

# Designing for Suburban Social Inclusion: A Case of Geo-Located Storytelling

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**Abstract.** This article showcases a digital solution for strengthening social inclusion and well-being of senior suburban residents of a socially diverse Finnish town. The study is framed as design research where research is conducted in order to feed into a design process. A background study was first conducted in order to identify the target group's needs, abilities, and attitudes towards the neighbourhood. The results revealed positive attitudes towards the area and the need for relatedness, autonomy, competence, pleasure and stimulation, physical thriving and security. Following a User-Centered Design process we based our design choices on these results and developed a local geocaching solution incorporating storytelling. The aim was to encourage senior citizens to socialize, be physically active and to experience the local urban place. An interview-based evaluation with older adults (n=6) combined with an analysis of online cache log data, showed positive experiences of the solution.

**Keywords:** Experience Design; Persuasive Technology; User-Centered Design; Social Inclusion; Design Research

## 1 Introduction

In order to place this article in a context, we will begin by briefly outlining the Ristinummi 2.0 project. It ran parallel with a project planned by the city of Vaasa, Finland, aiming to address the challenges of promoting social inclusion and well-being in the suburb of Ristinummi. The interventions included renovations and renewing of buildings and public spaces in the area, making them more accessible. Additionally, the aim of the Ristinummi 2.0 project was to explore how digital content may be utilized to promote a sense of social inclusion and well-being among elderly citizens living at home. Three different solutions have been designed and launched in the project so far. They include a local mentorship program providing digital support to seniors in the area, a local cinema event, as well as a geocaching solution consisting of local stories. For the sake of brevity, only the geocaching case is presented in this article. By way of introduction, geocaching is an activity or game that involves seeking out hidden artefacts or caches using GPS (Global Positioning System). A cache can be created by anyone and hidden anywhere in the world. The

coordinates of a cache are posted, by its creator, on the official geocaching-website, in order for others to find it. The activity of geocaching has been implemented and studied in a variety of contexts, for instance, education, tourism, road monitoring systems, virtual worlds such as Second Life, as well as the design of mobile games [1]. It has also been studied in the context of citizen science [2]

In this article, we explore the potential of caches consisting of local stories, in the context of social inclusion and well-being of senior citizens. The study is framed as design research [cf. 3], as research is aimed to feed into a design process, giving directions and validating design choices. By employing a user-centered design process, and by drawing on the theory of experience design as well as principles of persuasive technology, we have attempted to combine the two spheres of real life needs of social inclusion and a rapidly evolving networked society. The article begins with a presentation of the theoretical background guiding the digital design process, followed by a presentation of the design and development process of the digital content. Results from a study evaluating whether the geocaching solution succeeded in what it was designed for is finally presented, followed by some concluding remarks.

The article provides insights into the emerging area of how geo-located storytelling relates to experiences of social inclusion and well-being on multiple levels. Albeit the body of research on geo-social, playful services is growing, little attention has been devoted to the abilities and motivations of senior citizens to participate in these. The results of the empirical data offer unique insights into the subjective experiences of the elderly vis à vis digitally assisted communities. Also, our description of the case of the design process of social inclusion through user-centered design and storytelling points to how storytelling may be employed to encourage experiences of kinship and community, and how the stories were received by the target group.

## **2 Theoretical Background**

The area of digital design research and development spans several theoretical perspectives as it includes end-users and their contexts, as well as a product or content, and its design process [4]. The cross-disciplinary framework of theoretical perspectives we adhere to in the current case include a societal perspective on social inclusion and well-being in modern urban life, a perspective on the needs and abilities of the target group (i.e. senior citizens), and a design perspective. These perspectives are used as corner stones for making design choices. A foundation in such a framework ensures that digital technology is designed and used for all the right reasons [4].

