Applying Experience Design to Facilitate Wellbeing and Social Inclusion of Older Adults

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Abstract. The current article addresses the issue of how to design for meaningful experiences of wellbeing and social inclusion, supported by information and communication technology, among older adults. This is done with regard to a background study conducted for the purpose of collecting end user needs in order to inform design choices. Our design approach is influenced by the theory of Experience Design, in which design should be aimed at creating specific experiences. These experiences are considered to derive from a limited number of fundamental human needs. The study is framed as design research using the methodology of user-centred design as a guide for the creative process. Semi-structured focus group interviews were conducted with 25 older adults, identifying needs of autonomy, competence, relatedness, physical thriving, security, pleasure and stimulation. Design goals were set based on these needs and three interventions were designed and implemented accordingly.

Keywords: Older adults, social inclusion, wellbeing, Experience Design, user-centred design, fundamental human needs, information and communication technology.

1 Introduction

Social inclusion is a current focus of the European Union and the discussion regarding the potential of utilising ICT for facilitating social inclusion is highly topical with reference to the digital agenda of the Europe 2020 strategy [cf. 1]. Social inclusion has been described as "the process of improving the ability, opportunity, and dignity of people, disadvantaged on the basis of their identity, to take part in society" [2, p. 4]. A threefold definition has been proposed by Finnish sociologist Erik Allardt [3]. According to this definition, social inclusion refers to having, loving and being. The concept of having includes the possession of relevant cultural, economic and physical

means to belong. The second concept, loving, refers to social ties and the third concept, being, relates to self-actualisation through civic or work related participation. In short, social inclusion describes the ability to "participate fully in economic, social and cultural life" [4, p. 8]. Having basic needs met, being valued and respected are critical factors for all people in a socially inclusive society [5]. By promoting social inclusion, wellbeing and mental health of community members may be strengthened. This is considered a foundation for successful and strong communities [6].

Finland has, similarly to many other European countries, an increasingly ageing population. Worldwide the number of people over the age of 65 is estimated to reach 1.5 billion by 2050 [7]. There are political, economic and social concerns for how this demographic change will be sustainable for society. In the case of older adults, challenges of social inclusion are related to risks of exclusion from material recourses, civic activities, social relations, basic services and neighbourhood exclusion [8]. Older adults living at home face the risk of loneliness, and mental health problems may increase due to isolation [9]. Disadvantages and poor mental health of community members may have a negative impact on social cohesion as this weakens interpersonal trust, social participation and civic engagement [6]. Measures need to be taken to ensure that members of this ageing cohort are socially included, healthy and continue to be positive contributors to society as long as possible.

Digital solutions have significant potential for enhancing the lives of a large number of older adults in an efficient and cost-effective way [10]. These kinds of interventions have the potential of improving older adults' mental and physical wellbeing, enhancing their social connectedness, and generally offering an enjoyable way of spending time. [11], [12], [13]. According to Nycyk and Redell [14], studies on how interventions may contribute to wellbeing in later life generally show positive results when socially inclusive practices are employed. The potential of digital solutions to promote wellbeing will increase as younger generations familiar with ICTs grow older [10].

Our intention in this article is to explore the question of how to design for meaningful experiences of wellbeing and social inclusion mediated through digital solutions and other interventions. Our focus is thus on the perspective of Experience Design and we explore the possibilities of digitally facilitating social inclusion and wellbeing of older adults by theoretically grounding design choices. We specifically address the issue in relation to the Ristinummi 2.0 project. This project involved a broad range of measures executed by the city of Vaasa, Finland, in order to address the challenges of fostering social inclusion in the local community of Ristinummi. This district of the city of Vaasa is known for inhabiting a dense multicultural immigrant population, as well as an ageing Finnish population. Thus, the aim of the project was to explore how various digital solutions and interventions can be successfully used in order to facilitate social inclusion and wellbeing. It is an attempt to combine the two spheres of real life needs of social inclusion and wellbeing and a rapidly evolving society embracing digital technology. The project focuses on social inclusion at a local micro level, with special attention given to the social life and wellbeing of older adults.

The current study is framed as design research using the methodology of user-centred design (UCD) as a guide for the creative process. Experience Design [15], described in section 2, provides a theoretical framework for the purpose of the study.

This is followed by a literature review on ageing and ICT as well as a description of UCD. The background study results and according design goals are then presented and related to design choices made. Three interventions designed and implemented based on these results are also briefly described and followed by some concluding remarks.

By presenting a background study of a design case where fundamental human needs are used as a framework for developing meaningful experiences mediated through digital solutions and interventions, we state an example of a way of categorising data at the fuzzy front end of design. The study also has the potential of contributing to research on wellbeing of pre-frail older adults, as studies focusing on this aspect of health in this particular group of older adults are scarce [10]. There is also a call for more qualitative studies involving older adults, which we answer to through this study [16].

