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Inclusion of Elderly Users via Virtual Spaces in the Early Stages of the Innovation Process

Abstract

This article discusses collaborative innovation during the initial stages of firms' innovation processes via virtual spaces, focusing on a specific group: elderly users. These users represent a large and growing consumer market, which entails opportunities for companies developing products and services for elderly individuals. Firms that intend to meet the real needs of elders must involve those individuals in collaborative innovation processes. However, firms face challenges in the technical and interpersonal spheres when basing their early-stage innovation activities on the virtual inclusion of elderly individuals, which has received little attention. Focusing on these challenges, this article presents an exploratory case study employing a participatory action research approach, in which the authors were part of a project aimed at the development of a method of including elderly users via virtual spaces. Pilot implementations helped the innovation intermediary develop an improved method to better capture elderly individuals' inputs. We found that special efforts must be made prior to the virtual activity to familiarize elderly individuals with the technology. Additionally, virtual activity demands a more active role from intermediaries for two reasons: first, representatives from client organizations do not feel confident in leading virtual discussions and second, social hints, emotions and feelings are more difficult to grasp in a virtual space than in real-life interactions, which necessitates more focused and prepared intermediation. Elderly individuals' involvement is driven by their curiosity and desire to learn something new; therefore, the participation of elderly users must be valuable both to the organization's innovation process and to the elderly individuals themselves.

Keywords: virtual space; innovation intermediary; user involvement; collaborative innovation; elderly users; fuzzy front end

1 Introduction

Users are crucial sources of innovations (von Hippel, 1988) through, for example, sharing experiences, generating ideas for new products and testing prototypes, thereby lowering the costs and risks associated with research and development (Schreier et al., 2007, Wellner, 2015). Recently, as technology has advanced, the internet has become an important milieu for facilitating user engagement and innovative cocreation (Bradonjic et al., 2019). Internet-based methods and virtual environments have addressed the social aspects of knowledge creation, thus enriching interaction and flexibility during the innovation process. However, a struggle emerges when the user group in question is composed of elderly individuals, who are less knowledgeable and confident regarding the use of information technologies (Lee et al., 2019; Holgersson and Ellgren, 2020). This phenomenon is related to many challenges associated with increasing age, such as reduced vision and hearing, cognitive and memory deterioration and physical impairments (Demiris et al., 2004), which restrict communication and may impact the process of cocreation (Knight-Davidson et al.,

2020, Marschollek et al., 2007). Therefore, our research aims to understand *how elderly users can be included through the use of virtual environments during the early stages of a firm's innovation process.*

The reasoning underlying our interest in this user group pertains to a projected demographic shift, according to which the number of retirees will become disproportionately large compared to the working population (European Commission, 2018). People are living longer and experiencing more chronic illnesses, while simultaneously, the goal that older adults ought to "age in place" has been promoted (Demiris et al., 2004), which increases the need for new products and services that are tailored to elderly users. Current research concerning elderly people and innovation focuses on the perspectives of users at a time when the product has already been developed. For example, users' hesitation regarding technology, the degree of learned helplessness in older people when trying to use personal computers (Turner et al. 2007) and their specific needs, such as big buttons and screen size or simplified functionality, have been studied (Phiriyapokanon, 2011; Dupuy et al., 2016). Some exceptions to this rule exist, as highly educated elderly individuals as well as individuals with more technological experience tend to be more eager to accept new technology (Lee et al., 2019, Demiris et al., 2004). However, despite the growth of retirees as a consumer market (European Commission, 2018), very little research has studied the inclusion of elderly individuals in the process of collaborative R&D and innovation.

In approaches focusing on the general population, methods and tools for including users in collaborative innovation have ranged from surveys, interviews, focus groups, workshops, and observations (Schwartz et al., 2015) to the World Café, shadowing (Angelini et al., 2016) and more novel internet-based mechanisms such as virtual communities, virtual market testing or web-based prototyping (Sawhney et al., 2005). The use of such methods and tools varies across different stages of the innovation process, from the task of discovering users' insights and needs at an early stage to that of evaluating the quality and functionality of products and services during later stages of development (Feurstein et al., 2008). Nevertheless, stakeholder inclusion occurs mostly during the final stages of the innovation process, which does not allow sufficient flexibility to adjust the product during its development (Silva et al., 2019). Our research focuses on the fuzzy front end, as this phase is believed to have the highest impact on the overall innovation process and its outcomes, but it is also the field that has received the least attention (Herstatt and Verworn, 2004).

