



'Fast Forward': Accelerating Innovation in Health and Wellbeing

Gemma TEAL* and Tara FRENCH

Institute of Design Innovation, The Glasgow School of Art

Innovation within the UK National Health Service has the potential to improve and extend millions of lives, drive quality and productivity and support the UK economy. However, the pace and scale of systematic adoption and diffusion remains a challenge, and healthcare research infrastructure is designed to manage the risks associated with clinical trials rather than research leading to digital and service innovation.

Design approaches to innovation in health and wellbeing offer an opportunity to accelerate innovation, embrace interdisciplinarity and embed users in development. In particular, participatory design advocates involving users in the design process to achieve enhanced results in terms of efficiency and usability.

The paper will discuss the challenges of applying novel creative approaches to accelerate participative innovation in health and wellbeing, and offer some strategies for designers and design researchers who are working in this context. Conclusions are drawn about the need to understand how to better link upstream design research to implementation in order to further accelerate the rate at which transformative technology is embedded in health and care practice.

Keywords: Healthcare; service design; participatory design

Introduction

The aging demographic and increase in long term chronic conditions are among the greatest challenges currently facing public health services. In an attempt to overcome these challenges, governments are investing heavily in innovation and technology to consider alternative strategies for healthcare delivery to cope with increasing demand (Scottish Government, 2011).

Innovation within the UK National Health Service (NHS) has the potential to improve and extend millions of lives, drive quality and productivity and support the UK economy (Gerry & Wyatt, 2011). However, the pace and scale of systematic adoption and diffusion remains a challenge (ibid).

Traditionally the scope of research on health and healthcare services encompasses 'descriptive investigations of the experience of illness and people's perceptions of health and ill health to evaluations of health services in relation to their appropriateness, effectiveness and costs' (Bowling, 2002, p. 6). Lohr and Steinwachs (2002, p. 16) define the field of health services research as:

...the multidisciplinary field of scientific investigation that studies how social factors, financing systems, organizational structures and processes, health technologies, and personal behaviors affect access to health care, the quality and cost of health care, and ultimately our health and well-being.

Typically health services research is led by social science disciplines using qualitative methods that seek to understand phenomena within their context, uncover links among concepts and behaviors, and generate and refine theory (Bradley, Curry & Devers, 2007). Health services research often involves mixed methods, integrating qualitative and quantitative methods in social contexts to enhance understanding of social processes (Bowling, 2002). This type of research relies on a close working relationship with health professionals to ensure interventions are appropriate and to develop clinical outcome measures (ibid).

While this research can identify the determinants of health inequalities and develop recommendations for *improving* health services, these approaches offer limited scope for *innovation* in response to the challenges facing our public health services. In addition, many research studies fail to translate piloted interventions into meaningful patient care outcomes (Damschroder, Aron, Keith, Kirsh, Alexander & Lowery, 2009).

Within the broader field of medical research, the dominant biomedical model is being challenged for failing to take into account the psychological and social dimensions of health, and there is now a shift to a more patient-centric model to engage people fully in the management of their health and lifestyle choices (McHattie, Cumming & French, 2014). Related to this is a shift from evidence based medicine (EBM), which is disease oriented and professional-centered (Sweeney, MacAuley & Pereira Gray, 1998), to a patient-centered medicine which gives greater consideration to the role of the patient as the expert in their condition (Mezzich, Snaedal, van Weel & Heath, 2010). The patient's perspective is becoming increasingly important given that the logistics of care are non-linear and unpredictable due to the complexity of human agency and the variety of influences, social and cultural factors which impact upon a patient living with an illness (Greenhalgh, 2012). As such, the 'gold standard' Randomised Controlled Trial (RCT) is facing criticism of its appropriateness and external validity, and there is now a greater recognition of the value of mixed method approaches in the evaluation of healthcare delivery (Creswell, Klassen, Plano Clark & Smith, 2011).

Innovation within the health and care context, particularly in relation to technological innovations, requires a paradigm shift that embraces interdisciplinarity, complexity and collaboration with the wider network of end users and their caregivers (Greenhalgh et al., 2016). Health and care services face the competing challenges of standardizing services to remove variation and increase throughput, whilst attempting to deliver person-centered care to the individual. The UK National Health Service (NHS) is a complex adaptive system (Rouse, 2008), which can be understood and, as a result, improved only by using a participative and integrated approach.

Participatory approaches to healthcare innovation

Participatory design advocates involving users in the design process both to enhance efficiency and usability, and also to empower participants, fulfilling their democratic right to shape the products and services that affect them (Bowen, 2010). This approach originally stemmed from the Scandinavian workplace democracy movement (Muller, 2003), and has been most frequently concerned with the design of computer systems (Bowen 2010). Increasingly participatory design approaches are being applied to achieve democratic innovation in public services (Björgevinnsson, Ehn & Hillgren, 2010). Government and policy makers are continuing to emphasize

and invest in approaches to involve the public in decision-making, leading to increased participation in the development of innovation for the health and social care sector (Scottish Government, 2009). The lived experience of patients is becoming increasingly valued in terms of sharing experiences with others (e.g. healthtalk.org) and complements the expertise of healthcare professionals (Entwistle, Renfrew, Yearley, Forrester & Lamont, 1998).

