Evaluating user experience and perceived value of video communication service for older users (confidential draft)

Abstract

Visual information provided by video communication can enhance perceptions of social presence and contribute to affective communication. Thus, it has potential to enrich ambient assisted living (AAL) related products and services, which aim at better quality of life for the older adults by providing tools suitable for supporting social activities and fostering participation in social networks. This article describes findings from empirical evaluation of interactive video-communication service developed and introduced for older users, their family members and relatives and care personnel. The new service concept is based on touch screen PC and it uses an ICT component, which allows easy initiation of one-to-one and group video-communication, and video broadcasting. The service was validated in a context of 11-month field trial. Qualitative data collection methods, such as in-situ observations and interviews were used to collect data about subjective user experience from five families; altogether 13 people aged 30 – 86, and health care professionals. The goal of this paper is to discuss findings related to validation of the value proposition of this new service for older users, their families and formal caregivers.

Introduction

Today, both the public and private sectors are facing severe challenges in meeting the requirements to deliver services for ageing users. There are fewer resources available to serve increasingly ageing population, and the demand for a wide variety of high-quality services is growing. To tackle these challenges, service sector has started to adopt ICT (information and communication technology) not only for back office service management, but also for end-user service access. Digitally-enhanced services can provide benefits both for service providers in the form of more efficient service delivery and management and for the customers in the form of better service access and availability (Häikiö et al. 2010).

The research discussed in this paper explores a novel service concept, which uses video-based communication to deliver services for older adults. Previous studies on video-based services for the older adults have ranged from the remote consultations and support from healthcare professionals for older people residing at their homes (Arnaert and Delesie, 2001), to the use of video-communication technology to support and enhance communication between the older people and their family members (Demiris et al. 2008, Hensel et al. 2007). Findings by e.g. Hensel et al. (2007) suggest that the addition of visual nonverbal cues (such as facial expressions, gestures, and posture) in videophone as compared to traditional telephone communication enhances perceptions of social presence and contributes especially to affective communication. The visual component added in the video communication allows users to better evaluate how the other is doing and also facilitates a nursing home quality assurance function for the family member (Hensel et al. 2007). Use of ICT applications in a situation where communication with an older person is otherwise difficult to maintain has been identified to offer the possibility for a carer to be involved in the life of an individual older person (Sävenstedt et al. 2006). In addition, video call meetings have been identified

to be especially useful in Nordic countries during the cold winter months, when weather conditions can prevent older people from leaving the home (Savolainen et al. 2008). Thus, video communication has many potential benefits regarding services for older adults.

Successful adoption of new service requires that the service succeeds in creating value for its users and other actors who are needed in the service network. Jurison (2000) and Kim et al. (2007) have concluded that higher perceived value indicates greater willingness for the user to adopt the technology. People do not passively accept the value propositions presented by the service provider, but instead uniquely experience and create value within their own social contexts. Customers are active seekers of meaning, rather than just passive buyers or users of products or services (Helkkula and Kelleher, 2010). Therefore, validating value proposition through exploring realistic value creation is needed. Research findings by Helkkula and Kelleher (2010) reveal that customer service experiences (i.e. experiences in a service setting) are the basis for customer value perceptions.

It is challenging to determine and measure the value, since it is based on subjective experience and evaluated so individually and personally. In addition, people may have difficulties in verbally stating and describing what is valuable for them (Hoyer and MacInnis, 2007). Furthermore, people may not recognize their own values structures which they use for interpreting what is valuable for them. Studies have shown that the users and user groups have generic value priorities that are not directly associated with the technology to be adopted, but are generic values that guide humans in their lives (Isomursu et al. 2011). As an example, some users value stimulation over security, while others value conformity over hedonism. In psychology, it is well known that some values are unconscious or socially not desirable to mention. Also, developers' perceptions may be biased, as they view system goals and user preferences through their own set of values and assumptions. Goal of the study discussed in this paper is to make an empirical validation of value proposition of interactive video-communication service by evaluating the value expectations and perceived value from the viewpoint of the three user groups. Qualitative research approach was used to collect data in a field trial which lasted 11 months as a whole. The research question of this study is as follows:

What are the value expectations and perceived value of the proposed service from the viewpoint of 1) older adults, 2) their family members and relatives, and 3) health care professionals.

In this study, we use term "older adults" specifically when we discuss the old end-users of the service, meaning both the old user and his or her informal carer.

Related work

Video-communication

Arnaert and Delsie (2001) have reviewed a range of video-based communication trials and concluded that video-based communication has been well accepted among the older people, largely due to the visual contact it affords. In addition, user acceptance seems to grow in proportion to experience, while at first people may be slightly reserved to communicate on camera. Arnaert and Delsie (2001) have found that face-to-face contact with the caregivers gives older adults more confidence in following video-based interactions. Quite unexpectedly, worries regarding the issue of privacy have not been a major concern.

Sävenstedt et al. (2004) used videophones in a telecare project in Sweden to facilitate teleconsultations between nurses and older adults at a nursing home. They discovered that an important promoting aspect in telepresence was the creation of safety and familiarity in the teleconsultation encounter, which was related to the staff member's ability to facilitate the communication and be the safe known focus of orientation for the older person. The familiarity was shown to be an aspect that promoted presence. Older people seemed to have special requirements concerning the sensory environment of the teleconsultations (Sävenstedt et al., 2004); the quality of hearing was shown as more important than the quality of vision for the communication. Another interesting finding was related to attentiveness, which seemed to increase among the older adults as a result of video-based encounters. It might be that the increased attentiveness of the older people was a result of the special attention given by the staff members and the nurses.

Study findings by Hensel et al. (2007) on videophone communication between a nursing home resident and a geographically distant family member revealed five distinct themes regarding the videophones' impact: (1) *It was almost like being in the same room*; (2) I *could see how she is doing*; (3) *I can see that she's being cared for*; (4) *I shared more of her life*; and (5) *We had a lot of fun*. Furthermore, previous studies have stressed the effect of video communication on reducing the sense of loneliness and isolation, and helping to make new social contacts (Savolainen et al., 2008; Demiris et al., 2008).

The findings from other researchers indicate that a caring relationship maintained via remote communication needs to fulfill the same ethical demands as face-to-face communication, i.e. the demands of genuine communication and response to the needs of older people (Sävenstedt et al., 2006). It is also essential for video-based system to be robust in order to win the users' trust, as family carers and frail older people already live in a stressful life situation so they cannot be burdened with the additional problem of unreliable technology (Savolainen et al., 2008). In addition, the helpdesk function should be established to help the users when unexpected technology problems occur (Savolainen et al., 2008).

Concept of value

In a fairly recent development in HCI (Human-Computer Interaction) can be seen a growing interest and concentration on value-centered design. One reason for this is that gaining an understanding and acting on users' personal values is considered a powerful tool for better comprehending user behavior and reaching the users (Durgee, 1996).

Researchers have developed numerous different terms to describe value, where usually the perspective and context within which the value is considered differentiates the concept. E.g. Woodruff (1997) considers customer value as a *"customer's perceived preference for and evaluation of those product attributes, attribute performances, and consequences arising from use that facilitate (or block) achieving the customer's goals and purposes in use situations"*. According to Zeithaml (1988) the perceived value is the consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given. Bettman, Luce, and Payne (1998) state that the concept of customer perceived value refers to the value that customers perceive they receive or experience by using the offering. Kujala and Väänänen-Vainio-Mattila (2009) clarify the concept of value from the user's point of view by suggesting that the perceived value of the product is not located in system/product properties but arises as a consequence of user's perception and

experience of system/product. In addition, the user brings her/his psychological values, needs, and goals to that interaction. Thus, the resulting perceived value depends also on the person who perceives a product or system and the psychological values the person has.

In order to clarify the concept of value from users' perspective, Kujala and Väänänen-Vainio-Mattila (2009) propose the term *'user values*' that is used for users' motivations as it is done in psychology, i.e. to describe users' psychological values that affect their views as to what kind of purpose, functions and characteristics are important to them in a certain usage situation and context. According to e.g. Verplanken and Holland (2002) individuals differ in how they rank the importance of specific values. Madrigal and Kahle (1994) have stated that even though a scale is missing to assess personal values, they are considered better predictors of an individual's behavior and even more important than the effect of attitude on user behavior (Durgee, 1996). Thus, it is essential to find key value priorities behind different user groups and service context, and help designers develop insights and identify the linkage of users' in-depth service needs, motivations, and values to technology features (Kujala and Väänänen-Vainio-Mattila, 2009), and as a consequence, make detailed and crucial design decisions with understanding of the relevant values the users place on the service.

