by a close other delegate would be to take some form of compensation from the older adult without permission

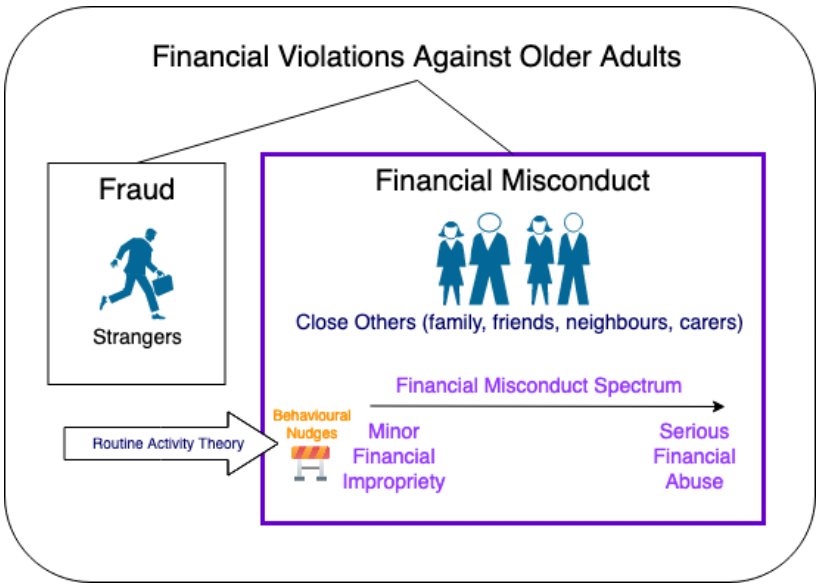


Figure 2.2: Financial violations against older adults are categorized into fraud perpetrated by strangers and acts of financial misconduct committed by close others. Routine activity and bank account access enable close others acting as delegates to engage in minor financial improprieties which can repeat and expand into serious financial abuse.

based on a sense of entitlement related to the assistance the close other provides. Even if the delegate believes they are entitled to the compensation and that the amount they are redirecting is negligible, it is still a violation of trust or abuse of power, even if the older adult might not view it as such. Other examples of financial misconduct include mismanagement of finances and financial privacy violations such as allowing excessive spending to drain the older adult's funds or sharing the older adult's transaction records. Table 2.1 shows a set of examples of relationships, task assistance requested, and potential acts of misconduct that could easily occur if the delegate has access to the older adult's online banking.

2.5 "The Good Carer"

The "good carer" concept is used within the field of sociology as a lens to evaluate the narratives of individuals who provide care for older adults. When caregivers present narratives, they often emphasize their "goodness" through examples or anecdotes that highlight various characteristics [40]. These include traits such as diligence, availability, self-sacrifice, and

Relationship	Task Older Adult Needs Performed	Potential Impropriety
Adult child	Transfer funds from savings to spending account	Also transfers funds to their own personal account
Niece/nephew	Check balance in chequing account, investment, and savings	Views balances in accounts, invading older adult's privacy
Grandchild	Does shopping for grandparent using own money & then transfers funds for reimbursement	Transfers funds for reimbursement, plus a little extra
Close friend	Uses the OA's credit card to shop for the OA then pays the resulting bill	Over-pays the credit card and spends the difference on personal expenses
Neighbour	Pay a utility bill	Also pays their own utility bill from the older adults' account

Table 2.1: Examples of the types of banking tasks that might be delegated to close others by older adults, and examples of the types of impropriety that such delegates could potentially engage in, because of access to accounts.

honesty. As the vast majority of caregivers are simply trying to provide valuable care, the "good carer" lens also highlights the reluctance that caregivers may have with sharing negative experiences related to caregiving. When discussing general topics such as mistreatment of older adults, many caregivers will distance themselves from poor caregiving conduct by reinforcing the same traits mentioned above. Providing care for an older adult can place significant burden on a close other, and can cause the close other to struggle with balancing the need for the care they provide and the need to care for themselves, a concept called *homo duplex* [40].

When discussing these conflicting motivations, caregivers will present a "good carer" narrative by focusing on the importance of the care they provide while downplaying their own very legitimate needs, potentially to their own detriment. The lens has been applied to studies that perform qualitative analysis of interview data related to caregiving. For example, it can help infer what a caregiver might be *omitting* in their narratives, or to better understand the motivations behind specific comments [40]. Rogers, Brooks, Vassilev, *et al.* use the lens to help understand the value that "weak ties" have in a more complex care dynamic because they help caregivers avoid the burden of being seen as a "good carer" [41]. This can be useful when attempting to evaluate both the depth of a caregiving relationship as well as the cost it levies on the close other by encouraging focus on the language close others use to describe their role in the caregiving dynamic. The "good carer" perspective

can also guide study methodology itself, such as when determining the wording and tone of questions for structured interviews of caregivers [42].

2.6 Summary

The context described above both sets the stage for the problems I investigate in this research as well as helps to describe the lenses with which I conducted it. Canadians, including myself, have a high level of trust in the banking system though it does provide a lot of restriction on how an individual can give someone access to bank on their behalf. Regardless of the access mechanism they choose, giving a close other access to their accounts increases the older adult's risks of misconduct and abuse. Some of these instances of abuse may be escalations of minor acts of misconduct that arise from mundane, routine activities. However, most close others are providing an important social role selflessly and honestly. For those people, they may be very sensitive to perceptions of them as caregivers and may present "good carer" narratives as a way of influencing those perceptions.

Chapter 3

Related Work

In the previous chapter I focused primarily on the sociological context around this research space, as it helps motivate investigation into mitigating financial misconduct. When it comes to addressing this topic there is large body of work in the fields of HCI and interface design that can be leveraged. Specifically, work that has been done in the fields of banking technology adoption, behavioural nudges, and delegated access mechanisms provide an interesting combination of techniques that can can be applied to delegated banking to benefit older adults.

3.1 Banking Technologies and Older Adults

As highlighted by Satchell and Dourish, the reasons that users *do not* make use of a given system can be just as important to consider as the reasons they do, and as such those researchers have described categories of non-users to help inform system design. Older adults can fall into several of the categories (such as "actively resistant" or "disenchanted") depending on their circumstance and personal values. Traditionally we might things of older adults as "lagging adoption", but this isn't the only reason they may not be using given systems [43]. While older adult adoption of online banking has been steadily increasing, this is a recent trend and there is still a large number of older adults who do not bank online. There has

been a reasonable amount of research towards understanding their perceptions, engagement with, and attitudes towards these technologies. Frik, Bernd, and Egelman have documented lower acceptance of technology by older adults in general due in large part to a lack of support for their specific abilities, needs, and vulnerabilities [31]. It also has been argued by Barros Pena, Clarke, Holmquist, *et al.* that this reticence due to privacy concerns is perfectly reasonable given the dissonance between values held by older adults and those presented by online banking systems. A particularly relevant example that they highlight is that some older adults' who highly value autonomy are seeing such a priority as incompatible with modern systems that prioritize accountability instead [44]. Accountability is a core tenet of banking applications that motivates more careful consideration of older adults' unique perspectives when considering them during design in this domain. This is even more true as various behavioural nudge mechanisms are explored which may leverage psychological heuristics that infringe on such values. Satchell and Dourish would characterize avoidance based on lack of support and recognition of individual needs as "disenfranchisement", a category which also includes non-use due to accessibility issues.

It has also been shown that privacy concerns may be an important factor that keep older adults from adopting new technologies [45], [46], due in part to the fact that the technologies may both acknowledge older adults' desire for privacy while simultaneously assuming that they do not actually have unique privacy needs [47], [48]. Banking information is both highly sensitive and contextually specific, which are factors that only increase the privacy concerns older adults have [49], [50]. Non-use based on these issues would be characterized by Satchell and Dourish as "active resistance".

It is possible that some of the risks posed by technological adoption can be mitigated by incorporating good practices. For example, prior work by Mcdonald and Mentis shows that there are benefits to maintaining and monitoring participation logs provided by services (such as online banking) with older adults who have mild cognitive impairment. The presence of such logs and act of reviewing them with spouses allowed the older adults to feel more secure

and confident about proper usage of those services by all parties [51]. This also ties back to the concept of "guardianship" that is discussed as part of Routine Activity Theory.

3.2 Behavioural Nudges

Adopted from their introduction in the field of behavioural economics [52], behavioural nudges have been extensively used in interface designs across many domains by HCI researchers and UX/UI designers. The principle of behavioural nudges is to manipulate the context in which a user is making a decision by changing the value proposition of certain actions. This is done with the aim of influencing the choices and actions of a user without limiting their options or removing agency by leveraging various psychological heuristics we use in in our decision making processes [20]. Thaler and Sunstein, the original proposers of behavioural nudges, also used the concepts of "automatic" and "reflective" thought from dual process theory to describe different ways in which nudges can influence thought [52]. Automatic thinking is often quick, subconscious, and intuitive whereas reflective thinking is much slower, analytical, and self-aware. Behavioural nudges can leverage psychological heuristics that target modes of thought along this spectrum, among many others.

Nudges are a common occurrence in our digital lives, often taking forms such as pop-up confirmation boxes, color coding options, and time delays [21], [22]. Mirsch, Lehrer, and Jung and Caraban, Karapanos, Gonçalves, *et al.* have each performed literature reviews of nudge designs both within and outside of the field of HCI, looking at the similarities in psychological heuristics used by nudges across various contexts [20], [53]. Between the two studies, these researchers identified approximately 35 different psychological effects that were leveraged by the nudges they investigated, with a large portion of designs relying on either the framing principle (shaping the presentation of the decision), or status quo bias (the preference of decision-makers to maintain the current state of things)[20], [53]–[55]. Additionally Caraban, Karapanos, Gonçalves, *et al.* identified 23 different nudge mechanisms and/or design elements

used in digital interface designs and grouped them into 6 higher level categories based on the psychological effects they leveraged: facilitate, confront, deceive, social influence, fear, and reinforcement. The nudges examined were used in domains such as social media, online shopping, advertising, and security applications; neither group identified any examples of nudge use in online banking.

When considering the ethics of nudging, there are some who consider the use of behavioural nudges to be *completely inappropriate* given that nudges inherently attempt to manipulate the choices of the user. In contrast, Thaler and Sunstein claim that nudges are ethical in that they are unavoidable (as designers are *always* influencing behaviour whether they are doing so intentionally or not) and in that they do not actually constrain behaviour and only provide guidance [52]. Hansen and Jespersen discuss both of these positions, concluding that the ethics of a nudge are more nuanced and are better determined by the specific methods of nudging [56]. Two characteristics that they identify as being critical to evaluating the ethics of a given nudge are its level of transparency, and the type of thought process it targets. They have deemed that the more transparent the nudge is and the more that it targets the reflective mind, the more ethically the nudge is perceived by its target. These factors are important enough that Caraban, Karapanos, Gonçalves, *et al.* charted the nudge mechanisms they identified along axes representing them.

Research into the efficacy of behavioural nudges has identified some important overall design considerations. There is evidence that nudges that attempt to dissuade individuals from specific behaviour have more impact when presented to the person *before* they exhibit said behaviour, such as in dissuading smoking [57]. This is of particular relevance in delegated online banking as it implies that nudges related to financial impropriety will be more effective at preventing small *initial* acts of misconduct by delegates as opposed to stopping an existing pattern of financial abuse, an idea supported by Routine Activity Theory [18]. Additionally, it has been posited that exposing a user to the same nudge many times over a long period may decrease the effectiveness of the nudge [58]. While there is a fair amount of research on

the use of behavioural nudges within the domains of security and privacy [22], [59], [60], this work was focused on investigating how to nudge the user either for their own benefit or the benefit of the system presenting the nudges. None of the prior research addresses privacy and security concerns related to a user acting on behalf of a third party, as is the case for delegated banking. As will be discussed throughout this thesis, the difference in application does have impacts on how nudges can and should be presented.

3.2.1 Personalization

A common method of improving the efficacy of behavioural nudges is *personalization*, which has been used in fields such as advertising and online security [61], [62]. Personalization can be defined as any tailoring of a user's experience based on their characteristics, preferences, behaviours or other personal information [63]. Peer, Egelman, Harbach, *et al.* distinguish between two types of personalization: personalizing "*the*" nudge, whereby the design of a specific nudge is tailored to an individual, and personalizing "*which*" nudge, which involves choosing appropriate nudge opportunities and mechanisms based on the individual [62]. Mills combine the ideas of personalizing "the" nudge, and "which" nudge under the category of "*delivery personalization*". Additionally, they identify the concept of "*choice personalization*" as the selection of specific outcome to nudge a given individual towards, as opposed to personalizing nudges aimed at guiding different individuals towards the same outcome [64]. They are careful to state that these two categories are not mutually exclusive and are often found working in concert with one another. Overall, personalization techniques have been shown to enhance the effect a nudge has on users in various contexts [59], [61], [62], although they are not without complications as users often react negatively, feeling that they have been manipulated or that their privacy has been violated. It has been shown that nudge personalization can have a negligible or even detrimental impact on user responses when the justification for the nudge is not immediately obvious to the person encountering them [63]. The same research also indicated that the acceptable level of personalization is dependent

on the perceived value proposition of the nudges. This is related to the ethical concerns of a lack of transparency or targeting automatic thought as outlined previously.

3.3 Banking Access for Close Others

Close others who provide financial support for older adults are making use of online banking to do so: it is convenient when the delegate is not geographically proximal to the older adult (making it hard for the delegate to go to the bank *with* the older adult), and it is temporally convenient for delegates who work full-time and cannot go to a bank during business hours [13]. There are contrasting factors to consider as well though, as greater perceptions of benefits provided by technological solutions, potentially driven by increased need for support, may cause rationalization of higher risk behaviour. Many delegation mechanisms such as password sharing and joint accounts can expose older adults to the risk of financial losses due to misconduct by a close other acting as a delegate [65].

Password sharing in financial delegation is common in Canada [13]. This can be extremely dangerous, as it gives a delegate unilateral access to the older adult's accounts without any legal authority, and may also give access to more personal information if the password is reused [14]. If, for example, the older adult uses the same password for their online banking system as for their email accounts, the delegate could gain full access to both. Due to the risks involved, password sharing is a practice that is strictly prohibited by the Terms of Service for the online banking systems of Canadian banks, meaning older adults have no legal protections if they share their passwords. As a partial solution, One-Time Passwords (OTPs) are a related mechanism that uses generated passwords that only give a delegate access for a single session. Given that these would require explicit upgrades to the online banking systems, it stands to reason that their use would also be covered by Terms of Service, mitigating two of the major risks of password sharing. OTPs can also theoretically be extended to support the restriction of which tasks can be performed during a session initiated with the OTP. In this

context of delegated banking, I've chosen to call these "Task-Specific One-Time Passwords" (TSOTPs) to reflect the control they would give an older adult, though they are functionally similar to some token-based authentication and authorization mechanisms used in many distributed computing systems (including systems for storing electronic health records [66], [67].) These would in turn mitigate the risks of unilateral access when sharing passwords. While there are some benefits to these mechanisms, neither single-use password variant appears to be supported by Canadian banks.

The common method for delegating access that Canadian banks do explicitly provide is joint accounts, whereby multiple individuals are named full and equal owners of a given account. In many cases this may not actually reflect the dynamics of the working relationship between the older adult and their delegate, as the older adult may not want the delegate to have full control over their assets. There is no legal protection for the fact that the older adult may not want to share those assets and/or will want to retain them exclusively for their own use [68]. A confounding factor is that joint accounts do provide significant value when it comes to managing and divesting estates after the passing of the older adult [68]. This makes them a more attractive option for those who wish to set up a single delegation mechanism that can last through the remainder of the older adult's lifetime and be useful when managing their estate. Other access mechanisms such as *proxy accounts* allow an older adult to give a delegate limited but persistent access and permissions through a separate set of credentials [33]. The term "proxy user" can be used to describe an extremely broad set of dynamics [69], however in this research I will strictly refer to it in the sense of a delegate who is using this specific delegation mechanism to access and manage an account holder's assets on their behalf. Proxy accounts are not supported by most online banking systems in North America [13], however proxy accounts have become prevalent in other domains such as within healthcare portals in the United States [70]. From the perspective of the banking system itself, one advantage of both joint and proxy accounts is that each user has separate credentials, and therefore the user's interaction can be tailored to them. This is quite relevant

when the goal is to encourage propriety as it allows techniques such as behavioural nudges to be targeted at individuals.

Power of Attorney (PoA) is not an access mechanism in and of itself but is a legal framework that gives a close other certain rights to act on behalf of an older adult or any person with limited capacity for independence. A PoA may be used to justify delegate account access through whatever mechanisms are available at the older adult's financial institution [13]. Trustee accounts are often used to support this legal framework as they place the delegate in charge of all banking activities on behalf of the older adult, who in turn has their access revoked entirely. As with PoAs, trustee accounts are typically only used when the older adult has been found to lack decision making capacity. New financial technologies (FinTechs) are beginning to leverage the presence of a PoA to enable novel third-party support mechanisms to make up for the limited support offered by banks. An example of this is Sibstar, which allows a close other to limit and monitor the spending of an older adult with dementia [71]. However, given that PoA and related mechanisms limit or remove the older adult's agency, I chose not to focus on them in this research.

As with traditional banking systems, FinTech applications may also be able to improve how well they support older adults by implementing dedicated delegation mechanisms such as proxy accounts. As part of a position paper for the accessFintech'24 workshop (part of the ASSETS'24 Conference), I performed an environmental scan of Fintech applications (including those of large Canadian banks) with the goal of identifying if and how they supported delegation. Of the 55 applications I researched, 23 of them offered joint account support and only 1, a government funded service in India, supported proxy accounts. In other jurisdictions such as the United Kingdom and Australia, open banking initiatives driven by government have allowed for significant growth in both investment and usage of the third-party application market by supporting a variety of banking use cases [72]. By contrast, the Canadian financial system is very closed, meaning that there is no open infrastructure to allow third-party providers to interface with and innovate on the traditional banking

systems [27].

This highlights that the research presented in this thesis may also have broader applications across both traditional financial institutions and FinTechs given the low rate of adoption for dedicated delegation mechanisms in all of these systems.

3.4 Summary

There has been a large amount of research done on older adults adoption of online banking technology, how behavioural nudges can be used to influence a user's decision making, and how older adults give delegates access to bank on their behalf. However, the intersections of these is under-represented in research. It is unclear how applying behavioural nudges in a delegated banking context may influence the way that those nudges should be designed to maximize their efficacy while minimizing impact on the relationships. There is also limited research into how novel delegation mechanisms impact the delegate's experience of providing support or the older adult's experience of requesting and receiving it. Among all of the access delegation mechanisms presented, I chose to focus on proxy accounts as they allow the older adult to retain agency, they provide older adults with the ability to have granular control over their delegates, they allow the online banking system to separately track who is doing what and they support direct nudging of delegates in order to encourage propriety.

To further explore the value and risks of each of these techniques within this domain, I ran a user study designed to collect empirical data on the perceptions of, and attitudes towards proxy accounts and behavioural nudges from both older adults and people who bank on behalf of older adults.

Chapter 4

Methodology

This study involved developing a high-fidelity prototype that incorporated the proxy accounts and behavioural nudges and having participants use it to perform a series of online banking tasks as if they were supporting an older adult. A combination of think-aloud interaction as well as pre- and post-interaction interviews provided rich data related to participants' insights on these techniques. Overall themes as well as outlying stances were identified through rigorous content analysis. The study was approved by the University of Manitoba Ethics Review Board.

4.1 Interface Design and Prototyping

Developing a high-fidelity, interactive web-based prototype that incorporated both proxy accounts and behavioural nudges offered several crucial benefits:

- It allowed for more natural exploration of the interface that would facilitate users "stumbling upon" the nudges, as opposed to being more prominent in static paper prototypes.
- Nudges could be interactive and conditional on user actions. For nudges that presented dynamic elements or required user input, this was necessary for more in-depth

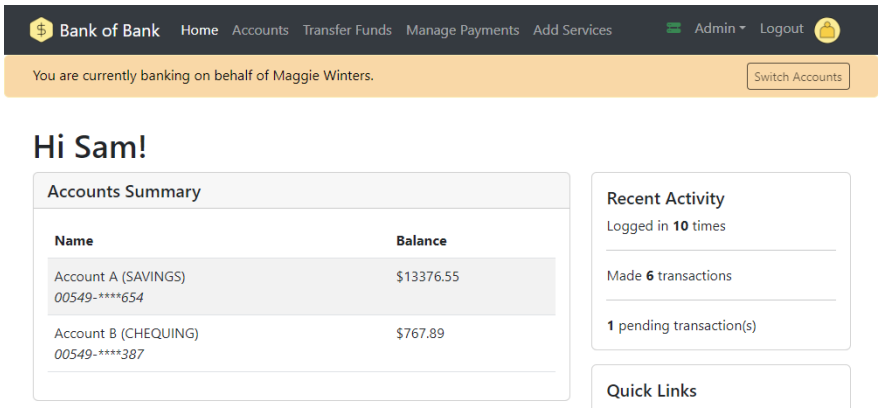


Figure 4.1: Screenshot of the prototype. The banner below the navigation bar persistently highlights that the user is logged in as a delegate.

evaluation.

- Proxy accounts could be approximated to give participants the experience of using this novel access mechanism.

- The user's interactions could be *logged*, providing an additional data source analyzing their responses to, and perceptions of the nudges.

The prototype development process began by using a digital whiteboarding tool to create and iterate on a series of low-fidelity prototypes. This started with the design of specific interface elements that leveraged each of the appropriate nudge mechanisms. In parallel, I created a design for a simplified banking interface that took inspiration from preexisting designs already created by large Canadian financial institutions. This included designing interface elements that mimicked advertising and information elements that are ubiquitous within bank interfaces. Overall, this was done with the goal of making any interactions with the interface as intuitive and automatic as possible for participants by leveraging their familiarity with existing designs. The important difference was that I specifically designed this interface to support proxy accounts, allowing the user to act as a delegate for an older adult and perform tasks on their behalf. Finally, the nudge and interface designs were combined to create complete paper prototypes that appeared similar to existing solutions but

were populated with our nudges as naturally as possible while supporting proxies. Prototypes were created for each of the pages that we anticipated would be necessary to allow users to perform all the common banking tasks performed by close others as identified by Latulipe, Dsouza, and Cumbers[13]. These tasks include paying bills, transferring funds, setting up automatic payment, and managing payees.

Once the paper prototypes were completed, I implemented the high-fidelity prototype as a browser-based web application using a Node.js/Express backend and an Angular frontend to enable fluid user interactions that were automatically logged. No major design modifications were needed to convert from the low-fidelity to high fidelity prototypes. The system was designed and implemented assuming the user was an older adult's delegate using a proxy account which had already been set up with the appropriate controls. This was done to give users an opportunity to work within this novel access pattern. A screenshot of the main page of the prototype can be found in Figure 4.1. A running instance of the prototype can be viewed at https://banking-study.cs.umanitoba.ca]banking-study.cs.umanitoba.ca, and the source code has been made open source on GitHub [73].

4.1.1 Nudge Selection

When considering how and when to nudge delegates, the nudges I chose to study in this research target routine activities with the aim of preventing delegates from engaging in any initial impropriety. The breadth of opportunities highlighted in Table 2.1 illustrate how there are many varied actions that a delegate may preform, each of which may justify different nudge designs. Overall, the prototype included 11 nudges leveraging a variety of mechanisms. The following considerations related to the delegated banking context guided our design process:

Targeted Banking Tasks: While almost all banking tasks offer opportunities to nudge the delegate, this needed to be balanced with the concern of over-exposing the user/participant and therefore I chose to focus on a subset of the most common

tasks [58].

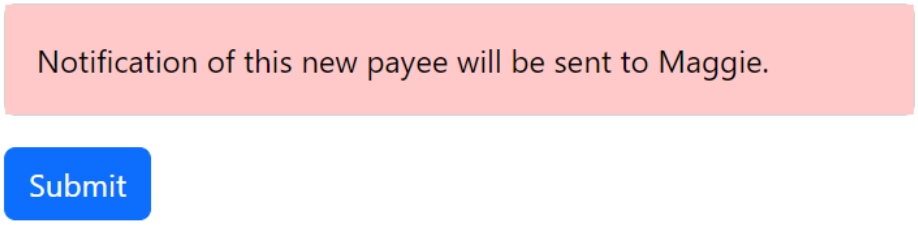
Appropriate Nudge Categories: To support close others and promote financial propriety *without causing harm to the relationship*, I avoided nudge mechanisms that leverage negative psychological effects even if they could potentially deter misconduct.

Message Tone: Given the desire for close other participants to feel supported (and certainly not mistrusted), the design ensured that messaging in the nudges addressed the user directly and in a positive manner. This presents a trade-off as a gentler tone may have impacted the efficacy of the nudges in deterring misconduct by not being as direct as possible.

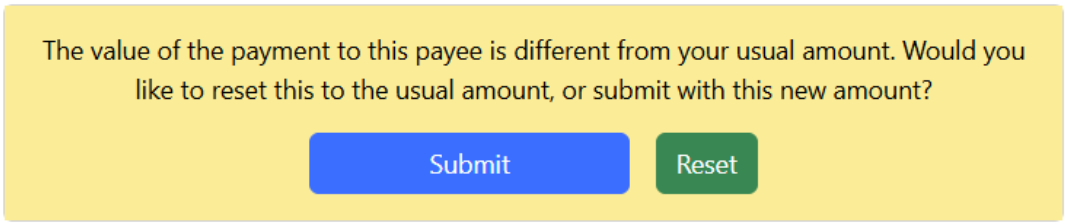
I intentionally excluded nudges that I saw as inappropriate in a context where the close others are likely to be trusted by the older adults. These included any mechanisms Caraban, Karapanos, Gonçalves, *et al.* categorized as leveraging deception-based or fear-based psychological effects [53]. Nudges that target users' automatic mind in a non-transparent way were also omitted, in line with the views of Hansen and Jespersen that these types of nudges are akin to deceit [56]. Nudges leveraging mechanisms such as raising visibility, creating friction, or public commitment were prioritized. The banner at the top of the prototype, reminding the proxy that they are banking on behalf of an older adult, is an example of a transparent nudge targeting the proxy's reflective mind (see Figure 4.1). This banner can be considered a minimum requirement for any proxy account interface, but it is also a nudge in its own right. The banner also represents an example of personalization applied to the nudges in the design. A full set of nudges included in the prototype can be found in Appendix D.

4.1.2 Personalization

The choice to use proxy accounts was partially motivated by the mechanism's ability to disambiguate users, as that in turn enables personalization directed specifically at a delegate. However, opportunities for personalization in the context of this prototype were relatively



(a) Raising Visibility



(b) Throttling Mindless Activity

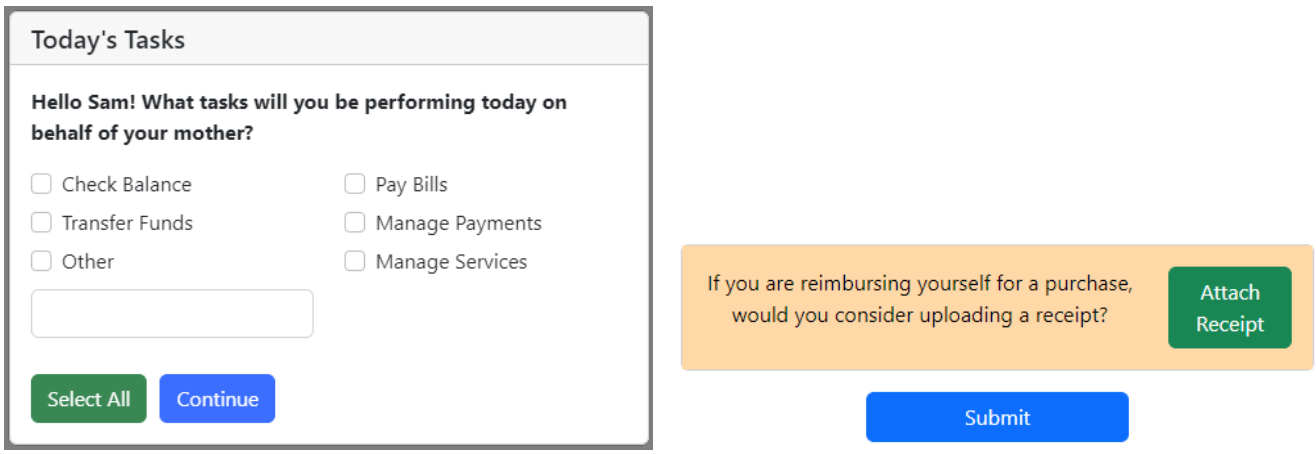
Figure 4.2: Nudge Examples #1

narrow. The nudges presented to each participant referred to the older adult they support either by their name or by their relationship to the participant (see Figure 4.4a). The banner at the top of the screen *always* stated the full name of the older adult (see Figure 4.1). Participants could also encounter a nudge that indicated that a payment being made was of an unusual value when compared to recent payments. This was included to provide an example of how an older adult's banking history could be used to personalize a nudge (see Figure 4.4c).