By employing qualitative modes of enquiry, we present a research case study supported by participatory action research (PAR), which allowed us to attain an insider's view of the planning design development and implementation of a method for the virtual inclusion of elderly users in organizations' innovation processes. The case under scrutiny is being developed by the Norwegian Smart Care Cluster (NSCC), in Stavanger, Norway. After this Introduction, we discuss the theoretical foundations of the article, which is followed by a section pertaining to methods, in which we explain the techniques used for data collection and analysis. Section 4 presents our findings in the empirical field, which are discussed and analysed in the subsequent section. Finally, the conclusion provides a summary of lessons learned that could help other firms apply similar methods.

2 Theoretical foundations

The literature pertaining to collaborative R&D and innovation has received attention from researchers adopting different approaches over recent decades, ranging from von Hippel (1978), who emphasized users as crucial sources of innovations, to the concept of open innovation (Chesbrough 2003; Pinarello et al., 2022), which emphasized the importance of including external ideas and consumers in the innovation process, and culminating in a recent approach of responsible

research and innovation, in which one of the main principles is user inclusion (Stilgoe et al., 2013; Demers-Payette et al., 2016; Lubberink et al., 2017). Scholars from the research domain of Living Lab, a unique form of network, have also discussed the importance of user inclusion, especially with respect to the role of users as cocreators throughout the value creation process (Leminen et al., 2015; Greve et al., 2021).

Collective creativity is critically important during the early phases of the innovation process. Often known as the "fuzzy front end", this period represents the predevelopment phase (ranging from idea generation to project planning) and features activities that define essential elements such as product concept, definition, strategy, market analysis, and technology plans (Khurana and Rosenthal, 1997; Sanders and Stappers, 2008). The complexity of the innovation process has posed challenges for firms, especially smaller firms, which usually lack of the resources or knowledge necessary to perform all the relevant tasks. At this point, the role of an innovation intermediary, which refers to an organization or body that acts as an agent or broker between two or more parties during the innovation process, becomes apparent (Howells, 2006). Such an intermediary generates value for firms by providing a range of services related to the search and selection of possible partners, identifying problems and developing solutions during the innovation process (Ståhlbröst, 2013; Howells and Thomas, 2022). By outsourcing these tasks to the intermediary, firms are able to concentrate on their core areas of specialization. In recent years, the Living Lab has become a popular innovation intermediary for supporting user-centric innovation using various methods (Schuurman et al., 2019). Various innovation intermediary communities, including physical and virtual communities, have been formed in the vicinity of living labs to stimulate interactions between organizations and users (Haukipuro and Väinämö, 2019).

Among collaborative innovation methods, one user involvement method for facilitating dialogue among large groups is called the World Café. Set in a context of a café with tables, small groups of people share their thoughts and discuss certain topics, thus generating new insights over a number of rounds of conversations (Brown and Isaacs, 2005). This method and its design principle can be adopted in various ways to suit specific occasions. Regarding the format, face-to-face sessions have traditionally been the preferred choice for collaborative innovation (Sanders et al., 2010; Singh et al., 2022), although such sessions come at a high cost, whereas virtual spaces have the advantage of being able to connect people across large geographical locations at a lower cost (Barrero et al. 2021; Lobe et al., 2020). The rapid development of information technology has enabled many-to-many communication among people, thus shifting society towards a virtual community (Kim et al., 2022) and providing new capabilities and opportunities for organizations to engage in collaborative innovation (Dąbrowska et al., 2022).

A user must be motivated to participate in cocreation activities (Lorenzo-Romero et al., 2014), which entails many benefits; for example, they are more curious and creative and are much less likely to drop out of longitudinal innovation processes (Nov et al., 2011; Jørgensen et al., 2018; Mirkovic et al., 2018). There are no fundamental differences in terms of motivation between virtual and real-world communities (Lampel and Bhalla, 2007). Researchers have investigated the nature of users' participation in innovation communities and highlighted the factors motivating them to contribute, including learning new things, stimulating curiosity, testing innovative solutions, feeling useful, improving their reputations, and being entertained (Ståhlbröst and Bergvall-Kåreborn, 2011, Nov et al., 2011).