Caregivers attitudes and values

Arnaert and Delsie (2001) state that nurses tend to be more skeptical about telenursing (i.e. nursing interventions from distance) care than patients. In addition, Sävenstedt et al. (2006) found that staff values and attitudes are an important cause of resistance to change and slowness in introduction of information and communication technology in healthcare of older people, and this resistance was primarily of an ethical nature. Furthermore, these doubts and resistance towards the use of technology in care of older people was often a collective decision, which made it difficult and caused an insecure feeling for an individual to stand alone and defend the introduction of new technology against a group (Sävenstedt et al, 2006). Important threat associated with the introduction of ICT solutions in care of older people was that it was thought not to be in the best interest of professional carers, instead, it was associated with a built-in wish of the care-providing system to cut costs and reduce the number of staff (ibid).

In a study by Sävenstedt et al. (2006) most carers of older people seemed to have little interest in ICT and in taking part in developing methods for utilizing technology in their work settings, which was perceived as being linked to the lack of experience with a technology and a fear of not being able to cope with the technical devices. Carers were revealed to perceive information and communication technology as a promoter of both inhumane (focus on efficiency and remote control) and humane (increased well-being and better assistance with older person's needs) care, a duality and paradox that seems to make them defensive and resistant to change (ibid). Carers expressed a fear that the use of ICT could contribute to a caring situation for older people where the closeness and intimacy of face-to-face communication will be reduced and replaced by a remote communication, which is characterized by superficiality in the personal relationship (ibid).

Nakamura et al. (1999) discovered that after some initial skepticism, the care providers however recognized the improvement made by the video-based communication to the quality of care. For example, the travel time saved contributed to the growth in the frequency of client interventions, and video-based communication also enabled a better assessment of older people's emotional

states and their need for support compared to the telephone. In addition, ten carers who participated in a study by Sävenstedt et al. (2006) considered that an increased usage of ICT applications would propel development towards more home-based care. Some carers were convinced that being cared for at home was the best thing for most old people, and facilitated by ICT, it would contribute to increased freedom for them (ibid).

Ambient assisted living (AAL)

Ambient Intelligence (AmI) is about sensitive, adaptive and responsive electronic environments that are unobtrusively integrated into our daily environment and that are not only aware of our presence, but respond to the actions of persons and objects and cater for their needs, habits, gestures, and passions (Aarts and Wichert, 2009; Riva, 2003). Ambient Assisted Living (AAL) is viewed as one of the most promising areas of AmI.

Most efforts towards building ambient assisted living systems for the older adults are based on developing pervasive devices and apply ambient intelligence technology to integrate these devices together to construct a safety environment, and to enable people with specific demands to live in their preferred environment longer (Kleinberg et al., 2007; Sun et al., 2009). Assisting elderly people with comprehensive ambient assisted living solutions sets high demands on the overall system quality and consequently on software and system engineering – user acceptance and support by various user interfaces is an absolute necessity (Kleinberg et al., 2007).

In addition, Sun et al. (2009) stress the importance of social connections and social activities in AAL efforts, and point out that the dependence on the assistive devices unconsciously reduces the social connections of the assisted people. Thus, we should be cautious not to leave the elderly people only with assistive devices, but also with our compassions and communications (ibid). Furthermore, Sun et al. (2009) argue that effective and efficient solutions to meet the AAL challenges should combine the forces from both the technological part and the societal ones. The participations of human beings could help fully express the potential of smart devices, and maintain the social awareness of the elderly people; the usage of advanced ICT technology could better connect the elderly people together, organize community activities.

Research focus and methods

Case study was selected as a research method. According to Yin (2009) case study is an empirical enquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. In case study there can be many variables of interest, it relies on multiple sources of evidence, and it benefits from the prior development of technological propositions to guide data collection and analysis (Yin 2009). In this study, the variables of interest were 1) value expectations and 2) perceived value of the proposed service concept for the trial participants.

The participants were recruited with the support end-user organisation, which is a non-profit organisation providing services for older adults and people with disabilities. Services include assisted living and rehabilitation, social services, and care services. Participants were recruited by the care personnel working in respital and home care services, and they were living in their own apartments independently or with assisting services. The criteria for selection was the following: (1) pairs of frail

old person and his or her informal carer, (2) existing customer of the service provider, (3) has family, relatives or friends who would be available through video-communication, and (4) is interested in participating the study on voluntary basis.

The service (to be described in more detail in chapter Service Description) could be used for both one-to-one video-communication, and video broadcasting. The adoption of different features was done in the following phases:

- in February 2011 video-communication equipment was installed in care facilities and it came possible to call one-to-one video calls with family and relatives from personal rooms,
- in April 2011 video-communication equipment came available for home users to call one-to-one video calls from home,
- in May 2011 broadcasting unit was installed in care facilities to enable participation to group activities from home (and personal rooms of care facilities if needed) and basically, end-user organisation produced their own program channel or older people,
- in October 2011 video-communication equipment were installed in satellite care facilities to enable participation to group activities broadcasted from the main facility.

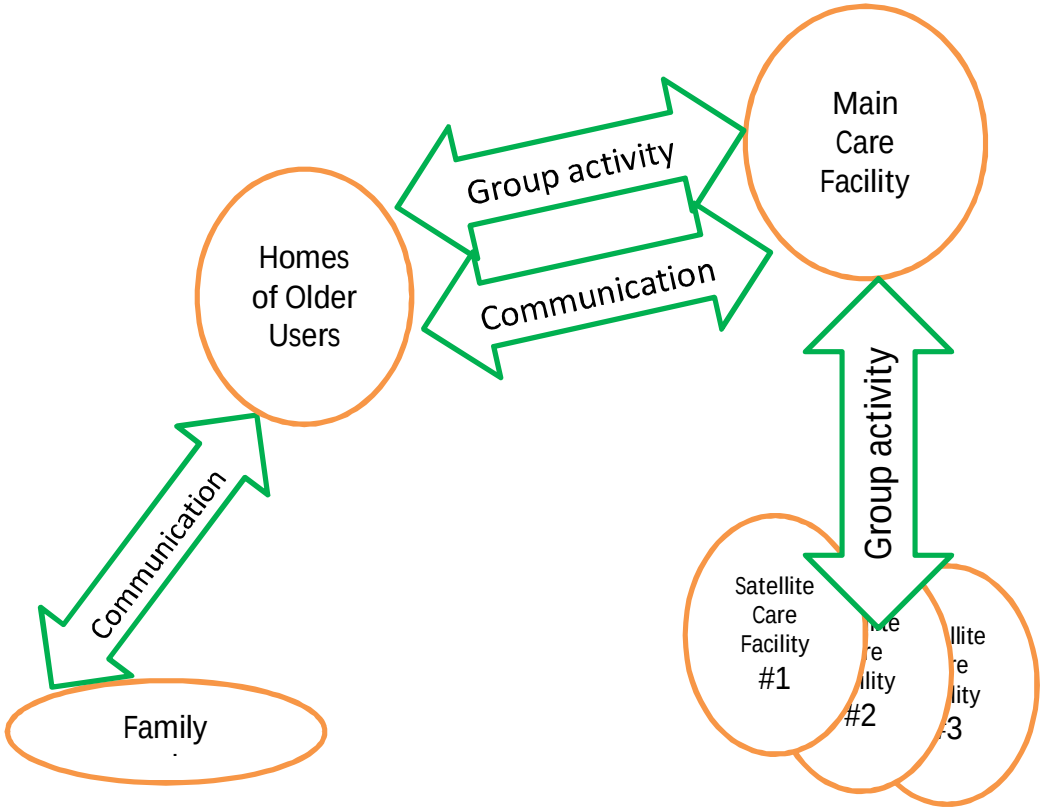

Figure 1. Service components.

To enable one-to-one video calls with family and relatives they were provided with a PC software and later a web portal for communication. Families and relatives were also recruited and introduced with the service and the research by the care personnel. Figure 1 illustrates the locations (orange circles) where the service was available, and video communication feature (green arrow) available between actors in different locations.

System description

System setups

During the field trial, four different settings with differing device setup were used as follows:

- homes of older adults
- main care facility
- satellite units of the care facility
- homes of family members and relatives

At home, the service interface was implemented with a touch-screen PC computer attached with a separate web-camera, microphone, loudspeakers, and associated video encoding software. Also, broadband internet connection was provided for the home users. The home users were able to use the very same technical setup when they were staying at the premises of the care provider for the purpose of respital care, i.e. a short-time care period allowing their informal carer some time for their own. At the headquarters of the care provider, a banqueting hall was used for group activities. The hall was equipped with a broadcasting unit with Vidyo HD-50 video conferencing device, separate web-camera, microphone, and loudspeakers. Broadband internet connection was already available.

Satellite units of the care provider were equipped with Vidyo HD-50 video conferencing device which was attached to a television, which was there before and was used to follow TV programs. The satellite care setup was used primarily for receiving broadcasts, even though they were occasionally also used for occupational therapy group sessions, and group discussions of care personnel. The setup included also a separate web-camera, microphone, and loudspeakers.