Where traditional health research recruits participants as subjects on which to study or experiment on, with the aim of answering a research question, participatory design research changes the relationship between the researcher and participant, experimenting *with* not *on*, and valuing participants' creativity and lived experience as assets for innovation. Collaboration with clinicians, academics and businesses who have expertise and networks is crucial to ensure that results become embedded beyond the design and development process.

Design as the Integrative Discipline

There is a growing recognition of the role of design in shaping future products, systems and services in the health and social care context. For example, the NHS has employed the use of design thinking within health improvement and an increased adoption of approaches such as user-centered health design and evidence based co-design (c.f. Bowen, McSeveny, Lockley, Wolstenholme, Cobb & Dearden, 2013; Robert, Cornwell, Locock, Purushotham, Sturmeay & Gager, 2015). The development of toolkits and the availability of online service design tools have made design processes more accessible to those who are not formally trained designers (Bevan, Robert, Bate, Maher & Wells, 2007). However, this has led to criticism of devaluing the role of designers within the process. In addition, while toolkits may support healthcare staff to involve patients in ongoing service improvement, it is questionable whether these processes lead to real innovation.

Design researchers are increasingly partnering within other disciplines to collaborate on research that aims to understand problems and identify potential solutions in health and wellbeing contexts (Macdonald et al., 2012) by sequentially integrating design work packages within a program of traditional qualitative and quantitative research methods. Designers respond to the findings of other disciplines and work with end users to propose tangible solutions to the problems identified.

This paper will introduce a participatory *design-led* approach for accelerating innovation in healthcare allowing rich collaboration with end users, health professionals, academics from other disciplines and businesses. This moves beyond designers working to translate the findings of social science research, to participatory design-led enquiry and collaborative innovation. Experience Labs provide safe spaces for participatory innovation, which aim to gather insight, enable creativity and collaboratively explore and develop ideas from early concepts through to functional prototypes.

The paper will discuss the challenges of applying these novel approaches within a traditional research infrastructure designed for clinical trials, and a policy environment that is driven by quantitative evidence and efficiency savings. The purpose of this paper is to offer some practical strategies for designers and design researchers who are working in this space.

Experience Labs to accelerate innovation

Experience Labs foreground design methods, and simultaneously explore challenges whilst developing ideas for new products or services, leveraging the contextual understanding, lived experience and creativity of participants. Participatory design approaches are used to involve end users (e.g. people who use services, health and care professionals) as the experts whose experiences are used to inspire and shape innovation. The Labs offer new possibilities for innovation and help to shift the focus towards long-term impact and sustainability, by empowering those who participate to become active agents in their own care. Experience Labs operate at the early stages of the design process to ensure that needs are fully understood and concepts are generated in response to practical user and system requirements.

Experience Labs are a design-led integrative practice, bringing together a mix of design disciplines, along with expertise from other disciplines such as the social sciences, health and information technology. Experience Labs are led and developed by the Institute of Design Innovation at the Glasgow School of Art (GSA), forming a core aspect of the Digital Health and Care Institute (DHI), an Innovation Centre tasked with transforming health and social care delivery in Scotland.

Experience Labs aim to replicate real life practice in real or realistic environments where rapid cycles of experience can trial ideas and allow

collaborators to engage in activities with experts in design innovation. Realistic physical environments may be temporarily created to allow users to safely experiment with and trial new ideas, overcoming the challenges of conducting research in risk averse health and care settings, and allowing participants to step outside their current environment. The Lab approach provides an opportunity to trial new health and social care models quickly and without high set-up costs (French, Blom & Raman, 2016). The process also significantly cuts the required development time for new technology. This reduces barriers to innovation, decreases risk and quickly provides evidence for health services to continue to invest time and resource in development and implementation.

The use of prototyping to realize ideas enables progression through: physical making; a safe space for failure leading to faster learning; and encouragement and permission to explore new behaviors (Coughlan, Suri & Canales, 2007). Making can begin with paper prototyping and gradually lead to experimentation with functional prototypes. This involves an iterative process of several cycles where ideas are trialled, adapted and refined (Swann, 2002). In this way, the term laboratory does not reflect the traditional use of the term in relation to science. Instead, the experimental nature of the Experience Lab relates to this exploration of new ideas and prototypes to understand the issues and validate potential solutions. This non-linear approach to innovation (Bessant & Rush, 1995) offers an opportunity to shorten the innovation cycle, using rapid iteration and testing to understand the needs and user requirements. By enabling participants to meaningfully consider future experiences we can move beyond simply attempting to improve the status quo.

Experience Labs are an emergent process similar to Participatory Action Research (Reason & Bradbury, 2013). The Lab changes and develops as those engaged deepen their understanding of needs. The Labs provide the opportunity for new communicative spaces and experiential learning (ibid). Activities in the Lab aim to open up the design process to encourage creativity, allow users to experience new services and digital technologies and gather deep insights on their experience, behaviors and attitudes (French, Teal & Raman 2016). Activities are crafted to move participants through a series of designed *spaces* and provide them with the experience, skills and language to critically reflect and evaluate new ideas.