Although the possibilities of collaborating virtually have broadened, certain issues remain unresolved. Themes such as media literacy have been reported to be important for virtual teamwork in regard to developing trust in virtual spaces (Breuer et al., 2020). Moreover, virtual communication is more restricted than face-to-face interaction, causing the development of trust in virtual collaboration to represent a substantial challenge (Eisenberg and Krishnan, 2018; Isaacs and

Tang, 1993). As such, although the same level of trust may be obtainable in virtual teams as in face-to-face teams, the process of developing trust is lengthier in virtual spaces (Breuer et al., 2020). In the context of user inclusion in innovation, trust is often highlighted as key to successful collaboration because it allows users to provide their honest opinions without fear or hesitation (Ceasar et al., 2017; Edwards et al., 2018). Trust is also associated with participant retention in longitudinal innovation processes, indicating that the development of trust is a way of creating stability and commitment. Edwards et al. (2018) posited that trust is created via mutual respect and shared responsibility. Respect is created by acknowledging the unique roles and contributions of each participant in the process, and sharing responsibility involves increasing the influence that such users have on this process (Edwards et al., 2018). In addition to contributing to trust, respect and power sharing have also been suggested to promote ownership of the innovation process among various stakeholders, which in turn has a positive impact on motivation to contribute (Ceasar et al., 2017; McConnell et al., 2018; Edwards et al., 2018).

Such aspects of collaborative innovation as participants' motivation and development of trust change according to the user group in question. In the case of virtual spaces, for example, the elderly population is reported to be slower than the average population to adopt new technology (Lee et al., 2019). This slowness poses a problem, as society at large has become increasingly dependent on these technologies, which in many cases can leave elderly individuals behind and render them unable to participate (Ragnedda and Muschert, 2013). Holgersson and Söderström (2019) found five categories of interpersonal factors that can lead to the digital exclusion of elderly individuals: 1) fear and anxiety regarding the use of digital technology; 2) negative attitudes towards using digital technology; 3) feeling "too old" to learn; 4) lack of knowledge and experience concerning the use of such technology; and 5) linguistic problems in understanding digital terminology. Bearing these issues in mind, the virtual inclusion of elderly individuals in collaborative innovation may be particularly challenging, as such individuals statistically exhibit lower media literacy than the population at large.

Regarding the early involvement of elderly individuals in innovation, recruitment should ensure the diversity of participants by taking into account factors such as demographics or experience with technology as well as the inclusion of specific groups, such as people with particular needs (Eisma et al., 2004). Personal characteristics such as users' ages and genders are believed to influence users' experiences with interactive technology and their contributions to collaborative innovation (Rodger and Pendharkar, 2004). The findings concerning who contributes the most to this process have been mixed considering studies on living labs across different countries (De Witte et al., 2021). Various combinations affect their cocreation methods and other factors (such as the session length and group size) when working with different age groups, for example, the inclusion of elderly participants rather than child participants. Gender can also have a similar influence. Although most living labs highlight the equal contributions of both genders, some labs have noted that women's contributions are hindered by the presence of men in the same group (De Witte et al., 2021). Therefore, in regard to the design and execution of cocreation activities, innovators and intermediaries must consider elements that are associated with age to ensure the use of effective methods for the collection of quality data from this targeted group. The selection of methods for involvement should be founded on an understanding of elderly people's needs and motivations as well as the contextual environment (Eisma et al., 2004).

3 Method

This article is the result of ongoing reflection, data collection, and action regarding the inclusion of elderly individuals during the early stages of the innovation process. The three authors of this study

are part of a research project that aims to promote the inclusion of diverse users in innovation processes[1]. A partner in this project is the Norwegian Smart Care Cluster (NSCC), an organization that acts as an innovation intermediary; the head office of NSCC is located in Stavanger, Norway, and the organization facilitates a cluster of digital health care and welfare technology. The NSCC hosts the living lab Norwegian Smart Care Lab (NSCLab), a testing centre that is developing a "virtual user café" to foster the inclusion of elderly users in firms' innovation process.

We conducted an exploratory case study by employing a participatory action research (PAR) approach. Derived from action research (Lewis, 1946), PAR brings together people with different levels of power, status, and influence to work on a thematic concern (McTaggart, 1991). Authentic participation in research entails that participants share ownership of and responsibility for the production of knowledge and the improvement of practice (McTaggart, 1991). Employing PAR allowed us to understand and improve the processes in which we were involved by being embedded in social relationships (Baum, MacDougall, Smith, 2006). PAR also afforded us easy access to data and participants. We have been collecting data since September 2020, when meetings concerning the design and planning of the "virtual user café" began.