2 Theoretical Background

2.1 Experience Design

The focus of digital design has shifted from the products to the end users' experiences of interacting with the products. There are different approaches to experience-driven design. However, we relied on Hassenzahl's theory of Experience Design [15] in the current design case. Taking the psychological perspective on design, Hassenzahl [15], [17] claims that the key to designing for positive and meaningful experiences is to ground the design on fundamental needs of the targeted population. An experience can be seen as a chunk of time a person has been through and is going to remember and it has been described as "sights and sounds, feelings and thoughts, motives and actions, all closely knitted together" [15, p.1]. According to the perspective, a desired experience should be outlined before a product is designed [15]. This process has been described as follows: *Experience Design* […] starts from the *Why*, tries to clarify the needs and emotions involved in an activity, the meaning, the experience. Only then, it determines functionality that is able to provide the experience (the *What*) and an appropriate way of putting the functionality to action (the *How*). Experience Design wants the *Why*, *What* and *How* to chime together, but with the *Why*, the needs and emotions, setting the tone […]. This leads to products, which are sensitive to the particularities of human experience. It leads to products able to tell enjoyable stories through their use or consumption." [18]. Although there is a strong emphasis on needs and emotions, the design perspective does not disregard other aspect of a product, such as content, functionality, interaction and presentation. These should rather be in line with the experience aimed for [15].

In line with several studies [19], [20], [21], we based the Experience Design approach on the needs listed by Sheldon et al. [22]. This list is based on a variety of prominent theories, such as Ryan and Deci's self-determination theory, Maslow's theory of personality, Epstein's cognitive-experiential self-theory, and Derber's lay theory of human needs. The ten needs are: *self-esteem, autonomy, competence, relatedness, pleasure-stimulation, physical thriving, self-actualisation-meaning,*

security, *popularity-influence*, and *money-luxury*. Studies have shown significant positive correlations between needs fulfilment and positive experiences related to the context of everyday life [22], wellbeing [23], [24] as well as in the context of technology use [19], [20]. For instance, positive and good user experiences (UX) of interactive products [19] and media content and technology [20] are a consequence of fulfilling human needs for relatedness, competence, autonomy, stimulation and popularity. According to these studies, fundamental psychological needs "beyond the instrumental" [25] hold a significant role as a source of positive emotions (e.g. pleasure, enjoyment), wellbeing and as motivators of action [cf. 26]. Referring to the Self Determination Theory (SDT), Szalma [27] argues that in order to design for the need of autonomy, interfaces or tasks should provide enough choices for setting goals. The author continues with competence and explains that this need is supported by digital solutions, which correspond to abilities and skills of the end users and that provide opportunities for developing skills. The third need in SDT-theory, relatedness, is facilitated through technology or content that support social interaction [27]. Hence, we argue that one of the cornerstones for facilitating social inclusion and wellbeing, is to keep the human being and her fundamental needs in mind [cf. 2], [3], [4], [5].

2.2 Digital Design for Positive Ageing

In order to make appropriate design decision we need to understand older adults' level of digital literacy and experiences of social inclusion and wellbeing [cf. 14] in their own community [28]. Later life is often characterised by challenges and loss, which is related to declining physiological, cognitive, and mental abilities [cf. 29], [30] as well as narrowing social relationships [31]. This highlights the relevance of considering issues of special needs for accessibility, usability, and UX in the design process. Security issues, fear of damaging the technology through inadequate use and expenses [32], motivation, and attitudes affect the adoption of technology among older adults [33], [34]. However, older adults are positive and motivated to use technology if they perceive it as beneficial and meaningful [35], [36]. The acquisition of digital skills may also in itself contribute to a sense of wellbeing and social inclusion [37], [38], [10].

The design of technology for wellbeing and social inclusion of older adults has mainly focused on helping them overcome problems in their everyday lives and to stay in touch with family and friends. However, there has been a shift from problem-based design to more possibility-driven and positive design [cf. 17], [39]. By focusing on positive experience of older adults, we may identify motivators for using digital solutions and resources related to adaptation and wellbeing, and thus design meaningful digital solutions and interventions promoting wellbeing and social inclusion [40]. Research pointing to positive aspects of ageing relate to the possibilities for growth and development. Negative thoughts and negative affect decrease with age, whereas positive affect remains stable, only decreasing in some studies among the oldest old [31]. These changes in psychosocial development have been explained as a change in perspective due to life experiences and limited time left to live [31]. In a literature review on hedonic and eudaimonic wellbeing in old age,

Araújo, Ribeiro, and Paúl, [41] concluded that optimism, positive attitudes toward ageing, purpose in life, resilience and coping are important factors for maintaining or regaining wellbeing in old age. Significant correlations have also been found between older adults' wellbeing and the fulfilment of autonomy, competence and relatedness [42]. Psychosocial interventions for facilitating and promoting relatedness have, for instance, shown a significant increase in wellbeing and quality of life of older adults [10], [11], [12], [13], [43]. Further factors contributing to wellbeing and social inclusion are the state of the elderlies' physical environments (e.g. their home and their neighbourhood), availability and proximity of services, as well as opportunities for engaging in hobbies [44], [45] and recreational activities [14], [46]. Nature and green areas have also proved to be beneficial for quality of life [47], [48], [see also 46] and for facilitating social activities [49]. Wellbeing may further be enhanced by the experience of natural light and the cycle of change between day and night [50], [51].

