Life Changes, Connection Stays: Photo Sharing and Social Connectedness for People with Special Needs

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ABSTRACT
We study the effects of digital photo sharing on social connectedness of people with special needs. We target people dealing with a transition in life that forced them to live away from their family and friends. Our study included four people with spinal-cord injury staying in a rehabilitation centre and eight elderly people staying in a nursing home. Each participant was provided with a web-enabled digital photo frame and their family members were provided with a camera phone. The results of our study show positive effects. For rehabilitants photo sharing simplified the way they could reconnect to their family. For the elderly people, photo sharing served as ‘food for talk’.

Keywords  
Social connectedness, photo sharing, photo frames, special needs, elderly, rehabilitation, ICT support

INTRODUCTION
Social connectedness affects one’s happiness and contentment [16], has a positive effect on personal well-being and health [8] and leads to higher levels of life satisfaction and self-esteem [17]. We use the definition of social connectedness of IJsselsteijn et al., who define it as “a positive emotional appraisal which is characterized by a feeling of staying in touch within ongoing social relationships” [9].

There are many reasons why people may be forced to leave their homes, either temporarily or permanently. For example, due to a degrading physical or mental condition elderly people are forced to leave their homes and start a new lifestyle in a nursing home. With this transition, the elderly people face the threat of losing the bond with family and friends, leading to frustration and loneliness [16; 5]. A more unexpected scenario is the hospitalization of a person after a serious accident or disease. This may suddenly change the life of an individual dramatically. Often, an initial short period of recovery is followed by a long rehabilitation period away from home and people have to prepare themselves to live with a permanent disability.

A serious threat in both situations is the loss of bond with loved ones. Staying in touch with family and friends often requires much additional effort from the rehabilitants and elderly people who are not involved any more in the small everyday things in life. Most of the social contacts in rehabilitation centers and nursing homes are based on scheduled visits and phone calls. For the rehabilitants and the elderly people it is challenging to continue maintaining their roles as a parent, partner or friend. They have a common need to stay connected with their loved ones.

Our aim is to offer Information and Communication Technologies (ICT) to support, maintain and enhance social connectedness for people with special needs, who live away from their family and friends. Our focus is not on the development of new technology but on studying the effects of using already available technology. We are particularly interested in the role that photo sharing can play in supporting social connectedness. Therefore we provided a SIM-based photo frame to people with spinal cord injury that stay in a rehabilitation centre for almost a year and to elderly people in a nursing home. This way we hope to facilitate sharing anecdotes, significant moments and small things in everyday life.

We first describe the prior work on using photo frames and photo sharing to support social connectedness. Next, related work on photo categorization is discussed as we use a photo categorization method for analysis. We then summarize the outcomes of our user requirements study, describe the set-up of our study, and present the results of interviews and of photo analyses. Finally, we present conclusions and ideas for further research.

RELATED WORK
Photo Sharing to Support Social Connectedness
Known examples of research on ICT support to enhance social connectedness are the support of elderly parents living alone and their family members [13; 4]. In these studies augmented photo frames were used to enhance interaction between both remote parties. Photos are often used to support communication in distributed families. Evjemo [6] found that sharing the day’s events by sending photos and drawings to a screen in the grandparent’s home would be an appreciated technology to support communication between grandparents and grandchildren in distributed families. They studied conversations between grandparents and small grandchildren in face-to-face and phone situations. They found that phone calls were infrequent and of short duration, probably because in face-to-face situations the
conversations are closely tied to the joint activities they undertake. Photos of the day’s events facilitate the phone conversations.

Okabe [15] distinguishes two patterns of camera phone usage that are related to social connectedness: sharing photos with close friends and family who are absent at the time the photo is taken, and sharing photos of events that are considered noteworthy. Kindberg et al. [10] made a taxonomy of the intentions of people to use a camera phone. He distinguishes two categories in the social part of this taxonomy relate to our context: the affective category contains photos intended for communication with absent family or friends, and the functional category contains photos to support a task by sharing with remote family or friends.

