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# Conceiving and developing a mainstream consumer service to support older or vulnerable people living independently

*Nikki Holliday, Dr. Gillian Ward, Darren Awang, David Harson*

*nikki.holliday@coventry.ac.uk*

*Health Design & Technology Institute, Coventry University Technology Park, Coventry, UK*

## Abstract

The project aimed to explore what potential users would want from an innovative consumer care service platform which helps people live independently, and helps friends and relatives more easily support them. Co-creation methods were used to design a prototype of the service with stakeholders. Existing technologies were repurposed to prototype the service concept, which was tested in-situ with older people and their carers. Results from this initial pilot were positive, with participants finding the service non-intrusive, reassuring, and easy to use. The service is now being developed as a customer proposition and commercialised with business modelling by ADI, support from the charity CarersUK, and a national channel partner, with the intention to roll the service out UK-wide to customers. This paper describes the methods and processes used, and how the holistic service design methodology is proving to be a powerful persuader to help take the service to commercialisation.

**KEYWORDS:** technology, telecare, assistive technology, co-creation, user engagement, service design

## Introduction

Within the United Kingdom, Assisted Living Technologies (ALT) and telecare services have yet to be established as a mainstream consumer option to support people who wish to age in place. Telecare services are made up of “a combination of sensors and other equipment to help people live independently. This is done by monitoring activity changes over time” (Department of Health, 2009, p. 5). Currently, up to 1.7 million people in England are using telecare (and telehealth) services, and this number is growing (Clark & Goodwin, 2010). The majority of these technology users source their products from the NHS and social care, which have traditionally dominated the purchase and supply of ALT in the UK. This has led to a lack of choice of services for older and vulnerable people, driven by public sector

commissioners negotiating block contracts for whole local authorities, rather than tailored purchases for individual users (SCIE, 2009). Also, with increased pressures on local authority budgets, the eligibility criteria for accessing adult social care has increased in many councils. For example, in 2007-08, eligibility in England was set at those with 'Substantial' needs and above by 70% of local authorities, and a further 2% of authorities required a need level of 'Critical' (CSCI, 2009). This has led to a situation where despite statutory services dominating the supply of telecare, 1.5 million people in England have care needs unmet by the state (CSCI, 2008).

It is argued that with the increasing provision of Direct Payments, which individuals can use to spend on technology for their needs as they wish, and the power of the 'Grey Pound' (the over 50s who hold 80% of the UK's personal wealth – ONS, 2012) there is an as yet relatively untapped market for commercially provided consumer care services (Department of Health, 2007; Netten et al., 2005). This market also extends to the 'Sandwich Generation' of adults who are caring for both their children and older parents (Ben-Galim & Silim, 2013). The market is potentially large. In 2008, local authorities spent £177 million on such technologies, in comparison to the £244 million spent by private purchasers (Which? 2009; Ward & Ray, 2011). This level of spend exists in a market where many potential customers are not aware of the services available to them privately (McCreadie et al., 2006), and those who are aware but are put off by the stigmatising design (Bichard, et al., 2007; Coughlin et al., 2007). There has been recognition that an increase in commercially available care-based technologies may do well to normalise and destigmatise the use of such products and services, leading to an increased level of private purchasing and self-management of care needs (Ricability, 2009; Ward & Ray, 2011). A representative quantitative survey of people aged 45 and over found that 67% would be willing to self-fund the purchase of products which would enable them to live independently in their own home for longer (provided the price was 'right' – Which? 2009). Some have argued that as statutory services are reduced further, and information and marketing regarding ALT is improved, an increasing number of people will be looking for consumer solutions to manage their care needs (Brownsell et al., 2008).

There is, therefore, a space for innovation which lies between the formal care and response provided by traditional health and social care alerting systems, and the informal support provided by carers and neighbours, who may be unable to access formal support from statutory services, particularly where they are prepared to pay for consumer and private services. The Delivering Assisted Living Lifestyles at Scale (dallas) programme, funded by the Technology Strategy Board (TSB) is a £23 million project which has established four communities (of which the i-Focus project is one) to demonstrate how ALT products and services can be used to promote wellbeing and enable people to live independently, whilst helping to grow the ALT sector and position UK companies to take advantage of increasing consumer demand for such services. Following this, under the dallas i-Focus programme, the Health Design & Technology Institute, on behalf of the Advanced Digital Institute (ADI), worked with key stakeholders (older people, carers of older people, and third sector and industry representatives) to develop the WarmNeighbourhoods® AroundMe™ service, which aims to help older and vulnerable people live at home, whilst helping their friends and family more easily support them.