Examples of Experience Lab projects are presented to illustrate the approach, the range and scope of innovation, and the timescales involved. The selected examples show the range of potential partners for Lab

projects: academic, business and civic collaborators from the health and social care sector. Project descriptions aim to briefly describe the context, methods and results, and highlight how this approach accelerated innovation.

Experience Lab Example 1: Skin self-examination following treatment for Melanoma

Context

Following successful treatment for skin melanoma, patients attend regular follow-up skin examinations due to the high risk of reoccurrence (19% of patients with stage I melanoma in a Scottish Study). For patients in remote and rural locations, follow-up care may involve long-distance travel, and in most cases melanoma reoccurrences are detected by patients themselves in the intervals between scheduled appointments. Research partners at the University of Aberdeen proposed a new service intervention to support skin self-examination and remote follow-up care. The Experience Lab aimed to validate, make and test a prototype of the new service with potential end users and health professionals.

Method

Designers from the Experience Lab team translated the proposed service into a service blueprint, and built an experience prototype of the intervention to be tested during the Lab. Volunteer patient participants were recruited through the volunteer coordinator of an NHS patient panel. Healthcare professionals were recruited through the network of the project partner. The prototype included all stages of the intervention: a simple digital prototype app, telephone, SMS and video conferencing protocols. Temporary home and clinic environments were created to test the prototype in realistic settings.

Five volunteer participants separately enacted a scenario where they had received an SMS asking them to undertake a skin examination and had discovered a new mole. The participant experienced each stage of the prototype service, with the health professionals enacting the service they would deliver as part of the intervention (Nurse Specialist and GP). The activities were filmed for live observation by members of the research team and partners. The day concluded with two focus groups, the first including

the patient participants, the second involving healthcare staff and members of the wider research team.

Data was collected in the form of field notes made by design researchers during observations and focus group sessions. Sketches were used to annotate field notes, detailing interactions with prototypes, and were also used to record design ideas in response to issues as they arose. Field notes were verified through review of video footage recorded during the Lab.

Results

The Experience Lab validated the new service intervention, and highlighted key user requirements and design improvements for the prototype service. These informed the next stage of design and development, which was led by software engineers at the partner institution. The Experience Lab was completed in one day and the overall project duration (including preparation and analysis) was completed in approximately three months. Following completion, the partner built the intervention and successfully piloted the technology (Murchie, Allan, Brant, Dennis, Hall, Masthoff & Johnson, 2015).

How did we accelerate innovation?

The Experience Lab team turned a written outline of a new service intervention into a service prototype with sufficient resolution to be tested and evaluated by potential users. This significantly reduced the development cycle for the partner and highlighted unanticipated requirements and potential problems for consideration. The outputs of traditional research that informed the project were translated into a tangible and experiential format for early feedback at the Lab. The methods and activities used through the Lab approach were able to communicate a complex service intervention to gain critical feedback from participants. The approach was fail fast through the opportunity for experiential learning, quickly adapting and refining the idea to overcome any issues without the associated investment of time, resource and high-set up cost associated with traditional approaches.

Experience Lab Example 2: Notification system for independent living

Context

The Notification System Experience Lab project aimed to explore a new concept for assisted living to support and empower older adults to live independently at home for longer, thereby relieving pressure on public services. The project was proposed by an SME and in order to protect the commercial interests of the project partner we will not detail the concept, but will share the methods and the high level insights uncovered.

Method

A series of Experience Labs were designed to explore the potential of the proposed system and user-test the initial hypotheses behind the concept by developing and validating a refined solution with users (French & Teal, 2015a). The first Lab allowed researchers to gain a contextual understanding by visiting end users in their own living environments to conduct experience interviews and receive guided tours of the participants' homes. The second Lab involved a field trip to a department store where participants were given a personalized guided shopping experience designed and led by the Lab team, which included product demonstration and testing. This setting provided access to home and technology departments and a mix of brands, in a retail environment. Participants were invited to share their experiences and insights from the day and also asked to prioritize scenarios (which were informed by Lab one) where they felt the proposed system would be beneficial.

The project culminated in a final Experience Lab that aimed to test the concept for the proposed system. Prior to the final Lab, the Lab team collaborated with the project partner to design a prototype and scenarios to be tested. A non-functioning prototype was built and operated by a member of the team to give participants the impression that the system was fully functional. This enabled testing and gained feedback on the concept in a realistic environment (mock home setting) without the time and cost required to build a working system.

The Lab involved experience testing of the prototype through role-play scenarios providing the opportunity to observe participants' actions and reactions to the prototype. The Lab concluded with a focus group, where participants discussed their impressions of the system.

Data was collected in the form of field notes, audio recordings that were transcribed and video footage of the role play. The data were analyzed using the technique of thematic analysis (Braun & Clarke, 2006), which was conducted by two design researchers who verified emerging and recurring themes.

Ethical approval for this project was obtained from GSA internal ethics committee. Recruitment was undertaken using existing networks and organizations, and an advertisement in a local newspaper.

