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Senior citizens evaluating welfare technology: User experiences in SENER-project

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Abstract

In an aging society, it is important to work for finding ways to integrate seniors in the society and to pursue seniors' wellbeing and independent living. The aim of this research is to explore the potential of information and communication technology (ICT) in enhancing active aging. More precisely, the research examines user experiences of 24 senior citizens in piloting health technology, the wellbeing box products, in the SENER-project.

The data were collected in interviews including semi-structured questions concerning senior citizens' experiences. In addition to qualitative data, information about usage times of tested devices or programs was analyzed to construct user type categories.

Three main type categories emerged: drop-outs, passive users, and active users. Drop-outs were too fragile to see more benefit than nuisance in the devices. In cases of passive users, families benefited more of the devices than the seniors themselves. Active users used the devices and programs themselves in various ways, for example monitored their health.

Senior citizens are heterogeneous in their use of ICT. Products of the wellbeing box were motivating in the sense of active aging policy if there existed an interest in health promotion. Seniors must not feel too fragile, and they have to see more benefits than nuisance in the use of ICT if they want to start to use it. Devices must not have technical problems, and enough guidance that matches the skills of the users must be offered. Senior citizens do not want technology to replace human help, but health information gathered by monitoring devices could be transmitted to home help personnel.

Keywords: aging, health technology, health promotion, attitudes to computers, computer user training

Introduction

Nowadays, we are living in an information society, which can be defined briefly as a creative society that is based on interaction [1]. In an information society, information and communication technology (ICT) has a major role, enabling access to the available information and services that aim to improve the quality of life. Although new technology has a major role, the most important issues are the way of doing things and developing technology [2,3]. In recent years, increasingly reliable and flexible communication systems have been developed. As a result, new low-cost sensors and signal processing technologies have been developed to measure and assess well-being, for example activity, quality of sleep, and blood pressure, in real-time.

Society is aging fast in developed countries, for example in Finland, where there are more than one million people of 65 years of age or older. Senior citizens have been seen to be at risk of becoming marginalized because of difficulties in using ICT. Findings of surveys made in USA suggest challenges in learning and using computer-mediated information technology in the age group of 75 years of age and older [4,5]. According a survey of 600 Finnish senior citizens aged 75–89 years, 90 % of the respondents had a cell phone, one-third had an access to the Internet, and 24 % had an e-mail address. However, only 4 % of the respondents had a smartphone and 3 % had a tablet computer. [6] In another Finnish study of 23 senior citizens aged 75 years or older, it was found that the interviewed senior citizens considered cell phone and technology connected to their everyday life (like barrier-free living) most beneficial and information technology most challenging – 41 % of them had a computer and the Internet, though [7]. On the other hand, since the 1990s, senior age group has been recognized as users of ICT and it has also been noticed that senior citizens are willing to learn [7,8]. However, compiled information on use of technology by senior citizens, especially those aged 75 years and older, is scarce [6]. It should also be noticed that age groups are heterogeneous, and especially in older age groups individuals differ significantly from one another [9].

The aim of Finnish society is to support independent living and reduce long-term institutional care. To achieve these goals there is a need for barrier-free living and new innovative services. Many senior citizens want to live and act independently as long as possible, which requires new services, for example in the form of ICT [10]. This research was done as part of the Finnish SENER -project (Senioripalveluinnovaatioiden tutkiminen ja pilotointi [Research and piloting of senior service innovations]. The project aimed to investigate the importance of participatory senior services with regard to segregation, exclusion, regional image, comfort, and security and safety. In focusing on senior citizens' participation in society and the prevention of segregation, the project aimed to enhance active aging. Studies in the SENER -project supported the project "Pihkassa Männistöön" coordinated by the City of Kuopio. The SENER -project, including this research, was an interdisciplinary effort combining social sciences and environmental informatics.

The concept of active aging emphasizes older people as autonomous citizens. In a holistic sense, it also highlights the society's role in optimizing opportunities for health, participation, and security in order to enhance quality of life as people age. [11–15] The aim of this research is to explore the potential of ICT to enhance active aging. More precisely, the research examines the user experiences of senior citizens in piloting health technology, wellbeing box products, in the SENER -project.

