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Investigating the multifaceted role of warm experts in enhancing and hindering older adults' digital skills in Finland

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ABSTRACT

Despite widespread digitalization, certain marginal and societal groups can still encounter challenges in the digital world. Promoting digital inclusion and digital support aims to reduce these disparities and enable equal participation. In this article, we examine the quality and dynamics of informal learning and digital support provided by warm experts from the perspective of older adults' subjective experiences. Specifically, we ask (1) what are the key elements of informal learning in the context of older adults' acquisition of digital skills? Based on the first question, we further examine (2) how do the identified key elements of informal learning influence older adults' subjective learning experiences and independent use of digital technologies? Our inductive thematic analysis is based on participant-induced elicitation (PIE) interviews (n = 21), conducted with older adults (aged 65+) in Finland in 2018. Our findings suggest that older adults are a heterogeneous group with different support needs and diverse prior experiences with digital technologies. Even when digital support from friends and family is available, it does not always facilitate independent use or meaningful learning experiences. The results show how informal digital support provided by warm experts can not only enhance, but also hinder digital inclusion and independent aging.

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Introduction

As everyday life is becoming increasingly digital, all members of society are expected to adapt and know how to use digital technologies (Llorente-Barroso et al., 2023). However, while the number of older adults utilising digital technologies is growing, there is still a consistent decline in internet activities, such as online banking and information seeking, when moving from the age group of 64 years or younger to 65 years or older (Official Statistics of Finland [OSF], 2024). Aging itself as a physiological phenomenon can be one explanatory factor, as physiological changes like cognitive decline (Dumas, 2017) and diminished fine motor skills (Hoogendam et al., 2014) can hinder learning of digital technologies in later life. However, despite the challenges posed by digital transitions and the constant change in digital technologies (Bhattacharjee et al., 2020), older adults can learn and master digital skills just like younger generations if given enough time (Calvo et al., 2017).

Ageing in a digital era is firmly intertwined with societal structures and social dynamics. For instance, societal expectations and social pressure regarding the use of digital services (Pihlainen et al., 2023) combined with personal history and 'learning to be old' (Gallistl et al., 2018; Rohner et al., 2021) can all shape older adults' digital encounters and impact how they navigate digital

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technologies. In addition, for many older adults, interaction with digital technologies is mediated through social relationships and often influenced by family and friends (Taipale, 2019). This leads to a focus on digital inclusion and the social element of digital training for older adults, as these technologies serve not just as tools but as pivotal facilitators for maintaining and establishing social relationships (Pihlainen et al., 2023). Given that lifelong learning is not only an indicator of independence but also healthy ageing, it is important to examine different forms of digital support for older adults (United Nations Economic Commission for Europe [UNECE], 2019).

Regarding research on the heterogenous use and non-use of digital technologies, digital support commonly encompasses all and any guidance or assistance provided for the purpose of navigating and utilising digital technologies (Aavikko et al., 2022; Hänninen et al., 2022; Marler & Hargittai, 2022). Prior research on digital support, digital skills and digital inclusion acknowledges the importance of informal learning and everyday assistance (Courtois & Verdegem, 2016; Taipale, 2019) while also suggesting that older adults often aspire to age in place and maintain independent lives in their own homes for as long as possible (Neves & Vetere, 2019). Digital technologies have the potential to support this goal (Francis et al., 2019; Peek et al., 2016), while in contrast, insufficient digital skills can impede older adults' ability and opportunities to engage in online activities (Takagi et al., 2014).

This research aims to highlight older adults' experiences with digital support received in informal learning settings. Furthermore, the study seeks to identify key elements of informal learning in this context and examine how these elements interact with older adults' subjective learning experiences and independent use of digital technologies. Thus, we ask (1) what are the key elements of informal learning in the context of older adults' acquisition of digital skills? Based on the first question, we further examine (2) how do the identified key elements of informal learning influence older adults' subjective learning experiences and independent use of digital technologies? By providing insights into the quality and characteristics of digital support from warm experts, this research contributes to a deeper understanding of the efficacy of informal learning in enhancing digital skills and digital inclusion for older adults.