Results

The proposed concept received positive feedback from participants and key insights were gained on functionality, usage, set up and price. Participants highlighted the importance of personalizing the system to each user, the level of support they require and their home. The findings revealed that participants were already adapting to personal challenges and making everyday life easier using both low and hi-tech solutions. In addition, ageing and anticipating additional support suggested that the system could be progressive and grow with the needs of the user, potentially leading to a younger target market.



Figure 1 Role-play using 'wizard of oz' prototype recorded using specialist camera equipment, (image: Sanne Ree Barthels, 2014).

How did we accelerate innovation?

The project provides an example of extreme collaboration between academics, business and end-users, to design a sustainable assisted living concept over a 3-month period. Through a rapid cycle of insight generation and prototyping, the Lab team was able to accelerate the development of a system that could offer a person-centered alternative to traditional health

and care services. Through undertaking the role-play, participants were able to experience and envision how the concept would be implemented within the home environment whilst also allowing the researchers to observe the reactions of participants to gain rapid feedback. The experience prototype enabled participants to embody the experience, and insights were gathered from both their observed instinctive reactions to the system and their personal reflections during the final focus group discussion. The researchers were able to distil key user requirements through this method, gained in one day.

Experience Lab Example 3: Ambulance Directory App

Context

One of the aims of the Scottish Ambulance Service (SAS), together with its partners, is to enable the delivery of care at home or in a homely setting, where safe and appropriate, through the development of appropriate protocols and pathways (Scottish Ambulance Service, 2014). The Directory App Experience Lab aimed to explore and develop a basic prototype of a directory of services to support ambulance clinicians to consider alternatives to Accident and Emergency, where safe and appropriate, and support initial small scale testing (French & Teal, 2015b).

Method

The Experience Lab was conducted over two days to generate requirements and co-design the ideal Directory App with ambulance clinicians. This involved investigating the current and likely future information needs of ambulance clinicians. It also explored ideas for use and functionality, and any resulting changes in behavior, working practice and outcomes. Prior to the Experience Lab, the two lead researchers separately spent a day shadowing ambulance clinicians, one focusing on a rural environment, the other on an urban environment, to gain contextual understanding.

The Lab design involved a mapping session, to create a physical map of services that were currently available to ambulance clinicians within their region, and to identify any ideas for future services that would be beneficial. Participants then took part in a role-play activity based on a patient scenario where having instant access to service related information via an app would have helped them deliver more effective and safe patient care. The

scenarios were provided by participants prior to the Lab to ensure that role-play activities were as realistic as possible, and were transformed into visual illustrations. Participants were briefed on each scenario and two scenarios, diabetes and falls, were selected by participants to role-play. The role-play involved enacting the scenario using normal working practice; paper prototyping a Directory App that would assist during the scenario with a designer who sketched the screens described by participants and inserted them into a plastic frame mock touchscreen tablet; a final role-play of the scenario using the paper prototype Directory App to understand how it would assist participants.

On day two, participants tested two existing Directory Applications, critiquing the content and user interface, and comparing these with the ideal directory they had created the previous day. Following this, participants considered what information the ideal Directory App should provide, and where information could be sourced.

The Lab culminated in participants then splitting into two groups to design prototypes of their ideal Directory App. Screens were designed on paper, and functional prototypes were created using a software application. This application enabled photographs of the screens to be uploaded with any buttons made functional by hyperlinking them to the appropriate screen, giving the user a realistic experience. The two ideal Directory Apps were then tested through role-play and the day concluded with a focus group discussion of the prototype ideal Directory Apps and Lab experience.

Data was collected in the form of field notes documenting the discussion and design decisions, alongside video footage of the role play. The field notes supported analysis of the four prototype apps by providing rationale for the designs. These were reviewed to identify key functional, navigational and content requirements, and also provided contexts of use and impact on working practices (see French & Teal, 2015b).

Ethical approval for this project was obtained from GSA internal ethics committee. Our project partners undertook recruitment: participants were released from normal duties in order to attend the Lab during work time.



Figure 2 Role-play activities using a paper prototype in a plastic frame, (image: Louise Mather, 2014).

Results

The rapid cycles of insight generation and prototyping led to the rapid co-design and testing of two ideal Directory Apps. The findings of the Lab identified key challenges, design implications and user requirements for the development of the Directory App, which were made tangible through the creation of functional prototypes.

How did we accelerate innovation?

The project provides an example of accelerated innovation for the development of a digital application, which can support ambulance clinicians in the field to find appropriate alternative pathways for patients. The Experience Lab resulted in two co-designed, functioning prototypes with accompanying video explanation by ambulance clinicians, achieved in two days of intensive activity. This accelerated innovation was made possible through the contextual preparation conducted prior to the Lab, which enabled the researchers to understand the working environment in order to: design Lab activities, use the experience to better understand the challenges being described and make more practical suggestions to overcome them, and finally gain an awareness of cultural and organizational challenges which are often unsaid.

The collaboration between the Lab team, ambulance clinicians and Human Computer Interaction academic brought together the relevant expertise required to rapidly co-design an application which was user-driven and would meet the needs in the field of application.