The AroundMe™ service uses connected home sensor technologies to help support an older or vulnerable person, allowing their friends and family (their 'personal neighbourhood') to be notified if, for example, the temperature in the house gets too low, or if an appliance that would normally be used regularly (such as a kettle) doesn't appear to have been used. It also

sends messages to friends and family to let them know that their loved one is up and OK. This report describes the service design methodology used to develop the AroundMe™ service with potential future customers and key stakeholders, and how a holistic approach incorporating stakeholder involvement, rapid prototyping, and in-situ testing can be used together to develop services which are both of value to the user, and feasible to commercialise at scale. The holistic approach was considered as other authors have identified that "...the greatest challenges of prototyping a service are authenticity and validity. For these issues it is important to consider the larger context of implementation, use, location, as well as the use of real people; thus a holistic approach." (Bhömer et al., 2013, p. 37). This project is therefore unique in that it brings together a range of service design methodologies in a holistic approach to better understand and provide for the needs of older and vulnerable people. Ethical approval for all aspects of the research was obtained through the Coventry University Ethics approval procedure.

## Co-creation and service design blueprinting

Two co-creation workshops were held to explore the user journey throughout potential service touch-points. The objective of the co-creation activities was to enable potential customers, their informal care and support 'neighbourhoods' and industry representatives to engage with the AroundMe™ service concept, and provide data to aid the definition and design of the initial service blueprint. The first workshop included potential future customers - older or vulnerable people and people who could make up part of their 'neighbourhood' (n=12). The second workshop included industry, charity, and service representatives (n=12). The structure of the workshops was based on a co-creation model, defined by Sanders and Stappers (2008, p. 6) as "any act of collective creativity, i.e. creativity that is shared by two or more people". Participants in the identified groups engaged in a series of activities including the use of service visualisation, personas, and a metaphorical bus journey to explore and map all stages of the users' engagement with the future service. This choice of methodology would allow the potential future customers to become 'co-creators of value' and develop a user-driven innovative service (Westerlund & Leminen, 2011), by directly informing the development of the service prototype for the later in-situ testing phase, therefore participants were asked to consider both the service journey and the sensor technology which would ultimately make up the service, and how it would be used. As well as being directly asked about potentially useful sensors (after being shown examples), participants were asked to consider what constitutes 'being OK', and what information would provide them with reassurance regarding their loved ones. The customer workshop was held prior to the industry workshop so the industry professionals would be able to comment on technical implications of the customer feedback which could impact upon commercial feasibility (Kristensson, 2008).

Photographs of the materials created and outputs produced were taken during the workshop to capture work in action. All materials generated in the workshops were carefully preserved for later analysis. Full annotations were made in situ and the materials produced in the workshops were summarised by the workshop leads and combined with their observations. The data were analysed to inform the initial service design blueprinting of the AroundMe™ service, including what sensors make up the service, and what a typical journey through the service would look like through blueprinting the customer service journey. The results regarding the service blueprint are described below.

### *Awareness of the service*

Participants discussed how potential customers would become aware of such a service. The workshops agreed that if the service were sold via supermarkets and other routinely visited places, then it may become mainstream and familiar, thus increasing the likelihood that consumers and families would opt for such a service. There was also discussion amongst the industry group about how to change people's attitudes to this type of service and to encourage the customers to think of it as 'insurance' or 'just in case' – and this discussion led to the idea of a national campaign similar to the 'Change 4 Life' campaign, which could inform people about what to expect from older age, and when they might start thinking about services like the AroundMe™ service which could provide peace of mind for older people and their families.

### *Joining the service*

The majority of consumer participants wanted to join the service via an online or paper application form. Some participants felt a telephone number to join the service would be useful. There was a concern that not all people would consent to or want to join the service, or be able to decide who was most appropriate to be part of their neighbourhood. It was agreed that the ultimate decision to purchase and use the service must rest with the person whose home it would be installed in. All consumer participants felt that the company providing the service would be well placed to install the equipment. There was an emphasis that the company should be reputable and provide people with identification when they arrive to install the service. It was also argued that having someone to install the equipment was not necessarily needed if the components could be simplified enough to be 'plug and play'.

