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Experience Labs: co-creating health and care innovations using design tools and artefacts

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Abstract: For healthcare innovations to be successful, the voices of those receiving or delivering such innovations need to be heard much earlier in the design process. This is not easy as there are likely to be multiple stakeholders involved, and their different backgrounds make it difficult to challenge or evaluate potential innovation in the early stage of development. This paper positions the Experience Lab as a means of co-creating sustainable, innovative solutions to healthcare challenges. The Experience Lab offers participants, both receiving and delivering healthcare, the opportunity to engage in the design process, share insights, experience new concepts and imagine new ways of responding to challenges. The material artefacts and bespoke tools provide the conditions through which to create new meanings and shared experiences. This paper presents the Experience Lab approach, artefacts and tools, providing examples of these in context. The paper concludes with the need for further research to understand the role of artefacts and tools in supporting detail design and implementation beyond the Lab, and the potential of the Lab approach for other contexts.

Keywords: participatory; healthcare; creativity; material artefacts

1. Introduction

In Scotland, one in four adults over 16 report some form of long term illness, health problem or disability (Scottish Government, 2009). We face increased care needs due to our ageing population, with a predicted rise of 38 per cent in the number of people who will be over 85 in the population by 2016, and a 144 per cent rise in the over 85s by 2031 (ibid). The challenges of increasing demand and costs are compounded by decreasing budgets, which are not predicted to climb back to their 2009-10 levels until 2025-26 (Christie, 2011).

The '2020' Vision set out by the Cabinet Secretary for Health, Wellbeing and Cities states that by the year 2020 "everyone is able to live longer healthier lives at home, or in a homely

setting" (Scottish Government, 2011). To enable this vision to become a reality there is a need for the focus of healthcare to shift from one of treatment, to one of prevention, anticipatory care and supported self-care, encouraging people to take increasing responsibility and agency in their own health.

The Christie Commission on the Future Delivery of Public Services (Christie, 2011, p.vi) called for a significant transformation of public services to meet these challenges. It highlighted the need for reform to "empower individuals and communities receiving public services by involving them in the design and delivery of the services they use", and the opportunity to use the talents and assets within communities to "support self-reliance and build resilience" (ibid, ix). The Scottish Government's Community Empowerment Action Plan (2009, p.8) makes a commitment to support people and communities to have "more power and influence over what matters to them".

Lived experience of patients can often complement the expertise of healthcare professionals and involving "lay perspectives" in health research can lead to a number of benefits for the quality and impact of the research (Entwistle, Renfrew, Yearley, Forrester & Lamont, 1998, p.463). Government and policy makers place greater emphasis on involving the public in decision-making and therefore innovation in the health and social care sector is becoming increasingly participatory (Scottish Government, 2009).

The key difference between participatory research approaches and conventional research approaches lies primarily in terms of the "alignment of power" within the process (Cornwall & Jewkes, 1995, p.1668). Various modes of participation exist including contractual, consultative, collaborative, and collegiate (Biggs, cited in Cornwall & Jewkes, 1995). In participatory approaches the researcher is no longer the person who conducts the research 'on' participants, but researches 'with' participants, becoming a learner and facilitator (Cornwall & Jewkes, 1995, p.1668).

In this paper, we position Experience Labs as a participatory approach through which to harness the lived experience of participants in a creative environment to co-create sustainable innovation in response to healthcare challenges. We describe our participatory research approach and the design tools and bespoke artefacts used in the process. The tools and artefacts are illustrated with examples, and their role in embodiment and learning is discussed.

2. Participatory approaches to healthcare innovation

The voice of research participants needs to be heard much earlier in the design process, i.e. prior to idea generation, in order to explore challenges and identify needs (Teal & French, in press). Participatory design is based on the premise that involving participants in the design of products and systems will achieve enhanced results in terms of efficiency and usability (Bowen, 2010). Engaging with participants at the early stages also allows for a deeper

understanding of experience in order to identify unmet needs for ideation, and can lead to positive benefits (Sanders & Stappers, 2008) and create user-driven solutions.

Pressure is increasing on healthcare services and digital technology is proposed as a potential solution to overcome many of the challenges. Design is increasingly concerned with the "future experiences of people, communities and cultures", and increasing emphasis is placed on the role of generative design tools to imagine these (ibid, p.10). Employing participatory design is therefore important in developing innovation to ensure that the products and services designed will meet the future needs of the people they are designed for, i.e. those delivering and receiving healthcare services.

