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Designing Interactive Public Displays as a New Form of Social Intervention in Nursing Homes

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ABSTRACT Positive peer relationship in nursing homes is an important component of residents' life quality. However, social interaction between residents is found to be limited, and their relationships are difficult to establish. In past decades, conventional social interventions have changed very little and had limitations. Although many studies have proved that interactive public displays (IPD) can socially connect people in one community, designing
for nursing homes is challenging due to the lack of supported knowledge. This report outlines the ongoing research that investigates how to design appropriate IPD to enhance residents’ social interaction and wellbeing. Research-through-Design is adopted to generate knowledge through an iterative process of developing experimental systems in a real-life setting. The preliminary findings confirmed our hypothesis that IPD could positively influence residents’ social behaviour and feelings. The key is not to push the complexity of technology, but to comply with their current habits, preferences and reduce related barriers.

KEYWORDS: interactive public displays, nursing homes, social interaction, social connectedness

Context and Motivation

Global population ageing has led to an increasing demand for high quality facilities and institutional care. Positive peer relationships are an important indicator of nursing home residents’ overall well-being. However, the lack of social interaction between residents is found to be a prevalent problem in nursing homes. In the past decades, the measures of conventional social interventions in nursing homes has changed very little. Efforts have been focused on creating friendly public spaces and hosting scheduled social activities (Heath and Phair 2000). However, residents’ typical daily life was still reported as staying in their rooms, alone and inactive (Gottesman and Bourestom 1974; Ice 2002; Ouden et al. 2015). Kovach and Robinson (1996) indicated that only improving physical facilities was not enough. Organizing regular social activities also has limitations: firstly, despite the apparent success during creative activities, residents have to entertain themselves for the rest of the day. Secondly, each activity is usually held based on certain themes, which might make it difficult to include the everyone’s interest. Furthermore, residents are hardly maintaining a sense of control when they passively follow caregivers during interventions. Chown (1981) argued that the provision of social opportunities is more beneficial to residents than enforced sociability. Therefore, more innovative ways are needed to create more social opportunities throughout the day (Ice 2002).

In recent years, interactive public displays (IPD) have shown the potential to enhance the social interaction and well-being of people in the same community. Based on modern technologies, IPD can create a platform to continuously detect the behaviour of community members and provide real-time feedback. Besides, since digital feedback has various means to present, interact and share, people can be more socially connected, not only in the cyber world but also in physical public spaces (Brignull and Rogers 2003). There are
already plenty of explorations to design such systems as a means of promoting information sharing, encouraging social participation and strengthening weak social ties (Churchill et al. 2003; McCarthy and Joseph F 2003; Kang, Yang and Wang 2013). However, few of them can be applied in nursing homes due to the specificity of context and target groups. Furthermore, older adults are now playing an increasingly minor role in cutting-edge design. The knowledge related to user demands, design methods and guidelines is still very limited. Motivated by these demands and challenges, this research focuses on informing the design of IPD to enhance care home residents’ social interaction and well-being.

Related Work
Concerns with IPD in human-computer interaction (HCI) have mainly focused on conceptual frameworks, related technologies and interaction patterns (Cardoso and Rui 2009; Vogel and Balakrishnan 2004; Linden et al. 2010). Within the design studies related to interactive public displays (IPDs), most efforts have been made on elaborating design principles, interface exploration and evaluation methods (Müller et al. 2010; Alt et al. 2012; Elhart et al. 2015). There have also been many case studies for specific contexts such as working environments, classrooms, urban space and museums (Beyer, Binder and Butz 2014; Kharrufa et al. 2013; Hsi and Fait 2005). These applications were designed with various purposes such as efficiency improvement, entertainment, advertising and exhibition. However, the great majority of these studies target younger generations as their default user group, and few of them can be directly applied in nursing homes due to the lack of related considerations. It is still unclear as to which kind of IPD is appropriate for application in nursing homes for better social interaction and well-being.