### *Using the service*

Both consumer and industry participants felt that ambient temperature and electrical appliance monitoring sensors would be the most useful for the intended service and target customers. Participants in the co-creation sessions stressed that the data and information collected from the sensors should be confidential and only shared between agreed persons in the neighbourhood. They felt this aspect of privacy within the neighbourhood and data not being shared with external agencies e.g. a call centre, was what made the service unique, as it would allow people to manage their own care needs within the sphere of their family, without outside interference. With regards to the sensors, participants felt that it would be useful if there was an 'in house' alert, prior to the 'neighbourhood' alert, which would enable the main user to ensure that everything was OK before the wider neighbourhood were contacted. This would enable them to remedy a drop in temperature by turning up the heating, or act as a reminder to make a hot drink in the morning if the service noticed that the main user's kettle had not been used that morning.

Both the consumer and industry groups felt that, although the ambient temperature monitor would be useful, fuel poverty or simply a concern with saving money may cause some customers to ignore a heat sensor message, or to switch the heating off after someone had visited or switched the heating on. The industry group were unable to find a solution to this that would still allow the main user choice and ultimate control over their living environment, and accepted that some older people will indeed be concerned with the cost of energy. Positively, many of the consumer participants felt that if the service could help with awareness of energy efficiency, and therefore reduce costs, then this could appeal to many customers. In terms of receiving the messages, participants identified that people would want

to use the service in a variety of ways, with different people using different sensors and message algorithms. It was felt that younger relatives or members of the ‘neighbourhood’ would be more interested in receiving messages via SMS, with older relatives and neighbours preferring a telephone call which would provide an automated message. The simplicity of wanting an SMS or telephone call surprised some of the industry participants who felt there could be more innovative ways to use technology for alerting the neighbourhood, for example, via an iPad. However, other industry participants agreed with the consumers that the messaging service should be kept simple to avoid confusing people or delaying responses.

### *Leaving the service*

Consumer participants were also asked to consider how they would want to leave the service. From this it was suggested that there must be an easy way to opt-out, especially if the main user was suddenly hospitalised, had moved into residential care, or had died. Most consumers felt a rolling contract was suitable, with customers being able to cancel the contact at a month’s notice. It was also discussed how the company would get their equipment back, once a ‘neighbourhood’ had left the service, and it was suggested that it could be returned via the post. There was a view that the equipment should be recycled where possible, however, the industry participants were mindful that recycling equipment may not be cost effective, although a desirable aim.

## Testing the prototype service design in situ

Following the results of the co-creation session, an iterative approach was adopted, with the co-creation results directly informing the in situ testing phase. The AroundMe™ service design was blueprinted, and existing home sensor technologies for the pilot service were chosen (an ambient temperature sensor, an electrical appliance monitor, and drawer/cupboard contacts) to provide a rapid prototype of the service. Although not the ideal final technical solution (e.g. the equipment was not at this stage simple enough for a plug and play set up), it allowed the quick prototyping of the service blueprint and was sufficient to trial the customers perceptions and perceived value of the service experience. The in situ testing was considered vital to follow from the prototype development, as the full value of a service cannot be determined by stakeholders until the “value in use” has been assessed (Kristensson, 2008, p. 482). The in situ testing aimed to explore how the connected home sensor technologies could help support an older or vulnerable person, by allowing their relatives or friends to be notified via an SMS text message if:

- » The temperature in the house gets too low – to alert friends and relatives to a drop in temperature that could leave the older or vulnerable person at risk of hypothermia, or other health conditions associated with a drop in temperature;
- » An appliance that would normally be used regularly (such as a kettle) doesn’t appear to have been used;
- » An appliance that would normally be used regularly *has* been used – to provide friends and relatives with reassurance that their loved one is indeed up and about and OK;
- » A door or drawer that would normally be opened each morning with regularity has or has not been used (e.g. a bathroom door, or the cutlery drawer), thus indicating the likelihood of whether or not a person has eaten;
- » A base unit to send data via GPRS to a cloud based server. The base unit would also sound ‘in house’ alerts regarding low temperatures or lack of activity, to allow the main

user to remedy this before an SMS text message is sent to their neighbourhood, causing unnecessary worry.

Temperature was monitored throughout the day. Use of appliances and doors and drawers was monitored during specified times, chosen by the user and their families after discussions about their day to day routines.

