

TOWARDS AN ORGANIC PARTICIPATORY APPROACH TO DESIGN FOR DIGITAL INCLUSION

Saikat Kundu^{1,a}, Alison McKay^{1,b}, Raymond Holt^{1,c}, Elizabeth Valentine^{2,d}, Ania Bobrowicz^{2,e}, Graeme Coleman^{3,f}, Lorna Gibson^{3,g} and Vicki Hanson^{3,h}

¹*School of Mechanical Engineering, University of Leeds, Leeds, LS2 9JT, UK.*

Email: ^as.kundu@leeds.ac.uk, ^ba.mckay@leeds.ac.uk, ^cr.j.holt@leeds.ac.uk

²*School of Engineering and Digital Arts, University of Kent, Canterbury, CT2 7NT, UK.*

Email: ^dev45@kent.ac.uk, ^ea.bobrowicz@kent.ac.uk

³*School of Computing, University of Dundee, Dundee, DD1 4HN, UK.*

Email: ^fgcoleman@computing.dundee.ac.uk, ^glgibson@computing.dundee.ac.uk,

^hvlh@computing.dundee.ac.uk

While emerging digital technologies are pervading many aspects of modern life and large portions of society are benefiting, a substantial minority remains digitally disengaged. The problem of digital disengagement is compounded by the fact that developments of new technologies tend not to address the needs of disengaged users. In this paper, a virtual participatory design approach is proposed. The approach has been evaluated in live student design projects to establish its feasibility. Aspirations, needs and voices of individuals from digitally disengaged communities, in the form of social stories were captured through interviews. The interviews were thematically analysed and argument maps produced to explore reasons behind individual problem-owners' digital disengagement, and motivational factors that might lead to engagement of individual problem-owners with digital technologies. The focus of this paper lies on the analyses of the interviews; early results are presented and outcomes from the different analysis methods discussed.

Keywords: Digital inclusion, Thematic analysis, Technology, Users.

1. INTRODUCTION

While emerging digital technologies are pervading many aspects of modern life and large portions of society are benefiting, a substantial minority remains digitally disengaged. Digital disengagement prevents people from enjoying the benefits offered by digital technologies and limits their opportunities in areas as diverse as work, entertainment, communication, transport services and healthcare. The problem is compounded by the fact that developments of new technologies tend not to address the needs of disengaged users.

There is a strong correlation between digital and social exclusion [1]. It is increasingly recognized that digital technologies could be used to better address the needs of disadvantaged groups and individuals, and so exploit untapped creativity and innovation among the digitally excluded. This would benefit society by promoting a sense of belonging and social cohesion. To this end it is pertinent to understand why, for example, people choose whether or not to learn to use a piece of technology or digital resource. It is known from previous research that a large proportion of older adults want to learn how to do one specific task rather than more general activities such as 'use the Internet'. Their interest is often triggered by becoming aware of functionalities or services offered by a particular technology

or service from which they would benefit [2]. At this point in the adoption of new technologies, once someone has decided they wish to start using it, design interventions can be used to deliver the technology to users in ways that address their individual needs. The overall goal of the research reported in this paper is to propose a design methodology that can be used to bring the voices of individual users, from digitally disengaged communities, into the very early stages of a design activity, before solutions have been explored or proposed. The research embodies the following questions: (i) What can people currently not do which they would do if they were digitally engaged? (ii) How might the disengaged, designers and other interested parties be brought together to create solutions that address the needs of individuals?

In this paper, a virtual participatory design approach is proposed. The approach has been evaluated in live design projects to establish its feasibility. Aspirations, needs and voices of individuals, from digitally disengaged communities, in the form of social stories were captured through interviews. The interviews were thematically analysed and argument maps produced to explore reasons behind individuals' digital disengagement, and motivational factors that might lead to engagement of individuals with digital technologies. In addition, the individuals' stories were stored in a virtual repository and made available to designers (undergraduate and Masters students in design projects) who proposed design responses to meet the needs, wants and aspirations that emerged from the stories; these responses were then evaluated, by the students, with users. The focus of this paper lies on the analyses of the interviews; early results are presented and results from the different analysis methods are discussed.