The validity of the research (Siggelkow, 2007) was ensured via the use of a combination of multiple data sources for data triangulation during the analysis (Hsieh and Shannon, 2005). Specifically, for this paper, data originated from participation in project meetings, interviews as well as observations of the two pilot implementations. The meetings at which data were gathered included public organizations such as the NSCC, research and education institutions (such as the University of Stavanger, which coordinated the project, and other research organizations), representatives from municipal governments, companies that participated in a brainstorming workshop in January 2020, the Rogaland Fire Department during the first phase of the pilot and the company Sensio during the second phase of the pilot.

Interviews were conducted after the two pilot applications with members of the NSCC, three representatives from the Fire Department, one representative from the company Sensio and 13 elderly individuals who were recruited via the Pensioners' Association and direct contact. These interviews lasted between 20 and 45 minutes each. All the interviewees participated in the "virtual user café", and the interviews were conducted virtually from February to July 2021 via Microsoft Teams or telephone. During the "virtual user café" rehearsal in December 2020 and the two pilot applications (December 2020 and April 2021), two authors performed observations.

The number of interviews was not predetermined, and the authors considered this number to be sufficient when (i) data saturation was achieved and (ii) data from the interviews added to the data collected by other means (observations and participant action in project meetings) were sufficient to allow the authors to understand fully how the inclusion of elderly users was facilitated via virtual environments during the early stages of the firm's innovation process.

For the purpose of reproducing some of the interviewees' answers in the article, we coded the participants to maintain their anonymity, as shown in Table 1.

[1] Releasing the Power of Users - Articulating user interest to accelerate new innovative pathways in digital health and welfare sector (project no.: 299192 SAMANSVAR Research Council of Norway), which was inaugurated in November 2019.

Table 1 – Interviewee's codes

Interviewee code	Organization
I-1	Rogaland Fire Department
I-2	Rogaland Fire Department
I-3	Rogaland Fire Department
I-4	NSCC
I-5	NSCC
I-6	Sensio
I-7 to I-19	Elderly participants

Engaging in PAR with respect to the implementation of the "virtual user café" in real time provided us with the opportunity to identify what did and did not work with respect to the improvement of the process. As noted by Kidd and Kral (2005), PAR researchers are unlikely to be interested simply in understanding a problem; rather, they wish to generate collectively developed action (Kroeker, 1996) aimed at changing the lives of the participants or, in our case, the processes of innovative firms. As explained by Walter (2009), the final stage of PAR during the first cycle is to reflect on the action and its outcomes, and this stage was performed following the first pilot application of the "virtual user café". When such reflection indicates that the results were not as successful as anticipated, these outcomes should be taken into consideration to plan different actions for the next cycle, which is the result of the second pilot application with elderly users. The cycles continue in this manner as long as necessary to resolve the problem or to attain the objective (Walter, 2009), which in our case was the inclusion of elderly users into firms' collaborative innovation process.

Following the data collection process, the data were analysed using an inductive content analysis technique. The themes for the analysis were not predefined and emerged as we examined the data. Since all authors conducted interviews, read interview transcripts and participated in project meetings, each author performed their own analysis prior to the team's analysis meetings. With the aim of conducting an objective qualitative analysis, data were discussed among the authors in three rounds, thus ensuring data triangulation (Hsieh and Shannon, 2005). After the main topics of the empirical findings were identified, the content analysis technique used the extant literature to analyse these findings and generate implications for practitioners and the literature. To perform this analysis, we employed the concepts of innovation intermediary, motivation for participation in collaborative innovation, virtual activities for innovation and elderly people's characteristics.

4 "Virtual user café" planning and implementation: Findings from the case study

Discussions among the research project participants with respect to the development of a collaborative innovation environment in Norway began in February 2020, at which point the initial idea was to follow the experience of the Josephs Innovation Lab in Nuremberg, Germany. I-4 from the NSCC explained that the point of the cluster was to determine whether this collaborative innovation virtual space had the potential to become a service that could be offered to member companies.

This section dwells upon the two pilot implementations of the activity. The first pilot implementation discussed innovation in the context of fire safety at home, while the second pilot aimed to discuss key obstacles faced by people with dementia that were relevant to a company that

produced technology innovation and home automation. Both pilots focused on brainstorming more than coming up with technology or other solutions.

4.1 "Virtual user café" for the fire department: Main stakeholders and responsibilities

One crucial task for the Rogaland Fire Department is to engage in fire prevention work by providing information, conducting risk assessments to identify the possible causes of fire, and improving emergency preparedness. The Safe Home group is responsible for a task called "fire safety for the risk groups", which targets people who have problems associated with living conditions, mobility, hearing, vision, age, smoking and drinking. The Fire Department aimed to collect insights from the group of elderly individuals via the "digital user café" to develop its service further.