### **2.1 Social Inclusion and Well-Being in Modern Urban Life**

The recent phenomenon of urbanization, urged on by factors such as the demand for workforce in industries, has led to an explosion of city dwellers. In 2014, the urban folks of the entire Finnish population accounted for 84 %, according to numbers from

World Data Bank [5]. The equivalent figure for the European Union is 75 % [5]. According to Louis Wirth [cf. 6], urbanism is characterized by impersonality and social distance. Bauman asserts that whereas in earlier days, the city offered people inside the city walls security and safety, today the very same place signifies uncertainty and even fear [7]. Research in the past decade has highlighted a sharp decline in social capital, particularly in the U.S. [7], [8]. A general sense of community is declining. Factors such as labor migration and urban modernization threaten to undermine social inclusion. However, others have argued that city life offers urban dwellers many opportunities to form close ties [cf. 6]. Further benefits of living in modern cities include: opportunities for increased income and political action, as well as availability of education and social services [9]. The other side of the coin, however, includes citizens who experience inequalities, various forms of exclusion and marginalization, poverty, crime, insecurity, ethnic division and antagonism, as well as serious environmental problems [cf. 6], [9].

Being valued, respected and having basic needs met are critical factors for all people in a socially inclusive society [10]. Finnish sociologist Erik Allardt has proposed a threefold definition of social inclusion, namely having, loving, and being [11]. Having refers to possession of relevant economic, cultural, and physical means to belong. Loving is the equivalent to social ties and bonds with kin and family. Being relates to self-actualization through civic or work related participation. In short, social inclusion describes the ability to “participate fully in economic, social and cultural life” [12, p. 8]. By promoting social inclusion, citizens’ well-being and mental health can be strengthened, which in turn is considered to be a foundation for successful communities [13]. Strong communities have further been claimed to be critical for successful nations [13].

Prior research on factors that promote mental health and prevent depression among senior citizens shows that psychosocial interventions significantly increase quality of life [14]. Interventions aiming to prevent loneliness by providing opportunities for social interaction seem to be overall successful in improving mental health [15], [16]. The state of the elderlies’ physical environments, including their home and the neighborhood, availability and proximity of services, as well as opportunities for engaging in hobbies and recreational activities further effect well-being and sense of social inclusion [17], [18]. Urban nature has also been credited for proving beneficial for quality of life [19], [20] and for helping people to be socially active [21]. Closeness to nature and green areas, being exposed to natural light, and seeing the cycle of change between day and night, as well as the seasons, might further have a positive effect on health, well-being, and sleep [22], [23].

## **2.2 Experience Design for Senior Citizens**

The goal of experience design is to provide positive and meaningful experiences through artifacts or interactive solutions [4]. It is geared towards the content of an experience to be designed in relation to human emotions and the satisfaction of fundamental human needs [4]. According to Hassenzahl [4], the key to experience design is to be found in the fundamental needs of people, which are seen as triggers of motivation and used as a starting point for design. A needs-based approach clarifies

where the emotion, motivation, and meaning comes from [24], and hence, makes it easier to address, and design for meaningful experiences in specific contexts for specific target groups. The approach is grounded in the generalizability of basic human needs listed by Sheldon et al. [25]. These needs are: self-esteem, autonomy, competence, relatedness, pleasure-stimulation, physical well-being, self-actualization-meaning, security, popularity-influence, and money-luxury [25]. A positive relationship between needs fulfillment and positive experiences has been revealed in studies related to the context of everyday life [25] as well as in the context of technology use [26], [27]. A similar correlation has also been found in the case of older adults' well-being and the fulfillment of autonomy, competence and relatedness [28]. Thus, according to the results from these studies, technology can be regarded as an extension of our ability to fulfill our basic needs.

According to the model of persuasive technology, a targeted behavior is more likely to happen when an individual's high motivation is in line with high ability to perform the desired task [29], and the behavior timely triggered by the technology. In the case of older adults, experts agree that for digital solutions to be used, they need to be directed towards "appropriate services that reflect older people's and respond to their needs" [30, p. 2]. Due to declining physiological, cognitive, and mental abilities of older adults [cf. 31], [32], issues of special needs for accessibility, usability, and user experience are of high importance in the design process. Security issues, fear of high costs or damaging the technology through inadequate use [30], motivation, and attitudes affect the adoption of technology in general among seniors [33]. Researchers argue for a "participative approach to the development and delivery of e-enabled services" in order to meet the needs of and empower older adults as end-users of technology and digital solutions [33, p. 6]. The User-Centered Design (UCD) process is a tool for designers to gain an understanding of targeted end-users, as their needs, desires, abilities, and constraints are determined [34].

Based on these theories we assumed that tasks must be meaningful [cf. 4], [25] within the ability range of the population, and timely triggered to create positive experiences [cf. 29]. Our ultimate goal was to design for positive and meaningful experiences, which fulfill fundamental needs related to social inclusion and well-being, through the use of technology.