One of the major consequences of the mobility limitations of people with disabilities is social isolation. According to Miller [12] the internet has the potential to improve these people’s independence and social connectedness because it enables interaction with others independent of distance and time. To support connectedness among distributed family members, Ashkanasy et al. [1] built an interactive display system that used internet and mobile phones with MMS capabilities. They used this system to find out to what extent sharing and manipulating images and textual content affects interaction and supports a sense of connectedness. Participants in their study not only shared photos of special events but also of everyday, mundane, aspects of their lives as they happened in time. The system afforded immediate, low-effort sharing of photos and this immediacy proved to be an important motivating factor for people to take and send photos. Another important finding concerns the nature of the exchanges. Maintaining the channels of communication was more important than the exchange of information. In other words, not the content of the exchange but the exchange itself was the focus of interactions.

**Photo Categorization**

To analyze the photos that were sent during our study we developed a categorization that will be presented later. Existing related categorization methods broadly fall into three types: free-style, nominal, and contextual metadata.

The free-style method is also known as ‘tagging’. The users construct their own flexible form of metadata by tagging, which makes the photos highly searchable. Well-known examples are Flickr, Facebook, and YouTube.

Nominal categorization methods use the default photo category lists that are common in literature and photo applications. Typical category lists that are often used include events (mundane or special), travel, portraits of people or animals, context (e.g., location, activity), visual interests (e.g., landscapes, art), humor, and media [7].

Finally, categorization based on contextual metadata is possible if contextual data of the photos are captured and stored. Naaman et al. [14] showed that contextual metadata categories (e.g., location, time of day, light status, weather status and temperature, and events) are most useful for recalling and finding photographs.

**USER REQUIREMENTS STUDY**

To explore the needs and barriers of people in our target group, we interviewed care professionals, rehabilitants in the spinal cord lesion department of a rehabilitation centre and elderly people in a nursing home.

A structured interview was prepared with questions about their background, current situation, social interactions and opportunities to support missing aspects of social connectedness. For care professionals, the structured interview included the centre’s philosophy towards social connectedness, and the current situation regarding connectedness of the rehabilitants and elderly people.

**Results of user requirements study**

In the rehabilitation centre we interviewed 5 rehabilitants (4 male, 1 female) and 4 healthcare professionals (a rehabilitation doctor, a psychologist, a nurse and an ergo-therapist). In the nursing home we interviewed the doctor and 5 people living there. The main results will be listed in the full paper. A more extensive description of the results of the interviews in the rehabilitation centre can be found in [3].

The rehabilitants with spinal cord lesions stay in the centre for up to one year in rooms with 1, 2 or 4 patients. The rehabilitation program includes functional recovery, using auxiliary tools, and preparing for return to the “real world” with their disability. They have a very busy and strict daily schedule of therapy sessions. The people in the nursing home sleep in rooms of 3 and do not have a busy schedule. They can join activities voluntarily.

In the current situation with physical contacts (visits) and virtual contacts (often by mobile phone), most rehabilitants feel sufficiently connected to their family and friends. However, they still miss the feeling of being involved in their lives. They miss life-time events with their families (e.g., family reunion, a swimming diploma), but also the spontaneous moments and small things in life: “I want to see the flowers in my home garden”, “I want to be part of the normal things again”.

One person living in the nursing home said he would find it confronting to regularly get photos from home on a photo frame: “that would stir up too many memories”. One person said she did not need extra photos because she had plenty of them. The other people were positive about sharing photos.

A clear requirement from the care professionals is that ICT intervention should not replace physical contacts. But they mention several situations where physical contact is difficult or impossible (e.g., small children that have to go to sleep during visiting hours; people
living too far away to visit often; people not visiting often because they find the nursing home environment depressing). Another requirement is that the technology should be user-friendly, controllable by the patients, and it should not take too much effort for the care professionals.