Informal learning paradox in later life

Within the scope of acquiring digital skills, informal learning typically refers to warm experts (e.g. family and friends) who provide support to less experienced older adults (Bakardjieva, 2005; Hänninen et al., 2021) and are commonly the primary source of digital support in later life (Gallistl et al., 2020). Due to a pre-existing relationship, warm experts often have comprehensive knowledge of the novice user (Taipale, 2019) which can reinforce the digital support process. In addition, older adults can benefit from receiving social and digital support from warm experts who are part of their everyday lives when compared to professional 'cold' experts (Kuoppamäki et al., 2022). However, not all older adults can rely on informal digital support due to, for instance, a lack of close relationships or relatives living far away (Olsson & Viscovi, 2018).

Broadly defined, informal learning can be any activity that increases understanding and knowledge and takes place without a formal curriculum or other externally set teaching criteria (Livingstone, 2001). Despite its diversity, all informal learning is united by the fact it is a self-paced action driven by the learner and based on volition (Jin et al., 2019). To the heterogeneous group of older adults, informal learning, in its numerous forms, can offer many benefits as it is typically naturally occurring and linked to real-life needs. It also provides the chance to influence how and when the actual learning takes place and highlight possible preferences regarding learning (Jin et al., 2019). This way, such situations can better meet older adults' expectations and needs as it offers more autonomy and is suitable for different learning requirements in later life (Findsen & Formosa, 2011).

Reflecting on the interaction between informal learning and digital inclusion, it is relevant to acknowledge the dynamics of these two as they can be seen as conflicting forces. In informal learning, the motivation to learn is intrinsic (Sharples et al., 2005) and learners often determine

their own goals and desired results (Morrison & Koole, 2018). However, navigating the rapidly changing digital world can frequently place older adults in complex situations (Pihlainen et al., 2023). Furthermore, digital inclusion goals set by the society (Finnish Government, 2022) can potentially conflict with the spontaneous and voluntary aspects of informal learning. This can pose an intriguing paradox within the discourse of digital inclusion and informal learning, as the expectation for adequate digital skills might be perceived more as an external demand than an individual choice.

Given that informal learning and the role of warm experts are often regarded as important solutions to enhancing the digital inclusion of older adults (Hänninen et al., 2022), it is essential to acknowledge that societal expectations and external pressures on learning and digital inclusion can not only influence but also potentially alter the dynamics and results of informal learning. This can be problematic when a significant portion of digital support in later life continues to primarily be the responsibility of warm experts (Pihlainen & Ng, 2022). Furthermore, as individuals who receive digital support from more formal sources need less help in the future if similar problems occur (Helsper & Van Deursen, 2017), it is relevant to take a closer look at the informal learning environment and explore how this form of digital support is perceived by older adults.

Older adults' digital skills and digital inclusion

In this research, digital skills refer to the ability to find, assess, and effectively use digital technologies and resources while also covering the competence to recognise what opportunities digitalisation can offer to the users of digital technologies (Saari et al., 2022). Considering this, digital skills encompass a broader scope than just practical device usage, extending to problem-solving, communication, and safety (European Commission, 2022). Digital skills and the ability to effectively use digital technologies and services are particularly important when a person has limited mobility or is undergoing social isolation, a matter that escalated during the COVID-19 pandemic (Banskota et al., 2020). As older adults already face a higher risk of social isolation due to general health decline (Waycott et al., 2019), it is necessary to prevent any further isolation as this can have a detrimental effect on mental and physical health in later life (Shankar et al., 2017).

Given the risks associated with social isolation, it is essential to examine the recent statistics on digital engagement among older adults in Finland. In 2023, 82% of older adults aged 65–74 and 54% of older adults aged 75–89 had used online banking within the last three months in Finland (OSF, 2024). Additionally, in 2023, 67% of Finns aged 65–74 and 37% aged 75–89 had looked for information about sickness, nutrition and health during the last three months. However, it is concerning that in the same year, only 78% of Finnish pensioners had used the internet within the last three months (OSF, 2024), pointing to a possible digital divide that may aggravate isolation for those who are not online.

