‘THINKING THROUGH THINGS’ TO SUPPORT COOPERATIVE DESIGN IN THE DEVELOPMENT OF TECHNOLOGY TO SUPPORT HEALTH & WELLBEING

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ABSTRACT

Literature highlights that the reason for non-acceptance of health technologies is complex (Sligo et al. 2017, Standing et al. 2018, Bentley et al, 2014). The context where the technologies will operate and how they relate to the end users’ lives are key factors to uptake and utilization. A number of researchers have suggested that the poor design of many devices and subsequent non-uptake may be directly attributed to the failure of technologists to engage end users and elicit understanding of their requirements. To date few studies have articulated how this might be achieved. This paper describes the outcomes of the first phase of a Horizon 2020 project, which adopted a participatory design research method, called ‘exhibition in a box’ developed by the authors which is predicated on ‘thinking with things’. Over one hundred older people across four countries participated in the study, which sought to develop a virtual digital coach to support active ageing. This paper discusses the themes that arose in relation to the barriers and enablers to engagement with technology as identified by participants within the study. It critically reflects on the strengths and challenges of the co-design methodology.

KEYWORDS

Design, Co-Design, Design for Health and Wellbeing, Health Technology

1. INTRODUCTION

Declining mortality rates mean higher life expectancies globally. In 2015 there were 901 million people aged 60 years and over worldwide. By 2050 it will have increased to 2.1 billion or 21.3% of the global population (DESA 2017). This ageing population and the resultant pressure on healthcare capacity and changing roles and expectations are driving demand for innovative solutions to support independence at home for people living with long term conditions and disability. Digital technologies are being seen as a way to respond to these challenges and as a consequence the way in which medical and healthcare is delivered is being transformed (EU 2018).

Much of the focus of technology to date has been on medical device development with a particular emphasis on products that measure to record data relating to physical functioning (e.g. blood pressure, heart rate, pulse-oxygen). However, more recently there has been an increased recognition of the link between social isolation, loneliness and reduced life expectancy (Bhatti et al 2017, Holt-Lundstad et al 2015) and this has led to a growing emphasis on policies to address the social dimension of health.

Alongside these changes, a paradigm shift has occurred within health that places greater emphasis on self-management and health promotion. Here responsibility is given to the individual to recognize and manage the symptoms of their condition (Lorig and Holman, 2004). Approaches that support a more pro-active approach and that do not rely on health and social care services are being promoted globally. Models of healthy and active ageing with a focus on the multi-stage life are replacing previous conceptualizations of ageing predicated on decline and withdrawal from society. Within this new paradigm

technology can play a key role in offering integrated solutions to promote on-going engagement in meaningful activity and promote community connectedness.

Whilst technology can potentially have a significant impact on health and wellbeing, to date the uptake of digital health technologies has been problematic in a number of wide-scale studies (Stevenson et al 2015). Literature highlights that the reason for non-acceptance is complex. Authors have cited confidence, the stigmatizing aesthetics of products, meaningfulness of technology in the broader context of the persons' life, ease of use and integration into everyday routines as important factors (Bentley et al 2014, Hanson et al 2010).

1.1 Aims of the Research

Novel Empowering Solutions and Technologies for Older People to Retain Everyday Life Activities (NESTORE) is a Horizon 2020 funded project focusing on a technological innovation to enable individuals to engage in health promoting activities as they age. The innovation is conceptualized as a 'friend, a companion and coach' seeking to valorize the capabilities of the older person, to recognize and support them in maximizing their abilities and to experience mental, physical and cognitive wellbeing. NESTORE is intended to promote choice, to educate, to signpost to opportunities, to connect individuals to community facilities and resources and to promote on-going social connectedness throughout the life-course. The system is not a medical device. Rather, it seeks to promote wellbeing through enabling the person to identify and reflect on current lifestyle choices and to access opportunities to engage in meaningful health promoting activities. To develop a solution fit for purpose it is therefore necessary to build understanding of what end users identify as being meaningful and the qualities and characteristics the technology needs to possess. The role of the design is to better understand the broader physical and social environments in which services and technologies will operate and how they relate to the contexts of the end-user. These insights are then communicated to the technologists in the development of the end product. The methodological approach followed in NESTORE provided for users to be involved in the design and development of the solution throughout the project duration.