There is a growing recognition of the role of design in shaping future services in the health and social care context. For example, the NHS has employed the use of design thinking within health improvement and increased adoption of approaches such as user-centred health design and evidence based co-design (Bowen et al., 2013; Robert et al., 2015). The development of toolkits and the availability of online design tools have made design processes more accessible to those who are not formally trained designers (Bevan, Robert, Bate, Maher & Wells, 2007). While toolkits may support healthcare staff to involve patients in ongoing service improvement, it is unclear whether these processes lead to transformative and sustainable service innovation in response to the challenges facing our public health and care services. These resources have also led to criticisms of a risk of devaluing the role of designers within the process. Healthcare is a complex adaptive system, and in addition to skills and expertise in developing new ideas, designers can provide a level of objectivity that people who are part of the system may find difficult to achieve.

3. Research approach: Experience Labs

Experience Labs are a design-led approach to co-creating sustainable health and social care innovations. The Labs are developed and led by a multidisciplinary team at the Institute of Design Innovation, The Glasgow School of Art and are currently at the core of the Digital Health and Care Institute (DHI), an innovation centre based in Scotland. We are exploring the potential of our approach across a wide range of projects in health and social care in order to share our knowledge and learning with the wider design community. We hypothesise that our participatory approach can respond to the challenges faced in this context through the space we create for collaboration; supporting participants towards creating "preferable futures" (Dunne & Raby, 2013; McAra-McWilliam, 2014, p.25); through designing bespoke tools and artefacts to support design methods and activities; the skills of the team and the enlightened evaluation of the approach to share the knowledge and learning.

3.1 Creating a space for creativity and collaboration

Experience Labs provide a safe space for creativity and collaboration among those who participate. The Lab offers the opportunity for new communicative spaces and experiential

learning (Reason & Bradbury, 2013) leading to the development of collaborative relationships. Experience Labs are an emergent process, similar to Participatory Action Research (ibid), and as a result the environment needs to be flexible. Flexibility allows the research team to gain a rich understanding of participants' experience, behaviours and attitudes as participants explore and experience digital technologies. Questions posed in the Lab are sometimes not fully developed. Developing the question is sometimes as valuable as finding the answer. This is all part of a creative process, which encourages participants to think broadly towards creating a preferable future. Flexibility is also an in built part of the planning of a Lab given that it is a creative process, predominantly focused on engaging participants to think creatively in terms of future experiences.

Experience Labs are designed to operate primarily at the collaborative mode of participation, but can also cut across all modes of participation as the design process evolves. In the Labs the academic, business and civic stakeholders, together with relevant user groups assume the role of co-creators. Co-creation involves a broad range of activities that are undertaken through the entire research and design process. This means involving participants at an early stage in the process, as early as scoping and planning research; and keeping them involved at the latter stages of the design process, allowing ideas to evolve from a concept stage to developing prototypes in an iterative manner towards creating a proof of concept.

While researchers, designers and the various stakeholders are experts in their respective domains, the users are experts of their own experiences. The Labs value the collective knowledge and shared motivations of all participants, and present outcomes that represent the interests of everyone involved. Overall, the Labs aim to empower those involved to feel a level ownership over what evolves as a result of the Lab process.

3.2 Experience Lab activities

Preparation and early stages of Experience Labs aim to gain an understanding of the lived experience of users, in order to design bespoke activities, artefacts and tools to facilitate co-creation. Inclusion of end-users is considered as crucial to the success of the innovation being explored to ensure that the concept developed meets their needs and preferences (Kline & Rosenburg, 1986). Scoping activities might include ethnographic observations and interviews in the user's home or work environment. Visual and experiential mapping activities are often used in the early stages of Experience Labs, aiming to explore the people, places, products and services involved to create a shared picture of the users current experiences.

Experience Lab activities largely involve observation, brainstorming and the embodiment and testing of ideas as physical and experiential prototypes. Prototyping allows thinking and ideas to evolve through physical making and creates a safe space for failure leading to faster learning (Coughlan, Fulton & Canales, 2007). It also provides encouragement and permission to explore new behaviours (ibid). This supports rapid cycles of making and trialling

experiential prototypes for new products, services or technology and extrapolation of future experiences in the new context. Prototyping often begins with low fidelity models and gradually leads to experimentation with a functional prototype as ideas are reviewed, adapted and refined (Swann, 2002). This reflects the experimental nature of the Labs with the term 'laboratory' representing the experimentation of new ideas and prototypes leading to user-driven innovation.