Experts agree that for digital solutions to be used by older adults, they have to be directed towards appropriate services that reflect and respond to their needs [52]. In order to accomplish this, researchers argue for a "participative approach to the development and delivery of e-enabled services" [33, p. 6]. UCD is an approach, which enables designers to gain an understanding of targeted end users, as their needs, desires, abilities, and limitations are determined [53]. The intended end users are involved throughout the design process. It is "an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, and usability knowledge and techniques. This approach enhances effectiveness and efficiency, improves human wellbeing, user satisfaction, accessibility and sustainability; and counteracts possible adverse effects of use on human health, safety and performance" [53]. Thus, the concept of UCD is referring to interface design of technology products. However, we use the term in a wider meaning within the field of Experience Design [cf. 46]. Here, the interface might as well expand beyond the technological interface into real life settings.

Although there are several approaches to and inspirational sources for a design [cf. 54], we argue for a user-centred empathic approach in the context of designing for positive experiences of social inclusion and wellbeing of older adults living in a specific location. This is due to the fact, that the population is a heterogeneous group of end users, with different abilities, needs and perceptions of social inclusion and wellbeing [cf. 14], [28], which may be overlooked if we merely base our design decisions on previous research or the designers' own assumptions. In the current case, we employed a research-based design method, in which a background study was carried out in order to inform the design of the digital solutions. Research was used at the front-end of the design process, in order to be able to create experiences that the end users can identify with, as it relates to their fundamental needs derived from their own context of living. User research was also conducted later in the design process in order to evaluate users' experiences of the interventions and to identify needs for improvements. The details of the UCD process employed in the current project have been described elsewhere [cf. 46].

3 Background Study

The aim of the study was to inform design goals in the front end of the design process. It specifically aimed to 1) investigate older adults' experiences of social inclusion and wellbeing in the suburb; 2) map these experiences to theories of fundamental human needs; 3) define design goals based on the results and 4) create interventions supporting the fulfilment of these needs and facilitating positive experiences of social inclusion and wellbeing.

3.1 Data Collection

A total of 25 pre-frail community-dwelling older adults (8 males and 17 females), living in the Ristinummi suburb, participated in the study. Time of residency in the area varied between ten and fifty-eight years among the participants. The participants were recruited through local church activities and local settlement activities, as well as through advertisement on bulletin boards at the local stores and health care facilities. The characteristics of the focus groups are presented in Table 1. Participation was voluntary and 30-euro gift certificates were used as incentives. Four semi-structured focus group interviews were conducted in order to discover the elderlies' positive and negative experiences related to the following topics: *the physical environment* (their neighbourhood and the house), *infrastructure and services*, *daily living activities*, *subjective wellbeing* and *digital literacy*. The interviews were scheduled for one hour at a time and conducted on site, at the facilities of the settlement and the Lutheran congregation. Two researchers were involved in the interviews and the interviews were audio-recorded with participants' consent.

Table 1. Characteristics of the focus groups.

Focus group	Number of participants	Gender	Digital Literacy	Background
1	6	Females	Low	Finnish
2	5	Females	Low	Ingrian
3	8	Males	Mixed	Finnish
4	6	Females	Mixed	Finnish

3.2 Data Analysis

The audio-recorded interviews were transcribed and coded. At the first phase of the analysis, we applied an inductive approach and the transcripts were analysed according to principles of qualitative thematic analysis. In line with the process described by [55], the transcripts were repeatedly read and codes were generated after which themes were searched for, reviewed and named. We then applied a more deductive approach, where the themes were mapped to the fundamental needs listed

by Sheldon et al. [22], as determinants of need satisfaction or dissatisfaction. This was done in an attempt to ground the design process in the theoretical perspectives of Experience Design [15] and fundamental human needs [22] and to ensure links with existing literature. The last categorisation was conducted by three researchers independently. Any discrepancies were discussed and a consensus was finally reached. The transcripts were then re-read one last time in order to check for additional categories and/or categories needing revision. No additions nor changes were required.

4 Results

The findings from the study are presented below. Firstly, we present the target group's experiences of need satisfaction and dissatisfaction related to their sense of wellbeing and social inclusion. Design goals for supporting wellbeing and inclusion, are further defined based on the experiences. Secondly, we describe the concrete outcomes of the study, i.e. the design choices made, along with assumptions about and users' experiences of how these support wellbeing and social inclusion.