The methods, activities and tools designed for the Lab allowed participants to quickly share challenges, opportunities and experiences. The sketching and role-play in particular made ideas tangible for participants and allowed them to experience how the application could support them in their working practice. The iterative nature of the Lab also meant that participants could make changes and suggestions live and through presentation of the app to others in the Lab they were able to receive immediate feedback.

The Lab team was able to observe participants using the sketched prototype app on day one and were then able to bring this awareness to the design activity on day two to make more relevant suggestions. Observation of the final prototypes and explanation by participants of how they would use the application helped to distil key insights and requirements for future development.

The project duration was approximately three months, including shadowing, preparation and analysis. Internal ethical approval of the project also aided the acceleration of the project.

Challenges of accelerated innovation in health and wellbeing

Developing relationships with partners and managing expectations

Accelerating innovation projects relies on effective working relationships with project partners. Project ideas are selected through a funding call, and applicants pitch their ideas to be tested and developed in Experience Labs. Managing intellectual property can be challenging in this context, as partners need to relinquish the lead role to the Experience Lab team, and to end user participants as the 'experts'. By relinquishing their ideas to the Experience Lab team and to the views and ideas of Lab participants, partners need to be willing to accept that their original idea may be changed beyond recognition, in pursuit of a practical, desirable and user driven solution to the original need they aimed to solve. Collaboration agreements are used to ensure partners retain foreground Intellectual Property (IP) and any IP

generated during the Experience Labs is jointly owned, and to detail how Experience Lab research will be published whilst protecting confidentiality and commercial interests.

Our approach is likely to be unfamiliar, and partners and participants may be new to research generally if coming from a health practice or industry background. Significant effort from the research team is invested in understanding the proposed idea: including undertaking literature review where appropriate and horizon scanning of related innovations, developing research questions and communicating the proposed Experience Lab activity with clear rationale, aims and outputs. Where appropriate, partners are involved in shaping plans, agreeing how they will contribute their resources and attend Labs as observers. Outputs and documentary videos from previous Experience Labs may be used to communicate our methods to manage expectations of what a Lab might involve. Despite these preparations, we often find there is nothing as good as experiencing a Lab to understand the power of accelerating innovation through design-led activities with end users. At the end of a project, partners frequently describe their early decision to 'suspend disbelief' and engage, expressing surprise at the quality of the insight, and the fast pace of development through the Experience Lab process, *'I just did 6 months research in one day!'* (project partner, Experience Lab Example 1). This is also evidenced by the return rate of previous partners who subsequently reapply to develop new project ideas.

Developing strong collaborative relationships with partners is vital to ensure the insights and ideas gathered through the Experience Lab process are appreciated and taken forward. Findings are delivered to partners as a report with prototypes and supporting evidence. Involving partners throughout the Lab process creates energy and commitment for continued development, financing, commercialization and embedding the innovation in practice when the project is handed back to the partners.

Ethical Considerations

Research ethics is a core part of any research project and ethics committees are in place to ensure the safety and wellbeing of participants, as well as to advise and support researchers in the ethical considerations of their study.

The examples included in this paper were granted ethical approval by GSA internal institutional ethics committee, however there are a number of

projects within the Experience Lab project portfolio that have required approval from NHS Ethics Committees and NHS Research and Development regional boards, governed by the Health Research Authority. These projects may require input from people living with long term conditions who have experience of using NHS services, involve NHS staff, or address sensitive topics such as breastfeeding. Applying for external ethical review (as opposed to institutional ethics) has a significant impact on the time taken to plan, adapt the study protocol to satisfy the requirements of ethical review and receive all the necessary opinions and permissions to commence the research. Although the NHS proportionate review states a turnaround time of 14 days for a provisional opinion to be returned following receipt of a valid application (NHS, 2015), favorable opinion required to commence the work is dependent upon clarifying the concerns of the committee and making any changes for further review, which can be a lengthy process. As Experience Lab methods are significantly different to traditional research, we frequently find that committees are unfamiliar with qualitative design-led approaches and this leads to many detailed clarifications before they feel qualified to assess the risk of our planned activities. NHS ethics applications are lengthy and designed for the intricacies of clinical trials that pose a high risk to participants. The methodological benchmarks forming the basis of assessments are also not aligned with qualitative studies and projects investigating complex issues in society (Stevenson et al., 2015). Design-led approaches to innovation and research in healthcare are, in general, not invasive or arduous and pose very low risk to the participants and research team.

In addition, Experience Lab projects are emergent, with each Experience Lab in a series informing the design of the subsequent Lab. NHS ethics committees require substantial amendments to be submitted for further review, and all research materials are required to be reviewed by the ethics committee. This process poses significant challenge to accelerating innovation, as design researchers require flexibility to be able to adapt materials and activities as more is known about the participants and the topics under study.

As our team becomes more experienced in completing ethics applications we aim to become clearer at explaining our methods and approaches to reduce the level of clarification required. However, in practice, each Experience Lab is bespoke to the project and context, therefore the methods we are describing are different for each application. In addition, our ethics applications may be reviewed by any one of more

than eighty different committees across the UK. This can negatively impact our experiential learning, and reduce the likelihood of building familiarity with our approach amongst reviewers.