2. BACKGROUND

Achieving high levels of digital inclusion is becoming increasingly important as society's dependence on digital technologies grows. The Digital Britain report [3] identifies a number of groups who are more likely to be excluded from using digital technologies. One such group is older adults. The report [3] recognises that although reasons for digital exclusion vary, some of the most common causes are the expense of digital products, the capabilities of users to interact with them and the availability of support for digital products and services.

A number of authors discuss the use of participatory design to improve the usability of digital devices for older users. For example, Massimi *et al.* [4, 5] and Kurniawan *et al.* [6] describe issues in the use of participatory design to design mobile phones for older adults. Leonardi *et al.* [7] report on a study of the importance of different places in the home and whether functional products are more or less acceptable. It is widely recognized, however, that achieving digital inclusion demands more than simply designing usable digital devices. For example, Hayashi and Baranauskas [8] report an exploration of the use of participatory design in achieving digital inclusion in Brazil. A key conclusion lies in understanding the goals of older adults and their relationships with others, and then translating these into design requirements.

Hayashi and Baranauskas [8] identify the importance of social relationships and the need for older adults to be able to live independently. A similar observation has been identified in this research and is reported later in this paper. Lindley *et al.* [9] report studies of relationships of older adults indicating that they typically wish to maintain their autonomy as well as a sense of dignity. Anecdotal evidence of current practices in the introduction of digital technologies to older adults (for example as depicted in [10]), where children/grandchildren 'set up' older adults with new technologies that they are then unable to use, work against this need to maintain autonomy. A key aspect of the student design work has been in providing solutions that older adults could install and support independently, or products with associated services to support products throughout their lives.

3. VIRTUAL PARTICIPATORY DESIGN AND ITS APPLICATION

The idea of virtual participatory design is to exploit digital technologies to create a virtual environment in which individuals' stories can be captured and made available to a range of designers in order

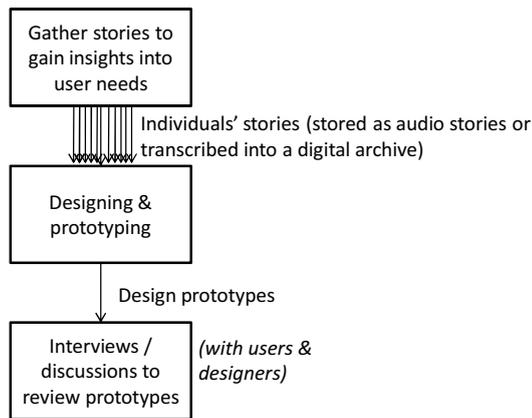


Figure 1. Establishment of a virtual participatory design environment.

that they might propose design responses to meet needs, wants and aspirations that emerge from the stories. This paper relates to the collection and analyses of the stories that might be used as the basis of such an environment. The social stories take the form of audio-recorded interviews and story-telling. The approach being used to establish this environment is shown in Figure 1; it encompasses both the setting up and experimental use of the design space. There are three key stages: story gathering, designing & prototyping (including some user evaluation of designs) and interviews/discussions to review prototypes. Although not shown in the diagram, the process is iterative both within and across the stages.

The proposed approach was applied and evaluated in live design projects to establish its feasibility and applicability. This involved the following steps.

Step 1: Individual stories, in the form of audio recorded interviews, were collected from older adults. The stories included issues related to interviewees' daily and working lives, interests and pastimes, contact with and use of technology (at home and in public places), and views on digital technology.

Step 2: The stories were collated in a virtual repository (i.e. a digital archive) and made available to student designers. In total, 29 interviews were available from three sites: Dundee, Kent and Leeds.

Step 3: The student designers listened to the stories in the virtual repository and carried out initial analyses to identify issues experienced by older adults in their daily lives and routines. In this way they gained insights into the needs of older adults as potential users of digital technologies.

Step 4: The student designers proposed a number of initial design concepts in response to what they learnt from listening to the stories.

Step 5: Low fidelity prototypes of the initial design concepts were created to aid in user evaluation.

Step 6: The student designers carried out evaluations of the design concepts (through interviews and discussions) with representative older adults by reviewing prototypes and obtaining user feedback. Originally it was intended to evaluate the design work with the original interviewees but practical difficulties such as the time taken to generate the designs made review with the original interviewees infeasible.

