# Beyond the 'Unofficial Proxy' - Navigating Technology Support for Older Adults' Banking Activities with Close Others


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## Abstract

In the context of extensive bank branch closures, and a rapidly ageing population, older adults' (OAs') reluctance to adopt digital banking platforms by themselves is concerning. However, many OAs rely on the support of close others (COs) to complete banking activities with them. This support is mostly provided through "unofficial" mechanisms such as sharing online banking credentials, which risk an OA's privacy and security. This paper replicates a Canadian study with OAs in a UK context and extends it with co-design workshops focused on novel banking solutions for OAs and COs, helping to formalise the role of unofficial proxies within online platforms. Results show that unofficial proxy banking also occurs with COs in a UK context and co-design reveals barriers to OAs' use of banking technology independently. We discuss recommendations for flexible, easily authenticated and easy to learn digital banking solutions for OAs in the future.



## CCS Concepts

• **Human-Centered Computing**; • **Human Computer Interaction; Empirical Studies in HCI;**;

## Keywords

Older adults, Close others, Caregivers, Online Banking, Privacy, Security, Power of Attorney

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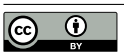



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## 1 Introduction

Using technology for banking is no longer a choice for older adults, but a necessity. In recent years, the U.K. has seen a rapid and extensive closure of bank branches, with a 40% reduction in the number of branches between 2012 and 2022 [17]. The COVID-19 pandemic further accelerated this process [55]. Using digital banking platforms (DBPs) before the pandemic was a preference that increased accessibility and convenience compared to in-person branch banking [120]. However, during the lockdowns, many branches closed or reduced operating hours despite the option to remain open as "essential services" [105]. Customers were encouraged to limit in-person branch visits and DBP use became compulsory for many [99].

Large proportions of the U.K. population were using DBPs in 2019[102], and these numbers have increased since the pandemic [82]. However, older adults (OAs) are a group commonly excluded due to three key barriers: i) lack of digital skills, ii) concerns about protecting privacy and security (fear of fraud), and iii) age-related issues (including physical and cognitive challenges [3]). Whilst DBP adoption also increased among OAs during the pandemic [102], the UK-based older adult charity, AgeUK's, annual 2023 report suggests only 14% of OAs manage their finances online. 58% rely on in-person banking, and 75% wish to complete at least one banking-task in-branch [3]. In the context of a rapidly ageing population [119, 128], understanding why OAs are not using DBPs, the consequences of this, and how they can be supported, are vitally important to ensure they are not left behind in the wake of rapid digitisation and bank branch closures.

When OAs struggle with technology, they often rely on family and friends, referred to here as "close others" (COs), for support [106]. Close others typically assist with instrumental activities of daily living (IADLs) including managing finances, taking medications and food preparation [49]. This extends to banking too: COs play an integral role in supporting OAs with banking tasks [32]. However, in the first study to investigate the mechanisms which COs use to support OAs with banking tasks, Latulipe et al [72] ran a survey study with OAs in Canada during the pandemic and found that such practices often involved unofficial means of access which compromised OAs' privacy and security and put them at

greater risk of financial exploitation. Unofficial access is often a norm for COs using banking apps on OAs' behalf as current systems lack a secondary 'login portal' or means of accessing bank account information for an OA through current banking interfaces.

This research aims to understand mechanisms used by COs to support OAs in banking tasks in the U.K., outside of the context of the pandemic, to enable COs to better support OAs without compromising OAs' privacy and security. To achieve this, we ran two studies: (i) a survey study that extended Latulipe et al's [72] study in two ways – we ran the study in a post-pandemic UK context. and included both OAs (n=24) and COs (n=35) as participants; (ii) co-design studies with OAs and COs.

The survey confirmed that many COs use the same "credential-sharing" workaround found by [72], and despite a large proportion of COs having Power of Attorney (POA - "a legal document that appoints someone [. . .] to make decisions on your behalf" [3])) for the OA they support, very few had invoked POA to provide support in an "official" capacity and even then, some COs still used their OA's credentials for convenience. Our co-design workshops show how COs support OAs in the UK as "unofficial proxies" – performing online banking tasks that circumvent security and privacy for many OAs. These (usually simple) DBP proxy-based activities are complicated through a lack of support for COs acting on behalf of OAs, doing their banking tasks and learning how they bank online and pay bills. The co-design and survey highlight the limitations of POA as an inflexible and inadequate support mechanism and how technologies are not built to support or scaffold these activities.

Through this work, we contribute ways that COs can move beyond their roles as 'unofficial proxies' – a sociotechnical support role for OAs that circumvents DBP restrictions, overcomes technical banking problems and stands-in for OAs when they experience banking struggles. We encourage designers of financial and banking applications to embed age-positive features including scaffolded learning for OAs and COs, as well as routes for COs to securely support OAs with financial tasks. For HCI researchers, we provide recommendations for a deeper investigation into the shared setup work COs perform and the nuanced banking activities they complete repeatedly as a proxy. We also highlight the need for more scaffolding and support for OAs to perform these activities and to officially get support from COs. We advocate for future research and design work on DBPs that supports the education required for both OAs and COs to feel autonomy performing regular banking interactions, without OAs sacrificing their independence. We also encourage banks to consider how to formalise these roles within their services.

## 2 Related Work

To determine how banking technology might be designed better for OA users, it is necessary to understand why comparatively fewer OAs engage with digital banking platforms (DBPs) currently. Compared to OAs' health [20, 43, 52, 53], care [4, 80, 98] and socialization [10, 11, 21, 116, 132, 136], (thanks to the framing of technology as a means to manage the "problems" associated with ageing within the field of HCI [127]) relatively little research focus has been dedicated towards understanding and improving OAs' experiences of DBPs. Some recent work has explored general design heuristics and usability-testing methods for OAs [29, 39, 76, 112]. However, the lack of literature specific to OAs' use of DBPs is concerning given the extensive closure of bank branches in the U.K. [17] and OAs' continued preference for in-person interactions [135] and banking methods [2] over digital ones.

Research suggests that OAs are interested in learning to use [48], and would benefit from using [71], DBPs. Nevertheless, studies exploring reasons for OAs' lack of DBP adoption have found usability concerns and lack of digital skills [48, 64, 71, 122], security concerns [48, 64, 122] and lack of help [122], to be key barriers to their use. Research also found usability concerns, age-related barriers and negative societal attitudes towards ageing affect OAs' ability to learn new technologies [13], which might explain their limited adoption.

### 2.1 Older Adults' Digital Skills

OAs are often assumed to be a homogenous group [84] of people with low levels of digital literacy who, therefore, avoid using technology [85, 127]. Little research explores factors that explain individual differences in technological literacy among OAs. However, experience with technology, rather than age-related cognitive differences, is suggested to account for these observed differences [7, 36, 37]. This finding suggests that supporting OAs in gaining more experience using DBPs might increase their adoption.

The challenges faced by OAs learning new technologies through training programs (age-related barriers, non-user-friendly design of technology, low perceived self-efficacy, negative societal attitude and complex training material [13]) are similar to proposed reasons for low DBP adoption among OAs [48, 64, 71, 122]. This suggests a possible link between lack of effective training in using DBPs and OAs' limited adoption.

