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# **Balancing Act or Compromise? A Case Study Highlighting the Challenges of Trialling IT services with the Elderly**

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**Abstract.** The world's population is ageing. Older members of society have needs from IT which can be quite specific, reflecting their living arrangements and increased likelihood of suffering from physical and cognitive impairments. So how can businesses offering IT services understand these needs to develop products and services that this demographic group (and their carers) will be willing to adopt? In this paper we outline the process we went through to attempt to answer this question. Because our research involved elderly and (in some cases) disabled trial participants, the process had ethical considerations at the forefront, which on occasion affected the operational processes involved in bringing the trial to life. We describe the various challenges we encountered, where possible how we overcame them (by balancing commercial, stakeholder and participant requirements or by compromising where we could not), and what we learnt for future trials.

**Keywords:** User trials, IT, Ethics, Trust, Business Processes, Organizations, Stakeholders.

## **1 Background – BT**

From developing the first amplified telephone handset in the 1920s for the deaf [1], to the highly successful BT Big Button 200 (Fig 1) with features such as easy-grip handsets for those with dexterity issues and an inductive coupler for use with hearing aids, BT has a long history of offering inclusive communication products. In addition, in collaboration with organizations such as local councils, telecare and telehealth services are offered with the intention of enabling such customers to live independently and securely in their own homes [2] (Fig 2).



**Fig. 1.**



**Fig. 2.**

As well as the financial and non-financial benefits these products and services bring to BT and to customers, the public sector is another expected beneficiary of such services, as quoted by Paul Burstow, MP, Department of Health in March 2012:

The widespread adoption of telehealth and telecare as part of an integrated care plan will mean better quality of care and greater independence for people with long-term conditions. Delivered from the front line it could save the NHS up to £1.2 billion over five years.<sup>1</sup>

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<sup>1</sup> <https://www.gov.uk/government/news/telehealth-and-telecare-could-save-nhs-1-2-billion>

So the rationale for offering these services is clear: for BT, the customer and the public sector. But BT, like other IT companies, constantly evolves its product set to meet the changing needs of its customers, reflecting demographic and societal changes, and to fulfil its business and Corporate Social Responsibility (CSR) ambitions. Successful products continue to be sold, less successful ones are discontinued. In order to maintain the refresh cycle of new products, BT has various foresight and development teams within its organisation. For this case study in particular, the Research and Innovation department, in collaboration with teams in CSR [3] and the Business Development teams in the Health sector-facing part of the organization, developed a specific concept to potentially add to the existing suite of inclusive products. The concept was to be delivered in the form of a trial service, to address a specific and evident issue facing predominantly elderly members of the UK Population – that of social isolation.

## 2 The Case for Researching Concepts to Address Social Isolation in Elderly User Groups

Social isolation among older people is an increasing problem. A survey conducted by Age UK in 2014 (Fig. 3) revealed that over 1 million people aged 65 and over admit to always or often feeling lonely, 30% of older people saying they would like to go out more often, while 41% say their TV or pet is their main form of companion. The charity also found that 12% feel “cut off” from society. Loneliness can be seriously damaging to health - feeling extreme loneliness can increase an older person's chances of premature death by 14% [4].

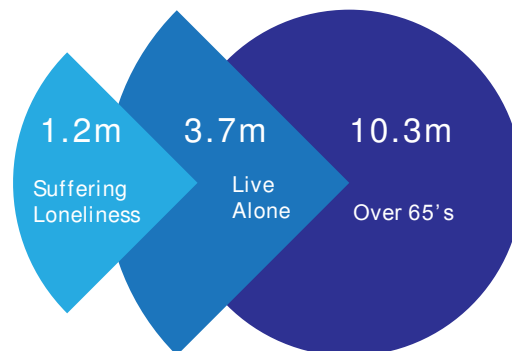


Fig. 3.

These statistics become more significant when looking at the projections for the future. In the UK, between 2015 and 2020, during which the general population is expected to rise 3%, the numbers aged over 65 are expected to increase by 12%; the numbers aged over 85 by 18% and the number of centenarians by 40% [5]. 25% of the UK population is projected to be aged 65 and over by 2050 [6]. When considering these

projections, the incidence of social isolation and its effect on health and social services becomes even more significant.