Interactive displays for social well-being in nursing homes have only been explored in limited studies. A great number of these studies discuss how to maintain distant intimate relationships between family members with ambient displays in older people’s private rooms (Biemans and Dijk 2009; Visser, Vastenburg, and Keyson 2011). Only a few studies have explored the social potential of IPD in a nursing environment (Gaver 2011). Major efforts were made on people with dementia. The public displays serve as a content-assist tool for animal-assistant-living therapy, reminiscence therapy and eco-therapy (Cohen and Werner 1998; Valk et al. 2017). Most of the design cases for residents who don’t have severe cognitive impairments lack systematic research and evaluation processes. Although they could initially prove the positive effects on residents’ behaviour and feelings, no work has yet considered capturing the key design factors and discussing how to generate an appropriate design.
Hypothesis, Research Questions and Methods
The hypothesis of this research is that properly designed IPD could be a new form of intervention to enhance nursing home residents' social interaction and well-being. This work addresses the following three research questions: RQ1. How can appropriate IPD be designed in nursing homes to enhance residents' social interaction and well-being? RQ2. To what extent can IPD influence residents' social behaviour and feelings? RQ3. What are the implications for the future design and development of IPD to enhance residents' social interaction and well-being?

RQ1 is the central research question, which could be divided into three sub-questions: 1. How can we understand residents' social demands and preferences from the perspective of interaction design and technology? 2. How can we capture residents' requirements to guide the design of IPD? 3. How can we evaluate the social influence of IPD in nursing homes?

The general approach adopted in this research is Research-through-Design. The specificity of the research context and target group means that structured studies must be conducted via specific design cases. Through an iterative process of developing and evaluating experimental systems in real-life settings, knowledge can be generated to answer the stated questions and also inform the design in consequent cycles.

Status and Findings
Study 1 – An Explorative Case Study ‘OutLook’
The research commenced with a factor-finding design project. Via an explorative design case ‘OutLook’, the aim was to gain initial insight into the social potential of IPD in nursing homes and how to design appropriate IPD in this context (Lin et al. 2016; Kang, Lin, et al. 2018). OutLook is a series of gallery-like displays that aims to enhance residents’ social interaction and feelings of connectedness by continuously demonstrating shared images of real-time views and trigger further communications through a ‘postcard-sending’ metaphor (Figure 1). To design OutLook, conventional design methods were adopted, including unstructured observations, interviews and brainstorm. After the implementation, a six-week field trial was performed to assess the influence of OutLook on residents’ behaviour via structured observations before and after the deployment. The field trial ended with semi-structured interviews to investigate residents’ subjective feelings. It was found that most related social interaction took place after the residents left the area. Such conversations were superficial and hardly sustainable. While most interviewed participants felt connected to the shared views, few felt connected to other people. The results indicated that OutLook could promote their social interaction and connectedness to some extent, but still has a lot of room for improvement (Kang et al. 2018). Key design factors and lessons learned were proposed: 1. The whole
design process should have a high level of involvement with residents to maintain mutual understanding. 2. The concept should consider residents’ common interests to increase the usage of IPD. 3. The attributes of IPD should follow residents’ typical daily routines. 4. The displayed contents should keep changing in an explicit way. 5. The interfaces should be friendly, explicit, and inviting for older adults. 6. The interactions should be low-effort, immediately responsive and sustainable. 7. The field trial should include the necessary introductions and explanations.

**Study 2 – Understanding Residents’ Social Preferences and Demands**

Study 1 showed that a technical interface was one of the main barriers of interaction with public displays for the generations born before 1950s. It was also found that print media was residents’ main source of information and self-entertainment in public spaces, but the social function of conventional print media products was poor, and therefore had the potential to be enhanced by design and technology. Therefore, Study 2 was conducted to deeper understand residents’ social preferences and demands by investigating their current use of print media, their preferred genres and the social barriers (Figure 2). The findings provided an overview of their preferred print media products in public spaces/private rooms, their preferred genres/topics, and their current related social scenarios/barriers (Kang et al. 2018).

