How Many Times Do I Need to Say, ‘It Is Me’? Investigating Two-Factor Authentication with Older Adults in Norway

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Abstract: We will have fewer healthcare personnel per older adult in the future. The use of assistive technology has been introduced to change the ways in which elderly care function, considering a more sustainable caregiving system. However, with the growing threats in cybersecurity, assistive technologies must be implemented with strong protective measures to ensure the privacy and safety of the elderly population. Two-factor authentication (2FA) has been implemented in most technologies used today, but not in assistive technologies. Research has also shown that 2FA methods can sometimes be user-unfriendly. Hence, in this study, we aim to explore the user experiences and attitudes of older adults in Norway towards performing 2FA, hoping that our findings can inform the implementation of assistive technologies. Through user testing and interviews with eight older adults, we found that 2FA methods using the physical bank code device and SMS verification were preferred. The perception of user-friendliness varied; Some prioritized ease in performing 2FA, while others valued familiarity, focusing more on avoiding mistakes. Based on our findings, we intend to implement the proposed 2FA methods into commonly used assistive technologies within the Norwegian caregiving system and evaluate these methods with a larger sample of older adults.

1 INTRODUCTION

The escalating number of ageing populations worldwide presents a significant societal challenge. According to World Health Organization (WHO, 2024a), this number is rising much faster than ever before. By 2050, the population of older adults aged 60 years and above will double, reaching 2.1 billion. The population of those aged 80 years and above will triple, reaching 426 million. In many countries, assistive technologies have been introduced and implemented in addressing this challenge. WHO (2024b) defines assistive technologies as technologies that can “*help maintain or improve an individual’s functioning related to cognition, communication, hearing, mobility, self-care and vision, thus enabling their health, well-being, inclusion and participation*”. Consequently, older adults become one of the primary user groups of assistive technologies, as they age and face certain functional and cognitive decline.

The contributions of assistive technologies to improved health and quality of life among older adults are evident (Fotteler et al., 2023; Sánchez et al., 2017). However, research has shown that assistive technologies used by older adults very often either lack a safety mechanism (Sánchez et al., 2017), or the authentication system presents usability issues for older adults, which result in them needing assistance from others (Ophoff & Renaud, 2023). Internet of Things (IoT) devices for instance, have been widely utilized in smart home solutions as assistive technologies for older adults. Many of them pose significant concerns regarding privacy and security because they lack of safety and security mechanism such as authentication (Paupini et al., 2022; Wilson, 2024).

Authentication is a crucial mechanism to ensure the right person has the right access. It has been becoming more important than ever, especially with the growth threats in cybersecurity nowadays. Internet Crime Complaint Center (IC3, 2023) reported an increase of 14% in incidents where older adults were fraud victims over internet, with a total loss of USD 3,427,717,654. For older adults residing in European Union Member States, Iceland and

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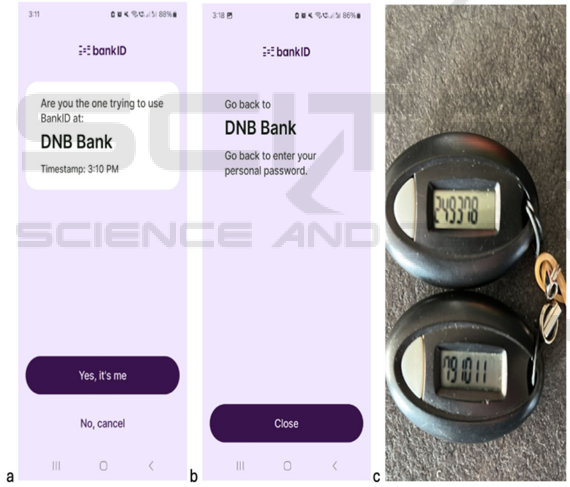
Norway, Kemp and Erades Pérez (2023) also reported instances of online fraud among older adults aged 65 and above. However, this group suffered less online frauds as compared to younger age groups, and this particular finding did not take into account factors such as internet usage and online shopping, which could potentially clarify the varying rates observed between older adults and younger adults.