Participants were recruited through a range of organisations across Coventry and the West Midlands, including local older peoples' and carers' charities, libraries, and housing associations. A flyer and participant information sheet were sent to the organisations to pass onto their relevant contacts. Interested potential participants were asked to contact the researchers directly to express their interest in taking part. The researchers then spoke to the participants and answered any questions they had. Once participants confirmed that all potential members in their 'personal neighbourhood' were happy to take part, a researcher visited the main user in their home, gained informed consent from all parties, and discussed the best placement of the technology with their user and their neighbourhood. The final trial consisted of 12 'neighbourhoods' (a neighbourhood consisted of the main customer or user, and their friends and family who wished to receive messages about the sensors) which included a total of 33 participants – 14 main users who had the service installed in their home (two neighbourhoods comprised of older couples as the main customers) and 19 friends and relatives. Three neighbourhoods included users with dementia. The age of the main users ranged from 55 to 85 years. Participants were asked to trial the service for a minimum of 12 weeks. Interviews took place at mid-point and end-point. A primarily qualitative approach was taken to explore the experiences of those trialling the service through the use of face to face and telephone interviews and an event diary. The interviews were transcribed, and with the event diaries, analysed using Long Table Analysis (Krueger & Cassey, 2000).

## Results from in-situ service testing

The results from the in-situ testing were overwhelmingly positive. The pilot service promoted greater understanding, awareness, reassurance, and involvement between the personal networked neighbourhoods, and participants liked the focus on positive well-being, and reassuring activity messages:

*"It's a non-intrusive comfort." (Heather, User)*

*"It's just a positive message isn't it?" (Phyllis, User)*

Overall, participants showed little concern regarding the AroundMe™ service, and felt that this was because the sensors and alerts were appropriate ways of communicating wellbeing within a family, without being too intrusive. Participants thought that the introduction of other sensors, for example, cameras, would however cause concern:

*"Initially I didn't know whether it would bother me, but it doesn't at all. Certainly if there was any camera work going on that would bother me. I would feel like I would have to dress instead of lounging around in a dressing gown ...and full make up, but no it's perfect, absolutely perfect ...I was telling somebody about it and they said 'Well don't you feel it's a bit Big Brother?' I said 'No, not at all, and they can't see you.'" (Wendy, User)*

It was found that the service increased awareness amongst the family of the main user's wellbeing, and allowed them to share caring duties and responsibilities within the family:

*"I think it makes me much more aware of when [my father] is having good days and bad days."*  
(George, Carer)

*"I think we are far more focused now aren't we? Even at the weekend, I mean at the moment we are far more focused about mum, still needs to get up to have her breakfast, and then Gary is doing the Saturdays and I'm doing the Sundays to make sure she is eating, so yes I think it has, it has helped us to focus hasn't it?"* (Susan, Carer)

Other neighbourhoods felt an increased sense of independence for all parties, both users and carers:

*"It gives me a bit more freedom as well."* (Karen, Carer)

*"I don't like to feel suffocated if you like, that they are always 'Are you OK? Is everything alright?' That sort of a way, I can't stand that. But [with] this, I am doing it myself if you like, with the machine and then sending to George – 'Yes everything is alright', so I think it is probably a relief for him too."* (Phyllis, User)

The service did not reduce contact within the neighbourhoods (a frequently cited concern of some when considering the use of technology services to manage care needs). Conversely, for most of the neighbourhoods, social contact increased, as the daily text messages acted as reminders for the responders and carers to make contact with their loved ones:

*"It works very well, because what normally happens is [I receive a message], and I pick up the phone and talk to Alice, because it reminds me that it's time to talk to you and check that you're OK...It prompts me because I'm not too good in the morning."* (Dawn, Carer)

On the whole, the system had little effect on the users' activities of daily living, who were able to 'carry on as usual', with the sensors picking up their activity in the background. The system did however increase the confidence with which the users carried out their routines, and for some, acted as a prompt to complete their daily activities in the morning, whether this was a prompt direct from the base unit to the user, or a prompt from a Carer receiving a 'no activity' message:

*"Funnily enough I would say yes it has [increased my confidence]. It's just that quiet knowledge that you know, if the worst does happen, sooner or later somebody will know."* (Heather, User)

*"It means I know if he hasn't had any lunch, so I can give him a call and say, 'Dad, come on, actually have something to eat'. So and of course, when he is, when he does come out and do things I think 'OK, yeah, I know he's about and round and doing stuff', so I'm a bit more relaxed."* (Sean, Carer)

The only area where the users felt the service impacted on their lives was at the weekend. It was felt by some that a more flexible technology would allow them to change their routine at the weekend, for example, to have a lie in without worrying about their neighbourhoods receiving an 'inactive' message.

