StoryCubes: Connecting Elders in Independent Living through Storytelling

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Abstract
One's home is often a place that reflects and affirms one's identity, but when an elderly person moves to a group living environment, they must re-assert themselves and make new social connections in a place that may inadvertently frame them in terms of their disabilities. We present StoryCubes, a system that helps residents of independent living communities make connections through sharing stories, and express their identity in terms of their unique background, interests, and values. StoryCubes centers around the creation and sharing of tangible paper objects which display and contain the stories of residents using QR code technology. StoryCubes can be displayed together, where residents and visitors can listen to stories within any cube that piques their interest. By giving residents a way to discover and share stories, they are able to gain a greater understanding of their fellow residents, helping them to better appreciate and become more comfortable in their shared living experience.

Keywords
Domestic experience, elderly, independent living, tangible computing, social engagement, stories

ACM Classification Keywords
H.5.m. [Information interfaces and presentation]: Miscellaneous;

Figure 1 "I don't think anyone here has the same interests as I do" – *User 05*

Introduction

Independent living communities are becoming an increasingly common form of domestic experience. By 2050 the number of elderly over 85 in the U.S. is expected to grow six fold, and the proportion of the population over age 65 is projected to increase from 12.7% in 2005 to 20.3% in 2050 as the Baby Boom generation continues to age [1]. Asian countries have seen their traditional nuclear families dispersed by globalization, forcing them to turn increasingly to independent living communities [2].

Elders entering these communities from long-time homes suddenly find their familiar affordances vanish. Unlike a traditional home, independent living communities bring elders in very close contact with one another on a regular basis, and require elders to share many common facilities such as dining and activity areas. Many residents have significantly decreased mobility, and may be unable to leave the facility without close supervision. Research shows that quality of life for older adults is highly affected by independence and social engagement [3].

In our initial exploratory research, we interviewed a variety of people who had moved from one home to another: people who moved for work, family, school or opportunity; and people who had moved to a retirement home. Of all of these groups we found that retirement community residents had the most alienated relationship with their current domestic experience. Because of this, we were motivated to create a system that would allow elders to feel more connected with their independent living facility, through increased awareness, sharing, and social interaction with other residents.

Contextual Inquiry

Using the Contextual Inquiry method [4], we initially observed and conducted eight interviews with residents and staff in an independent living facility. Our investigation explored residents' patterns of socialization, their involvement with community activities, their daily lives, and their attitudes toward technology. We created an affinity wall (Figure 1) to reveal patterns in our data.

One major finding was that most residents were having trouble establishing meaningful relationships within the community. Our interviews revealed that residents seemed to have trouble finding other like-minded residents, despite the presence of residents with common interests in the community. We expected activities to be a center for forming social connections, but we found that activities were not fully functioning in this role. Most of these activities resulted in little meaningful interaction between the residents themselves. We also found that many residents were not taking advantage of many of the activities, because the activities did not match their interests, or because they found the activities demeaning. Many residents were pessimistic about their chances of finding like-minded friends, so they were less enthusiastic about socialization. However, we found that there was some informal socialization in dining and lounge areas and this was important in facilitating the creation of casual social connections, which inspired us to create a system that would deepen and reinforce this effect.

We also learned that residents preferred to see and express themselves in terms of their life accomplishments, background, education, and interests; and that they did not want to identify with

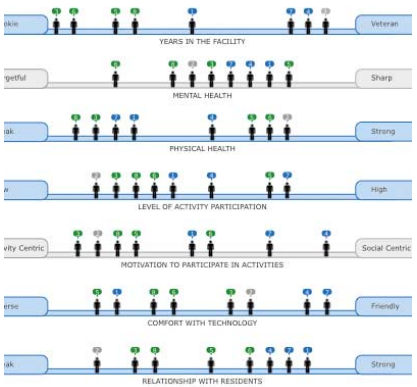

Figure 2 Based on data from our research, we have categorized user behaviors to gain more understanding about our users.