The Consortium responsible for undertaking the research comprises of sixteen partners from eight European countries. Research expertise includes: design, health (psychology, medicine, nutrition), engineering, business and technology. These partners span Higher Education Institutions and Industry. The overall study is divided into 4 distinct phases. Phase one of the research utilizes participatory research methods and is focused on developing cultural and behavioural insights related to technology, initially in the United Kingdom. Phase two extends and develops this participatory methodology to focus on the materiality, interaction and usability issues related to the NESTORE system. Co-design groups in the Netherlands, Italy and Spain extend cultural insights and test the transferability of the methodology. Phase three of the study then supports the development of prototypes and product through an iterative process. Phase four of the research comprises of a pilot study with 60 participants across Italy, Netherlands and Spain.

1.2 Methods of Engagement

Participatory methods are centred on the principle that participant engagement can provide value throughout research planning and implementation, yielding findings that directly reflect on a community's needs and perceptions. Participants are given an active role, allowing them to shape the direction and methods of the research itself. Multiple benefits are associated with the use of participatory methods including developing collaborative and productive partnerships with participants, providing participants with a voice and harnessing participant engagement to stimulate positive change and the design of better products. Within this study, co-design was defined as creativity of designers and people not trained in design working together in the design development process. From the outset of the research it was envisaged that as the project evolved multiple levels of engagement and participation would occur. For instance, in the earlier stages of the research, individuals would be actively involved in the co-design of the products whilst at other points participants would play more of a role in providing feedback and reflections on the products being developed.

The overall study design followed the UK Design Council's Double Diamond with the initial phases of the research interrogating the requirements of the product by adopting a more exploratory approach, asking questions, conceptualizing possibilities rather than offering solutions. (figure 1)

Figure 1. Design Council (UK) Double Diamond

2. DESIGN OF THE RESEARCH

This paper describes phases one and two of the study which sought to explore the problem space. The first of these phases was undertaken in the United Kingdom with the aim of inviting community living older people to engage in a co-design process to build understanding of user requirements of the technology, identify factors that promote and inhibit use and explore potential contexts where technologies would be used.

Phase two of the research was then undertaken in the partner countries of Spain, Italy and the Netherlands. The same co-design methodology was used with groups of community living older people in these countries with the addition that themes from the first phase of the study were shared to build understanding of the potential for transferability. The aims of this phase were therefore to: build understanding of the similarities/differences in requirements of older people in these countries; to test and understand the transferability of the methodology developed.

As part of this element of the study, a group of older people was recruited and actively engaged in analyzing data generated from the research.

3. METHODS

Co-design methods in NESTORE drew on an existing body of work developed by the authors (Chamberlain and Roddis, 2003 Chamberlain and Yoxall 2012, Chamberlain and Craig 2013) which used objects and artefacts as methods to stimulate and scaffold thinking, offering valuable vehicles through which the complexities of lives can be understood. The concept of exhibition is embedded within the culture of art and design and has a long history as a form of gathering employed to prompt academic discourse.

Exhibition in a box (Chamberlain and Craig 2013) takes the form of nine objects defined through user work-shops across multiple research projects. The objects have been carefully selected to code, represent and prompt further discussion on themes that have emerged through earlier research. The objects form the basis of an exhibition, contained in a box (figure 2) a la Duchamp that can be transported to diverse environs including the home. Just as exhibition pieces invite individuals to express ideas and opinions and to articulate deeply held values and opinions so the objects provide an opportunity for participants to express their emotional responses, to respond to and describe things of importance in the context of the research theme.

Figure 2. Exhibition in a box

Whilst traditional qualitative research methods using structured and semi-structured interviews can preference the views of the researcher who can make assumptions about what the issues are, Exhibition in a box offers participants the space to reflect, discuss, explore and define the questions that reflect their priorities. The objects offer scaffolds for communication because at one and the same time they are both concrete and abstract.

4. THE STUDY

4.1 Phase One

Ethical approval for the study was granted from Sheffield Hallam University's Ethics Committee in October 2017. Between October 2017 - January 2018 a convenience sample of 82 older user representatives were recruited from across organizations across the city of Sheffield based in the north of England to participate in a series of NESTORE co-design workshops.