Participants liked the set up and installation of the service (and found the telephone helpline useful where necessary), however all participants stated they would have preferred the option of a self-installation service which would utilise 'plug and play' style equipment. Indeed, there were some issues regarding installation and set up, with some participants requiring 'post-



installation' tweaking to fully customise the system to their own lifestyles and housing set-up, for example, repositioning the temperature sensor so it was not placed in a draft. In some cases this required an engineer making an extra visit to the home, causing a delay to the trial customers being able to fully use the service:

*"We were putting that [temperature sensor] right in that corner, and it kept saying, a couple of times it said 'Your heating is too low' ...But I wouldn't have thought it was 16 or whatever it was over there... There must have been a draft." (Mildred, User)*

Participants disliked the impersonal nature of the messaging, as they found they lacked clarity, with a number of participants not immediately associating a message saying "Your friend is not active today" with the AroundMe™ service. Some participants were initially concerned this was a scam message:

*"If it were possible to either, at the beginning, either to sort of say, right, programme this number into your phone so you know what it is and if possible, maybe give the, rather than a friend, give an identifying ...relationship, mother, father, daughter, or even a name if that were possible." (Lois, Carer)*

There was concern that the service could be confusing for some, particularly those with dementia. Carers of participants with dementia indeed described how the base unit in particular had caused some confusion:

*"The other thing she was telling me last night, this is my mother again, she said 'I've spotted those lights in there so I've switched them off' [the lights on the base unit]. I said 'You mustn't do that', so I've got to tape up the plug ...Which we have to do with things because she loves switching things off at the socket if she gets the chance." (Frank, Carer)*

Despite some glitches in the technology, and concerns that the service could be a confusing one for those with cognitive impairments, overall the participants were very pleased with the service, and wished to continue using it beyond the trial. Interestingly, even participants who did not have any specific worries prior to taking part in the trial (who could be considered 'early adopters') saw the value of the service during their experience:

*"No I didn't [have any prior worries], which is odd because she is 82, so... one would think 'well, what if she falls?' ...It really took her to be ill for me to think, actually this is a really good idea... it's changed my mind... I have now found that I'm waiting for that text message at eleven o'clock ...So it's become a lot more relevant to me (Lorraine, Carer)*

With regards the future development, participants felt the option of additional sensors, and a website to monitor patterns could be useful add-ons, however only if they did not increase the cost of the service:

*"I think generally people would like to be able to not necessarily see absolutely everything, but to be able to have some useful sort of intelligence about it, and obviously not have a whole heap of data that they have to read through to be able to decipher... Somebody needs to do some work on what the right reports are that people would find useful." (George, Carer)*

## Discussion

The development of the AroundMe™ service using existing repurposed technology allowed testing without commitment to a final technology solution and enabled quick prototyping and testing of the service in situ with customers. The service design methodologies chosen supported the centrality of users and future potential customers of services as the knowledge base, and the importance of understanding the value of the service from the customers' viewpoint. This led to a swift understanding of whether the service concept worked outside of a traditional research setting, without committing to expensive, unsuitable technology, and led to a successful service design which is fit for purpose and meets the needs of its future customers. The positive results elicited from the in-situ testing are likely to have arisen from adopting co-creation and living lab methodologies – by involving potential future customers early in the development of the service we have developed a usable, effective and desirable service which is innovative in that it can support low-level care needs outside of traditional statutory provision. The project also demonstrates the potential fruitfulness of using service design methodology to develop existing technologies into better designed services to meet current and future user needs, rather than focusing time and effort on costly bespoke technology development. The next phase of the research will be to scale up the service offering for testing with 1000 users across the wider UK context. Whilst the previous winter trial with 33 users from the West Midlands proved successful, it is important to assess whether the service designed works outside of the local context in which it was generated (Wolfgang et al., 2009). This gradual scaling up allows the testing of value at various levels of scale, thus reducing the risk of a service not of value to a larger context.

In conclusion, by including a range of stakeholders, including end-user and industry representatives throughout the co-creation phases, and by adopting an iterative attitude to the research and service development, we are ever closer to the completion of the aim – to develop a scalable commercial service. The end report detailing the results of the in situ testing is proving to be a powerful persuader to take the service to commercialisation. Indeed, the service is now being developed as a customer installation proposition and commercialised with business modelling by ADI, support from the national charity CarersUK, and a national channel partner, with the intention to roll the service out UK-wide to customers. It is hoped that other organisations can learn from the holistic approach adopted within this project and further help to improve the choice and quality of services for older and vulnerable people who are looking for consumer solutions to manage their care needs in an environment of dwindling state support.

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