4.1 Experiences and Design Goals

The most prominent needs identified in the study were relatedness, competence, autonomy, physical thriving, pleasure/stimulation and security [22]. These are scrutinised next, along with a presentation of defined design goals. A summary of the results are presented in Table 2.

Experiences of relatedness and according design goals. Relatedness has been defined as a "[f]eeling that you have regular intimate contact with people who care about you rather than feeling lonely and uncared for" [22, p.339]. The need for relatedness was mentioned in all of the focus group interviews and its importance in promoting wellbeing among older adults has been highlighted in several studies [cf. 10], [11], [43]. Aspects supporting the need for relatedness mentioned by the participants in the current study included socialising with friends, relatives and neighbours, as well as participating in organised social activities. Several of the participants were pleased with the fact that there are many elderly people living in the area. This is exemplified in the following interview excerpt: "It is much nicer to live here [compared to the city centre]. In my house, the solidarity between the inhabitants is quite good. […]. There are only older people living there now and they do not really like a lot of noise. In the summer, we sit in the backyard where I usually put out chairs and benches to sit on" (A1). "It is also quite good where I live. We live in a house of four families by the street, with a large backyard. It is amazing there in the summer" (A2). "Within minutes after sitting down on a bench, we are ususally several people sitting there. You really cannot complain" (A1). One focus group of women who immigrated from Ingria about 20 years ago, seemed to be particularly satisfied with their sense of relatedness and generally with living in Ristinummi. They said that they have nothing to complain about and that they look after each other.

However, the loss of close relationships, such as the death of a spouse or friends and children moving away, were issues of dissatisfactions for several participants. This was particularly evident among participants who had moved to the area due to work related reasons and who were now retired and living alone. A sense of loneliness in the evenings was mentioned by a majority of participants. Traditional media technology, such as television and mobile phones, was used for combatting these feelings. One female focus group wished for more spontaneous visits at each other's homes. One participant particularly mentioned how sad it was when a family of immigrant background moved out from next door. She said they always had their door open for visitors. However, this was not an issue for the male focus group. They preferred to meet outside of their homes, in order to relax and be on their own once at home. Both the male and female focus groups also mentioned that they lack a community centre where they could meet up, although there is a local settlement facility for this purpose.

Design goals: Based on these findings, we concluded that in order to combat feelings of loneliness and to promote a sense of belonging, the interventions should create opportunities for social interaction.

Experiences of competence and according design goals. A competence experience includes the "[f]eeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective" [22, p. 339]. In our study it was evident that the older adults prefer to engage in activities they already know and master. They want to feel competent in what they are doing and, thus, tend to avoid situations where there is a risk of losing face. Regarding their digital competence, the interviews revealed mixed results. Some participants did not own a computer, while some owned a computer but did not use it. Reasons mentioned for not using computers were: lack of skills for using the technology, lack of confidence in the ability to use the technology, concerns about security, and a lack of interest. For instance, one of the female focus group participants said that: "No, although we have it [Internet] at home. I don't know how to use it and I wouldn't learn because I have bad eyesight" (D2). Others did use their computer for paying bills, booking appointments at the hospital's clinical laboratory, reading evening magazines, and searching for knitting instructions. Several of the participants mentioned that they would like to learn how to use computers and the Internet. This is highlighted by a male interviewee who said: "We need someone to teach us" (A1). Others did not find it important, although they acknowledged the increasing amount of information and services available online. Thus, the majority of the participants had a low level of digital literacy although many of them were motivated to learn how to use computers.

Design goals: In order to support a sense of competence and develop their skills of using technology related to the experiences designed for, the provision of digital support as well as technology was considered to be important in order to avoid exclusion [cf. 37], [38], [10]. In addition, as the majority of the participants had a low level of digital literacy, further goals were to design user-friendly digital solutions or to use more traditional media technology that the target group was familiar with.

Experiences of autonomy and according design goals. Autonomy is about "[f]eeling like you are the cause of your own actions rather than feeling that external forces or pressures are the cause of your actions." [22, p. 339]. The need for autonomy in the case of older adults was related to being able to manage on their own

and live independent lives. Making their own decisions about what to do with their time is an important factor contributing to a sense of autonomy. The older adults' autonomy and sense of social inclusion are supported by the proximity and availability of a wide variety of services, which was highly appreciated by all of the participants. Having a driver's license and a car and the availability of regular public transportation were also factors supporting autonomy. All these factors have previously been found to contribute to the wellbeing and social inclusion of older adults [14]. However, complaints were made regarding expenses related to public transportation and participation in certain activities, low frequency of bus services as well as the lack of a local bank office. This is highlighted in the following interview excerpt: "[…] The local bank office was closed down, and that is an important service for the elderly. […] now you have to go all the way to the city centre. Getting there is quite expensive, like a small bill" (C5). Seasonal issues, more specifically the ice and snow during winter, were also addressed as a factor hindering the participants' ability to take a walk. This restricted their independence regarding many aspects, such as going shopping or attending activities on their own.