To enhance the security of authentication mechanisms, two-factor authentication (2FA) has been extensively implemented. Some examples of 2FA methods include physical tokens, biometric verification, and SMS verification codes. These methods combine something the user knows (like a password) with something the user has (like a physical token or a verification app on smartphone), providing an additional layer of security. In Norway, one of the most common 2FA methods is the use of a bank ID. Users can verify their identity either by approving access via their bank ID app (see Fig. 1a and 1b), or by entering a code generated on a physical bank code device (see. Fig. 1c).


Are you the one trying to use BankID at:
DNB Bank
Timestamp: 3:10 PM

Go back to
DNB Bank
Go back to enter your personal password.

Figure 1(a) and (b): The bank ID app, where users first confirm their identity and then return to the application to enter their personal password, (c): Physical bank code device that generates a six-digit code when prompted.

Research has been conducted to investigate the use of 2FA among older adults. Das et al. (2020) highlighted the lack of inclusive design in methods for 2FA. They proposed design modifications to enhance the use of 2FA among older adults, which include confirming registration and increasing the size of a USB-C security key to make it more acceptable for older adults. As mentioned earlier, in Norway we have been practising different methods of 2FA, making their findings about the USB-C security key less relevant. To the best of our knowledge, no usability evaluations have been conducted with older adults regarding their user experience with these 2FA methods. Moreover, there have not been many studies focusing on the implementation of 2FA onto the use of assistive technologies, which is a growing trend worldwide due to the increasing ageing population.

Therefore, in this study, we aim to explore the user experiences and attitudes among older adults in Norway towards performing 2FA. Specifically, we hope that the findings of this study can inform the implementation of assistive technologies, as many of the assistive technologies in use today lack an authentitication mechanism that can ensure a more secured use among the users.

2 METHODOLOGY

In this study, we conducted one-to-one user testing sessions to observe how older adults performed 2FA. This approach allowed us to identify usability issues that these older adults encountered when using different methods of 2FA. During the session, we also asked the participants questions concerning their user experiences and attitudes towards those methods and 2FA in general using a semi-structured interview guide.

2.1 Recruitment and Ethical Considerations

Participants were recruited via convenient sampling (Sedgwick, 2013), as they were easily accessible and met the inclusion criteria. The inclusion criteria include aged 65 and above (an age group that begins to use assistive technologies according to a report by Helsedirektoratet (2023)), being home-dwelling (one of the common factors older adults using assistive technologies) and having good cognitive function (as they are the one performing 2FA and not relying on others, such as next-of-kin).

The participants were first briefed about the study during the recruitment process. A consent form was then presented, detailing the user testing process and expectations for their participation. As testing all methods of 2FA could be time-consuming and potentially overwhelming, we purposefully informed them that they could take a break whenever needed, or even withdraw from the study if they felt uncomfortable continuing with the user testing. All participants' consent had to be obtained before we began conducting the user testing. Prior to starting data collection, we obtained approval for assessment concerning data collection from Sikt – Norwegian Agency for Shared Services in Education and Research as it involved collecting personal data.