Strong motivation to learn a new technology moderates the success of OAs' attempts to acquire digital skills [89]. For example, during the pandemic, many OAs learned to use new technology to stay connected with their family and friends [116]. However, it remains unclear why this effect does not seem to have been replicated in the adoption of DBPs in response to bank branches closing.

### 2.2 Older Adults' Security Concerns

As a group, OAs are more vulnerable to fraud than the general population due, predominantly, to varying levels of digital literacy [1, 103]. Vulnerability is exacerbated by cognitive decline [12, 46, 63, 115], social isolation and loneliness [12, 63, 77, 115], depression [12, 77], lower financial literacy [12, 115], financial fragility [134], risk-taking and impulsivity [12, 115], a lack of knowledge surrounding fraud prevention, and overconfidence in one's ability to manage their finances [47]. Nearly 70% of all financial abuse against OAs was perpetrated by known, trusted individuals or family members [26] (cf. "Financial Exploitation" [30]).

Substantial evidence exists suggesting OAs are generally more concerned than other groups about privacy and security when online [22, 34, 87, 88], especially when disclosing sensitive information [44]. Accordingly, OAs express greater concern for their privacy when interacting with online banking and e-commerce

interfaces than younger groups [110]: fear of fraud is a found to be a key barrier to OAs' use of DBPs [48, 64, 122].

Despite their concerns, OAs struggle to implement successful privacy and data-protection strategies [33, 45, 57]. This could be because the design of technology to enhance privacy and security can exclude OAs as users [72]. Studies exploring OAs' experiences using 2-factor-authentication, a security measure often implemented in online banking and e-commerce interfaces [8], found that OAs took considerably longer than students in previous studies and required help to complete the two-factor-authentication tasks [27, 28]. Researchers argue that OAs' lack of understanding and use of technology designed to enhance privacy and security protection, may explain their greater vulnerability to fraud [5, 72, 109, 111].

Research has also found that OAs consider "non-use" of digital services to be an effective data-protection strategy when they are concerned and do not feel equipped to protect their privacy [108]. This lack of confidence in technology to protect their data may explain why OAs prefer in-person to online banking modalities. Another concerning finding is that when the perceived benefits of use of an online platform are high, even if an OA's initial concern for privacy is high, they engage in fewer privacy-protective behaviors than if perceived benefits are low [50].

## 2.3 Age-Related Barriers to Technology Use

Diverting the discourse surrounding ageing in HCI research away from declining abilities is critical in expanding our understanding of OAs' experiences of technology [127]. Nevertheless, there are physiological changes associated with ageing which can affect OAs' sensory, motor, and cognitive functions. These changes collectively influence how OAs experience technological devices and interfaces, and in turn, the usability of these for OA users. Sometimes these are as simple as fingerprints wearing over time, resulting in usability issues with biometric fingerprint options [15]. However, other physical and cognitive changes can result in usability issues which might be more challenging to address.

*2.3.1 Physical Changes.* One of the most common physical changes experienced by OAs is age-related vision deterioration [69] which affects visual acuity, depth perception, and contrast sensitivity. This can impact their ability to complete cursor-moving [60] and typing tasks [78] in addition to a more general loss in independence [92, 94], resulting in them often receiving more support from COs. Other common physical changes are decline in motor function [117] and the onset of arthritis [56]. These result in reduced dexterity [124], fine motor control [126], hand-eye coordination [90], and hand and wrist mobility [125], which also affect the user experience for the affected OAs [129], particularly when interacting with touchscreen interfaces [76, 96], including tablets.

*2.3.2 Cognitive Changes.* The biological changes associated with ageing also affect OAs' cognition [118], and prevalence of neurological conditions such as dementia and Parkinson's [31] increases with age. These can result in memory issues which might make it more difficult for OAs to remember authentication details like PINs and passwords [65, 100], complicating access to DBPs. Furthermore, 'cognitively old' OAs' resistance behaviors were found to be more strongly influenced by barriers including usability and security concerns than 'cognitively young' OAs [23].

The effects of the biological changes associated with ageing have not been explored in relation to OAs' use of DBPs. However, given that cognitive impairment has been associated with loss of independence [14] and is the reason many OAs are encouraged to organize Power of Attorney for health and finances [9], it could be one important reason why COs might assume responsibility for managing OAs' finances. Another reason why COs might support OAs using DBPs is if the biological changes discussed above affect the usability of DBPs, making them challenging for OAs to use.

## 2.4 The Role of Close Others in Supporting Older Adults

OAs have been found to seek support from their family and friends, and particularly their grandchildren, for help with technology [106]. Emotional support from COs also plays a key role in facilitating OAs' adoption and learning of new technologies [24, 81, 123, 131]. OAs have also been found to rely on COs' support when using new technology whose use was necessary, such as contact-tracing apps during the pandemic [6]. This research demonstrates the integral role COs play in supporting OAs with technology generally.

OAs help each other [58] and/or rely on their COs [104] for matters regarding online privacy and security, and document the role of "self-appointed family technology managers" [97] who protect the OAs in their household from online threats to their privacy and security. Additionally, studies of the resources used by OAs when they need help or have questions surrounding this matter suggest that "social resources" (family and friends) are prioritized over cybersecurity expertise [95, 101]. As a result, researchers have proposed roles of "security caregiver" in OAs' caregiving teams [27, 28], or community-based "facilitators" with technical experience [70] to support OAs in preserving their privacy and security whilst online.

As previously discussed, whilst COs play an important role in educating and supporting OAs surrounding privacy and security, they can also cause significant privacy and security issues. OAs, particularly those with mild cognitive impairment [89], are often encouraged to share their passwords with COs [73], despite this being a problematic practice [42]. OAs give great consideration to benefits and risks of password-sharing [65, 100], only sharing when they perceive low risk and high benefits.

Nevertheless, when OAs share their online banking passwords to allow COs access to support them in managing their finances, this compromises their privacy (because they have no control over what information the CO has access to within the banking portal) and their security (because credential disclosure violates banks' terms of use and puts them at risk of financial abuse / exploitation). More recently, attempts to formalise proxy control in DBPs have been made through introducing prototype 'proxy accounts' as a means of exploring how COs can exert different types of financial support, without misconduct or imposing on an OA [54].

OAs' confidence in their ability to manage their finances independently does not seem to decrease with age [41] or cognitive ability [47], especially as managing finances is not solely contingent on e.g., physical mobility in older age [16]. These patterns are

especially concerning given that over-confidence in one's ability to manage their finances is linked to increased risk of falling victim to fraud [47].

Previous research has found that OAs often deny receiving support for financial activities, despite reporting decreased independence with other daily tasks [94], or underreport it, compared with COs' reports [67, 68, 83]. This could be due to the adoption of "unofficial" mechanisms which they did not wish to disclose or unwanted disclosure of being viewed as an older adult. The OAs most often disclosing assistance with financial matters were those also reporting sensory loss [94], which could impact their independence, but is associated with less stigma than cognitive impairment.