Family members and relatives used their own PC computer, web-camera, microphone, and loudspeakers to use the service. When the trial period started, they installed VidyoDesktop video conferencing software available for downloading in the internet. Usage instructions and login information were provided by technology provider participating in the field trial. In later phase of the study, VidyoDesktop was replaced by technology provider's web-based video conferencing portal.

Functionality

The main functionalities of the system were one-to-one video call, group video call and broadcasting. Group video call and broadcasting features were used by the service provider to offer an access to group activities arranged at the headquarters of the care provider. Group activity included both open and closed group activities: chair exercises, singing events, joint coffee discussions, and occupational therapy groups facilitated by an occupational therapist student. Also occasional broadcasts, such as religious singing events, juke box jury, morning gymnastics, poetry group, older people's week program, Father's Day program, brass concert, and various Christmas events, were broadcasted.

Every week three main activities were broadcasted real time from service provider's premises: 30 minutes chair exercise, 45 minutes group singing event and 30 minutes joint coffee discussion. Over 70 broadcasts were organised during the study and the amount of participants in individual events varied from 1 to 60. Participants included home users and older adults living in the satellite care

facilities. Participants were informed about the weekly activity program using a paper leaflet, which was delivered to their homes, and also via program guide functionality available through the system. In other care facilities the personnel informed the clients about the week's program.

Value proposition

In the co-design phase before the trials many activities targeting to get understanding of the customers and end-users, use context, and technological possibilities in order to design the service concept and define the value proposition. These activities included 1) 11 workshops and meetings by researchers, platform provider and care service provider, 2) interviews of five experts including care personnel, customers and representative of local association of informal carers, and 3) a small user study including a usability test, and before and after use interviews of three employees and three older people. Detailed findings of these co-design activities are not reported in this paper. The value proposition defined through these activities is described in Table 1. In this paper, we explore the value proposition for only three value network actors: older adults, their families and relatives, and formal carers. Therefore, the value proposition for service and technology providers are excluded in Table 1.

Table 1. Value proposition.

User group	Value
Older user	A new way to communicate for all users, including users with age-related reduced motor and cognitive skills.
	Experience of mastering ICT, including older adults with little prior experience on ICT.
	Encourages users to meet new people with the same kind of interests that they have.
Family and relatives	Relieves the concern of informal carers during respital care. Gives peace of mind.
Formal carers	The nurses will have fewer interruptions in their work, because customers can communicate independently to their homes.
For both older users and their families and relatives	Support for independent living of older people; people are able to live at home longer and more independently than without the technology. The service provides a possibility for older users and their closest people to see each other face-to-face (through video communication) more often than before. The service encourages users to be more socially active.
For all three user groups	Improves communication between the informal carer and the care service unit.
	The service will provide more organised activities for the customers of the respital care unit.
	The customers will enjoy more their stay at the respital care.

Participants

Five families were recruited for the study as home users. Four of these families participated in the group activities. One family decided to use the one-to-one video communication only for

communicating with their distant family members, and chose not to participate in group activities. Similarly, two families decided to use the video communication only for group activities and not for communicating with their distant family members.

Two thirds (9 out of 13) of the participants were older adults aged 70 – 86 and the rest were family members and relatives aged 30 – 57. Three older adults were cared by their informal carers i.e. their spouses, and they had illnesses that had influence on their cognitive skills (Alzheimer disease, Parkinson's disease, stroke). The characteristics of participants are described in Table 2.

Seven health care professionals, two men and five women, participated in the interviews and group discussions. Their ages were from 26 to 53. They worked as occupational therapists, physiotherapists, practical nurses, registered nurses and social work trainee.

Table 2. List of participants

	ID	Year of Birth	Gender	Living situation	Role in the family	Functional limitations
Family 1	1	1931	Female	With a spouse	Person cared for	Severe difficulties with memory and learning
	2	1927	Male	With a spouse	Informal carer	Mobility Sight Sense of touch
	3	1956	Male	With a spouse	Relative	No
Family 2	7	1927	Male	With a spouse	Person cared for	Mobility Sight Hearing Speech Sense of touch
	8	1933	Female	With a spouse	Informal carer	Sight
Family 3	9	1933	Male	With a spouse	Person cared for	Memory and learning Mobility Sight
	10	1941	Female	With a spouse	Informal carer	No
Family 4	18	1925	Female	Alone	"Independent"	Mobility Sight Hearing
	19	1949	Male	With a spouse	Relative	No
	23	1981	Female	With a spouse and children	Relative	No
Family 5	20	1930	Male	With a spouse	Person cared for	Several
	21	1927	Female	With a spouse	Informal carer	Memory and learning Mobility Hearing

	22	1954	Male	With a spouse	Relative	No

Data collection methods

During the 11 month field trial, we collected data to study how the service was able to create value for the three user groups. The data was collected using qualitative research methods; through observations and interviews. In addition, video communication log data was collected and analysed after the trial period. The following subchapters describe what data was collected and how before the field trial started, during field trial, and after it. Summary of the data collection methods is presented in Table 3.

Table 3. Data collection methods.

	Before use	During use	After use
Older adults	Interviews of seven older participants, including also close family members.	Observation by occupational therapist who was in contact with people when needed.	Interviews of seven older participants, including also close family members.
Care personnel	Observation by occupational therapist who was in contact with care personnel.	Observations of two user trainings. Three observations in distant units. Two interviews of employees of service provider working in distant units. Group interview of employees of service provider working in distant unit. Interview of an occupatioanal therapist. Diary.	Interviews of physiotherapist, and practical nurse. Group interview of two occupational therapists and a student.
Family	Observation by occupational therapist who was in contact with people during recruitment.	Observation by occupational therapist who was in contact with people when needed.	Interviews of four relatives.

Before use evaluation

In order to collect information about how the service was received by the home participants the researchers visited them at least two times during the study. During the first visit the participants were introduced to the technology by means of a hands-on demonstration. The participants could

try the one-to-one communication functionality by making a test call either to their relative, or if no relative was available, a technical support person. Two researchers observed the learning process, skills and the capabilities of the older users to use the system independently or with the help of their spouses.

Participants were interviewed for collecting data about their background information, prior expectations towards the service, social networks, attitudes towards the care they received from the care provider, and wellbeing and loneliness. Questions related to wellbeing were adapted from well-being module from the European Social Survey (ESS). Loneliness was studied using a loneliness questionnaire based on Hughes et al. (2004). Because some participants had difficulties with their cognitive skills, also questionnaire data was collected using interviewing method. One participant (u1) was not interviewed because of his/her severe difficulties with memory and learning, and one couple answered the questions together (u20 & u21). The loneliness and wellbeing data was used only to support qualitative analysis, as the user group is too small for quantitative analysis. Also, we think that qualitative analysis is better suited for studying perceived value.

Value expectations towards the service were studied by asking the participants to describe:

- earlier experience on the service or similar services
- general expectations
- expected need for the service
- expected use purposes of the service
- expected communication partners, and
- expected time the user thinks is needed to learn and use the new service.

It was difficult to gather information about family members' and relatives' expectations, because researchers did not have direct contact with them until the end of the trial. They also joined the study one by one during the duration of the study. There were also some drop outs, because they found out that their computer setup at home was not suitable for this purpose. In the beginning researchers tried to use a web questionnaire to collect data about expectations of relatives, but it was not a success, and it was abandonded. Thus, the expectations of relatives and families were not systematically studied until in the final interview in retrospect. However, care personnel involved in the recruitment process was able to observe reactions and response of family members and relatives to the opportunity to join the study and adopt the service. This data was available for analysis.

The value expectations of the formal caregivers were studied in co-design activities before the trials to formulate the value proposition. However, in the beginning of the field trial the importance of value creation for formal caregivers was not sufficiently recognized nor addressed. In the beginning, they were merely seen as resources representing the viewpoint of care service provider; not as individual users with needs, hopes, expectations and aspirations. However, during the field trial, the researchers realized that the value creation needs to be studied separately for formal carers as human beings and service provider as an organization.

During use evaluation

We collected data about experiences related to the use of the service through both direct and indirect observations. Firstly, we directly observed the users during the field trial period. Secondly,

we asked the care personnel interacting daily with their customers to observe issues related to the use of the service, and requested them to write down observed issues.

One occupational therapist working with the care provider was nominated to be responsible of the data collection activities. She collected information captured by her colleagues, and reported those with her direct observations regularly in a diary. Her role was of a participant observer who engaged personally in the research activities (Patton, 1990). She received feedback and practical questions also from the participants through everyday interactions, including face-to-face discussions and phone calls. She wrote 84 notes to diary from January to November 2011. The notes concerned user recruitment (21 notes), technical problems (14 notes), personal user experience of the therapists (12 notes), research arrangements (11 notes), experience of older users and their families and relatives (10 notes), practical arrangements with the users (9 notes), and experience of other formal carers and volunteers (7 notes).