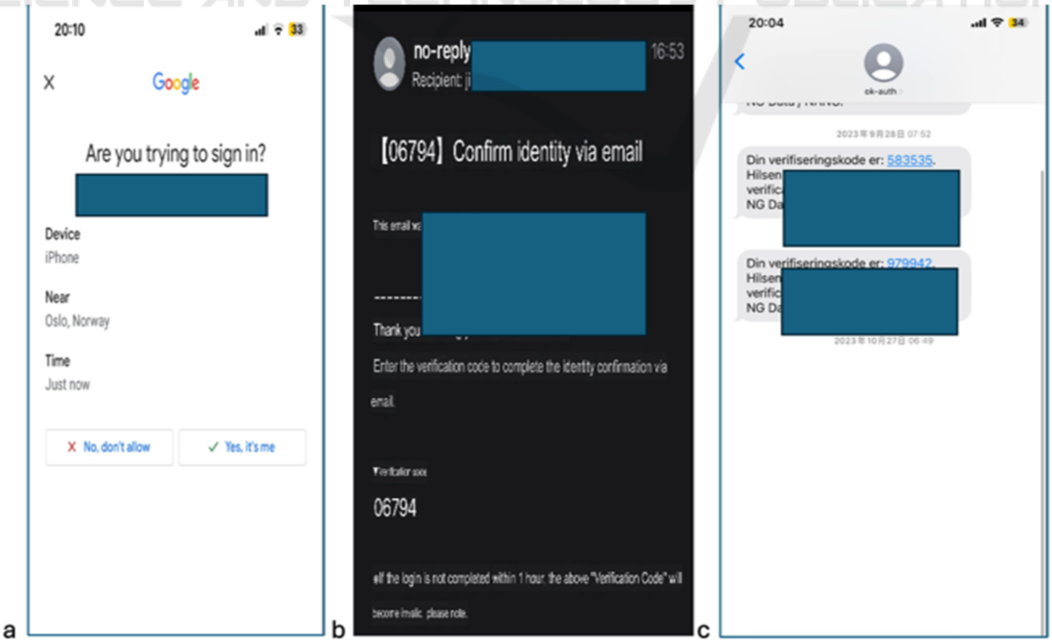
2.2 Data Collection and Analysis

We started by gathering demographic information from each participant that could be relevant for data analysis, which included age, education, employment before retirement and so on. To access their skills in using general Information and Communication Technologies (ICT), we asked them to rate themselves in on a scale of 1 to 10, with 1 indicating very poor skills in using ICT and 10 indicating advanced ICT proficiency. In addition to that, we were also interested in their experiences with assistive technologies and performing 2FA. Lastly, we asked them to rate their concern about privacy and cybersecurity on a scale of 1 to 10, with 1 being not concern at all and 10 being extremely concern. When explaining assistive technologies to the participants, we provided examples such as smart watch, smart home devices, safety alarms, and devices equipped with GPS, all of which aid individuals in living more independently and safely. They were also shown some examples of 2FA, with the most common ones in Norway being the bank ID and bank code device.

During the user testing, all participants were asked to use five methods of 2FA, and we observed how they completed the process. These methods included in-app verification (without a code, see Fig. 2a), email verification (where users had to retrieve a verification code from an email then enter it into the requesting application, see Fig. 2b), SMS verification (similar to email, but the participants received the code via SMS text; see Fig. 2c), and lastly bank ID (both via the app and the physical bank code device; see Fig 1a, b and c). Except for the bank code device, all interactions took place on a smartphone as we did not provide any additional devices such as a laptop for email verification. This is because older adults in Norway normally do not own or use laptops at home, as they can rely solely on their smartphones for everyday digital transactions.

After each method, we asked them questions related to their user experience and attitudes. For examples, “What do you think about the process just now, in terms task difficulty”, “How do you feel about receiving a verification code via email/app/SMS?” and “What do you think of this extra step of verifying yourself?”. At the end of each method, the participants were asked to complete the System Usability SUS questionnaires. Each user testing took around 60 to 90 minutes.

Qualitative data were analysed using thematic analysis (Clarke & Braun, 2017), as we aimed to identify similarities and differences in the participants’ user experiences and attitudes towards performing 2FA, in relations to their demographic backgrounds. Given its flexibility, this approach is



Are you trying to sign in?

[redacted]

Device
iPhone

Near
Oslo, Norway

Time
Just now

X No, don't allow ✓ Yes, it's me

no-reply [redacted] 16:53
Recipient: ji

[06794] Confirm identity via email

This email w [redacted]

Thank you

Enter the verification code to complete the identity confirmation via email

Verification code
06794

If the login is not completed within 1 hour, the above "Verification Code" will become invalid, please note.

2023年9月28日 07:52

Din verifiseringskode er: 583535.
Hilsen
verific
NG Da [redacted]

Din verifiseringskode er: 979942.
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Figure 2(a): In-app verification where users only had to click on confirming their identify, (b): Verification code sent to an email with instructions, (c): Verification code sent via SMS.

were recorded and transcribed. After being familiarizing ourselves with the qualitative data, we generated codes and themes based on the data. For SUS scores, we calculated the average scores for all ten statements for each method.