In the U.K., the legitimate mechanism, recognised by banks, by which a CO can manage the finances on behalf of an OA is through obtaining financial Power of Attorney (POA) [3, 25]. COs register as an "Attorney" for the "Donor" (OA) at the Office of the Public Guardian [3]. POA is then registered with the bank in a process known as "invoking." Alternative mechanisms include joint accounts, third party mandates, and companion/carer cards [25], but each of these has different levels of access and requires time-consuming and sometimes confusing administrative processes every time levels of access need to change based on evolving circumstances. However, research conducted in Canada during the early stages of the pandemic [72] found many OAs rely on COs to manage their finances using "unofficial" means. COs were most commonly banking on behalf of (rather than assisting) the OA, using DBPs which were accessed through sharing of credentials [72].

The most relevant research in the U.K. around how COs support OAs with banking was conducted 10 years ago, and focusses only on how to facilitate OAs' delegation of purchasing small items or groceries to a CO or carer [32]. The authors identify the workarounds used at the time as "credential-sharing" (giving the CO their PIN), "payback" (after the purchase has been made on the OA's behalf) and cashiers (who hold funds for the OA, from which small purchases can be made). They propose the "helper card," allowing COs to make purchases on the OAs' behalf in a way which is traceable by banks. This mechanism is now employed by multiple banks across the U.K., including Lloyds [9, 79], Halifax [51] and Santander [114].

Whilst this solution has been successfully implemented, there are many other financial activities for which OAs seem to seek support from COs [72], which may not be currently addressed by official support mechanisms. COs can exploit unofficial mechanisms such as through using DBPs and "credential-sharing" workarounds to support OAs but these can cause privacy and security concerns and put OAs at risk of financial exploitation. Thus, it is important to understand how COs support OAs with banking activities in the U.K.

# 3 Methodology

In this section we set out our methodological approach for running both the survey (study 1) and co-design workshops (study 2). It was an inclusion criteria that all participants across both studies were recruited from within the UK. Following the survey in study 1, co-design sessions were used (study 2) to explore the needs of OAs and COs in this type of support relationship, to inform future design solutions to improve the way OAs are supported by COs.

Following our literature review, we posed the following questions to guide this research:

**RQ1:** How can COs be supported to better provide for OAs when facilitating their online DBP activities?

**RQ2:** How can OAs be better supported by banks' DBPs to reduce their reliance on unofficial mechanisms of support?.

## 3.1 Survey Methodology (Study 1)

This study aimed to replicate and extend Latulipe et al.'s survey [72] of how COs support OAs with banking tasks specific to the United Kingdom, and outside of the pandemic context. We extended their survey to explore how OAs perceive the help provided by COs. Also, differently to Latulipe et al.'s [72], by including OAs as participants, in addition to their COs, our survey aimed to capture the experiences of OAs first-hand to explore possible differences in the reports and perceptions of support provided by COs between each group.

Participants were recruited via social media (including Instagram, Facebook, and Reddit), using convenience and snowball sampling methods and via purposive sampling through the participant recruitment platform, Prolific [107]. In total, of the 59 responses included in the analyses, 24 (40.7%) were OAs who are supported by a CO for banking activities, and 35 (59.3%) were COs who support an OA in banking activities. 13 COs (22.0%), were OAs (aged 60+) themselves. 55 respondents disclosed the OA's age and 54 respondents disclosed the CO's age.

*3.1.1 Materials and Procedure.* An online survey was chosen due to convenience of self-administration and efficient collection of large amounts of data [19]. Attempts were made to reach OAs with limited internet access through organizations with links to OAs (including AgeUK, University of the 3rd Age, etc.) as an effective means of accessing and recording the experiences of harder-to-reach OA sub-groups, as recommended by [66].

The survey consisted of 25 questions in total covering full information, consent and demographic questions, the Lawton Instrumental Activities of Daily Living (IADL) Scale with numeric scoring (Table 1), banking task questions directed at COs and OAs, perceptions and experiences of support, and online banking struggles, and an opt-in for the co-design workshops. This study was approved by UCL's Research Ethics Committee. A separate form was used to collect participants' email addresses for the prize-draw to win one of three £10 "John Lewis" (UK Superstore) vouchers as an incentive for participation.

*3.1.2 Survey Data Analysis.* Of the 87 responses to the online survey, 19 responses were excluded due to incomplete consent. The threshold for survey completion was set at 80%, resulting in the exclusion of a further 9 responses. In total, 59 responses were included in the analyses. First, a series of new variables were created based on participants' responses. Responses were assigned to an age-group based on the reported age of the OA: OAs aged 60-80 years were "Younger" OAs, and OAs aged 80+ were "Older" OAs. An independence score was calculated from the questions based on IADL Scale, following [78]'s proposed method: for each item,

**Table 1: Interpretation of IADL score.**

| IADL score | Interpretation |
|---|---|
| 0-2 | Not at all independent |
| 3-4 | Not very independent |
| 5-6 | Somewhat independent |
| 7-8 | Very independent |

participants received a score of either 1 or 0. The participant's score on each of 8 items was added to calculate the final "Independence Score."

Quantitative analyses were performed on responses to closed-answer questions. Where appropriate, statistical tests were also performed, such as the Mann-Whitney U test of significance. Qualitative data from open-answer questions were analyzed using Affinity Diagramming, performed using Miro [93]. Each response to the open-ended questions were added to individual "Sticky notes." After initial familiarization with the data, similar responses to each question were grouped together and presented as themes. The results of the qualitative analysis are reported alongside the results from the co-design workshops to avoid repetition as well as consolidate the findings.

*3.1.3 Study 2 Persona Development.* The results from these analyses both led to the design of the co-design workshops (because they demonstrated that COs do support OAs via "unofficial" means in the UK) and informed the design of the workshop and development of materials used such as the user personas. The data from the survey was reviewed prior to commencing the co-design workshops and interesting responses e.g., around close others' actions, informed aspects such as our personas for the workshops. Three data-driven personas were created, each representing one of three key struggles identified in the initial review of survey responses:

1. Struggling due to lack of confidence to manage finances independently (due to loss of loved one who previously managed finances for them both).
2. Struggling due to lack of technological skills to manage finances using online banking platforms.
3. Struggling to manage finances due to cognitive impairment.

Each persona consisted of a name, age, photograph, paragraph outlining the persona's situation (compiled using elements from different participants' responses to the open-answer survey questions in Study 1) and key challenge, and a table showing banking modalities and tasks with which they were struggling. The personas were introduced to both contextualise the problem for the co-design participants, and serve as a starting point for discussion. The personas also gave the co-design participants the option to contribute to discussion based on a persona's experiences, rather than their own (either due to sensitivity, or if they can't relate on a personal level with the problems raised in the discussion).

## 3.2 Co-Design Workshops Methodology (Study 2)

Four co-design sessions were conducted with a total of 9 participants (5 OAs and 4 COs):

- CoDesign Session 1: 2 OAs (3 women)
- CoDesign Session 2: 3 OAs (2 men)
- CoDesign Session 3: 2 COs (1 man, 1 woman)
- CoDesign Session 4: 2 COs (2 women)

The first two sessions included only OAs (2 men and 3 women – 4 aged 70-79 and 1 aged 60-69) who were all retired but indicated they had used technology extensively in their career. The second two sessions included only COs (1 man and 3 women, all aged 50-59) who all supported an OA aged between 80-89. The OAs were recruited via a community organisation and the COs were recruited via snowball sampling. As such, participants in each session had some foreknowledge of each other. No participants were recruited directly from the survey, but given its anonymity, it is unknown whether any of the co-design participants also completed the survey or not.