Inclusion criteria for the study were that participants should be community living older people aged 50 and over; Individuals able to give informed consent; people who had some degree of familiarity with the use of technology (reflecting future groups of people who may use NESTORE).

Workshops were facilitated across a number of different venues including community centres, people's homes, and the user-laboratory space within the University. Each workshop lasted on average between one to two hours. The workshops began with a general introduction from the research team and an invitation for participants to share (verbally) activities they engaged in and found meaningful, with a particular focus on hobbies or leisure. Exhibition in a box was then introduced and participants were invited, in turn, to select and use the object to explore their ideas further (this might relate to the objects form, its sensory quality or a more metaphorical use). This was shared with the broader group. Participants were then invited to share associations that came to mind when they heard the word technology. Again, the critical artefacts were used to explore and interrogate these themes further. With permission, each workshop was audio-recorded and then transcribed.

These transcriptions were then shared with a group of ten older people in the UK who formed an expert group for NESTORE (figure 3). During a one day workshop these individuals were engaged in a process of identifying the main themes from the overall data collection and identifying the most important factors in relation to considerations and user requirements of NESTORE. These were; Privacy, Empowerment, Fits my life, Personalization, Cost, Freedom, Ergonomics, Reliability, Observation, Connectedness, Security, Infrastructure, Being social, Engaging, Keeping active.

Figure 3. Expert group UK

4.2 Phase Two

A similar methodology was adopted in workshops with older people in each of the partner countries (Milan, Barcelona, Delft). Nominated members of the country partner NESTORE team facilitated each workshop. All took part in earlier briefing meetings with the UK team prior to the workshop and workshops were delivered in the local language. The UK team was present and contributed to the workshop with translation support. A convenience sample of 30 older people across the 3 countries took part in this phase of the research (Figure 4 & 5).

Workshop participants engaged in the thinking through things method with exhibition in a box sharing their personal insights into what is meaningful in their lives and their opinions and relationships with technology. The second part of the workshop focused on the priorities identified from the user workshops conducted in the UK. Participants were collectively asked to reflect on each of these and whether they agreed or disagreed with their validity in the context of what NESTORE should consider in its development and application. In addition the participants were asked if there were any themes they felt were missing from the list.

Figure 4. Co-design workshops Milan

Figure 5. Co-design workshops Delft

5. RESULTS

Findings from phase one of the study were found to be congruent across countries with a few minor differences mainly concerning the politics of how NESTORE might be appropriated (distributed through

current health systems and regulations) and a call for NESTORE to be underpinned by research. There were no significant cultural differences however it was noted that climate and environment should be carefully considered in how it might impact on lifestyles. The workshops were conducted during the winter period with extreme cold weather in the UK and the Netherlands in contrast with mild pleasant weather in Italy and Spain. This has significant bearing on the ability for people to engage in outdoor activities.

Attitudes to and responses to technology across all workshops were polarized. Digital technologies were seen as mechanisms through which to access information, and to offer vehicles and opportunities for new learning and to connect to interests. At the same time individuals framed technology as having potential detrimental affects on health and posing a threat to the present way of life. Barriers to engaging in technology included the speed of change leading to challenges in new learning at a point of cognitive decline, questions relating to privacy and trust in terms of who is able to access and use the data generated and the reliability of the technology and the information and readings created. Prohibitive costs and lack of technological infrastructures were also seen as challenges. Design considerations, which were identified as supporting engagement and adoption, included the potential for personalization, portability, durability and considerations in relation to ergonomics. Features that promoted control and the building of self-efficacy were also valued. An aesthetic that was fit for purpose, as according to Dieter Rams ‘good design is aesthetic’ (Rosenfield 2012). A visual language that expresses reliability and durability for example, was identified as an important aspect in the design of NESTORE.

Above all it was necessary to consider how technology relates to other elements of the person’s life and how it fits with self-concept and value system. Specific design considerations identified by individuals participating in the study are described as follows:

The ability to **personalize** the technology was by far the most desirable design consideration expressed in this element of the research. This was seen as a way to counter the uniformity of existing technology and to enable participants to create a sense of identity and ownership.

Because one of the things about this tech, which you’ve just been alluding to then, is that it’s identifiable with you, isn’t it? You make your decisions on what you’d like.