Conclusions
Rehabilitants and people in the nursing home want to be involved in the lives of their family and friends, in the special events as well as in the small everyday things. In our case study we facilitate capturing and sharing snapshots of everyday things in and around the house. Our goal is to study the role of photo sharing for social connectedness between rehabilitants and people in a nursing home and their friends and family.

EMPIRICAL STUDY
Participants
Two target groups with special needs participated in our study: rehabilitants and elderly people in nursing homes.

Rehabilitants
Four rehabilitants, all with a spinal cord lesion and temporarily living in a rehabilitation clinic, participated in this study. They share bedrooms (2 or 4 people) and have a very busy daily schedule of therapy sessions. Rehabilitant 1 (R1) is a woman, 41 years old, with 3 juvenile children of 13-17 years old, 1 daughter and 2 sons. The 15 years old daughter lived temporarily in a foster home at the time of the study. R1 lived in the rehabilitation centre for 10 months. Rehabilitant 2 (R2) is a young, unmarried woman (age 26) who lived alone but had close contact with her parents and her two older sisters and their family. The third rehabilitant (R3) is a male of 57 with a wife and 4 children (23-32 years old), all living on their own, and 2 grandchildren. Both R2 and R3 lived in the rehabilitation centre for 2 months. The last rehabilitant (R4) is a woman of 55 with a husband and 3 children, 2 daughters and a son, of 20-25 years old. She lived in the centre for 1 month. others on average 80. They slept in rooms with 3 people, and during the day they all sat around tables in their communal living room.

Some of the elderly people have several children (up to 9) participating in this study, while others have only one child involved. Four of the elderly participants have children or grandchildren living abroad. Two of the elderly participants are not able to communicate by speech because of aphasia. Only the younger woman of 50 still has a living partner.

Differences and commonalities
In both user groups, they live away from their family and it is difficult for loved ones to visit on a regular basis. The groups differ in age (generally) and the rehabilitants more often have a partner and up-growing children at home. Another important difference is the hope of rehabilitants to go back home. The people in the nursing home will stay there for the rest of their lives.

Design of intervention
The study lasted for about 6-7 weeks. For sharing photos, the rehabilitants and people in the nursing home were provided with a Vodafone™ 520 photo frame with a 7” TFT screen with resolution of 800 x 480 that can receive digital photos sent through a multimedia message (MMS) or uploaded through a website. The family of the rehabilitants and elderly people were given a MMS-capable mobile phone with a built-in 1.3 MP digital camera and a pre-paid SIM. Only the family of the woman with the three juvenile children got three mobile phones, one for each child. All the rehabilitants got the login name and password of a personal photo web-page to upload and manage (edit, delete, add text, etcetera) photos on their photo frame. This setup enabled family members to take and share snapshots of spontaneous moments and of events in daily life. Photos could also be taken and sent by the own mobile phones of the relatives and friends.

The photo frames of the rehabilitants were placed next to their beds. That is the place where they stay most of the time when they do not have therapy or visitors. The photo frames of the elderly people were positioned on their personal place on the table in the communal living room, the place where they spend most of the day.

Measures
The effects of our intervention on the communication between participants and their families were examined using interviews, quantitative analysis of the photos sent, and a qualitative content analysis of those photos.

The interviews were conducted at three moments: just before the test started (pre-test), during the test, and immediately after the test (post-test). In the rehabilitation centre we conducted separate interviews with the rehabilitants and one of their family members. In the nursing home, the pre-test and post-test interviews were held with the participant and a relative together, and the interview during the test with the participant and a care professional. There were several reasons why elderly participants were not interviewed
alone: some of them were not able to communicate by speech, some got emotional very easily.

The pre-test interviews were structured interviews that aimed to identify a baseline of the amount and ways of social contacts and the feelings of social connectedness. During the test, after a few weeks, the participants were visited and interviewed informally. We asked the rehabilitants, the elderly participants and the care professionals in the nursing home their first impressions about the photo frame. The post-test interview focused on the experiences of the participants with the photo frame. Questions were posed to identify usability issues, the effects of the intervention on quantitative and qualitative aspects of social connectedness, and possible extensions of the connected photo frame.