3 RESULTS

A total of eight older adults participated in this study. All of them had experience with 2FA, either they did it themselves or with help and assistance from someone. In Norway, many services require 2FA, so it was not surprising that all of them had some experience with it; with internet banking being one example. However, not all 2FA methods were equally familiar to them. SMS verification and bank ID verification via the physical code device were considered the most common methods among them. Although all of them use smartphone daily, they rated their ICT skills very differently. This could be due to their use of technologies prior to retirement, in addition to how they used their smartphones. Despite the varied self-rated ICT skills, when it came to concerns about privacy and cybersecurity, none of them rated it below 8. Only P1 and P8 have used assistive technologies, i.e., smart watches. Table 1 summarizes the participants' profiles.

3.1 Usability

All participants managed to perform all five 2FA methods with minimal difficulty. Among these methods, they were most familiar with using the physical bank code device, followed by the SMS verification method. Almost all of them required a bit guidance, primarily on understanding where they received the verification code, especially for email and in-app methods. The reason is that they had limited experience using these two methods. Both P1 and P5 mentioned that they rarely used email for anything nowadays. P5 even shared his past experiences with email verification where he had trouble with receiving the verification code and entering it before it got expired. On the other hand, P4, who had previously worked as a doctor, was comfortable with using email as checking emails was not unfamiliar to him. We observed that most participants were slightly irritated when required to check their email for the verification code, compared to checking an SMS message for the code. Upon asking, they explained that they used SMS messages far more frequently than email. They rarely checked emails nowadays, so the interface did not seem familiar to them. None of the participants experienced any difficulties using the SMS verification method. The only minor annoyance for some was the need to switch between apps to retrieve the SMS verification code and input it into the app requesting the code. To remember the code, some participants also jotted it down on paper. This need to switch between apps and

Table 1: Participants' profile.

	Age	Gender	Smartphone use	Education level	Employment before retirement	ICT skills (1 to 10)	Experience in using assistive technologies	Experience in performing 2FA	Concern about privacy and cybersecurity (1 to 10)
P1	66	F	Everyday	High school	House keeping	3	Yes	Yes	8
P2	67	M	Everyday	High school	Cook	1	No	Yes	8
P3	65	F	Everyday	Bachelor	House keeping	1	No	Yes	9
P4	80	M	Everyday	Master	Doctor	6	No	Yes	10
P5	68	M	Everyday	High school	Freelance in ICT	6	No	Yes	9
P6	70	M	Everyday	High school	Engineer	6	No	Yes	9
P7	72	F	Everyday	High school	Customer service	8	No	Yes	9
P8	75	M	Everyday	Master	Researcher	9	Yes	Yes	10

write down the code was also noted in the case of email verification.

Although most participants needed some explanations for in-app verification and bank ID verification, they found these methods to be very easy and intuitive. They took a bit little more time to understand the process and ensure that they were doing everything correctly. Their unfamiliarity with these methods, coupled with a fear of making mistakes, accounted for this. However, they demonstrated a completely different level of confidence when verifying using the physical bank code device.

The SUS results are consistent with our observations and some clarifications we received. We calculated the average scores of all SUS statements for all methods. The results are presented in Table 2. As shown in the table, the 2FA methods using the physical bank code device and SMS verification scored very high in terms of their usability (high for positive responses in odd-numbered statements and low for negative responses in even-numbered statements). Email verification was the least favoured, as indicated by both the SUS scores, the interview results, and through observation.

Interestingly, despite generally high usability scores, SMS verification received lower scores on statements 5 and 6 compared to in-app verification. This may be due to the extra effort required by older adults to write down the verification code. In-app verification was commented on by most participants as being very convenient. The verification notification appeared on the screen, and users only needed to click on it, and then click on "Yes" (see Fig 2a) when asked to verify their identity. In terms of preferences, we noticed that most participants valued familiarity over ease of performing the 2FA methods. This can be observed when looking at the scores for statements 5 and 6 (which lean more towards ease), and 7, 9, and 10 (which lean more towards familiarity), along with the clarifications we received.

3.2 Thematic Analysis

We identified three themes in total. The first one is “**Feeling the need as older adults**”. Some of the codes that were generated and organized under this theme were “protecting their identity and information better”, “feeling safer”, “is important and necessary”, “user-friendliness”, “writing it down”, “asking help to ensure safety and protection” and “being afraid of online frauds”. All participants expressed that they perceived 2FA as crucial mechanism for protecting them when using assistive technologies, as well as other digital technologies in general. This attitude was consistent across all participants, regardless of their demographic background such as age, level of education and ICT skills. Almost all of them understood why 2FA was required. For P3, she mentioned, “*I don’t really know (the reason). I mostly ask my son to help with new technology thing*.”. However, she has been told many times by peers and family members that online frauds occur, and older adults are one of the target groups. For P6, he was sometimes frustrated with performing 2FA, but he

Table 2: SUS results for each two-factor authentication method.