Step 7: From the feedback obtained in Step 6, the student designers produced an updated and detailed definition of design requirements and technical design specifications to inform final design solutions.

Step 8: Final design solutions were produced to meet the needs, wants and aspirations of older adults (examples from one of the student design projects are available at: www.leeds.ac.uk/product-design/showcase/proddesignv3/index.htm#/118/) and high fidelity prototypes created to aid in user testing.

4. METHOD

The social stories are a key part of proposed virtual participatory design approach because they are the means by which designers gain access to a wider number users' perspectives than would be feasible if they were required to establish direct contact with them. The stories were captured in the form of audio recorded interviews (and in some cases synthesized summaries of the interviews). They were used in two ways.

- Design students used them to inform their design activities and allowed researchers to determine whether the use of audio-recorded social stories was an effective means of giving access to users' perspectives. This research is ongoing but early findings indicate that short focussed video-recordings are likely to be better than audio-recordings that ranged from 10 minutes to over an hour in length; we are currently exploring this aspect.
- The stories were analyzed to explore reasons behind individual users' digital disengagement, and motivational factors that might lead to their engagement with digital technologies. This paper reports the results of these analyses.

The interviews were analysed using thematic analysis. Thematic analysis is a means of identifying themes or patterns within data [11]. It is a flexible analytic method well-suited for use with qualitative data [11]. One of the major goals of the analyses reported in this paper was to identify common themes around which future (more focussed video-recorded) interviews can be carried out. A theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set [11]. The thematic analysis method used is outlined in this section. It involved the following steps: transcription of interview data, coding of the transcribed data, analysis of the coded data and identification of themes, and the generation of thematic maps.

4.1. Transcription of Interview Data

Three interviews (one from each site) were identified for analysis. Transcripts of the audio recorded interviews were produced as a means of ensuring that the analysis results could be traced back to the source data, the individual interviews, and to reduce the risk of inconsistent interpretations, for example, as a result of regional accents of both the interviewers and interviewees. Before carrying out the formal analysis, the transcribed data was reviewed and an initial list of ideas about key themes in the data and points of interest were noted.

4.2. Coding of the Transcribed Data

The transcribed data was coded to identify features that were of potential interest. During coding the following features were considered: issues related to needs experienced by the interviewees in their daily lives and routines, technology currently used by the interviewees (at home and in public places), interviewees' views on digital technology, barriers and potential motivations for using digital technologies, and potential design ideas.

It should be noted that coding is a qualitative and so sometimes subjective process; for this reason an iterative approach was adopted. To improve the reliability of the coding process, three codings (one for each site at Dundee, Kent and Leeds) were completed independently (by four researchers in total, two in Dundee, one in Kent and one in Leeds) for each transcribed interview. The following coding methods were used:

- manual coding based on personal experience and domain knowledge of the analysts,
- argument mapping [12] using the Rationale™ software tool (<http://rationale.austthink.com/>), and
- thematic analysis (which includes coding) using the ATLAS.ti software tool (www.atlasti.com) followed by mind mapping.

Key differences were found to occur where either individual researchers identified small numbers of points not picked up by the others and the occurrence of homonyms and synonyms in

the codings. These differences were identified and resolved while reviewing and analysing the initial thematic maps (reported later).

4.3. Analysis of the Coded Data and Theme Identification

The coded data was sorted, analysed and searched to identify potential themes or patterns in several iterative steps involving. With each iteration, names and specifics of each identified theme or pattern were refined and checked with respect to the themes and patterns identified in the entire data set. In thematic analysis, themes or patterns within data are identified in one of two primary ways: an inductive or ‘bottom up’ way [13], or in a theoretical or deductive or ‘top down’ way [14, 15]. In addition, a thematic analysis typically focuses exclusively on just one of the two primary levels at which themes are to be identified: at a semantic or explicit level, or at a latent or interpretative level [14]. At a semantic level, the themes are identified within the explicit or surface meanings of the data and the analyst does not look for anything beyond that. On a latent level, thematic analysis goes beyond the semantic content of the data and examines underlying ideas, assumptions, conceptualizations and ideologies that are theorized as shaping or informing the semantic content of the data [11].