### **2.3 Related Research on Positive Experiences of Geo-Located Storytelling**

In a study on players' experiences with geographical collaborative systems, Hooper and Rettberg [35] found that geocaching is strongly grounded in social experiences, such as fellowship, cooperation, and community. Another common aspect found related to competition, and challenge, strongly coupled with a third stark trait of geocaching, namely excitement and thrill. In their study, geocaching came across as goal-oriented, exciting and energetic. Similar to these findings, previous studies have shown that incentives for participating in geocaching include health, physical activity, togetherness [cf. relatedness], education, natural beauty, challenge, discovery, fun, and technological curiosity [36], [37], which all promote individual well-being [cf. 15], [16], [17], [18].

Relating storytelling to locations is not a new phenomenon. However, the advent of new media, mobile technology and geo located services provides new opportunities for location-based storytelling. In geocaching activities, the narrative of a cache has been found to be one key to creating a positive experience for geocachers [38]. Ihamäki [38] defines the narrative experience within the context of geocaching as “the interaction between objects and physical location”. She found that storytelling through geocaching can impact the end-user as the “narrative experience can shift and take on new meaning when we are forced to challenge our thinking during the interaction that has solidified our perceptions, attitudes, and beliefs.” [38, p. 109]. She further describes the story to be twofold: the narrative of the cache itself as developed by the creator of the cache, in addition to the narrative experience of the cache visitors’ experiences in the moment, including the whole context and experience of their hunt for the cache [38]. The possibilities of geocachers to create own content and monitor other players are factors attributed to the success of the geocaching.com site [39].

### 3 Designing the Content

Ristinummi 2.0 adheres to design research [3] as data is collected before, during and after the design of the digital content. The data collected before explains the needs of the target audience. This is part of a user-centered design process, which extends throughout (during) the iterative development of the solution. Here, the aim is to gather data for the improvement of the design [cf. 3]. Understanding users’ subjective experiences with interactive systems is an essential determinant for developing and improving product [4]. The data collected after the design of the solution involves the final implementation in the targeted context and for the targeted audience. The purpose is to see if the goals of the solution are met and gather knowledge about the impact and user experience of the design [cf. 3].

#### 3.1 The UCD Process

In order to properly understand and design for the needs of the citizens, we used a UCD approach including several phases. *Phase one* involved a background study including target group interviews, expert interviews and a literature review. A qualitative analysis of the collected data was conducted with the purpose of identifying possibilities and limitations of facilitating social inclusion and well-being of the target group, through digital solutions. This was compared with existing measures and activities aimed at the intended target group. The results of the background study highlighted the importance of fulfilling needs of autonomy, competence, relatedness, pleasure and stimulation, as well as physical thriving [cf. 4]. The local availability and proximity of services, public transportation, organized activities, the closeness to nature and the availability of trails for outdoor activity, were further found to contribute to social inclusion and well-being of the senior citizens of Ristinummi [cf. 17], [19]. However, one finding of the study was that most

of the participants felt lonely. Thus, lack of social relations and sense of belonging was one aspect of social inclusion needing some kind of intervention. Dissatisfactions regarding declining physical health were also mentioned by most of the participants. As a consequence of these results, we aimed for a persuasive solution [29] that would nudge senior citizens to go out in the neighborhood in order to gain the benefits of health and social activity identified in the previous research [19], [120], [21], [22], [23]. We further concluded that it is essential to provide digital support and solutions that are easy to use for novices, as the study also revealed mixed levels of digital literacy among the interviewees.

*Phase two* involved planning and designing for experiences that would target relevant needs identified in phase one; a needs-based approach for making design choices. A geocaching solution was chosen, as the geocaching concept was considered to be able to meet several of the needs identified in the background study. A basic geocaching.com membership is also free of charge, thus, eliminating an economic barrier for participation in the activity [cf. 29]. At this point, a storyteller was involved in the project. The storytelling process started with an ideation phase. Decisions regarding the content and the number of geocaches were made at this point. In order to explore and learn about the area and its history, the storyteller attached to the project availed himself of a number of sources and methods. Reviewing literature on the history of Vaasa provided facts and figures. Interviews with local citizens provided stories from a personal angle from the past 30-40 years. Periodicals published directly connected to the suburb, available from the mid-70's onward, provided stories about the suburb itself and current issues from the past years. Historians employed by the church provided facts on the different graveyards and their histories. The storyteller and one of the researchers further carried out location scouting in order to learn more about the suburb. *Phase three* consisted of developing and putting together content for the digital solution. During *phase four*, the first iteration of the geocaching solution was tried out in real life settings. In *phase five*, the experiences of the Ristinummi geocache trail were evaluated through user studies and by analyzing written cache logs made on the geocaching.com website. *Phase six* included making improvements based on the data as well as a continuous process of maintenance.