Because of this evidence, the BT teams collaborated to develop a conceptual service which could potentially reduce social isolation among elderly people. BT is well-positioned to be able to do this having the ability to offer fast Internet access to provide connectivity, to be able to work with consumer device vendors, to work with these vendors to adapt products' user interfaces according to the target user group's needs, and to work with external organisations to explore options for the concept's route to market and ongoing technical support for any prospective service. With these factors in place, a trial plan was created.

### **3 Trial Objectives**

The original intentions of the trial were, over a period of 12 months, to build upon previous research on the role of technology in addressing loneliness, and to inform the strategic direction for the implementation of these technologies. The technology for the trial was deliberately simple – a system using Skype over the participants' existing TV.

The county of Cornwall was chosen as the geographical location for the trial as:

1. Its population's age is higher than the national average (1:4 is over 65 years old) and is expected to increase [7],
2. There was an established collaboration between some of the stakeholder groups to deliver the trial, and
3. Infrastructure was already in place to deal with technical and participant support during the trial.

The original objectives of the trial, from a commercial point of view, were to:

- Measure the benefits of TV video chat in reducing social isolation.
- Evaluate performance, experiences of the user and their families/carers and feature sets to identify improvements and future service enhancements.
- Understand usage models and frequency of use to support proposition insight.
- Understand geographic and demographic elements to support any proposed business model.

Another objective was to be able to use research findings for publication due to its relevance in the field of Human Computer Interaction (HCI) which includes 'Inclusion and Accessibility', 'Designing for the Elderly' and 'User Interface Experience Design'. To enable us to do this, ethical approval was needed; this was provided by a university partner whose faculties specialise in researching technology use in elderly populations. Having ethical approval to ensure participants are protected is vital and an activity all stakeholders supported. However, it was the negotiation of the detailed recruitment and participant engagement processes for this ethical approval procedure with the multiple stakeholders which created the first of the trial's many challenges.

## 4 Challenges

### 4.1 Challenge 1 – Balancing the needs of multiple stakeholders for ethical approval.

The stakeholders were those involved in bringing the trial to launch who also had an interest in the trial's output. The number and diversity of these stakeholders is demonstrated in the list below:

- Local delivery and support team (part of BT).
- Local development council who ran outreach programmes to educate elderly IT users.
- Local housing associations for referral of potential participants.
- Local charities for the referral of potential participants.
- A non-BT Internet Service Provider to provide the high-speed Internet connections for the service.
- Device vendor (supplier of the hardware to be installed on participants' TVs).
- CSR and regional Broadband roll-out programme managers within BT.
- Public sector-facing marketing teams of BT.
- University partner advising and supporting the BT research team through the ethical approval process.

All stakeholders had a common desire for the highest levels of participant safety and protection. However, the production of the detailed processes and documentation which the ethics approval committee required, needed to take into account a variety of logistical requirements from different stakeholders. For example, one of the charities was already running a similar exercise in trialling non-technical means of reducing social isolation and were some way ahead of BT's research team in developing their own ethically approved participant referral and engagement processes. While honouring their wish to keep our processes aligned with theirs for the recruitment programme they were running, it did not fully match the resourcing capabilities of (for example) the housing associations who needed separate, parallel participant referral processes. The nature of the work of both organisations was in itself different – one being a charity supporting the elderly, the other organisations dealing with aspects of social housing tenancies). This in itself doubled the already significant quantity of process documentation required by the ethics approval committee.

Letters of communication to participants similarly required agreement from all parties to ensure consistency in the tone, content and intent of the documentation, from the original flyer advertising the trial, to welcome letters, to letters advising of the end of the trial and letters outlining what participants needed to expect in terms of providing feedback to the researchers. Legal documentation was thoroughly reviewed (i.e. terms and conditions plus two sets of participant consent forms). Finally, technical criteria checklists, for the use by the referrer (outreach worker, charity or housing association

representative) needed to be produced such that the referrer themselves – usually an individual from a non-technical background – was confident that they could record that such criteria could be met for the trial service to be delivered in the participant’s home. Another requirement upon this referrer was that they recommend the participant on a subjective assessment of whether or not the individual would benefit from such a service, taking into account what they knew of the participant’s health, social network and living arrangements. As this was a responsibility upon the referrer (BT did not engage the participant directly until all consents had been given), this too needed special consideration. Again, these processes did not extend to all referral parties because some wished to retain their own processes, and this too had to be taken into consideration.