RESULTS
Quantitative analysis of photos sent
Rehabilitants
Most photos were sent by MMS. Only R1 received photos by Internet, uploaded by her husband. There was a big difference between rehabilitants in the amount of photos they received. R1 received 146 photos in 6 weeks time (from 11 senders), R2 received 43 photos in 7 weeks (6 senders), R3 received 29 photos in 2 weeks (3 senders), and R4 received 55 photos in 7 weeks (4 senders).

Figure 1 gives an overview of the amount of photos sent per person over time. Only people sending more than 8 photos are included. R1 received most photos from her children, R2 from a friend and her two sisters. R4 only wanted to receive photos from her own family. All photos for R3 were sent within two days. Thereafter, the phone was blocked because the wrong pin code was entered too many times. That is why photos sent to R3 are excluded from Figure 1. The amount of photos varied per week but in general the numbers decreased in the second half of the study.

Sending or uploading photos takes place in batches. The peaks in Figure 2 can be explained by family members uploading many photos from previous holidays or special events via Internet. Often, many photos of the same holiday, wedding or family dinner were uploaded. After a couple of weeks the amount of photos sent diminished.

User experiences
We describe below the main results of the interviews, focusing on user experiences and the effect of the photo sharing on the feelings of social connectedness.

Rehabilitants
Pre-test interviews were conducted with each of the 4 rehabilitants and their family members. Because R3 was dismissed from the clinic unexpectedly quickly he did not take part in the post-test measurement. In the pre-test interview all rehabilitants and their relatives were positive about trying the photo frame, although they all indicated to be satisfied about their current social contacts. The woman that had been in the rehabilitation centre for almost a year and her husband indicated that it would have been better for her to have such a frame earlier, to give some distraction and keep her connected at the time she could hardly move.

In the post-test interviews, the rehabilitants indicated that the photo frame did not really change the social contacts of the rehabilitants. Visitors, amounts of cards and normal photos, phone calls, and emails, remained the same. However, 2 of the 3 rehabilitants mentioned they often called the senders of photos they received, to thank them. In these phone calls the photos were used. Figure 2 provides an overview of the amount of photos sent over time to the 8 persons (P1-P8) in the nursing home.

Persons in the nursing home
The majority (92.2%) of the 450 photos were uploaded by Internet. One reason was that many photos were about events in the past. Furthermore family members were not familiar with MMS and found it difficult to
discussed only briefly and the conversation proceeded more generally. A few times the photo frame was used by people who did not visit the rehabilitant for quite some time. For them it served as a means to lower the threshold to get in contact again. These experiences with the photo frame were mentioned explicitly by the rehabilitants as being very valuable.

The rehabilitants used the photo frame in different ways. One of them used it as a normal photo frame, looking at it once in a while. Another one had a fixed moment during the day when she laid down and watched the photos. The third rehabilitant selected one photo that she preferred to display during the day, and only at some moments she browsed the photos. They all felt disappointed if they did not receive new photos each day. Only one rehabilitant told her family about this disappointment. For privacy reasons two of the three rehabilitants turned their frame black during the day, when they were in therapy sessions.

All the rehabilitants liked the photo frame. They did not mind that the quality of some of the photos was not good. They especially mentioned the surprise effect of receiving new photos. By getting a visualization of things that happened, they felt closer to the stories of their family and friends. Not only the content of the photos is important: “the feeling that people think of you” was mentioned several times as something that was really appreciated.

People in the nursing home
The pre-test interviews revealed that family members are enthusiastic about using photos to keep in contact. They expect the photo frame will simplify and enhance the exchange of photos. The family members of the two people with aphasia indicated that this might be a new medium to communicate with their mother.