### 3.2 Geo-Located Content

The design, development and implementation of the geo-located content were conducted in phase two, three and four in the UCD process described above. The geocaches were created according to a historical timeline, where cache one tells the story of the revival of Ristinummi during the 1970's, and cache two tells the story of the cultural life in the area from the 1980's onwards. Cache three tells the story of the graveyards in the area and some prominent people who are buried there. Cache four tells the story of the influx of people to and the cultural diversity of the area from the 1970's to the present day. Cache five tells the story of the Alkula estate, which was at the forefront of the industrialization of the region in the 1800's. The place was brought back to life in the 1990's and currently provides activities for both young and old. Cache six tells the story of the water reservoir of the city of Vaasa. This also

serves as an outdoor recreational space with a number of tracks and paths for trekking, bicycling and skiing around the area. The geocaches were hidden in places related to the stories and care was taken to hide the geocaches at places that are easily accessible for older adults, but not necessarily easy to find.

Cache containers were further designed according to the theme of the stories told, in order to enrich the geocaching experience. The container of the first geocache is a plastic snail hidden in a birch forest close to the houses built for a housing fair in 1975. The container of the second geocache is a Frisbee hidden at the local Frisbee golf course. The third geocache container is a cemetery candle lantern hidden close to an old cemetery. The container of the fourth cache is a small spice-jar. In order to mirror the theme of the story on cultural diversity and the influx of people, the cache contains images of African instruments. The container of the fifth cache is a tobacco case hidden close to the Alkula estate. The cache container reflects the cultivation of tobacco at the estate from the 1773 to the early 1800's. The sixth and final cache container is a small plastic hippo designed for picking lingonberries. It is placed in the woods, close to a trail leading to Pilvilampi. At the end of the trail there is a peaceful place with a beautiful view over Pilvilampi. This cache is a mystery cache. Geocachers are required to knit a case for a mobile phone, which reveals a roman number when finished. This number is included in a mathematical puzzle, requiring further calculations according to instructions, in order to get the right coordinates of the geocache. Knitting instructions and the mathematical puzzle are available on the [geocaching.com](http://geocaching.com) website.

### **3.3 A Multi-Platform Storytelling Approach**

By multiplatform storytelling we refer to the orchestration of the story across multiple media platforms in addition to the real life location-based hunt. Our strategy was to use the [geocaching.com](http://geocaching.com) site for shorter versions of the stories, which would nudge people to search for the caches in order to find more information. Longer versions of the stories were distributed in paper form in four of the larger geocaches as well as digitally on a blog created for the project (Ristinummi – The story). The two smaller geocaches, number four and five, contained a link to the blog. The blog included other treats, such as pictures and stories of famous people who have lived in Ristinummi, excerpts from the local newspaper that was published during the 70's, as well as a recipe for cakes dating back to 1755 etc. Some of the caches also contained pictures related to the written stories. The stories are available in three languages, Finnish, Swedish and English. Hence, the stories have been created using multimodal representations (images and written texts) in order to enrich the narrative experience.

### **3.4 Digital Support**

According to the model of persuasive technology, engaging in a new behavior requires both high motivation and high ability [29]. The results of the background study showed that the ability and experiences of using the web and related technology are limited among the seniors. In order to avoid exclusion due to factors such as lack

of access to appropriate technology, lack of skills of using the technology, or fear of feeling incompetent, we organized two local geocaching courses in cooperation with the local adult education centers. The first course specifically targeted senior citizens of Ristinummi. Participation was free, the participants had the possibility of borrowing technological equipment needed for geocaching, and they were taught how to use the technology, the website, and how to search for caches. Participating in the course and a geocaching event that was jointly organized was further intended to facilitate a sense of relatedness and belonging. The second course was open to people of all ages.