In this research, due to the nature of the data gathering method, specifically that they were informal interviews targeting the pre-requirements stage of a design activity (with a view to identifying issues and gaining insights into the needs of individuals), the following approaches during data analysis and theme identification:

- a deductive approach (rather than inductive approach) was used in the analysis of the coded interview data, and
- reasoning at a latent level was used in the identification of themes and patterns.

4.4. Generation of Thematic Maps Showing Initial Set of Themes

The previous phase, after several iterative steps, resulted in nine thematic maps [one by each site (i.e. Dundee, Kent and Leeds) for each of the three interviews]. A thematic map highlights key themes and shows relationships between these themes (both decompositions and connections) in the data set that has been analysed.

The initial themes for each of the three interviews were collated in a table. These collated themes were reviewed and analysed by the authors in a workshop setting. This process refined each theme, generating clear definitions and names for each theme, and resulted in a collection of themes that encompassed all themes found in all three interviews. Finally, this collection of themes was used to identify common themes across the three interviews; these common themes were used to inform the generation of a final, integrated, thematic map (see Table 4.1.). This thematic map provides insights on barriers and reasons for digital disengagement among older adults, and on potential motivational factors that might lead to engagement with digital technologies.

5. RESULTS

Summaries of the interviews and interviewees are given in Table 1. It can be seen that the social stories were gathered in a number of different ways; this resulted in differences in richness, quantity and quality of the data collected. As discussed in Section 4, one interview from each row was selected for analysis. Word clouds are provided in Figure 2 to give an overall impression of the content of each of the interviews used in the analysis. A summary of the final themes resulting from the analyses is given in Table 2.

6. DISCUSSION

It can be seen from Table 2 that six key themes were identified: acceptance of purposeful household technology, confident resistance to digital technology, technology concerns (both personal and societal), lifestyle changes, and the need for social interaction.

Table 2. A summary of the final themes and sub-themes resulting from analysis of the interviews.

Themes	Sub-themes
Acceptance of purposeful household technology	Worth effort to learn Used for practical purpose or for individualised consumption of standard media Frequent use, tried and tested
Confident resistance to modern (digital) technology	Understands usefulness but is largely uninterested Convinced of lack of need for it Self-confident in using technology if required Detached - "Not my world," "too old" Too busy to learn/Not enough time to use Satisfaction with the traditional (e.g. likes TV with just 4 channels, radio)
Technology concerns - Self	Scared (of all the wires, telephones) etc. Lack of previous exposure Language/terminology barriers Concern over doing something wrong Too fast Too powerful Too addictive Too intrusive Too complicated Lack of space Lack of ability to cope when things go wrong - Current technology - Future technology (e.g. updates) Lack of "proxy help" Need for step-by-step instructions/guidance Expensive (only Kent and Leeds)
Technology concerns - Social	Too much technology, omnipresent Does everything over reliance upon Over Indulgent (also reflected in society today in general), gimmicky Loss of face-to-face conversation Potential of isolation/loneliness Reduces freedom
Lifestyle changes	Age and health related changes affecting ability to use technology (e.g. visual, hearing, bodily dexterity, digit coordination, less active, mental agility, memory) Balancing help and autonomy (e.g. moving in with children who want to help out with everything) Personality changes: more cautious (concern of errors in general)
Need for social interaction	Importance of sharing similar experiences, learning, communication Fear of socially isolating experiences

participatory design whilst minimising the time and effort needed from the users themselves. In addition, the interviews inspired the students to carry out the same style of research with their own focus groups. These experiences led to the conclusion that the approach we propose should aim towards inspiring and informing designers early in a design process. To this end our future plans are to video record short vignettes focussed around the themes reported in this paper.

A key finding from the interviews was the importance of focussing technology developments on user needs, as opposed to usability, as a means of fostering technology acceptance. Some of these needs, such as those related to age-related long-sightedness, are likely to remain constant whereas others, such as the capabilities of users, are likely to change over time. For example, the number of users who will have used the internet in their work will increase dramatically over the next 10–15 years

and this is likely to affect digital engagement among retired people. With respect to the users' needs, a key issue arises from the strong emphasis on the need to support people's independence and autonomy, while providing them with self-sustaining, supportive environments where digital technologies and products are inconspicuous, unobtrusive and intuitive to use.

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