Design goals: In order to support autonomy, we concluded that it should be voluntary to use or take part in the intervention. We further concluded that any activity or event designed in relation to the solutions should be affordable and within proximity, thus avoiding exclusion due to transportation and participation fees. It should further be possible to take part in experiences designed for during summer.

Experiences related to physical thriving and according design goals. Physical thriving refers to "[f]eeling that your body is healthy and well-taken care of rather than feeling out of shape or unhealthy" [22, p. 339]. Factors supporting the fulfilment of this need included the living environment, which was described as beautiful, green and nice. The closeness to nature and availability of paths for walking, bicycling and skiing in the area are highly appreciated. This is illustrated in the following interview excerpts: "It is a nice place" (B1). "Yes it is. The nature is beautiful in this area" (B2). Current studies on the wellbeing of older adults have highlighted the positive effects of spending time outdoors in green areas [47], [48], [49], [50], [51]. However, physical issues sometimes make it difficult to get out and enjoy these opportunities. Another determinant of dissatisfaction was the lack of a local gym. This issue was raised in both the male and female focus groups.

Design goals: As a consequence of these results, we decided to aim for solutions and interventions that would nudge the older adults to go out in the neighbourhood in order to gain the benefits of health and social activity identified in previous research.

Experiences of pleasure and stimulation and according design goals. This need has been defined as a "[f]eeling that you get plenty of enjoyment and pleasure rather than feeling bored and under stimulated by life" [22, p. 339]. The older adults' need for pleasure and stimulation is evident as most of the participants engage in a wide variety of fun, pleasurable and stimulating activities. These include playing games, handicraft, reading books, watching television, participating in organised activities by the church or local Settlement, as well as travelling. This is highlighted by the following excerpt in which one interviewee states: "[…] we go for walks and in the summer we are spending a lot of time out in nature. We play Bingo on Fridays and we talk" (D1). Several participants mentioned that there are a lot of activities available in the community but that it is up to oneself to be active. Opportunities for engaging in

hobbies and recreational activities affect wellbeing and sense of social inclusion [14]. However, there was a call for more activities by some of the female participants. They specifically mentioned interesting lectures and cultural events to attend.
Design goals: As a consequence of these results we concluded that the design should result in experiences of fun and/or stimulating activities corresponding to the target groups' interests.

Experiences related to security and according design goals. Security is defined as "[f]eeling safe and in control of your life rather than feeling uncertain and threatened by your circumstances" [22, p. 339]. Overall the participants felt safe in the community. The interviews revealed that the need for security involves both physical safety and the sense of security provided by daily routines and close relationships with other people [cf. 14]. The area is experienced as safe and secure during daytime. Contrary to this, there were experiences of insecurity in the evenings and at night, especially outside the local pub. Property crimes and increased drug use, were also issues of concern. Both the male and female participants concluded that it is unsafe for females to be out in the community late in the evenings.
Design goals: In order to ensure a sense of security we decided that it should be possible to enjoy the experiences designed for during daytime. Although the participants felt lonely during the evenings, it was more important to us to design for experiences, which may be enjoyed during safe hours and in safe surroundings.

Table 2. Experience design goals related to need satisfaction and dissatisfaction.

Needs	Determinants of satisfaction	Determinants of dissatisfaction	Experience design goals
Autonomy	Ability to manage on their own Independence regarding decision making Public transportation Proximity of services	Expenses of transportation Expenses of participation in activities Low frequency of bus services Seasonal issues Lack of local bank office	Voluntariness Free (of charge) Proximity Summer activity
Competence	Familiar activities Activities contributing to a sense of mastery Digital skills	Low digital literacy	Digital support User-friendliness Familiarity
Relatedness	Close social ties Distant social ties Participation in social activities Technology	Loneliness in evenings Loss of close relationships Lack of a community centre	Social interaction
Physical thriving	Physical activities Closeness to nature Opportunities for outdoor exercise Local health care services	Physical ill health Lack of a local gym Lack of local clinical laboratory services	Physical activities outdoors

Pleasure/stimulation	Leisure activities Media consumption Travelling Church activities	Lack of interesting lectures Lack of local cultural events	Fun Stimulation Pleasure
Security	Physical safety Daily routines Close relationships	Lack of security at night Property crimes Increased drug use	Safety Daytime activity