	Average scores for each method				
SUS statements (Scale 1 to 5, 1 is strongly disagree and 5 is strongly agree)	In-app	Email	SMS	Bank ID (app)	Bank code device
1. I think that I would like to use this system frequently.	3.00	3.25	3.88	4.00	4.50
2. I found the system unnecessarily complex.	1.25	1.63	1.00	1.50	1.00
3. I thought the system was easy to use.	3.00	2.75	3.88	3.75	4.63
4. I think that I would need the support of a technical person to be able to use this system.	1.88	2.50	1.38	2.75	1.38
5. I found the various functions in this system were well integrated.	2.88	3.00	2.50	3.25	3.25
6. I thought there was too much inconsistency in this system.	1.38	3.13	1.63	2.25	1.13
7. I would imagine that most people would learn to use this system very quickly.	3.75	3.75	4.38	4.00	4.75
8. I found the system very cumbersome to use.	1.50	3.00	1.25	1.75	1.00
9. I felt very confident using the system.	3.00	2.75	3.75	2.88	4.00
10. I needed to learn a lot of things before I could get going with this system.	1.75	2.38	1.13	1.75	1.00

knew that it was necessary, "*How many times do I need to say, 'it is me!'…it is like those websites keep on asking if I were human!*".

Besides the need of 2FA to provide safer use of digital technologies for older adults, there is also a need that for these authentication methods to be user-friendly for them. When comparing all the methods they tested, they frequently commented on the inconvenience of needing to switch to a specific app, read the code sent there, and then switch back to the app that requested for the code and enter it there. We observed that some of them were irritated by this back-and-forth process as they couldn't remember the code. Some noted the code on a piece of paper, even without our instruction to do so. We clarified with them after the testing if this was a practice they always had, and their answer was yes. They have had bad experiences in remembering the code and switching in between apps, so writing the code down became their preferred solution.

The second theme is "**Preferring the old-fashioned way despite downfalls**", with codes such as "used it for many years", "use daily", "easier than the app now", "familiar", "not new", "less chance for mistakes", "small in size" and "lost it a few times". The physical bank code device appeared to be a favourite among the participants. Based on our observation, none of them had issues using the code generated by the bank code device, and then entering a password. When asked about their user experience, they expressed that this method was the most familiar method to them. A few mentioned its disadvantages, which included the size of the device being too small and the inconvenience of having to carry it around when traveling. However, most participants still preferred it over the newer version of the bank ID, which is on an app. They felt that they would make fewer mistake with a code device than with an app. "*I am so bad with new technologies and apps! If I drop my bank code device somewhere, no one would know who it belongs to. But if I drop my phone somewhere, everything is in it! And I have read about phone being hacked and stuff like this…*", expressed by P7. The same pattern was observed in older adults' preference of receiving verification codes via SMS over in-app verification, despite the fact that in-app verification appeared to be more effortless to them.

Under this theme, we also noticed that most older adults desired new technologies to consider their existing everyday routines. While 2FA appears to be something new in their lives, its implementation does not have to be completely unfamiliar. For instance, utilizing bank ID verification via the physical bank code device could be an option that does not introduce an entirely new concept to them. The same applies to receiving verification code via SMS, as most of them use SMS daily and felt safer using this method than others. However, SMS phishing remains as a concern. P7 found it challenging at times but reported that it had become easier now after following some guidelines, "*I know that those that are not Norwegian number are definitely spam, and usually one can tell from the text they write. If I receive something suddenly, like this code when I do not request for it, then something must be wrong…*".