Two researchers visited all four different care facilities of the care service provider and observed the service use and customers' comments and reactions in situ, and also interviewed care personnel. Field notes were written to capture the researchers' observations and all interviews were recorded. Researchers were encouraged to evaluate motivation for use, effect on users' state of mind and vitality, and influence on the users. In addition, they evaluated is the timing and environment favourable for service use, who are present, occurence of distractions, who uses the service, which functionalities are used, and what is the outcome of the service use.

In addition, automatic logging of log data was used in order to follow usage activity during use.

After use evaluation

In the end of the study, an end-of-trial interview was arranged at the homes of the older users. The home participants were asked open-ended questions about their experiences, group activities, social network characteristics, usability of the technology used, and well-being and loneliness. Regarding their experiences, they were especially encouraged to tell about the perceived value; what they think about the service, did it meet their expectations, for what purposes they used it for, was it useful, were there some situations where the service was especially useful, was the service something they needed, and does the service provide new benefit or advantage to them.

Relatives were also interviewed and they were asked open-ended questions about their experiences:

- expectations in the beginning,
- earlier experience regarding video communication services,
- responses toward the service,
- their older relative's responses toward the service,
- correspondence to expectations,
- use behaviour and –purposes,
- usefulness,
- compatibility with user's needs,
- benefit or advantage provided to the user,
- did the service use take much time,
- service's impact on easiness and frequency of getting information,
- what motivates them to use the service.

Data about experiences of care personnel was collected with three interviews. One was a group interview of two occupational therapists and a student studying occupational therapy performed by two researchers. In addition, there were one-to-one interviews with a physiotherapist and practical nurse. These people were selected as they were the central people in the study and used the service most. The student who facilitated the closed group activities wrote a therapy plan for both groups and reported her observations and experiences in a study report. She also wrote a summary of the findings, which was used as a starting point for the first group interview. This group interview was recorded and professionally transcribed verbatim.

The questions exploring the perceived value of the care personnel included the following:

- responses toward the service
- correspondence to expectations
- use behaviour and –purposes
- usefulness
- compatibility with user's needs
- benefit or advantage provided to the user
- changes in the amount and quality of social relationships.

The data was analysed using qualitative content analysis (as in Elo & Kyngäs, 2008). More specifically, open coding was used to organising the data and grouping findings related to different user group's value expectations and perceived value.

Findings

We divide here the field trial findings separately for three main user groups, i.e. (1) older adults (older users and their informal carers), (2) their family and relatives, and (3) nurses and other formal care personnel. For each group, we discuss the value expectations, i.e. what hopes and expectations the users had towards the service, and analyse the perceived value from the viewpoint of each user group. In addition, we identify factors that were found to slow down or hinder service adoption.

Value for older adults

Expected value

First, the older adults expressed cautiousness towards the novel technology supported service, and were doubtful about their own capabilities in learning to use the service. Their life situation was also difficult in many ways; they suffered from illnesses, such as Alzheimer, or they had limited functional capacity after a stroke. Thus, they had become dependent on other people's help and support. Also the informal carers (typically spouses) were exhausted and could suffer from depression, and they sometimes had difficulties to recognise these symptoms by themselves. Diary notes showed that these reasons created clear problems for recruiting users to participate in the study, the nurses had to be very persuasive to assure the users that their skills and capabilities would allow them to use technical components needed. This often required demonstrating the technology in order to show how it is used. Also communication with the family, relatives, and technical support was usually needed before people were recruited.

"Family member came to pick up one person and we had a short meeting about this project. Currently, their life situation is too busy and stressful. We agreed to discuss about this later. They were interested if the life situation gets better." (Diary, March 2011)

The older adults expected the service to provide them a new mechanism for communication. They directly expressed two aspects adding value to their existing communication mechanisms. Firstly, many had difficulties to use a telephone or a mobile phone due to physical or cognitive limitations. They got tired on holding a phone during the conversation, or could not even grab one properly. Some could not hear properly, and others were not able to cope with using the phone independently and needed the help of someone else (often their spouse) to initiate a call on their behalf.

"He (#20) does not manage the use of a mobile phone, but this [new service] is good, since also he is able to use this (on his own)." (#21)

Secondly, they expected the video feature, i.e. complementing audio with a video image, to provide them added value through added visual component.

"You will see who you are talking to, with a phone you won't see (#9)*."*

Also, a couple of users would have been able to use a normal computer with video communication tools, but they were reluctant to adopt a computer. They had an impression that normal off-the-shelf computers and tools are too complicated for them, and they did not want to invest time to learn them. Other participants' poor physical condition prevented them from using computers. One family member said:

"Skype would be too difficult for someone like her. She doesn't want to learn to use a computer anymore." (#23)

Two informal carers had their own computers, which they used regularly for communication with their own friends and relatives. They also used Skype and sometimes did that together with their spouses.

"He often sits next to me when I'm using Skype." (#8)

It was observed that informal carers were often responsible for communication and social interaction in and outside the family. This was sometimes difficult for both informal carer and person being cared for. People being cared for who were not able to use computers and who were not familiar with new technology, had difficulties to understand how and why their spouses spend time on computers. Informal carer considered that computers are important for them in order to be in contact with their families and friends, especially because they are not able to leave homes whenever they need or want to.

"My wife has a computer, she plays with it." (#9)

"I hope that my spouse finds friends who he can be in contact with. (#10)

The strongest value expectation for the older adults was the expectation of stimulating social activity which would enrich their daily lives.

"This would bring along some nice pastime (#21)."

"This cheers up an old person (#20)."

"You now get revived when you start using this in the morning (#18)."

Most of the older participants already had limitations in physical mobility and/or cognitive decline which limited their possibilities to go out. Therefore, they expected that the service would provide them with a stimulating possibility to participate in activities outside the limited constraints of their own home, and therefore feel more connected with the local community.

"It is good to know what is happening (#20)".

"Since you are not able to leave from your home, it is nice to be able to follow from home (#21)"

Some hoped to enlarge their social circle by making new friends, as shown in the following excerpts:

"It could be nice if I could find friendly chatting partners and friends (#7)".

"Hopefully my spouse will find new friends to whom he will be able to make a connection (#10)."

They also expected that it would be fun to talk with other people and have a connection to service provider's facilities (#7).When participants were asked if they would like to communicate more with their friends and relatives, all answered no. Thus, they were quite satisfied with the amount of communication with their friends and relatives already before the study.

Experienced value

Video communication

According to the data collected during and after the trial, the home users reported that they were very satisfied and pleased with the service. They had mostly positive comments regarding their thoughts and opinions about the service experience:

"It is interesting indeed (#9)";

"Good 'machine', definitely (#2)";

"It feels so ordinary, nice, when you see each other from face to face (#18)";

"There is no more to learn than to put the power on; -- We couldn't guess that it would be this good. This is easy." (#21)

Visual communication possibility created clear added value for the users, as described by the following participants:

"It gives so much, seeing the other person – The video picture supports verbal communication." (#2)

"*You will see if things are alright on the other side (#2)"*

"…one picture is more than thousand words, and seeing clarified the whole situation at once (#18)".

"My grand grandchild was born during the time of using this device. This has enabled to see her to grow. With a phone you will just hear the voice." (#18)

One participant (#18) described how she first thought the service would be suitable only for younger people and she hesitated to participate. However, as soon as the study started, she said that she "lights up" in the morning when she turns the service on.

Technical components of the system were easy to learn and use for most users. Two users (#9 and #20) had severe difficulties with their memory or cognitive skills and they could not learn to use the system totally independently. However, also they were able to use the service when their informal carer helped them with the technical setup. Most participants expressed feelings of achievement and joy from mastering new technology on their own, as illustrated in following:

"Nice experience, made me feel good, it is always nice to learn something new (#18)".

"I called our home user (#18). She told about her day and said that she had tried to use the device by herself (went to phone book and back) and she had experienced feeling of success. She said that it doesn't feel that anxious anymore." (Diary, August 2011)

"Oh dear, I'm able to do this!"" (#21)

"I called our home user (#21). She was really proud of herself for managing this device and for calling her son…" (Diary, August 2011)

Some users had experienced safety value through using video communication with their relatives. Video communication had provided them an opportunity to actually show, for example, medication bottles or even written medication prescriptions; allowing the relative to give advice which would not be possible through audio connection only.

"We have discussed issues related to medication and also other important things (#21)."

The value proposition expected that the service would relieve the constant concern of informal carers while the person being care for is staying at the respital care. However, in practise, it was found out that most informal carers are not home or they just want to rest when their spouse is away. Thus, the service was not used much for communication between respital care unit and informal carers at home.

Participants also had additional ideas or expectations that the technology was not able to fulfil. One downside was that the friends and relatives available for one-to-one video communication were limited. For example, participants would have been interested to communicate with their other older family members who are living far away or call to homecare services or public health centre.