4.2 Experience Design Choices

As the digital literacy was low for the majority of the test participants, we found the Experience Design approach to be valuable as our focus was on defining experience goals delivered through technology rather than to focus on technology per se. Next in the design process, three researchers compared the design goals to existing measures and interventions consisting of digital solutions for meeting needs of the target groups. Here the guidelines from the funding agency restricted the process to designing and piloting content related to existing technological solutions, as opposed to developing completely new digital solutions. Identified options were discussed among the researchers. One option we considered was creating a Facebook group for facilitating social relations and for informing participants about local social activities and events. However, as the digital literacy among most of the focus group participants was very low, we concluded that this option would not be a good choice as the main aim of the project was facilitating social inclusion. We wanted to avoid the risk of exclusion due to low digital competence and lack of appropriate technology. However, three interventions were finally selected based on the goals set. These were: a local digital mentorship programme for meeting the need of improved digital literacy among the target group; a geocaching solution based on local stories for promoting and facilitating social relatedness, physical activity, pleasure and stimulation; a local cinema event for contributing to needs of pleasure and stimulation as well as relatedness. Next, we present the cases and discuss their potential of meeting identified needs and defined experience goals. Results from UX studies evaluating the interventions, are also briefly described. The experience design goals UX evaluations of the interventions are also summarised in Table 3.

Digital mentorship programme. The need to improve their digital literacy was clearly expressed by participants of our study. As a response to this, we planned a local digital mentorship programme with the aim of supporting older adults in the art of being a digital participant of everyday life. It was a programme for digital support developed in co-operation with the local adult education centres and the local school of Ristinummi. The plan was that the support and guidance should be given by pupils during computer classes at the local school. The programme functioned on a drop-in basis and was built around individual needs of participants. Participation was voluntary and free of charge. This setup was aimed to increase their sense of autonomy and competence, which the improved digital skills most likely also do [cf. 10], [37], [38]. The mentorship programme further aimed to build older adults'

confidence in using technology in general. We also assumed that the involvement of the local school would strengthen participants' local identity and contribute to a sense of relatedness and belonging [cf. 22]. We were not able to evaluate the UX of this intervention.

Geocaching trail incorporating storytelling. We decided to test geocaching as a digital solution for promoting wellbeing and social inclusion [see 46]. Geocaching is a worldwide game that involves hiding and finding hidden artefacts or caches using GPS. A cache can be created by anyone and hidden anywhere in the world, after which the coordinates are posted on the official Geocaching.com website in order for others to find it. Thus, we saw the potential of a geocaching solution to be able to fulfil many of the needs identified in the background study [46]. Our assumption was that the solution would meet the needs of physical thriving, autonomy, competence, pleasure, stimulation and relatedness, which all promote mental health and wellbeing [22]. Previous studies have, for instance, shown that motivations for participating in geocaching include health, physical activity, education, togetherness, natural beauty, challenge, fun, discovery, and technological curiosity [56], [57]. Thus, we created six geocaches in cooperation with local people, writing and presenting stories about historical local figures, places, and people [46]. A Geocaching.com membership is also free of charge, thus excluding economic barriers for participation.

In order to eliminate barriers related to lack of access to appropriate technology, lack of skills of using the technology, or fear of feeling incompetent, we organised two geocaching courses in cooperation with the local adult education centres. The first course specifically targeted older adults of Ristinummi. During the course, participants were able to borrow technical equipment needed for the geocaching activity. They were taught how to use the technology, GPS, the Geocaching.com website, and how to search for caches. The course and a geocaching event organised within the frames of it, were further intended to promote relatedness. The second course was not restricted to older participants.

Users' experiences of the geocaching activity and the designed geocache trail were evaluated through individual interviews with six older adults (3 males and 3 females). The analysis also included 589 written logs of the trail, which were posted on the official Geocaching.com website. The results of this study have been published elsewhere [see 46] and are only shortly presented here. The study, which addressed the potential of geo-located storytelling in the context of social inclusion and wellbeing of older adults, revealed the fulfilment of a sense of autonomy, competence, relatedness, pleasure-stimulation and physical thriving [46]. Social and health benefits (physical, psychological and cognitive) of the activity were particularly highlighted, which proves the potential of the solution to contribute to wellbeing and a sense of inclusion of older adults. Relatedness was, for instance, supported as the geocaching activity was considered to be a way of spending time with family and friends and meeting like-minded people. It was also considered to facilitate collaboration and to function as a subject for making conversation. Factors found to support physical thriving were physical exercise, the opportunity to enjoy nature, a reason to get out of the house, weight loss and decreased blood pressure. The geocaching activity was generally considered to increase the motivation for participating in physical activity and daily walks. The results further show that the geocaching trail, including the stories and geocaches, was considered to be extensive

and well executed. Local users of the solution were pleased that new geocaches were created in the area. The proximity simplified the geocaching activity and resulted in a re-discovery of local places, which brought back pleasant memories. The cache containers were further described as ”fun, colourful, original, surprising, interesting, nice, appropriate, beautiful, refreshing, and good” [46, p. 95]. The interviewees concluded that the technology required for engaging in geocaching is quite easy to use. However, the use of geocaching apps and the Geocaching.com website requires some learning and the participants were pleased that local geocaching courses were arranged.