Material and methods

A case study was carried out to follow the participants' use of wellbeing box products during one year piloting period. Since the research supported the project "Pihkassa Männistöön", except one all the participants lived in Männistö suburb. The data of this research is part of a larger data set collected in the project. The entire data set includes answers to the structured and semi-structured questions of an interview questionnaire; this research analyzes the answers to the semi-structured questions. [16]

The senior citizens who participated in the research were recruited by an announcement in a local newspaper. Therefore, the participants were volunteers, which has been the case in many studies dealing with senior citizens and the usability of ICT [17]. Several participants mentioned that they wanted to contribute to research that benefits (older) people and society. The participants were asked to sign a written consent to use the deindividualized interview data in the research report. Participants who suffered symptoms of dementia were interviewed in the presence of their family. In interview extracts of this article, participants are coded in a following way: F for female and M for male. After a letter, there is a number stating a participant's age.

During the early summer of 2014, the wellbeing box products (concept developed by Active Life Village Ltd.) were delivered to 22 participants in 17 households; five married couples started the process. The wellbeing box included a tablet computer with a user-friendly interface (Samsung Galaxy Tab 2 10,2 + 3G), a sleep monitor (Beddit Pro Single, Beddit Pro Douple, or Beddit Standalone), stove guard (Innohome SA 101), activity wristband (Fitbit Flex or Withings Pulse Ox), medical dispenser (Addoz GSM Medication dispenser), smart weighing scale (Withings Scale ws-50), blood pressure monitor (Withings Blood Pressure wireless monitor), wireless object locator (Doro MemoryPlus 335), and a motion-activated voice reminder (Defender Memo Minder MKII).

Later on, two more senior citizens joined the process and seven dropped out of the process for various reasons, which are discussed later in this article. 17 seniors carried out the research process from their first interview in autumn 2014 or winter 2015 until the last interview in summer 2015. At the beginning of the process, the ages of the participants ranged from 67 to 90 years, the average age being 78 years. Most of the participants were younger retired people under 85 years. Only three of them belonged to the "oldest-old" age group, 85 years old or more [18, 10]. However, 16 out of 24 participants were 75 years old or older. Twelve of the participants were female and five male, spread evenly across all age groups.

The interview data were collected in three phases in order to follow the senior citizens' experiences during the piloting process. Four months after the service delivery, a questionnaire was filled in an interview with the researcher (the first author). Two more follow-up interviews were carried out at four-month intervals – the questions were modified to some extent to suit the phase of the piloting process. Semi-structured questions concerned the user experiences of the participants: descriptions of what devices were used, the benefits experienced from the devices, and opinions about the guidance in using the devices available in the project. In addition, the positive and negative user experiences were inquired about.

In this article, quantitative data are also used concerning usage times of some devices or programs during the period from June 1st 2014 to May 31st 2015, which was also when the qualitative interview data were collected. This study uses mixed methods in a limited sense: quantitative data about the actual use of devices and programs in addition to qualitative interview data about the experiences of the participants.

Information about usage times was gathered from reports from the service vendor. Tables were compiled concerning the number of days that the participants had used a certain device or program during four three-month periods in summer 2014, autumn 2014, winter 2015, and spring 2015. Information about usage time is available about the activity wristband, sleep monitor, and blood pressure monitor. Information is also available about the usage times of different programs on the tablet. Programs were divided into three categories: free time and entertainment (for example music, newspapers, TV, weather, shopping), utility (for example camera, calendar, maps, bank), and connection (for example Skype, e-mail). Information is limited - it does not cover all the piloted devices – and as such it is used as additional data to the qualitative data.

The figure 1 shows how the data were collected during the piloting process.