4.2 Participants and Recruitment

Recruitment was done via posters on campus and throughout Winnipeg, and emails sent to lists for university alumni, credit union associations, and the Centre on Aging newsletter. The goal was to recruit and gain feedback and insights from the following groups:

Close Others: Adults (18+) who already perform online banking tasks on behalf of an older adult (65+).



(a) Public Commitment

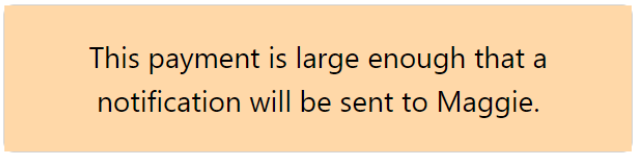
(b) Suggesting Alternatives

Figure 4.3: Nudge Examples #2

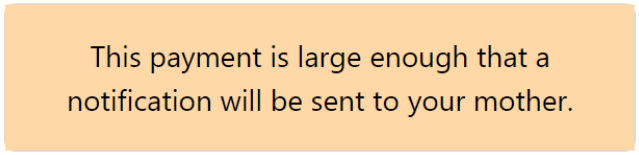
Older Adults: Older adults (65+) who currently use online banking, with or without delegated assistance.

Banking Professionals: Adults (18+) who work in client-facing roles in a Canadian financial institution.

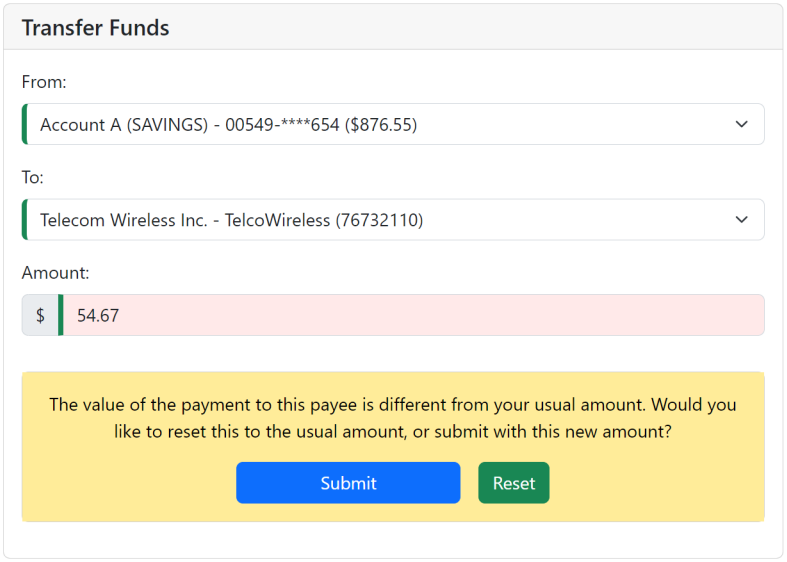
While older adults are the primary motivators for this design, they may not actually use these interfaces and choose to delegate banking tasks to close others entirely. The inclusion of older adults as participants was done to allow us to get an impression of how they might feel if proxy accounts and behavioural nudges were put in place to influence the behaviour of their current or future delegates. Banking professionals were included with the hopes of getting a sense of both: a) how the prototype might handle the types of tasks that they witness in-person in their bank/credit union, and b) their impressions of if and how the institutions they work for might adopt and integrate some of the interface and interaction designs into their own systems. Recruitment materials can be found in Appendix C. Notably, the recruitment materials did not include any mention of financial misconduct, proxy accounts, or behavioural nudges. The former two were omitted to allow us to discuss alternate access mechanisms without priming participants. The latter was omitted to allow us to minimize observation bias the participants may have when interacting with the prototype. Because these details



(a) Invoking the OA's Name



(b) Invoking the Relationship



(c) Unusual Payment

Figure 4.4: Personalized Nudges

were omitted from the recruitment and consent documents this is classified as a deception study and required additional ethics board approvals and participant debriefing accordingly.

Ultimately, 21 participants were recruited, primarily from the alumni and gerontological research community mailing lists. Each was given an ID based on their age group and status as close others. Of the 21 participants, 4 were adult close others who provided banking support to older adults (CO1-4), 6 were older adults who were not currently receiving any assistance with banking tasks (OA1-6), and 10 were *older adults who also held the role of being a close other* providing banking support to other older adults (OC1-10). There was one banking professional participant (BP1).

4.3 Session Structure

Participants took part in a single audio-recorded session lasting from 60 to 90 minutes, during which I guided them through 3 distinct phases: a pre-interaction interview, a think-aloud interaction with the high-fidelity prototype, and a post-interaction interview and debrief. Participants were compensated with $30 either delivered to them directly via e-transfer or donated to one of five pre-selected charities on their behalf. Participants could attend via Zoom or in-person on campus. The audio for each session was recorded for transcription and analysis. Participants were not informed about session details or exposed to the prototype prior to the session.

4.3.1 Phase 1: Pre-Interaction Interview

Sessions began with an open-ended interview with the goal of gaining insight into the participant's banking support contexts. Again, I did not steer discussion towards issues of financial misconduct during this interview in order to prevent priming effects. Close other participants were asked questions about what access mechanisms they used to support an older adult, what tasks they performed, and their overarching feelings about providing support. Older adult participants were asked about how they use online banking, if and how the receive help, and if and how they have considered delegating banking tasks in the future. The banking professional was asked questions related to the support dynamics they see in their professional capacity and the banking policies that inform how they handle those dynamics.

The second goal of the interviews was to build rapport with the participants. Given that we intended to investigate themes of trust and financial propriety in close personal relationships, we needed open communication from the participant, and so building trust with the participant was critical. To this end, I endeavoured to guide the interviews in a way that illustrated my position that close others are providing essential support, deserve recognition, and should not be held under suspicion of misconduct.

Additionally, between the open-ended interview and the chance to interact with the prototype, participants were asked to fill out a very short questionnaire containing questions about their age and caregiving context to ensure that this information was collected about all participants regardless of the direction the open-ended interview took. The final item on this questionnaire asked participants to provide the name of somebody that they provided support for, or a fictitious name that we could use, to allow us to personalize the interface. The list of questions can be found in Appendix B.

4.3.2 Phase 2: Think-Aloud Interaction

Participants were asked to complete common banking tasks using the high-fidelity prototype described in Section 4.1. Regardless of their actual demographic, they were asked to perform these tasks from the perspective of a close other acting on behalf of an older adult using a proxy account set up for them by the older adult they support. All participants were asked to perform the same set of tasks, which included internal transfers (between accounts), external transfers (between accounts of different clients through the banks), e-transfers (a common electronic payment mechanism provided by all Canadian banks/credit unions), bill payments, and payee management.

Participants were asked to think aloud as they performed the tasks to provide the researchers with insight on their thoughts on the interface and things they deemed notable. They were told to only complete tasks that they felt comfortable with, which also allowed me to include tasks related to gift giving that not all participants might find appropriate. Importantly, participants were *not* made aware of the presence or purpose of the behavioural nudges in the design, in order to avoid priming effects and ensure unbiased responses. To encourage natural interaction, participants did not share their screens so that they did not feel 'watched' while working with 'sensitive banking information'. Instead, the prototype logged all of the participant's interactions as well as the nudges that they were exposed to. This combination of think-aloud and interaction logging allowed for observational notes on

non-verbal behaviours while still recording interaction context for the participant's verbal thoughts. The full task guidebook given to the participants can be found in Appendix B.

4.3.3 Phase 3: Semi-Structured Interview

After they finished the tasks in the prototype, they were asked follow-up questions in a semi-structured interview. Initially, participants were asked to highlight specific elements or interactions they noticed that were directed at them as a proxy. Once they could not think of additional elements, they were debriefed about the inclusion of the behavioural nudges in the prototype, as well as the high-level intent for their inclusion. The full debrief script can be found in Appendix B. With the additional context, participants were again asked about what they noticed was different to determine how awareness changed their perceptions of the design. From there, discussions were allowed to branch into topics that the participants thought relevant. When conversations strayed too far off-topic or slowed down considerably they were steered towards their thoughts on the ethical appropriateness of the nudges, the potential efficacy of the nudges at deterring financial misconduct (as guided by RAT), and how participants would feel if nudges were used in their own contexts. Once those avenues were exhausted or time was reached, the session was concluded.

4.4 Data Collection and Analysis

The primary sources of data used in analysis were the audio recordings of the session. These were transcribed manually to ensure accuracy and encourage familiarity with the data. Log entries related to the participants interaction with the prototype were inserted into the transcripts at the relevant timestamps in order to provide additional context for their verbalized thoughts.

Open-ended interview data related to caregiving context was analyzed separately from data related to the interface design. The context shared by each participant about their

role in informal caregiving dynamics was used to aid in interpretation of responses related to the design of the prototype and themes of nudging and proxying. Additionally, content analysis [74] was used to analyze the responses to common questions in order to gain a broad understanding of the participant pool.

Data from the think-aloud interaction and semi-structured interviews was analyzed with a more rigorous content analysis. A table was built that matched participants to their specific responses to given questions. Each response was also labeled according to the attitude of their response (such as "positive", "skeptical", or "disliked"). The individual context of the participants was taken into consideration when applying these labels. Overall, this approach allowed for easy identification of the common attitudes, specific concerns, and extreme opinions while also gaining insight into the reasons behind them.

Chapter 5

Results

5.1 Online Banking Support Contexts

In the pre-interaction discussions of banking habits and/or support contexts, close other participants were asked about their methods of accessing online banking for the older adult they support, what tasks they performed, and how they perceived and managed the burden of providing that assistance. None of the participants reported using proxy accounts, two of the 14 used a password the older adult had set up for themselves, and in five cases the close other set up the online banking credentials under the guise of the older adult account holder (with their permission).

In these latter cases, the banks were not aware that the close other was "impersonating" the older adult in order to set up access for themselves. OC7 opted to use their aunt's email in order to obfuscate their actions from the bank:

> What I do is I *am* [aunt], and that's the easiest way for me. I have her email, I do everything. I don't want stuff about her coming through my email, so it's as if she's doing the banking herself. I mean that's what it seems like [to the bank], but it's me. - OC7

Two of the participants had been admonished by the banks for password sharing, which

made them feel uncomfortable. In both cases they still chose to adopt the practice given that it was most convenient. CO2, who provides banking assistance to their mother-in-law who is in her late 90s and lives alone on the other side of the country, explains:

> Yes, I have to lie to them. We went in... My wife and I got set up [to assist mother-in-law]... Anyway, the bank allows me to do financial things for them, but they don't let me use the internet. I can use the telephone, but they don't trust the internet. - CO2

This participant also chose to go through the additional effort of switching mobile SIM cards in order to impersonate the older adult and perform her banking tasks online while traveling:

> Except for now, they've got this two step verification using my cellphone number, but because I'm in the States for 3 months I got a new cell phone, we took out my old SIM card ... so I'm gonna have to pull out the new SIM card, put in the old SIM card to get my verification and that's *fine*, I get it, it just slows things down a little. - CO2

This behaviour was all contextualized as they explained that careful attention was required to ensure legitimate transactions they made on behalf of their mother-in-law *appeared* legitimate:

> ... I wanna go out of my way to avoid the appearance that anybody might think I am [taking advantage of mother-in-law], which is why I put my wife's email on there, because it says [wife's last name, same as mother-in-law's last name]. You know, just little things that we're trying to do, that I'm maybe overly sensitive of, but am definitely sensitive of. - CO2

Seven of the 14 participants who act as close others provided banking help using joint accounts, which is unsurprising given that they are more heavily supported by financial institutions. Some joint accounts were created through a Power of Attorney, while others were

set up without one (though still with the involvement of the older adult). Four participants explained that joint accounts also make handling of estates easier in the event of the older adult's passing, since a Power of Attorney loses its legal standing upon death and the close other would lose the ability to manage the accounts legally without already having joint access. Nine of the 14 close other participants reported that they chose to assist an older adult in-person, however they often did so in conjunction with one of the methods above (password sharing, joint accounts).

CO1 was the only participant who indicated that they preferred to help the older adult they support by directing them through necessary tasks in-person or over the phone. CO1 highlighted that they saw this as a way of fostering their mother's independence by not having the ability to directly access her accounts:

> I want her to hold it, and I want her to be able to do it so she has the confidence later, so if she's not pushing the buttons herself she's not, uh, learning any of the technology and she's not equipped to work with it later. - CO1

Despite some hurdles, banking on behalf of an older adult was not considered too much of a burden for the close other participants. Most of the older adults being assisted by study participants had simplified financial situations and automated bill payments. Once a dynamic for access was established, the close others considered the workload to be quite minimal, with all reporting less than 1 hour of time spent on such tasks each week.

However, one participant, CO3, did note that while the amount of time that it took them to perform banking tasks on their father's behalf was relatively low, there was additional stress associated with the perceived urgency of the tasks and the channels used to communicate with other family members about their father's banking needs.

> It's not much of a big task for me, but it's just like, it's the constant stuff, you know, and it takes so much of my time, you know, sometimes when I'm actually busy I have to, you know, leave whatever I'm doing, sort out his bills for him

> and stuff like that. It's not about the time it takes, it actually takes just a [little] time, it's just that sometimes I actually get busy, just doing, living, job, just to come and set up bills... - CO3

In instances where the close other performed non-banking tasks in support of an older adult such as providing transportation, administering medication, or shopping for the older adult (reported by 12 of 14 close others), they reported that these tasks took much more time overall than just the banking tasks.

Most of the older adult participants indicated that they would likely delegate banking tasks and responsibilities to their adult children in the future if necessary. The four older adults I spoke to who did not have descendants were unsure about whom they would be able to delegate to in the future. Most mentioned spouses or more distant relatives such as nieces, nephews, or siblings. However, they tended to be much less confident in those dynamics due to concerns about the ability of their age-group peers also declining and/or limited levels of trust for more distant relations. Only one participant said that they would consider delegating banking tasks to a professional caregiver in the future.

5.2 Concerns About Financial Misconduct

Multiple participants shared personal stories and concerns about financial abuse or misconduct perpetrated by people close to older adults at various points during their sessions. A notable example was shared by OC6, an older adult who provided banking support to their aunt. They shared anecdotes about financial abuse of a different older adult relative perpetrated by a family member:

> You know I'm really worried about people who steal from older adults. That's a problem. I don't steal from mine, I never did, but I have a cousin who would help herself to her mother's money, and I think that's wrong, but obviously there's no regulation for that ... I mean my cousin is not an evil person but she, you know,

> her mother [unknowingly] helped finance her house, which is not nice. ... When her mother eventually passes away, that estate is going to be a whole lot less. - OC6

When asked about how they expected to be supported when they aged, one close other participant mentioned fears of falling victim themselves:

> This is more problematic, because I don't have children. And, although I have nieces and nephews, who knows where they will be at the time I need that assistance? So in fact, that is a bit of a concern for me, you know. ... I'm very grateful that banks, if they see a big cheque go through, they'll call you, because I think elderly people, especially those with cognitive impairment, are horribly vulnerable to, um, mistakes by caregivers or worse! - OC4

Another volunteered their thoughts on the complicated nature of misconduct perpetrated by close relations when discussing how they saw older adults as prone to minimizing their own experiences as victims of misconduct:

> "Significant underreporting to put it mildly, and "Oh, he didn't mean to, he didn't mean to". And they stay with them! And if you are dependent on the caregiver, and, you know, I don't know what the answer is." - OC3

The banking professional also indicated that concerns around financial abuse are relevant to their work day-to-day:

> I've seen a situation where there was an older member who has, I believe, a couple of kids on their account, it wasn't just one. And there was a situation where funds were being transferred through online banking, right? One of them had access to their online banking just because they were joint. So, there was a situation like that where funds were being e-transferred and the member wasn't aware of that, the elderly member. And it caused a big problem... - BP1

5.2.1 Support for Routine Activity Theory

The core of concept of Routine Activity Theory was described to the participant when they were debriefed about the presence and purpose of the nudges. Some participants did not offer specific responses to the theory, but four participants indicated (either directly or indirectly) that they saw it as a potentially valid explanation for the origins of misconduct towards older adults. For example, OA2 thought it could be an explanation, but the mere consideration caused dismay:

> Well I think the potential is there for sure. But I... wouldn't sleep at night if I did that. - OA2

Even before being debriefed, OC4 shared an anecdote that exemplified RAT's explanation for how close others might end up committing financial misconduct:

> You know I've heard horror stories where families get, they take this on initially but as time goes on they get tired and resentful and start paying themselves. And, uh.. You know I had a friend who's family member who had power of attorney wrote himself a cheque for $25,000. It was a big hassle in the family to get him, his power of attorney revoked. Thank goodness somebody else was checking! - OC4

Two participants did not see RAT as a reasonable theory for the origin of misconduct. Specifically, OC6 was of the opinion that most perpetrators are inherently malicious:

> I don't see how a few bucks here, a few bucks there, "oh, she'll pay for that" will snowball into something significant. I don't see how it can unless you are setting out to. - OC6

This quote also highlights a tendency of older adults in certain situations to not view the taking of "a few bucks" as "something significant"!

5.3 Perceptions of Proxy Accounts

All of the participants were vocally positive about the idea of using proxy accounts. They did consider some barriers to adoption such as potential legal or logistical friction, but felt that proxy accounts would benefit both close others and older adults if banks could work thorough those considerations. OC1 appreciated the control an older adult would have over the potential actions of the close other, thereby supporting the older adult's agency:

> I do like the proxy options, and the permissions, you know the gradient of permissions that a person can authorize. So I think that that has a lot of potential. - OC1

One notable benefit identified was the legitimacy that proxy accounts could provide to close others. For example C02, who went through many efforts to "impersonate" their mother-in-law, explained:

> I think the whole concept of a surrogate account is great, because I feel, guilty but annoyed that my bank...is making me do this *nefarious route* of pretending to be her. - CO2

The banking professional also saw value in this:

> ...our institution or other institutions could adapt something like this where they have a proxy system. ... this is something that would work... there are a lot of situations where our elderly members don't want to use online banking but, you know, their caretakers do and it makes it easier for everyone, so I think that this is something that's important. - BP1

This participant also explained that many older adults already use joint accounts at the financial institution where they work, because it is the only official option for access, and indicated proxy accounts would be a great alternative for many based on additional controls:

> That's their only option [joint accounts] yeah. I mean some of them have power of attorney obviously, and it's the same kind of deal, they get as full access as they can. But I'm sure something like a proxy account where some of those things maybe when you're setting it up in the branch, with an advisor let's say, where you can limit what happens online? Again, I don't think they should have- it depends on, you know, the relationship, right? ...So I think that, yeah, having limitations for that is important. - BP1

An additional benefit that was mentioned was the possibility of intentionally limiting the scope of permissions given to a close other in order to limit the burden of care:

> And maybe they don't want to be bothered with paying the Visa bill, paying the carpenter, paying the caregiver, they only want reimbursement for what they do. So maybe it would be a restriction they would want, so they don't get in over their head or have too much responsibility. - OC5

There was also value seen in the ability to change the limits and notifications as trust in the close other increased, though CO4 was cautious about taking it too far and not keeping a close enough eye on their assets:

> Well that's a bit of a challenge because you have things changing in potentially two opposite directions. Uhh, trust may be increasing. At least at the beginning that's fairly likely because you have initial questions and then later say "yes, this is going well, carry on." But while trust may be increasing... "Do you want to be alerted to things?" "No, I don't really want to." But then, should you be alerted to things? The less involved you are, the easier it is to be taken to the cleaners, you know?

While participants liked the idea that proxy accounts could have limits on payments or transaction amounts, there were some concerns that this could cause a problem in emergency

situations. OC5 also discussed this issue, and the potential need to contact the bank to raise the limit:

> I have to say if there's a restriction with no explanation, then um, if I did need to do that and I had to phone the bank or send a message in the bank and wait for the message to come back whenever it did, that would be really tricky in some circumstances. - OC5

5.4 Perceptions of Behavioural Nudges

In the following sections we summarize responses to the nudges that garnered the most reaction from participants during their interactions with the prototype, as well as prompted discussion in the post-interaction interviews. Not all participants were exposed to or interacted with every nudge. Some nudges were passive, not being triggered by or requiring any specific action from the user. Other nudges may not have been encountered if the participant did not explore the interface extensively, as there were multiple ways to complete some of the tasks as well as nudges outside of the task interaction flows. A table showing which participants encountered which nudges can be found in Appendix E.

5.4.1 Hidden Transactions

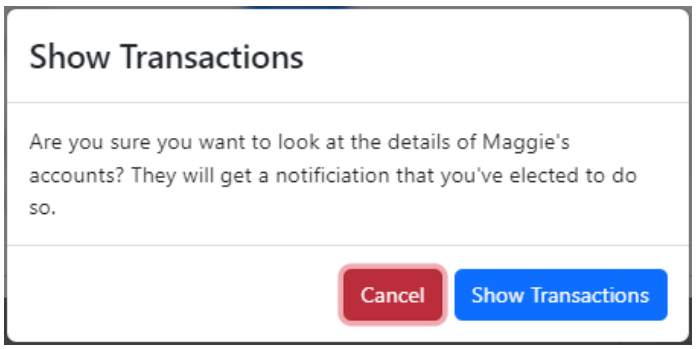


Figure 5.1: Show Hidden Transactions Confirmation Nudge

Both CO1 and OC9 mentioned in their pre-interaction interviews that they had concerns about seeing financial information that they felt shouldn't be disclosed or that an older adult would want to remain private. This scenario was explored by one of the first nudges that could be seen in the prototype: one that caused transactions to be hidden by default. When participants looked at the details of an account, the list of transactions was blurred out and covered by a floating button that could be clicked to show them. This action required confirmation via a dialog box that indicated that the older adult would be notified if they continued (see Fig 5.1).

Attitudes towards this nudge were neutral. While a few participants appreciated it conceptually, most found it unnecessary. Twelve of the 14 participants that encountered the nudge decided they wanted to see the transactions in order to "double-check them" and quickly confirmed the dialog without reacting to the triggered notification. One participant initially canceled after reading the notification, but returned and opted to show the transactions the second time. Only one participant was vocally supportive of this specific nudge:

> Oh, I see, oh that's good... She will see that I'm snooping around in her account, that's good! I *like* that... - CO2

5.4.2 Uploading Receipts

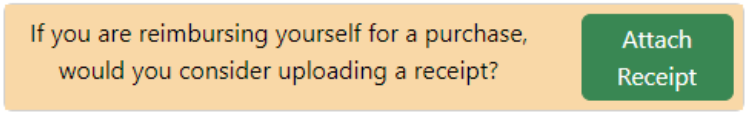


Figure 5.2: Uploading Receipt Nudge

One task the participants performed was to reimburse themselves for shopping they had done on the older adult's behalf. Configuring this transfer caused a panel to pop up asking the user if they would like to upload an associated receipt (see Fig 5.2). This nudge was

well-regarded, with 7 of 8 participants seeing it as quite useful. Participants saw this as a way of providing additional accountability and transparency:

> ...then I'm leaving a paper trail, or at least an information trail, of what's happening. Which is a good idea in those situations. - OA4

CO4 was initially worried about providing the banks with detailed spending information they might not otherwise have, but was more in favour when considering uploading non-itemized receipts:

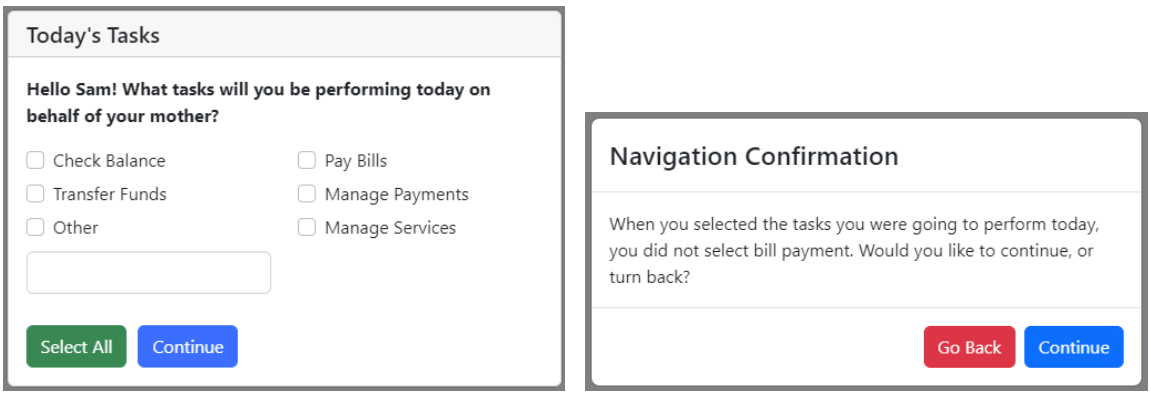
> ... because if we're using this bank and their credit card and all that, then they already have that information... and if they're just trying to confirm that, it seems alright. -C04

OC6 provided a totally different objection to the nudge: they were concerned about causing additional burden when performing tasks by creating a feeling of obligation to upload receipts:

> Yeah I'm not uploading any receipts or anything, forget it. That's too much, you know? There's enough to do. - OC6

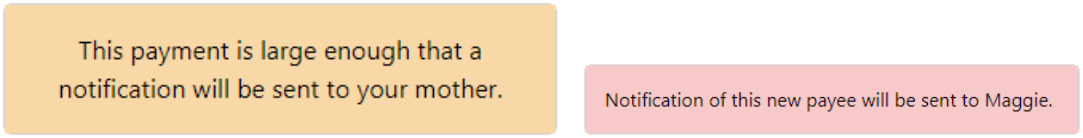
5.4.3 Task Selection

When they first logged in, participants were asked to indicate what tasks they would be performing from a predefined list. Any subsequent navigation to a page that was not related to the selected tasks triggered a popup that asked them if they wished to continue or return to the previous page (see Fig 5.3). These task selection and navigation confirmation nudges were perceived at best as unnecessary and at worst as actively detrimental. Participants did not see enough value in these nudges to justify the annoyance of having to interact with them.