The elderly group included 13 (9 male and 4 female) pensioners in their 70s, with the eldest participants being in their early 80s. Due to their engagement with various organizations, several participants had some experience with virtual meetings. Some participants also mentioned having computer experience due to their careers. As such, this group was generally quite proficient with the use of such technology.

Prior to the meetings with users, members of the project team conducted a rehearsal with the client, the Rogaland Fire Department, to test the use of Zoom as a tool for user inclusion. All pensioners were contacted by project members via telephone to offer them participation in a trial run of the Zoom software.

Workshops

The "virtual user café" was split into two workshops (WS1 and WS2). WS1 consisted of a presentation from the research project and the Rogaland Fire Department with the purpose of introducing the issue of fire safety in houses. Subsequently, breakout rooms allowed participants to become familiar with one another as a strategy to develop trust and allow them to familiarize themselves with the platform. Three participant groups received a separate homework assignment related to assessing fire hazards in their own homes, which was to be discussed during WS2.

WS2 included an ideation exercise, according to which the elderly individuals were encouraged to assume a famous personality (e.g., Greta Thunberg or Donald Trump) and develop ideas for how to improve fire safety awareness. Many pensioners were nervous regarding the notion of using the digital platform, so the ideation format increased the difficulty of participation. After each participant presented their ideas, the groups were supposed to vote on ideas to select one such idea to develop further; however, this step was not completed due to a lack of time. I-5 from the NSCC noted how confused the elderly individuals felt due to the ideation format that required them to assume a famous personality. This sentiment was echoed by some of the elderly participants, who simply ignored that aspect of the assignment. As I-11 explained, *"It was difficult. I did not quite understand. I did not grasp the concept, but it may be to free you from yourself. I just ignored it and came up with ideas as myself instead. I used what I have experienced myself."*

In the breakout room of WS2, each representative from the Rogaland Fire Department led a group through the innovation process. I-1 commented that she felt apprehensive regarding that aspect of the process because she had never been involved in such an innovation process or engaged in virtual conversations with users. I-3 also noted that she felt that she had been thrown into the process on short notice and did not feel as if she had sufficient information beforehand, although she also noted that she was willing to learn: "*We use statistics and lists. We have never sat down and taken users' perspectives, like 'How do you want to receive this information?'. We are taking that lesson with us going forward. (…) This method, we don't know it the way you do, but we can do a mini-format. We will try to use the same model with other risk groups, initially refugees".*

4.2 "Virtual user café" for home automation: Less planning and more confidence

The second pilot implementation of the "virtual user café" was oriented towards the goal of brainstorming product innovation for people with dementia. The client firm involved in this process was Sensio, a Norwegian producer of welfare technology. This workshop was a one-day event with the aim of answering the following question: "What is necessary for me to take the next step and acquire welfare technology?"

Based on the debriefing discussions that were conducted following the first phase of the pilot, the organizer instituted certain changes. Some participants requested that the breakout rooms be more structured and feature more guidance for the discussion. In the context of digital communication, people receive fewer social cues on screen, so some people ended up talking more than was desired (according to some participants).

The first breakout room (45 minutes) aimed to allow the participants to become familiar with one another and to express how they imagined their future living situation. To ensure that the same scene was set for all participants, the event's facilitators introduced a persona with early-stage dementia. Following a break, three presentations were conducted: 1) Sensio presented possibilities related to welfare technology for people with dementia, 2) a researcher presented statistics and facts concerning dementia, and 3) a researcher presented a political document explaining future challenges to health care. In the second breakout room (70 minutes), participants discussed a timeline for the persona, ranging from noticing the early signs of dementia until the establishment of a diagnosis, at which point the municipality became responsible for the persona's care. I5 from the NSCC commented on the use of a persona. She noted that it was more difficult to introduce this notion to some people who were unfamiliar with the concept but also that this process ultimately worked well because it was less personal, and so everyone had greater freedom to express their opinions.