*3.2.1 Materials and Procedure.* Initially, participants completed an 'onboarding questionnaire' asking about their age, gender, employment status and confidence using technology, as well as what banking modalities they use and whether they received support from a CO. Anyone who had not previously consented to take part was asked to complete the online consent process before taking part in the workshop.

Participants were given paper copies of all three personas (see Section 3.1.3 for details), post-it notes to make notes and to contribute to a series of 'boards' (A3 sheets of paper with headings) which were designed to scaffold them in completing the co-design tasks. The session was audio recorded and photos of non-identifying features (e.g., hands, backs of people's heads and not faces) and design decisions were taken (e.g., Fig 1 below).

An ice-breaker activity was used to allow participants to get to know each other and create a welcoming environment. Participants were then introduced to the three personas: Grace, Henry and Maria. The personas were meant as a way to trigger discussion but also to act as reference points if the users wanted some distance from their own personal stories. Once they had familiarized themselves with each persona, each participant was assigned one persona for the first co-design activity which aimed to identify the needs of the target users and the issues with current solutions. Participants considered the needs of their assigned persona relevant to banking, and how their assigned persona's COs might support them using current technology. They noted their thoughts on sticky notes and placed them on the "Needs" or "Support from COs" boards. Their contributions to these boards were then discussed as a group. The second activity invited participants to generate ideas for potential solutions to the needs and challenges they identified in Activity 1. Questions such as "How might technology be changed [to encourage personal independence]?" were asked. To close, participants were given the opportunity to share any final thoughts before the recording was stopped and they were thanked for their participation and given a £10 Love2Shop voucher as reimbursement. Sessions lasted between 30-60 minutes in length. All sessions took place in a shared meeting place at the researchers' home institution, where catering was also provided.

**Figure 1: Photograph from OA Co-Design Session 1.**

*3.2.2 Data Analysis.* A thematic analysis of the transcripts, photos and drawings (e.g., Fig 2) was conducted following methodology outlined by Braun and Clarke [18].

Initial codes were generated between the researchers using an inductive first pass (discussion, consideration and alteration) of the codes from survey data, followed by a collaborative deductive (comparison of notes, and decision on final codes) between the researchers. Further codes were generated throughout the analysis of the co-design session transcripts through an iterative process. The analysis process took place between all authors, with each author reading through the data set and contributing to an initial set of low-level summaries. During a second pass the authors discussed their low-level codes and iterated on themes such as "Security struggles", "Individual access blocks" and "Credential gatekeeping", that became part of higher level, 'artful and interpretative' [18] themes, labelled such as, "Technological barriers".

Five themes were identified: (i) Technological barriers, (ii) Physical barriers (including both age-related Cognitive and Physical impairment), (iii) Emotional barriers (including lack of confidence), (iv) "Current solutions" (including the limitations of support mechanisms currently available to OAs and their COs) and "Future solutions" (including user-requirements of any future solutions, and design ideas).

CDOA# and CDCO# are used as participant-identifiers for quotes by OA and CO co-design participants respectively. (Where qualitative survey data is discussed, identifiers beginning OS indicate online-survey participants).

## 4 Findings

Our findings draw together the qualitative co-design workshops with both OAs and COs and present this alongside our survey findings. We first discuss the main barriers to OAs feeling independent and autonomous using digital banking platforms (DBPs), identifying personal and shared usability and accessibility issues. We then explore the proxy-driven support constructs and shared mechanisms that COs use to facilitate OAs banking interactions. Lastly, education and setup support are explored through a future-facing design discussion, where participants suggest authentication support from COs, a need for flexibility and adaptability for DBPs and opportunities for banks and services to better present structured and scaffolded learning for their services, targeted at both OAs and COs.

### 4.1 Sociotechnical Banking Barriers

This section explores the technological, physical and emotional barriers that OAs and COs discussed when accessing and using DBPs for shared financial activities. Many found that their barriers were simply technological and that they were overloaded by all of the different functions on different DBPs: "The plethora of options can be baffling but also, often the wording of the options is very succinct. It's crystal clear to me when I look at a website what a button or link means. But if you're not using technology all the time, you don't know what that button means" (CD-CO3). COs also echoed this difficulty with DBPs basic functionality, adding: "It still has to be short because my dad struggles to move around pages. He won't look at the second half [of the screen]. He feels every piece of information is on the screen. He forgets you can scroll" (CD-CO4). One CO also explained how describing the texture of the interaction to his elderly father helped to convey the correct way to move through a mobile DBP app: "You're saying, 'No, not that button. [...] It's that one... What? No. Okay, so, the tap is more like a short, sharp prod. Yes, that's right and now you have to, like, stroke the screen really gently to scroll"' (CD-CO3). They explained that this type of support over the phone for technological issues quickly became unsustainable and frustrating for both parties, and in such cases the CO resorted to completing tasks on behalf of the OA, often without being physically present in the same space

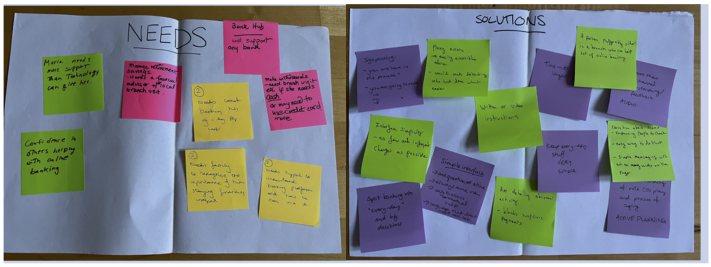


**Figure 2: Needs and Solutions boards from Co-Design Sessions.**

**Table 2: How COs support OAs with banking activities,**

| | CO assists OA | Complete tasks together | CO completes tasks on behalf of OA |
|---|---|---|---|
| CO physically present with OA | 13 | 13 | 6 |
| CO on the phone with OA | 1 | 0 | 3 |
| CO not present with OA | | | 23 |

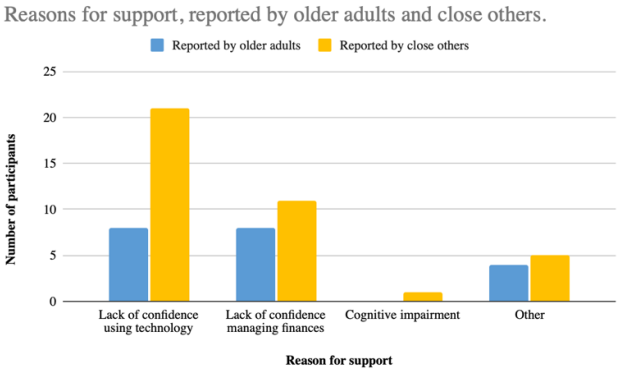


**Figure 3: Reasons for support, reported by OAs and COs.**

as each other. This kind of remote support given to OAs by COs, in the OAs absence, was also seen to be frequently reported by survey participants: 23 participants (38.9%) reported that the COs completed tasks on behalf of the OA without being physically present with the OA, or over the phone. The table below (Table 2) shows how many COs supported OAs (as reported by both) when (i) both were physically present together in person or (ii) over the phone and (iii) by the COs without OAs being present across all 59 participants.