In order to improve our understanding of the complexities of NHS ethics processes, and attempt to shorten timescales, we have undertaken training and internal Experience Lab research to improve our understanding of NHS ethics processes. We have consulted with specialists in the ethics of health research, and refined how we frame our research to reflect the low risk nature of our methods. It has been beneficial to seek learning from the strategies of other participative research projects, such as establishing ethical frameworks for projects involving multiple different collaborators and contexts (Pahl, n.d.). We would recommend that other design researchers working in this field do not underestimate the impact of achieving ethical approvals on the timescales of their projects, and include funding for specialist advisors within their research proposals. Despite the challenge posed for accelerated innovation in health, the research team has found ethical review to be beneficial to the quality, planning, conduct and communication of our work.

Recruitment of participants

A key challenge for the Experience Lab team is in recruiting volunteers to participate in our research. The success of our Experience Labs is highly reliant on participation from the right mix of people to creatively contribute their individual experience and ideas. While the numbers of people we are seeking to recruit may be relatively low due to the qualitative nature of our research, for some Experience Lab projects we are seeking participants with highly specific characteristics in rural areas, posing a significant challenge.

A wide variety of approaches to recruitment have been employed as demonstrated in our three examples, including advertising in local press, recruiting through researcher and partner networks, word of mouth and more recently through pop-up stands in busy local shopping centers (Teal & French, 2016). All these activities take time to design and action, impacting on project timescales. In addition, we must provide sufficient notice to ensure participants are available and can arrange time off work or caring duties to attend. Depending on the participant characteristics we are seeking, we may need to schedule Experience Labs over evenings and weekends when participants are more likely to be available.

A successful strategy for recruiting participants has leveraged design skills in rethinking the aesthetics of recruitment materials, attracting attention by distinguishing them from the standard format used by traditional research studies (ibid). Due to the nature of some Experience Labs it has been possible to delegate recruitment to the project partners, relying on their expertise, networks and resources. Researchers from the Experience Lab team often visit community groups and speak at public engagement events, in order to raise awareness of the general opportunities to participate in our research or to promote a specific project. As the number of completed Experience Lab projects increases, we have a growing number of previous participants who are keen to be contacted for future opportunities to engage in relevant research.

Facilitating collaboration and managing power relationships

A key principle of Experience Labs is that participants are experts with equal status and ability to contribute valuable insights and ideas. Researchers design safe spaces for collaboration, carefully considering power relationships and using facilitation skills to achieve a relaxed, collegiate and empowering atmosphere. Researchers also need to consider whether project partners can attend Experience Labs, and whether their role should be as active participant or observer, to ensure participants feel uninhibited in criticizing a potential idea.

This can be a challenge when designing Experience Labs for participants from organizations with hierarchical structures, or existing networks where participants may know each other. In order to overcome this, researchers may undertake contextual research within an organization (as described in Experience Lab Example 3) in order to understand any cultural issues that could impact on collaborative spaces for innovation. Where we feel it would not be desirable to enable equal collaboration amongst participants, we hold multiple Experience Labs or preparatory Labs to prime participants to this way of working.

Rigor

To ensure rigor within our research, the Experience Lab approach employs a range of design research methodologies to gain a rich understanding of experience. The research design of each Lab carefully considers the research question and context to identify the most appropriate methods and modes of analysis. The design also considers the prospective participants who will be invited to take part in the Labs in order

to gain a variety of perspectives. Validity and reliability is ensured through triangulation, reflexivity, and through detailed recordings of the Lab (audio, visual and field notes) with analysis and interpretation conducted and verified by the team. This includes the analysis of artefacts produced during the Labs, which embody the learning and collaborative design decisions (French, Teal & Raman, 2016).

Communicating the rigor of such an approach within the healthcare environment can be challenging when using methodologies that produce qualitative data, given the dominance of the Random Control Trial (RCT) and positivist paradigms requiring scientific evidence to support or refute a hypothesis (Greenhalgh, et al., 2016). In addition, RCT is often not appropriate for innovations in the social realm for ethical and logistical reasons (Shiell-Davis, 2015).

In order to scale, innovations should be supported by evidence relating to the 'real-world' demonstrating evidence of benefit to users (ibid). In addition, innovations that meet identified needs of service users, communities, or populations are most commonly scaled up (ibid). By involving real end users (e.g. frontline healthcare professionals, people who use the relevant health services) and trialling innovations in real or realistic settings, Experience Labs can quickly enable understanding of potential and perceived benefits from end users, and verify whether innovations meet an identified need. By designing and prototyping with end users, we can ensure innovations are practical and desirable, enabling end users to critically reflect on an experience. In addition, researchers can observe users interacting with prototypes of new technologies to see the potential benefits and impact on current practice.

In the context of embedding and scaling innovation, it is argued that 'good enough' evidence is sufficient rather than investing in numerous pilots to pursue 'perfect data' (Parker & Leadbeater, 2013). While it is not asserted that Experience Labs provide 'good enough' data to support full scale implementation for all types and scales of intervention, the process may increase the likelihood of investment of time and resource in further developing innovations that are likely to be successful in meeting a real need and providing desired benefits for individuals and health services.