Based on this understanding three design strategies were proposed: 1. Comply with residents’ habits of using existing print media products such as newspapers and magazines. 2. Design new print media products with residents’ preferred genres such as history and culture. 3. Augment residents’ personal print media products with other genres such as family, travel experiences and hobbies. These strategies aimed to influence residents’ social status in different degrees. It was hypothesized that the first strategy could be an ideal
solution to start because it has the lowest learning cost, and related genres such as news, life and activities in nursing homes would be effective in improving the quantity of residents’ social interaction. The second and third strategies were more challenging as they would alter their current lifestyles, but it was hypothesized that once residents became familiar with the first strategy, their quality of interaction and feelings would be improved by sharing self-interests, relationships and past experiences.

**Study 3 – Co-Designing an Example IPD System**

Based on Study 2, the first strategy – to design an IPD system to promote residents’ communications by digitally augmenting printed newspapers – was used first. After reviewing well-established design methods, the Usability, Safety, Attractiveness Participatory (USAP) Model was adjusted for the general design and research approach (Demirbilek and Demirkan 2004). In Study 3, two phases of co-design were conducted with 14 residents (Figure 3). The findings showed that most residents had positive perceptions of an envisioned system that could attract them to use and/or create more social opportunities. The chosen method and process was effective for capturing residents’ requirements and thus guiding the system development.

**Study 4 – Exploring the Social Influence of IPD in Nursing Homes**

Currently Study 4 – that is the third phase of the adapted USAP model – is being conducted (Figure 5). It was expected that 20 residents in groups would be invited to experience the prototype system ‘IStamp’ that was derived from Study 3 (Figure 4). It is a system attached to public tables in nursing homes aiming to support residents’ self-entertainment and promote their communication. Residents are provided with a stamp-like tool to select printed
The research objectives of Phase 3 are to explore the factors of IPD that could influence residents’ user experience, social behaviour and feelings. The design objective is to preliminarily evaluate the prototype system and gain feedback for further refinements. The preliminary result showed that their perceived attractiveness was very positive. The prototype system was effective to enhance residents’ social interaction. But their sense of social closeness showed no significant differences between before and after using the system, which matches the hypothesis in Study 2 that the first design strategy would have a stronger influence on residents’ social interaction than social connectedness.

**Next Plan**
In the coming year, the group trial will continue and after completion, key factors will be summarized and the prototype system refined, which will be further evaluated in Phase 4 (Figure 5). In this phase,
how the system influences residents’ social behaviour and feelings in their everyday life will be investigated. Following this, whether the system is adaptive to Strategy 2 and 3 will be further explored.

**Expected Contributions**

This research aims to make the following contributions:

1. Provide a deeper understanding of nursing home residents’ social demands and preferences from the perspective of interaction design and technology.
2. Provide appropriate methods and techniques to design an IPD system for residents’ social interaction and well-being.
3. Explore the potential influence of IPD systems on residents’ social behaviour and feelings.
4. Illustrate the implications/frameworks to inform the future design of IPD systems to enhance nursing home residents’ social interaction and well-being.

**Disclosure statement**

No potential conflict of interest was reported by the author.

**References**


**Biography**

*Kai Kang* achieved his Bachelor’s degree in Digital Media Technology (2011) and Master’s degree in Digital Media Art (2014) from Jiangnan University, Wuxi, China. In 2015, he started his PhD at the Department of Industrial Design, Eindhoven University of Technology. He is working on the research topic: *Designing for Social Interaction and Well-Being*, supervised by Prof. Caroline Hummels, Dr Jun Hu and Dr Bart Hengeveld. His research interests lie in interactive public display, interactive installations, digital media, elderly care, and social interaction.

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