The third and last theme is "**Variety in preferences**". This theme was derived based on codes illustrating contrasting opinions among the participants, and therefore emphasizes on the importance of providing different alternatives to older adults when performing 2FA. For instance, some would prioritize the 2FA methods being effortless, while the others would rather spend more effort to ensure mistakes were not made. When asked about what they deem important, all participants agreed on the importance of 2FA for safety and cybersecurity. However, their criteria for assessing different 2FA methods varied individually. Even what they perceived as "user-friendly" was different. P8 mentioned, "*If I need to choose something that is user-friendly, I will choose a method that is simple, easy to understand......Like just now (refers to in-app verification and bank ID verification via app), I need to only press one button to confirm*". Among all participants, P1 shared the same sentiment as P8, "*I prefer the first one (referring to in-app verification), I don't need to write anything… So even it is more complicated to use another app (refer to the app to verify identity), need to open it, press and get verified, it was easier for me*". Both of them also appreciated that the instructions for in-app verification were very simple and straightforward.

On the other hand, several participants equated user-friendliness with familiarity and safety in performing 2FA methods. For instance, P5 compared 2FA methods after performing them, and commented, "*These (referring to methods using verification code, such as SMS verification, email verification and bank ID using the physical code device) take always more time for me, but they work, just…. using some time, and the verification code comes fast! (Referring to that the extra time spent wasn't that much of an effort)*". This same opinion was also held by P3, P4 and P7. P2 and P6 felt that all methods were almost the same in terms of user-friendliness. However, for P6, one unique factor made a difference, "*I do not like this (referring to relying on his smartphone) very much, because if I forget the phone where I go, then it is not possible to* *log in…*". He expressed that he disliked relying too heavily on smartphones and therefore tended to be unaware of where his phone was most of the time.

4 DISCUSSION

After evaluating five different 2FA methods with eight participants and gaining more in-depth opinions from them through a semi-structured interview, we managed to identify the pros and cons of each method along with deeper insights concerning their opinions and attitudes towards 2FA authentication, privacy and cybersecurity.

Despite there being obvious preferred 2FA methods among the participants, they prioritized differently in terms of what was important to them, which included factors such as effort and confidence in conducting the 2FA. The 2FA methods using the physical bank code and SMS verification were preferred by most participants, while email was the least favoured. In Das et al. (2020)'s study, they identified "device compatibility" as one of the factors preventing older adults from adopting 2FA. Most of their participants only used tablet and smartphone, and the Yubico Security Key device they tested was neither compatible with a tablet nor a smartphone. In our study, since the bank code device has been widely implemented in Norway for various technologies, such as internet banking and the tax system, these older adults used it frequently and therefore, device compatibility was not an issue. In fact, due to its compatibility, this method was considered as one of the most familiar and hence, safest among these participants.

Email has been becoming less popular among older adults as new media platforms have replaced email communication (Nguyen et al., 2021). Older adults in this study also reported a decreased use of email, making email verification less convenient and user-friendly for them. As email can contain more text than a standard SMS message, they typically include more instructions in addition to providing a 2FA verification code. Das et al. (2020) reported that instructions could impact on how older adults perceived 2FA. In our study, participants preferred straightforward instructions, like those they encountered in SMS verification and in-app verification.

4.1 Proposed Design Considerations

When implementing 2FA in assistive technologies, we propose the following three designs considerations based on our findings. To better illustrate the concept, we couple them with existing assistive technologies commonly used in Norway. The first design consideration is **to utilize commonly used technologies rather than creating new ones**. More precisely, we recommend receiving verification codes via SMS and a bank code device, as opposed to verifying identity through a bank ID app or via email. For instance, when logging into the user profile on a touch screen-based, compensation and wellness type of assistive technology named MEMOplanner Medium (see Fig 3a)(Abilia, 2024), users can first enter a verification code sent to their phone via SMS, or retrive the code generated on their bank code device, then enter their password. This technology is a time and planning aid that compensates for memory deterioration in older adults. Since it utilizes a large touch screen for interaction, we believe 2FA methods with which users are familiar with, both retrieving and entering a verification code are most suitable. Comparing these two 2FA methods, the physical bank code device is safer than the SMS verification. SMS verification has its shortcomings, as SMS phishing can occur and the SMS technology itself has many vulnerabilities (Drake & Gauravaram, 2019).