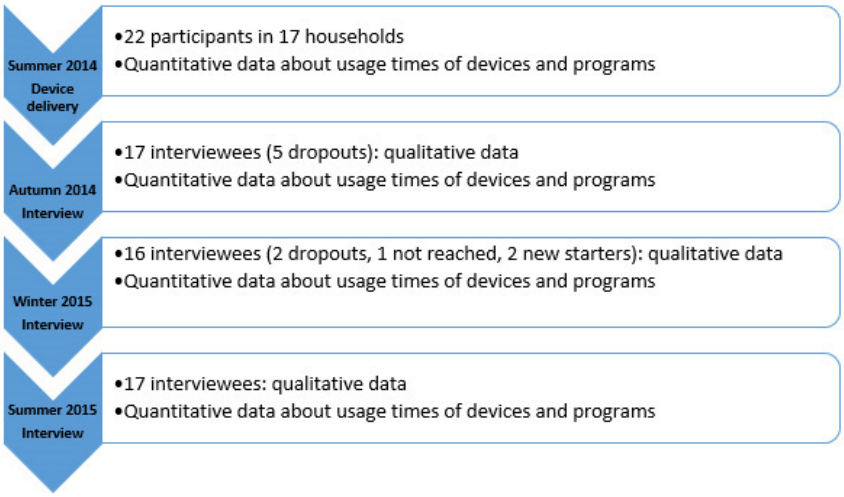

Figure 1. Data collection during the piloting process.

The interviews were carried out at participants' homes and lasted from one to two hours. Answers to the semi-structured questions of the questionnaire were written down using the words of the interviewee. Three interviewees suffered symptoms of dementia but they answered the questions themselves as far as they could – the assisting family members' comments were added to the data. If any information about technical problems with the devices emerged in the interviews it was transferred to the technical support in the project by the researcher.

The qualitative data were analyzed by the first author, and the analysis was discussed in the project group. Data-driven content analysis was used to find out user types. Here, content analysis is understood as a broader framework compared to a single method [19, 20]. The material was arranged in tables according to the thematic questions. First, a preliminary table was made according to the devices the participants said they had used. Special interest was placed on the final interview, which showed where the participants had ended up as device users. The data were read through several times and more tables were made according to the original statements of the interviewees considering positive and negative user experiences, effects experienced on everyday life, usefulness of the devices and estimations of which devices could also be used in the future. The statements were coded to find out similarities, reduced, and categorized as user types. Also, information about the usage time was added. In the table 1, an example of constructing a type category is shown.

According to the ways the participants described their user experiences and how they constructed themselves as users of the piloted devices, two main categories of user types emerged: active and passive users. Active users could be arranged into three sub-categories: all-round enthusiasts, health information minded seniors, and convalescent tablet users. The third main category is that of the drop-outs. Data on drop-outs were collected in telephone calls or in first phase interviews.

Table 1. Constructing a type category.

Devices used reported in the interview	Usage time	Original statement	Reduced statement	Type category
• Activity wristband • Blood pressure monitor • Sleep monitor • Stove guard • Motion activated voice reminder • Tablet computer	Activity wristband: summer 2014: 59 days; autumn 2014: 77 days; winter 2015: 18 days; spring 2015: 21 days. Blood pressure monitor: summer 2014: 2 days; autumn 2014: 11 days; winter 2015: 1 day; spring 2015: 3 days. Sleep monitor: autumn 2014: 2 days. Tablet computer/utility: summer 2014: 6 minutes. Tablet computer/connection: summer 2014: 4 minutes; autumn 2014: 8 minutes. Tablet computer/free time and entertainment: summer 2014: 40 minutes.	"They [the family] make it [everyday life] more difficult by bringing in all kinds of equipment." "My family persuaded me to participate, my son-in-law signed me up." "How could one get wiser to be able to use [the devices]." "I could have learned something though I am stupid."	Enrolled in the project by family. Family has an interest in using the devices. The senior participant feels unable to use the devices.	Passive user

Results

Type categories and progress in use of the devices

Seven out of 24 participants dropped out of the process: either they did not test the devices, did not want to be interviewed, or quit after the first interview. Passive users are senior citizens whose family benefits from the devices. Active users used the devices and programs themselves in various ways. Active users account for the majority which implies that most of the participants were "younger old" and volunteered for the project. In a case study like this, it is not possible to make generalizations but in this research, the active users are, on average, younger than dropouts or passive users. More than twice as many females than males participated in the project, which is shown particularly in the category of active users.

Participants were asked about changes in their use of the devices. The first point to describe the changes took place six or seven months after installation of the devices in the households, and the second about five months after that. Passive users or their family members mentioned mainly that there had been no changes during the whole process. Active users, despite their sub-category, showed some enthusiasm and learning after 6–7 months of use. In the five months after that, a year from the beginning of the piloting process, active users reported having reached some routine in using the devices. In the following extracts, a 72-year-old lady describes the progress in her case.