CD-CO3's comment is further supported through the survey outlining how a lack of confidence (Fig 3, below) in the technology was the greatest barrier to using a DBP.

Beyond the technological limitations that invited greater physical support from COs, generational and cultural barriers also came into play to limit some OAs' engagement with the DBPs. One CO was prompted through a persona of how ingrained sexism plays a role in preventing engagement: "Grace [persona] is a woman of her time. And [it's] not uncommon to have women who have not engaged with financial matters at all because it's viewed as a male role. And that is really difficult when they suddenly find themselves having to do it because it is daunting and scary" (CD-CO1). Another CO spoke to the ongoing challenge of keeping consecutive generations of adults familiar with new technology as they enter older age: "The technological challenges faced by each new generation of ageing adults will be obviously different but the biology of ageing and the principles we've discussed will remain the same" (CD-CO3). CD-CO3 acknowledges the change in technology over time, yet still expects that new technological challenges will arise that will be equally, if not more challenging than existing ones as time progresses.

This perceived trend was again somewhat reflected through the survey data which shows greater independence (Fig 4, below) in OAs for in-person banking compared to less independence and far greater reliance on COs for online banking.

The emotional barriers that OAs felt, also impacted their confidence and self-perception. For CDOA3, this was particularly felt when something was likely to go wrong on a DBP: "for a proud, independent person like [myself], falling victim to an [online] scam or making a costly mistake would be a real blow" (CD-OA3). COs also felt that the personas reminded them of situations where they had supported an OA and felt their reluctance or lack of confidence: "Henry [persona] has to be able to [achieve his goals] on his own because as soon as he picks up the phone and says, 'I don't understand this, can you help me?' [. . .] he'll see [that] as the thin end of the edge and won't want to do it. So, he'll have to be able to do on his own" (CD-CO4). The importance of instilling independence and confidence in these systems is made apparent here and how when even the smallest mistake may be made, this can remove an OA's confidence in a banking system in the long-term. OAs themselves recognised this too, with one commenting of the Maria persona: "She's [Maria – persona] making mistakes, well she's gonna lose confidence" (CD-OA4).

In our survey (Table 3), OAs self-described as feeling confident completing more everyday tasks using DBPs, such as making cash withdrawals or monitoring their balance, but help was needed by COs for the more complex tasks. Whilst there is not a link in our survey between errors performing complex tasks and CO help, or between emotional confidence and CO support, there is a clear need for greater scaffolding for both OAs and COs in DBPs for these more complex tasks.

## 4.2 Proxy-Driven Support

Our personas brought to light the disparities between 'official' and 'unofficial' mechanisms for COs to support OAs. In the UK, Power of Attorney (PoA) is used typically by caregivers of OAs (e.g., an adult child) to have control over their finances when an assessment has been made whereby they cannot independently manage their finances anymore. However, there is often nuance in these blunt and far-reaching decisions that result in power imbalances. One CO exemplifies this, saying: "Power of Attorney is great if you [know what you] want to do, you know, make major decisions, but it's complicated and lengthy to set up, and really not necessary to solve your problem if you want to get somebody to go buy you some milk or to pay the cleaner" (CD-CO3), which was reflected in survey responses (Table 4). The complex and lengthy setup and unwieldy nature of POA for basic tasks was acknowledged by another respondent who preferred circumventing 'official' security measures

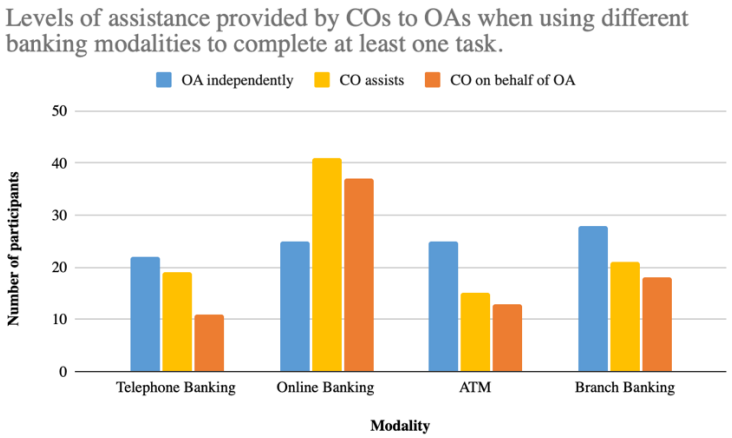


**Figure 4: Levels of assistance provided, using different banking modalities to complete at least one task.**

**Table 3: Levels of assistance provided for different banking tasks.**

| Task | OA independently | CO assists OA | CO on behalf of OA | NA |
|---|---|---|---|---|
| Make withdrawals | 38 | 11 | 10 | 0 |
| Monitor balance | 24 | 19 | 15 | 1 |
| Manage retirement savings | 18 | 20 | 14 | 7 |
| Pay bills | 24 | 17 | 16 | 2 |
| Transfer funds | 21 | 16 | 21 | 1 |
| Manage credit cards | 23 | 11 | 14 | 11 |
| Manage insurance | 15 | 18 | 20 | 6 |
| Manage pension payments | 19 | 17 | 9 | 14 |
| Pay mortgage | 5 | 3 | 4 | 47 |

**Table 4: POA present and invoked, by most used support modality.**

| Most used modality for support | Number of participants | POA present | | POA invoked | |
|---|---|---|---|---|---|
| | | N | % | N | % |
| Online Banking | 31 | 17 | 54.8 | 9 | 29.0 |
| Telephone | 26 | 11 | 42.3 | 2 | 7.7 |
| ATM | 0 | - | - | - | - |
| Branch Banking | 2 | 0 | - | 0 | - |

over the officiality of POA: "I would like to be able to do more and it to be easier to do this 'properly' using the power of attorney, but the process is complicated so it is easier to use their credentials and log on myself" (OS-CO21). Our survey too, showed a strong trend for POA being used to support online banking, foremost, for OAs who struggled with even simple tasks online.

This contrasts with a clear preference held by COs for 'unofficial' workarounds to technology problems arising with COs, from requiring additional authentication from OAs that don't require POA. The role of the 'Unofficial Proxy' comes into play for mundane banking tasks that require (often) simple workarounds or creative thinking by COs to solve a banking problem. As CD-OA5 describes a workaround to log into an online banking system, which was more common than engaging in offline banking support as shown in Table 5 "What we [did] was 'you write down what you want to do' and then we'll implement it, so you don't have to go into the branch. They never actually got involved in the online side of it" (CD-OA5). Others discussed how doing banking actions 'unofficially' saved them time when performing other caregiving duties for an OA: "The current credentials-based system might potentially be open to abuse [...] but also facilitates us carers finding face-saving, time-efficient solutions for the older people we love and help to keep going" (CD-CO3). Perceived trust in COs' own roles too, played a part in their decision to circumvent privacy and security measures for an OA: "My mother and I don't worry about privacy and security issues. She is lucky having daughters she

**Table 5: COs' knowledge of OAs' online and other (offline) banking credentials.**

| | Online banking credentials | | Other banking credentials | |
|---|---|---|---|---|
| | N | % | N | % |
| Known | 40 | 67.8 | 35 | 59.3 |
| Unknown | 19 | 32.2 | 24 | 40.7 |

can trust" (OS-CO22). Our survey too, showed the reality of just how many COs hold ownership of OAs' banking credentials, even when POA had not been invoked, with 74.1% of COs knowing OAs' credentials.