When all agreements were met and documentation produced, the ethical approval board itself caused another impact on the roll-out of the trial, because our application was submitted during summer recess and the board did not meet until some weeks after. Although this was a known factor, it had an impact on the ability to start recruiting participants, and in turn this affected the timescales for launch of the trial service.

As a result, the trial start date was pushed back, leading to a loss of momentum, especially with the internal commercial partners. However the need for ethical approval was paramount, so the trial launch continued and approval was eventually gained to start recruitment.

#### **4.2 Challenge 2 – Issues with Trust**

Popular and widespread adoption of new technology is less straightforward than it might initially appear; given that technology is always imperfect there are initially more barriers to take-up than drivers that will push adoption – this was especially true of our group of participants. Central to the adoption process is the need to consider the question of whether the technology itself can be trusted as well as the necessary trust in those who deploy, control and deliver such technology. In this trial, this task was made more complex because we needed to access and engage with a potentially vulnerable population of elderly people. To do this we needed to build a trusted relationship with those stakeholders through whom we wished to access the participant population, as well as the participants themselves, and also to address any trust issues around the technology we proposed to deliver.

**Trust issues in Participant Engagement.** Rigorous research requires participant engagement with the research process and in this instance recruitment and engagement posed a challenge. From a recruitment perspective trust issues were more complex because we did not have an existing relationship or direct access to a sample with the required characteristics, hence this gave rise to the necessity to leverage relationships with stakeholders who did. This placed an extra burden on the trust/risk relationship in two ways; stakeholders were being asked to trust both our technology and our ethical rigour in sharing their personal contacts whilst participants were being asked to trust the judgement of stakeholders in recommending referral and participation in the trial.

Without a direct trust relationship with those delivering the trial, participants were required to rely ‘second hand’ on their trusted stakeholder relationship and in turn this introduces a potential risk to disrupt or redefine the confidence they have in that relationship – a relationship risk that applies to both participants and stakeholders, albeit for different reasons.

Any asymmetry of relationships between individuals and institutions is also important in understanding the issues of risk and trust and this presents a further complication here between the parties concerned: participants (who are in receipt of services from stakeholders), stakeholder institutions (supplying services to potential participants) and those organising and running the trial (supplying a service to stakeholders’ participant referrals). Each party concerned is required to address and assess the level of trust required and risk involved but each will perceive both the risk and degree of trust differently. From a business perspective we could not measure, with any certainty, the impact these relationships may have had on perception of risk, trust, and willingness to participate or engage with the technology offered, as a result it was difficult to pre-empt, react to or manage these varied perceptions.

**Trust in Technology.** The unfamiliar nature of cutting edge technologies can be intimidating, particularly for a potentially non-technical, elderly population, but since we proposed to utilise the television as our medium of delivery, trust issues around technology were minimised because the television is a technology that has gained longstanding trust and acceptance in most homes, amongst most users. This was a challenge which we considered but believe we overcame because from the users’ perspective what we were offering was a different way of using that tried, tested and trusted technology, combined with an enhanced service proposition that aimed to improve and extend opportunities for communication with friends and family. This gave us confidence that any issues concerning the device and its usage were not due to trust (or lack of) in the technology itself.

### **4.3 Challenge 3 – Technical and Organisational Issues**

The delivery of service into participants’ homes depended on a co-ordination of tasks led by BT’s Research Project team, with Internet connections (where required) delivered by a 3<sup>rd</sup> party supplier, and a separate local delivery team installing the devices on participants’ TV sets. Co-ordination of the two parts of the delivery process was problematic because there was no direct link between the two – all interactions were mediated by the Research Project team. There was a dependency between Internet connections being delivered before the local delivery team could install devices. At the outset of the trial, we had agreement from these two teams that co-ordination of these parts of the delivery process would be seamless, although as we will discuss later, such attempts were thwarted by various different issues.

