



A case study on experiences with integrated technologies in a care home for older adults

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ABSTRACT

To facilitate independent living for the growing population of older adults, innovative housing solutions such as novel concepts of care homes with integrated technologies have been developed. This case study exposes a significant gap between the intended goal of fostering independence in older adults and the actual impact of technology on their daily lives. The study explored perceptions, experiences, and needs regarding residents' use of integrated technologies along with the technologies' contribution to handling their everyday life in a Care+ home. Data were analyzed through qualitative content analysis. The key finding is that one size does not 'fit' all, indicating that the standardized technology installed in the apartments often fails to meet the users' individual needs. This research identifies a critical gap in tailoring technologies to the unique needs of older users. Aligning technological solutions with aging-in-place policies focused on autonomy and well-being is essential for enhancing care environments.

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Introduction

Due to the rising life expectancy rates, it is of vital importance to enable older persons to relish prosperous and rewarding lives despite needing care.¹ Hence, it becomes crucial to foster the creation of domestic settings that support everyday activities amidst diminishing capabilities and promote a lifestyle of active and healthy aging, in alignment with the explicit policy goals in Norway and across Europe.^{2,3} The impact of an increasingly aging population due to higher age and low fertility rates poses significant challenges to the public care system in Norway,⁴ as well as in many other parts of the world.⁵ The expected rise in demand for health and social care services, coupled with the escalating staff expenditures and the lack of qualified workers within the services in the last few decades, has called for new and innovative approaches to support older people to live independently in their own homes as long as possible.^{2,6,7}

Firstly, the policy of *aging in place* allows individuals to realize their potential for physical, social, and mental well-being, such as postponing the need for care for as long as possible. Secondly, this policy rests on the principle of providing older persons with adequate protection, security, and care predominantly at the place where they live.¹ In the Norwegian welfare system, this will include offering adapted housing to promote independent living, home assistance, and home nursing services, the integration of different technologies, and access to a social environment.^{2,8} Several concepts have been launched, such as senior co-housing, where people share common areas and equipment, a concept designed to enhance coping and self-management in addition to promoting social networks.^{9,10} Another strategy is the establishment of different care home models¹¹ by offering a facilitated physical environment that can support independent living for longer than what is possible in the person's original home. A significant aim of such strategies is to prevent or delay the need for moving to a nursing home. An important part of these care home innovations is the integration of different technologies. This may, for example, include social alarms, smart-home devices for automatic regulation of heating, lighting, and heat monitors for the

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stove, as well as tablets for communication purposes.⁷ The purpose of the technology is to support residents' independence in addition to compensating for functional decline.^{7,12}

Multiple studies have revealed that technologies may not align well with the everyday life and functional capabilities of older users. At times, the user interface is not designed to accommodate the physical and/or mental abilities and needs of older people, thus hindering the utilization of the technology.^{11,13,14} Further, studies suggest that an excessively complicated interface may pose obstacles to effective technology utilization, and the users may need more technology proficiency than they tend to have.^{15,16} Despite these challenges, large investments are spent on implementing technologies in homebased care and care homes to support older adults aging in place.^{17–19} The development is driven by policies which tend to focus on technological innovations and related markets, rather than on the needs of the users.^{19,20}

Both Norwegian white papers and research highlight the need for innovative home environment solutions, including technology integration, for aging in place. However, the solutions need to be arranged appropriately. In this regard, it is significant to keep in mind that older adults are not a homogenous group. During their long lives, they have developed various skills, experiences, and preferences.²¹ Further, the aging process is complex and requires a multidisciplinary approach to assess and select the most appropriate technology for the target group. Intrinsic challenges related to aging processes are reported as older persons may have diminished fingertip sensitivity when using touch screens, impaired vision when reading instructions, and weaker fine motor skills.^{22,23} In addition, older adults tend to have slower learning processes and limited adaptability to new settings and technologies than younger adults.¹⁵ Several studies underscore the significance of considering these aspects of aging when implementing technology to support older adults' functional capacity and everyday life.^{15,24,25}