One elderly person hesitated before he agreed to participate because he often does not understand new technology. The family of another person hesitated because of the effort it would take. However, the fact that the elderly person was so enthusiastic persuaded the family to try it.

The post-test interviews revealed that the main effect of the photos was not as intended initially: to provide the elderly people with information of everyday life of their family members. All the families asserted that the photos served as ‘food for talk’. The elderly people were all very proud of the photos they received and sometimes they were even emotionally moved. The photos facilitated conversations between them and their family, other elderly people around and their family members and the care professionals. The elderly people really enjoyed the photos. They provided some diversion, something to talk about, and for the people with aphasia they enriched the communication means: they pinpointed on the photos what they meant and drew attention to it.

The family members sent photos with certain goals: some said they sent recognizable photos for the elderly person, e.g. of birthdays, family dinners, photos the elderly person liked. Other family members stated they did not send photos of confronting events (i.e. no photos of events the elderly person cannot attend anymore). Instead, they sent photos of normal everyday things like the children playing or the dog. Others indicated they sent photos to keep in touch during their business trips. Most family members found the trial period too short, especially to start using the camera phone. Some intend to keep using the frame when they are abroad, or when communication by phone is impossible because the elderly person is unable speak.

Conclusions
Both the elderly people and the rehabilitants liked the photo frame for different reasons. The rehabilitants liked the surprise effect of receiving photos, while the elderly people used the photos they received to show to other people and talk about them. For both user groups not only the contents of the photos but also the idea that someone thought of them were really appreciated.

The photo frame positively influenced the social connectedness of both user groups. Although in the interviews the rehabilitants stated that the photo frame did not really change their social contacts, they also mentioned they often called the sender after receiving a new photo. Moreover, two of them received a photo from someone they had not seen for a long time. These are the kinds of actions that enhance or at least maintain social connectedness. For the participants in the nursing home the photos enhanced connectedness because they served as a catalyst to talk or as a new medium to communicate for the people with aphasia.

The amount of photos sent decreased over time. Possible reasons are that the novelty effect of the photo frame reduced or, in case of the people in the nursing home, many of the relevant old photos were already sent. The study period was too short to identify whether the amount of photos sent over time will become stable or sending photos will extinguish after some time. Especially the relatives of the participants in the nursing home found the trial period too short and expressed the intention to keep using the frame. In the next section we describe the setup and results of the qualitative content analysis of the photos.

CONTENT ANALYSIS OF PHOTOS
To analyze the photos that were sent we used a nominal categorization, described in more detail in [2]. Similar to [10] and [18] we focus on the intentions of people to send photos. Because of the setup of our study, all the photos are in two of the categories in Kindberg’s taxonomy [10]: the affective category with photos intended for communication with absent family or friends and the functional category with photos to support a task by sharing with remote family or friends. Hence we developed a more fine-grained categorization, taking categories like those of Garau [7] in mind. We used a method similar to [11]: independently produce categories and then reach iterative agreement on the coding categories. We agreed to look from the point of
view of the sender (why was the photo sent) with the receiver (rehabilitant or elderly person) in mind, to get categories that are meaningful for social connectedness.

**The Categorization**
The categorization used in the studies is:

1. **Message**: “I tell you something with this photo or I will show you something new”.
2. **Greetings**: “I want to say hi to you”.
3. **Everyday life**: “I want to keep you involved in the regular events in my environment”.
4. **Special events**: “I want to inform you about a special event”.
5. **Something funny or aesthetic**: “I want to show you something and cheer you up”.