Embedding

At the end of an Experience Lab project, partners are supported by the DHI to apply for further support to progress their innovation through

detailed design, development and commercialization. Depending on the nature of the innovation, substantial investment and development may be required in order to bring a product or service to market, or embed within the NHS. While many Experience Lab innovations present significant potential for impact in terms of positive outcomes for individuals and health services, further research is required to evaluate the impact of the Experience Lab process and findings on the success of their subsequent implementation. This presents a challenge for the Experience Lab team to communicate the value of design in terms of health outcomes or cost savings for the NHS in the short term. However the portfolio of Lab projects and partner organizations offers a wide variety of case studies to support this evaluation activity in the longer term.

In the meantime, by working with our project partners to gather insight about their experiences of working with the Lab team and the impact on the quality and speed of innovation in comparison to traditional approaches, we hope to understand and improve the model. Further research will also seek to define the potential unintended positive consequences for participants of Experience Lab projects and understand any increasing capacity for innovation.

Conclusions

Design offers specialist expertise and methods that are suited to accelerated research and innovation in healthcare. The Experience Lab approach and the examples of projects provided in this paper illustrate the way in which this approach can accelerate innovation through extreme collaboration with end users, rapid cycles of experience and iteration, and design-led translation of findings to guide commercialization and implementation.

The challenges discussed highlight the need to develop an appropriate ethical approval process to reflect the emergent nature of design-led research and the need to maintain creative freedom within the design process. Strategies are proposed for managing accelerated participatory design research in health, in terms of designing appropriate ethical frameworks and recruitment strategies, empowering equal participation, evidencing and evaluating the value of design, and managing complex collaborations.

Further research is needed to track completed Experience Lab projects with the aim of understanding and evidencing the longer term impact of

accelerated innovation on the projects, partners, participants, and health outcomes. Research is also needed to understand how best to communicate and evidence Experience Lab findings to support commercialization, securing further investment and embedding innovation in healthcare practice. In addition, there is a need to better understand how our activities can integrate with implementation in order to further accelerate the rate within which transformative technology is embedded in health and care practice.

While this paper has focused specifically on health related innovation, it is suggested that this learning can be related more broadly to accelerating innovation within other contexts, and discussion is invited around appropriate contexts and networks for testing this approach. We also invite discussion around the potential for these approaches to be adapted and applied within organizations, and how design practitioners might adapt this practice for use in commercial and social innovation.

Acknowledgements: *We would like to thank our colleagues, project partners and participants who have been involved in Experience Lab projects. The Experience Labs are funded by the Scottish Funding Council, in partnership with Scottish Enterprise and Highlands and Islands Enterprise.*

References

- Bessant, J., & Rush, H. (1995). Building bridges for innovation: the role of consultants in technology transfer. *Research policy*, 24(1), 97-114.
- Bevan, H., Robert, G., Bate, P., Maher, L., & Wells, J. (2007). Using a Design Approach to Assist Large-Scale Organizational Change "10 High Impact Changes" to Improve the National Health Service in England. *The Journal of Applied Behavioral Science*, 43(1), 135-152.
- Bowen, S. (2010, April). Critical theory and participatory design. In *Proceedings of CHI*.
- Bowen, S., McSeveny, K., Lockley, E., Wolstenholme, D., Cobb, M., & Dearden, A. (2013). How was it for you? Experiences of participatory design in the UK health service. *CoDesign*, 9(4), 230-246.
- Bowling, A. (2002). *Research methods in health: investigating health and health services*. (2nd ed.). Open University Press.

- Bradley, E. H., Curry, L. A., & Devers, K. J. (2007). Qualitative data analysis for health services research: developing taxonomy, themes, and theory. *Health services research, 42*(4), 1758-1772.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology, 3*(2), 77-101.
- Coughlan, P., Suri, J. F., & Canales, K. (2007). Prototypes as (Design) Tools for Behavioral and Organizational Change A Design-Based Approach to Help Organizations Change Work Behaviors. *The journal of applied behavioral science, 43*(1), 122-134.
- Creswell, J. W., Klassen, A., Plano Clark, V. L., & Smith, K. (2011) *Best practices for mixed methods research in the health sciences*, Office of Behavioral and Social Sciences Research, National Institutes of Health.
- Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci, 4*(1), 50.
- Entwistle, V. A., Renfrew, M. J., Yearley, S., Forrester, J., & Lamont, T. (1998). Lay perspectives: advantages for health research. *BMJ, 316*(7129), 463-466.
- French, T., Blom, J., & Raman, S. (2016). Designing in rural highland contexts: Exploring the role of technology in facilitating human connections. *eTELEMED 2016 : The Eighth International Conference on eHealth, Telemedicine, and Social Medicine*.
- French, T., & Teal, G. (2015a). Transforming healthcare through design-led innovation. In *Design 4 Health European Conference*.
- French, T., & Teal, G. (2015b). Co-designing a digital directory of services. *Procedia Computer Science, 63*, 445-450.
- French, T., Teal, G., & Raman, S. (2016). Experience Labs: co-creating health and care innovations using design tools and artefacts. in: P. Lloyd & E. Bohemia, eds., *Proceedings of DRS2016: Design + Research + Society - Future-Focused Thinking*, Volume 7, 2965-2979.
- Gerry, P., & Wyatt, S. (2011). NHS Chief Executive's Review of Innovation in the NHS Summary of the responses to the Call for Evidence and Ideas. Young Foundation.
- Greenhalgh, T. (2012). Why do we always end up here? Evidence-based Medicine's Conceptual Cul-de-Sacs and some Off-Road Alternative Routes, *Journal of Primary Health Care. 4* (2) 92-97
- Greenhalgh, T., Shaw, S., Wherton, J., Hughes, G., Lynch, J., Hinder, S., ... & Procter, R. (2016). SCALS: a fourth-generation study of assisted living