Local cinema event. A cinema event was organised and held at the local school in order to contribute to the social inclusion and wellbeing of older adults. Mobile cinema equipment was employed in order to provide a high quality experience for the audience. The film that was shown had recently premiered at cinemas across the nation. It was directed by a famous Finnish film director and, furthermore, featured some prominent Finnish actors. The story of this drama comedy is a about a woman in her thirties, who decides to return to her hometown together with her boyfriend and her teenage daughter. Her intention is to take care of her father who is in his 70s and thus, revive their relationship. Moving in with him in her childhood home, together with her boyfriend and a teenager, results in both conflicts and humorous encounters. Our assumption was that this event would meet needs of pleasure and stimulation and a sense of relatedness [cf. 22]. It was also a way of bringing a cultural event closer to the older adults, enabling cultural participation. Our assumption was further that this kind of event would be an enjoyable topic of discussion. Meeting up around an interesting lecture or event was one wish expressed in the interviews. Thus, in order to further contribute to a sense of pleasure and relatedness, the participants were invited for a coffee/tea at the school cafeteria after the film had finished. Showing the movie free of charge and at the local school was assumed to contribute to autonomy and a sense of local identity and to remove barriers related to transportation and financial resources. Further, as this was an experience mediated through mobile digital technology not requiring an active use of the equipment by the target group, there was no threat to the sense of competence or ability to participate.

The experience of the intervention was evaluated by interviewing 11 participants. The interviews revealed that the local cinema event was an appreciated and positive experience. All participants wished for more of these types of events to take place in their local community. As one participant concluded: ”It is better to have the cinema here in the local community compared to the city centre. It saves us both time and money. It doesn’t have to be free of charge either”. One also said that she had not been to a cinema since she was a child and that this event brought back positive memories from her childhood. Another participant stated that: ”You would not expect that this would be arranged here in our community. It was a pleasant surprise”. Thus, this experience met needs of autonomy, pleasure and stimulation. Negative experiences mentioned by the interviewees were that it was sometimes difficult to hear and follow what the actors in the film said. The film should have been texted, in order to avoid this. In addition, some of the participants did not like the movie, although they did enjoy the event. Implications drawn from this study, is that local access to cultural events facilitates positive and meaningful experiences among older adults. Consequently, digitalisation of culture has a potential of enabling and

increasing cultural access and participation by older adults living in suburbs and rural areas.

Table 3. Needs, Experience design goals and UX evaluations of the interventions.

Needs	Experience design goals	Mentorship programme	Geocaching activity	Local cinema event
Autonomy	Voluntariness	x	x	x
	Free (of charge)	x	x	x
	Proximity	x	x	x
	Summer activities		x	x
			UX: independent decision-making; proximity.	UX: proximity; no fees.
Competence	Digital support	x	x	
	User-friendliness		x	x
	Familiarity		x	x
			UX: goal achievement; learning to use technology and apps.	
Relatedness	Social interaction	x	x	x
			UX: subject for making conversation; collaboration; spend time with family and friends; meet like-minded people; read Geocache logs.	
Physical thriving	Physical activities outdoors		x	
			UX: physical exercise; enjoy nature; reason to get out of the house; weight loss; decreased blood pressure;	

Pleasure/stimulation	Fun		x	x
	Stimulation		x	x
	Pleasure		x	x
			UX: educative content; challenge; thrill; evocation; fun.	UX: evocation; fun; pleasure.
Security	Safety	x	x	x
	Daytime activities	x	x	x

6 Discussion and Conclusion

This article presents a background study aiming to uncover how to facilitate digitally mediated social inclusion and wellbeing of older adults. In order to design for positive and meaningful experiences, we applied the theory of Experience Design using fundamental human needs [22] as a starting point for the design process. A needs perspective tries to clarify where the emotion, motivation, and meaning comes from [15], [26] and makes it easier to address meaningful experiences in specific contexts for specific target groups [26]. We used a research-based UCD method, in which focus group interviews with targeted end users were conducted at the front-end of the design process. This background study was designed to illuminate the most important needs of the target groups, which in turn were guiding and inspiring the task of defining experience design goals.

There is a vast amount of information that may be derived from interviews with intended end users at the front end of design. Deciding which ones to implement in the design process is not always an easy task. In our case, we found it useful to map the findings onto the list of fundamental human needs listed by Sheldon and colleagues [22]. This enabled us to comply with the principles of Experience Design and it was a useful framework for categorising elderlies' needs and for setting concrete design goals. This also made it easier to evaluate whether we succeeded in designing for the identified needs and defined experience goals. The results of the UX studies conducted later in the design process [cf. 46] were categorised according to the same list of needs [22], which made it possible to compare the results at the different points in the design process. It further enabled us to compare the results to other studies utilising the same list of needs and an Experience Design approach.