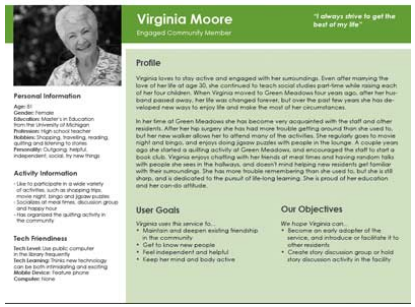

Figure 3 A snapshot of our persona.

their present disabilities or relative lack of independence. This finding led to the key insight that while residents were able to see beyond their own appearances and disabilities, they had more trouble seeing others in these terms, and as such they may have been distancing themselves from connecting with other residents as they distanced themselves from their circumstances. This observation is in line with existing research on aging labels and self-esteem [5].

Our contextual inquiry also revealed a disparity in residents' comfort with different types of technology. From our primary and secondary research, we realized that ease of use and approachability would be essential considerations in our eventual design.

We also found that most residents love to tell stories, and use storytelling as a way of explaining who they are. Later this motivated us to create a system that would allow residents to represent themselves to their community through the lens of their stories.

Design Process

From our contextual inquiry data and the affinity wall we identified several behavioral variables which indicated some significant variation between residents. Our behavioral map revealed two clusters of residents, which led to our two personas: Charles Smith and Virginia Moore.

The persona of Charles helped us empathize with elders who are having trouble making connections in the community. Many residents want to express and share themselves, but their pessimism about finding commonalities leads them to put limited energy into interacting with others. This inspired us to create a system where residents could express themselves outside of face-to-face interaction, and where they could discover a common interest as a precursor to direct engagement.

The persona of Virginia helped us to understand and empathize with elders who are more actively engaging with the community. Some residents exhibit a social energy for both sharing and learning about others, which we hoped to channel towards helping other residents become more connected in the community.

In developing our design, we followed an iterative process of idea formation, prototyping and evaluation. We created a lo-fi prototype to help us validate our core concept, and a mid-fi prototype to test the look-and-feel and intuitiveness of our system.

Our Solution: StoryCubes

We propose a tangible computing [6] system called StoryCubes. This system creates mutual understanding and appreciation between independent living residents by helping them to express themselves and identify with each other's rich backgrounds, interests, and personalities through the experience of telling and listening to stories. Unlike activities that require face-to-face interaction, which may invite superficial judgment, StoryCubes allows elders to connect first through each others' past, as a bridge towards accepting each others' present.

StoryCubes supports the recording and playing of stories through paper craft cubes that work as a rich and accessible interface for elderly users. A StoryCube is a physical manifestation of a community resident, where each face of the cube shows a picture

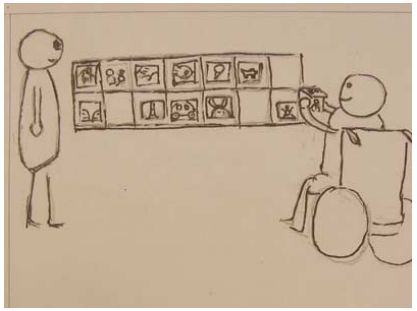

Figure 4 Unique arrangements of the cubes creates opportunities for community awareness and meaning-making.

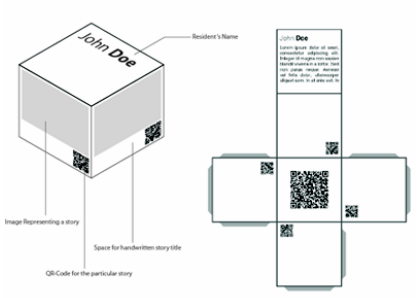

Figure 5 The anatomy of the cube.

representing a resident's story. The many faces of the cube support the idea that there are many different aspects of a person. Cubes are a familiar form, which are easy to create and organize. To retrieve a story, users can place any face of the cube into our recording and playback device, causing the associated story to be played aloud. QR codes were selected over other technologies (e.g. RFID) because they allow StoryCubes to be produced easily and cheaply.