- technologies in their organisational, social, political and policy context. *BMJ open*, 6(2), e010208.
- Lohr, K. N., & Steinwachs, D. M. (2002). Health services research: an evolving definition of the field. *Health services research*, 37(1), 15.
- Macdonald, A. S., Teal, G., Bamford, C., & Moynihan, P. J. (2012). Hospitalfoodie: an interprofessional case study of the redesign of the nutritional management and monitoring system for vulnerable older hospital patients. *Quality in primary care*, 20(3), 169-177.
- McHattie, L. S., Cumming, G., & French, T. (2014). Transforming patient experience: health web science meets medicine 2.0. *Medicine 2.0*, 3(1).
- Mezzich, J. E., Snaedal, J., van Weel, C., & Heath, I. (2010). From disease to patient to person: towards a person-centered medicine. *Mount Sinai Journal of Medicine*, 77, 304-306.
- Muller, M. J. (2003). Participatory design: the third space in HCI. *Human-computer interaction: Development process*, 4235, 165-185.
- Murchie, P., Allan, J. L., Brant, W., Dennis, M., Hall, S., Masthoff, J., ... & Johnston, M. (2015). Total skin self-examination at home for people treated for cutaneous melanoma: development and pilot of a digital intervention. *BMJ open*, 5(8), e007993.
- NHS Health Research Authority. (2015). Proportionate Review – Frequently Asked Questions. Retrieved 26 Apr, 2016, from <http://www.hra.nhs.uk/documents/2015/11/proportionate-review-frequently-asked-questions.pdf>
- Pahl, K. (n.d.). Case study: ethical challenges of co-production. Retrieved 26 Apr, 2016 from <http://www.esrc.ac.uk/funding/guidance-for-applicants/research-ethics/ethics-case-studies/case-study-ethical-challenges-of-co-production/>
- Parker, S. & Leadbeater, C. (2013). Call for Action: Ten Lessons for Local Authority Innovators. Nesta. Retrieved 26 Apr, 2016, from https://www.nesta.org.uk/sites/default/files/creative_councils_10_lessons.pdf
- Reason, P. & Bradbury, H. (2008) *The SAGE Handbook of Action Research*, (2nd ed.). London: Sage Publications Inc.
- Robert, G., Cornwell, J., Locock, L., Purushotham, A., Sturme, G., & Gager, M. (2015). Patients and staff as codesigners of healthcare services. *BMJ*, 350, g7714.

- Rouse, W. B. (2008). Health care as a complex adaptive system: implications for design and management. *Bridge-Washington-National Academy of Engineering-*, 38(1), 17.
- Scottish Ambulance Service. (2014). Taking care to the patient. Retrieved 2 Jun, 2015, from:
http://www.scottishambulance.com/UserFiles/file/TheService/Publications/Strategic%20Plan_Online%20pdf.pdf
- Scottish Government. (2009). *Community Empowerment Action Plan*. Retrieved 26 Apr, 2016, from:
<http://www.gov.scot/Publications/2009/03/20155113/0>
- Scottish Government. (2011). *2020 Vision*. Retrieved 26 Apr, 2016, from:
<http://www.gov.scot/Topics/Health/Policy/2020-Vision>
- Shiell-Davis, K. (2015). What Works Scotland Evidence Review: Scaling-Up Innovations. Retrieved 26 Apr, 2016, from:
<http://whatworksscotland.ac.uk/wp-content/uploads/2015/06/WWS-EB-evidence-review-Scaling-Up-Innovations-June-2015.pdf>
- Stevenson, F. A., Gibson, W., Pelletier, C., Chryssikou, V., & Park, S. (2015). Reconsidering 'ethics' and 'quality' in healthcare research: the case for an iterative ethical paradigm. *BMC medical ethics*, 16(1), 21.
- Swann, C. (2002). Action research and the practice of design. *Design Issues*, 18 (2), p.49-61.
- Sweeney, K.G., MacAuley, D. & Pereira Gray, D. 1998. Personal significance: the third dimension. *Lancet*. 351, 134-6
- Teal, G., & French, T. (2016). Designed Engagement. in: P. Lloyd & E. Bohemia, eds., *Proceedings of DRS2016: Design + Research + Society - Future-Focused Thinking*, Volume 9, 3653-3668.