"It would be nice to contact his older sister. They talk on the phone every week, but it would be nice talk face to face. It would be also useful if homecare would call and give instructions, e.g. what medicines to take." (#21)

"It would be useful to call to a health centre." (#20)

Technical problems sometimes caused trouble and grief. It was found out that the users sometimes also misinterpret error situations:

> *"I got email from a relative. There had been some technical problems in the video connections at the respital care unit and the error message said that 'the person is not home or available'. The older person was really upset, because he thought that his wife is at home, but the device says that she isn't." (Diary, August 2011)*

It proved essential that in the very beginning the users could have hands-on experiments with the service, since after having tried out the service functionalities in practice they noticed to their pleasant surprise that they were able to get grasp of the operation of the service and to use it independently.

> *"At first I had a doubt of whether I would be able to use it, but it is easy. We got help in the beginning and we have also learned ourselves by experimenting with it."* (#21)

However, for example one user reported that adopting the service into use was not a big issue (she was experienced user of assistive technology, for example, she had also e.g. reader TV in use at home):

> *"Adopting the device was not a big deal."* (#18)

The users expressed that as they had accepted to take this kind of a novel technological system at their homes, and as someone had took effort in providing them the service offerings, in consequence they felt that they should then also regularly use the device and participate in the broadcasts. However, the users typically described this as positive motivational issue, and not a stressful pressure (except the case discussed before), as described in the following comments:

> *"I have myself taken a stand that when there comes some service offerings, I need to follow it. There has not been any pressure for this."* (#10)

> "*It is also to some extent so, that as they have given this kind of device for you to try out, you also should use it* (but not in a negative way)." (#21)

> *"I felt that I had to use this, as I'm part of this* (user study). *I would have participated in the events also live, in situ."* (#18)

Broadcasting

Broadcasting functionality was well received among participants. Family 1 did not use it much, but families 2, 3, and 4 mainly used the service for following broadcasted group activities. Only family 5 used the service more for communication with their family and relatives than for group activities.The ones who chose to participate in video-supported group activities, found them valuable. They expressed that participating exercise sessions increased both the quantity and quality of physical exercise, as shown in the following quotes:

> *"When you think the exercise sessions, this device has been useful for us." (#9&10)*

> *"We wouldn't have exercised this much* (without the device*)." (#9)*

> *"If you exercise by yourself, it remains short. It is good that there is this separate time reserved for exercising." (#7&8)*

Short physical distance to the on site -events was not always reason not to participate in digital activities. As an example one couple (#20 and 21) who lived near the main facility of the care provider used video communication also to participate in group activities. The person being cared for was in a wheelchair and also her informal carer had limitations with her mobility. Thus, they were not able to leave their home that easily even though the physical distance to banquet hall was short. One another participant (#18) who lived near the main facility sometimes participated in one site-events and sometimes to digital ones.

> *"Home user (#18) gave feedback about the lecture. She said that it was wonderful to follow it from home, because she was able to hear and see well, even the videos that the lecturer showed. Later she participated in chair exercises on site." (Diary, October 2011)*

Occupational therapy sessions led by professional occupational therapists were very highly valued by the older participants. Firstly, they seldom could participate in social interaction without the help of their spouses, so these social situations increased their self-esteem as they could participate alone. Secondly, even though some users expressed that they hoped to make new friends with the help of the service, this seemed to be very difficult. Specially designed occupation therapy group work sessions were successful in helping the participants in bonding with each other and forming new social relationships. Third, a few users experienced advancement in a physical condition, e.g. speech production, already during short occupational therapy session. The appreciation towards therapist-led group activities are well illustrated in comments, where the participants express feelings of sorrow because the activity ended:

> *"There could be more of these kinds of facilitated conversation things* (closed group communications)*. (#9)*

> *"My spouse and participant #7 understand each other even though they both have difficulties with their speech." (#10)*

> *"Participant #7 was a bit quiet, but soon it (speech) got substantially better. He said to me that he likes that it has improved because we were taking turns when we were discussing about the subject." (#9)*

Also, the nurses had observed that before and after a broadcasted group activity, home users lingered on video communication room and chatted informally. They learned to know each other, and seemed to enjoy discussing with each other. However, even though the system would have allowed the users to establish informal discussion groups and meet to chat informally anytime, this did not happen during the time of the trial. Spontaneous informal communication was observed only between older adults and their family or relatives.

> *"We could meet some new people* (other project participants). *We could talk a little before the start of the service offerings; It felt like we were already friends." (#18)*

"We received new acquaintances. #7 and #20 and #18, she was a sharp woman." (#9&10)

The service provided value also for informal carers, the close family members who were living in the same household. As the service could be used by users who normally were very dependent on their spouse and informal carer, it provided also the spouse an opportunity to have a break and do their own things while the person who normally required constant care and attention was engaged with the service. This was valued by informal carers. They stated that having a bit more independency increases the quality of their relationship, and provides both of them an opportunity for self-directed activity.

"I have not participated in activities; I have done something else. As an example, I have gone to a computer and had some own time there." (#10)

However, some families suffered from technical problems so often that the spouse could not leave the home because she wanted to be available if technical failures would occur.

"As I have noticed the Mrs from family 2 (#8) can leave the home for her chores after switching the device on. She waves for goodbye, and she is taking her own time and leaves for the chores but I'm not able to do so." (#10)

"But the thing is that I cannot leave from home. When the program starts, the connection can break, and he (#9) isn't able to work it out by himself. Thus, I am forced to be here all the time." (#10)

Not all users took part in group activities. When the first family entered the study, the broadcasting unit was not yet installed. When the possibility came later, they were encouraged to participate, but they were not interested anymore, because the service had not meet their expectations regarding group discussions with family members and broadcasts which were not available early enough.

During the study one person (#18) expressed that she would not like to continue following service broadcasts. It was found out that she had expected that her participation through video would arouse interest or positive attention among her friends or acquaintances from the group. Researchers interpreted that she was a bit disappointed when she had received quite neutral comments from her peers. She also had difficulties to hear properly and she said that the sound quality of music events is not good enough when she participated with video connection. She also experienced some pressure to participate in all video activities, because she was involved in a research project. When the care personnel and researchers found this out, she was encouraged to join live activities whenever she wants, and ensured that there was no pressure to participate video activities.

As the video communication equipment were installed and available for use in all care facilities, the residents of the care facilities could also join group events. These occasional participants were older and disabled people especially from respital care unit. The service provided them a chance to participate in the activities, such as joint coffee discussions or chair exercises. They mainly responded positively.

"Today three respital care users and one home user participated in the joint coffee discussion. People were happily surprised when I told about the device for them. Event went fine and atmosphere was positive…" (Diary, September 2011)

Value for relatives

Expected value

As earlier was mentioned, family members' and relatives' expectations were not studied until in the final interview. In retrospect they evaluated that they did not have much expectations (#23) or they expected that *"it should be simple enough and stabile"* (#22). One person expected that video communication service would provide activities to his parents and family members could communicate more using the group discussions (#3).

Experienced value

Some of the older adults used the video communication possibility to communicate with their family members or relatives, but not all. Some family members said that as they live close by, they prefer visiting the older adults in person. Others said that they are too busy with their work and everyday routines to adopt new means of communication. However, the users who did use the service for communicating with their family members valued this new communication means highly. Some reported that service allowed them to be more involved with the lives of their relatives, as described in the following: *"It is easier to see physical presence from the screen. When the connection is established it is possible to see them both, which wouldn't happen on the phone. It is easier to evaluate the situation, both are there and follow what is happening… looks interested and you can see that he is delighted." (#3)*

"It has been changing the feeling of belonging, how has been the health, how did the night go, ordinary family issues, daycare discussion with a son, how has the grandchild's horse being doing, nice things like that." (#21)

"They (my parents) *have used* (the service) *to show all kinds of problem situations to me with the help of the camera." (#22)*

When relatives were asked to compare this service with other communication methods, several reasons were identified to show added value compared with other technologies:

- it is a communication method for people who can not use mobile phones or other video communication technology (such as Skype) by themselves,
- it enables more regular communication with those people who do not live close to you,
- because it enables more regular communication, it prevents loneliness,
- it enables communication also when travelling,
- it improves the quality of the communication, because you can see each other and it is easier to see how the other is doing,
- it improves quality of life because seeing each other gives energy and joy,
- it improves the quality of the communication, because possibility to see each other stimulates memory more than just hearing voice,
- it improves the quality of communication, because people can't be busy or do anything else in the same time as they would do while physical visits,
- interactive broadcasts make users more active compared to TV which makes them passive,

- it enables group discussions, because many people can join discussions from the same device (e.g. phone discussions are usually one-to-one discussions),
- it replaces mobile phone.

Especially in one family, video communication service was found to be intuitive and natural way to communicate.