## 4 User Experience Study

The aim of this study, included in phase five in the design process, was two-fold. One purpose of the study was to illuminate how older adults perceived that the geo-located content and the activity of geocaching meets needs related to social inclusion and well-being [cf. 10], [12], [15], [17], motivational factors [4], [25], [27], simplicity and triggers [29]. A second purpose was to evaluate the user experience of the solution in order to see if we succeeded in designing for positive narrative experiences. The analyzes were based on interviews with senior citizens as well as geocache logs at the geocaching.com site.

### 4.1 Empirical Data

**Interviews: Data collection and principles of analysis.** Semi-structured individual interviews were carried out with 3 females and 3 males in an age range of 65-75. The participants had different levels of previous experiences of geocaching. Nonetheless, all of them were recruited through geocaching courses. The participants in the background study were also informed about this study, however, only one senior decided to participate. The other participants were older adults over the age of 65 who had received information about the courses through information sheets handed out by the adult education centers. Participation was voluntary and the interviews were conducted over the phone and lasted between 25 and 45 minutes. The interviews were audio recorded with participants' consent. The interview data were transcribed, repeatedly read, coded, and analyzed according to principles of qualitative content analysis. The content was coded and categorized according to the three cornerstones of persuasive technology [29], including needs and motivations, behavioral triggers, and simplicity of using the technology. Identified needs were further categorized according to the fundamental needs presented by Sheldon and colleagues [25]. Three researchers conducted this categorization independently. Any discrepancies were discussed and a consensus was reached.

**Online geocache logs: Data collection and principles of analysis.** By June 18<sup>th</sup> 2015, 589 written logs about the geocaches had been made on the geocaching.com site. These were further included in analyzes of users' experiences in order to validate findings from the interviews with senior citizens. The geocaches have been logged by

people of all ages, both locals and people living outside of Ristinummi and by both males and females. The logs contained comments made about the geocaches, photos and the geocachers' own stories about their experiences of searching for and finding a cache. The logs were analyzed according to principles of qualitative content analysis. The computer software NVivo was used in order to categorize and analyze the qualitative data. The data was coded *in vivo* by inductively selecting keywords of each sentence in order to facilitate further categorization.

## 4.2 Results and Discussion

The results are categorized as follows: a) motivations and needs of senior citizens; b) triggers of initiating geocaching activities in the case of senior citizens; c) the ability of seniors for using technology related to the geocaching activity; d) user experience of the current geocaching solution; e) the narrative experience; f) evaluation of the multimodal, multi-platform approach. The interview excerpts and cache logs illustrating and corroborating results have been translated from Finnish and Swedish to English by the researchers. The code of the participant being cited is presented in brackets after each excerpt.

**A) Needs and motivation.** The interviews revealed that the activity of geocaching fulfills senior citizens' need for autonomy, relatedness, competence, pleasure, and stimulation, as well as physical thriving. This finding corresponds with the needs identified in the background study as well as with previous research on motivations for participating in the activity of geocaching [36], [37]. These findings are also validated in the analysis of the log data. However, social, physical, and cognitive benefits, as well as autonomy provided by the activity were particularly highlighted in the interviews with the informants. *Autonomy* is achieved by the fact that geocaching is something you can do whenever you feel like it and you make your own decisions regarding which type of cache to search for. Geocaching also contributed to *relatedness* as participants experienced it as a way to spend time with family, friends and like-minded people. This is illustrated in the following excerpt where a male participant said: "*I think that geocaching is quite a social activity. I participate in several geocaching events per year and there I meet like-minded people. One of my friends organized a geocaching event to celebrate his 60<sup>th</sup> birthday. There were up to 50 people participating in that event. [...] It (geocaching) also gives you something to talk about when you meet other people*" (P2). A female participant mentioned that she got involved in the activity of geocaching in order to cope with the loss of her spouse and for combatting feelings of loneliness and a sense of social isolation. She even created her own geocaches close to her home in order to be able to watch people searching for her geocaches. This made her feel less lonely. Written geocache logs on the geocaching.com website also contributed to a sense of relatedness, as well as cooperation between geocachers when searching for caches.