(a) Task List (b) Confirmation

Figure 5.3: Task Selection and Navigation Nudges



(a) Large Payment (b) New Payee

Figure 5.4: Notification Nudges
(These would appear above "Submit" buttons)

5.4.4 Transaction and Payee Notifications

Certain high-impact or unusual tasks such as large transfers or adding new payees indicated that a notification would be sent to the older adult in response (see Fig 5.4). All participants who discussed these notifications appreciated the increased transparency, and were vocally supportive of their inclusion. For example, OC5 commented:

> Adding a new payee and somebody would need to check? I think that's *very* useful because, especially if somebody else is helping you with your banking, you don't really want them to add more payees out of your account. So that's actually probably good that it would come back to the owner of the account. - OC5

The banking professional agreed:

> I think adding that feature... some way to notify the member when something's

> going on with their account, I think that's really important. Because that member, the one in my situation, they had no clue until they came to the bank and I told her... So I think transparency with the member and what's going on with whoever is taking care of their accounts, that's extremely important... - BP1

Many participants had concerns about the method of notification delivery given that many older adults do not use some of the technologies that serve as common communication channels for such notifications. Participants suggested various alternative methods, such as sending the notifications via mail or phone call. Others suggested sending them to other proxies, if applicable, to ensure they are received and reviewed by a trusted and capable individual.

5.4.5 Reminding of Consequences

Multiple nudges highlighted statistics related to the rate of financial abuse of older adults (see Fig 5.5). They were received with mildly positive responses from 6 of the 11 participants who discussed them explicitly, as they appreciated the reminder of risks. This was the only passive informational nudge in the design that did not mention the older adult's name (as the "banking on behalf of" banner does). It was also the only nudge that caused participants to raise concerns that nudges might be ignored after repeated exposures.

OA3 succinctly highlighted what they thought of the passive informational nudges when talking about nudging as a whole:

> I think it's a good reminder for the proxy to be aware of that sort of thing. Big brother is watching <chuckles> - OA3

5.5 Perceptions of Nudge Ethics & Efficacy

During the post-interaction interviews, discussion with many participants touched upon the use of behavioural nudges in this context holistically.

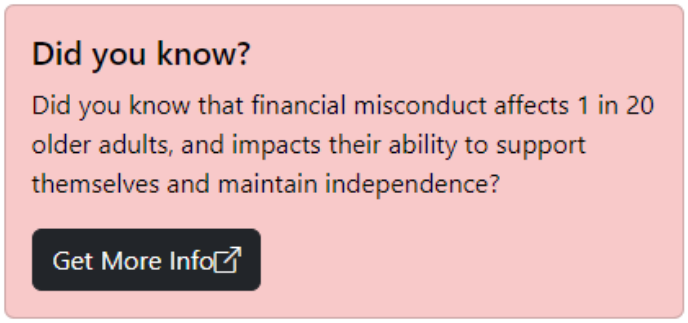


Figure 5.5: Reminding of Consequences

5.5.1 Ethics of Nudging

All participants approved of this application of behavioural nudges. They considered them to be ethical due in large part to the perception of older adults as a vulnerable population and the stated intent of protecting their privacy and financial security. CO1 stated:

> Well, in a case like this it's ethical. You know, I guess, you know, you need to use the ethics lens before you start guiding or manipulating behaviour, but as long as it has the best interest of the client in mind, both the client and the user, yes, I think it's very appropriate. - CO1

When plainly asked if they found nudging to be appropriate, OA1 noted that while it might be bothersome to some people, they would support it:

> It depends on the character of the person. If I was doing this... I wouldn't care and I would just click this and say that's just the way it's set up and that's the way you've gotta go. If it was somebody who was thinking, was worried about people watching what they're doing, then they might get a little annoyed. - OA1

5.5.2 Perceived Efficacy of Nudges

When asked about the perceived efficacy of using nudges guided by RAT at deterring financial misconduct, opinions varied. Participants who were imagining initially altruistic close

others, such as RAT highlights, believed that the nudges would help them stay diligent and accountable. In response to being debriefed on the nudges, C02 said this about the concept of encouraging financial propriety:

> No, I thought that was great! I thought the idea of reminding people of good practices, was, was good! - CO2

Participants who believed that any close others committing financial misconduct would always have had inherently malicious intentions were skeptical of the efficacy of nudges. They believed that these proxies would simply ignore all nudges. Skeptical participants saw much greater effectiveness in setting limits and controls through proxy accounts as they could be used to limit the potential for exploitation and provide opportunities for increased oversight. OA4 shared their opinion:

> I don't think there's any way to have something like this that's impervious to malicious... If somebody's out there to really take advantage of the person ... And I can't think off the top of my head how to manage that except, you know, putting limits on things. - OA4

OC6, who shared knowledge of actual cases of misconduct within their family, mentioned the notification nudges as potentially effective:

> So you're trying to set up deterrents for people who help themselves? I don't know how you would do that ... You discourage them? You let them know you're keeping track? - OC6

However, their line of thinking immediately shifted towards explicitly malicious close others which was outside of the scope of this research, though was a common concern across many participants.

5.5.3 Attitudes Towards Use in Personal Case

Almost all of the older adult participants stated that they fully trusted the people they expected to delegate banking tasks to in the future. When asked how they would feel about nudges being presented to their future delegates in the manner of the prototype, only OC6 expressed a concern. They specified that the nudges gave them an impression of being watched that they did not want to impose upon their children:

> ...you know, being the caregiver of a senior is a lot, so the last thing you want is somebody breathing [down your neck] and asking questions about what you're doing. - OC6

The rest of the older adult participants liked the idea of nudges being presented to their future delegates. C03 was positive, stating:

> Yeah, it's necessary and it's beneficial in the sense that it actually reminds you that you're not the owner of the bank account, and it's trying to guide you with your conduct of how you use the bank account. - CO3

Older adults that had specific people in mind as future close others took the perspective of those caregivers into account when considering how the nudges would be received. For example 0C7 thought their daughter would be annoyed:

> Maybe, yeah. Well I think for example my daughters would be annoyed too by extra clicks. And I trust them to go in and do what they need to do. - OC7

But OC3 thought their daughter would be fine with the nudges:

> I have complete faith in my daughter and I think that she would say "yep, good I know about that. I'm not doing that [committing financial misconduct], I have the receipts." - OC3

5.5.4 Presentation of Nudges to Older Adults

One advantage that we saw in the use of proxy accounts was that it gives the ability to directly target close others with the nudges. This is beneficial in both directions, as it also ensures that nudges *are not* being presented to older adults that might be seen as calling their actions or ability to manage their own affairs into question, thereby causing offense. As an example of this, OA6 maintained their own perspective when interacting with the prototype, instead of imagining they were a close other supporting an older adult. This caused some distress when they encountered the nudge highlighting the prevalence of financial abuse:

> But you know what it struck me as? It struck me as saying "you are incompetent"... I never even thought about it that you were saying that the other person could take advantage of me. - OA6

On the other hand, when imagining if they saw these nudges while banking on their own behalves, a few older adult participants felt that some of the nudges could be useful to help them avoid errors and mistakes. For example, OC5 explained why when discussing the balance between nudge-based reminders and proxy account-based limits, specifically in reference to being prompted to adjust bill payment amounts (see Figure 4.4c:

> There were times that I had to go back and make another payment or correction because you just can't do it when you're wiped, so you really need to do it with a clear mind. And that's, that's more and more dangerous when you get older I think... They didn't bother me when there was a change [in the bill payment amount] because it did seem legit, and I can see that if I'm older, that that would be quite useful. Because you do kind of forget... - OC5

5.6 The Gift Transfer Task

Close others who take on financial task assistance responsibilities may do so out of a variety of motivations. As a way to understand how close others view this responsibility, we included a 'gift transfer' task in the study session, in which the participant was told that the older adult wanted them to 'transfer $20 to themselves as a thank-you for their help with banking'. This study task was partly a way to test the validity of the idea of Routine Activity Theory - that close others might feel like they were 'owed something' in compensation for the assistance they provided to the older adult. Participants were told at the beginning of the study that they did not have to do anything they felt uncomfortable with. Of the 20 participants in the study who reached this task, 14 went ahead and completed the transfer, while 6 either said that they did not feel comfortable doing this, or considered it unnecessary.

CO1 did choose to transfer the gift, but was vocally uncomfortable while doing so. When asked about it immediately afterwards, they indicated that it felt like they were doing something wrong:

> Umm, yeah, so that, just that part makes me uncomfortable because I know that people take advantage of older adults, especially when they have no idea of what's going on. - CO1

Those who considered the gift unnecessary often mentioned other ways that they could be compensated, or other uses for the money. For example, OC5 felt the older adult was being too generous:

> Okay, I'm gonna decline that. Because $20 to me doesn't mean much, but it does to her, so, I would just leave it at that. And I would say thank you, and maybe I would say, you know, "[aunt], why don't we go out for lunch when I'm there", you know? - OC5

OA2 was even more emphatically against accepting the transfer, simply sighing and stating "I don't *want* any money!"

5.7 Perceived Responsibilities of the Bank

Participants had varied opinions on banks' responsibilities to provide additional features designed to protect older adults such as proxy account and behavioural nudges. Several stated explicitly that banks have an obligation to do more to protect vulnerable clients, while others believed that it was up to family members or other close others to ensure that older adults did not experience financial misconduct. For example, OC6 commented:

> Is it their place to do that? I think it should be in the will or in the other siblings to be a watchdog on their mother's account, you know? I don't think it's the bank's job. Yeah, I don't know if it's their job. - OC6

In contrast, OA1 said:

> Well they [the banks] have the, the money. They're getting the benefit of using that money. They should provide the, I guess assurance, that problems can be solved and the system can be used. - OA1

A few participants implied that they believed that banks should be doing more, but showed skepticism due to the lack of legal structures or pressures for banks to do so:

> I really don't know what banks, what rules banks function under in these kind of circumstances. - OC4

Five participants were asked how their opinion of the banks would change if the banks added nudges to their online interfaces. They all responded favourably, believing this change would show awareness of the issue of misconduct, something that many participants found currently lacking.

Chapter 6

Discussion

The older adult participants helped me understand concerns from the perspective of those who may delegate banking tasks in the future, while the close other participants provided valuable context about their experiences serving as financial delegates. The stories shared by close others were particularly poignant. These participants may have been comfortable sharing these stories because they align with their own "good carer" personal narratives [40]. These narratives and the other data collected help inform answers to my research questions related to how these people experience behavioural nudges and proxy accounts generally, as well as their perceived efficacy in supporting older adult, delegates, and preventing financial misconduct. However certain emergent themes related to participants' preexisting security and privacy concerns and barriers to delegated care are worth initial discussion to provide additional context to the results.

6.1 Security Posture and Concerns

The feelings of trust the participants had in their informal care relationships clearly defined their security postures and their attitudes towards financial misconduct. The only participants who discussed concerns about misconduct perpetrated by a close other were those who had personal or second-hand experiences with it. Participants that had not experienced

or heard about misconduct affecting someone they knew were either dismissive of the possibility of such misconduct, or were significantly more concerned about fraud perpetrated by unknown parties. These results align with research that shows people are likely to underestimate risks of financial misconduct by family members or other people close to them and overestimate the risk of fraud perpetrated by strangers [37].

Older adult participants were comfortable with the possibility of sharing their credentials in order to delegate banking tasks, reinforcing previous findings [13]. This illustrates a potential gap in participants' knowledge about digital security: none of them spoke of any concerns about what might happen if their close other lost control of the older adult's passwords, likely because they had such high levels of trust in their potential future delegates. Given that password reuse across different systems is common [14], [75], the scope of access to the older adult's personal information granted by the sharing of a single password may be much greater than the participants realize.

Given the trust most older adults have in their close others, my results suggest that security and privacy features in online banking interfaces should be incorporated in a way that makes them beneficial to both older adults and their delegates. For example, encouraging delegates to attach receipts for transactions is not just as a method of validation or accountability, but also serves as a future reference. Similarly, a banking interface that encourages a logged in delegate to add a second delegate can both serve to enable oversight *and* enables sharing the financial task workload.

6.2 Challenges of Legitimacy for Close Others

My results uncovered serious challenges around legitimacy of close others supporting older adults with financial tasks. There are clear ease of use benefits to the practice of sharing passwords for financial accounts that cause older adults and close others to leverage this practice. However, use of this access mechanism causes additional friction because it violates

bank policies. Five close other participants had to impersonate the older adult they support in order to set up online banking accounts that they used to conduct banking on behalf of the older adult, which demonstrates a clear need for legitimate access mechanisms. Close others should not need to feel like criminals while supporting older adults with banking tasks. Close other participants spoke of these issues with bafflement and discomfort as they highlighted several ways that they would attempt to more accurately impersonate an older adult they supported in order to complete banking tasks and avoid the disapproving eye of the financial institutions. This negatively impacts close others, making them feel like they are acting inappropriately even while they are performing a valuable service and acting as 'good carers' [40].

6.3 Behavioural Nudges and Trust

The behavioural nudges that I included allowed me to successfully gather a wide-ranging set of perspectives that effectively highlights some of the pros, cons, and considerations about their use within the context of delegated online banking. The first question that I wanted to answer as part of this research was how behavioural nudges might affect perceived trust when presented to delegates banking on behalf of older adults (RQ1). Overall the participants in this study did not state that actual levels of trust would be impacted by nudges being presented to close others, likely due to the high levels of trust they had in their own caregiving dynamics and a desire to present the close others as "good carers". Participants almost universally indicated that the level of trust they had in their close others should inform the frequency and tone of the nudges. However, this could be seen as a lack of acknowledgment that the influence between nudging (specifically frequency and tone) and trust is potentially bi-directional. I do not believe that the data and analysis performed as part of this study is exhaustive enough to provide strong conclusions here, though additional research may be able to investigate this interaction in greater depth.

A few participants indicated that a system that presents nudges to close others might be seen as a reflection of the *financial institution's* level of trust in the delegates. This is an interesting contrast to the fact that participants felt that banks including nudges in their interfaces would *increase their trust in the financial institution* due to being seen as indications that the institution cares about the well being of older adults.

> **RQ1**: *How do behavioural nudges affect perceived trust within close other/older adult relationships?*
>
> My participants, most of which had firm trust in their close others, did not see nudges as likely to affect perceived trust within the relationship. Instead, some saw the nudges as reflections of the banks' inherent mistrust of delegates, which was appreciated as an indication that they were considering the vulnerability of older adults who delegate.

6.4 Perceived Efficacy of Behavioural Nudges

My next research question (RQ2) focused on understanding how behavioural nudges would be perceived as possible deterrents of financial misconduct, and how personalization of nudges might affect those perceptions. Given that the primary concerns of participants were related to fraud instead of misconduct, the strict limits enabled by proxy accounts were perceived as more likely to minimize financial damage in the case that an untrusted individual managed to gain access to the account. By comparison, the idea of mitigating misconduct via subtle suggestion was not considered as effective. The lukewarm opinions expressed by the participants in hypothesizing about the potential efficacy of nudges at deterring financial misconduct is unsurprising given the high level of trust the participants had in their relationships. Participants also raised concerns about close others being over-burdened or annoyed by more interactions and repeated exposure, potentially reducing the nudges' effectiveness, which is a known issue with behavioural nudging [58].

Despite these concerns, the nudges were still seen to have merit in a different way than I had intended. The nudges' utility, from our participants' perspectives, was in encouraging and supporting visibility and communication within the support dynamic and reminding the close others of their fiduciary responsibilities. For both older adults and close others alike, the ability of the older adult to have greater awareness of the actions performed by their close other could increase the sense of security and trust between them. Nudges may also help support the close other's 'good carer' self-image by providing visible evidence of both diligence and accuracy. Using nudges to remind users that the information is being automatically shared, or to encourage them to volunteer more information about transactions they are performing, elicited positive responses from our participants for these reasons. Given that participants had no ethical concerns about the use of nudges in this context, including nudges in interfaces could have a positive impact on both the users' experiences and their caregiving dynamics, so long as any burden they place on the close others is carefully balanced. Further investigation is needed to determine whether such nudges would actually be effective at deterring financial misconduct.

Personalization of the behavioural nudges in my study (a sub-topic of RQ2) leveraged a very small subset of the personalization techniques that have been explored in other domains such as e-commerce. In those situations, extensive profiles about an individual may be developed using information whose provenance the user is unaware of, which can cause discomfort due to feelings of privacy invasion [61]. The nudges that I designed and presented to participants do not leverage a deep, opaque set of personal information. Instead, I limited myself to using information that our participants agreed in retrospect was appropriate for banks to both have and make use of such as data related to transactions made through the given bank. This, combined with the fact that participants felt that the personalization was being included for valuable reasons and was successful in "reminding the person that it's a privilege that you've undertaken, it's a responsibility" (OC4), imply that this type of personalization could be both appropriate and effective at increasing the behavioural nudges'

ability to deter misconduct.

RQ2: *How are nudges perceived as possible deterrents of financial misconduct and how are perceptions affected by personalization of the nudges?*
Behavioural nudges were seen as having limited efficacy as deterrent of misconduct by my participants. This is likely due in part to the high level of trust they have in their delegates and therefore were more concerned about explicitly malicious actors than the kinds of routine activity situations anticipated by RAT. Despite that, personalization was seen as likely to improve efficacy as a deterrent, expecially when it invoked the name of, and delegates' relationship with, the older adult. Investigation into lower-trust dynamics could glean more insight into efficacy in higher-risk scenarios.

6.5 The Value of Proxy Accounts

The prototype enabled participants to interact with a banking interface using proxy accounts to access an older adult's bank account and provide assistance, instead of logging in using the older adult's password. This allowed me to explore RQ3: how do older adults and close others experience proxy accounts as a mechanism for delegated banking? Our participants had positive experiences with this access mechanism because it would eliminate close others' needs to impersonate an older adult for the sake of convenient access, enabling the close other to feel supported and acknowledged by the financial institution. The ability of the older adult to set limits on transactions was seen as a strong benefit by providing control over the extent of damage that could be caused by a malicious actor (either an ill-intentioned close other, or an unknown criminal stealing the close other's credentials).

Proxy accounts would also allow the older adult to set up multiple close others as proxies, which was seen as positive by participants. This expands on results showing that older adult spouses examining bank transactions together helps create a shared understanding and added

sense of security [51], and from the work of Setterlund, Tilse, Wilson, *et al.* who claim that the presence of "guardians" can help deter financial misconduct by an informal caregiver arising from routine activities [18]. Additionally, some close other participants noted that having multiple delegates would allow sharing of the workload and flexibility in how and when they provide assistance, which could help to lessen the overall caregiving burden [76]–[78]. Sharing the burden in turn allows support to continue for longer periods of time, helping the older adult remain independent and age in place for longer [10].

While adding more proxy accounts to support additional delegates does cause a slightly increased security risk by virtue of creating more login credentials that can be lost or misappropriated, careful configuration of the associated accounts would greatly mitigate the impact of such events by ensuring that malicious actors can be easily detected through logging and notification controls and have limited ability to manipulate assets through restricted permissions. Ultimately, the implementation of proxy accounts would potentially require a non-trivial effort from financial institutions, but from the perspective of their customers this would be extremely worthwhile given the increasing use of online banking [79], the aging population [80], and the recognition that proxy accounts could be useful in informal care dynamics for older adults [33]. The result from this user study further supports this by highlighting the concrete benefits proxy accounts would bring to older adults and their delegates.

> **RQ3**: *How do older adults and close others experience the proxy account as a mechanism for close others to banking support to older adults?*
>
> Participants were extremely positive about proxy accounts, with older adults appreciating the control and transparency and close others appreciating the legitimacy and accountability benefits. They were also seen to have benefits when managing multiple close others. Participants also believed that proxies would be useful in many caregiving contexts beyond their own, specifically those where the older adult had limited trust in their delegates.

6.6 Summary

I explored my research questions through a user study that allowed both other adults and close others to perform a series of banking tasks "on behalf of an older adult" through a high-fidelity prototype. The prototype leveraged a proxy account mechanism and behavioural nudges to help guide the participants towards continued financial propriety as they performed financial tasks on behalf of an older adult they care for. Participant reactions to behavioural nudges presented to banking delegates by our prototype were mixed. They were generally in favour of nudges that provided transparency, tracking of information, and notifications to the older adult, but were less positive about nudges that were seen as "just extra clicks" with no repercussions. Most would have been comfortable with nudges being presented in their caregiving contexts (RQ1), but saw limited relevance to deterring misconduct (RQ2). In contrast to the nudges, proxy accounts were highly regarded for their support for setting limits on others and for allowing multiple delegates to provide support, giving the older adult *more* control over their financial affairs and limiting the burden on delegates (RQ3). One emergent benefit was the feeling of legitimacy that proxy accounts gave the close others who otherwise felt that they needed to quietly impersonate the older adult they support, which was very uncomfortable.

Chapter 7

Design Space for Nudging in Financial Delegation Contexts

The user study I performed focused specifically on the informal caregiving dynamics between older adults and their close others, and allowed some insight into the research questions I set out to explore related to older adults and delegated banking. However, older adults are not the only people who can benefit from delegating their banking tasks to close others and there are a wide variety of reasons people of any age may wish to delegate financial tasks. For example, recent work in financial technologies have focused on how they can support people with bipolar disorder [81], or those with acquired brain injury [8]. There are also temporary situations in which people might want to delegate responsibilities such as extended remote travel or short-term disability.

Given the broad applicability and a desire to go beyond the scope of my original research questions, in this chapter I present a design space building upon the results of the user study that designers can use to devise systems that leverage delegated access mechanisms and behavioural nudges to support both the account holder and their delegates in a variety of contexts. Three major considerations form the basis of the design space, though there are other considerations that I choose to highlight separately. In order to help ground the

space I (along with Dr. Latulipe) provide examples of how the space can be used both to contextualize study results and to inform design decisions.

7.1 Design Space Axes

There are 3 main considerations I identified when designing systems for financial account delegation:

1. The level of trust in the relationship between account holder and delegate
2. The access mechanism used to give delegate access to the account(s)
3. The various types of behavioural nudges that can be employed to nudge the delegate towards continued propriety, and the psychological heuristics they leverage

The relationship axis is continuous, whereas the access and nudge mechanism axes are discrete. A simple method of visualizing this space is to illustrate each axis independently as shown in Figure 7.1. This method is easy to understand at a glance, but doesn't clearly illustrate the inter-related nature of the axes as they are informed and impacted by each others. To aid in keeping this connectedness in mind, I've also chosen to describe the design space as a volume defined by axes representing each of the considerations, as visualized in Figure 7.2. The two visualizations can also be used in concert, as the independent axis view allows for more visual clarity of an individual set of considerations whereas the the volume can more clearly contrast multiple combinations, especially when a given evaluation/design does not take a single "value" in a given axis. With those methods of visualizing the space defined, each of the axes can described in greater detail.

7.1.1 Relationship Trust Axis

Relationships between account holders and delegates vary by type and by level of trust. While a financial delegate who is a close family member may be assumed to be highly trusted, this

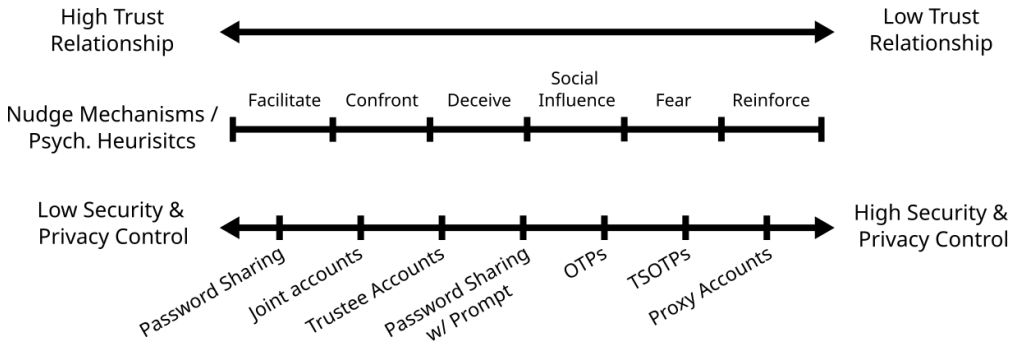


Figure 7.1: A Design Space for Nudges in Delegated Banking. This represents the design space as a series of three independent axes.

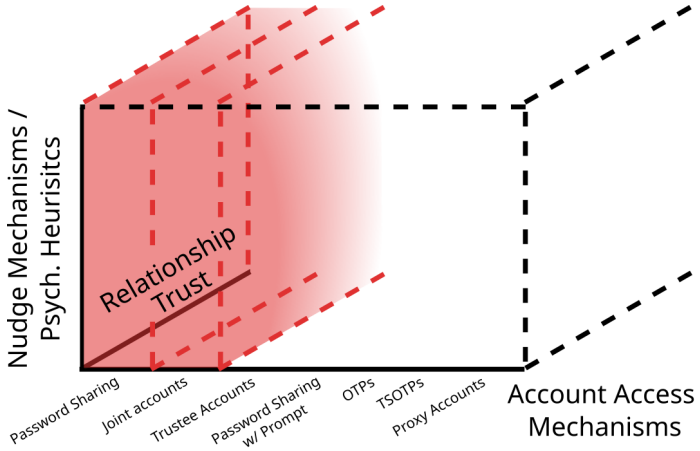


Figure 7.2: A 3-Dimensional Representation of the Design Space. The area shaded in red indicates mechanisms where the delegate is not separately promptable and so nudges are not advised, unless they are designed for both audiences: the account holder and the delegate. Generally, neither *Password Sharing* nor *Joint Accounts* are good mechanisms for financial delegation, despite their common appropriation for delegation purposes.

is not always the case. Conversely a delegate who is an appointed trustee, a friend, or a distant relation might be considered to be a more distant relationship but could still have the complete trust of the older adult. While one might hope that no account holder ever has to appoint a financial delegate whom they do not fully trust, such situations can occur. For example, a court could grant a Power of Attorney to a family member based on perceived incapacitation that renders the older adult unable to access their accounts themselves, and that person may not be trusted by the account holder. There could also be situations in which an older adult has a limited support system and must rely on someone they have

limited trust in. In situations with lower levels of trust, it is critical that access mechanisms with functional limits are used, and stronger behavioral nudges may be warranted.

The level of trust between an account holder and their delegate can be considered a fixed constraint by designers and should be taken into consideration when selecting both delegation mechanisms and designing behavioral nudges to support delegates and encourage financial propriety. In our design space, level of trust is represented as the first/Z-axis, with lower-trust relationships in the background and higher-trust relationships in the foreground.

7.1.2 Access Mechanism Axis

The second/X-axis in this design space represents these various access mechanisms that can be used to give delegates access to financial accounts. This axis includes both mechanisms that are commonly used but not approved (password sharing), as well as access mechanisms that are not yet commonly available in online banking (such as Password with Prompt, TSOTPs, and Proxy accounts). As a step towards the development of a design space for financial delegation contexts, it was necessary to explicitly analyze the various ways that access to financial accounts can be provided to a delegate. This analysis was done based on a synthesis of literature related to the various mechanisms, my professional experience in the fields of security and privacy, and careful reasoning between myself and Dr. Latulipe.

Table 7.1 lists access mechanisms in columns, with the table rows detailing impacts of each access mechanism on account holders and delegates. This table characterizes how each access mechanism impacts the privacy (2nd and 3rd row) and security (1st and 3rd row) of the primary account holder, as well as their autonomy (4th row). Transparency of delegate actions (5th row) refers to the ability of the financial institution to detect whether the older adult or the delegate is logged in, and whether the mechanism would allow the older adult to view a record of actions taken by the delegate. The next two (Rows 6 & 7) represent the ease with which an account holder can setup and revoke delegate access for each access mechanism, and this would vary depending on the policies, procedures, and interfaces provided by the

Access Mechanism	Passwor Sharing	Joint Account	Trustee Account (PoA)	Password Sharing \w Prompt	One-Time Password (OTP)	Task Specific OTP	Proxy Account
Delegate has Own Login Credentials	N	Y	Y	N	Token	Token	Y
AH's Privacy Protected	N	N	N	N	N	Y	Y
Functional Limits on Delegate Actions	N	N	N	Generic	N	Y	Y
AH Maintains Account Access	Y	Y	N	Y	Y	Y	Y
Transparency of Delegate Actions	N	Y	Y	Y	Y	Y	Y
Ease of Delegate Access Setup for AH	Simple	Hard	Hard	Simple	Moderate	Moderate	?
Ease of Delegate Access Revocation	Hard	Hard	Hard	Hard	N/A	N/A	Simple
Delegate Explicitly Acknowledged	N	N	Y	Y	Y	Y	Y
Delegate Separately Promptable	N	N	Y	Y	Y	Y	Y
Suitable with Multiple Delegates	N	Y	Y	N	Partially	Partially	Y
Impacts Credit Rating of Delegate	N	Y	N	N	N	N	?
Acceptance by Banks	N	Y	Y	Unlikely	Likely	Likely	?