While there is a significant portion of older adults who do not use digital technologies (Anderson & Perrin, 2017; Hunsaker & Hargittai, 2018), portraying them as universally resistant to digital technologies and lacking necessary digital skills would be misleading (Schirmer et al., 2022). Drawing from 'aged heterogeneity', the diversity and individual differences tend to increase as people age (Dannefer, 1988; Loos, 2012), indicating that experiences with digital technologies can be as diverse as the individuals themselves. Therefore, it is important to acknowledge the intra-age variability within this demographic as well, instead of solely comparing statistics across different age groups (Stone et al., 2017). Still, if individuals or population groups do not have adequate skills and resources to access digital information, they may be at greater risk of digital exclusion (Hill et al., 2015; Reneland-Forsman, 2018) and being disconnected from society as services and information are increasingly used and shared online (Bhattacharjee et al., 2020; Dobransky & Hargittai, 2016; Heitplatz, 2020; Waycott et al., 2019).

Given this perspective, the objective of enhancing digital inclusion highlights the importance of adequate digital skills, as these skills can enable older adults to maintain societal ties in later life (Delello & McWhorter, 2017). In a society deeply integrated with digital technologies, the notion of digital inclusion is widely acknowledged to produce social inclusion and equality through education, services, and opportunities to make an impact (Gallistl et al., 2020). Furthermore, at its core, digital inclusion can be seen as active involvement in a society shaped by modern technologies (Seifert & Rössel, 2019). To provide this opportunity for everyone equally, it becomes essential to extend digital skill training to those who require it (Bhattacharjee et al., 2020).

Materials and methods

The qualitative analysis is based on participant-induced elicitation (PIE) interviews carried out with Finnish older adults aged between 65 and 89 (Hänninen et al., 2023). The interviews were conducted in Central Finland during November and December 2018. All participants were aged between 57 and 89 with mixed backgrounds in education, from elementary school to university level. In the present study, we focus only on the interviewees aged 65 or over, as it is the common definition of an older adult not only according to the United Nations (United Nations, 2023) but also in reference to research on the use or non-use of digital technologies (Anderson & Perrin, 2017; Friemel, 2016; Hunsaker & Hargittai, 2018; Rasi-Heikkinen et al., 2022). Consequently, 21 of the total 23 participants were included in the analysis. Twelve of the interviewees were female and nine were male. Interviewees were recruited through a housing association that provides communal housing amenities to older adults aged 55 or older (Hänninen et al., 2023).

While this was not mandated in our research design, all participants had previous experience with digital technologies as all interviewees owned at least one digital device. The majority of interviewees possessed multiple technological devices, such as tablets and laptops, but they all maintained ownership of at least a smartphone or a feature phone (Hänninen, 2020; Kuoppamäki et al., 2022). In addition, some interviewees mentioned having participated in digital technology courses as well as attending digital support events organised by libraries. However, not everyone used these opportunities and this information was not systematically collected in this research.

As the data was initially collected for a broader purpose, the interview questions were comprehensive. They covered the extent of digital technology use by older adults in their daily activities, including the perceived advantages and challenges in adopting digital technologies and services, as well as personal experiences with digital support. Additionally, participants were asked about their daily choices and reasons for using digital technologies. The average duration of the interviews was approximately one hour. All interviews were audio-recorded and transcribed, resulting in a total of 166 273 words. In addition, photographs were taken during the interviews to document the fieldwork. The research was conducted following the General Data Protection Regulation (European Parliament & Council of European Union, 2016). All participant names given in this research are pseudonyms to protect their anonymity.