> *I have got used to using [the devices], it has become a routine, for example, using the activity wristband when walking. (F72)*

> *The devices have become a part of everyday life. For example, the blood pressure monitor when my medication was changed. When it [the monitor] worked. (F72)*

Two active users said that they had "got lazier" due to illness or because the devices did not work. The next extracts from the first and the last interview of the same lady show how the interest declined in her case.

> *Following the readings brings a routine. It keeps the issue at hand. (F67)*

> *[The devices] would [affect everyday life] if you were interested in seeing how active you are. (F68)*

Generally, if a device did not work participants gave up trying to use it as the piloting process proceeded. For example, the 72-year-old lady in the previous extracts had used the blood pressure monitor "when it worked". When it did not work, she bought an "ordinary" meter.

On the other hand, two seniors, 78- and 75- year-old ladies, expressed a growing interest in learning more: one of these two had registered for ICT training for senior citizens. The fact that some, but only a few of all the participants, sought more training describes the situation that senior citizens are a heterogeneous group in learning to use ICT [8].

Table 2 shows the number and average age of interviewees in each of the main user type category, and also the gender distributions in the categories. In the following, the type categories are discussed in more detail.

Drop-outs

Four of the seven drop-outs were made anxious by the use or thought of using the piloted devices. They had all been registered in the project by their family. For example, a 78-year-old lady was interviewed once, but dropped out later because, according to her daughter, she was made anxious by the devices and did not learn to use them. Another lady never started the process. She told the researcher on the phone that she had so many problems with her health that she felt very tired and did not think that the devices that were on the offer would benefit her. These senior citizens saw more nuisance than benefit in the process. Perceived benefits have found to be key aspects in promoting older people's use of technology [21–23].

Apart from nuisance, poor health was also mentioned as a reason not to participate. In the type category of drop-outs, seniors reported suffering from somatic illnesses like arthritis, poor vision, vertigo, and heart problems. Symptoms of dementia were not reported. Furthermore, there was one case of death, which is here interpreted as a drop-out case.

Table 2. Main user type categories in the data.

User type categories	N	Average age (years)	Number of females(F)/males (M)
Drop-outs	7	81	5F/2M
Passive users	5	82	3F/2M
Active users	12	75	9F/3M
Total	24	78	17F/7M

Passive users

Passive users were enrolled in the project by their family. Three of them suffered from symptoms of dementia, one felt she was totally incapable of using the techno-logy, and one followed his wife without much interest from his side. The devices helped family members to monitor the wellbeing of their aged parent from personal health records accumulated from weighing or blood pressure monitoring. They also made everyday life easier in households where one of the family members suffered from dementia: a wireless object locator was used in finding keys and wallet that repeatedly went missing or a motion-activated voice reminder at the door reminded the resident not to go out of the door at night time. In this category, techno-logy mostly increased the feeling of safety of family members, which is shown in the next extracts from interviews with senior participants' family members:

> *The motion-activated voice reminder and stove guard are really good. I have left the stove on myself.*

> *Not for mother [no effect on everyday life], but a relief for the family. There has been a need to monitor weight because of too big a weight loss.*

The devices were also used in an attempt to activate a more passive spouse to lead a healthier life as the following accounts of an active wife and a more passive husband show.

> *I am more interested. I get all [the devices ready] for my husband. The activity wristband measures exercise. F75*

> *I am not interested. But I am happy to be involved in research that benefits people and society. M81*

On the whole, passive users did not experience the benefits of the devices themselves but their family members did. Passive users or their family members reported that safety technology would promote independent living at home in the future when aging. Therefore, stove guard and an opportunity to monitor health of a dementia-sufferer were considered beneficial. Family members – daughters, sons-in-law, and wives – suggested that the devices and programs should be more user-friendly: simpler and in Finnish.

Active users

Active users made use of the piloted devices by themselves. They ended up using different devices and program options, which is seen in the data under three different subcategories: all-round enthusiasts, heath information minded seniors, and convalescent tablet users. In table 3, active user subcategories by number, age, and gender are listed.