> *"In the beginning these situations were almost scripted, but now they are almost spontaneous, the technology tool has disappeared. My mom walks around the house and comments things every now and then." (#22)*

In another family more difficulties were faced.

> *"My father is informal carer and kind of tied to daily chores and duties. Maybe he felt that the device is something extra to take over… My parents feel that this kind of devices are only for formal discussions." (#3)*

Home users could use the service while they were staying at the respital care unit of the care service provider. It was important for the relatives that the service is available when promised.However, sometimes the service availability was limited:

> *"My father was promised that even if he would stay in a different room at the respital care, the device is always ready for him. He can't help in that matter and he is really upset if the device is there, but he can't communicate with it. He stays there often during weekends and project workers are not there to help." (#22)*

There were some technical difficulties in the beginning. Families and relatives used their own or their employer's computers or and it required some effort from them and technical support to get the system working.

> *"In the beginning, it was a bit difficult – there was this thing related to audio connection that person from care service provider took care of. After that it has turned out well." (#19)*

> *"Two of our family members were not able to adopt it because of information security issues or something." (#19)*

> *"Yes (it met my expectations). The only thing was those technical problems, which were simple to solve... My husband told me how to select the right camera option." (#23)*

One relative, who had mainly positive experiences about this service, expressed her worry about technology's possible passivizing influence on people. Some older people might stop going out of their homes to participate live activities, if they have a possibility to participate from home.

Value for formal carers

Expected value

As earlier was mentioned, the importance of value creation for formal caregivers was not sufficiently recognized nor addressed during the early phases of the project. Formal caregivers were seen as resources used by the care service provider; not as human individuals with needs, hopes, expectations and aspirations.

The initial value proposition for the care personnel was formulated along the lines of better care service quality. Obviously, this value expectation reflects really the organizational point of view, and is not detailed and personalized enough for value creation at personal level which is needed to motivate individual nurses to participate in service value co-creation. In retrospect care professionals evaluated that they suffered from anxiety associated with technical components of the system in the beginning.

Experienced value

Although some nurses suffered from anxiety associated with technical components of the system, their attitudes were much more positive after they had a chance to actually try the service and related technical components. All interviewees found the service as easy to use.

> *"At first, I thought: Help me, what is this? How this is used? But then I got introduced with the service and now I think that everything is going surprisingly well."*

The caregivers found it rewarding to learn to use the service and to teach others to use it. The person who was in charge of the project reported that it was easy to introduce the service to care personnel, and show them how to use it. Interviewed care professionals valued also the possibility to present the possibilities of the service for students and other people who were visiting the care facilities, because it gave a modern impression of their organization. They said that as technology is used more and more in the society it is only natural to start adopting technology supported services also in care services. One nurse commented:

> *"This is modern-day technology. In the future, older people are different, who knows what kind of gadgets they'll use. They are used to technology and they know how to use it."*

Some formal care personnel, such as the person who facilitated singing events, used much of his day travelling from facility to another. He was able to reduce the time used for traveling, as the satellite facilities could use video to participate in events arranged at the main facility of care provider. He estimated that in consequence he saves up to five to six work hours weekly. He was also happy because eliminating the need to travel from one facility to another during a working day allowed him to commute by bike, as he did not need his car anymore during the day.

The service also had an effect on the social relationships of the nurses. The interviewees in the satellite facilities said that they had experienced to be a bit isolated from the main facility. One of the benefits of the service has been the possibility to be in contact with the main facility and thus feel more connected. One interviewee also experienced that during the project she has been in co-operation with the caregivers of the main facility and the project has brought caregivers from different facilities closer to each other.

Finally, the formal care personnel did get value from seeing that their customers enjoyed the services and were able to participate better and in more versatile way in the services offered by the service provider.

> *"First successful coffee discussion. We had two home users. The element of peer support realised when men shared stories about their lifes and how they got ill. The atmosphere was very positive and customers said that time went really fast when chatting. One person from respital care also participated and he smiled a lot and participated."*

"We had coffee discussion with four of our home users. Theme was to discuss about local dialect. Event was a success and entertaining and customers gave positive feedback." (Diary, August 2011)

The occupational therapist who used video communication for therapy sessions was happy that she could reach new customers who clearly benefited from the service. She also found new ways of working refreshing and wanted to learn and develop new working practices.

"We had 'project dates' with our home users, also researchers participated. It went fine and we got valuable feedback concerning this study." (Diary, September 2011)

Nurses were pleased to see that their customers were more socially active. Also, nurses in satellite facilities were happy that their customers had a chance to participate in wider selection of facilitated activities. They had learned that they could encourage participation at the satellite facility by showing example themselves, e.g. by participating in singing or exercising.

However, as there were occasional technical problems, for example, in audio quality or internet connection, the care personnel felt some anxiety towards the technology. In the case of technical problems, the older adults naturally expected the service provider to fix all problems, and usually it was a nurse or other member of care personnel who were closest by and needed to tackle the problem situation somehow. Therefore, the formal care personnel felt that adding technical components adds their responsibilities in dealing with possible – or inevitable – problems, resulting in negative experienced value. In addition, they felt that especially the poor sound quality should be improved and feeling of presence should be enhanced to get the service even better.

"Juke box jury with three participants on site, a couple of home users and one satellite care facility. They still complained about poor sound quality, but the athmophere was nice and unreserved. People on site enjoyed the music and one got emotional and burst into tears… Home users might not feel the atmosphere in a same way. Especially people in the satellite units are more difficult to get really excited." (Diary, September 2011)

There were some negative experiences regarding the time and effort that had to be used in the beginning of the project to get the broadcasting service running. As an example, the care personnel was respontilbe in recruiting users, collecting data, and ordering user accounts. Because of the broadcast functionality, all kind of changes were made to the work processes and also to the physical environment, such as changing furniture, training other caregivers to use the service, providing technical help and support during broadcasts, scheduling, planning, communication, and dissemination. Still, sometimes the information did not flow as planned.

"First Juke Box Jury. We had eight participants from one satellite unit. They liked it. We were supposed to have participants on site from two other units, but they didn't have time to bring them on time and one customer had got wrong information from our reception…" (Diary August 2011)

"We had singing event (on site) with one satellite unit and one home user. Suddenly people in satellite unit just disappeared, but the connection was on until the end. Where did they went? For a coffee?" (Diary, October 2011)

Also, even if the group activities existed already before the project, some changes were necessary when they were broadcasted through video. As an example, one headache was the lyrics of the songs. They were first in their original format as MS Word documents, but they were later changed as MS Power Point slides, because customers said that scrolling the words is distracting. These kinds of small changes took time and effort.

Some of the group activities are normally held by volunteers, who were also trained to user this service. Their experiences were quite positive.

> *"Religious singing event hosted by external volunteers. It went great. Great feedback from satellite unit." (Diary, June 2011)*

> *"Singing event which was hosted by external volunteers. It went fine and hosts gave positive feedback. It didn't disturb event on site anyhow. 40 people participated on site and 10 through the device." (Diary, August 2011)*

Analysis of the value

Older users

Our analysis indicates that the initial value proposition of the service was partially met. The service concept was successful in offering a new way to communicate for older users. However, the understanding on how and why the older adults communicated with this new communication service changed during the field trial. The initial value proposition expected that the service would bring peace of mind for older adults and their caretakers through supporting communication during respital care. However, the field trial experiences show that the service was more successful in creating value when the older adults were able to use it at home compared to when they were staying in respital care. The service was also successful in creating positive experiences of mastering ICT. However, this value proposition was realized only through use; the older participants did not expect to get value through positive experiences of mastering technology. The participants also learned to know new people, as expected in the original value proposition. However, the expectations of participants towards establishing new social relationships seemed to be higher than what was actually achieved. For example, the older adults did not establish informal discussion groups and meet to chat informally. Those who used the service to communicate with their relatives, got help and support that they needed for independent living. Participants also enjoyed especially of the new activities available through wider service selection as assumed in the initial value proposition.

Our findings show that there were differences between value expectations and perceived value among older users. Table 4 summarizes how the understanding from value creation from the viewpoint of older user developed during the study.

Table 4. Comparison between expectations and experiences among older participants

Value expectation	Perceived value
New communication tool.	Pleasant and interesting way to communicate.

	Limited possibilities regarding people to contact (-).
Difficulty to learn and use technical components (-).	Easy to use. Feeling of achievement and joy through learning and mastering technical components. Technical problems, e.g. with the Internet connections, sometimes hindered use (-). Not all relatives living further away had needed equipment or skills to use the service, and therefore could not be contacted. (-)
Communication tool for independent use.	Most users learned to use the service independently, but not all.
Communication tool with visual component.	Visual communication supports verbal communication. Added value from visual communication.
Stimulation for social activity.	Facilitated group activities were successful in stimulating social activity. Communicating with relatives and family was found valuable. Expectations of forming new social relationships were not fully met. Especially informal and spontaneous interaction with new people did not happen. (-)
Participation in activities outside home.	Increase in quantity and quality of physical exercise. Poor sound quality in some activities (-).
Enlarging social circle.	Participants learned to know new people in facilitated activities. The service was not used for spontaneous interaction. (-)
Contacting care service provider.	The service had little support to contact care service provider (-).
Mastering technology would raise interest among peers.	Little interest among peers (-).