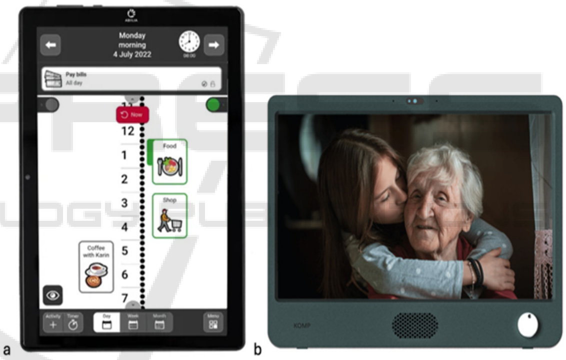


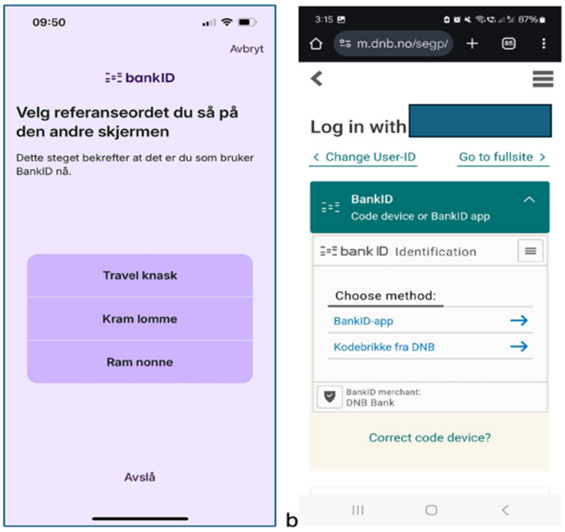
Figure 3: (a) MEMOplanner Medium from (Abilia, 2024), (b): KOMP from (Kompany, 2024).

This design consideration is particularly important, given that introducing a new, unfamiliar assistive technology can be intimidating to older adults (Glomsås et al., 2021). To minimize their fear of accepting and learning new technologies, we can utilize existing one, for instance SMS verification and bank ID verification via the physical bank code device. Almost half of our participants perceived such methods as more user-friendly, considering they felt more confident in performing them. They preferred the methods with which they were familiar, even if these could require extra efforts. For them, feeling secure in their use of technology and avoiding mistake were more important. This finding is consistent with that of Kuerbis et al. (2017) who identified personal motivational factors among older adults in their technology use (such as previous experience, attitudes, complexity/ usability, etc.), and design principles summarized by Iancu and Iancu (2020) which need to take their cognitive abilities into account. However, it is important to note that recommending these two methods does not imply that only these methods shall be considered, and not the others. Instead, it simply means that these methods should be prioritized when not all methods can be implemented. We discuss more about this finding in the third design consideration.

The second design consideration is **to avoid unnecessary typing** when performing 2FA. This is particularly suitable for assistive technologies that either do not have a touch screen, or have a touch screen that is small. A social contact type assistive technology named KOMP falls into that category (see Fig 3b). It is a one-button device with a single screen, roughly the size and shape of a small TV (Kompany, 2024). Older users can receive calls, text and image messages from their family, friends and caregivers via KOMP. Using the only button on KOMP, older users can turn the device on and off, and control the volume. We suggest that when logging onto KOMP, this button can also be used to navigate between options on the screen during 2FA. The 2FA methods could be in-app verification or bank ID via the app, which do not require any typing. Users simply select the correct option.

The latest design of Bank ID via the app (lauched after we completed all user testing) offers the option to perform 2FA by selecting the matching verification code, eliminating the need for typing, as illustrated in Figure 4. Older adults' fear of making mistakes increases when they have to interact with small user interfaces (Iancu & Iancu, 2020), (Iancu & Iancu, 2020). Our observations corroborate this finding.

Lastly, we highly recommend that, whenever possible, several 2FA alternatives should be provided. Older adults constitute a very diverse user group. Although we observed certain commonalities among them, there were still significant differences, particularly in how they perceived user-friendliness. All participants in this study found in-app verification to be effortless as it only required one button click. However, not all of them perceived it as a user-friendly 2FA method. For some participants, they needed to spend more time and effort reading the instructions on the screen to ensure they didn't make mistakes. This was seen as less user-friendly than other methods, such as SMS verification and bank ID verification using the physical bank code device.



Velg referanseordet du så på den andre skjermen

Dette steget bekrefter at det er du som bruker BankID nå.