Care+, the empirical context of this study, is a Norwegian care home concept designed for people above the age of 67 and financed by municipalities. The first Care+-home was opened in 2012, and in 2023, there were 13 Care+-homes in Oslo. Each Care+-home features individual apartments, which are legally the residents' homes, granting them the status of tenant.²⁶ A key aspect of Care+ is the integration of different technological solutions, establishing a technological infrastructure across all apartments.^{6,16} The integrated technology is expected to have a central role in supporting the safety, security, and independence of residents while being tailored to individual needs.²⁷ However, studies show that the technology played a considerably less supportive role than expected, partly due to persistent operational challenges and also due to many devices with poorly designed user interfaces, such as tablets for communication.^{25,27} A Norwegian study on older home-dwellers highlights the lack of focus on user needs, concluding that various devices should largely be implemented through an adapted and person-centered approach.²⁸

There seems to be a need for further investigation of how the technologies installed in Care+-homes are perceived and experienced by residents and staff. The study aims to explore the perceptions, experiences, and needs to be related to residents' use of integrated technologies and contribution to handling everyday life as described by residents and staff in a Care+-home.

Theoretical approach

Based on the aim of our study, we have chosen a theoretical perspective developed from observational studies on how people interact with technologies in various settings. The concepts of 'fit' and 'misfit' are retrieved from Jeanette Pols²⁹ studies of practices of care technologies, serving as a theoretical lens in this study. 'Fit' indicates that something is adapted suitably to making a solution or service

perceived as good by the user. A core argument from Pols (2012) is that making a solution 'fit' is demanding and context-dependent, implying that whether something is 'fit' is temporary and changes dynamically between the user and the device. For technology to be 'fit', it must be perceived as relevant and meet the specific needs of the users. In addition, the technology must be user-friendly and not perceived as complicated to use. It must also be reliable, in line with users' expectations, and support independent living.²⁹ Finally, a 'fit' device should be flexible, allowing for individual adaptation and adjustment.³⁰ This means that technologies must have properties that can be handled, adjusted, and experimented with to determine whether they will work in accordance with users' varying needs and expectations. If these aspects are not met, the device may be perceived as a 'misfit' by the user, which increases the possibility of rejection and non-use.

Materials and methods

This case study has a qualitative research design and combines a qualitative interview method with an ethnographic approach, the latter being preferable when exploring ways of using technology.³¹ Field methodology provides a good insight into observations of actions, relationships, and experiences in natural situations.^{32,33} This study is based on empirical data collected between June and August 2022.

Research context

The Care+-home under study consists of 124 apartments, some of which accommodate couples. The building is owned and run by a non-profit foundation. The staff includes a manager with a healthcare background. In addition, there are house hosts available 24/7 whose main responsibility is to organize activities in the common facilities. Unlike the night hosts, the house-hosts do not have a professional healthcare qualification. Residents who need healthcare services can receive assistance from home nursing or practical home help services following approval from the municipality. One of the house hosts has a designated responsibility to execute training on the devices, offering individualized supervision through trial and error. All training sessions and every resident's individual needs for help are recorded in logs, which gives the Care+-home manager an overview of each resident's technological assistance needs.

Each apartment has installed several integrated technologies: An *adjustment panel* for ceiling light and temperature is designed as a flat white screen with grey text without physical buttons. Lights are turned on and off by tapping a fingertip carefully on the appropriate panel point and dimmed by gently pressing and quickly withdrawing the finger to the correct brightness level. The temperature inside the apartments can be adjusted to three degrees above or below the season's set core temperature. The hallway panel for ceiling lights has a dual function; it is combined with a "home-away" function that turns off all unnecessary electric appliances when residents leave the apartment. The cooktop is an *induction hob* and appears as a large black screen when the power is off. It is turned on by pressing a fingertip on the power point before selecting a desired cooking section. In addition, a *stove guard* must be activated before turning on the hob. Each apartment's *entrance door lock* is a cylinder-shaped knob, and locking/unlocking involves several steps in a defined sequence: First, the lock is activated with a tag, which then activates a tiny green light on the knob. Then a tinkle sound appears before the user is prompted to turn the knob twice. A *tablet* for information and communication (ICT) connects residents and house hosts through software for several options, such as access to the in-house café menu, activities scheduled, internet browsing, radio, etc.