The trial service required a high speed Internet connection, with uplink speeds higher than standard ADSL. Despite investment in infrastructure in the region [8], high-speed connectivity was not ubiquitous and take-up was inconsistent within the participant



group for the trial. Some participants had pre-existing high-speed services so could go straight to the device-installation phase; others did not, either having no Internet connection at all, or using ADSL, which in addition to insufficient uplink speeds is prone to lower speeds in rural areas due to the distance from the exchange. Because of this, according to the trial terms and conditions, BT offered to provide high-speed Internet connections to participants who did not have them already. Although being an existing BT customer was a condition for trial referral, some non-BT customers were referred and in order for the team to arrange upgrades to participants' existing connections, we needed to ask for MAC addresses (a condition of the ISP industry at the time). This was a concept beyond the understanding of many participants, but only they, as the account holder, could obtain it from their ISP, adding further complications to the task of getting participants connected and placing an added level of responsibility upon them, which we had intended to avoid. Additionally, delivery of some of the fast Internet connections was delayed due to delivery timescales in the third party organisation, due in turn to challenges presented by the Cornish environment and delays from *their* supplier of infrastructure and engineering teams. Some of the fibre-to-the-premises connections - although offering the highest speed Internet connectivity and theoretically the best user experience when using the device - were the most problematic due to these issues.

These delays became compounded by issues with the local device installation team, who were managed by yet another stakeholder group. However problems encountered here, which could not be foreseen, were associated with organisational and resourcing problems rather than technical issues. The delivery of devices and their support was intended to be an "add-on" to existing services the organisation already offered. Installation engineers to install and support the trial service were agreed upon at an early stage, but in due course the teams involved shrank in size, with redundancy and sick leave affecting resourcing profiles, and our trial service deliveries were de-prioritised as a result. Engineers left, taking skills with them, and their replacements were not sufficiently skilled or available to complete the tasks. The knock-on effect was that participant deliveries were delayed, and ongoing support was not available, necessitating the research project manager to become involved directly in technical support issues. This was challenging due to his location being over 350 miles from the trial location but essential due to the level of technical support needed by participants. Whilst this was provided as an act of good will, the lack of ongoing local support resulted in a loss of momentum and interest amongst participants.

#### **4.4. Challenge 4 – Technology Engagement**

The final challenge presented itself during and after the trial. In our attempts to provide a trial technology to those who were socially isolated (to meet the original objective of the study) our referral partners suggested participants they knew whose relatives lived far way away, or who did not have a local social network. For some, this worked well, or rather it augmented existing relationships, for others, it did not help, as in the case of those who had relatives in the US or Australia where significant time differences meant the service was not useful, because when they were awake and ready to use the service, their relatives were asleep, or at work. Participants observed and

accepted that their younger relatives often have dependent children to attend to, were likely to be working full time and have busy social lives, and therefore it was hard to find a mutually convenient time to call. Although the intention was for this trial technology to enhance social interaction (as geographic barriers are eliminated by the technology), the complex context of people's lives meant that quite often, even the convenience of a Skype over TV service was not enough to increase interaction and as a result, some participants found this a barrier to use.

In addition, within this cohort, there was an observed deterioration of existing social networks, such that those who did not have many living relatives did not have anyone else they wanted to connect with and hence did not find a use for the technology – it seemed they needed a *pre-existing* social network for it to work beneficially. Additionally one participant mentioned that, as she is disabled, she had the device set up with her bedroom TV as she goes to bed early, but this too was a barrier as she was uncomfortable being able to be seen in bed by even her own relatives, inferring a concern this participant had regarding her privacy. Finally, usability issues such as the usage of the device's remote control (Fig.4), switching between input channels on the TV and intermittent technical problems presented barriers to use. Without local technical support, it was also challenging to make changes to installed devices, provide additional training or add new connections to participants' devices remotely, which had knock-on effects to the devices' usage, and therefore our ability to collect participants' experiences of the device's usage as initially planned.