Table 7.1: A functional analysis matrix of online bank access mechanisms for delegates assisting account holders (AH), with each row representing factors that entail benefits/risks to the account holder, delegate and/or financial institution.

financial institution. Whether the delegation mechanism recognizes the legitimacy of delegate (Row 8) was included in response to feedback from participants during the user study (See Section 6.2). Rows 9 and 10 relate to whether a delegate can be prompted, and therefore nudged independently from the account holder, and whether the mechanism easily supports multiple delegates. The final two rows (11 and 12) are institutionally focused, highlighting whether the mechanisms provide credit protection from the delegates actions and whether the banks are likely to *legally* support their adoption and, ultimately, be willing to implement them.

Password sharing with delegates exposes account holders to many risks due to password reuse [14] and a lack of access control. If an account holder gives a close other the password to access their online banking, the close other can perform any action that the account holder would be able to. Additionally, the close other may even be able to *change* the password, effectively barring the account holder from accessing their own account. Password sharing also means that the financial institution can not tell who performed particular financial transactions and limits the ability to target behavioural nudges. One method of disambiguating users when passwords are shared is to present a question dialog upon sign-in that asks the user whether they are the primary account holder or a delegate banking on behalf of the primary account holder (Fig. 7.3). There is no way of validating the user's response to such a dialog box, but a well-intentioned delegate should have no reason to pretend to be the account holder. This disambiguation could be used to ensure that nudges are being presented to the close other specifically, instead of also to the account holder, allowing more targeted nudges to be designed. This technique could be used as a stopgap measure to allow some nudge designs to be implemented before a more flexible and secure access mechanism is put in place, but is unlikely to be something that banks would support because it acknowledges and, in a sense, condones continued use of password sharing which is risky and contrary to banks' Terms of Service.

One-Time Passwords (OTPs) provide additional security by using separate credentials,

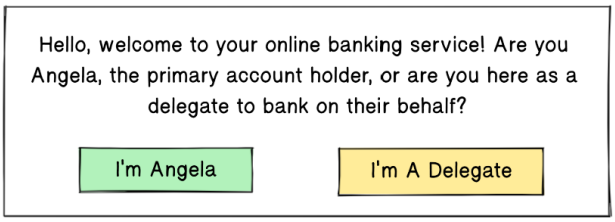


Figure 7.3: Dialog to disambiguate the current user. This could be used to determine when a delegate is banking on behalf of an account holder.

but they are typically only valid for a single-use within a limited time period. That could be particularly problematic for account holders that desire or require more frequent banking task assistance, as they would have to set up a one time password every time they want a close other to assist them. If they want this assistance because they struggle with online banking technology it is reasonable to assume that they may also struggle with creating a one time password. A variation of OTPs are Task-Specific One-Time Passwords (TSOTPs). These would allow a delegate access to an account but only to perform a very specific task (such as paying a utility bill). We are not aware of Task-Specific One-Time Passwords being implemented in any banking contexts at this time, but they are an obvious mechanism that could be employed to address some of the privacy and security issues associated with financial delegation. However, it is likely that setup of TSOTPs would be even more cumbersome and challenging, and may not be seen as worth the effort, especially in cases where the account holder struggles with technology.

Joint accounts allow full access to funds for all named parties meaning the account holder has limited legal protection from the actions of their delegates, though transactions are attributable to whichever party logged in. They do not provide privacy either as all account holders can see all transactions related to the joint account. As noted by legal scholar Wiseman, joint accounts are convenient for the purposes of financial task delegation but flawed by the assumption of full joint ownership of the contained assets:

> In a typical scenario, an account holder creates a new joint bank account with an adult child and is the sole contributor of funds to the account. The account

> holder intends to retain control over the funds for the remainder of her life, but also wants an adult child to have the power to assist with financial transactions, as needed. In terms of empowering the assistance of the adult child, creation of a joint bank account makes this possible because, at common law, a joint bank account is a recognized form of joint tenancy, with each co-holder entitled to an undivided share of the funds in the account and associated individual and independent rights of deposit and withdrawal. However, at common law, there is no recognition of the primacy of the account holder's interests; it is equity that provides that recognition, through the doctrine of resulting trusts. [68]

Joint accounts can make sense when multiple individuals intend to contribute to and share funds in an account as part of a household relationship (e.g. in marital or common-law partnerships), but they are problematic when the funds belong to one individual and the other individual is added to the account for the sole purpose of assisting the primary account holder with conducting financial transactions.

Proxy accounts (if well-designed) can allow the account holder to customize what the delegate can see and do in the account(s), and therefore can address both security (i.e., by setting limits on the amount of money that can be transferred out, or prohibiting the addition of new payees) and privacy risks (i.e., by limiting how far back in the transaction history the delegate can browse, or by limiting the visibility of certain accounts, such as saving and investment accounts.) The separation of credentials cleanly solves the password reuse issue as well. However, proxy accounts do require the account holder to have enough technical literacy to set up and monitor over time, or more rigorous institutional support from the financial institution to configure and monitor on behalf of, and ideally in concert with the account holder. Proxy accounts are not being provided by Canadian banks currently.

The various mechanisms are ordered in Table 7.1 and in Figures 7.1 & 7.2 such that mechanisms we consider to provide less protection for the account holder's security and privacy are towards the left, and those with significant protection are to the right. This

ordering is intended to make it easier to use the design space visually, such that the high-level constraints/benefits of the relevant mechanism can be easily compared when relating two regions of the space to each other. Ordering specifically based on the amount of granular control that the account holder has in limiting what the delegate can do and see was chosen to support the goal of minimizing risks of financial misconduct, though research and design focused on other goals in delegated contexts may warrant a different ordering based on other characteristics.

7.1.3 Nudge Mechanism Axis

The third/Y-axis for this design space represents the various nudge mechanisms and/or psychological heuristics that a designer can leverage in financial delegation interfaces. This axis of the design space is predicated on the stance of Hansen and Jespersen regarding the broader ethics of nudging: that the ethical validity depends on the psychological mechanisms used, the transparency of the nudges, the context in which they are presented, and the user's ability to engage with the designers about their experiences of being nudged [56]. Each of these aspects of nudge ethics could be used to define the axis, as can other aspects such as the type of thought they target (eg. reflective vs. automatic thought), but we have chosen to focus primarily on the first one: psychological mechanisms.

As mentioned in Section 3.2, there are a very broad set of psychological heuristics that can be used in nudges. While a designer can certainly choose a heuristic and design a novel nudge based on it, or can look at a previously designed nudge to interpret the heuristics they use, it is useful to leverage a pre-existing taxonomy that helps identify specific mechanisms and their related effects. One example of this is the work of Mirsch, Lehrer, and Jung, who focused primarily on 19 observed psychological effects and then identified various nudges that made use of them. Taking a different approach, Caraban, Karapanos, Gonçalves, *et al.* created a taxonomy that groups nudges based on the specific design and interaction choices they target, then identified the various heuristics leveraged within that style of interaction,

and finally grouped the nudges into 6 higher-level categories as summarized below [53]:

Facilitate: Focuses on guiding the user by improving the *ease* with which choices in their own best interest can be made. An example heuristic is the *status-quo bias*.

Confront: In some instances the opposite of facilitation, these nudges call the users' instinctual or prior decisions into question. A perfect example is the *regret aversion bias*.

Deceive: A canonical example would be the *placebo effect*, but would also include any nudges that obfuscate or mislead the user.

Social Influence: Leveraging heuristics that describe our decision making based on social norms and societal tendencies, such as *herd instinct bias*.

Reinforce: Both subtle and overt mechanisms that push towards decisions by "increasing their presence in individuals' thinking", such as the *availability heuristic*, which posits that we assume that things that easily come to mind are more important.

Fear: An example of using fear would be taking advantage of *scarcity bias*, whereby our fear of losing out on the opportunity to acquire or retain a finite resource influences our decisions.

The same or similar taxonomies can also be used to evaluate the transparency of nudges, or any other aspect of nudge design that a designer feels is important to apply to this axis of the design space. For example, Caraban, Karapanos, Gonçalves, *et al.* also placed the 23 nudge designs they identified on a plane defined by the transparency of the nudge on one axis and how the nudge targeted reflective versus automatic thinking on the other axis. As another example, Mirsch, Lehrer, and Jung ordered the 20 psychological heuristics they identified by the frequency with with they were used in existign designs [20]. For the sake of simplicity, we have chosen to flatten the choice of nudge to a single dimension in this

space based on the mechanisms identified by Caraban, Karapanos, Gonçalves, *et al.* [53], but existing research can be used to add as much depth to nudge design selection as is required for a given domain. My choice of ordering for the nudge mechanisms along the appropriate axes in Figures 7.1 & 7.2 is based on the order the nudges are presented in the Caraban, Karapanos, Gonçalves, *et al.* paper [53].

With all three axes in place, designers can leverage them to make more informed and novel choices based on the interactions between them. For example, if a designer knows they are is attempting to address relationships with a specific level of trust, that can in turn help inform which psychological heuristics may be appropriate and which access mechanisms should be made available to allow the account holder to safely delegate tasks. If a designer is limited in the delegation mechanisms the system they are designing in offers they can use those constraints in the design space to investigate which nudge designs are applicable and safe to use, and what ranges of relationship trust they are able to support. Specific examples of evaluations like these are explored later on in Section 7.5.

7.2 Personalization

The three axes discussed in the previous sections can aid designers in determining a set of nudges that are applicable and appropriate to delegated banking, depending on psychological heuristics, access mechanisms, and relationship characteristics. An additional dimension that can be considered is the addition and degree of personalization that can be applied to nudges presented to delegates. While personalization is a very common technique for enhancing behavioural nudging broadly (see Section 3.2.1) there are considerations that apply to the delegated banking context. I have not included personalization as a fourth main axis in the design space because the types of personalization applicable would be particular to each nudge mechanism, and so can be thought as a design-space within each nudge. There are two characteristics that are unique to or work differently in a delegated banking context that

I've identified as part of this design space: personalizing based on the social relationships, and leveraging sensitive financial information.

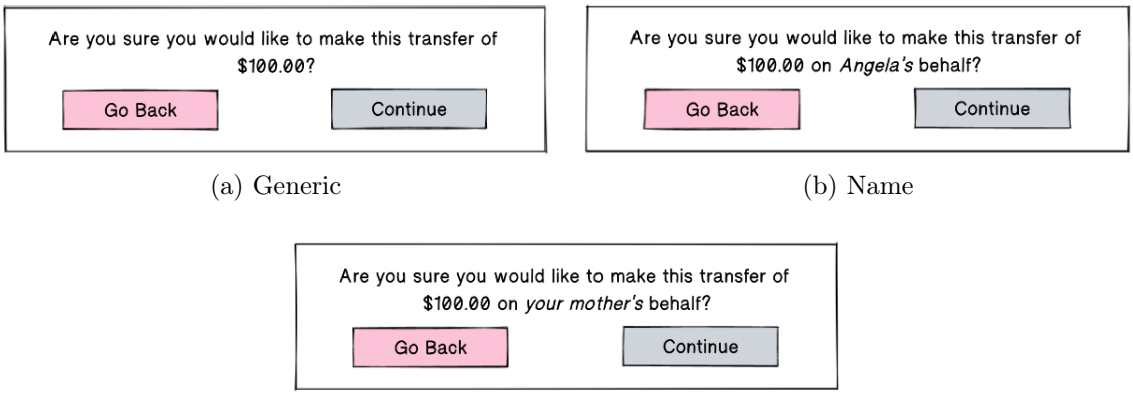
7.2.1 Personalizing with Social Information

The first category of personalization, which I am calling "social information", consists of information about a person and their relationships. Within the context of delegated banking for account holders, this can include details such as the delegate's name, age, occupation, or other personally identifiable information (PII). It is also possible to leverage information about the account holder themselves, such as their name, gendered pronouns, or their relationship to the delegate (e.g., referring to "your parent" in a nudge directed at a delegate). Figure 7.4 shows an example of a simple popup nudge with different types of social personalization applied. As in the example, this category of information is primarily useful for personalizing *the nudges themselves* as opposed to personalizing *which nudges* get presented.

Relationship dynamics can vary greatly and so we theorize that there are likely both positive and negative potential effects related to the levels of social personalization. Nudges that leverage low levels of personalization may not deter delegates from inappropriate behaviour as strongly as those with more personalization. This is balanced by the likelihood that weak personalization decreases the possibility of evoking negative emotions in the delegate associated with the account owner that could impact the relationship. On the opposite end of the spectrum, high levels of personalization may have a stronger deterring effect but may also increase the likelihood of negative impacts on the relationship.

As mentioned previously, power of attorney may enable delegates to gain access via certain mechanisms, such as trustee accounts, and exercise more control over an account holder's finances. However, the legal framework of power of attorney is relevant regardless of access mechanism, and therefore it is worth taking into account when designing nudges. This adds another characteristic to social personalization as it codifies and formalizes some aspects of the relationship between the delegate and the account holder. When a PoA is

invoked, nudging based on certain tasks may no longer be appropriate, or should be reworded to respect the legal authority with which the delegate performs some of those actions.



(a) Generic

(b) Name

(c) Relation

Figure 7.4: Social Personalization Examples

7.2.2 Personalizing with Banking History

Nudges presented to delegates could also be personalized using information about the account holder's assets, such as leveraging the account holder's banking history. This could be done through nudges that are triggered by unusual transactions, by a delegate performing an action/task for the first time, or nudges that are related to availability of funds. Personalizing in this way could be effective at encouraging both proper conduct (the goal of our research) as well as feelings of accuracy and safety for the delegate (an emergent theme arising from the user study, see Section 6.3). An important consideration when personalizing with banking history is the potential violation of privacy as account holder may not want certain financial information exposed or leveraged this way. The access delegation mechanism used may be used as an indication of the account holder's privacy preferences (as with highly-configurable proxy accounts), and therefore appropriate information to leverage for personalization, but other mechanisms might mislead or obfuscate those preference (such as when password sharing is the only available option).

7.2.3 Ethics of Personalization

These approaches to personalization are not mutually exclusive, as social information can be combined with financial history data to provide richer nudges. One of the common concerns users have with personalization is the sourcing of the data [61]. This should not be a concern in the context of delegate banking given that we propose leveraging information that a user's financial institution could be reasonably expected to possess. Nudges leveraging more personal or unrelated information such as images of the account holder or data about the account holder gained from third-party providers could have significant negative effects especially when encountered in this context, and should therefore be avoided. Given the lack of guidelines for leveraging these types of information, more research on the impact of nudge personalization would be extremely useful in creating more detailed guidelines for designers who wish to use this technique in their own nudge designs.

7.3 Leveraging the Design Space

Having defined the design space, I will now highlight three different ways that it can be used to investigate potential designs. First, I will highlight a slice of the design space in which there is high trust between the account holder and the delegate as a way of exploring which access mechanisms and nudges may be appropriate to apply within those dynamics. Secondly, I present hypothetical delegation scenarios created by my advisor, Dr. Latulipe, who used the design space to identify appropriate delegation mechanisms and nudges to meet user needs in those scenarios. Third, I will apply the findings from the user study discussed in Section 5 to highlight how the design space can be used to provide structure to and contextualize results of studies related to delegated banking and nudging.

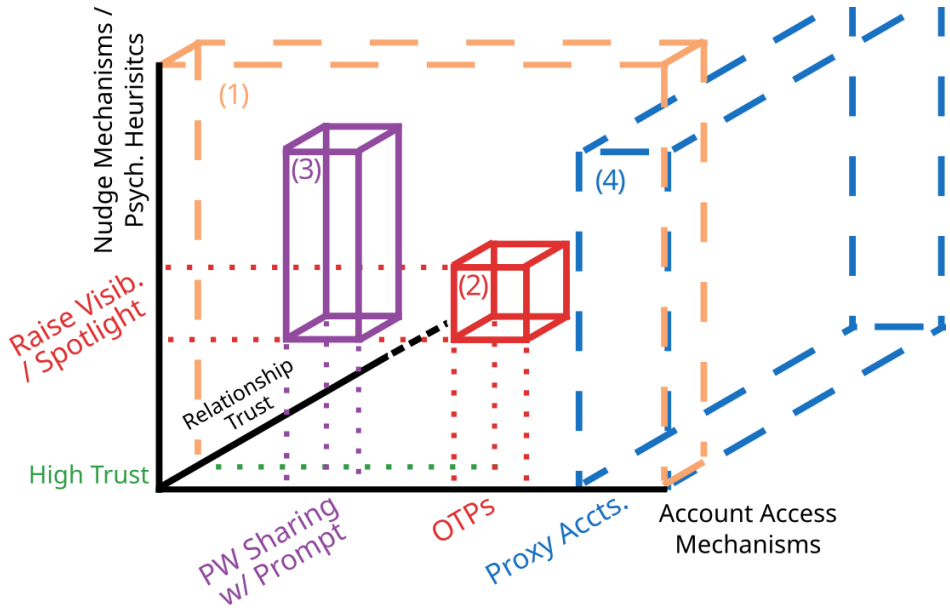


Figure 7.5: Example Evaluations in the Design Space. The orange rectangle labeled (1) represents a section of the space for high-trust relationships where the appropriateness of nudges across different access mechanisms is explored, see Section 7.3.1. The red cube labeled (2) represents a scenario in which a One-Time Password is given to a trusted delegate and behavioural prompts are developed to raise visibility of their actions, see Section 7.3.2. The purple rectangle labeled (3) represents a scenario in which Password Sharing with Prompt is used with multiple delegates and a variety of nudge mechanisms are employed, see Section 7.3.2. Finally, the blue rectangle labeled (4) represents the proxy account nudges explored in the user study prototype (see Section 4.1).

7.3.1 Nudge Appropriateness by Access Mechanism for High Trust Relationships

If we assume a specific level of trust in the relationship between the account holder and the delegate, we can hold that variable constant and perform an evaluation of the interactions between access mechanism and nudge types and consider which access mechanisms are appropriate for that level of trust and which nudges are appropriate to use given the features of each access mechanism. Table 7.2 presents an evaluation of the *appropriateness* of Caraban's 23 types of nudges for each of the seven main access mechanisms, assuming the nudges would be presented to members of relationships in which there is a reasonable level of trust between the account holder and the delegate. Each cell in this table is colour-coded

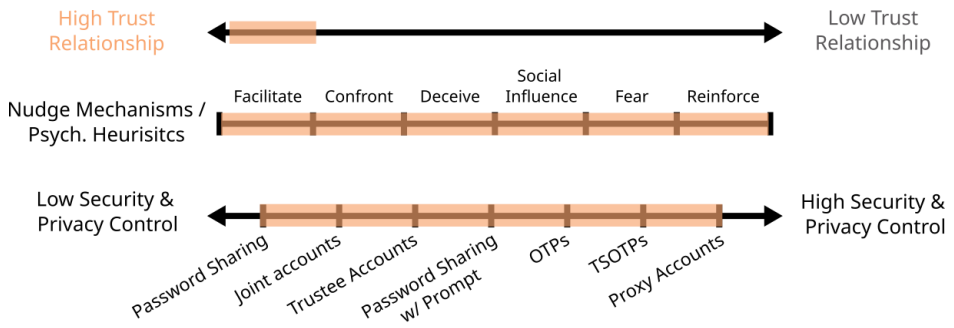


Figure 7.6: Location of the broad evaluation of high-trust scenarios along the space axes.

from green, meaning the nudge is appropriate, to pink, indicating the nudge is inappropriate to use. Each interaction between access mechanism and nudge type is evaluated in terms of whether the combination is wholly inappropriate for financial delegation contexts, might offend the account holder, the delegate, or both, or whether that type of nudge presented through that access mechanism is unlikely to offend either and therefore considered appropriate to deploy. It is worth noting that this colour coding does not represent the likelihood of the nudge being effective at deterring misconduct or whether the nudge would be *desired*, simply at how likely they are to be *offensive* and which individuals they may be offensive to. The focus here is on identifying nudges that ensure the trust relationship between the account holder and their delegate is not harmed by offensive nudging. This exploration of a specific slice of the design space provides a high-level evaluation of nudge appropriateness across all access mechanisms applicable to situations in which there is a significant amount of trust between an account holder and their delegate, and is shown as an orange rectangle labeled (1) in Figure 7.5, and as shown in Figure 7.6. The evaluations of appropriateness in Table 7.2 are based on consideration of common delegation relationships as reported in the literature [13], as well as the results of the user study in user described in Chapter 5. Overall, I was able to identify 4 distinct slices of the space based on the interactions between psychological heuristic, delegation dynamics, and access mechanism: nudges that are wholly inappropriate, nudges that may harmfully leverage the social dynamics, nudges that could offend those with a sense of "ownership", and nudges that are likely safe in most contexts.

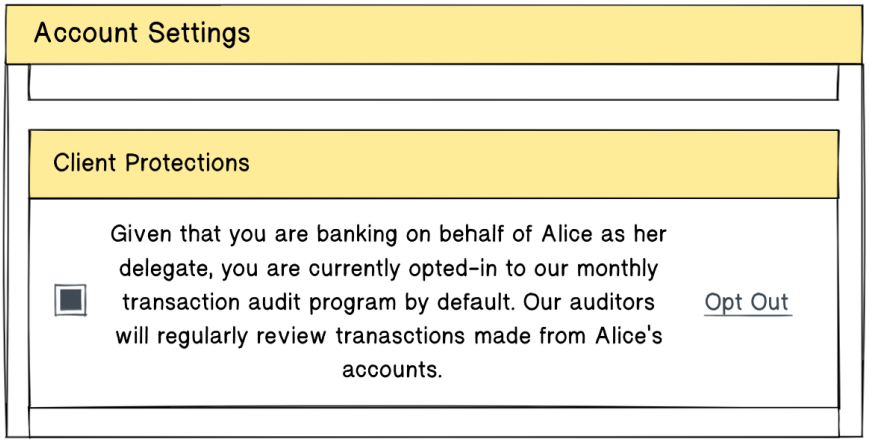
	Nudge Category	Nudge Mechanism	PW Sharing	Joint	Trustee	PW w/ Prompt	OTP	TSOTP	Proxy
1	Facilitate	Opt-out Policies	IA	IA	IA	IA	IA	IA	IA
2	Deceive	Add Inferior Alternatives	IA	IA	IA	IA	IA	IA	IA
3	Deceive	Biasing the Memory	IA	IA	IA	IA	IA	IA	IA
4	Deceive	Placebo	IA	IA	IA	IA	IA	IA	IA
5	Deceive	Deceptive Visualization	IA	IA	IA	IA	IA	IA	IA
6	Reinforce	Subliminal Priming	IA	IA	IA	IA	IA	IA	IA
7	Fear	Scarcity	IA	IA	IA	IA	IA	IA	IA
8	Social Influence	Reciprocity	O-B	O-B	O-B	O-B	O-B	O-B	O-B
9	Social Influence	Enable Comparisons	O-B	O-B	O-B	O-B	O-B	O-B	O-B
10	Confront	Multiple Viewpoints	O-B	O-B	O-B	O-B	O-B	O-B	O-B
11	Reinforce	Instigate Empathy	O-B	O-B	O-B	O-B	O-B	O-B	O-B
12	Facilitate	Hiding	O-AH	O-B	O-D	UO	UO	UO	**UO**
13	Facilitate	Suggest Alternatives	O-AH	O-B	O-D	UO	UO	UO	UO
14	Social Influence	Public Commitment	O-AH	O-B	O-D	UO	UO	UO	**UO**
15	Social Influence	Raise Visibility	O-AH	O-B	O-D	UO	UO	UO	**UO**
16	Confront	Remind Consequences	O-AH	O-B	O-D	UO	UO	UO	UO
17	Confront	Create Friction	O-AH	O-B	O-D	UO	UO	UO	**UO**
18	Facilitate	Defaults	UO	UO	UO	UO	UO	UO	**UO**
19	Facilitate	Positioning	UO	UO	UO	UO	UO	UO	UO
20	Confront	Throttling Mindless Activity	UO	UO	UO	UO	UO	UO	UO
21	Fear	Reduce Distance	UO	UO	UO	UO	UO	UO	UO
22	Reinforce	JIT Prompts	UO	UO	UO	UO	UO	UO	**UO**
23	Reinforce	Ambient Feedback	UO	UO	UO	UO	UO	UO	**UO**

Table 7.2: Legend: UO = Unoffensive, O-AH = Can offend account holder, O-D = Can offend delegate, O-B = Can offend both older adult and delegate, IA = Inappropriate. Using the design space to identify nudges that may offend users in high trust relationships. It is important to note that while nudges can be presented across all access mechanisms, in password sharing and joint accounts it is not possible to predict who will see the nudge: it could be the account holder or the delegate.

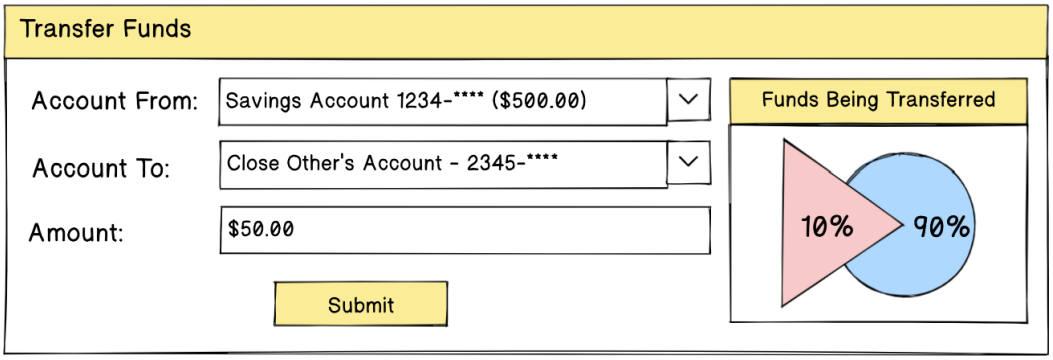
Inappropriate Nudge Effects

The relationships between account holders and their delegates are often personal and important and should be supported positively. This means certain nudge mechanisms would be inappropriate, the majority of which Caraban, Karapanos, Gonçalves, *et al.* identify as non-transparent (it is not obvious to the user that they are being nudged) and automatic (relying on the user's subconscious information processing). These nudges include all of the mechanisms Caraban, Karapanos, Gonçalves, *et al.* classify as "deceptive", which elegantly justifies their danger. Examples of two of these nudges are shown in Figures 7.7a and 7.7b.

While deceptive nudges may be effective at influencing behaviour, the harm that could be done if delegates became aware of the nudges would result in them feeling manipulated in a way that would severely harm the feelings and perceptions of trust, as suggested by the ethical stance of Hansen and Jespersen [56]. Any situation in which a well-meaning delegate feels like they are being held under suspicion is likely to cause increased psychological stress and therefore increase the burden of providing assistance, and should likely be avoided. These nudges are denoted as *inappropriate* across all access mechanisms in Table 7.2 (Rows 1-7).



(a) Opt-Out Policy or Placebo: Describes a default policy of auditing transactions made on behalf of an older adult. May also be used as placebo if no auditing is conducted.

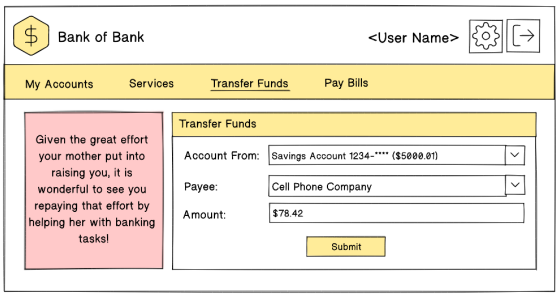


(b) Deceptive Visualization: The exploded pie chart on the right gives a misleading representation of the proportion of the account's funds the transfer is withdrawing.