Recruitment of participants

Written materials detailing the project, along with invitations to participate, were distributed to all residents several weeks prior to the recruitment period. An ethnographic approach guided the recruitment process. This entailed identifying potential participants among those present in the café area during midday over the three days when the first and last authors visited. The authors engaged in informal conversations with numerous residents, subsequently identifying potential participants who expressed willingness to be interviewed. Following preliminary discussions regarding their experiences with housing and technologies, residents were queried about their interest in further dialogues on the subject. Those expressing interest and willingness to share their technology usage experiences were invited to participate. A total of three residents, comprising one man and two women, volunteered. Each had been living in Care+ for over a year and agreed to participate after receiving more detailed information about the research project.

The staff, consisting of the house manager and several house hosts, were recruited through the manager with a total of four participants, including the manager, who had accepted the invitation. All had worked at the Care+ home for more than a year. In addition, two home nurses were recruited through the home nursing district manager. Although the sample size for this case study was small, the interviews from different groups provided rich descriptions with various perspectives, and the use of a recognized content analysis method resulted in a thorough and consistent analysis of the data.³⁴

Data collection

The collection of data was carried out between April and August 2022. In general, all participants were interviewed separately, except the home nurses, who were interviewed together for practical reasons. All were interviewed by the first or last author, except two of the residents and one house host, who were interviewed by both researchers in the initial interview process to ensure consistency in the conduction of the interviews.

Staff members (including the home nurses) were interviewed in an office setting, while each resident was interviewed in their own apartment. A combination of a semi-structured interview guide was used to ensure the inclusion of important aspects, such as descriptions and experiences with frequently used devices, relevant training, perceived user-friendliness of selected devices, and observations of how they used the devices in their apartment. The ethnographic approach provided demonstrations of the residents' technology use and furnishing of the apartments, facilitating rich descriptions of their experiences and perceptions of the technology. Descriptions from field notes were integrated into the interview transcripts. Each interview was audio recorded and transcribed immediately by the first author to ensure that the observations were described correctly, and field notes from interviews with residents were included in the transcripts while being fresh in mind to ensure thick and rich empirical descriptions³³.

This article focuses on a selected range of devices, namely the light and temperature adjustment panels, the induction hob, the front door lock, and the tablet. These were integrated technologies that many residents interacted with daily or represented key functions, except for the tablet, which was frequently discussed among residents, house-hosts, and the home nurses.

Analytic approach

We analyzed the data using qualitative content analysis in adherence with a conventional approach where categories are derived directly from the textual data³⁵ guided by Graneheim and

Lundman.³⁵ The first and last authors read through all transcriptions multiple times to obtain a comprehensive understanding and identify both manifest and latent content to be interpreted. Given that the residents' experiences are the primary interest of the study, these transcripts were analyzed first in terms of selecting meaning units, entailing selected text units with statements that relate to the same central meaning.³⁵ The meaning units were analyzed and abstracted into condensed meaning units close to the text. The condensed meaning units were then labeled with initial codes to offer new and nuanced interpretations. Subsequently, the first analytical steps were repeated on the transcripts from the house hosts, the manager, and the home nurses. The whole process resulted in various tentative codes for all meaning units. All tentative codes from the whole material were then assessed and compared based on differences and similarities, and some were sorted out based on the research questions. The next step involved the categorization of these codes into several tentative sub-categories and categories by the first author, followed by assessment by the last author.

Suggested condensed units, codes, and tentative categories were then translated into English for all authors to assess and discuss, leading to the refinement of the tentative categories and sub-categories. The final analyses were characterized by reflection and discussion of the last analytical steps culminating in an agreement on four sub-categories and two categories that were substantially consistent, as shown in Table 1. Finally, an overarching and latent theme was formulated and agreed upon, representing the underlying meaning drawn from the whole dataset.³⁵

Results

The overarching theme from the analysis is called "One size does not fit all." This theme refers to the overall finding that integrated technological solutions, which are a part of the technological infrastructure of Care+ and common for all residents, do not necessarily fit individual needs. This overall theme is divided into the main categories of "Daily technology struggles" and "Overcoming the struggles", as outlined in Table 1.

One size does not fit all

The overall theme shed light on the consequences of implementing uniform technological solutions for all the residents, which were perceived as inflexible with few possibilities for individual adjustments. All participants described most of the installed technology as too complex and even unsuitable for many of their needs. However, according to the house hosts, many of the residents seem to have learned to handle several technologies or developed strategies to avoid their use altogether.