However, despite the enthusiasm for these 'unofficial' workarounds, some COs also felt skeptical that not all of their counterparts would be using these workarounds for the benefit of another OA: "They might not have the best of intentions" (CD-CO2). Others too, highlighted the difficulty for OAs who don't have immediate family or friends who can help them, or who wanted to maintain a sense of independence when e.g., POA was being forced upon them: "Obviously they're relying on friends and relatives to help [OAs] [...] but there's a lot of people who don't necessarily have family support or who don't want family to support them with that and they want to do it independently" (CD-CO2).

It is of interest that the majority of 'unofficial tasks' that COs perform on OAs' behalf, are not the more complex activities like 'Managing pensions', 'Managing insurance', or 'paying mortgage' that our survey enquired about, but instead the more mundane 'Making withdrawals' and 'checking balance', everyday tasks that OAs and COs brought to light during the co-design sessions. While COs undoubtedly also handled these more complex tasks, it was the routine banking activities that COs discussed most frequently e.g., "[Mother] obviously needed me to step in [...] I would have to step in, in time to log on for her. And that's it. Time and time again, it was the same thing [with DBP online tasks] with her" (CD-CO2). Projecting the necessity of the CO role onto the Maria persona again, CD-CO2 expands on the time-consuming nature of intervening with these small tasks: "I would like to be able to do more [online] and it to be easier to do this setup "properly" [for her, Maria], [but] it's the same steps, over and over, and she [Maria] might be told, then just forget again" (CD-CO2).

The co-design discussions too, prompted some COs and OAs to reflect on how the need for POA may not come about until the need is already too late and the ability of the OA to willingly and autonomously relinquish their own financial independence to a CO becomes imbalanced, leading to COs taking control out of necessity rather than choice. This can strip OAs of their autonomy of spending for everyday simple tasks, as mentioned above and leads COs to feel concern regarding when it is appropriate to invoke POA: "Ageing is often quite insidious. Some people have big step changes, but some people don't, and may not be aware of declining capabilities" (CD-CO3). OAs felt similarly, adding: "The trouble is you become old before you start thinking about some of these things and sometimes it's almost too late to put these sort of things in place" (CD-OA5).

Overall, the benefits of current 'unofficial' DBP methods used by COs are apparent. However, COs express their own concerns about circumventing 'official' banking methods and the mismatch between the unwieldiness of POA for simple DBP interactions, that can strip OAs of much-needed autonomy to complete simple banking tasks.

## 4.3 Scaffolding OA and CO Support

This section deals with the future needs that OAs and COs expressed towards improving DBPs and how banks and online banking service designers should better scaffold their online banking service interactions, to cater for the nuance and non-linearity of OAs ageing and, in particular, how sudden changes to an OA's life necessitate changes to the way routine DBP tasks are managed by COs.

Recognising their role as 'unofficial proxies' many COs showed animosity towards banks for the hassle that managing simple actions required of them. Of the nature of complex ageing transitions, multiple participants expressed a desire for DBPs to cater for the nuance and complexity of ageing across individual circumstances: "It would be good if banks took some initiative in understanding the transition[s] people go through." (CD-CO3), "It would be ideal if banks and other institutions recognized the pathway associated with ageing and how it relates to capacity to undertake banking activities and that it's also not a linear deterioration." (OS-CO23) and of the need to distinguish OA DBP interactions from CO ones: "It should be very clear to people [banks] when it's her [OA} doing it, not me [CO] so that if there's any confusion, people can track who did what." (CD-CO1).

The adaptability and flexibility of DBP services was also called into question during co-design discussions, with participants advocating for structured walkthroughs of specific banking tasks, e.g., paying bills, with the DBP scaffolding the interactions such as: "'This is the process and this is where you are in the process. So there are five things we need to do for you to pay this person"' (CD-CO3). Building on this CD-CO2 suggested: "Maybe it's useful to use audio as well. As you're clicking through a process, trying to do something, would it be useful to have, 'Did you mean £12,300.00 or did you mean £123.00?' Then there's an interruption so that if you typed the wrong thing, not only is it querying it, but it's querying it in a different way that's making sit up and pay attention." (CD-CO2).

Better structure for the DBP authentication process was also desired by participants, with OAs considering: "It's also quite hard to plan for it because it takes a certain amount of imagination to think, 'what am I going to struggle with?' when your situation is evolving. One day I might just forget it all [login details]" (CDOA1), with CD-CO3 later adding: "It makes my blood run cold to think

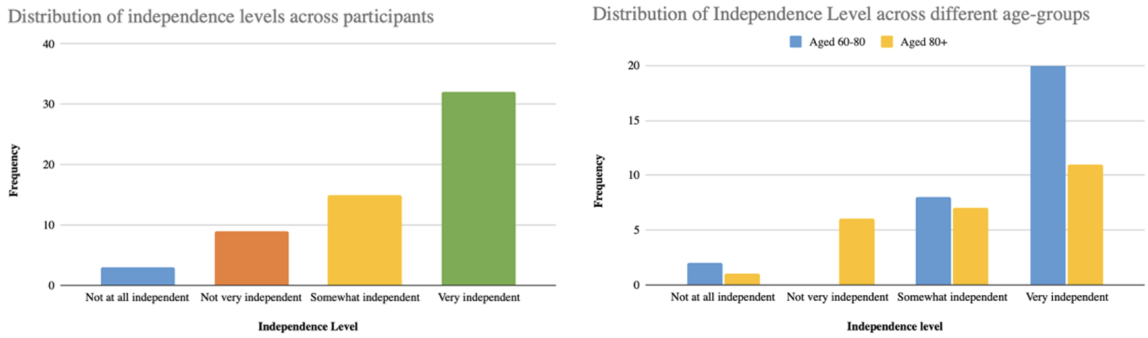


**Figure 5: (Left): Distribution of OAs' independence levels. (Right): OAs' independence levels by Age Group. In both age groups, the largest proportion of OAs were classified as "Very independent."**

that the banks might suddenly require my mother somehow hold up a device and get her face pictured in the frame [to login]" (CD-CO3).

Further, despite our survey initially showing high levels of OA independence when performing Instrumental Activities of Daily Living (IADLs, Fig 5 below), both OAs and COs during co-design felt that better scaffolding and education about the full functionality of DBPs up-front, when starting to use them, could support their independence further.

"Some sort of training, or book that you could go through where you can [learn to] make those transfers" (CD-OA4). This was echoed by OS-CO13 and CD-CO3, suggesting that banks investing in teaching for the specific interactions of their services when OAs first start to use them, could save COs time in the long-run: "Teach them to a high enough level they could do it independently" (OS-CO13), "I think it'd be valuable for them [banks]. If you show someone which buttons do what, guide them through it, then they're more likely to remember than we are. You'll need to come back to it [training] again and again maybe, but it's there then [for OAs]" (CD-CO3).