Participant-induced elicitation (PIE) is an interview approach rooted in photo-elicitation, which involves capturing photographs pertinent to the research topic (Bignante, 2010; Collier, 1957; Epstein et al., 2006; Harper, 2002). In this research, participants were asked to select one or two meaningful devices or applications integral to their digital daily lives which were then photographed and used as the basis for the interviews (Hänninen et al., 2023). Incorporating interviewees' digital devices and applications in the interview process made the concept of digital technologies more tangible for older adults, facilitating more personal and in-depth discussions (Downs et al., 2019; Kaufmann, 2018). In addition, photographs provide researchers an advantageous reference point during data analysis and can expose inconsistencies when observed technology usage deviates from participants' descriptions (Hänninen, 2020).

The inductive thematic analysis (Clarke et al., 2015; Terry et al., 2017) was conducted through a recursive process. First, all discussions related to digital support were meticulously

examined and familiarised with. Through systematic and careful close reading, initial themes emerged from the interview data, identifying the key elements of informal learning. During the cyclical process, themes were refined and interviews were revisited regularly to ensure the finalised themes accurately reflect the data. Subsequently, building upon the first part of the analysis, it was further investigated how the identified key elements of the informal learning environment interacted with older adults' overall subjective learning experience and independent use of digital technologies. The inductive thematic analysis was done by the corresponding author. However, all authors acquainted themselves with the dataset, and a continuous dialogue concerning the validity of the results has been maintained throughout the research process. Analysis of the research data was done manually and no specialised software was employed in the process.

Drawing from the interview data, informal digital support does not automatically lead to experiences of learning and often fails to meet the unique needs of older adults. Building from previous research that has called into question the efficacy of informal digital support in enhancing digital skills (Courtois & Verdegem, 2016; Eynon & Helsper, 2015; Galperin & Arcidiacono, 2019), digital support received from family and friends can also conflict with the needs of older adults and thus be, at least partly, unsuitable for them (Mehraeen, 2017; Pihlainen & Ng, 2022). However, research that goes deeper into the quality and characteristics of digital support and informal learning is still scarce (Geerts et al., 2023; Korpela et al., 2023).

Results

In the first part of the results, we examine the varied support needs of older adults and the key elements of informal learning. In the second part, based on the identified key elements, we focus more precisely on older adults' subjective experiences of learning and look closer at the informal learning settings where the personal experience of acquiring new skills is formed by the interviewees. Through this, we seek explanations as to why there can be a discrepancy if digital support is seen as an unambiguous way to enhance the digital skills and digital inclusion of older adults. In reality, not all digital support is effective or helpful.

Key elements of informal learning in later life

Despite the diversity of the participants, there were several similarities and unifying elements between them. For example, digital support was typically needed at home or other familiar locations in an informal learning environment. In addition, in line with previous research (Martínez & Olsson, 2022; Taipale, 2019), support was often received from warm experts who were typically interviewees' children, grandchildren, or friends. Receiving digital support in one's own safe environment was perceived as a positive element of informal learning as it was a quality that formal and non-formal digital support could not offer. Moreover, Alma, 69, describes below that seeking digital support from warm experts was often a preferred choice because they were perceived as more available sources of support than someone unfamiliar:

> Well, it's very easy to just call and say 'Hey, listen can you help me?' I mean, if you must search and look for support from outside your circle, before anything, you first need to find out where you can even get the help. And then, on top of that, also figure out who is suitable for this specific matter. To be honest, I have not really thought about this because I have managed well with my own circle so far.

The interviewees' experiences of continuous change regarding digital devices and software made informal learning more challenging and repetitive at an older age. Regular updates brought new features, functions, and visuals which meant that existing knowledge became obsolete. In these cases, interviewees were commonly forced to learn the same thing repeatedly. Erika, 73, explained her views towards continuous change as follows:

> It really annoys me that it keeps changing, especially with that [Windows 10], new things and different features keep coming up. You barely have enough time to get used to the previous version, and then the whole thing changes again somehow. That causes problems.