Daily technology struggles

The first main category focuses on different struggles encountered by the residents while interacting with the technologies in everyday life. All participants suggested simpler devices or easier approaches to conduct necessary daily tasks in their apartments.

Table 1
Overview of findings.

Theme	One size does not fit all	
	Daily technology struggles	Overcoming the struggles
Categories	Daily technology struggles	Overcoming the struggles
Sub-categories	Challenging technology Call for simplicity	Learning challenges in ageing Needing safe tracks in everyday life

Challenging technology

The integrated technology was unanimously perceived as unnecessarily challenging, both to learn and to use. The adjustment panel for light/temperature was deemed the most challenging device in daily use, although managed by some after extensive training. For several residents, it was challenging to withdraw the fingertip quickly enough from the panel when trying to dim lights or to identify where to place the fingertip. As one resident commented:

"So, it says "dim" here somewhere, but I don't see it. . . (tried to dim the light, but seemed to hold the button for too long so that the dimming function didn't kick in). Maybe it says "dim"? (Interviewer confirmed) Yes, then I'll press it." (Resident 2).

When turning hallway lights off, the residents often touched the "home-away" button inadvertently, which turned off all non-essential appliances. This was a frequent issue after moving in and caused stress among residents, according to the house hosts. Additionally, the home nurses acknowledged making the same mistake occasionally. Many residents were described by the house hosts to struggle with turning the power on/off button on the induction hob, selecting the correct cooking section, and adjusting the heat settings. While some residents mastered the hob operation after training, others needed reminder notes to perform correct pressing. The design of the panel and the hob was described as rather unsuitable for older people unfamiliar with digital screens, according to a house-host: *"There is nothing which is intuitive for people who are unfamiliar with a display or a screen. It is just a black surface."* (House-host 1).

Several residents were considered by the house hosts to struggle with locking their entrance door, and all described this issue as unnecessarily challenging. Even if residents cognitively knew the procedure, practical execution was hindered by impaired vision or hearing, weakened hand grip, etc., making it difficult to perform the task. Some residents were described as afraid to deadlock their front door, which caused anxiety to leave their apartment. Others experienced that they were almost forced into needing help, as described by one house-host:

Well, first you place the tag and then turn (the knob) the right way, and you must wait a bit, because if you do it too fast and start twisting, it will deadlock, and then you must wait for help, right? However, we who do this all the time find it easy to use, but those in a wheelchair might not reach the knob with the tag, or they don't come close enough, then they stay on too long, and then it deadlocks. And they don't understand why, but it's their home, right? This becomes a barrier for them. (House host 2)

All participants also described the tablet as difficult to use, and none of the resident participants had engaged with it after the introduction. The house-hosts considered the present software as user-unfriendly, noting challenges such as difficulty in finding the correct point to press to exit an app. They described that some residents used the tablet for menu checking and a few for ordering food delivery. The most striking issue, however, was the wall-mounting of the tablet at sitting height next to a doorway, which resulted in it being covered by adjacent furniture.

Call for simplicity

All participants expressed a preference for simpler and more familiar technologies, as explained by one house-host:

"Eh, yes, I feel that it (the technology) should be the kind of standard that you are used to, because I know that it is difficult to train the

new staff members as well because they also didn't understand how the devices work, because it is completely new, even for our generation." (House host 3)

For example, there were no traditional light switches or dimmers in the living room or hallway, which could have simplified lighting control. Furthermore, as the participants pointed out, it would be better to replace the fancy induction hobs, which were unfamiliar to most residents, with simple, regular stoves featuring separate cooking plates and traditional switches to adjust the heating. Additionally, the cylinder-shaped doorknob was suggested to be replaced with an ordinary handle, or, most importantly, a knob without the need for twisting, and a locking mechanism simplified by using a tag or a key card.

The house hosts also advocated for more user involvement when selecting integrated technology. One suggested the use of new and digital solutions that are designed with a traditional appearance:

"Yes, and now it is fully digital. You see, it's completely recognizable, everybody recognizes it, and it can perform the same things they used to do, despite being completely digital. And it exists in the market, and it is sad that we do not have it." (Manager)

Overcoming the struggles

The other main finding pertains to the challenges encountered while using the technologies, such as variations in individuals' capacity to learn and adapt to the new technologies. The analysis also uncovered that many residents had developed alternative tracks to cope with the daily difficulties of using these technologies.