Fig. 4

## 5 What did we learn?

Despite the challenges of the trial, a significant amount was learnt, some of which was unexpected, but all of which was valuable. Our attempt to prove that social isolation could be alleviated by Skype over TV could not be delivered by this trial alone, but our understanding of the barriers to use (as described above), and the requirement for local, accessible support delivered by trusted individuals and organisations is vital for the success of a service such as this. As a result, one of our main conclusions was that customers need a *service* more than just a *device*. And that service includes one that a customer can trust and that will be delivered responsibly and supported fully, with seamless single point-of-contact customer experience (regardless of the number of suppliers actually involved).

### **5.1 The importance of user engagement in service design**

A key lesson learnt is in the value of engaging with a population of potential real end users; as service developers and technologists we may believe that our product or service is new, exciting and innovative but we have to accept that this view may not be upheld by non-technical potential users who may tell us some uncomfortable truths. By listening to users' experience and understanding how engaging with a technology relates to their own desires and experience we can gain valuable insights that would not otherwise be accessible. In undertaking such an endeavour we are likely to encounter views that run counter to our own but it is not until we engage with consumers of that product or service that we can create the opportunity to understand why it might, for example, appear to be a technologically elegant solution from a developer's perspective but a clumsy one from a user's perspective. In a business context it is the opinion of the consumer that is most important and if we confine ourselves to a focus on technological solutions in isolation we may well end up 'fixing' the wrong things. This is particularly important in the public sector where funds are at stake that are needed to provide services that will ultimately be used by the people who are paying for them such as health care programmes [9].

Some might argue that the process of soliciting opinion from potential end users is not objective because they are not well-informed enough to judge the value of a product or service as mere 'members of the public.' Technologists and service designers are also members of the public of course and we would argue that there is value in the very process of uncovering knowledge gaps or misunderstanding because it allows us to address the 'right' aspects of a product or service to enable development and better understanding. As Bruni et al [10] (2008, p.16) describe, our potential end users may not be technological experts, but they are experts in 'lived experience.' In listening to and taking account of what participants tell us we can create the opportunity for the co-creation of trust to create better, appropriate and more user-centric products and services that have wider market appeal. If we design services around the end users and involve them and engage with them from the outset, trust and confidence are more likely to follow as a natural consequence and by listening to and responding to end users we can start to develop an empathy with the user perspective that addresses any issues that impact on trust, acceptability and take-up.

### **5.2 Understanding Technology Adoption**

Classic adoption theories such as Rogers' (1995) 'diffusion of innovations' [11] and the Davis' (1989) 'technology acceptance model' [12] both address the importance of social structures and personal beliefs in the acceptance of any new technology. In order to achieve public buy-in with technological developments, we need to understand the issues from a number of perspectives. Acceptance of, and trust in the technology to be

offered is of central importance to the adoption of new solutions, but trust of those people involved in the introduction and delivery of technology is also central and this relationship is often ignored or overlooked. Decisions regarding whether or not to engage are not necessarily based on technical novelty alone, but on the analysis of attendant risks and benefits. This risk-based approach repositions the question of trust and places it at the baseline of every discussion whilst simultaneously expanding its importance [9]. We need to consider these discussions in the light of this.

An additional learning point is that technology adoption may be enabled by re-focussing marketing efforts *away* from the target demographic. It can be a hard thing to admit that one needs help – that one is struggling to cope with living alone for example. Often this is instead recognised by other family members. Additional user research conducted by BT among a sample of adults with elderly relatives suggested the main instigator for adoption of these services may actually be *this population* and not their elderly relatives. Not only did they perceive value in being able to physically see their relatives using the technology, they could see the value of integrating such a service with other telecare or smart home services to remotely monitor their relatives in the case of falls etc. They are also likely to be willing to support their relatives in the setting up and maintenance of such a service, and deal with suppliers if things go wrong.