In the context of informal learning, adaptable digital support was crucial as digital support encompassed a wide range of challenges, from the setup of a new digital device to their daily use. For example, digital support was frequently needed when buying a new device and getting it started. According to the participants, new devices no longer came with proper paper instructions, which posed a challenge as paper instructions were experienced as an easier way to get to know the features of a new device among older adults. In addition, interviewees emphasised that even if there were instructions available, they were often full of technology-related concepts that were difficult to understand. Rita, 65, describes her challenges with setting up her new smartphone as follows:

> Sometimes it really feels like those instructions, well, they have been written by people for whom this [digitalization] is a normal everyday matter. And then people like me can't understand what the technical words mean, even if it is written in Finnish. On these occasions, you would often need professional help. Just like in nursing or when doctors use their professional terminology, and then the patient completely misses the point. But for hospital staff, it's self-evident what it means.

Based on the interview data, receiving digital support in an informal learning setting had many benefits and elements that other forms of digital support could not provide. For example, getting digital support from friends and family often felt more reliable and safer. Additionally, according to Alma, 69, the possibility of receiving support without having to pay for it was highly appreciated because help was often repeatedly needed for the same problem. This would have caused a significant financial strain if using outside support such as paid customer service, as Alma points out:

> Of course, I rather take help from my own close circle because then it doesn't cost anything. Well, in some way it always costs something, as it is compensated in some other way than money, but outsiders always come with a fee.

Still, even though the digital support from warm experts was free in financial terms, the participants felt they were often compensating or paying an emotional price for the help. In line with previous research (Geerts et al., 2023; Peek et al., 2016), several participants in this research experienced shame and anxiety about being a burden when contacting family and friends with regularly occurring problems. Some participants also felt that warm experts' time was more valuable than their own. In the interviews, there were examples of a struggle and choice between asking for help from warm experts or paying money for outside assistance. As Irene, 84, explains, she didn't want to be that person who always bothers those close to her and is dependent on others:

> Of course, I wouldn't want to be someone who always bothers other people. It's a feeling, I don't want to rely on others as much. I just don't want to be that person who, when someone gets my call or message, automatically thinks 'Oh, she needs help again, we'll have to go. Again'. Or to be a person who only sends messages asking for help instead of just sending nice messages. That's why it would be helpful to have [public digital support], but it's quite hopeless. I don't believe we can have such public services so frequently available. I don't know, though.

Furthermore, it was often challenging to even be aware of what kind of digital support was needed. As one general characteristic of informal learning, technology can be a great unknown and sometimes it was difficult to understand the limitless possibilities on offer and where to start exploring. In many cases, there was a desire and interest to learn something new, but older adults did not necessarily know where to start looking and what kind of help to ask for. In this case, digital skills encompassed more than just the practical aspect of utilising digital devices as there was a need for a broader understanding of the possibilities of digital technologies. Julia, 71, illustrates this feeling below:

> Well, you can get quite far by exploring independently, but I'm not sure. There are certain things I'd like to search from there. But I haven't really considered it so necessary. You can find almost anything there though, without a doubt. I could certainly get some apps to my tablet if I could get it to work. But nothing too big. I don't know. What kind of apps there is typically available?

Challenges regarding the use of digital technologies and informal digital support were not only limited to unknown possibilities or emotional struggles. Drawing from the interviews, digital support was needed when acquiring new skills, identifying scams, and avoiding the dangers of the internet. On several occasions, digital support was more about bolstering confidence and encouragement than actually teaching how to use devices or applications. The essence of strengthening confidence was often described as a situation in which a trustworthy individual stood by, observed actions, and warned if something bad or dangerous was about to take place. As Irene, 84, discloses below, she appreciated the element of empathic support and having someone 'to hold her hand' while she navigated the digital service system, even though she probably could have managed it alone as well:

> Well yeah, I mainly need this kind of faith reinforcement for myself. I can manage pretty well without it if there is nobody around, but I'm certainly happy to use these kinds of faith boosters.