In addition, our analysis shows that the participants reported value experiences which they could not anticipate as value expectations before use. These include:

- Safety value through using video communication e.g. in medication taking.
- Adding visual component to communication helps to understand how other person is feeling better compared to audio connection
- Improvement of physical condition; e.g. improvement in speech production.
- Opportunity to feel more connected with relatives living far away.

- Closed group activities i.e. occupational therapy sessions increased self-esteem as older adults with severe cognitive or motor challenges were able to participate alone without the participation of their informal carers.
- As the service could be used independently by older adults this provided a possibility for a break for informal carers.

Relatives

The initial value proposition of relieving constant concern of family and relatives was met in the field trial from the viewpoint of relatives, but not from the viewpoint of family members who lived with the older adults, i.e.informal carers. Jatka tähän

Some differences between value expectations and perceived value among relatives. Table 5 summarizes the value expectations and perceived value from the relative's point of view.

Table 5. Comparison between expectations and experiences among relatives

Value expectation	Perceived value
System is simple and stabile.	Service was intuitive and natural for the older people. Remote installation of video conferencing software often required technical skills and knowledge. (-)
Service would provide stimulation or activity for the older people.	Using visual communication for interacting with relatives gives energy and joy.
New communication tool with group communication possibility.	The service was able to provide a new communication method also for the relatives. Enables group discussions. Especially, group discussions where many people joined discussions from the same device were valued in interaction with relatives.

In addition, the relatives reported experienced value that was not included in their initial value expectations. These include:

- Service provided an opportunity to feel more connectedness with relatives.
- Service created safety value through because using video communication helped in certain problem situations.
- In some cases, the video communication method created more regular communication practices.
- The service could support in preventing loneliness of both older people and their relatives.
- Provides a rich communication method also when relatives are travelling, e.g. during business trips.
- Compared with telephone communication, the service improves the quality of the communication and interaction, because you can see each other and it is easier to see how the other is doing.

- Compared with telephone communication, the service improves the quality of the communication, because possibility to see each other stimulates memories more than just hearing voice.
- For some users, the service provided a more relaxed and informal way to communicate compared with daily visits. The users reported that they felt they could do other things (homework, for example) while they were interacting with video communication, whereas they felt it was not polite to do homework if one received a visitor.
- Interactive broadcasts make users more active compared to following TV programs.

Formal caregivers

Jatka tähän

Figure 6. Comparison between expectations and experiences among health care professionals

Value expectation	Perceived value
Better service quality.	Possibility to provide a wider selection of services. Possibility to provide services in versatile ways.
Difficulty to learn and use technical components.	Easy to use. Learning and mastering technical components was rewarding. Technical problems added their responsibilities, which sometimes caused anxiety (-).
No expectations.	Possibility to present the service for visitors.
No expectations.	Reduced time used for traveling.
No expectations.	Possibility to commute by bike.
No expectations.	Opportunity to feel more connected with colleagues in other facilities.
No expectations.	Opportunity to co-operate with colleagues in other facilities.
No expectations.	Joy on behalf of the customers.
No expectations.	Refreshing to learn new things.
No expectations.	Technology adoption took a lot of time, which caused anxiety especially in the beginning (-).

Use activity during the pilot

Technology provider logged use activity of home users, their relatives, and carers. Based on log data it was possible to analyse how many calls each family called, how much time their used for point to point –calls (video communication) and conference calls (broadcasts). See Figure 2 for the analysis of the data.

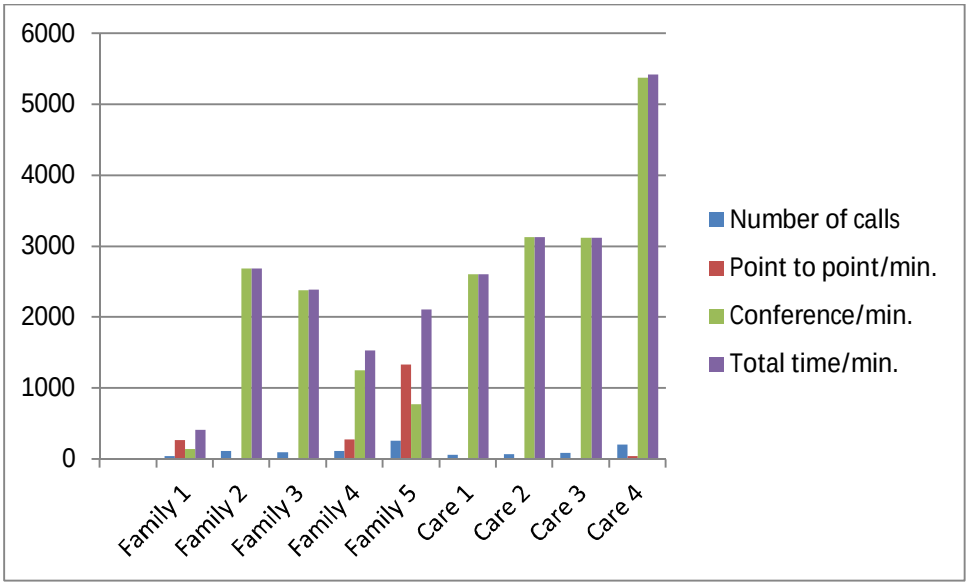

Figure 2. Usage log data.

Concerning the first family the adoption of the service did not proceed smoothly or without problems, thus affecting family's perceptions about the easiness of adoption and their overall use activity. Clearly, the service adoption process was not smooth enough when the first family joined the study.

"...but it proceeded so very slowly the whole operation." (#2)

In addition, only the informal carer of the first family was capable of operating the service, due to the very severe memory impairment of his spouse. They called 45 calls and used the service for 414 minutes in total (see Figure 2).

The second family called 117 calls and used the service 2691 minutes in total. They called the most when measured by duration of the calls. The third family called 101 calls and used the service 2392 minutes in total. As the Figure 2 shows the second and third family mainly used the service for open and closed group activities and not for communication with their friends and relatives. A couple of point to point calls visible in the graph were test calls or interview calls made by technology provider's technical support and researchers.

Fourth family used the service for both purposes, for communication with family members and relatives, and group activities. However, more time was used for group activities. They called 114 calls and used the service 1534 minutes in total.

The fifth family's use behaviour was different compared to the others. They used the service for both purposes, but they used more time for communication with family members and relatives compared withthe group activities. The qualitative findings showed that this family received wide range of benefits from using the service, e.g. safety value through discussion related to medication and other important things. They called the most when measured by number of calls. They made 262 calls and used the service 2111 minutes in total. They also continued the service use some time after the trials and made a contract directly with service provider.

“Care 1”,”Care 2”, and “Care 3” entities in the graph represent the use of video-conferencing devices in the satellite care facilities. This data shows how the permanent residents of care facilities participated in group activities broadcasted from the main facility. Care 1 used the service for 2604 minutes, which was less than in the other two satellite care facilities who used the service for 3130 and 3119 minutes. Qualitative findings showed that there were problems with sound quality in Care 1 and also, their daily routines and schedules were different than in the other units and thus, they were not able to follow the broadcasts as often than in the other units. Care 4 represents the use of broadcasting unit in main care facility: it was used for 5428 minutes.

Willingness to adopt

Old adults

Considering the permanent adoption of the system, users brought out an issue of costs. How much would it cost per month for them to keep the device and use the service in the future after the end of the project? One family also felt that currently the broadcasted service offerings were not versatile enough and there were not so many broadcasts per week in order to get them to adopt the service in long-term use. The following comments illustrate how the participants commented the pricing issue:

> *“We discussed the price. If it would be cheap, then we would get it.”* (#9&10)

> *“How much would it cost, subscriber charges, the device, etc.? Not with this current offering, there are not enough service offerings for us.”* (#7&8)

However, one family expressed clearly that they would be more than willing to adopt the system in permanent use, and they were ready to pay money for it:

> *“I don’t suppose you would get it for free. It shouldn’t be a question about money, when you are not able to use even a phone, and this would bring benefits.”* (#20&21)

Thus, there were somewhat contradictory point of views between individual families in regard to the question of adopting the service, and imagining the future situation where the service would be in everyday use and whether or not it would integrate into and support their everyday lives:

> *“I don’t know about the everyday life… It might become a burden then.”* (#10)

> *“I am in an opinion that it could be a kind of buttress.”* (#21)

The following reasons were identified diminishing the usage of WeCare technology:

- life situation, e.g. busy at work (family 4)
- limited selection of services (especially in the beginning when there weren’t other users) (family 1)
- lack of technical support, difficulties to get user accounts for other family members (family 1)
- technology readiness, especially with family portal (family 1)
- difficulty of changing habits of older people (family 1, family 4)

Relatives

One relative (#22) stated that they were very willing to take the service into use on their own expense:

> *"It would be great, if this wouldn't end here."* (#22)

He was in the opinion that this kind of service activates its users, contrary to watching programs on TV, which passivizes the users. He (#22) considered that there is a demand for this kind of service product.