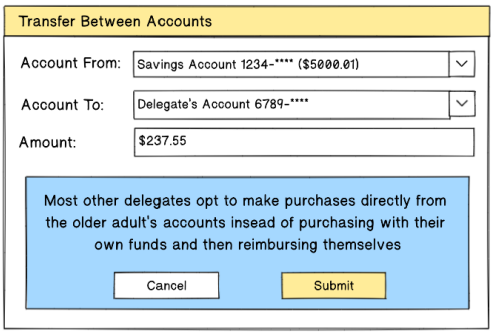
Figure 7.7: Inappropriate Nudges

Harmfully Addressing the Relationship

Somewhat similarly, there are also nudge designs that leverage and address social relationships. In the context of delegated banking, such nudges would reflect directly on the relationship between the delegate and the account holder. The nudge mechanisms that leverage these heuristics, such as *reciprocity* and *enabling comparisons*, are therefore more likely to have an impact on, or even offend, all members of the relationships when presented. As an example, leveraging the relationships themselves by encouraging reciprocity due to an older adult's historical support of a close other acting as delegate (e.g. implying that a child should properly support their parent given that they were supported through childhood) could be a source of social friction (see Figure 7.8a). Such nudges are dangerous in part because they assume a positive historical relationship between the delegate and the older adult, which may not be the case, but also because they turn the relationship into something that is very transactional. In another example, the *herd instinct bias* could also be leveraged to attempt to encourage a delegate to act in the same way as other delegates (see Figure 7.8b). This implies that all delegates should act in similar ways, which may not reflect the specifics of each older adult/delegate dynamic. These nudges could be offensive regardless of which access mechanism is used for delegation, and as such the entirety of the related rows in Table 7.2 are marked as likely to offend both the delegate and the account holder (Rows 8-11).



(a) Reciprocity: Addresses the history of support the older adult has given to a child acting as delegate as a way of motivating reciprocal care.



(b) Herd Instinct: Highlights the behaviour of others to influence the future caregiving actions of the delegate.

Figure 7.8: Nudges that harmfully address the relationship.

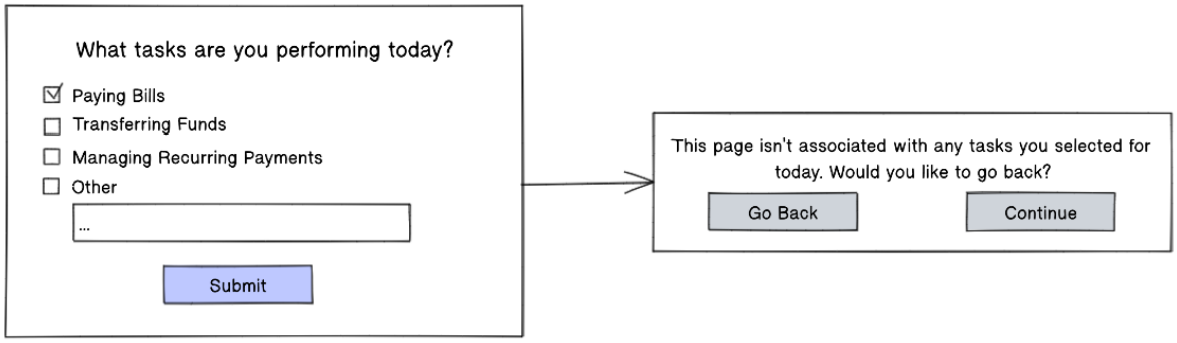
Offending those with "Ownership"

A third concern with nudging in this context is how nudges might affect individuals with a sense of ownership over the accounts, such as in trustee or joint accounts. Some nudge mechanisms, such as *throttling mindless activity* or *raising visibility* actively place additional burden on the user beyond what they may think is reasonable for someone who has the legal right to the accounts and therefore should be able to act without what one participant in the user study referred to as "someone breathing down your neck" (see Section 5.5.3). Not being able to distinguish user role is an issue with password sharing, because the system only sees one user. This means a nudge designed for a delegate could be presented to the actual account holder who has the right to see their own transactions and pay bills of any amount, and so the account holder could be offended by being presented with throttling nudges or visibility nudges (see Figure 7.9). With trustee accounts, the delegate can be distinguished (and is indeed the only one with access), but they may have a sense of ownership because of the legal framework in which they were granted access and so might similarly find hiding and friction nudges to be offensive. Finally, in the case of joint accounts, it is impossible for the system to determine which (if either) user is acting as a delegate. Even if one of the joint account holders really is just a "delegate" with no equity of their own in the account, that delegate may understand the legal status joint access gives them and therefore *feel* a sense of ownership regardless of the primary account holder's intent. Each of these situations in which offensive nudges might be presented to "owners" are within Rows 12-17 of Table 7.2.

Unoffensive Nudges

I have labeled the nudges not subject to the above concerns as "Unoffensive" (UO) across all mechanisms. Given that this is based on our limited reasoning, it is important to highlight that future research may uncover additional considerations to be taken into account in high-trust situations, and that all nudges should still be carefully considered before being incorporated into a design.

(a) Throttling Mindless Activity



(b) Public Commitment

Figure 7.9: Nudges that may offend account "owners".

7.3.2 Specific Interaction Design Examples

The previous example aims to show that the space can be used to help guide exploration of the design domain by highlighting possible constraints to be considered. The design space also can be used to guide interaction design that starts with specific scenarios gleaned from real users or created based on user-centered research. Dr. Latulipe created two fictional scenarios inspired by people and situations in her own life to illustrate how this could be done. We then worked together to use the design space to think through each set of constraints to come up with novel approaches for supporting both the account holder and delegate in those scenarios. The two scenarios are presented verbatim below, each followed by our analysis to indicate how the space can be applied to theoretical design. In both of these examples, the trust levels and access mechanisms are set, and we use the design space to evaluate which nudge designs might be appropriate within each scenario.

Scenario 1: Jerome's ABI

> Jerome, who has an acquired brain injury (ABI) that impacts his cognitive ability and makes it difficult for him to complete certain tasks that require numeracy - he doesn't currently trust his brain to get the details of banking transactions right. Jerome has no close family, and wants to give a close trusted friend, Ani, the ability to log in to his bank account to pay some bills, transfer enough money from savings to chequing to cover those bills, and ensure auto-withdrawals such as rent and utilities are covered. Jerome is recovering from his ABI and expects to be able to take care of his finances himself soon. In this scenario, a temporary access mechanism might be appropriate for a bank to offer. Because Jerome trusts Ani, and wants Ani to be able to perform a variety of tasks on his behalf, the OTP access mechanism may be appropriate. Jerome can log in to his bank account and generate a one-time password for Ani, and then give Ani the bills that need to be paid and instructions to make sure his funds are set up across accounts to manage the outgoing payments.

At the intersection of OTP access and high levels of trust, Table 7.2 shows which nudges could be appropriate for Jerome's insitution to deploy. For example, *raising visibility* nudges, which Caraban, Karapanos, Gonçalves, *et al.* identify as leveraging the *spotlight effect* heuristic are shown as appropriate for this mechanism. These nudges leverage people's tendency to feel like their actions are more visible than they actually are [53]. Concrete examples of this mechanism would include dialog box messages presented to Ani notifying her that some actions (such as large transfers between accounts, adding payees, bill payments that are unusually high) will cause notifications to be sent to Jerome. In the case of OTP access, a designer can assume that the delegate *does not* have a persistent legal right to manage those assets as might be expected with a joint account. Actions of a delegate using an OTP can be communicated to the account holder, which means that the *raise visibility* mechanism is both possible and potentially effective - the delegate can have a reasonable expectation that

the system will actually follow through and inform the account holder of their actions during their session. As a user of an OTP, Ani is acknowledged as a delegate and not the owner of the accounts, and therefore is unlikely to be offended by behavioural prompts that inform her that her actions are being logged and communicated. For a delegate like Ani, who is trusted by Jerome, nudges like this may be seen positively, as a way of increasing communication. This evaluation covers a single nudge being presented through a single mechanism and for a dynamic with a high level of trust. As such, it is labeled as Example (2) in Figure 7.5 and shown individually in Figure 7.10.

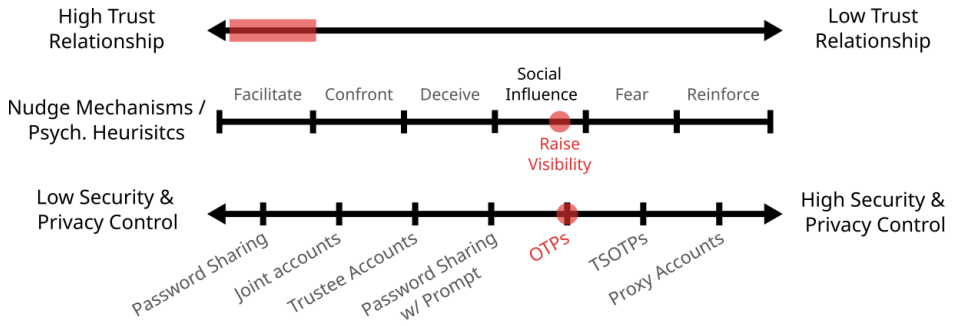


Figure 7.10: Location of Jerome's scenario along the design space axes.

Scenario 2: Shanti Goes Hiking

Shanti, a recent college graduate, is hiking the Appalachian Trail (a 3500Km trek that covers 14 US states and typically takes 5-7 months to complete), and has decided to go low-tech. She carries a basic cell phone for emergencies, but is not easily able to do any banking. She has shared her bank account credentials with her long-term girlfriend, Erin, and has notified her bank that a delegate may be banking on her behalf. When Erin logs in, she is prompted to declare herself as a delegate (Password Sharing with Prompt mechanism). While Shanti has significant trust in Erin, she has also given her password credentials to her father, Hassan, so that he can monitor the account as well. When either Hassan or Erin access Shanti's online bank account, they will be prompted to declare

themselves as banking on Shanti's behalf when they log in.

In this situation, the behavioural prompts that make sense to deploy (as determined from Table 7.2), include *hiding*, *suggesting alternatives*, *public commitment*, *raise visibility*, *remind consequences*, *create friction*, *defaults*, *positioning*, *throttling mindless activity*, *reduce distance*, *JIT prompts*, and *ambient feedback*. A designer creating prompts for this scenario may add a banner or frame around the entire interface with labels noting that the delegate is banking on behalf of Shanti, which is an example of *reminding of consequences* and *public commitment*. Similarly, a designer may create a prompt that appears when one of the delegates is making a transfer to their own accounts that suggests that they upload an associated receipt. This nudge would be a *just-in-time* prompt that *raises visibility* and encourages accountability. Adding the prompt as a popup would also allow it to *cause friction* if more emphasis on uploading receipts is desired. This scenario is shown as the purple rectangle labeled (3) in Figure 7.5 and individually in Figure 7.11.

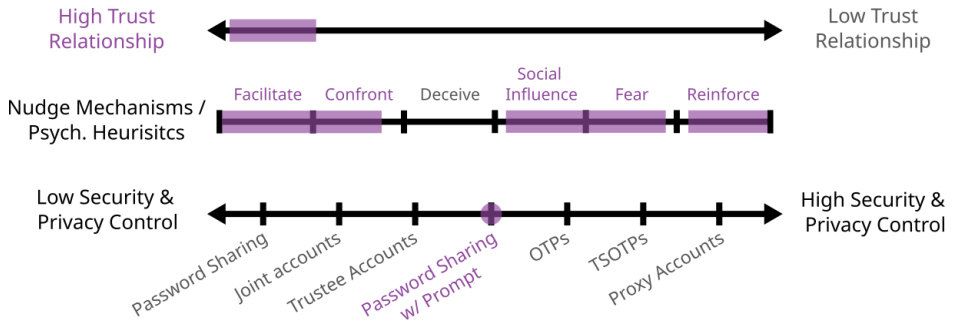


Figure 7.11: Location of Shanti's scenario along the design space axes.

7.3.3 User Study Results in the Space

To further highlight the utility of the design space I also chose to show how a more simple analysis of participant responses to the user study and prototype design from Chapter 5 fits within the space. As mentioned previously, the study focused on one type of relationship (between older adults and close others), only explored proxy accounts, and only presented a

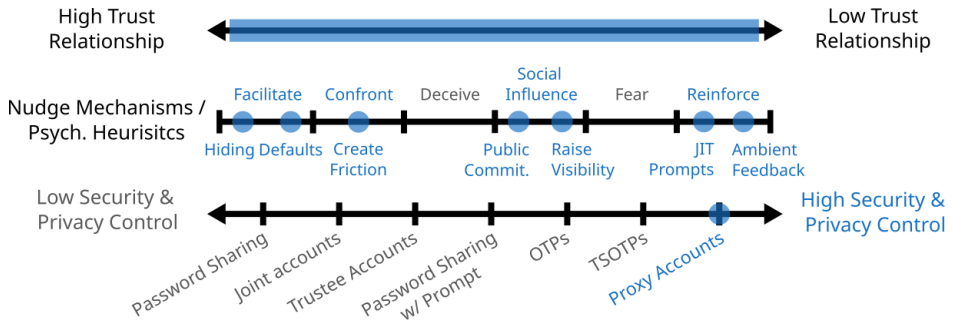


Figure 7.12: Location of the user study results (see Chapter 5) along the design space axes.

subset of nudge mechanisms. In general, the participants discussed their thoughts on relationships with varying levels of trust. Based on the discussed results, I was able to determine the range of trust levels that my participants thought appropriate for each mechanism,

These evaluations are illustrated in Table 7.3. Based on the characteristics of the study, the results of this evaluation occupies a volume within the designs space shown as the blue rectangle labeled (4) in Figure 7.5 and individually in Figure 7.12.

7.4 Other Considerations

The previous sections outlined the dimensions of the space and showed how the space can be used. Here I discuss a few other aspects that are worth considering when designing for delegated contexts.

7.4.1 Temporal Aspects of Delegation Relationships

Another set of considerations yet to be discussed are related to the impacts of nudging users over longer periods of time. Research has shown that, in general contexts, attitudes towards a nudge might change over time, potentially reducing a nudge's efficacy [58]. This means that the content and types of nudges presented to a user over a period of time may need to vary in order to remain fresh and impactful, or even help mitigate situations where the repeated nudges are seen as actively detrimental through repeated exposure. The only axis

Nudge Mechanism	Psych. Heuristic	Level of Trust In the Delegate
Nudge Example Description		No Trust — Complete Trust
Hiding	**Status Quo Bias**	
Hiding private transactions in an account details page by default.		
Suggest Alternatives	**Status Quo Bias**	
A form tooltip suggesting a previously used amount for a routine transfer.		
Public Commitment	**Commitment Bias**	
Asking the delegate to select which tasks they will perform before logging in.		
Raise Visibility	**Spotlight Effect**	
Indicate that a given action will trigger a notification to the account holder.		
Remind Consequences	**Regret Aversion**	
A banner indicating the impacts of financial misconduct of older adults.		
Create Friction	**Regret Aversion**	
Second-guessing the user if they navigate to a page they may not need.		
Defaults	**Status Quo Bias**	
Automatically populating the current credit card balance when paying it off.		
JIT Prompts	**Availability Heuristic**	
Asking the user to upload a receipt just before they click "Submit" on a transfer.		
Ambient Feedback	**Availability Heuristic**	
Changing the color of a payment field as the value increases.		

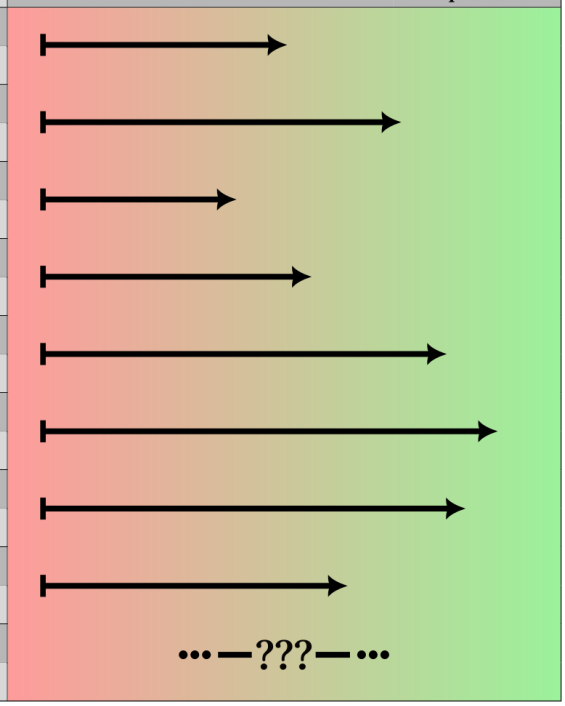


Table 7.3: Evaluation of the user study results using the design space. Arrows indicate the range of trust levels within which participants wanted the given nudge to be presented to their delegates. No data was collected about *ambient feedback* prompts.

of the design space relevant to this phenomenon within the control of the designer is the impact of the access mechanism. If configured correctly, certain mechanisms can aid in the overall reduction of nudges presented to the user by restricting the tasks that the delegate is allowed to perform, thereby reducing the decisions and interactions that may need to be nudged.

More specifically to the context of delegated banking and nudging to encourage propriety however, there are a number of additional temporal factors that can be considered:

- *Changing Needs:* The needs of caregiving relationships vary over time. For example, an account holder may initially require occasional assistance from a delegate, but eventually may need to hand off financial management entirely due to cognitive decline. Conversely, they may suffer from an acute illness that requires significant delegation

initially but requires less and less as they regain their autonomy. These relates to the various roles a delegate can take discussed in Section 7.1.1.

- *Relationship Trust:* If an older adult leverages support from a delegate for an extended period of time, the level of trust that the older adult has in the delegate may change, and therefor the need for or value of nudging the delegate may also change.

- *Routine Activity:* Independently of changes in trust, Routine Activity Theory posits that financial impropriety can begin after a long period of time, due to the additive cost of long-term informal care burdens [18].

7.4.2 Multiple Delegates

As mentioned in Section 2.4, Routine Activity Theory suggests that the idea of 'guardianship' or multiple delegates has potential for reinforcement of good conduct [18]. This is in line with some of the findings from the user study that indicated that some older adults would prefer to appoint multiple delegates who can keep an eye on each others' activities and improve accountability and to share the burden of providing long-term financial task assistance (such as a second delegate taking over when a first delegate goes on vacation). Some of the access mechanisms we have described are suitable for use with multiple delegates, as shown in the third-last row of Table 7.1. Suitability here relates to the ability of the account holder to differentiate which delegate took which action, and the ability for the delegates to operate independently of one another while still maintaining oversight. We label Joint Accounts, Trustee Accounts, and Proxy Accounts as access mechanisms that are suitable for appointing multiple delegates, because each delegate has their own credentials and so the system can tell who is taking which actions and can log that information for the account holder (or other delegates) to view. OTPs and TSOTPs may be suitable for use with multiple delegates, but this would require the account holder to remember who they gave the one-time tokens to and when, as the system would only be able to log the transactions performed during

those sessions as delegate transactions. The mechanisms also do not allow for delegates to log in repeatedly or to explicitly see what other delegates have done, so they do not enable persistent guardianship over the accounts.

It is also worth considering the impact of multiple delegates on behavioural nudging, such as options for more complex nudging. For example, a nudge could highlight the visibility of one delegate's actions to other delegates, or compare the actions being performed between delegates (such as in Shanti's scenario above). When doing this designs may also be informed by the level of trust between delegates and should take the possibility of impacting that trust into account. The initial versions of the design space has limited dedicated support for these more complicated dynamics, but does aim to provide some structure to guide how designers might reason about them.

7.4.3 Institutional and Legal Factors

The adoption of the behavioural nudges and proxy accounts we have discussed within this context is ultimately up to the financial institutions and third-party applications that provide online banking services. To this end, it is worth considering how to ensure that interface design would be useful to institutions both in terms of appealing to them as businesses that want to support older adult clients and as entities with legal and ethical obligations. For example, the access mechanisms described in Table 7.1 may not all be offered by financial institutions due to legal constraints around privacy and liability. In particular, password sharing is an access mechanism that explicitly violates the Terms of Service (ToS) of most financial institutions and consequently removes liability from the institution if financial misconduct occurs through this access mechanism. Nonetheless, previous work shows that password sharing by older adults to provide delegates access is common [13]. The access mechanism we labeled 'password sharing with prompt' (see Table 7.1, Column 4 and Figure 7.3) is unlikely to be embraced by many institutions, as it would be seen as condoning a practice that violates their ToS. However, given the ease and prevalence of password sharing, disam-

biguation through a prompt is highly pragmatic and could provide important misconduct detection benefits, as well as the ability to appropriately nudge well-intentioned delegates to maintain financial propriety. Institutions also have to comply with legal requirements for securing client accounts and ensuring the privacy of client information. This limits how much access institutions are willing to give to delegates without seeing documentation such as a Power of Attorney. Thus, access mechanisms such as proxy accounts, OTPs, and TSOTPs, which address a spectrum of financial task assistance needs, may not be possible without legislative policy changes in certain jurisdictions. However, third-party services may not be subject to the same restrictions, allowing them to provide different delegation models than more strongly regulated institutions.

Financial institutions need to consider both well-intentioned delegates (the target of the nudge design space) as well as those who may be attempting to commit financial abuse against an individual who trusts them very deliberately. Thus, it is important to realize that financial propriety nudges could actually *empower* delegates who *deliberately set out to commit financial abuse* by tipping them off to the types of activities that might be considered suspicious. For example, nudges that are triggered by the detection of unusually large transfer amounts could inform an ill-intentioned delegate of certain thresholds that are flagged for further investigation. While this is not a concern for delegates who are not inherently malicious, this perspective on how nudges might influence deliberately malicious actors needs to be taken into account when designing them and may require considering additional theories of criminology beyond Routine Activity Theory.

The design space does not incorporate such legal considerations into the axes in order to enable fully exploration of the space across access mechanisms with greater focus on the support of account holders and the delegates that support them. I hope this lens can provide guidance for legislative reform and the ensuing policy, system, and interface design decisions made by financial institutions to support these dynamics.

7.4.4 Designing for Other Dynamics and Domains

This design space has been focused entirely on delegated banking but these considerations are also relevant for nudging delegation in other domains via web-based portals in other domains such as entertainment [82], [83], healthcare [84], shopping [85], and government services and taxation [86]. Pregnancy tracking applications are another candidate for this space given that pregnant people are often supported by multiple close others and/or professional caregivers [87]. Song, Faklaris, Cai, *et al.* also highlighted the need for better design of access mechanisms that support more than a single individual for task delegation in workplace settings, as delegation has led to account/password sharing there. Therefore, this domain may also benefit from behavioural nudging to reinforce workplace norms [88].

Participants in the user study highlighted that joint accounts are useful when dealing with end-of-life situations due to the persistent access they grant. Delegation also happens in other planned or unplanned ways when a user dies and their close others need to deal with still opened web accounts across a variety of domains [89]. Designers can also think of coming-of-age scenarios, as parents or guardians initially banking on their children's behalves are effectively acting as "proxies" with shared passwords [69]. Prior work has shown that systems in various domains tend to assume a single user per account and do not support delegation explicitly; these systems will end up supporting multiple users per account implicitly through insecure means such as password sharing [70], [88]. These examples demonstrate that supporting delegation through both choice of access mechanism and through the design of nudges is applicable and important beyond the financial delegation context.

7.5 Summary

This chapter presents the design space of nudges aimed at promoting financial propriety of close others when they are banking online on behalf of account holders. I have identified three main factors that can help designers better support financial delegation. The first factor

relates to the potential deployment of behavioural nudges based on various psychological heuristics. The second axis relates to the choice of access mechanisms account holders use to grant delegates access to their accounts as these impact which nudge mechanisms are applicable and how the nudges are perceived. The final axis represents the relationships present in the informal support dynamics. I have also identified other considerations related to personalization, nudging over time, and legal factors. This design space lays the foundation of characteristics and considerations that could be used to influence the choice of access and behavioural nudging mechanisms for designers looking to support people who wish to receive support and to those who they have assist them with online banking. Dr. Latulipe and I have also provided examples to help guide users of the design space through its use. The design decisions and factors presented here certainly do not constitute an exhaustive list but may serve as a starting point either for designers looking to incorporate these tools into their own interfaces, or for future, deeper, research into additional factors that can inform better design. I believe the design space described in this chapter can help system designers in domains other than delegated banking think through both access mechanisms and interface nudges that can steer delegated users towards providing responsible and accountable support.

Chapter 8

Conclusions

This chapter presents a summary of all of the contributions of the research presented in this thesis, a description of the publications and other impacts, limitations of the work, and a summary of some of the future directions in which this work can be taken.

8.1 Contributions

I set out to explore and provide insight into a series of research questions related to supporting delegated online banking for older adults and preventing financial misconduct (see Section 1.1). To this end, I developed a prototype of an online banking system that incorporates both behavioural nudges and proxy accounts and performed a user study during which older adults and close others performed banking tasks using that prototype. A running instance of the prototype and the source code for it have been made publicly available for researchers and designers to interact with and build upon (running prototype, GitHub Repository). The user study involved three phases: an open-ended discussion of the participant's caregiving contexts, a think-aloud interaction with the prototype, and a semi-structured discussion about their thoughts on the prototype which included a debrief about the presence and purpose of the behavioural nudges. Audio from sessions was recorded and then manually transcribed and merged with interaction logs from the prototype.

Through analysis of the user study data I have shown that while it is possible that nudges could impact the perception of trust in lower-trust dynamics, more people would prefer financial institutions focus on factoring the level of trust within a relationship into how often and disruptively nudges are presented to delegates (RQ1). Additionally, I have shown that people in high-trust delegation dynamics see my behavioural nudges as having limited impact at deterring financial misconduct but also see personalization as a viable option for increasing their efficacy (RQ2). Finally, the study results clearly demonstrated that both older adults and close others see extensive benefits to using proxy accounts in their delegation contexts (RQ3).

Building beyond the results of the study based on a desire to generalize the results, I have also contributed a design space to assist researchers and designers in exploring the relationships between trust, delegated access mechanisms, and behavioural nudges when supporting delegated banking in varied social contexts. The space is accompanied by sample evaluations to help highlight potential applications.

8.2 Resulting Engagement and Publications

The research that I have undertaken has allowed me to take part in several workshops and present in multiple venues. I was invited to the PIM 2022 workshop "Successfully aging with our information and our information tools", offered as a part of ASIS&T 2022. At this workshop, I was able to provide insight into how we can improve the way information is shared with delegates to support aging. I also took part in the accessFintech 2024 workshop as part of ASSETS'24, during which I was able to highlight how proxy accounts with flexible delegate controls can help increase long-term accessibility of online banking for people with accessibility concerns.

In terms of resulting publications, I presented preliminary results of the user study at the University of Mantioba Centre on Aging's 40th Annual Spring Research Symposium in

2023. Following that, I co-authored a paper with Dr. Latulipe reporting the full results of the study that was accepted to Graphics Interface 2024 and that I presented at conference in Halifax in June of that year [23]. A paper that presents the generalized design space is currently in progress.

8.3 Limitations

This study into perceptions of behavioural nudging of close others and proxy accounts for online banking was performed by myself and Dr. Latulipe, both researchers from Western cultures. It also primarily recruited participants who presented those same cultural norms and lived experiences of informal care. This leaves the very real possibility that attitudes towards proxy accounts and behavioural nudging would elicit very different responses from older adults, delegates, or financial institutions grounded in other cultures. It also seems likely based on the recruitment methods, and in many cases was explicitly stated, that the participants were highly educated. Further research in this area would benefit greatly from leveraging the perspectives of more diverse peoples to ensure that their values and priorities are reflected in future designs. Additionally, the sample size was relatively small ($n = 21$), further limiting generalizability.