However, even if it was known what kind of support was needed, there was still the question of where to ask for it. In the interviews, participants described how there was not enough public or free help available. In this case, warm experts and informal learning unquestionably offered an element that formal and non-formal support could not. Peter, 81, for example, strongly felt that paid services were not helpful, or not even a real option as they were so expensive to use: 'Where do I get help? Not from society, that's for sure'.

In addition, the everchanging role of a warm expert can be seen as one element of informal learning, as being a warm expert involved providing regular 'customer support' with digital devices but also offering more specific help with online banking and finding solutions to safety issues. It was also emphasised by many of the research participants that with digital devices and software, there is very little or no room for error. In a regular face-to-face customer service situation, even if it takes some time and hand signals to demonstrate, it was experienced that the customer service representative would eventually understand and know how to help. This was not the case for technological devices, where the interviewees felt you could not use such an approach because the device could not have a conversation with you like a real person. For Irene, 84, it was clear that technology should not replace this kind of human contact, as she described her struggle with digital services:

> When there's no person serving you, to whom you could explain what's going on. With digital devices, everything must be so exact. You have to get right. All the requests and selections must be correct or it goes wrong. But if there is a real person serving you at some office, you can explain and try again and after listening for a while, they eventually understand what you mean.

Furthermore, the majority of the interviewees emphasised that learning is not only about attaining new skills but also re-evaluating and unlearning outdated knowledge that was no longer valid, which proved to be difficult in many instances. Even if digital support was there and easily available, most participants found that learning in later life generally required more patience, endurance, and repetition. In addition, warm experts who offered digital support commonly went through the instructions too quickly and did not consider the older adult's individual needs. Drawing from the interviews, excessive digital support can be recognised as one of the key elements of informal learning. Due to over-helping, experiences of learning were not that easy, as Nina, 71, expresses below:

> When my son explains things or sets up the internet for me, he doesn't have the patience to go slowly. It is like 'Do this and then this and this and this'. But try doing it alone tomorrow. If I had a paper that explains a) press

this, and then this happens, and after that, press two times this, and then this happens, and so on. Then it would sink in better. [laughs]

It was unambiguous throughout the interviews that informal digital support can extend beyond the scope of technical assistance, as it encompasses several dimensions such as 'handholding' and the strengthening of older adults' confidence. Thus, emphatic support was identified as one key element of informal learning. This finding aligns with previous research which highlights the social element as a central aspect of digital support (Korpela et al., 2023; Tsai et al., 2017), but also older adults' inclination to look for social support when learning to use new digital technologies (Llorente-Barroso et al., 2023). Despite the heterogeneity of informal learning environments, there were several unifying elements that made informal learning distinct from other sources of digital support. These key characteristics included, for example, receiving digital support in a familiar safe space from individuals who were seen as reliable and well-known.

Generational learning barriers: older adults' subjective struggles of informal digital support

As Martínez and Olsson (2022) emphasise, several studies focus on how warm experts facilitate the use of digital technologies, often portraying intergenerational learning and interaction as relatively straightforward. However, help does not always equal learning, and a large number of key elements recognised in this research were perceived as obstacles to informal learning. Drawing from the initial analysis, one element was the continuous change of digital technologies which made informal learning repetitive and sometimes frustrating.

Furthermore, the feeling of being a burden or paying an emotional price occurred in situations where older adults made pragmatic decisions based on caring for the younger generation and their presumed needs, rather than their own learning needs. If older adults perceived warm experts' time as more valuable than their own, they hesitated to ask for digital support and avoided paying the emotional price. This consequently hindered the acquisition of digital skills. As a result, independent use of digital technologies was interrupted as digital support was rarely asked for and only after careful consideration. This finding aligns with previous research (Martínez & Olsson, 2022) in which older adults weighed their own personal needs and requirements against the perceived needs of their family members.