Learning challenges in aging

The participating residents described challenges in learning how to use new technology, which was in line with the house hosts' observations. Training needs appeared for almost all residents when moving in, with each device necessitating at least two training sessions. The hosts described an average time frame of two to three months taken by a new resident to adapt and master everyday life in the apartments with the integration of technology. The hosts also experienced major differences in residents' learning abilities. One of the residents perceived her handling as sufficient considering her age:

"No, not at all (used to such devices). I am old, I will soon be 100 years old. I'm 96. So, it's no wonder I can't do all this, then." (Resident 2)

A few residents, however, were described as almost self-taught to learn handling some of the devices, or they had been guided by their next-of-kin and even offered assistance to others who struggled. Also, one of our participants who was very keen to learn how to use the new devices seemed to be one of the few residents being technically inclined in addition to being a fast learner. At the other end of the scale were residents who forgot what they had learned through training and displayed a great need for repetition. Others had forgotten their recent participation in training, while some of them struggled despite repeated training, displaying major needs for more training and/or ongoing help.

Needing safe tracks in everyday life

All participants described ways of handling the technology, and our analysis revealed several alternative tracks. One pathway was to

simplify the usage of a device. The adjustment panel for light and temperature, for example, was used like a switch to turn the light on or off and not for dimming, as described by one resident:

"Yes, it's just a little... you just have to try the simplest thing, and then you use it... so the on-and-off is no big deal. Then just press the top one (on the panel) so that you... I don't do anything with the dimming and the "home-away"-button and all that. I just use that one (points to where it says light-off/light-on the panel) and turn it off and on." (Resident 2)

Another way of coping with the technology was to place small instruction notes on the adjustment panels or on the hob by house hosts or next-of-kin to provide necessary guidance. The tablet was used by a few of the residents only to check the in-house café menu, despite providing several options, such as radio, photo gallery, communication, etc.

Another alternative pathway chosen by the residents was to neglect a device, particularly the tablet. One resident explained that the menu could also be read on the information screens in the shared living spaces, making it unnecessary to use the tablet for this purpose. Another neglected technology was the entrance door lock, which meant some residents left the apartment door unlocked in their absence. The home nurses also often came across some residents who ignored the light panel, by sitting in the dark and waiting for them to come to switch the light panels on/off, and some had even acquired alternative lighting sources:

"... they have these lamps of theirs that they have, that are on. Many of them have. And when we leave for the evening, they turn on the lamps which they manage to turn off." (Home nurse)

The house hosts found many residents neglecting the temperature regulation on the adjustment panel and having taped over the "home-away" button in order to avoid pressing it accidentally when leaving the apartment.

A third alternative pathway embraced by some of the residents was to camouflage their needs or lack of skills in using the technologies by asking the home nurses or visitors for help, thus avoiding asking the house hosts, which all residents were requested to do. Several residents were described to frequently rely on next-of-kin for temperature regulation. The home nurses experienced that some were anxious to touch the devices, which led to dilemmas as the home nurses wished to be helpful but were falling short of time. They expressed:

"... they ask us to turn on and perform everything. Because they would rather not touch it. (-And how are such inquiries followed up? we asked) We'll solve it then and there." (Home nurse)

The additional tasks driven by the technology were perceived as time-consuming for the busy home nurses: *"We can't always come running to push a button. We are occupied with providing care for people with major care needs, so we can't run and (snap fingers) just do that." (Home nurse)* This form of assistance was concealed from the house hosts and was not recorded in the logs. This finding might be understood as some residents' determination not to learn to use the devices and/or preference to conceal their technological inabilities in front of the house hosts, fearing to be considered a burden.

Discussion

The two categories, "Daily technology struggles" and "Overcoming the struggles", comprise the diverse experiences, perceptions, and

needs pertaining to residents' use of technologies in this Care+ home. The findings describe the residents', home nurses', and house hosts' continuous and daily work to achieve a fit with the technology. Additionally, the findings show that many of the technologies can be seen not to be particularly irrelevant, non-usable, or fail to meet the individual needs of the residents. Such issues are critical and form a fundamental argument in the development of user-friendly technology that is fit for the user, according to Pols (2012). Achieving this 'fit' requires time and effort from the older persons, the staff, and often also from family members and visitors referred to as *warm experts*.³⁶ However, despite the collective efforts of the residents, the warm experts, and the staff, the findings reveal that a 'fit' was not always reached, often resulting in a 'misfit'.