Lastly, going into detail on what this training might look like, participants suggested designing the training to make mistakes to help OAs think through error recovery as well as targeted pointers on the DBP to signpost specific interactions: "[referencing training app idea] . . .deliberately make things go wrong. So that they ask, 'What do you do in this situation?"' (CD-OA5), and suggesting: "Before they [OAs] try and do something, they could watch a video which shows them 'press this button if you want to make a payment' and it shows you where on the screen it is" (CD-CO2).

Overall, both OAs and COs were eager for training and education across DBPs that structures, challenges and reinforces interactions on these platforms for OAs. For COs, the first step towards this is for banks and DBP designers to engage with the complexity of life transitions and the diversity of ageing to tailor this training to OAs specific needs. In the Discussion, we explore the feasibility of these needs for banks, DBP designers and HCI and CSCW researchers looking to broaden the support that online banking platforms can provide to both COs and OAs and how the roles of the 'unofficial proxy' could be better formalised through DBP designs.

## 5 Discussion

Through our findings we explored the role of the 'unofficial proxy' – performed by close others of older adults and how this support places requirements on COs to adopt, adapt and stand-in for OAs for online banking tasks. Formally recognising unofficial proxy interactions arises implications for the design of DBPs, particularly allowing this unofficial role to become supported through DBPs and better aid the experience of both OAs and COs on these platforms.

### 5.1 Formalising 'Unofficial Proxies' Role on DBPs

In Latulipe et al.'s [72] and Dunphy et al.'s [32] studies, these "credential sharing" workarounds highlighted the role of unofficial proxies, and allowed friends, relatives and close family to login to DPBs on OAs' behalf. However, our findings suggest the need for DBPs to now go beyond this role, take ownership of the interactions involved with it and to create DBP online platforms that embrace COs' management of finances to avoid security, privacy and power risks. The unofficial proxy role then, is not confined to the UK context, yet many of the more complex banking interactions our COs performed on DBPs were driven by needing to perform tasks when they had been given Power of Attorney over an OA.

Our co-design showed how exact circumstances surrounding the sharing of credentials will vary from person to person: e.g., some COs might keep a record of passwords in case an OA forgets these or is unable to access their account for another reason. Future work might consider exploring further how COs keep track of and manage such extensive banking responsibilities. Nevertheless, the privacy and security risks associated with their role still apply; namely how OAs giving COs access to their accounts can result in bank balances or debts becoming unintentionally shared and violating individuals' privacy [44]. This could also put them at increased risk of financial fraud and exploitation if the CO has malicious intent and even creating new security risks [30]. The DBP interactions and workarounds seen by our unofficial proxies also violates many banks' terms of use, voiding any fraud protection support should an OA fall victim to this kind of misuse of their information. Nevertheless, sharing credentials with COs remains one of the few avenues open to OAs should POA be forced upon them; or even without it, when they may require additional assistance

to complete daily banking activities, to avoid reducing individual confidence as seen with CD-OA4 and CD-CO4.

There is, evidently, a need for banks and DBP developers to engage with unofficial proxies' interactions, recognising a middle ground between not breaching privacy and security and also recognising the shared complexity of needing to bank online that exists for COs as OAs age. One solution could simply see a 'proxy portal' – whereby COs can specifically login on behalf of OAs. OAs could then view the changes to their banking that a CO has proposed in their own view and either approve or deny the change. Whilst reducing the banking actions to simple yes or no (agree/disagree) decisions by an OA, this would likely maintain privacy and security better than logging into the OAs account directly.

Alternatively, developers could for example, by way of facial recognition technology, allow COs to login to OAs accounts (should, e.g., POA have been given and verified by the bank too), but in a similar way to enterprise management software, see some features of an OAs account 'greyed out' or restricted. This would give the CO the ability to see the same account information as the OA, thus still 'managing it' with them, but the interactions with an OA's finances would rest with the OA still.

Neither of these design implementations provide a perfect solution to formalising the unofficial proxy role within banking services, yet embracing these platform changes could reduce risk and the likelihood of a CO accidentally or intentionally compromising an OA's finances, given the POA-level power they might hold.

*5.1.1 On The 'Power' of Power of Attorney.* Whilst formalising the role of the unofficial proxy is our recommendation in order to better protect both OAs and COs privacy and security, this must be done so in the context of where power resides in the relationship between OAs, COs and DBPs. This study has dealt with the power roles that COs often hold over an OA, e.g., when Power of Attorney (POA) is invoked. HCI research has also dealt extensively with power roles in regard to technology use, and in instances of attempting to 'empower' individuals that are in some way marginalised [91, 113, 133]. In our study, POA in the UK context yields COs wide-ranging powers over an OA and is particularly complicated by those who want to take more nuanced actions and management tasks on behalf of an OA, such as managing account credentials for CD-CO3. Whilst our survey showed that only a small proportion of COs had actually gone through the lengthy POA process in order to hold control over an OA's banking, there is still little discussion around the nuance of how OAs may feel about being obliged to surrender their financial autonomy or wishing to revoke a CO's POA in the long-term.

Ismail et al. [59] discuss how power structures often affect how likely a marginalised individual is to surrender or concede to those with perceived more power. COs in our study were typically significantly younger than the OAs they were looking after and as such, there is a need to identify whether OAs feel an obligation to surrender their financial autonomy to COs to make use of DBPs on their behalf. Doing so could also better inform banks' provision for supporting OAs and COs and make the engagement with online platforms more equitable for all parties.

## 5.2 Optimising DBPs for Future Banking Practises

*5.2.1 Usability.* Regarding the overall user experience of DBPs from our co-design sessions, OAs and COs found a need to improve many features for ease of use and reliability, especially around the ambiguity of gestural interactions on DBPs for OAs, as CD-CO3 pointed out. Some of the aforementioned barriers to these features appeared novel including the perceived verbal 'clutter' of online banking services as well as the distinctions mentioned between tapping, scrolling and long-pressing that COs noticed of OAs when supporting them when co-present. Gatsou et al. [48] and Xiaofu et al. [64] also found that unfamiliar vocabulary was common across DBPs as well coming up against barriers including a confusing layout. Previous work has also suggested workarounds to improve navigation, including Mingming et al. and Xiaofu et al. [38, 64], who suggested providing additional guidance in the form of "pre- and post-action states" for each step, making it clear to OA users what would happen if they clicked on each button. Vocabulary too, should be familiar to OA users, and consistent across interfaces. New vocabulary should be introduced to the user, and new names should be given to similar terms to avoid confusion, for example "one-time passcodes" and app "passcodes."

Another suggestion made by co-design participants to improve usability was to include multi-modal feedback. By using audio to narrate the actions that OAs are performing, users could more easily identify when they have made a mistake, which echoes recommendations made by Gatsou et al. [48]. A considerable number of studies have explored the effect of multimodal feedback on the usability of interfaces for OAs, concluding that auditory feedback improves task performance in OAs [35] both familiar [62] and unfamiliar [75] with digital interfaces, as well as those with visual impairments [61]. However, more research is needed to assess whether multi-modal feedback prevents OAs from making mistakes when using DBPs.