Conversely, some participants also had alternative motives or reasons that outweighed their desire and intention to learn how to use digital technologies. For these older adults, technology-related challenges were occasionally experienced as a benefit, serving as an incentive for the younger family members to visit. As Alma, 69, concisely described, she preferred her son's frequent visits over mastering the use of digital technologies herself: 'At least they [children] come to visit when there's a reason'. In such instances, social interaction took precedence and overshadowed the informal learning. Consequently, neither learning nor independent use of digital technologies occurred and there was also no associated feeling of imposing on their younger relatives. In this case, the choice to prioritise social interaction over digital skills was conscious but also indicated a deeper social need among older adults as there was a prevalent desire for more frequent visits from their families.

Acknowledging these key elements of informal learning, the challenges tied to digital support frequently culminated in either excessive assistance (over-helping) or insufficient support (under-helping). Under-helping was manifested, for example, in situations where the support was 'there' for the older adults but was available only according to the terms and schedules of the warm expert. By contrast, over-helping reflected scenarios where there was too much assistance, which was often described as overwhelming and frustrating. Over-helping in this context meant, for example, installing and updating a device or downloading applications on behalf of older adults even if they could have managed these 'digital chores' (Taipale, 2019) themselves. In many cases, over-

helping resulted in an experience where everything was sorted out on behalf of the older adults instead of providing an opportunity for the interviewees to learn for themselves.

With regards to both under-helping and over-helping, informal digital support in these instances did not result in experiences of learning or independent use. On the contrary, it led to a situation where older adults had to repeatedly ask for support for the same problem. Reflecting on this finding, repetition as a part of informal learning can be necessary due to age-related cognitive issues (Dumas, 2017) or rapid changes in technology (Bhattacharjee et al., 2020) but, according to the interview data, repetition can also rise from under-helping and over-helping. Furthermore, even if digital support was easily available when older adults needed it, numerous interviewees expressed that self-efficacy in completing digital tasks had not been genuinely taught to them, as Irene, 84, describes below:

> If only someone would guide me step by step. It's all a bit uncertain, like shooting in the dark. I'm afraid it'll go wrong, and this is probably why. There is no one who says, 'Do this and do that'. And we have practiced it only a few times. I've never really been taught.

To recapitulate, both key elements, over-helping and under-helping, exhibit strong associations with informal digital support. While over-helping frequently stemmed from warm experts' lack of patience, it primarily occurred in safe environments where support was provided by someone familiar or close. As neither non-formal nor formal digital support can typically be provided in older adults' homes or home-like environments, this finding is strongly linked to informal learning. Furthermore, mirroring over-helping and under-helping, our findings are in line with previous research (Kuoppamäki et al., 2022) which highlights that warm experts do not necessarily possess good digital skills or are automatically available when needed. Additionally, there can also be a mismatch between older adults' preference for unhurried digital support and the hectic, time-constrained lives of their close relatives (Pihlainen & Ng, 2022). Thus, it is necessary to recognise and examine the factors contributing to under-helping and over-helping as a considerable portion of digital support in later life still comes from the expertise of family and friends (Pihlainen & Ng, 2022).

Conclusions, limitations, and future research

This research examined how informal digital support can affect older adults' personal learning experiences and their ability to use digital technologies independently. In this paper, we asked (1) what are the key elements of informal learning in the context of older adults' acquisition of digital skills? Based on the first question, we further examined (2) how do the identified key elements of informal learning influence older adults' subjective learning experiences and independent use of digital technologies? While the results highlight the importance of informal learning in the acquisition of digital skills among older adults, this study also contributes to literature showing how different characteristics of informal digital support can hinder learning and paradoxically prevent digital inclusion.

Recalling the results of the first research question, the key elements of informal learning included a dependable and secure source of digital support, the ever-changing role of warm experts, a diverse array of digital support needs, and repetitive learning. The latter commonly arose from age-related challenges and the constant evolution of digital technologies. Additionally, although digital support was free in financial terms, there was an emotional toll associated with acquiring digital support from family and friends. On the other hand, emotional support and 'hand holding' between warm experts and older adults were experienced as enriching elements of informal learning that were highly valued by the participants.