5 Discussion

There is a great deal of evidence to suggest that the innovation intermediary (NSCC) has developed a new and stimulating development in the field of innovation management in the form of the virtual inclusion of elderly individuals. However, we could see challenges emerging from this more collaborative (and thus less controlled) mode of user inclusion. According to the interviewees from the fire department and Sensio, the benefits of the activity for the client organizations were clear, and the participation of elderly individuals in the brainstorming process was useful to generate understanding of their difficulties and ideas pertaining to products and services. I-2 from the fire department noted that "*It was very useful, (...) getting new insights to reach out to the population with fire safety information. Also, I think users had a good experience with learning something new and getting new tips about their own safety. Both us facilitating and the people participating learned a lot from the (virtual user) café."* She added that the fire department, inspired by the "virtual user café", is planning to continue user inclusion by running a similar workshop with substance users. The results reported by participants correspond to the advantages of collaborative innovation with customers or users that have been highlighted by previous studies (i.e., von Hippel 1978; Chesbrough 2003; Greer and Lei, 2012).

Due to the workshops and the associated planning and debriefing activities as well as the interviews, we have gained several insights into ways of increasing the efficiency and effectiveness of the engagement of elderly people via digital platforms. Some emerging issues were related to participants' age, while other such issues were related to the virtual nature of the activity. Therefore, the discussion session was organized to include five main points arising from the data analysis.

First, we discuss one issue that could hinder the full potential of the virtual activity with respect to the roles and activities of the organizer of the event (the intermediary). The second point of analysis is the lack of confidence on the part of the client organizations. The third point is related to participants' diversity and the importance of recruitment. The fourth point focuses on elderly individuals' motivation to collaborate, which we found to be an important predictor of their inputs. Finally, the fifth point highlights the need for trust among elder participants and ways of developing such trust in virtual spaces.

Throughout the innovation process, the virtual activity proved to require more active participation from the intermediary, i.e., in our case, the NSCC. When communicating via the internet, fewer social cues are available than in interactions in real life; for example, body languages and postures are more difficult to detect (Rheingold, 2000; Matheson, 1991). A virtual activity thus generates less feedback from participants to the client organization in terms of nonverbal communication, such as gestures, or emotions, such as impatience or disagreement. According to I-6 (Sensio), "*I'm afraid that some people did not quite dare to say everything they had on their minds because it was digital. And they were a user group that were not digital natives, so they were probably uncomfortable*." In such cases, the intermediary conducting a virtual activity must sharpen its engagement process to achieve better results in order to capture the contributions made by participants. I-5 (NSCC) noted that *"It was a good idea to split into small breakout rooms to get a personal touch that perhaps is not very present in digital arenas. We get more in-depth insights in small groups, and then we can share it in the big group to continue with the discussion."* Given the fact that user inclusion represents a cultural change for many firms (Kratzer et al., 2017), especially when the activity in question is virtual, the intermediary plays a larger role in ensuring that the innovation process remains active.

When we started this project, our initial assumption was that elderly individuals would exhibit a lack of confidence regarding the use of communication technology. I-2 from NSCC recalled the following: "*Before we had the virtual user café, I thought 'are we really going to have a digital café with the elders?' I thought it was not to going to work at all. I thought that they would not be knowledgeable or comfortable with the technology. They could forget to mute, and I was sure it would be difficult. But it turned out okay; they did very well with technical things, and they were very insightful."* Elderly individuals' lack of confidence with respect to using the technology was reduced due to the early preparation prior to the innovation meeting, when the intermediary (NSCC) explained how to use the Zoom platform and allowed the elderly individuals to practice using it. Interestingly, the feeling of insecurity regarding virtual activity was strong among the client firms. From the interviews, we learned that client organizations might not feel capable of conducting virtual innovation activities with participants. I-1 from the Fire Department noted that "*We were three persons from the Fire Department, and each one of us had to lead one group in the innovation process. We were supposed to lead the conversations. So, I was nervous about that. We are not used to doing it digitally. The innovation process was also new.*" When the intermediary engages in facilitation tasks, the client organization has more opportunity to interact with participants. I-3 from the Fire Department added that *"It's easiest to lead a discussion when you're not taking notes."* This finding highlights the importance of the intermediary role played by the organizer and the need for the presence of such an intermediary throughout the event to support the interactions between participants and organizations (Ståhlbröst and Bergvall-Kåreborn, 2011). It is possible that playing a central role in the innovation process can increase the client's feeling of ownership (McConnel et al., 2018), which would be relevant in the case of a pilot implementation of a new method of user inclusion. However, the client would normally feel ownership of their own innovation process in any case, and efforts are usually focused on increasing the ownership of the users included in the process (Jørgensen et al., 2018; McConnell et al., 2018).