*5.2.2 Modes of Support.* Different types of support were required across the different types of tasks that both OAs and COs used when engaging with DBPs. These modes included in-person, remote, and semi-supported (e.g., by a CO guiding an OA through a banking task over the phone). The most common mode of support that COs provided OAs was technological, whilst the most cited reason for needing support (by all participants) was lack of confidence with technology. This juxtaposition could be due to differences in perception between OAs and COs or from some OAs' lower technological literacy, resulting from individual differences in experience [7, 36, 37]. COs further highlighted how the usability issues discussed were a drawback to OAs they cared for, feeling confident and independent using DBPs by themselves into later life. Our findings, too, built on existing literature around the transition to reliance on COs in early older-adulthood [48, 64, 71] and showed how in-person support was most valuable in instilling confidence in OAs using DBPs. There could be a number of reasons for this, including technological-literacy requirements for support to be provided over the phone exceeding OAs' abilities [74], or this could be due to OAs' preferences for in-person interactions over digital ones [135].

However, our findings did still show that many COs are not present when they support OAs and complete tasks on their behalf; but that they consult them before or afterwards. This suggests that a large majority of DBP support can be put in place remotely, with online banking the easiest way to do this. Therefore, DBPs should be flexible to the modes of support that COs can provide and again must better cater to the individual preferences of each OA and CO pairing so that, e.g., COs can enable one support preference over another, and OAs have a way to agree to this either on the platform itself or through engaging with their bank to give authorisation too.

*5.2.3 Improving DBP Education.* Lastly, OAs' digital literacy appeared a strong indicator of their success when engaging with a DBP. Existing research also suggests that a key determinant of OAs' technological literacy is prior experience engaging with digital interfaces [7, 36, 37]. This was supported by our co-design participants who explained how even the best designed DBP interface will likely still not be intuitive for all OAs to use if they lack experience or confidence with digital technology (in particular, due to prior bad experiences with an online service or platform).

Whilst our participants favoured traditional types of training, from using physical books and paper to in-person training by banks for OAs, where all the functionality of the system is provided up front, it is likely that either COs or OAs could forget aspects of this training later on, simply due to the large amount of up-front information. Whilst familiar, it may instead be better to structure the apps themselves, as CDCO3 had suggested, and has been suggested by Tanprasert et al. [121] so that the app can guide OAs and COs through a banking interaction in real time – showing which buttons to press, how, and what the resultant action will be. This could instill greater confidence for an OA and reduce anxiety for COs who may worry about an OA making an unrecoverable error.

Whilst previous research has explored the effectiveness of in-person training programs on improving OAs' wider technological literacy [13, 86, 130], the effectiveness outcomes were mixed. In our view, based on our co-design sessions, some combination of in-person or even community training [40] (through charities such as AgeUK or U3A) is most likely to improve education for both OAs and COs in the long term and ensure that the information and actions required to use DBPs successfully are retained.

## 6 Limitations and Future Work

This research extended the survey work of Latulipe et al. [72] by running the study in a post-pandemic context in the UK and with OAs and COs. We further extended the work through co-design insights from both OAs and COs. Our study, thus, contained limitations from our own work and built on limitations of Latulipe et al.'s 2022 study [72]. First, we acknowledge that in conducting the survey, there was an uneven distribution of OAs' independence levels. Whilst Laparra-Hernandez et al. [71] also had a smaller number of less independent OAs, compared to more independent OAs, the very small number of "Not at all independent" OAs is more likely to reflect bias in the sampling methods than differences in OAs' independence from Canada to the UK. Additional research involving more OAs with lower IADL scores is needed to validate comparisons drawn between our data and Latulipe et al.'s [72], and to gain a more representative understanding of OAs' experiences.

Our survey also deliberately set out to recruit both OAs and their COs, and participants were actively encouraged to share their survey response with another CO or OA. Our measures were designed so that discrepancies between OAs and COs self-reported support (received and given), could be investigated and accounted for. Unfortunately, no participants linked their responses, meaning these discrepancies could not be explored. Therefore, reported experiences were subject to stakeholder-related biases, e.g., subjective mood and experiences at the time of taking the survey. Future work should consider purposive sampling of OA-CO pairs to mitigate such biases.

Whilst we also aimed to maintain a balance between OAs and COs for our co-design work, we held a greater proportion of CO responses to better answer RQ2 and to understand COs' complex sociotechnical roles, balancing privacy against shared responsibility for protecting OAs' welfare on DBPs. As we recruited small groups (2-3 participants) for our co-design sessions, this meant all participants had the opportunity to contribute equally to the discussion, and little moderation was needed. Nevertheless, it would be beneficial to consider larger groups of older adults co-designing DBP features and those from diverse backgrounds (e.g., non-White, British or low-income, with other diversity characteristics) together in future to be better representative of the unofficial mechanisms that could be used across different communities.

Recruiting participants for the survey and workshops was challenging due to the sensitive nature of the topic. Some OAs declared themselves "tech-phobic" or were reluctant to admit they received support from a CO, whereas others felt the "minimal" amount of support they received was not enough to qualify for the study. Therefore, future studies might broaden eligibility criteria by asking participants whether they ever, and how often they, receive support, with a range of options rather than simply stating that receiving support from a CO is part of the eligibility criteria. It may also be beneficial to specify that receiving support does not necessarily mean being completely reliant on a CO as it was in the case of POA in our study.

Additionally, despite being reassured that the study was completely anonymous, some people who were approached to participate were worried about disclosing the "unofficial" mechanisms they use to support OAs would violate their banks' terms of use. In such a case in future, further reassurances should be made by researchers to establish that independent research will not affect a participants' rights or status with their banks or services.

Finally, and interestingly, since this research was conducted, a new banking solution for people with dementia and their caregivers was launched. Sibstar (https://www.sibstar.co.uk) provides a new type of account with a debit card with a limit which provides the OA with independence, and an app for their CO to monitor spending. However, to sign up for this service, COs must have a Lasting Power of Attorney in place for their OA. Whilst this service caters to a specific use case (those OAs living with Dementia), we encourage researchers to explore new DBP products and services that might also help to formalise previously 'unofficial' workarounds and to move towards more inclusive banking practices for COs and OAs.

## 7 Conclusion

This study evidenced how COs support OAs in a UK post-pandemic context. Whilst replicating parts of the Candian banking study's survey, we added co-design workshops with COs and OAs that provided recommendations for moving beyond 'unofficial proxies' – encouraging banks to formalise these 'credential sharing' and other workarounds into the way they provide for, and educate others about their services. We advocate for greater integration with existing DBPs to improve OAs and COs upfront education about these services, through to considering the power relations that COs and OAs share when banking (and how banks should reflect these power relations in usability features). We also propose identifying modes of engagement with banking services when a CO cannot be physically present to support a banking task. We contribute a new and timely understanding of how COs can move beyond these unofficial mechanisms to better facilitate OAs' independence and share responsibility for banking in a more equitable, efficient manner. The implications of this work are extensive, considering global ageing, the ubiquity of online bank accounts, and the rise in financial crimes against OAs as well as planning for, and preserving, personal independence into older adulthood.

## Acknowledgments

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