Only allotting a relatively short time with each of the participants limited the ability to establish a rapport with them before discussing particularly sensitive topics like family and personal finance. Specifically when it comes to the interest in any sort of misconduct perpetrated by close others, there may have been circumstances that participants were uncomfortable to discuss in the context of the proposed changes due to a lack of trust or comfort with researchers. In the same vein, we were also unable to explicitly select participants who had personal experience or awareness of concrete instances of misconduct. While some of the participants did have these empirical insights, the majority did not, and therefore were simply asked to speculate based on their intuition or hypothetical scenarios presented.

The design space presented is subject to some of the same limitation given that it was strongly informed by my experiences and conclusions regarding the user study. Additionally, I have not yet had the opportunity to use the design space to build new interface designs or revise the prototype interface using the design space as a framework to further increase confidence in its utility and efficacy as a design tool.

8.4 Future Work

This work shows that behavioural nudges have potential to mitigate misconduct in the context of delegated banking, but further investigation with longitudinal real-world deployments that empirically measure their effectiveness (including changes in efficacy over time) would be extremely beneficial. These studies could also explore the concrete impact of personalization at improving efficacy of the nudges.

With regards to proxy accounts, further work is needed to investigate how to enhance the functionality and control, and how to enable older adults to set up and monitor the accounts even if they are not comfortable with online banking themselves. Participatory design with banking experts would help ensure that proxy accounts are designed in a way that satisfies regulatory frameworks and financial institution cultures.

As mentioned in Section 3.3, the emergence of new financial technologies (FinTech) provides another avenue for application of the techniques I have investigated in this research. While they may not have the same restrictions as traditional financial institutions, no FinTechs based in North America support any form of safe and configurable delegation. It would be very beneficial to investigate whether such third-party systems would provide a more accessible way to pilot proxy accounts and behavioural nudges in production systems.

Finally, I would love the opportunity to further ground the design space in future designs and future research into delegated banking to increase its efficacy as a design tool. This is all towards the end goal of minimizing the adoption costs of behavioural nudges and proxy

accounts to the point where they receive support from traditional financial institutions in Canada, maximizing the positive impact they can have for older adults and their delegates.

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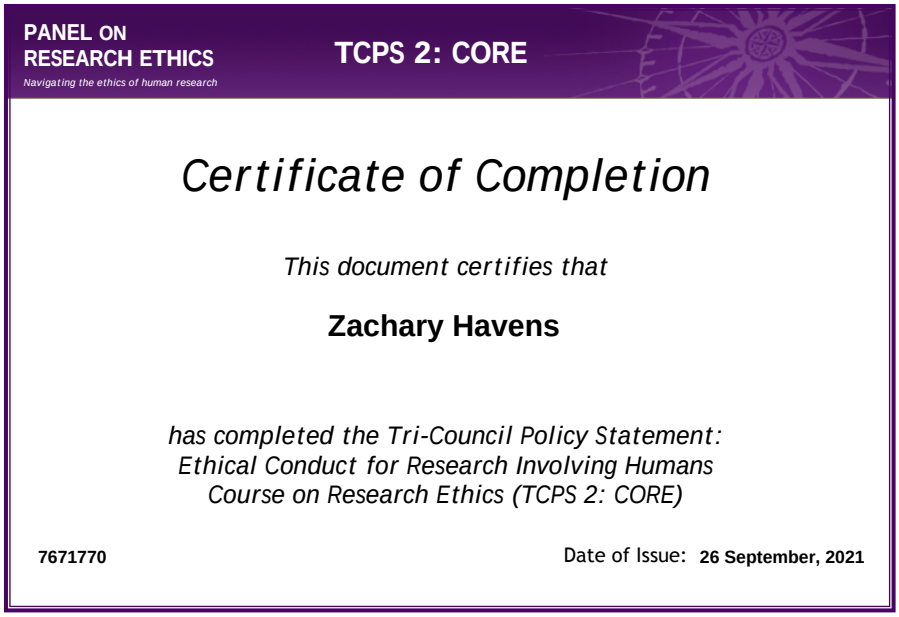
Appendix A

Certificates and Approvals

TCPS 2: Core Certificate



PANEL ON RESEARCH ETHICS
Navigating the ethics of human research

TCPS 2: CORE

Certificate of Completion

This document certifies that

Zachary Havens

has completed the Tri-Council Policy Statement:
Ethical Conduct for Research Involving Humans
Course on Research Ethics (TCPS 2: CORE)

7671770

Date of Issue: **26 September, 2021**

Research Ethics Protocol Approval

University of Manitoba | Research Ethics and Compliance

Human Ethics - Fort Garry
208-194 Dafoe Road
Winnipeg, MB R3T 2N2
T: 204 474 8872
humanethics@umanitoba.ca

PROTOCOL APPROVAL

Effective: September 22, 2022 Expiry: September 21, 2023

Principal Investigator:	Zach Havens
Advisor:	Celine Latulipe
Protocol Number:	HE2022-0193
Protocol Title:	*Gathering Feedback on Novel Online Banking Interfaces Designed to Support Caregivers*

Andrea L Szwajcer, Chair, REB2

Research Ethics Board 2 has reviewed and approved the above research. The Human Ethics Office (HEO) is constituted and operates in accordance with the current *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*- TCPS 2 (2018).

This approval is subject to the following conditions:

i. Approval is granted for the research and purposes described in the protocol only.

ii. Any changes to the protocol or research materials must be approved by the HEO before implementation.

iii. Any deviations to the research or adverse events must be reported to the HEO immediately through an REB Event.

iv. This approval is valid for one year only. A Renewal Request must be submitted and approved prior to the above expiry date.

v. A Protocol Closure must be submitted to the HEO when the research is complete or if the research is terminated.

vi. The University of Manitoba may request to audit your research documentation to confirm compliance with this approved protocol, and with the UM *Ethics of Research Involving Humans*Ethics of Research Involving Humans policies and procedures.

Appendix B

Study Supplementary Information

Study Introduction and Interview Guidelines

Intro Script

<To be read aloud by the interviewer at the start of the session.>

Thank you for agreeing to participate in this study about informal caregivers and online banking. Over the next hour and a half or so, we are going work through a couple segments together. We're going to start off with a conversation where we will ask some questions about your informal care dynamics and experiences and we will establish some context for the research we are doing here. We will also have a very short questionnaire for you to fill out. Following that, we will give you a chance to interact with a prototype online banking system we've developed that is designed to support informal caregivers specifically. You'll do this by performing a set of simulated banking tasks that we have prepared for you. After you've had the opportunity to see and use the prototype, we will take some time to discuss your experience with the prototype and how it relates to your real-world experiences with informal care. As mentioned in the consent form you signed prior to scheduling this session, we will be taking an audio recording of the entire session. Recordings will be transcribed, and any identifying information will be anonymized during the process. If we become aware

of any instances or likelihood of abuse of a senior during this session we will be obligated to disclose that information to the Elder Abuse Protection Team as required by law.
Before we get started with the recording and the interview, we would like to compensate you in advance of your participation today. *<Transfer compensation.>* Now that we've handled that, do you have any questions before we get started?

Interview Guidelines

- Interview should begin by asking the participant if they could describe the informal care relationships that they are a part of.
- If they don't mention it themselves, we will ask them about the time they spend, the types of caregiving tasks they engage in, what challenges they face in caregiving, and what value they perceive in the work they do.
- The conversation should be allowed to follow from there, keeping the following in mind:
  - The intent is to gather rich information about the participant's real world caregiving experiences (including with online banking) to provide context for their perception of the interface presented in the next phase of the session.
  - Our standpoint is that these caregivers are performing extremely valuable social efforts and should feel supported in their roles throughout this interview. Their caregiving burden should be fully acknowledged by the interviewer.
  - Building a valuable rapport during the initial interview could have positive effects on their willingness to think aloud when interacting with the prototype in the next phase and discuss it during the final interview.
- Notes should be taken regarding non-verbal cues and contextual observations that will be inserted into the transcripts.

- The interview will end either after 30 mins or it seems that useful discussion has stopped, whichever is sooner. At that point, we will present the participant with the questionnaire (See Appendix B).

Caregiving and Personalization Questionnaire

Note that this same survey will be given to older adult participants, even if they do not provide care for another older adult. What is your age?

- 18-35
- 36-60
- 61-80

How many older adults do you perform banking tasks on behalf of? (Number)
What are your relationships to those older adults? (Select all that apply.)

- Child
- Spouse
- Friend
- Neighbor
- Relative

How frequently do you use online banking to perform tasks for an older adult?

- Every day
- Once or more a week
- A few times a month

- Once a month
- A few times a year
- Once a year

What banking tasks do you perform for older adults you support? (Select all that apply.)

- Monitor Balances
- Manage Retirement Savings
- Pay Bills
- Transfer Funds
- Manage Credit Cards
- Manage Insurance
- Manage Pension Payments
- Pay Mortgages

What method do you do to access the older adults' banking information? (Select all that apply.)

- Assist the older adult In-Person
- Password Sharing
- Joint Accounts
- Proxy Accounts

How long does it take you to perform the banking tasks you need to complete? (Text)
How much time do you spend helping/supporting this older adult(s) with other (non-banking tasks)? (Text)

What is a name we can use to represent one of the older adults you support? (This does not have to be their real name. This is used to personalize the prototype you will interact with in the next section. Once used, this name is not stored or kept anywhere.) (Text)

Think Aloud Observation Guidelines

Introduction Script

Read aloud to the participant after the questionnaire has been completed and we begin the think-aloud interaction phase.

"Thanks again for your continued participation in this study. The next thing we will do is have you work through a set of online banking tasks using a prototype interface we would like your opinion on. I/We will have you log in to our system using a set of fake credentials, and do the tasks listed in your guidebook <sent or handed to participant> in whatever order you see fit. All the tasks are optional, so if there are any you aren't familiar with or aren't comfortable doing, please skip them! As you work through the tasks, I/we would like you to verbalize your thought process and opinions on the experience aloud. I/we will be taking notes and audio recording to add to the transcript of the discussion we just had while I/we take some notes. It is important for you to know that we are not testing you, we are testing the interface. If there are any difficulties you encounter those are likely due to issues in the prototype, and these are important for us to discover and fix. Do you have any questions before we proceed?"

Observation Guidelines

- No questions should be asked by the researcher during the session, though any questions asked by the participant can and should be answered.
- Observation notes will be taken focusing on the non-verbal expressions made by the

participant, especially in response to the prompts and nudges encountered.

- The researcher should not be looking at the screen as the participant interacts, except when prompted/requested by the participant.

  This is to encourage them to think aloud instead of relying on the researcher's ability to see their interactions,

  and to give a semblance of privacy that would be present in real-world scenarios.

  - The researcher will be aware of these events as the participant describes them aloud.

Participant Task Guidebook

The following is your guidebook for interacting with and evaluating our prototype online banking interface that is intended to support informal caregivers. There are multiple "days' worth" of tasks we would like you to perform. While you do these tasks, we would like for you to talk through your experience and impressions aloud. As stated previously, all tasks are optional and if you are uncomfortable or unfamiliar with any, we encourage you to skip them (please verbally indicate if you are doing so). To ensure that we have enough time to discuss the interface afterwards, we will limit this section to 20 minutes. If you have any questions, feel free to ask your interviewer.

Reminder #1: Please think aloud as you work through the tasks listed below.

Reminder #2: This a fake banking interface, and we will not ask for any information related to you or your relations real-world bank accounts or activities. No actions taken within this system will be reflected in the real-world.

Task Set ("Day") #1

Imagine you have banking tasks to do for the older adult you assist. Please do the following while thinking aloud:

1. Navigate to the online banking system at https://banking-study.cs.umanitoba.ca

2. Log in to the system using the following:

   Username: *<username>*

   Password: *<password>*

3. Perform the "day's" banking tasks on behalf of the older adult you're helping. (Skip any you are uncomfortable with.)

   - Transfer $200.00 from Account A (savings) to Account B (chequing) to ensure there are enough funds in the account for the older adult to pay for groceries this week using their debit card.
   - Pay the latest cell phone bill of $54.67 to Telecom Wireless Inc. from Account B.
   - Pay off the outstanding balance on the credit card ending in 4321.
   - Reimburse yourself $96.54 for the groceries you bought last week. (Your account is already set up in the list of recipients.)

4. Once you have completed all your tasks for the "day", please log out of the system before proceeding.

Your tasks continue, day 2 is on the following page...

Task Set ("Day") #2

Imagine it is now the following week and you have more banking to do for the older adult you assist. As before, please do the following while thinking aloud:

1. Log back in using the same username and password as above

2. Perform your banking tasks for the "day". (Skip any you are uncomfortable with.)

   - A local carpenter came to fix the handrail in the older adult's house the other day. E-transfer them $217.17 at handyperson@carpentry.com.

- You've organized a new professional caregiver to come administer the older adult's medication, so you'll need to be paying them regularly. Do the following:
  - Set up a new e-Transfer payee: Alex Caregiver, a.care@caregivers.com, 204-555-1173
  - Send an initial e-Transfer of $60 directly to cover the current week.
  - Set up an automatic payment of $120 every other Monday starting on the next Monday.
- The older adult you support is very thankful for all the help you've provided over the last couple weeks, so they would like you to transfer $20 to your connected account directly as a token of their appreciation.

3. Once you have completed all your tasks for the "day", please log out of the system and let your interviewer know you are finished!

Semi-Structured Interview Guidelines and Deception Debrief

Interview Time: *45 minutes from the start of this interview or 1.5hrs since start of session, whichever is earliest.*

Observation Method: *Audio is being recorded, interviewer should take notes of non-verbal cues and context where appropriate.*

DEBRIEF NOTE: *At some point during this interview the deception related to the nudges must be revealed. If the participant was either aware or suspicious of the nudges during the interaction phase, it can be revealed immediately (skip to the debrief script). Otherwise, as many of the pre-debrief questions/topics should be explored as possible, before debriefing the participant. If 20 minutes of the interview has elapsed, the debrief should be delivered at the earliest possible moment to give the participant the opportunity to discuss the deception and*

the nudges with full awareness of their purpose.

Introduction Script

To be read at the start of this interview phase.

Thank you for taking the time to use our prototype and work through those tasks. Now that you have done so, I/we would like to discuss your experience both with our prototype and with online banking on behalf of older adults more broadly. This will take us right to the end of the study session (no later than 90 minutes after we started today). First off, what were your impressions of the interface?

Pre-Debrief Topics *These are general topics about the interface and banking on behalf of close others that*

- Were there any specific aspects that you liked or disliked?
  - How would you compare these aspects to your existing online banking interfaces?
- Did performing any of the tasks feel unnatural to you?
- Did you feel like any aspects were supporting your specific needs in banking on behalf of an older adult?
  - How might you change the interface to better support you and your close others/older adults?
- Are there any tasks you've had to perform for yourself/an older adult that weren't covered during your interaction?

Debrief

To be read to the participant verbatim when appropriate during the interview. In the event that the participant wishes to withdraw at any point after they have begun interacting with

the prototype, this should also be read to them before ending the session to ensure that all deception is disclosed.

The interface that you just interacted with has some specific design elements that are added to support informal caregivers that you may or may not have noticed. Examples of these elements included the pop-ups, confirmation questions, and information panels. These are all examples of a class of elements called "behavioural nudges". Our specific goal with these nudges is to encourage continued financial propriety by caregivers who may use online banking interfaces like this on behalf of older adults they are helping. There are many studies that show that financial misconduct against older adults does occur and theorize that it often stems from mundane, routine behaviour, rather than from specific malicious intent. The nudges that we included are intended to be supportive of caregivers and discouraging financial misconduct. We are not presenting them because we suspect you of any misconduct yourself, but are interested in understanding how the presence of these nudges makes you feel and how useful you think they may be in discouraging misconduct by those who may be susceptible to it.

Post-Debrief Topics

Other specific topics or questions to explore with the participants once the deception has been revealed:

- Does knowing the nudges' intent change your thoughts on them?
  - How does it make you feel that they were presented to you in this context?
  - Do you feel trusted, distrusted, or neutral?
- Who do you think the nudges are benefiting?
  - How do you think they benefit those groups/individuals?

  - Would the nudges affect your impressions of your financial institution? If so, how?

- Do you think that the nudges may help a hypothetical close other avoid financial misconduct?

  - Which of the nudges do you think would be most effective?

- Some of the nudges you interacted with were personalized using your information and the older adult name you gave us in the questionnaire. What did you think of that?

  - How do you think this would impact the effectiveness of the nudges?

Closing Statements

To be read upon the conclusion of the interview and study session, or upon participant's withdrawal. If for some reason the debrief script has not been read to the participant, that should be read immediately preceding this.

With that, we can conclude your session! I/we and my/our fellow researchers would like to sincerely thank you for your participation. We hope that the information that you and the other participants have helped us gather will allow us to continue improving these interfaces to support people like yourself in informal caregiving relationships. As mentioned in your consent form, we will be posting a brief, non-technical summary of the results to the study website once analysis is complete, sometime near the end of January. Any final reports will be freely available on the University's research repository and the study website as well. Thank you again for your time, and I/we hope you have an excellent day!

Appendix C

Study Recruitment Materials

Social Media Post

Twitter post (fits 240 character limit):

We are looking for study participants who bank online on behalf of older adults to get their thoughts on new design elements meant to support them. See poster/link for details and feel free to share broadly. https://celinelatulipe.net/gathering-feedback-on-banking-interfaces-for-caregivers/

<Same post used for Facebook/Instagram/Reddit, etc.>

Recruitment Poster

ONLINE BANKING INTERFACE STUDY

Do you support older adults with online banking?
Are you an older adult who banks online?
We would love your input!

Researchers in the Department of Computer Science at the University of Manitoba are studying designs to support people online banking on behalf of older adults (65+).

WE ARE LOOKING FOR VOLUNTEERS WHO MEET THE FOLLOWING CRITERIA

Must be 18+ years of age

18+

Must use online banking with a Canadian insitution

Must Either:

Be 65+ years of age

65+

Or

Support someone 65+ with their banking

Or

Work at a Canadian financial institution *

This study requires a single session lasting no longer than 90 minutes. You can participate either in-person at the University of Manitoba's Fort Garry campus*, or virtually via Zoom. (In-person participants will receive a parking token.)

In appreciation of your time you will receive $30 compensation. This can be e-transferred to you directly, or donated to one of the following five charities on your behalf (your choice):

- David Suzuki Foundation
- Food Banks Canada
- Indspire (First Nations Education)
- Doctors Without Borders
- Alzheimer's Society of Canada

75-90 minutes

$30 compensation

IF YOU ARE INTERESTED AND MEET THE ABOVE CRITERIA, PLEASE GO TO THE FOLLOWING LINK FOR DETAILS:

https://celinelatulipe.net/gathering-feedback-on-banking-interfaces-for-caregivers/

* Client-facing employees of a financial instituion working in Winnipeg may participate in-person at their place of work. Please indicate this option on the consent form and the research team will arrange a time to come to your office or branch to conduct the study with you.

For more information, please contact Zach Havens (havensz@myumanitoba.ca) or Dr. Celine Latulipe (celine.latulipe@umanitoba.ca).

This research has been approved by the Research Ethics Board at the University of Manitoba, Fort Garry campus. If you have any concerns or complaints about this project, you may contact any of the above-named persons or the Human Ethics Coordinator at 204-474-7122 or humanethics@umanitoba.ca.

University of Manitoba

HCI Lab
UNIVERSITY OF MANITOBA

This poster has been designed using resources from Flaticon.com

External Recruitment Letter

Project Title: Designing Behavioural Nudges to Encourage Financial Propriety of Older Adult Proxies

Researchers: Zach Havens (havensz@myumanitoba.ca), Dr. Celine Latulipe (celine.latulipe@umanitoba.ca)

This research is being conducted by Zach Havens (havensz@myumanitoba.ca) and Dr. Celine Latulipe (celine.latulipe@umanitoba.ca) of the Department of Computer Science at the University of Manitoba.

The purpose of this study is to gather information about how informal caregivers who provide support for an older adult with banking tasks make use of online banking. Our study will make use of a prototype of a theoretical online banking interface to give participants the opportunity to interact proposed design changes and gather feedback. Results of this study will help with the development of new online banking interfaces that more securely support older adult banking clients and their caregivers.

You are invited to participate in this study! Participation in the study will consist of a single session lasting approximately 90 minutes and can be conducted in-person or online. We will ask you about your current caregiving relationships that involve older adults with banking tasks, how caregivers access accounts, and what concerns and challenges you see. We will then ask you to interact with a prototype of an online banking interface while you discuss your experience aloud. This prototype will have behavioural nudges designed to support close others when conducting banking tasks on behalf of an older adult. Finally, we will ask you about your perceptions of the potential impacts and effectiveness of these nudges. Risks associated with participating in this study are no greater than in everyday life. The benefit of participation is making sure that your experiences with informal care are considered when we make suggestions for future designs intended to support you and other caregivers.

Participation in this study is voluntary. We are looking for individuals who meet the follow-

ing criteria:

- Must be 18+ years of age
- Must use online banking to perform financial transactions or other tasks
- Must either:
  - Support an older adult (65+) with their banking tasks
  - Be 65 or older

For those who wish to participate online, there are a few additional criteria:

- Participant must have access to a desktop or laptop computer with either the Chrome or Firefox browser installed.
- Participant must have a reliable Internet connection to use for the study session
- Participant must be comfortable using Zoom.

Once you consent to taking part in the study, as a token of thanks for your cooperation, you will receive $30 compensation. This can either be e-transferred to you directly or given as a donation to one of the following charities:

- David Suzuki Foundation
- Food Banks Canada
- Indspire (First Nations Education)
- Doctors Without Borders
- Alzheimer's Society of Canada

Those who participate in-person will also be given a parking token for a University parking lot.

If you are interested and meet the above criteria, please follow the link to the consent form found on the study website. Once completed, that form must either be emailed to Zach Havens (havensz@myumanitoba.ca) or printed and mailed to:

Dr. Celine Latulipe

Department of Computer Science

E2-560 EITC

University of Manitoba

Winnipeg, Manitoba, Canada

R3T 2N2

Once a completed consent form has been received, we will reach out to you to schedule a session.

This research has been approved by the Research Ethics Board at the University of Manitoba, Fort Garry campus. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator at 204-474-7122 or humanethics@umanitoba.ca.

To participate in the survey, please go to the following link: https://celinelatulipe.net/gathering-feedback-on-banking-interfaces-for-caregivers/

Personal Contacts

Hi <personal contact name>,

I am conducting an study as part of my research into older adults, caregivers, & banking technologies, in collaboration with my research colleagues in the Department of Computer Science at the University of Manitoba. I am looking to recruit older adults (65+) who bank online, or people currently supporting older adults using online banking to perform financial tasks. Participation in the study will take approximately 90 minutes in a single session.

As a token of appreciation for your time, you can either receive $30 directly, or have the same amount donated to one of five national charities (you get to choose from the list of five charities).

Additional details about the online survey are included below and on the study webpage. If you are not interested in participating in this study, you do not have to reply to this email. Feel free to forward this email to anyone who might be interested in participating.

<Same text from Appendix H included here>

Thank you,

<Researcher Name>

<Researcher Email>

Consent Form

Project Title: Designing Behavioural Nudges to Encourage Financial Propriety of Older Adult Proxies

Researchers: Zach Havens (havensz@myumanitoba.ca), Dr. Celine Latulipe (celine.latulipe@umanitoba.ca)

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask to the researchers mentioned above. Please take the time to read this carefully and to understand any accompanying information. Participation in this study is voluntary: you may choose to withdraw from this study at any point in time during both the interaction and interview part of this study. During participation, any questions asked, or tasks requested are also voluntary and any can be declined without penalty. Risks of participating in this study are no greater than in everyday life.

Study Procedure

The study consists of a single session lasting approximately 1.5 hours. During this session there will be an interview and questionnaire that discuss your informal caregiving relationships. Following that, you will get an opportunity to interact with a prototype online baking interface that has been designed to support informal caregivers. Finally, a second interview will give us the opportunity to discuss your experience with the interface and changes you might make to it to better support you and your caregiving dynamics and needs. The study session can either be conducted in-person, or online. In-person sessions will be conducted in the HCI Lab's study space at the University of Manitoba's Fort Gary campus in which we can provide a computer for you to use during the session. Additionally,

banking professionals may opt to participate in their place of work. Online sessions will be conducted over Zoom and will require you to use your own desktop or laptop computer.

Compensation

In recognition of your willingness to participate, you will receive a $30 compensation delivered at the beginning of your study session. This compensation can either be delivered to you directly by e-transfer or donated to one of 5 preselected charities on your behalf. Members of the research team will not receive any tax incentives for such donations. The available charities are:

- Alzheimer's Society of Canada
- David Suzuki Foundation
- Doctors Without Borders
- Food Banks Canada
- Indspire (First Nations Education)

Participants who choose to participate at the University of Manitoba campus will additionally receive a parking token to cover any parking costs incurred by their participation.

Risks and Benefits

This research will contribute knowledge about how online banking systems can assist those who bank on behalf of older adults. We aim to provide useful information and guidelines that designers can use to improve banking systems' interfaces to better support these use cases and motivation for banks to adopt them. You will have the opportunity to reflect on how your activities as informal caregivers or older adults are being recognized as valuable, and how financial institutions can better support you.

To achieve this, we will be asking you questions about your experiences as users of online banking systems as well as questions about your informal caregiving relationships. There is

a possibility that these discussions may cause some emotional discomfort, or cause social risks associated with the sharing of information. We will encourage you to only share information you are comfortable with, and that you have permission to share with use throughout the study session.

Consent

All information you provide is considered completely confidential; your name will not be included, or in any other way associated, with the data collected in the study. Audio recording of the interview sessions is essential to the research analysis. Audio recording will be manually transcribed and anonymized by members of the research team to protect participants and their relations. Screen recordings will also be taken when participating in-person using a provided device and used to annotate transcription data. All recordings will be destroyed after transcription is complete. Data collected during this study will be used for data analysis purposes only. We may use anonymized quotes from the recording for purposes of public presentation; however, we will not present video, screenshots, or audio. Each participant will be assigned a number that will be used to present anonymized quotes (e.g., CO1 for a close other #4, OA2 for older adult #2, or BP7 for banking professional #7). That is, your image or sound will not be used in papers, presentations, put on the internet, etc. Please initial your response for the appropriate options below. (Feel free to consent to both options if you would like flexibility when scheduling a session.)

(Consent options on the next page.)

a) I CONSENT to participate in-person on the University of Manitoba Fort Gary campus. I acknowledge that I will have my voice recorded via digital recorder and my interactions with the prototype logged and screen recorded.

_____

b) I CONSENT to participate online. I acknowledge that I will have my voice recorded via

online conferencing software (i.e. audio-only recordings via Zoom), and that my interactions with the prototype will be logged.

_____

c) I am an employee of a bank or credit union in Winnipeg, Manitoba and I CONSENT to participate in-person at the bank or credit union branch at which I work. I acknowledge that I will have my voice recorded via digital recorder and my interactions with the prototype logged and screen recorded.

_____

Employer Consent

If you are an employee of a financial institution, you may require approval from your employer to participate in this study. A letter you can present to your employer to aid in communicating the details of your participation can be found on the study website. Please attest that you have received the appropriate approvals before participating:
I am an employee of a bank or credit union and I ATTEST that I have received any necessary approvals from my employer to participate _____

Data Lifetime

All data will be stored on Microsoft Teams servers controlled by the University of Manitoba. Only researchers associated with this study have access and will maintain the data it until it is deleted two years following the completion of the study or June 2025 (whichever is earlier). Once published (in journals, conferences, or thesis of students), results of the study will be made available to the public for free on the University of Manitoba's public research repository (MSpace). Again, no personal information about your involvement will be included. Please note that the University of Manitoba may look at the research records to see that the research is being done in a safe and proper way.