The results of the background highlighted the importance of fulfilling needs of autonomy, competence, relatedness, pleasure and stimulation, security as well as physical thriving. These are in line with previous research on the wellbeing of older adults [cf. 10], [11], [12], [42] as well as positive (user) experiences [cf. 19], [20], [22], [23], [26]. The findings also imply that there are individual differences

regarding older adults' experiences of relatedness as well as preferences for how to meet this need. Ingrian Finns, for instance, seemed to be particularly satisfied with the sense of relatedness and more generally with living in Ristinummi. This has probably to do with their common background. However, being active members of a congregation might also explain the strong bonds of the group and their overall happiness and satisfaction. Recent research point to the fact that religion and religious engagement might be a factor contributing to wellbeing among older adults [cf. 41]. Also, participants who had moved to the area for work related purposes, were the least satisfied with the sense of relatedness. There were also differences between males and females regarding preferences for social interactions within the community. Whereas females wished for spontaneous visits at each other's homes and more events and interesting lectures to meet up around, the males wanted to meet outside of their homes and to participate in different kinds of activities. Thus, this study imply that the fundamental needs are similar across this age group but that there are individual differences regarding the experiences of and preferences and abilities for fulfilling needs of relatedness. Thus, the study supports previous research highlighting the heterogeneity of community-dwelling older adults [10], [14], [16].

Based on the findings from the background study, we defined experience design goals, after which we started to explore and chose solutions and interventions, which would correspond to these goals. The experiences aimed for were the guiding light for the design choices made, which enables the creation and implementation of interventions "for all the right reasons" [15]. As the digital literacy was very low among most of the participants, we decided to focus the interventions on experiences of social inclusion and wellbeing and applying user-friendly technology to support these. We also concluded that it is essential to provide digital support and solutions that are easy to use for novices, thus avoiding exclusion due to lack of digital skills or lack of motivation.

The three interventions designed and implemented were a digital mentorship programme, a geocaching trail consisting of location-based stories and a local cinema event utilising mobile cinema equipment. Results of UX studies validated the potential of these interventions to meet several of the design goals previously defined. Older adults' participation in geo-social, playful experiences, proved to meet several of the needs identified in the background study. The local cinema event was experienced as fun and pleasurable, particularly meeting needs of autonomy and pleasure-stimulation. The UX study of this intervention highlights the importance of bringing culture to the local community of older adults, particularly those living in suburbs or rural areas. The digitalisation of culture has the potential of enabling participation in an efficient way and it might consequently function as a motivator for older adults to start using ICT. The need for digital support was also evident in both the background study and the UX studies evaluating the interventions. We need to keep in mind that interventions and digital solutions designed for facilitating social inclusion and wellbeing might still leave some people feeling excluded [14]. However, designing one solution or intervention that would fit all, may not be a realistic goal. Although, more research in the area will inform on the complexity and depth of these experiences [14].

As with any study, the current one also has its' limitations. The results of the background study are neither exhaustive nor conclusive. However, in line with a UCD

method and the theory of Experience Design, they served as a foundation for informing and basing our design solutions on. Due to the guidelines provided by the financial agency, it might have been more beneficial to restrict the focus group interviews to consider existing solutions in order to identify which ones would benefit the older adults best. However, we wanted to test and validate this kind of needs-based, open approach in order to comply with the theory of Experience Design and principles of UCD. The end users were involved in the piloting of the interventions in order to explore whether we succeeded in designing experiences aimed for and to improve the interventions.

Issues limiting the generalisability and validity of the findings of the study include a low number of test participants, the location variable, and the possibility of group thinking, which is an inherent risk of focus group interviews. Another risk in conducting focus group interviews is that findings are skewed due to one or more participants dominating the discussion. However, this was partly counteracted in our study by conducting interviews with males and females separately. Also, adopting pre-defined themes in the analysis of the data includes the risk of important issues to be left out. However, we combined this with an inductive approach, allowing subsequent themes to emerge in the analysis.

To conclude, understanding older adults' experiences in their own local community is essential when designing and implementing interventions for social inclusion and wellbeing. By applying the method of UCD, designers are able to take diversities and local and individual experiences into consideration early on in the design process. Although the aim of the current project was to design and pilot interventions and content for existing technological solutions, the approach described here is also valuable for projects aiming at designing and implementing more innovative digital solutions. We are, for instance, currently involved in another project, @geing Online [58], which aims at developing an innovative application for facilitating access to social activities among pre-frail older adults living at home. This project applies a similar UCD approach, identifying the needs, abilities and preferences of the target group(s) before making design choices and developing the solution. Further, the advent of new technologies, such as virtual and augmented reality, robotics, Internet of Things, and more intuitive interfaces, provides new opportunities for facilitating positive and active ageing with ICTs. As younger generations whose lives are immersed by ICTs reach middle and late adulthood, these opportunities will be even greater.

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