In case of other families, the relative (#3) in family 1 experienced that they had no real need for the service. His mother (#1), i.e. the person cared for was in such a poor physical condition, that she had not been able to use the service at all, and thus, only her spouse, the informal carer (#2) had used the service. Also, the usage of the service faded out, as the relative (#3) had to call to informal carer every time to turn on the device before they could initiate the video-communication with the service. However, he (#3) considered that if the condition of his mother would have been any better, the whole situation would have been different. Also, when they started to use the service in the very beginning of the trial, there were no broadcasting service offerings available at that time. His mother is very social, and he considered that she would have been pleased to participate in the singing events.

One other relative (#23) in family 4 considered that they could considerate using the service also in the future, if their older relative (#18) would want to use it. She herself would be happy to continue the communication with the help of the service. The only thing she was a bit concerned from the point of view of improving health, was that the singing events were broadcasted from somewhere else, but there are also similar type of service offerings in situ at her older relative's (#18) living environment. She (#18) would be able to participate in these events also in situ, which would be good so that she would have more physical activity and an opportunity to meet others face to face. The relative (#23) considered that the service broadcasts are good for people who are not able to move around.

Our observations showed that the older participants tended to switch off all their electronic devices while they are not using them. Because of this, in two families (family 1, family 4) relatives needed to use their mobile phones to call to their parents or grandparents when they wanted to communicate with them through video service. In the final interview it was discovered that this sometimes hindered technology use.

> *"The slight attempt to use the technology faded out, because you had to first call them and say that switch the computer on." (#3)*

Care professionals

All caregivers thought that there is a demand for this kind of services. According to their opinion, video-based services were a good addition to their normal activities and these services have a lot of potential, but they cannot be a replacement for in situ activities. Caregivers emphasized the

importance of having activities on site, because it is difficult to take customers with many disabilities to service provider's more distant sites to take part in the events on the spot. Participating in different activities is important as they contribute in maintaining the functional capacity of their customers.

They all had the same notion that the service does not have any disadvantages considering their jobs and they have not received any negative feedback from their customers or colleagues either. Although, one interviewee mentioned that there has been some "wondering" among the caregivers. All caregivers said that they would like to adopt the service in permanent use in their care organization. They saw the service as a means to differentiate their care services from the other service providers. Adopting technology-supported services would be seen as a sign of market leader who provides novel, high-quality care services for the customers. The service was also seen as an opportunity to improve quality and co-operation inside the organization.

Discussion

The objective of this study was to validate the value proposition of video communication service from the viewpoint of older adults, family members and relatives, and care personnel.

The findings show that older people expected that video-communication service would mostly serve as a tool which would make communication easier, and provide social activity and connectedness through video communication possibilities. After they had used the service for some months, they stated that video communication possibility creates them clear added value over other communication methods. They also expressed their feelings of achievement and joy from mastering new technology on their own. Those who participated in video broadcasts stated that it increased their social activity by providing means to meet other people before the sessions and adding the quantity and quality of their physical exercise. The occupational therapy sessions were professionally guided and they increased the self-esteem of participants as they were able to participate alone and these sessions were also good opportunity to bond with each other. A few users experienced advancement in other participant's speech production, which made them happy. Also Sävenstedt et al. (2004) have recognized the importance of the staff members' ability to facilitate the communication in video-based communication.

Family members and relatives did not have many expectations or requirements regarding the simplicity and stability of the technology. One person expected that video communication service would provide activities to his parents and family members could communicate more using the group discussions. There were differences how families and relatives experienced value. Those who only tried to make a video call or two did not see much difference to other ways to communicate, but those who used video communication for a longer time period valued this new communication means highly and they discovered new ways of using technology. These ways included solving older people's problem situations by giving instructions via video and demonstrating new home that the older person has never been able to visit.

The detailed and personalized expectations of the care personnel were difficult to explore, because their expectations were first interpreted primarily through the organizational point of view. Mainly, they hoped that the new service would benefit their customers and they would be able to provide

better service quality for the customers. However, when their experiences were studied, the care personnel were revealed to be able to use the service for creating value for themselves. Besides getting value from seeing that their customers got benefit from the service, they also found new ways of working as refreshing, they were happy to provide a wider selection of services, they felt more connected with the other nurses, and they found it personally rewarding to learn new skills through using the service.

During the trial, we noted that it is crucial to provide value not only to the end users, i.e. the older adults, but also for other user groups whose involvement is required to keep the system up and running. Especially the role of formal carers was found to be extremely important. Nurses and other care personnel are the ones who introduce the service to the users, help them in adopting the service and are needed in keeping it running. If they do not feel that the service creates value, they are not motivated to participate in service provisioning and in consequence service adoption and quality suffers.

Previous studies (e.g. Arnaert and Delsie, 2001; Sävenstedt et al., 2006) have revealed that nurses tend to have more doubts and resistance towards the usage of technology in elderly care, and these skeptical attitudes have been found to be an important cause of resistance to change. In our study the caregivers also expressed somewhat doubtful attitudes towards the introduction and use of novel technical solution, and also experienced anxiety for using this new technology. However, the caregivers' experiences turned out to be very positive after they had adopted the service into use, especially when they had observed that older people were happier and more capable of doing things during the day after participating in the broadcasts. This behavioral and attitudinal change has been also noticed by Nakamura et al. (1999), who discovered that after some initial skepticism, the care providers recognized the improvement the video-based communication makes to the quality of care.

Interestingly, in the beginning of the study it turned out clearly challenging to recruit older users to participate in the trial, but finally those who participated were quite motivated to use the service regularly and stay along as long as the trial would continue. One reason might be that older people who are less experienced with technology might have difficulties to imagine the possible value that the service use would bring for them. Our analysis indicates that the value expectations of older adults were primarily related to technical and physical features of the service, and not the more intangible things such as feelings of achievement or independency, experience of connectedness or increased quality of relationship with close ones. This was recognized also in earlier studies by Arnaert and Delsie (2001) who stated that user acceptance seems to grow in proportion to experience.

In addition, some of the values and new ways of using technology evolve during a long time use and they are hard to demonstrate for the users. Also, older users might be hesitant to participate in technology trials, because they doubt their skills and capabilities to use technology and fear possible problem situations. Their self-confidence regarding technology should be supported by giving possibilities to try out different kind of technologies and have positive experiences. Also, it should be made sure that there is help available in problem situations and older users know how to contact the "help desk".

This study shows that the three user groups discussed in this paper were able to use the video communication service to create value for themselves. Also, already during this trial, it was clear that

value creation process evolved with time. Some value creation activity can happen and be recognized already at the first usage time (e.g. relative feels safer, because his parents seem to be ok), but some only arise and can be recognized later (e.g. relative feels more connected with her grandparents, because she can share the first months with a newborn baby through video-communication). In addition, because of the difficulty of demonstrating the value proposition for older users until they have actually tried the service, new and more flexible methods should be developed for service adoption. These could include more intuitive demonstrations, such as video presentations, user interviews and testimonials, and virtual rehearsal, or more flexible contracts, such as three months free trial. In this trial, we found out that the participants spoke highly about their experiences to their peers, and could have been rather effective in recruiting more users, if that would have been possible during the field trial.

Interestingly, one participant had started to think about her own behavior while she was able to observe that the others have already done some outdoor activities before 10 am. This kind of social comparison (defined e.g. in Oinas-Kukkonen and Harjumaa 2009) could be used as technique to encourage older people to be more active in their everyday life.

Summary

In this paper, we validated how video connection can be used to create added value for end users and their social network, and the service provider of home care services. We analyzed the value each user group expected to receive, and how these value expectations were fulfilled when the service was adopted. The results indicate that understanding value expectations of each user group is important in designing and adoption of a new service concept. Value expectations of different user groups can be very different, and failure to address each user group can hinder adoption of the service.

Our results also show that expected value may differ from the value created in actual use. In our case study, not all value expectations were met, and not all value creation was foreseen by the designers or users before actually adopting the service in their everyday lives. Even though the duration of our field trial was limited, we were able to observe that value creation evolved during use. Several factors contributed to evolution of experienced value: the service content and quality evolved during the trial period, the physical, cognitive and mental condition of the end users could change, social relationships evolved with time, and skills and competences of the users developed. Therefore, value creation validation should be seen as continuous activity which is needed to address changing conditions and expectations.

Acknowledgements

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