The first category contains photos that tell or show the rehabilitant something new. Examples are new things in and around the house, a choice of tiles for the bathroom that is going to be adapted or a newborn baby. Photos in this category are meant for notification or discussion. Sending a message will probably be followed by (synchronous) communication when the time is right. The second category contains photos that show people greeting the rehabilitant. Usually this is the first portrait photo of a person in a sequence of photos. A greeting does not need to be followed by communication. The third category contains photos meant to keep the rehabilitant informed and connected to regular events and everyday things. They typically contain photos of kids, the garden, going to school/work, walk the dog. These photos are not necessarily followed by communication. The photos of special events are meant to keep the rehabilitant informed and involved in special moments (holidays, parties). The photos in this category are likely to become the topic of conversation. The photos that show something funny or something the receiver probably likes are sent to cheer the rehabilitant up and at the same time to say “I think about you”. These photos are sent with affective intentions and are not necessarily followed by communication.

**Results of the Photo Analysis**
This categorization was used to analyze the photos sent to the participants. Categorization was done by us, the authors of this paper, because most of the elderly people were not able to do this and for the rehabilitants and their families it would have been too much of a burden.

**Rehabilitants**
For the trials with rehabilitants we split up in 2 groups of 2 people who independently categorized the photos. This resulted in 2 categorizations, with an inter-rater reliability score of 0.62 (Cohen’s Kappa). The main differences between our ratings were caused by lack of knowledge of the location and situation where the photo was taken. Many of these differences could be resolved by interviewing the rehabilitants after the study. The inter-rater reliability after the corrections was 0.90.

**Elderly people in the nursing home**
The photos of the trials with the elderly people in the nursing home were categorized independently by 2 researchers. This resulted in 2 categorizations of the 450 photos, with an inter-rater reliability score (Kappa) of 0.56. In this study an extra difficulty was the time dimension. It appeared that many people sent photos from events in the past. Many of the differences could be resolved by using texts that were sent along with the photos (only possible with internet uploads) and by using knowledge from the interviews. After the corrections the inter-rater reliability was 0.87.

**Results for both target groups**
In the remaining part of this section we use the corrected categorizations to describe the contents and size of each of the categories. The photos with remaining differences between raters are treated separately in an extra category labeled “unknown/undecided”. Figure 3 shows the percentages of photos in the various categories for both rehabilitants and elderly people. The contents of each of the categories will be described in more detail below.

**Figure 3: Percentages of photos per category**
Only one of the photos of the elderly people belongs to the category messages. The photo shows a happy New Year wish. For the rehabilitants 14.8% of the photos belong to this category. Typical examples are photos of new wallpaper at home, photos of a new (temporary) living environment of a daughter living with foster parents and a photo of a little niece with her arm in plaster to tell that she had a small accident.

The percentage of photos in the category greetings is 8.2 for the people in the nursing home and 14.8 for the rehabilitants. This category typically contains photos of people posing for the rehabilitant, sometimes also waving. The rehabilitant that only wanted to have photo contact with her own family only received greetings from family members. The greeting photos of one of the other rehabilitants are mainly from her children and their friends. In contrast, the unmarried rehabilitant received greetings from the members of the families of her sisters but also from colleagues and friends. The greeting photos sent to the people in the nursing home often are of close relatives: their children and grown-up grandchildren. Other people that are on the photos are often accompanied by a child of the person that received the photo. 
For the rehabilitants photos of everyday life formed by far the biggest category (44.2%). For the people in the nursing home only 21.1% of the photos belong to this category. Examples are photos of pets, gardens, young children playing, photos taken while walking the dog. Mentioned as being special are photos of a daughter and husband “still in his working clothes” preparing and eating a meal and the photo of a son behind the computer “in a position I have often seen him before”. Photos of the garden made it possible for one of the rehabilitants “to see the garden in a season that I otherwise would have missed”.

For the rehabilitants the special events form the smallest category with 3.8% of the photos. Only two rehabilitants received photos in this category. The unmarried woman got photos of children in the zoo and the families of her sisters on vacation. The woman with a daughter in a foster home received photos of the vacation of her daughter with the foster parents. For the elderly people the special events are by far the biggest category, 54.4% of the photos. Most of these photos (65.7%) were taken many years ago and show holidays of the elderly people, a trip to Lourdes, wedding anniversaries, and family dinners.