The third focus of the discussion pertains to the participation of elderly people. The heterogeneity of participants was an issue noted by interviewees from the NSCC and the two clients (the Fire Department and Sensio). During the first phase of the pilot, representatives from the client mentioned that women were quieter, giving more space for men when they spoke. This finding could be explained in terms of the customs and habits of this age group and/or in terms of the fact that men are responsible for the "hard" maintenance of the house in Norway and thus exhibit more interest in household gadgets in a broader sense (Kitterød, 2012). I-3 from the fire department suggested that *"the old ladies could have been in a separate group from the old men. The same result happens with refugee groups. I usually give information to men and women together, but then we send men out and talk only to women about safety in the kitchen and burns affecting children."* This phenomenon is linked to the findings reported by Mordini et al. (2009) concerning the fact that the variety of participants influences their active participation. This finding also highlights the recruitment of participants, which was noted by some interviewees and discussed by Eisma et al. (2004). The choice of participants strongly influences the effectiveness of an activity in terms of innovation. While gender might have influenced the differential contributions of male and female participants (De Witte et al., 2021), the impression suggested by our study is that men contributed more actively to the discussions because in their generation (70+ years old), men played more active roles in working life and politics, whereas such a career was not as common for women. It is also possible that the virtual format may have played a role in these differences. The recruited women appeared to have less experience with digital communication, which could hinder their contributions. Many of the men, on the other hand, were more actively engaged in unions or associations that had already transitioned to using virtual communication following the onset of the COVID-19 pandemic. It is not possible to identify the exact degree to which age, gender, and the virtual format impacted these uneven contributions, but it seems likely that all of these factors influenced this observation.

A fourth point regarding the inclusion of elderly individuals that emerged is that these individuals were motivated to collaborate in the innovation process if they also benefited from that process, not only in terms of the products that could result from the innovation process but also in terms of learning. Participants expected to obtain new knowledge that was targeted to their needs. Elderly participant I-16 exhibited a positive attitude towards the activity with the Fire Department, noting that "*I've learned a lot and have become more certain that I'm not sure about everything, but I'm much safer*". She added that "*The theme was the most important thing that made me [participate again in WS2]*." Elderly participant I-14 exhibited an interest in participating in additional similar activities by saying that "*I want to be someone who's learned something…and I will even be wiser and can help others. [I am] interested in dealing with reality. If it's a café, I'm interested in that too". It was not because I was going to learn about the fire brigade; the theme was relevant because it can be applied to almost everything*". Moreover, some elderly individuals mentioned that they were willing to participate virtually in collaborative innovation with firms to keep themselves "up to date" in terms of using digital tools, which represents a specific motivation for digital participation. This finding echoes the key motivational factors suggested by Ståhlbröst and Bergvall-Kåreborn (2011), such as learning new things, stimulating curiosity, and testing innovative products and services.

A fifth noteworthy point of discussion that represented an overarching theme throughout the analysis was trust. This theme is important to teamwork in general (Breuer et al., 2016), to virtual teamwork (Breuer et al., 2020), and to collaborative innovation (Ceasar et al., 2017). In a virtual innovation workshop, participants face the inherent risk of failure, such as the production of bad ideas, pressing the wrong buttons, or asking stupid questions. Therefore, an ability and willingness to take risks is necessary in innovation contexts, and this willingness requires participants to trust one another. In our data, we saw several efforts that were made to establish trust among the firm,

the intermediary and the elderly participants. Since elderly individuals are frequently less digitally adept than the working population, they were made the focus of trust-building efforts, which took three main forms. First, recruiting participants via organizations such as the Pensioners' Association helped establish trust because by sharing information regarding the event, the association conferred legitimacy on the NSCC. A few participants were recruited via friends and family, which also helped build trust, as explained by I-7, who was recruited by her relative: *"I would have been sceptical if it was someone else because it's difficult with the computer. I was afraid I'd press the wrong button on the computer. (...) It wasn't hard when [my relative] showed me [how to do it], and there were no problems".* This participant also alluded to the second point, which entailed the provision of guidance and opportunities to practice to elderly individuals before their participation as a means of ameliorating their potential discomfort resulting from low media literacy (Breuer et al., 2020). Third, in the case of the Fire Department, conducting two sessions was a way of familiarizing participants with the virtual format and with one another prior to the idea-generation phase. In the case of Sensio, this practice was echoed by the use of an initial breakout room for the same purpose.