Figure 4: (a) Bank ID verification using app where users are asked to choose matching verification code, (b) Bank ID verification allows users to choose verification via app or physical code device.

The design offering several alternatives can be seen in Fig 4b. When accessing internet banking, users are always asked to choose a method for their bank ID verification, which could be via an app or a physical bank code device. This kind of design can also be implemented in assistive technologies accordingly, based on the interaction styles, size, and type of devices. When assistive technologies adopt a small touchscreen (like smart home devices such as robot vacuum cleaners and smart door locks utilizing apps on smartphones) or have no touchscreen at all (like KOMP and medicine dispensers), then the in-app verification and bank ID verification via an app that requires no typing should be included. On the other hand, when the assistive technologies have a large touchscreen with an on-screen keyboard, they can offer all methods if possible.

4.2 Privacy and Cybersecurity Concern

In terms of privacy and cybersecurity concerns, all participants reported high levels of concern, which is why they would always opt for 2FA. In a study also conducted in Norway, Ellefsen and Chen (2022) obtained similar findings, with older adults seeing more pros than cons in 2FA. All of them performed 2FA despite initially finding it tedious and experiencing a delay in the login process due to the extra step.

Our finding is contrary to previous study by (Drake & Gauravaram, 2019), which highlighted the importance of usability over privacy and security. All of our participants acknowledged the importance of having 2FA in the daily use of technologies. This discrepancy in findings could be attributed to the accelerated digitalization due to the pandemic and, more recently, the emergence of artificial intelligence. During the pandemic, restrictions led to the digitalization of many activities, necessitating the broader use of assistive technologies among older adults (Mendoza-Holgado et al., 2024). Many phishers utilized artificial intelligence to create websites, emails, and other digital content that appear realistic but are fake to victimize users (Eze & Shamir, 2024). Among the targeted demographics, older adults are frequently victimized (Grilli et al., 2021). Participants in our study reported hearing similar stories through their peers and family members, as well as on social media.

5 CONCLUSIONS

In this study, we aim to explore the user experiences and attitudes among older adults in Norway towards performing 2FA. By evaluating different 2FA methods with eight older adults, we investigated how they perceived the usability of each method. We hope that our findings can inform the implementation of assistive technologies. Our findings indicate that bank ID verification using the physical bank code device and SMS verification were preferred by most participants. However, participants perceived user-friendliness in different ways. Some prioritized avoiding mistakes when performing 2FA, while others valued effortlessness more. Despite their varied socio-demographic backgrounds, all participants understood the importance of performing 2FA and expressed high concern for privacy and cybersecurity.

This study’s biggest limitation is the small sample size. The sample size of eight is small for assessing the usability of 2FA methods, particularly given that there were five methods in total and that familiarity with some of the 2FA methods varied among these participants. Hence, possible bias could occur. However, at this phase of the study, our aim was to gather qualitative data through observation of all participants performing each 2FA method, and to gain further insights through follow-up interviews. Besides, some might argue that the choice of using SUS could be questionable. However, after reviewing its pros and cons (Drew et al., 2018), we concluded that SUS was suitable as we were comparing these 2FA methods based on user preference, which is strongly related in their “success” in performing 2FA. Another limitation is that we did not include any biometric-oriented 2FA methods. The reason for this is that such methods are device-dependent, where users can also save their passwords in the devices they use. In this study, we wanted to focus solely on methods that are not device-dependent with saved passwords, and therefore require an additional step and effort from older adults.

In the future, we hope to conduct more evaluations involving larger, more diverse participant groups, as the findings here represent a small group of participants with limited extent of diversity. Based on more comprehensive finding, we can then implement the proposed 2FA methods onto some commonly used assistive technologies among older adults in Norway and evaluate how the users perceived their usability. It is worth noting that not all banks around the world use a physical device for 2FA, and this method is not employed in all countries either. Therefore, our findings cannot be generalized. Nevertheless, we hope these findings can inspire designers and policymakers to consider other alternative methods when enforcing the use of 2FA among older adults. By ensuring secure use of assistive technologies, we can contribute to healthier aging among older adults, reducing the likelihood of older adults being victimized from cyberattacks, data breaches and identity theft, among other privacy and cybersecurity issues.

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