There are no big differences between ages in the subcategories. However, it should be noticed that the subcategory of all-round enthusiasts contains four of the seven participants under 75 years old but also the oldest 90 years old one. The proportion of male participants is shared equally between the all-round enthusiasts and the health information minded. The subcategories are described more in the following section.

Table 3. Active user subcategories.

Active user subcategory:	N	Average age (years)	Number of females(F)/males (M)
All-round enthusiasts	6	75	4F/2M
Health information minded seniors	4	74	3F/1M
Convalescent tablet users	2	77	2F

All-round enthusiasts

The most active users harnessed the various options in their use. In this type category, it was typical to report the activating impact of the devices as well as the benefits of the programs on the tablet. The activity wristband was most commonly mentioned, and also according to the data on usage times, it was used almost every day. The activity wristband's recommendation of 10,000 steps per day pushed participants to go for a walk. However, it should be noted that these seniors were already keen on physical activity in the form of walking: so the activity wristband strengthened their existing activity rather than generating it. The activity wristband together with the weighing scale and also to some extent, the blood pressure monitor, were used in monitoring health: in some cases loss of weight and lower blood pressures combined with higher activity in exercising (walking) were reported. The next extract describes one of the most positive user experiences.

> *A great effect [on everyday life]! You have to go out, I am an active user of the activity wristband. The blood pressure monitor is great. I feel that my blood pressure has lowered because of exercise. Also the sleep monitor is great. I lead a regular life. I see when there has been a bad night. On the tablet, it is good that for example the newspapers are readily loaded there. I have registered for training [computer course for seniors]. I am enthusiastic. F75*

In the previous example, the participant was motivated to learn more about computers. Many users of this type category used the tablet computer for various purposes. They used Skype to keep in contact with relatives who live far away or were travelling, used the camera, read the papers, watched TV, learned to pay bills on the Internet and to check the store's supply of products before going shopping. The most active tablet user used 9 different utility programs for as much as 19,153 minutes in three months, which is 3.5 hours per day. For entertainment and free time programs, the maximum usage was 935 minutes in three months (for 11 different programs). Programs meant for connection were used less, 316 minutes in three months at the most. The importance of summer cottages for Finns [24] is shown in the data as participants appreciate the possibility to read the newspaper or check the weather report on the tablet computer at their cottage.

In this category, participants thought that the piloted devices promoted activity but they were not the kinds of devices that would necessarily be beneficial in coping at home in the future. In their opinion, a human helper would be better than technology [25]. However, they thought that ICT could be useful in producing health information that could be transmitted to home care. They also mentioned that the Internet could be used in ordering shopping from the store to home.

These senior citizens were of the opinion that guidance in using these kinds of devices should be focused on, especially at the beginning of use. It should not be too quick and should be tailored according to the user's skills. For example, a senior peer supervisor would be good for that purpose.

Health information minded seniors

Senior citizens in this category were keen on monitoring their own health but not on using the tablet computer for other purposes. The activity wristband, blood pressure monitor, weighing scale, and to some extent also the sleep monitor were used. In addition to health monitoring devices, everybody also used the stove alarm.

These seniors were either very interested in keeping up their physical health by exercising or interested in monitoring their health because of some problems, for example atrial fibrillation. They were annoyed if the devices did not work and the reports were not available.

> *Non [of the devices] complicates everyday life. Monitoring your activity with the wristband is interesting. And the weighing scale – if it worked. F75*

> *It is nice to check them when they work. Most of all I would be interested in monitoring sleep. M67*

In this subcategory, there was another computer in the household, somebody else in the household had mainly used it, or there was no energy for learning to use one. These senior citizens would have needed written instructions in Finnish or felt that, however interesting the project, it was more for those who comprehend computers better. These kinds of devices were not considered to be very useful in coping at home in the future. However, reminding devices and information transmission from devices to home care in addition to human helpers were considered useful.

Convalescent tablet users

Two participants ended up using mostly the tablet computer and various programs on it. They became ill during the piloting process and could not exercise, which affected their use of the activity wristband. Instead, they used the tablet computer in various ways. Especially, the utility together with the entertainment and free time programs were used: they learned to search for information in the Internet, paid bills, listened to music, read newspapers, and took pictures. At maximum, the use of utility programs by a participant (10 different ones) was 955 minutes (16 hours) in three months and the use of entertainment and free time programs (14 different ones) 1043 minutes (17 hours) in three months. The connection programs were not used very much: the maximum use was 127 minutes (2 hours) by a participant in three months.