A sense of *competence* was derived from goal achievement, i.e. finding a cache, as well as learning to use new technology. *Pleasure and stimulation* included learning about (new) places online as well as offline, the challenge of solving puzzles and mysteries, the thrill of searching for a cache, creating and hiding a cache, and reading comments of other people on geocaching.com. The significance of location-based

information is highlighted in the following interview excerpt by a 65 year old male: *“It [geocaching] is a good way to learn about a place or a building. If you are abroad the geocaches usually take you to meaningful places of some kind. Geocaches usually contain information, which is not available at tourist offices. For example, close to where I live there is a geocache close to a church. The cache contains information about the church, such as the year it was built, the architects involved and so on. It is nice to be able to tell people these details about the church, which I wouldn’t know otherwise”* (P2). Geocaching further contributed to fulfilling the need of *physical thriving*. This was related to physical exercise, the opportunity to enjoy nature, a reason to get out of the house, weight loss and decreasing blood pressure. The geocaching activity was considered to increase the motivation for participating in physical exercise and daily walks, making them feel more meaningful.

**B) Triggers.** Triggers related to the technology were identified as signals in the form of e-mails or beeps produced by mobile geocaching apps, signaling the publishing of a new cache or nearby caches. Several of the interviewees mentioned, for instance, that they are triggered to search for caches when they are out picking berries or driving around and they notice nearby caches on their mobile geocaching apps. However, the signals of new caches being published do not trigger immediate actions among the interviewees. The search for geocaches is rather related to their need for doing something fun or stimulating, getting exercise and fresh air, the need for social interaction or a need to be alone. One interviewee said: *“I have tried to be the first to find a cache, however I have not yet succeeded in that. [...] The motivation is more about getting out into the woods, getting fresh air and exercise”* (P3). Nice weather was also considered to be a motivator. However, this can be related to the above-mentioned needs. Thus, the activity of geocaching as a whole and its ability to meet fundamental needs of the elderly seem to play a larger role in persuading behavior than technological triggers.

**C) Ability to use technology related to the activity.** The type of technology used for the activity varied between test participants. Some used an iPad, others used their smartphones and one of the participants used a GPS device. The website geocaching.com and the GPS-technology are, according to several of the participants, quite easy to use. Most of the participants did, however, mention that learning to use the technology required some time and effort. Some of the participants concluded that it is difficult to understand how to use geocaching apps on smartphones and iPads. In other cases the apps were found to be easy to use, whereas the participants wanted to learn more about all the information available on the geocaching.com website. This is illustrated in the following interview excerpt: *“Well, the technology is quite easy to use in my opinion. Of course you need some time to learn it all. I use a smartphone for geocaching but I have recently purchased an iPad, which will be used from now on. You get much more information from the geocaching.com website than from mobile apps. However, I don’t know that much about what kind of information is available on geocaching.com, so I think it is good that geocaching courses are organized in order to learn about these kinds of things”* (P2). Thus, organizing a geocaching course seemed to be a good choice in our case [cf. 30]. The participants also appreciated the opportunity to collaborate and learn together with the other course participants, further contributing to a sense of relatedness and belonging.

Several of the interviewees further mentioned that their children and grandchildren had taught them how to use the technology.

**D) Geocaching experiences.** As the results on needs and motivations presented above imply, the geocaching solution generates positive experiences by fulfilling seniors' needs for relatedness, autonomy, competence, pleasure and stimulation as well as a physical thriving. The geocaching trail as a whole was further described as extensive and well executed. Local users of the solution were pleased that new geocaches were created in the area. This is highlighted in the following excerpt from a geocache log: *"It's nice with new caches in the neighborhood, so you don't always have to go far in order to log one. I'm looking forward to more!"*. Locals were also grateful for the re-discover local places, which the geocaching trail led to. This brought back pleasant memories and resulted in a re-appreciation of the local area. The cache logs further revealed that geocachers from outside of Ristinummi enjoyed the stories and places they were guided to. Thus, besides resulting in re-appreciation of the local neighborhood, individual well-being and social belonging, the data also revealed a potential of the solution to raise awareness, appreciation and knowledge of beautiful, significant and interesting places and people of Ristinummi, among both local and non-local people. This, in turn, might result in more positive attitudes towards the area as a whole, as opposed to its current negative reputation. The location of the geocaches also, in some cases, nudged people to explore the surroundings further. The theme-based design of the cache containers further contributed to a positive experience of the solution. The cache containers were described as fun, colorful, original, surprising, interesting, nice, appropriate, beautiful, refreshing, and good. Several users mentioned that the design of the cache containers put a smile on their faces.