It is important to note that the integration of the technologies into daily life at Care+ included repeated training sessions offered by the house hosts over a period of several months in accordance with individual needs. In general, older people have various experiences in using technology from their previous lives, meaning they start from different points when learning new technologies.³⁷ When technology is perceived as useful, it encourages older people to be more willing to learn. Further, they need more time when learning, and the process appears more complex and circumstantial. It is important to note that competencies and skills related to digitalization are more incidental in older people who have not received systematic digital training compared to younger people.³⁸ However, this is likely to change as daily use of the internet among older people (65–79 years) has significantly increased in the last few years.³⁹ Our findings show how the residents in our study learned to use the technology by trial and error, often relying on warm experts, such as family members and other residents. Several also made written notes on how to use some of the devices, such as the hob, or chose not to use some of the devices. Others occasionally reverted to alternative low-tech solutions, such as private lamps with familiar switches. These findings show that older persons may rely on alternative solutions that are available, indicating that the adoption of technology used in the context of aging in place may be affected by several aspects: Challenges in the domain of independent living (need for help), behavioral options (what are the alternatives), personal thoughts on technology use (needs, interest, and willingness to invest in it), the influences of the social network (willingness of family members and friends who are accustomed users of technology to support or pressurize for using technology), the influence of organizations (how much technology is in use in the services they use or financial support for purchase), and the role of the physical environment (how well the technology fits in the settings they live in).⁴⁰

Another approach used by the residents to ensure 'fit' was to simplify the use of devices, which is in line with the notion of "selective use" as described by Nelly Oudshoorn.⁴¹ According to Oudshoorn (2008), "selective use" is when technology users choose to use only some functions or use the technology only in certain circumstances. Literature on technology and aging also shows the need for devices that resemble artifacts familiar to the elderly or give them preference for choosing which technology to use, facilitating learning and interaction with devices.^{25,42,43} Modern technology has become increasingly complex with a growing number of functionalities, which may create difficulties for older users.³⁶ While many functionalities may be an asset, they are supposed to support individual choices and problem-solving instead of pre-defined singular solutions.^{44,45}

The described challenges call for more flexible technologies adapted to meet individual needs.²⁹ Further, meeting individual needs might also potentially be reached by co-designing technology with older persons, incorporating their preferences and insights.⁴⁶ The different ways in which the technology proved to be a 'misfit' are reflected in how older persons often seem to fail when trying to use the different devices, which at times meant neglecting the device and

not using it at all. The software on the tablet, for example, was not subject to remediation by the retailer and therefore resulted in not being used by most of the residents. The reasons for the non-use or 'misfit' may be logical, particularly when physical or cognitive impairments in users become too apparent or when the devices do not match individual needs. Such panels and screens are not user-friendly, according to Iancu and Iancu,²⁴ as reduced vision produces lower contrast sensitivity and color vision.²² Merely having access to technology or even using it does not mean that it fits with individual needs or the activities of everyday life or supports independent living. Instead, it can become a barrier,⁴⁷ as seen with the doorknobs that several residents were unable to use. Older people have diminished tactile sensitivity, and many have weakened fine motor skills.²³ Struggles with technology might result in social isolation if the residents are hesitant to leave the door unlocked and choose to stay at home. The described consequences contrast with the aim of the Care + concept, which is to facilitate social participation,²⁶ and Norwegian policy on aging in place,¹⁸ which states that the technology should compensate for a functional decline to enable aging in place and independent living.

The instances of 'misfit' sometimes resulted in continuous demands for assistance from the home nurses, or the technology-related needs were circumvented as the residents found alternative ways of using or avoiding using the technologies they could not master. This finding of camouflaged delegation to handle challenging technology for busy home nurses may be understood as a need for safe tracks in the residents' everyday lives but was perceived as additional tasks for the home nurses.⁴⁸ In such instances, the installed technology paradoxically seems to contribute to a decrease in the residents' independence.