Dedicating time to allow participants to become familiar with one another and the people from the organizations who conducted the virtual activity as well as the attempts to reduce digital difficulties align well with the recommendations made by Breuer et al. (2020). The findings of those authors indicated that one of the main aspects that causes virtual teamwork to be challenging is the fact that the process of developing trust takes longer than in the context of face-to-face teamwork. Neutral facilitators have frequently been highlighted as key to establishing trust in innovation processes (Jørgensen et al., 2018). Namely, when the discussion is facilitated by a neutral intermediary, participants feel free to express criticism towards the firm/product/service that they might otherwise keep to themselves to spare the feelings of firm representatives. Elderly participant I-15 highlighted the importance of facilitation: "*I am left with an impression that [the facilitator] was curious and engaged (...) It was motivating, it's an important element. (...) Someone who says 'that's an exciting thought'. (...) [The facilitator] was good at that. I think it's a more important aspect of communication in the digital world".* As this participant indicated, facilitation is particularly important in the virtual format due to the limitations of online communication (Breuer et al., 2020).

6 Conclusion

Although we cannot draw solid conclusions regarding the best method to facilitate the virtual inclusion of elderly individuals in the early stages of the innovation process, as the innovation process in the two client organizations (the Fire Department and Sensio) has not been concluded with the launch of a process or product, we can draw attention to some elements that might suggest insights into best practices with respect to the design of a method of ensuring the virtual inclusion of elderly individuals.

From a more theoretical perspective, scholarly discussions concerning innovation intermediaries provide a useful lens that can help innovation scholars and practitioners comprehend the complexities of the actors and institutions that are involved in the design and implementation of a new virtual space for collaborative innovation. As studies indicate, the activities that innovation intermediaries perform vary broadly among innovators (Howells, 2006; Howells and Thomas 2022). In regard to virtual spaces, collaborative innovation would benefit from more structured involvement from intermediaries since client organizations may not feel capable of conducting virtual activities. Social hints, emotions and feelings are more difficult to grasp virtually than in interactions in real life, which demands more focused and prepared intermediation.

In our case studies, when we transitioned from planning and designing to implementing the virtual inclusion of elderly individuals, we noticed the emergence of a series of obstacles, which raised questions regarding how such a process could be better designed for ease of implementation in order to minimize the drawbacks resulting from the unique characteristics of elderly individuals with respect to using the technology. As practical implications of this study, we discuss some challenging factors associated with the implementation of the "virtual user café", thereby providing insights into ways in which the inclusion of elderly individuals during the early stages of the innovation process could be made smoother in the future. Firms planning to include elderly individuals in the innovation process to design better products and services should develop this inclusion as a two-way process, according to which the firm obtains knowledge from the participation of elderly individuals and simultaneously offers those individuals some knowledge (or other incentives) in return as a motivating factor. Demonstrating the value of participation to elderly individuals, such as by providing them with opportunities to learn something, may encourage their involvement. This issue is worth considering when planning collaborative innovation with elderly individuals even beyond the context of a virtual space.

Another interpersonal aspect pertaining to collaborative innovation via virtual spaces is represented by the various means by which trust is developed so that cocreation with users can be accomplished. While efforts to developed trust with elderly individuals appeared to be successful, the assumption that the firms were comfortable during this process may have been an oversight, as illustrated by statements made by individuals from the Fire Department. This situation might indicate that the intermediary bears a great deal of responsibility in this regard, both during the recruitment process and when acting as facilitators of the innovation workshops.

As the participants in our study (client organizations and elderly individuals) were unfamiliar with collaborative innovation, especially in a virtual space, the question of whether participants with previous experience with face-to-face collaborative innovation would exhibit different behaviours remains unanswered. Additionally, the virtual space that we present faces certain limitations; for instance, users are unable to interact with products in real life. Brainstorming and obtaining knowledge from users during the early stages of the innovation process worked well; however, it cannot be affirmed that this virtual space would continue to generate reliable outcomes if the firms were to need inputs in the final stages, i.e., for testing prototypes. These workshops were conducted during the COVID-19 pandemic, when many traditional methods, such as physical meetings, were not feasible.

Specifically, regarding elderly individuals as the user group, insufficient attention has yet been given to the way in which virtual spaces can enable collaborative innovation. We have tried to contribute to this scholarly debate by providing an exploratory case study of a virtual method designed by an innovation intermediary, including by providing details and describing the challenges encountered when this process transitioned to the implementation stage. Little research has been conducted to investigate virtual spaces for collaborative innovation; therefore, the implications of our study, despite our focus on elderly individuals, may be beneficial with respect to encouraging the virtual inclusion of the general public or that of other special groups (people with disabilities, for example).

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