The category with funny or aesthetic photos contains 12.6% of the photos of rehabilitants and 7.8% of the photos of the elderly people. In this category we find many photos of people who put on funny faces, the dog looking funny, as well as photos of a nice view of a lake, of winter sceneries, nice old buildings or a vase with flowers. These photos can often be attributed to other categories as well, dependent on where and when they were taken. In the final ratings, we gave preference to this category when applicable.

The category unknown/undecided contains in total 6.6% of the photos of the rehabilitants and 8.2% of the photos of the elderly people. In almost half of the rehabilitant’s photos in this category differences occurred because we did not know if a person or object was new to the rehabilitant so we could not decide between category 1, 2 or 5. The remaining half had other reasons that occurred only once or twice (unknown location, unclear photo). For the photos of the elderly people most differences in categorization occurred because it was not clear if the photo was old or recent.

Discussion
We anticipated that the category messages would be smaller for elderly people than for people who only left home temporarily, but surprisingly, there was only one photo in this category. The messages sent to rehabilitants are all in the affective category [10]. That might be caused by the fact that these rehabilitants were about to go home and were already regularly going home during the weekends.

The people in the nursing home received less photos of greetings than the rehabilitants, and the photos they received almost always contain close relatives; other relations are almost always accompanied by a child of the recipient.

The rehabilitants received many photos of everyday, mundane aspects of life and especially appreciated the normal things they did not see for quite a while. Though second in size for the elderly people the category special events was surprisingly small, considering it comprises all photos of small children, animals and people in their normal environment.

The fact that rehabilitants received very few photos of special events – two of them even received none – might be partly explained by the fact that the family did not go on vacation in the time of the pilot. However, no photos of other special events like parties were sent either. This might be because such special events did not occur during the time of the pilot. Another reason (sometimes heard during interviews) might be that these photos were not sent because the relatives think it will be painful for the people in the nursing home or rehabilitation centre to see the nice things they cannot attend. The elderly people received many photos of past events. Remarkably, on 10% of the photos, the elderly person was on the photo. For one person, this was even 50% of the photos.

CONCLUSIONS AND FURTHER RESEARCH
Photo sharing enhanced social connectedness for both groups of people participating in our case study. For the rehabilitants the effects were as anticipated: sharing everyday things of life was highly valued, they often called the sender after receiving photos, and they mentioned repeatedly that the idea that a family member thinks about them is the thing that counts. For the people in the nursing home the effect of the photo frame was not as initially intended. They mainly received photos of special events in the past, hardly of everyday life. For them the photos served as ‘food for talk’ which improved the connection to their family members but also to their caregivers and other people in the nursing home in another way than anticipated.

Longitudinal studies are needed to confirm our findings and see if the effects we found and the way the photo frame was used change over time. To be able to generalize the needs and benefits of photo sharing for people with special needs, it is required to assess our concepts with people with other disabilities or transitions, e.g. children staying in hospitals, cognitive impaired people.

As photo frames can play an important role in (re)establishing social connectedness, the threshold for friends and family to upload photos should be really low. In the future photo frames for people with special needs can be made more intelligent. There are several intelligent features that can be added to enhance photo sharing and better fit the needs of these user groups. For example, using pervasive computing and context awareness to automatically capture and share moments of daily life with a remote family member. The challenges for capturing such moments while
safeguarding privacy should be explored. Alternatively, the system could trigger reminders to family members to take pictures of a particular moment of daily life. Also, the moment and order in which photo’s are shown on the device could be determined by several contextual parameters, e.g. the time and location when it was sent, the time and frequency the receiver looks at it, etcetera.

Furthermore, the ability to know when the person has seen a picture and know what they felt at the moment of seeing it could further foster connectedness. Tagging and categorizing is already popular. Thus, for receivers directly on the photo frame and share these with the sender, could augment the experience and new benefits could emerge. We believe that these and other smart features added to traditional digital photo frames can add significant value to people who want to be part of the lives of their remote loved ones.

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