Abuse Disclosure

If a researcher becomes aware of instances or likelihood of abuse of a senior through the course of the study session, that researcher will be obligated to notify the Manitoba Elder Abuse Protection Team as required by law (The Seniors' Rights And Elder Abuse Protection Act 6(1)).

Study Results

A summary of findings for this research in non-scientific language will be posted to the study website once initial data analysis has been completed (by May 31, 2023). Please initial your response below if you want to receive a notification when that information has been made available:

I DO want to receive a summary of the findings of this research: _____

If you do, please provide an email address or postal address:

_____

(A postal address will receive a printed copy of the summary.)

Your signature on this form indicates that you have understood, to your satisfaction, the information regarding participation in the research project and have agreed to participate as a subject. By signing the form, you also confirm that you are of the age of majority in Canada (18 years or more). In no way does this form waives your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and to refrain from answering any questions asked, without prejudice or consequence. You may withdraw from the study any time between the time a signed consent form is received until 1 month after your study session has been conducted; past this time data analysis and writing will be

conducted and it will be impossible to remove the data. To withdraw, please contact contact Dr. Celine Latulipe at 204-474-6791 or celine.latulipe@umanitoba.ca, or Zach Havens at havensz@myumanitoba.ca. This research has been approved by the Research Ethics Board at the University of Manitoba, Fort Garry campus. If you have any concerns or complaints, you may contact Dr. Celine Latulipe at 204-474-6791 or celine.latulipe@umanitoba.ca, or the Human Ethics Secretariat at 204-474-7122 or humanethics@umanitoba.ca. A physical copy of this consent will be given to you to keep for your records and reference upon request. Having read the provided information and after all my questions were answered to my satisfaction, I understand what I am freely consenting to.

Participant: _____ Signature: _____

Date: _____

Researcher: _____ Signature: _____

Date: _____

Information Letter for Employers

Project Title: Designing Behavioural Nudges to Encourage Financial Propriety of Older Adult Proxies

Researchers: Zach Havens, Dr. Celine Latulipe (havensz@myumanitoba.ca, celine.latulipe@umanitoba.ca)

This letter is to inform the employer of a prospective participant in the above-named study about the parameters of their participation and their terms of consent. You may use this letter as a formal means of signing approvals for your own records, but this does not need to be provided to the researchers. Participants will indicate that they have received any necessary approvals from their employers in the consent form that they submit to the research team.

Overview

This research will contribute knowledge about how online banking systems can assist those who bank on behalf of older adults. We aim to provide useful information and guidelines that designers can use to improve banking systems' interfaces to better support these use cases and motivation for banks to adopt them. The participant will have the opportunity to reflect on how financial institutions can better support these dynamics and how they can help effect these changes if they deem them worthwhile. Participation in this study is voluntary: the participant may choose to withdraw from this study at any point in time during both the interaction and interview part of this study. During participation, any questions asked, or tasks requested are also voluntary and any can be declined without penalty. Risks of participating in this study are no greater than in everyday life.

Study Procedure

The study consists of a single session lasting approximately 1.5 hours. During this session there will be an interview and questionnaire that discuss the participant's informal caregiving relationships, or perceptions of the caregiving dynamics of others. They will get an opportunity to interact with a prototype online baking interface that has been designed to support informal caregivers, and a second interview will give us the opportunity to discuss their experience with and opinions of the interface. The study session can either be conducted on-campus, in-office/branch, or online. In-person sessions will be conducted in the HCI Lab's study space at the University of Manitoba's Fort Gary campus or in the participant's place of work. When participating in-person, a laptop will be provided for the participant to use during the session. Online sessions will be conducted over Zoom and will require the participant to use their own desktop or laptop computer. When participating in your branch or office we will use cellular hotspots and will not require access to your internet networks.

Compensation

In recognition of their willingness to participate, the participant will receive a $30 compensation delivered at the beginning of their study session. This compensation can either be delivered to the participant directly or donated to one of 5 preselected charities on their behalf. Members of the research team will not receive any tax incentives for such donations. Participants who choose to participate on the university's campus will additionally receive a parking token to cover any parking costs incurred by their participation. If the participant is unable to accept direct financial compensation, they are still eligible for the charitable donation option.

Consent

The participant will be consenting to the following:

- Voice recordings being collected throughout the session:
  - By phone/audio recorder if in-person or on-site
  - Via Zoom audio-only recordings
- Interactions being logged by the banking system prototype
- If participating in-person or on-site, screen recordings of their interactions with the prototype being collected on the University-owned device provided by the researchers. (No video recordings will be taken if participating over Zoom)
- That they have received appropriate approvals from their employer if necessary

Data Security:

All information the participant provides is considered completely confidential; neither their name or the name of the institution they work for will be included, or in any other way associated, with the data collected in the study. Audio recordings will be manually

transcribed and anonymized by members of the research team to protect participants, their employers, and their relations. All recordings will be destroyed after transcription is complete. Data collected during this study will be used for data analysis purposes only. We may use anonymized quotes from the recording for purposes of public presentation; however, we will not present video, screenshots, or audio. Each participant will be assigned a number that will be used to present anonymized quotes (e.g., BP1 for banking professional #1, etc.). That is, the participants image or audio will not be used in papers, presentations, put on the internet, etc. All data will be stored on Microsoft Teams servers controlled by the University of Manitoba. Only researchers associated with this study have access and will maintain the data it until it is deleted two years following the completion of the study or June 2025 (whichever is earlier). Once published (in journals, conferences, or thesis of students), results of the study will be made available to the public for free on the University of Manitoba's public research repository (MSpace). Again, no personal information about the participant's involvement will be included. Please note that the University of Manitoba may look at the research records to see that the research is being done in a safe and proper way.

Abuse Disclosure

If a researcher becomes aware of instances or likelihood of abuse of a senior through the course of the study session, that researcher will be obligated to notify the Manitoba Elder Abuse Protection Team as required by law (The Seniors' Rights And Elder Abuse Protection Act 6(1)).

A summary of findings for this research in non-scientific language will be posted to the study website once initial data analysis has been completed (by May 31, 2023). Please initial your response below if you want to receive a notification when that information has been made available:

This research has been approved by the Research Ethics Board at the University of Manitoba,

Fort Garry campus. If you have any concerns or complaints, you may contact Dr. Celine Latulipe at 204-474-6791 or celine.latulipe@umanitoba.ca, or the Human Ethics Secretariat at 204-474-7122 or humanethics@umanitoba.ca.

For your own purposes, we've provided the signature spaces below if you wish to use this document to indicate that necessary approvals have been granted. This form does not need to be provided to the research team alongside the participant's consent form.

Participant: _____ Signature: _____

Date: _____

Employer: _____ Signature: _____

Date: _____

Appendix D

Banking Prototype Nudges

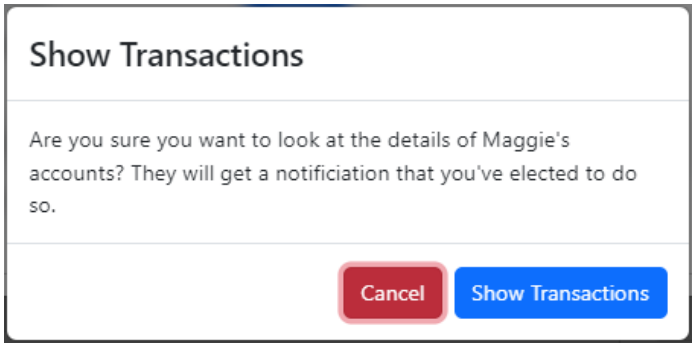
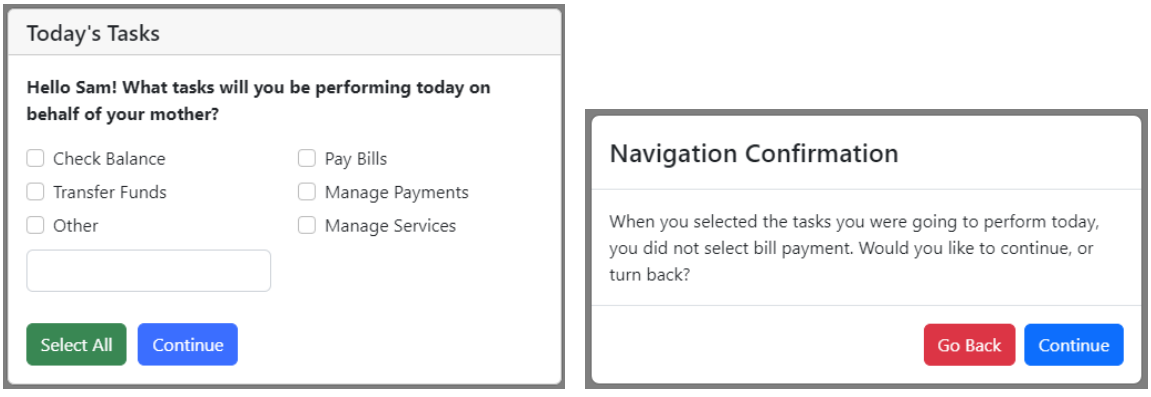


Figure D.1: Add Close Other Nudge: Presented on login to ask the user if they would like to start the process of adding another delegate.



(a) Task List (b) Confirmation

Figure D.2: Task Selection and Navigation Confirmation Nudges: Presented on login to ask the delegate which tasks they will be performing, and prompting them if they navigate to an unrelated page.

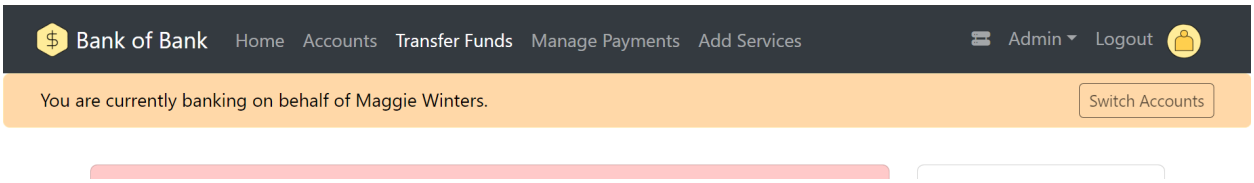
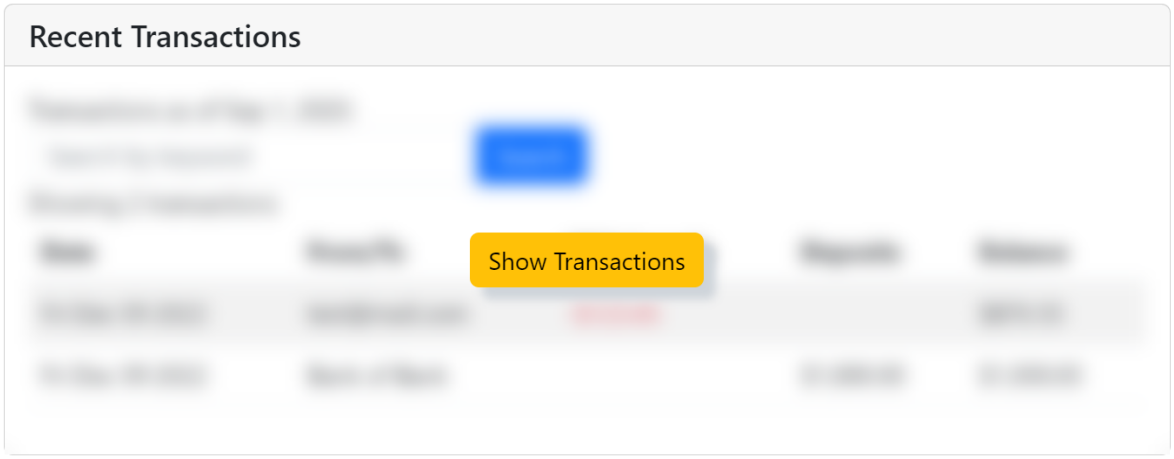
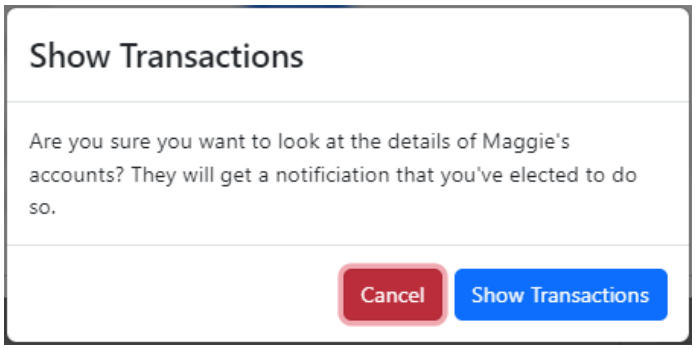


Figure D.3: Behalf of Banner Nudge: Always present below the navbar at the top of the page to remind the user they are acting as a delegate.



(a) Hidden Transaction List



(b) Confirmation

Figure D.4: Show Hidden Transactions and Confirmation Nudges: Transactions for a given account are hidden by default, but a delegate can confirm that they would like to see them after being made aware taht the older adult will be notified.

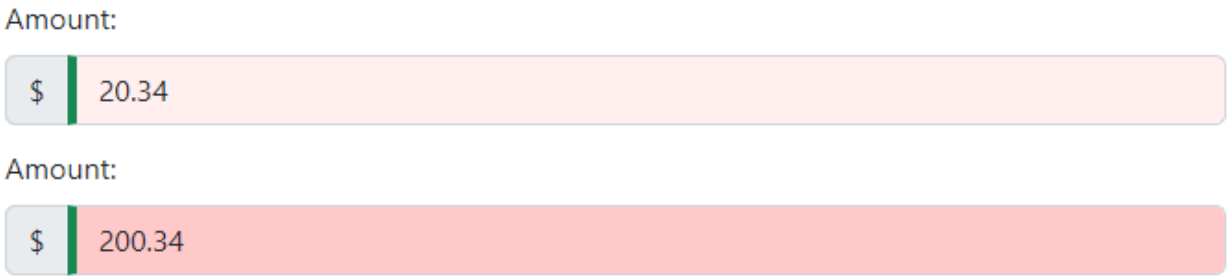


Figure D.5: Coloured Amount Field Nudge: Background of the input field becomes more red as the value in the field increases, maximizing at $200.

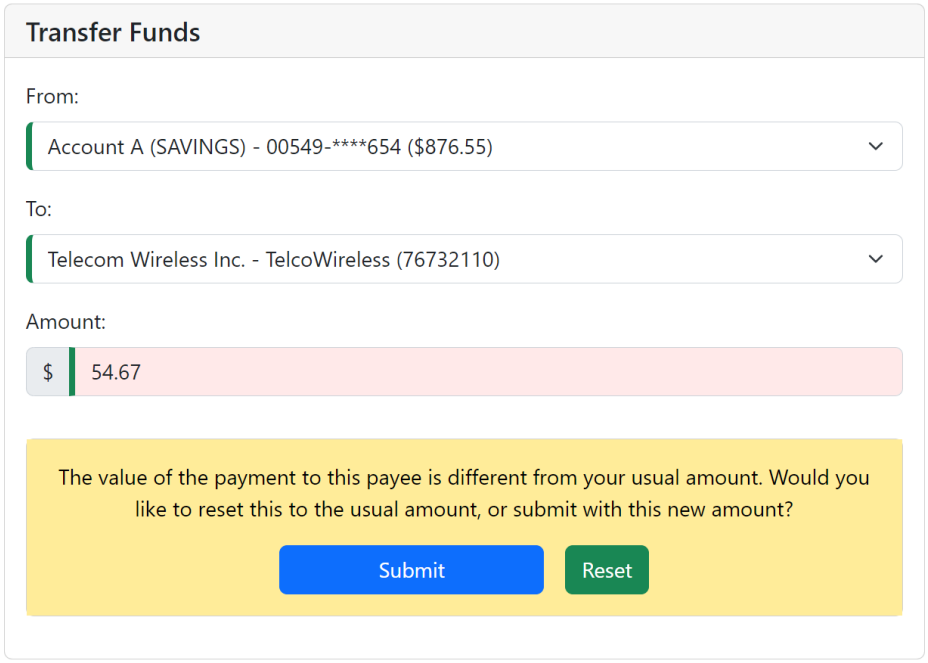


Figure D.6: Unusual Amount Prompt: Triggered when the delegate attempts to pay a bill of an unusual amount ot a given payee.

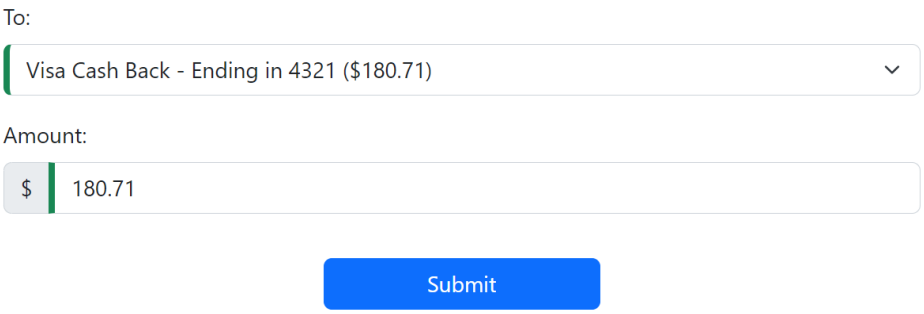


Figure D.7: Automatically Set Balance Nudge: Sets the amount field to the current balance of a credit card when chosen as the destination account.

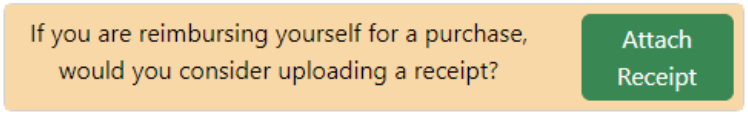


Figure D.8: Uploading Receipt Nudge: Triggered when the delegate is transferring from one of the older adult's accounts to one of their own.

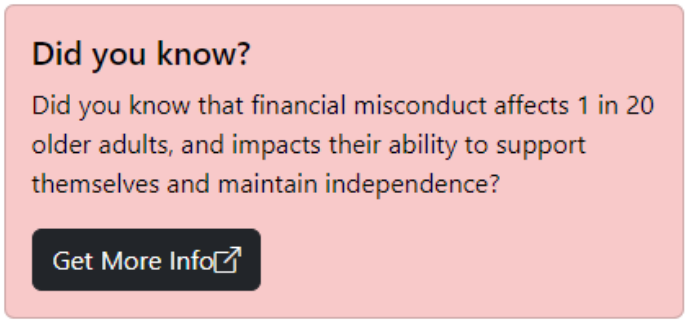
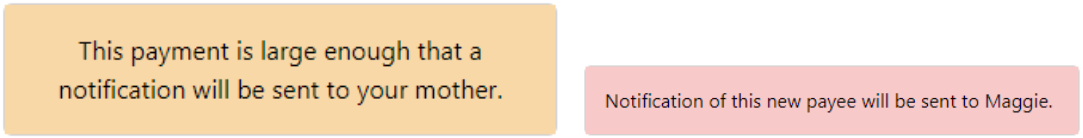


Figure D.9: Reminding of Consequences Nudge: Presented either as a banner across the top of the main page body or in a sidebar on the left or right of the page.



(a) Large Payment (b) New Payee

Figure D.10: Notification Nudges: These would appear above "Submit" buttons in relevant forms.

Appendix E

User Study Participant Nudge Exposure

PID	Add Close Other	Task Selection	Navigation Confirmation	Behalf Of Banner	Show Transactions Button	Show Transactions Prompt	Colored Amount Field	Unusual Amount Prompt	Automatically Set Balance	Add Receipt Prompt	Financial Misconduct Info	Large Amount Notification	Adding Payee Notification
CO1	E	NE	NE	E	E	E	E	E	E	E	E	E	E
OA1	E	NE	NE	E	E	NE	E	E	E	E	E	E	E
CO3	NE	NE	NE	E	NE	NE	E	NE	E	E	E	NE	NE
OC1	E	NE	NE	E	NE	NE	E	E	E	E	E	E	E
CO2	E	E	NE	E	E	E	E	NE	E	E	E	E	E
OC2	E	E	E	E	E	E	E	E	E	E	E	E	E
OC3	E	E	NE	E	E	E	E	E	E	E	E	E	E
OA3	E	E	NE	E	E	NE	E	NE	E	E	E	E	E
OC4	E	E	E	E	NE	NE	E	E	E	E	E	E	E
OC7	E	E	E	E	NE	NE	E	E	E	E	E	E	E
CO4	E	E	NE	E	E	E	E	E	E	E	E	E	E
OC6	E	E	E	E	E	E	E	E	E	E	E	E	E
OC5	E	E	E	E	E	E	E	E	E	E	E	E	E
OC10	E	E	NE	E	E	E	E	E	E	NE	E	E	E
OC8	E	E	NE	E	E	E	E	E	NE	E	E	E	E
OA2	E	E	E	E	E	E	E	E	NE	NE	E	E	E
OA5	E	E	NE	E	E	E	E	E	E	E	E	E	E
OA4	E	E	NE	E	NE	NE	E	E	E	E	E	E	E
OA6	E	E	NE	E	E	E	E	E	E	E	E	NE	E
OC9	E	E	E	E	NE	NE	E	E	E	E	E	E	E
BP1	E	E	E	E	NE	NE	E	E	E	E	E	E	E

Table E.1: The nudges presented to each participant by the prototype as they performed the tasks during the interaction phase.

E = Exposed, NE = Not Exposed

Appendix F

Ethics Protocol

Full protocol begins on the next page.

Research Ethics & Compliance
Human Ethics Office-Fort Garry
208-194 Dafoe Road
Winnipeg, MB R3T 2N2
T: 204 474 7122
humanethics@umanitoba.ca
umanitoba.ca/research

Amendment
HE2022-0193
Zach Havens

Table of Contents

1. Amendment Summary

Please provide a brief summary of the requested changes	Updating the consent form to have more include info about reporting elder abuse in other provinces.
Please provide a justification for these changes	Eliminates ambiguity for non-Manitoban participants.
Will there be changes to the number of participants?	No
Will there be any changes in recruitment?	No
Will there be changes in recruitment material?	No
Will there be any changes to the consent form?	Yes
Please describe the changes to the consent form	Updating the consent form to have more include info about reporting elder abuse in other provinces.
Will participants need to be re-consented?	No

2. Summary - Summary

Protocol Title	Gathering Feedback on Novel Online Banking Interfaces Designed to Support Caregivers
Principal Investigator	Zach Havens
Primary Department	Computer Science
Application Initiated By	Zach Havens

3. Summary - Purpose of the Research

Select the appropriate REB for review:	REB 2
Is this a study that has already been approved by another Canadian institution?	No
Does this study only involve the use of secondary data?	No
Provide a brief statement about the project written in lay language. Do not cut and paste directly from the study proposal.	This project aims to gain insight into how close others/ caregivers support older adults by performing banking tasks on their behalf via online banking platforms. We will have participants interact with a realistic model of an online banking interface that presents them with behavioral nudges intended to help close others and gather information on their experience with and impressions of them. This research will enable more well-informed design of such interfaces by financial institutions in the future.
Describe the research question(s) and objectives for this research study.	RQ1. How do behavioural nudges affect perceived trust within close other/older adult relationships? RQ2: How are the behavioural nudges perceived as possible deterrents of financial misconduct? RQ3: How does the level of nudge personalization affect perceived trust and effectiveness as a deterrent?
Describe the research methods.	This study consists of a single 3-phase session with each participant. The first phase will begin with an open-ended interview that aims to gain insight into the participant's informal caregiving relationships and build rapport with them, and will have the participants complete a questionnaire that establishes additional caregiving context and aids in personalization during the next phase. The second phase is a think-aloud interaction component where the participant will be asked to complete a set of realistic online baking tasks using a provided high-fidelity prototype while discussing their experience out loud. The prototype is web-based and will be accessed through a browser. The prototype will present the participants with the nudges as they perform these tasks. The participants will not be debriefed about the intended purpose of the nudges before interacting with them. The third phase is a semi-structured interview that aims to gain insight into the participant's experiences with and perceptions of the nudges, as well as how they might impact the caregiving relationships they have. They will be informed about the intent of the nudges they saw during this interview.
Describe briefly in a step-by-step manner what the research team will be doing with participants, after they have been recruited and consented.	1. The PI will give a verbal introduction to the study and begin the open-ended intro interview based on a given observation protocol (Appendix A) 2. The PI will guide the open-ended interview with the participant while audio recording is being taken and the PI takes notes (see Appendix A). 3. The participant will complete a questionnaire (delivered through Microsoft Forms) gathering caregiving and personalization

	info. (See Appendix B) 4. The PI will verbally deliver an introduction to the prototype and the think-aloud interaction session (See Appendix C), then give the participant a guide document with a set of online banking tasks to perform (see Appendix D). The participant will be asked to complete all tasks they are comfortable with using the study prototype while thinking aloud about the interaction. The session will be screen recorded and audio recorded, and the PI will take observation notes throughout. Participants will be able to ask the PI questions as they see fit, but the PI will keep interjections to a minimum. 5. Once the participant has finished performing tasks, the PI will begin the semi-structured interview following a set of broad questions and guidelines (see Appendix E).
Where will the study take place?	The study will take place either in-person on campus in the HCI Lab's study room (EITC-E2-488), or online via a UM licensed Zoom (UM Zoom) call. Participants will be given the option to participate via either method according to their preference and/or availability as indicated in the consent form (see Appendix J).
Approximately how long will this study take for participants?	This study will take a participant approximately 1.5 hours in a single session.

4. Summary - Research

Type of Research (select all that apply):	Master's Thesis
Type of Study (select all that apply):	Survey, Focus Group/Interview, Observational

5. Summary - General Questions

Does the study involve participants who are not legally or practically able to give their valid consent to participate?	No
Does the study involve participants who are under the age of 18?	No
Are participants from a population that may be marginalized or vulnerable in the context of research?	Yes
Does this research include the use of personal health information?	No
Does this study use deception (i.e., will participants be intentionally misled about the purpose of the study, their own performance, or other features of the study)?	Yes
Will the majority of participants identify as First Nations, Inuit, and/or Metis?	No
Will the analysis of the research results use First Nations, Inuit, and/or Metis identity as a variable?	No
Will the interpretation of research results refer to First Nations, Inuit, and/or Metis people, language, history or culture?	No
Will participants be given the choice to waive their anonymity?	No
Does this study require approval from another organization?	Yes
Will this study include involvement or recruitment from a specific organization?	No
Will this study occur in locations outside of the University of Manitoba?	No

6. Research Personnel

Name/Department	Role	CORE	PHIA	Access	Contact	Contact Level	Oath Of Confidentiality
Zach Havens / Computer Science	PI			Signature Authority		Primary	
Celine Latulipe / Computer Science	Advisor/ Supervisor			Signature Authority	Yes	Primary	

Describe each team member's role in the study (e.g. staff, research assistant, student, statistician, supervisor etc.)	Zach is the Master's student, and principal investigator for the project. He will be the primary designer of the study, developer of the prototype, researcher doing the sessions with participants, and primary data analyst. Dr. Latulipe is the advisor, and will assist with study design and data analysis.
Are any of the research team members affiliated with institutions other than the University of Manitoba?	No
What type of data (e.g. directly identifiable, anonymized) will each individual have access to?	All researchers will have access to the full dataset. This will include raw audio (directly identifiable) and screen recordings, data logged by the prototype system, observation notes, and survey responses (all anonymized). We will also have anonymized transcripts of the audio recordings.
How will the PI ensure that all research team members are aware of their responsibilities regarding participants' privacy and confidentiality? Research coordinators and assistants must complete an Oath of Confidentiality.	The research team consists of 2 members, both of whom are intimately familiar with the design of the study, this protocol, and the characteristics of the data. Submission of this protocol implies that both members are fully aware of their responsibilities. Both researchers have TCPS 2 certification.
Do any of the research team members have a study related conflict of interest that could compromise or reasonably be perceived to compromise the objective conduct of the research or the integrity of the data generated by the study? Conflicts of interest may include business, commercial or financial interests, dual roles (e.g. teacher and PI), as well as personal matters and career interests	Yes
Please describe. Please explain how you will ensure participants do not feel pressure or obligation to participate or perceive that they may be penalized for choosing not to participate.	Personal contacts may be recruited for the study by both the PI and Advisor. Any personal recruitment will be done using a specific script (see Appendix I) that is worded to emphasize optional participation.