These participants had positive user experiences as the next extract describes.

> *The tablet as a whole [was a positive experience]. I had always been against it [learning to use a computer], I thought it is too difficult, but it was not. F78*

In the above case, the participant learned to use a computer during the piloting process. The second convalescent tablet user was already familiar with using a computer. In both cases, family members were able to help in learning and using a tablet computer. Without a written manual it would have been impossible to learn – delivery of the devices and guidance in using them was felt to be too rushed.

These users thought that however good a tablet computer is, it is of no use if they suffer memory loss when growing older. Reminding and safety technology would be more important then. Also in this subcategory, transmitting health information to home help was suggested.

Discussion

This research adds to our knowledge of the use of ICT of senior citizens generally, and those age 75 years and older more specifically [6]. In general, the health technology products of the wellbeing box were felt to be activating in the sense of an active aging policy, optimizing opportunities for health. The activity wristband, blood pressure monitor, and smart weighing scale were used to strengthen an existing interest in health promotion. The tablet computer was used to ease everyday life and for fun. Previous findings suggest senior citizens are heterogeneous in many regards [8,9,26]. Also in this research, different types of ICT users were found.

The seniors who seemed to benefit from the tested wellbeing box products in the most versatile ways were all-round enthusiasts who were capable of using the devices and programs in ways which suited their everyday life. These senior citizens, men and women, lead an active independent life: they were physically active, spent time at their cottages, and demonstrated a keenness to learn to use ICT and take advantage of the benefits. The average age of participants in this group was 75 years, but the ages ranged from 67 to 90 years. In the group of health information minded seniors, the average age was 74 years, ranging between 67 and 80 years. Senior citizens in this group were active in the sense of physical activity and they used the devices for health promotion. Convalescent tablet users, whose average age was 77 years, were confined to physical inactivity by illness. They used the tablet computer's entertainment and free time programs in addition to utility programs as a relief when ailing and

recovering. Passive users and drop-outs were somewhat older than the before-mentioned active users. The drop-outs felt too fragile to benefit from participating in using the devices. In families with a member with dementia, it was found that other family members became the users of the devices.

In this small sample, there was an inverse relationship between age and ICT use. However, on an individual level, there were differences; a 90 year old can be as active as a 67 year old. Non-use of ICT by an older person appears to be connected to poor health: dementia or feeling too ill or troubled. What devices and programs are suitable and beneficial to whom is dependent on a person's functioning, life situation, and lifestyle. The devices themselves affect the use or non-use: according to the user experiences of this project, if there are a lot of technical problems with the devices, the interest in using them will cease soon after the first enthusiasm. Senior citizens also need a lot of guidance in learning to use the devices especially at the beginning, which has also been proved, for example by Hernández-Encuentra or Nordlund and their teams [22, 6]. Supervision should be offered in a way that matches users' skills – i.e. not too hastily. Written instructions in one's native language would be appreciated.

The findings of this research are limited to a small sample of 24 senior citizens living in the same suburb and piloting certain devices for a period of a year. Therefore, the results cannot be generalized to the general population of old people. Recruiting participants by way of an announcement in a newspaper has resulted in a biased sample of motivated ICT-users. Nevertheless, the results are directional and consistent with recent Finnish studies [6,7,9].

In summary, the heterogeneous needs of users in older age groups should be considered when developing and offering ICT-solutions to senior citizens. To promote active aging and senior citizens' integration into an information society, ICT-services and supervision in using them suited to users' skills should be available. Senior citizens do not want technology to replace human help. Instead, they want it to increase their safety. Growing old is anticipated becoming forgetful. Therefore, reminding and safety technology would assist independent living at home. Senior citizens also see combining technology with home help services as a good option: health information gathered by monitoring devices could be transmitted to home help personnel like it is suggested in the national Finnish ICT strategy for social and health services [27]. In this way, monitoring devices could promote autonomous citizenship and coping at home.

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