**E) Narrative experience.** As mentioned previously in the article, the narrative experience of geocaching is both the story created by the cache itself and the merge of the personal experiences of the people visiting the cache [38]. In the current case, the personal experiences of searching for and finding a cache were shared in the online cache logs on the geocaching.com site. The geocachers described, for instance, the weather, the surroundings, physical obstacles encountered etc. The following excerpt from an online log illustrates the description of a personal experience: *"So I chose the wrong approach again! That is racing straight for the cache. There was a path close by... The smart ones chose that one."* They also posted photos related to the places where the caches were hidden. The personal experiences were mostly presented in a humorous way. Additionally, the analysis of the cache logs revealed a tendency among the geocachers to continue the personal stories shared by another geocacher, through adding their own experiences of searching for and finding the same cache. By this, the shared stories became dynamic and continued through a participatory co-creative process [39], further contributing to experiences of relatedness and belonging as well as autonomy, competence, pleasure and stimulation. Another finding shows how stories of personal geocaching experiences tended to extend over several caches. For instance, one geocacher described how he always managed to take the most difficult path to a cache. This story continued over three of the caches, also including dimensions of a participatory co-creative process as others continued the stories.

**F) The multimodal, multi-platform approach.** The use of both pictures and written text added to the positive experience. However, experiences of utilizing

several different platforms for distributing the geo-located stories were mixed. There was no traffic to the blog, for instance, revealing the fact that adding a link at a physical geocache is not the best way to nudge people to follow it. Another solution would be to add it to the geocaching.com site. Further, presenting long written stories in paper versions at the physical geocaches is perhaps not the most successful approach due to the principle of avoiding mugglers (i.e. non-geocachers) inherent in the activity of geocaching. Further, whether one takes the time to read the stories depends on interest, intention and time. For instance, if the intention is to be the first to find a cache or to find as many caches as possible that day, reading a long story is not a priority. The mystery cache created within the frames of the current case, however, was a successful multimodal attempt. Knitting in order to figure out the right coordinates was highly appreciated by the female geocachers. Those who were not into knitting had taken a collaborative approach, either involving elderly female relatives or a spouse for the knitting part, or a fellow geocacher who had already solved the mystery. Several geocachers approached the puzzle in a more creative manner and tried to solve it using Excel.

## 5 Conclusion

Using a GPS device or mobile phone as a vehicle to explore caches hidden in the woods and urban places, encourages physical and social activity, playful learning of the history of one's neighborhood, and generates pleasurable experiences [cf. 4], all of which are known factors contributing to well-being. This study, addressing the potential of geo-located storytelling in the context of social inclusion and well-being of senior citizens, revealed the fulfillment of a sense of autonomy, competence, relatedness, pleasure-stimulation and physical thriving. Senior citizens highlighted in particular social and health benefits (physical, psychological and cognitive) of the activity, thus contributing to well-being and a sense of inclusion. However, geocaching does not necessarily appeal to everyone due to individual differences regarding interest in the activity and the use of technology.

According to Ihamaäki [38] the narrative experience of geocaching is both the story created by the cache itself and the merge of the personal experiences of the people searching for the cache. Our results develop this conception further by adding a dimension of an expanding collective narrative involving how cache visitors reflect on a story and expand on it by adding their own experiences to the online log, which then turns into a wider collective narrative. The story, hence, becomes dynamic and continues through a participatory co-creative process [cf. 39] adding to feelings of autonomy, competence, relatedness, pleasure and stimulation.

The case presented in the article was framed as design research out of a user-centered design perspective, where the end-users have been involved in the process for the purpose of facilitating an adequate and relevant design. Understanding how people experience the local area and understanding their incitements for participating in the community or not and the consequences of their actions is key when designing smart cities. The article gives an example of how we as designers may create digital content in order to spur urban experiences, and contribute to the visibility, awareness,

and appreciation of historical and contemporary landmarks and people in an urban area. It further shows how we may contribute to balancing the virtual and nature. By creating digital stories hidden in parks and green areas we are able to nudge people to go out and explore and/or experience urban spaces and green areas.

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