### **5.3 Understanding Issues of Trust**

In the course of working with multiple stakeholders supporting a vulnerable population we have learned that trusted relationships are a necessary and key component for success. Those relationships can be enhanced by explicit, clearly defined and appropriate benefits to all concerned and voluntary, mutually understood and agreed boundaries. When balanced with respect for the value of the opinions of end users we can increase opportunities for reciprocity in the consumer/developer relationship that can be translated into robust product and service offerings that can benefit consumers, business and wider society. We need to enter into these relationships with as much knowledge as possible about the potential impacts, particularly when dealing with a vulnerable population and this highlights the importance of the quality of trusted relationships between stakeholders and potential participants and between both stakeholders and participants and those delivering the trial.

These aspects of risk and trust are particularly apparent when comparing the challenges of recruitment and engagement for this trial with a previous trial led by a charity, with BT providing technical support, to a similar participant group. Participants were originally signed up to the trial by a community GP, and thereafter engagement was managed by a charity, of which one individual grew relationships and trust with participants and was a single point of contact for them throughout the trial period. The success of this recruitment strategy was in contrast to that experienced on this trial, inferring that existing levels of trust between the GP and charity representative were more fully formed than those encountered on our trial. To summarise, it is clear therefore that success of technology introduction needs to consider and build these important trust relationships, potentially over a longer period than we had initially assumed.

## 6 Conclusions

In having completed the trial, we are now able to summarise the findings and translate them into new service ideas to the business and stakeholders. Our findings go beyond the user experience aspects we originally envisaged – our learnings apply to the entire service launch, delivery and support aspects, so were greater than we first envisaged. For us this was an unexpected but worthy result.

As of 2016, the participants of our trial probably represent the last generation willing to use a single-function service like this however, so in the future this service may be embedded within a wider suite of inclusive and smart home products, delivered responsibly and supported through established networks of family members, social services and/or the NHS, to meet changing needs.

Additionally, there are customers with different needs who may benefit from simple video communication services – the autistic population, for example, may find interaction easier when mediated via a screen. Wider understanding of their needs would be required in developing these communications services.

The challenge is now to develop products and services which meet evolving consumer, stakeholder and supplier needs. We hope our trial learning enables our organisation – and others – to design new products effectively with these considerations in mind.

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## 7 References

1. Maguire, C., McNally, S.: Remembering the Post Office's Role in Creating the First NHS Hearing Aid. <http://www.btplc.com/Innovation/Innovationnews/RememberingthePostOffices/index.htm> (2015)
2. BT Health Case Study in Report, BBC Look North: <https://www.youtube.com/watch?v=TNu7jzizj90M> (2015)
3. <http://www.btplc.com/Betterfuture/>
4. Age UK: Over a Million Older People in the UK Regularly Feel Lonely. <http://www.ageuk.org.uk/latest-news/archive/over-1-million-older-people-in-uk-feel-lonely/> (2014)
5. UK Parliament Research: Political challenges relating to an aging population: Key issues for the 2015 Parliament. <http://www.parliament.uk/business/publications/research/key-issues-parliament-2015/social-change/aging-population/> (2015)

6. Cracknell, R.: Key Issues for the New Parliament 2010: The Ageing Population. House of Commons Library Research, London. [http://www.parliament.uk/documents/commons/lib/research/key\\_issues/Key-Issues-The-ageing-population2007.pdf](http://www.parliament.uk/documents/commons/lib/research/key_issues/Key-Issues-The-ageing-population2007.pdf) (2007)
7. Policy and Intelligence Team, Cornwall Council: <http://www.cornwall.gov.uk/council-and-democracy/data-and-research/data-by-topic/population/> (2016)
8. Superfast Cornwall: Superfast Cornwall 2011-2015 EU Programme: <http://www.superfastcornwall.org/programme> (2015)
9. Lacohee, H., Cofta, P., Phippen, A., Furnell, S.: Understanding Public Perceptions: Trust and Engagement in ICT-Mediated Services. International Engineering Consortium. pp 224-248. Professional Education International Inc. Chicago, USA. (2008)
10. Bruni, R. A., Laupacis, A. Martin, D.K.: Public Engagement in Setting Priorities in Health Care, Canadian Medical Association Journal, 179, 15-18. (2008)
11. Rogers, E. M.: Diffusion of Innovations: Fifth Edition. Chapter 1 p12. Free Press, New York (2003)
12. Davis, F.D.: Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly. Vol. 13, No. 3, 319-399 (2004)