All in all, our findings reveal that the chosen integrated technologies seem to have limited usefulness in everyday life for several of the residents at Care+. Our findings show that complex and inflexible common technological solutions do not fit well with the needs and competencies of the target group. It can be argued that the non- or selective use of these technologies does not align well with current policies on aging in place. For these technologies to support the residents' independent living and alleviate the current pressure on healthcare services, we argue for a much more nuanced approach. This means, on the one hand, that common solutions should be flexible and adaptable according to individual needs, to ensure a 'fit'. On the other hand, it is important to note that 'fit' is not a static experience that is achieved once and for all but needs to be assessed at regular intervals as individual needs alter over time. Hence, to enhance successful aging in place, it is necessary that home nurses and house hosts have the necessary competence, time, and resources to make the needed assessments and adjustments. This is because one size (type of technological solution) does not 'fit' all.

Limitations of the study

This is a limited study including three groups (residents, house hosts, and homecare nurses) from a single Care+ home. The design of a case study focusing on one Care+ home, including a limited number of participants, might hinder a comprehensive understanding of the topic, despite efforts to conduct a thorough and consistent analysis. The use of convenience sampling introduces potential biases, such as selection bias, and might limit the transferability of the findings. In addition, the geographical focus on Eastern Norway may limit the applicability of the results to other regions or countries with distinct cultural contexts.

Despite the limitations, this study also has its strengths. The ethnographic approach, combined with qualitative interviews, provided in-depth insights into user experiences with technology in a Norwegian care home. The methodological strength lies in the richness of

the data gathered from a diverse group of participants, including house hosts, home care nurses, and residents, which offered a comprehensive understanding of the technological interactions in the care setting. The focused analysis of specific technologies and transcription enhances the study's rigor and relevance. Accordingly, the authors consider that this approach effectively captures the nuanced ways in which technology integrates into daily life within the care environment. In addition, the authors represent several disciplines and international perspectives, thus adding depth to the analysis.

Implications for practice

In terms of practical implications, it is crucial to highlight the significance of incorporating flexible technology and user-friendly solutions for older persons to support the goal of aging in place and living independent lives. This study might inspire countries that have not yet embraced the new home care concepts for aging in place and are leaning towards community-based care models. By shedding light on potential improvements for future structures of this nature, the study provides valuable foresight for enhancing older care and the adoption of more effective care models.

Conclusion

The study exposes a gap between the intended goal of fostering older adults' independence and the actual impact of technology in their daily lives. While technology holds the promise to facilitate independent aging, thereby reducing the reliance on institutional care and healthcare services, it can become a limiting factor in the daily lives of older people when it does not fit with their needs, preferences, or user abilities. In many cases, technology complicates rather than simplifies the routines of users, underscoring the need for a critical re-evaluation of the design and functionality of these devices. Recognizing the heterogeneity among older people regarding technology usage, it is imperative to develop flexible and user-friendly features to reach the potential of the technologies. This study serves as a valuable reminder of the importance of a user-centric approach in the development and implementation of flexible and adaptable technology in care settings to fit the users' needs.

Ethics approval and consent to participate

All included individuals were able to participate in the interviews and provided informed consent. There were no risks for the participants, as they were able to choose where to be interviewed, and interviews did not include traumatizing topics or health information. All participants received written and oral information about the study prior to the recruitment and gave written informed consent. The study was approved by The Norwegian Agency for Shared Services in Education and Research (project number 894,113) and complies with guidelines from The National Committee for Research in the Social Sciences and the Humanities.^{49,50}

Consent for publication

Not applicable.

Declaration of generative AI in scientific writing

No AI technology or tools were used while writing this manuscript.

Declaration of competing interest

The authors declare that they have no competing interests in this section.

CRediT authorship contribution statement

Nina Jøranson: Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Minna Zechner:** Writing – review & editing, Validation, Methodology, Investigation. **Rosa Silva:** Writing – review & editing, Validation, Methodology, Investigation. **Nilufer Korkmaz Yaylagul:** Writing – review & editing, Validation, Methodology, Investigation. **Hilde Thygesen:** Writing – review & editing, Validation, Supervision, Project administration, Methodology, Investigation, Data curation, Conceptualization.

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