Stories for the cube can be recorded using the prompts that appear on a touch-screen interface when users insert a blank cube face into the device. When their story is complete, users can select and print a picture to represent their story. Pictures can be selected from a binder near the device, or users can find a picture through a text or voice-driven image search on the touch screen interface. The selected picture is printed as a sticker, which users can stick to one of the faces of their cube. The sticker has a small QR code in its corner, which is what allows the picture's story to be played back when a cube's face is inserted in the device. Residents can be given a pre-made blank starter cube, or they can create it themselves as part of a craft activity.

Story cubes are displayed together as a collage in a common area, representing the varied interests and backgrounds of the community (Figure 4), and creating more opportunities for residents to interact with each other when they are recording or listening to stories. Passers-by can both admire the collection as a whole, explore, and interact with each individual cube. Users can discover pictures that they identify with, allowing them to find residents who share their interests or backgrounds. They may then use information gleaned from a person's StoryCube as a conversation starter, which may lead to further face-to-face interaction, understanding, and friendship.

Accessibility

One of the primary concerns when designing for elderly populations is accessibility and comfort with technology. Interviewees indicated that they would be willing to learn new technologies, but only if they were truly useful. The majority of our interviewees did not own computers, had either feature phones or traditional land-line phones, and were not frequent television viewers. Residents also exhibited comfort with physical interaction and manipulation, as evident in the popularity of activities such as arts and crafts, jigsaw puzzles, or the creation of elaborate dioramas within the facility. This led us to consider that a paper craft artifact might be especially approachable, and would fit well with existing community interests.

Critical Mass

For StoryCubes to be a success, it is important to generate a sufficient number of story cubes, and for there to be a balance between story creation and story listening. From our research we found that less social residents, contrary to our expectations, were especially interested in telling stories, and were also interested in listening to the stories of others. Socially outgoing residents were equally interested in telling and listening to stories. From our interviews and observations, we infer that socially engaged residents will listen and reach out to other residents who tell stories, encouraging hesitant residents to continue telling stories and making connections. Staff also has a role to play in the system, by seeding their own stories, and assisting the residents in creating their cubes.

Figure 6 "Telling stories is a good activity, and way of getting to know each other" – *Concept validation participant*

Figure 7 Mid-fi prototype used for usability testing

Concept Validation

We created our lo-fi prototype (Figure 6) to test the validity of the design solution in situ. The prototype consisted of a set of story cubes, a simple mock cube scanner device, and a set of drawings representing different screens on the display component of the system. Stories were obtained from storycorps.org, and played back surreptitiously using an iPhone. Our prototype evaluation revealed that our fundamental concept of telling and listening to stories was sound; residents were especially enthusiastic about recording their stories and the idea of representing others through the cubes made sense to them. For example, one resident was particularly interested in a StoryCube that had an image of "Pearl Harbor", and felt an emotional connection after hearing the story, prompting her to reminisce and record her own experience. The pictures and the stories about others' interests acted as triggers for reflecting on their own personal experiences and motivated them to narrate their own.

Usability Testing

Once the concept was validated for acceptability, we developed a mid-fi prototype (Figure 7), leveraging affordances from other devices our target population is familiar with, like the record player and microphone. The goal of our mid-fi prototype was to evaluate the flow for recording and listening to stories, and to evaluate the overall appearance of the system. We employed the "Wizard of Oz" [7] technique to simulate some functionality, which was helpful, but led to some confusion when the simulation was revealed. Our evaluation indicated that the user flow for recording and listening was more clear than in our lo-fi prototype, but needed further refinement, and that the look-and-feel of the device required additional improvement in order to convey its purpose.

Conclusion

Through user-centered research, we were able to understand and address the problem of social isolation and lack of appreciation for the domestic experience in independent living communities. StoryCubes fosters the creation of social connections and mutual appreciation, while taking into account the identity and accessibility needs of the elderly.

Our research indicated that long-term preservation was an important consideration when recording stories. StoryCube information could be backed up to a central server, which would also allow stories to be emailed or written to physical media for sharing outside of the living community context. There is also an opportunity to leverage staff, family members, and visitors to improve the adoption of StoryCubes within the facility.

Based on the feedback we received, StoryCubes enhances elders' ability to express and share their experiences through stories, and may facilitate the creation of connections within independent living communities. Implementing this system has the potential to produce positive change in appreciation for the domestic experience in independent living community.

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