If personalization and the ability to adapt and shape the technology reflected the owners personality then the opposite was true in relation to the operation of digital devices. Participants identified the need above all for **consistency in design**, in the symbols used on controls across products. The following quote was typical of a number of responses:

you have no idea of what the symbols mean, and the lack of consistency around design, where you suddenly go – is that making it hotter or is that making it colder? I have no idea.

These characteristics both align with and validate existing usability guidelines for IT systems (Rajanen, (Marghescu) 2009).

Portability was another design consideration. Older people in our study enjoyed travel and pursuits in the locality and did not want to be tied to the home or to a particular room in the house. Within this size and weight were both factors as the following quotes reflect:

Fancy carrying that around! When you’ve got so much shopping and so much else in your life, that you feel as though you must have this huge thing.

Participants valued design features to promote **control and self-efficacy**. Individuals, for instance were clear that not being dependent on others to update the device or change batteries should be a consideration especially if the aim of the technology was to increase self-efficacy. Participants also appreciated the choice and option to have time to disconnect from technology and there was much discussion about feelings in relation to using systems that were completely automated. There were mixed views in terms of whether devices should have multiple functions or whether a single piece of technology should have a single function. This extensive quote encapsulates the dilemma:

I'm not striving to have that mobile phone that can take the best pictures, If I'm taking a photo, I want an ordinary camera. For me a phone is not something that's counting how many steps I do, it's something that when I need to make a call or text something, I do. I like its separateness. I'm not comfortable with this race to have everything on your wrist, sort of social interaction. I don't know, it just doesn't feel right to me.

One unexpected theme that emerged during this phase of the research was discussion across three of the workshops relating to the **potential negative impact technology** may have on health. Concern was expressed as to whether a focus on measurement of health behaviours (pedometers, step counters) could result in the focus being on the behaviour rather than the activity itself.

another woman a couple of weeks ago. She'd got one. And she was saying oh I've only done 7,000 and something, and I really need to fit in... I thought, it's gone 8 o'clock, what the hell? Surely there's something more meaningful that you can do with your life than count up a few more steps, so you get this magic 10,000.

A number of strengths in relation to the exhibition in a box method were identified. The objects transcended boundaries of culture, language and age and whilst the objects remained unchanging the associations they prompted and the stories they elicited were dynamic and ever changing. Across the various workshop/focus groups different objects elicited the same themes of conversation. Particularly powerful were the key which very much related to security and the dice which participants used to talk about parity of access. Participants shared rich descriptions of their attitudes towards and experiences of technology and a depth of information was offered within the first few minutes of the workshop beginning. Older people expressed appreciation of the tangibility of the objects and their sensory qualities, acting as a physical prompt. The method also enabled individuals to achieve some distance when sharing more personal stories by 'speaking through the objects' or using the objects metaphorically. Rather than being dependent on fixed interview schedules whereby the researcher had pre-defined questions the method very much preferred the views of participants. This is integral to the co-design process. Finally, individuals participating in the workshops expressed enjoyment of the experience and reflected on their learning and the new insights they had gained through the process. This positive experience led to an expressed interest in participating in other elements of the study.

6. DISCUSSION AND CONCLUSION

This research study aimed to inform the design and development of NESTORE a digital platform and tangible interface which seeks to promote wellbeing through enabling the person to identify and reflect on current lifestyle choices and to access opportunities to engage in meaningful health promoting activities. In response to an ageing population and growing pressures on health services digital technologies are seen as a solution to these challenges. However there is to date limited uptake of health technologies with literature suggesting lack of user engagement being a significant reason for this. Whilst the literature is clear in terms of the importance of involving end users from the beginning of the design process in collective imagining, few papers exist of ways to accomplish this. Traditional qualitative research methods using structured and semi-structured interviews can preference the views of the researcher who can make assumptions about what the issues are. This can be particularly challenging when seeking to imagine facets of products that have yet to be created. Within this study, Exhibition in a Box provided a tangible tool to offer participants a space to reflect, discuss, explore and begin to envision the qualities and characteristics NESTORE might need to possess. Finding ways to involve people authentically within research is important and Exhibition in a box offers a useful method for engagement where researcher and participant enter a space on equal terms and individuals are literally able to think and talk through things.

The next phase of the research brings the design team and expert users together with the technologists, and through a series of co-design events creatively translate these user requirements into tangible interactive prototypes.

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