7. Participants - Participants

How many participants do you expect to recruit?	I expect to recruit between 5 and 20 participants in informal care relationships, given that this is a qualitative study that will rely on extensive analysis of a large quantity of data from a small participant set. Additionally, we would like to recruit 5-10 banking professionals (who may or may not be in informal care relationships) to gain perspective from the banking industry.
What is the inclusion criteria to participate in the study?	Participants must be Canadian residents or citizens 18 years of age or older who use online banking via a desktop computer. Additionally, they must either support a family member or friend who is an older adult (65+) with banking tasks, be older adults (65+) themselves, or have worked in the last 5 years in a managerial and/or client-facing role for a Canadian bank or credit union. For individuals who wish to participate online, they will need to have access to a desktop or laptop with a supported browser (Chrome or Firefox), an adequate internet connection, and the ability to use Zoom video conferencing software. All participants must be willing to have the session audio recorded, whether they are caregivers, older adults, or banking professionals.
What criteria would someone become ineligible to participate?	Any of the following criteria would render someone ineligible: - Younger than 18 years of age - Not a Canadian resident or citizen - Does not use online banking via a desktop computer. - Is not one of the following: - An older adult - Someone who assists an older adult with banking tasks - Someone who has worked in a financial institution in the last 5 years in a client-facing role. - Unwillingness to have their session audio recorded. Additional exclusion criteria for those who choose to participate virtually: - No access to a desktop or laptop computer (tablets, phones, etc. do not qualify) - Inadequate internet connection - Unfamiliarity or unwillingness to use Zoom.
Will the participants in your study be UNAWARE that they are participants?	No
Will information about the participants be obtained from sources other than the participants?	No
Will participants receive any compensation for participating (e.g. honorarium, course credit, food, parking)?	Yes

8. Participants - Compensation

What is the compensation for participating?	Participants will be given CAD$30 for participating in the study, delivered via online e-transfer. Alternatively, participants may choose from one of the following five charities, and we will donate CAD$30 to the charity on their behalf instead. - David Suzuki Foundation - Food Banks Canada - Indspire (First Nations Education) - Doctors Without Borders - Alzheimer's Society of Canada Researchers will not use donations as tax deductions. Individuals who participate on campus will be given a parking token to cover parking costs. Participants who work at a bank may not be able to receive financial compensation directly, and therefore may have to take the donation option by default.
Please provide justification for these compensation arrangements	Compensation of CAD$30 per participants equates to approximately $20/hour for a 1.5 hour session. The choice between e-transfer or charitable donation allows participants to give as much or as little personal information as they are comfortable with as well as allowing others to benefit from their participation if they wish. The addition of parking reimbursement will be used to minimize the financial burden for those participating in-person.
When will participants receive their compensation?	E-transfers will be made at the beginning of each participant's study session to ensure that compensation is not conditional on completion. Parking tokens will be given to in-person participants at this time as well. Donations requests will be recorded at the beginning of a participants session. Actual donations will be aggregated across all participants upon completion of all study sessions and donated as a lump sum at that point in time. A notification will be sent to the participants at that point in time indicating that their donation has been processed.
Participants must be able to keep their compensation if they withdraw from the study. Please describe this process	Direct compensation will be delivered at the very beginning of their study session, so any withdrawal after that point will not affect the completed compensation transfer. Donation requests recorded at the beginning of the session will be honoured once all participants' sessions have been completed regardless of withdrawal status.

9. Participants - Recruitment

Provide a step-by-step description of how you will identify and recruit participants. Describe how prospective participants will be identified, who will contact prospective participants and by what means this will be done

Note that all recruitment materials will point potential participants to study information on the advisor's webpage: https://celinelatulipe.net/gathering-feedback-on-banking-interfaces-for-caregivers/. This includes direction to consent forms that they can fill out and submit to indicate willingness to participate in the study. Recruitment Channel 1: Social media posts on Facebook, Twitter, Instagram, Reddit, (see Appendix F). Posts will be made by both research team members using personal accounts. Recruitment Channel 2: Posters (see Appendix G) placed in locations where permission has been given around campus, in community gathering places (churches, community centers, etc.), and senior living centers. Recruitment Channel 3: Centre on Aging newsletter (see Appendix H). Celine will contact Rachel Ines/Michelle Porter in the Centre on Aging. Recruitment Channel 4: Email to personal contacts (see Appendix L). Recruitment Channel 5: Postcards with study details and a QR code to the study website shared with and distributed via personal contacts (see Appendix M) The first 5-20 respondents will be selected to participate in the study. We will not be doing any additional selection process from among the respondents.

Attach copies of all material that will be given/read to participants and/or third parties:

Type	Name	Document
recother	Appendix F: Social Media	AppendixF_SocialMedia.pdf
recposter	Appendix G: Recruitment Poster	BankingNudgesRecruitmentPoster_v6.pdf
recemail	Appendix H: CoA Newsletter	AppendixH_CoA_newsletter_v2.pdf
recemail	Appendix I: Personal Contacts	AppendixI_PersonalContacts.pdf
recposter	Appendix L: Recruitment Postcard	BankingStudyRecruitmentPostcard_8_5x11_v1.pdf

10. Consent - Informed Consent Process

Describe the consent process. Where and how will consent be obtained?	All recruitment materials will direct prospective participants to the study webpage that will contain a link to a consent form (see Appendix J). This form will need to be filled out by prospective participants and ether emailed or printed and physically mailed to the research team before scheduling any study sessions with them. At the beginning of the study session itself (online, at-institution, or in-person), participants will be verbally reminded of the consent form that they previously signed. A copy of their signed form will be available for them to review at that time if they choose (a physical copy if in person, or a digital copy emailed to them if online). Participants who work at a financial institution may require approval from their employers. They may use the Employer Approval Letter (Appendix K) to aid in the approval process. The consent form asks them to attest that they have received the appropriate approvals.

Attach consent form(s):

Type	Name	Document
consentdoc	AppendixJ_Consent_Form_v10.pdf	AppendixJ_Consent_Form_v10.pdf
otherassent	AppendixK_Information_Letter_for_Employers_v2.pdf	AppendixK_Information_Letter_for_Employers_v2.pdf

11. Data - Confidentiality

Are there conditions in which privacy or confidentiality cannot be guaranteed (e.g., focus groups)?	No

12. Data - Data

Please review the different types of information researchers may seek to collect, use, share and access based on the TCPS 2, Chapter 5

Anonymous information – the information never had identifiers associated with it (e.g., anonymous surveys) and risk of identification of individuals is low or very low.

Anonymized information – the information is irrevocably stripped of direct identifiers, a code is not kept to allow future re-linkage, and risk of re-identification of individuals from remaining indirect identifiers is low or very low.

Directly identifying information – the information identifies a specific individual through direct identifiers (e.g., name, social insurance number, personal health number).

Indirectly identifying information – the information can reasonably be expected to identify an individual through a combination of indirect identifiers (e.g., date of birth, place of residence or unique personal characteristic).

Coded information – direct identifiers are removed from the information and replaced with a code. Depending on access to the code, it may be possible to re-identify specific participants (e.g., the principal investigator retains a list that links the participants' code names with their actual name so data can be re-linked if necessary).

Will this study include a survey or questionnaire?	Yes
How will the survey be administered?	The questionnaire (see Appendix B) will be administered through a Microsoft Form created through a U of M account. If the participant is participating in person, the survey will be completed on a laptop provided and managed by the Computer Science department. If they are participating virtually they will be sent a link to the survey and asked to complete it on their own device. The participants will not be required to log in to any accounts (personal or otherwise) in order to complete the questionnaire.
Is this data anonymous, anonymized, coded, indirectly identifiable or directly identifiable? Please Explain.	Given that the survey contains open-text fields, it is considered confidential. Once responses have been received they will be coded by a randomly assigned participant ID and will become anonymized. Participants will be asked to optionally volunteer the first name of an older adult that they support while completing the survey. This can be the real name of the individual or a pseudonym that they would like us to use throughout the prototype interaction component of the study. After use in the prototype (which is temporary and not stored/logged anywhere), the given name will be removed (whether real or not) to maintain anonymity.
Do you intend to provide participants feedback based on the survey/questionnaire results?	No

Where will this data be stored?	On the University of Manitoba Microsoft Teams server. We have created a channel within a private team that is only accessible to the two researchers. The form and the excel spreadsheet that collects responses will reside in that team space, which is only accessible to the research team.
What will ultimately happen to this data? How long will you keep it? If you will destroy the data, when (MMYY)? Please provide justification if identifiable data will be kept indefinitely.	We will keep the data on this team for two years following the completion of the final participant session (~06/24).

Attach survey(s)/questionnaire(s)

Type	Name	Document
	AppendixB_CaregivingQuestionnaire.pdf	AppendixB_CaregivingQuestionnaire.pdf

Does this study involve interviews?	Yes
Who will conduct the interview?	The interviews will be conducted by the PI.
Will any individual(s) other than the research personnel be present during the interview?	No
Will these interviews involve audio recording or, video recording?	Yes
List the procedures that will be recorded.	The entirety of the session with a participant will be audio recorded. Additionally, a screen recording of the participants interaction with the prototype will be taken.
State the purpose of recording.	The audio recording is necessary to fully capture both the open-ended and semi-structured interviews for later transcription. It is also necessary for transcribing the participants voiced thoughts during the think-aloud interaction with the prototype. Screen recording will be used taken for in-person participants to insert comments about the specifics of the participants' interactions with the prototype into the transcript of the think-aloud interaction to provide richer context for the thoughts voiced.
Will participants be permitted to review, edit, and/or erase the recording?	No
Where will this data be stored? How will you maintain participant confidentiality	Online Participants: Audio will be recorded via UM Zooms cloud recording feature using the audio-only option to ensure that participants may still use their cameras without their video being captures. We will not be capturing screens from participants to eliminate risks that unintended information is captured. In-Person Participants: Both audio recordings and screen recordings will be taken on the HCI lab-owned device provided by the research team for the participants to use during interaction. Audio and screen will be recorded

	using Online Broadcaster Software (OBS), with recording files being saved locally on the Computer Science-managed device provided to them. Post-Session (Both): As soon as a participant's session is completed, all recordings will be uploaded from their respective recording devices/ platforms to the University of Manitoba Teams Server in the Sharepoint folder associated with a private channel only accessible by the two members of the research team. As soon as the uploads have been completed and verified, the original recordings will be deleted from the original device or UM Zoom (whichever is applicable).
What will happen to the recordings once the data is transcribed? How long will you keep it? If you will destroy the data, when (MMYY)? Please provide justification if identifiable data will be kept indefinitely.	The original recordings (audio and screen) will be destroyed within 1 month following transcription, (~03/23). This will give a brief opportunity for transcriptions to be updated if errors are discovered while minimizing lifetime of confidential data.
Who will transcribe the data?	Transcription will be done manually by the PI from audio session recordings. No automated transcriptions functionality will be used (eg. Zoom's transcription for virtual sessions).
Will the transcripts be anonymized, coded, or identifiable? Please explain	References to the participant themselves will be coded in the transcripts. Any references to other people in the transcripts will be anonymized.
Where will this data be stored?	Both the transcripts and coding document that contains mappings from participants to ID key will be stored on the University of Manitoba Teams Server, within the private channel only accessible by the two researchers. This coding document will be stored in a different folder than the rest of the data.
What will happen to the transcripts? How long will you keep it? If you will destroy the data, when (MMYY)? Please provide justification if identifiable data will be kept indefinitely.	We will keep the data on this team for two years following the completion of the final participant session, (~06/24).

Attach interview questions:

Type	Name	Document
	AppendixA_Intro_OpenEndedInterview_v2.pdf	AppendixA_Intro_OpenEndedInterview_v2.docx
	AppendixE_SemiStructuredInterviewGuidelines.pdf	AppendixE_SemiStructuredInterviewGuidelines.pdf

Does this study involve focus groups?	No
Does your study involve observations?	Yes
Please provide your observation plan.	Coded observations of non-verbal aspects of the participants' interaction sessions will be made by the PI / interviewer. Notes will be recorded in a OneNote document stored on the University of Manitoba Teams server, within the private channel only accessible by the two researchers. Details can be found in Appendix C. Tasks to be performed

by the participants for observation will be presented in a personalized guidebook (see Appendix D).

Does this study have an observation guide?	Yes

Attach observation guide:

Type	Name	Document
	AppendixC_ThinkAloudObservationGuide.pdf	AppendixC_ThinkAloudObservationGuide.pdf
	AppendixD_ParticipantTaskGuidebook.pdf	AppendixD_ParticipantTaskGuidebook.pdf

Are there any other data mediums that are not listed above? This includes paper consent forms, paper assent forms, photos, participant ID keys/codebooks, handwritten notes, observation notes, log files, articifacts (e.g. notes, gifts, cards).	Yes

Please select all of the data you may create, collect, access, store or share during or related to this study

Data Medium	Log files
Is this data anonymous, anonymized, coded, indirectly identifiable or directly identifiable? Please explain	Logs generated by the prototype and will use a coded participant ID in all log entries. Anonymized (coded).
Where will this data be stored?	Data will initially be stored on the web server that hosts the prototype, which is managed by the Computer Science department. Data will be copied to the University of Manitoba Teams Server, in a private channel only accessible by the research team for analysis.
What will ultimately happen to this data? How long will you keep it? If you will destroy the data, when (MMYY)? Please provide justification for why the data will be kept indefinitely.	We will keep the data in Teams for two years following the completion of the final participant session (~06/25).
Data Medium	Paper Consent Forms
Is this data anonymous, anonymized, coded, indirectly identifiable or directly identifiable? Please explain	Paper copies of the consent form mailed to the researchers. Directly identifiable.
Where will this data be stored?	Data will be stored in a locked cabinet within the advisors office on the University of Manitoba Campus (E2-481 EITC),
What will ultimately happen to this data? How long will you keep it? If you will destroy the data, when (MMYY)? Please provide	We will keep the data in Teams for two years following the completion of the final participant session (~06/25).

justification for why the data will be kept indefinitely.	
Data Medium	Honorarium receipt forms
Is this data anonymous, anonymized, coded, indirectly identifiable or directly identifiable? Please explain	Directly identifiable.
Where will this data be stored?	Data will be stored in the University of Manitoba Teams Server, in a private channel only accessible by the research team. Receipts will be encrypted with SHA-256, using a key only known by the research team.
What will ultimately happen to this data? How long will you keep it? If you will destroy the data, when (MMYY)? Please provide justification for why the data will be kept indefinitely.	We will keep the data in Teams for two years following the completion of the final participant session (~06/25).
Data Medium	Observation notes
Is this data anonymous, anonymized, coded, indirectly identifiable or directly identifiable? Please explain	Anonymized (coded).
Where will this data be stored?	Data will be stored in the University of Manitoba Teams Server, in a private channel only accessible by the research team.
What will ultimately happen to this data? How long will you keep it? If you will destroy the data, when (MMYY)? Please provide justification for why the data will be kept indefinitely.	We will keep the data in Teams for two years following the completion of the final participant session (~06/25).
Data Medium	Participant ID key
Is this data anonymous, anonymized, coded, indirectly identifiable or directly identifiable? Please explain	Directly identifiable.
Where will this data be stored?	Data will be stored in the University of Manitoba Teams Server, in a private channel only accessible by the research team. The key will be in a separate folder from all other data. The key file will be encrypted with SHA-256, using a key only known by the research team.
What will ultimately happen to this data? How long will you keep it? If you will destroy the data, when (MMYY)? Please provide justification for why the data will be kept indefinitely.	We will keep the data in Teams for two years following the completion of the final participant session (~06/25).

Data Medium	Other
Is this data anonymous, anonymized, coded, indirectly identifiable or directly identifiable? Please explain	Email communications: Directly identifiable.
Where will this data be stored?	Data will be stored in the University of Manitoba's Outlook/365 mail servers.
What will ultimately happen to this data? How long will you keep it? If you will destroy the data, when (MMYY)? Please provide justification for why the data will be kept indefinitely.	We will keep the data in Teams for two years following the completion of the final participant session (~06/25). Attachments, including digitally submitted consent forms will be kept for the same length of time as the emails themselves.
Data Medium	Handwritten notes
Is this data anonymous, anonymized, coded, indirectly identifiable or directly identifiable? Please explain	Anonymized (coded).
Where will this data be stored?	Handwritten notes that might be taken during observation (in addition to those taken in OneNote) will be stored in the HCI lab on the University of Manitoba Campus (E2-534 EITC), in a locked desk drawer only accessible by the PI. This room is always locked, and is only accessible by researchers.
What will ultimately happen to this data? How long will you keep it? If you will destroy the data, when (MMYY)? Please provide justification for why the data will be kept indefinitely.	We will keep the data in Teams for two years following the completion of the final participant session (~06/25).

13. Data - Data Transfer

Will data be transferred from one site to another?	No
Will data be transferred between research team members?	Yes
Please describe in detail how the data will be transferred. What identifiable data will be transferred? How and where will it be stored? What safeguards will be used to protect the data during transfer and storage?	All data will be shared/transferred between research team members using the university's Sharepoint/Teams servers. Access to the containing folders will be restricted to the team members to ensure all data added inherits this limited access.
Will the data be archived or made accessible to the public and/or other researchers?	No

14. Deception

Deception refers to the deliberate withholding of essential information or the provision of deliberately misleading information about the research or its purposes. Withholding the hypothesis is not deception.

Provide detailed information on the extent and nature of deception and why the research could not be conducted without it. This description must be sufficient to justify a waiver of informed consent	This deception is related to the nudges which are being presented in a controlled environment. The purpose of this research is to gain insight into close others' experience with behavioural nudges intended to subtly influence their decision-making process. We will not be informing them of this purpose before they interact with the prototype because doing so might prime them by bringing the nudges into sharper focus, and potentially influencing their natural perceptions of them. The purpose of the think-aloud interaction is to get their thoughts on the nudges in real-time before later discussion is influenced by the explicit acknowledgement of the nudges. This also gives the opportunity for the participants to realize the influencing factor naturally in a way that mimics the subtle interface changes made by banks to their interfaces.
How will debriefing be provided to participants?	Debriefing will be done verbally during the semi-structured interview conducted after the interaction phase has been completed. At an appropriate time during that interview, the participants will be told about the intended purpose of the nudges that were presented and the reason for their inclusion (that we are attempting to ensure financial propriety by caregivers). They will then be given an opportunity to ask questions and engage in further discussion about the nudges. (See Appendix E for context of that interview and debriefing guidelines.)
When and by whom?	Debriefing will be done by the interviewer during the semi-structured interview portion of the session, after the participant has completed their interaction with the prototype. If the participant chooses to withdraw from the study after interacting with the prototype, but before the interview, the researcher will quickly debrief the participant before they leave/end the session.
Provide justification if debriefing will not be given.	N/A

Attach debriefing document(s)

Type	Name	Document
	Appendix E: Semi-Structured Guidelines/Debrief	AppendixE_SemiStructuredInterviewGuidelines.pdf

15. Risks/Benefits - Benefits

What are the expected benefits of the research?	This research will contribute knowledge about the impact and perceptions of nudges in online banking systems that aim to mitigate financial misconduct by people who bank on behalf of older adults. This will provide useful information that designers can use to improve banking systems' efficacy and potentially decrease elder financial abuse.
What are the indirect benefits for participants participating in the research?	Results of this study will help with the design of new behavioural nudges that can be adopted by Canadian banks to more securely support older adult banking clients and their caregivers while minimizing the impact on their interpersonal relationships.
What are the direct benefits for participants participating in the research?	Participants will have the opportunity to reflect on how their activities as informal caregivers are being recognized as valuable, and how financial institutions can better support them. For participants who are themselves older adults, the study will give them the opportunity to reflect on future help they might receive with banking tasks and issues around financial elder abuse.

16. Risks/Benefits - Risks

What are the risks (psychological, physical, emotional, social, legal, economic, or political) to participants, or to a third party?	Psychological and emotional risks could arise if the participants encounter a specific question during interviews that elicit negative responses. There is also a potential social risk if they participants discuss private experiences about the older adult they help (or about a close other, in the case of older adult participants).
Provide a description of the risks, the steps that will be taken to reduce or eliminate them, and the steps that will be taken to improve any actual harm to participants, including (if appropriate) providing a list of helpful resources.	During interviews, participants will be encouraged to only share information that they are comfortable with, and that they have permission to share. If the participant is showing visible discomfort the interviewer will give the them an opportunity to have the conversation redirected or reframed.
Is there a possibility that abuse of children or persons in care might be discovered in the course of the study?	Yes
Current laws require that allegations of certain offenses against children or persons in care be reported to legal authorities. Indicate the provisions that have been made for complying with the law.	We will inform each participant through the consent form (see Appendix J) and the study session introduction (see Appendix A) that we may be legally obligated to disclose any instances of elder abuse that are discussed during the session to the Manitoba Elder Abuse Protection Team per "The Seniors' Rights And Elder Abuse Protection Act (Bill 213) 6(1)".

17. Dissemination/Withdrawing - Feedback

Will you be providing participants with the opportunity to review their data?	No
How will information from or about your participants be presented (e.g., summary statistics for the whole group, direct quotations from their interviews)?	Information from or about participants will be presented as direct quotations from interview transcripts and field notes, and summary thematic analysis performed across all participants.
Will your publications refer to individual participants?	Yes
How will they do so (e.g., by their real name, by a pseudonym, by a general descriptor such as “one female student” or “one factory worker”)?	Participants will receive coded labels (e.g. CO1, CO2, CO3, ... for close others who help an older adult with banking or OA1, OA2, ... for older adult participants, BP1, BP2, ... for banking professionals). The relationship between the close other and the older adult they help may also be identified, but in the most anonymous way possible (i.e.. helps parent, helps other family member, helps neighbour, etc.)
How will the research results be disseminated, to whom, and for what intended purpose?	The results will be reported in RA Havens' Master's thesis which will be put on MSpace, University of Manitoba's institutional repository. Findings will also be disseminated as a research paper or poster submitted to a venue such as ACM CHI or other similar human-computer interaction conferences or journals.
Steps should be taken to provide participants with a brief, non-technical summary of research results as soon as possible after the data collection phase of the study is completed should they want it. Provide your plans for providing project results to participants. Participants should be given a choice of how they wish to receive a summary and should be told approximately when (MMYY) to expect it.	A brief, non-technical summary of high-level findings will be posted on the study web page: https://celinelatulipe.net/gathering-feedback-on-banking-interfaces-for-caregivers/. The link to this page will be provided to the participants in a follow-up email when the summary is posted. If requested in the consent form (see Appendix J), a physical copy may also be sent by mail. Results will be posted six months after the final participant session (anticipate this to be 05/23).

18. Dissemination/Withdrawing - Withdrawing

How and when are participants informed of their right to withdraw?	Participants will be informed of their right to withdraw as part of the consent form (see Appendix J), as well as during the introduction to the study session (see Appendix A).
What procedures will be followed for participants who wish to withdraw at any point during the study?	Withdrawal during the study session: Participants simply need to verbally indicate their desire to withdraw to one of the researchers at any point during the session. They will be thanked for their time, reassured that their compensation/ donation is not conditional on their continued participation, and that their data (if any) will be deleted within 24 hours. If they have interacted with the prototype (and therefore been exposed to the nudge-related deception), the participant will be debriefed (see Appendix E). The session (if in progress) will then conclude immediately. Withdrawal before participation or after a study session has been completed: Participants can contact any member of the research team via email or physical mail indicating that they wish to withdraw. Their data (if any) will be deleted within 24 hours of receipt of their communication. A response acknowledging their intent to withdraw, thanking them for their time, and confirming destruction of their data will be sent back to them using the same method they used to send their withdrawal notice.
Please indicate what will be done with the participants data when they request to withdraw	All data related to the participant will be deleted/destroyed when they request to withdraw. This includes, audio/screen recordings, transcripts, field/observation notes, and log files.
Is there a deadline after which the nature of your data analysis would make it impossible for participants to withdraw? Please provide a MMYY.	It will be impossible to withdraw entirely once thematic analysis of interview transcripts has proceeded to a stage where analysis is being done between participants, as their data will have been used for aggregate analysis. This will likely be one months after the final participant session (anticipate this to be 01/23).

19. Dissemination/Withdrawing - Other Approvals

How will you obtain approval from the groups/ organizations?	Participants will be asked to attest that they have received the proper approvals from their employers in the consent form that they provide. Researchers will not be seeking approval from their employers on their behalf. We will provide a letter that participants may use to inform their employers of the details of the study if necessary (see Appendix K)

Attach copies of communication or approval:

Type	Name	Document
	AppendixK_Information_Letter_for_Employers_v2	Appendix_K__Information_Letter_for_Employers_v2.pdf

20. Attachments

Type	Name	Version	Status	Filename	Uploaded Date
Recruitment Documents	AppendixF_SocialMedia.pdf	1	Approved	AppendixF_SocialMedia.pdf	07/08/2022
Recruitment Documents	AppendixH_CoA_newsletter.pdf	1	Approved	AppendixH_CoA_newsletter.pdf	09/21/2022
Recruitment Documents	AppendixI_PersonalContacts.pdf	1	Approved	AppendixI_PersonalContacts.pdf	07/08/2022
Debriefing Document	AppendixE_SemiStructuredInterviewGuidelines.pdf	1	Approved	AppendixE_SemiStructuredInterviewGuidelines.pdf	07/08/2022
Consent Documents	AppendixJ_Consent_Form_v7.pdf	1	Approved	AppendixJ_Consent_Form_v7.pdf	03/29/2023
Survey/Questionnaire Document	AppendixB_CaregivingQuestionnaire.pdf	1	Approved	AppendixB_CaregivingQuestionnaire.pdf	07/08/2022
Interview Document	AppendixA_Intro_OpenEndedInterview.pdf	1	Approved	AppendixA_Intro_OpenEndedInterview_v2.docx	05/21/2022
Interview Document	AppendixE_SemiStructuredInterviewGuidelines.pdf	1	Approved	AppendixE_SemiStructuredInterviewGuidelines.pdf	07/08/2022
Observation Guide Document	AppendixC_ThinkAloud_ObservationGuide.pdf	1	Approved	AppendixC_ThinkAloud_ObservationGuide.pdf	07/08/2022
Observation Guide Document	AppendixD_ParticipantTaskGuidebook.pdf	1	Approved	AppendixD_ParticipantTaskGuidebook.pdf	07/08/2022
Recruitment Documents	AppendixG_BankingNudgesRecruitmentPoster_B5.pdf	1	Approved	AppendixG_BankingNudgesRecruitmentPoster_v6.pdf	11/09/2022
Consent Documents	AppendixK_Employer_Approval_Form_v1.pdf	1	Approved	AppendixK_Information_Letter_for_Employers_v2.pdf	11/16/2022
Recruitment Documents	BankingStudyRecruitmentPostcard_8_5x11_v1.pdf	1	Approved	BankingStudyRecruitmentPostcard_8_5x11_v1.pdf	11/25/2022
Other Approval Documents	AppendixK_Information_Letter_for_Employers_v2.pdf	2	Approved	AppendixK_Information_Letter_for_Employers_v2.pdf	11/25/2022