Regarding the second research question, our results demonstrated that informal digital support does not automatically lead to successful learning experiences or independent use of digital technologies. Even though most participants experienced digital support from warm experts as

reliable and safer than other forms of digital support (see also Kuoppamäki et al., 2022; Olsson & Viscovi, 2018), informal digital support also included elements that could limit the acquisition of digital skills. For example, over-helping reflected a situation where interviewees experienced informal digital support unsuitable for their needs as it did not support their independent use of digital devices. This finding is in line with previous research (Xiong & Zuo, 2019) which highlights that warm experts may encounter challenges when trying to empathise with the perspective and everyday lives of older adults, which can result in unsuitable guidance and a lack of useful advice.

Elaborating further on over-helping, it can be differentiated from proxy use which alludes to different, but closely related, phenomena. While proxy use can be described as 'leaning on' (Galperin & Arcidiacono, 2019), where older adults rely on younger family members to navigate online tasks on their behalf (Hänninen et al., 2021), over-helping occurs when older adults are actively seeking digital support but instead of gaining new skills and knowledge, the digital issue is resolved on their behalf by a warm expert. Thus, both over-helping and proxy use can contribute to older adults' dependency on helpers. However, while the latter represents a more systematic pattern of managing digital tasks on another's behalf (Marler & Hargittai, 2022; Reisdorf et al., 2021), the former arises in response to specific digital challenges.

This finding is in line with previous research (Gallistl et al., 2021; Geerts et al., 2023), stating that informal support cannot fully replace more organised digital training or sufficiently support the learning processes of older adults. Furthermore, consistent with prior studies (Courtois & Verdegem, 2016; Portz et al., 2019), our research demonstrated that family members can experience challenges explaining basic technology-related tasks to older adults and commonly feel frustrated with the slow teaching process. However, it is crucial to understand that even if informal digital support is not always optimal, the potential advantages may overcome the drawbacks. These advantages can be emotional or financial factors that make informal digital support a better option.

Against this backdrop, the results of this study highlighted the role of empathic support and 'handholding', as social support can contribute to better digital skills (Kuoppamäki et al., 2022). Moreover, the social interaction between older adults and warm experts inherently holds value, which can promote older adults' well-being (Francis et al., 2019). However, as some of the identified key elements of informal learning were simultaneously acting as both constraints and enablers, the relationship between the key elements and subjective learning experiences can be portrayed as a multifaceted interplay. For instance, continuous digital transformation, despite presenting a challenge, also commonly acted as a catalyst for learning new digital skills among older adults. Reflecting this, the subjective learning experiences and independent use of digital technologies often depended on the context and how the identified key elements were navigated or leveraged.

From a wider perspective, challenges persist regarding the discoverability of digital support as well. In Finland, many have limited knowledge of digital support opportunities and are unaware that government agencies have an obligation to support the use of their own services, digital or not (The Finnish Digital Agency, 2023). While authorities are not mandated to teach basic digital skills, there is a need to clarify the division of roles, specifying what guidance can be expected from them and what should be acquired through self-effort or with help from family and friends. To develop a more inclusive and effective digital support policy, the discoverability of already existing affordable digital support initiatives should be improved, while also recognising and enhancing the role of informal and non-formal learning networks. Furthermore, emphasis should be placed on preventing siloed efforts on digital support, as investing in cross-sectoral collaboration can foster a comprehensive support system that bridges formal and informal learning environments.

Due to the fundamental elements of qualitative research and inductive thematic analysis, this study acknowledges the potential limitations, including subjectivity in interpretations and the ambiguity of data. Given that the insights and nuances of informal digital support are informed by a restricted number of participants sharing similar living situations in communal housing, the findings of this research may have limited transferability. In addition, the qualitative interpretations are dependent on the context and may not capture the full variability of informal digital support,

especially when the daily lives and the digital world are becoming more and more intertwined. Thus, future research could expand on this foundation and look deeper into how societal pressures on digital skill acquisition can influence the outcomes of informal learning.

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