Later stages of Experience Labs often use role play activities, and may involve testing prototypes in realistic environments to understand how participants interact with the prototypes and how it changes current working practices or experiences. Experience Lab activities are recorded and footage is later analysed to gain deeper insights into how participants engage with tools and with others. A videographer documents the experience of taking part as a key outcome of the research activity to accompany a full report detailing research findings and themes, user requirements and ideas, together with iterated prototypes.

3.3 Design tools and bespoke artefacts

Experience Labs are experiential in that they allow and provide space for participants to experience new products or services in order to critically reflect and give feedback. The role of design within this process is to create both the environment and artefacts in order for participants to be able to do this. Design tools and bespoke artefacts create a 'new reality' (Niedderer, 2013 p.6), which allows participants to experience a concept that is unknown to them. In this way, there is no one method that fits all; each Lab is unique to the context, participants and collaboration. The Labs use a range of generative tools including, experience prototypes, scenario based tools, storyboards, and role-play. The tools can also be used in the Lab to explore current, near future, and speculative future experience (Sanders & Stappers, 2014) although it is a premise of the Labs to ensure that participants are guided to consider preferable futures. These tools are typical to collaborative activities facilitated by designers and can reveal underlying patterns (ibid), in addition to providing a rich understanding of participant experience. Design tools encourage participants to share their experiences and build on each other's ideas. The tools help to open up the design process to multiple stakeholders (Koskinen, Zimmerman, Binder, Redstrom & Wensveen, 2011). Many participants come to a Lab with feelings of apprehension and uncertainty, but the tools and artefacts gently ease them into the process.

Material artefacts are created and made by designers within the Lab team to supplement the tools and enable participants to gain a more realistic experience. Artefacts provide rich insights into people's everyday experience, act as a mediator and coordinator of information and provide "an understanding of important processes, protocols or conventions" (Vyas, Heylen, Nijholt & Van Der Veer, 2009, p.106). Artefacts can be used at different stages of the Lab process to aid brainstorming and exploration of ideas, enhance interactions among participants, enable the design of concepts, and collaborative prototyping. The artefacts are

crafted aesthetically but are not finished to a professional standard (Gaver, Dunne & Pacenti, 1999) and enable participants to understand and imagine how a proposed idea may work for them whilst having the flexibility or ambiguity (Gaver, Beaver & Benford, 2003) to be changed or manipulated by participants throughout the process of the Lab. The artefacts generate creative discussion amongst participants, the results of which are used to iterate the design. The artefacts and tools help to communicate experiential information to participants, and through the process of engaging with the artefact through the tool during the Lab, participants can begin to understand how the proposed innovation would cater to their needs and 'fit' with their everyday experience or practice (or not). Artefacts not only enable the tangibility of a possible solution but they also provide the opportunity to share ideas, reflect, envision and record (Vyas et al, 2009). Artefacts and tools can therefore be used as both a data generation method and a form of analysis and evaluation of what occurs during the Lab (Niedderer, 2013).

The artefacts facilitate communication within the Labs by providing a common language that allows people to share and be listened to: overcoming barriers of discipline, hierarchy and culture. They allow participants to communicate visually and directly with each other (Martin & Hanington, 2012). The tools and artefacts, like the method, are open-ended. They help to keep the discussion focussed and provide a common means of expression. However, there is an additional level of interpretation and use that is involved in the creation of an artefact. Each artefact is therefore unique. An artefact projects the "thoughts, feelings, and desires that are difficult to communicate through more conventional verbal means" (ibid, p.94) and the shared motivation of the group involved in its creation. They embody the new knowledge that has been created through the collaborative process. The tangibility of possible future innovations allows participants to begin to discuss and explore how the concept could be embodied and implemented.

3.3 Role of the Lab team

Within the context of Experience Labs, the design process is opened up to include end users, and the designer's task is to ensure non-designers feel safe outside their 'comfort zone', enabling creative conversations to happen. At this early stage there are many unknowns, and the opportunity identified is likely to be difficult to articulate at the *fuzzy front end* (Sanders & Stappers, 2008) of the development process. All this uncertainty can be overwhelming to non-designers, and faced with the task of taking ideas forward, it can be tempting to revert to inductive problem solving, and tried and tested approaches that offer little scope for real innovation (Bate, Robert & Bevan, 2004).

In his ethnographic study of designers, Michlewski (2015, p.53) highlights the distinctive *design attitude* of designers in positively embracing uncertainty and ambiguity in order to take "a creative leap" and innovate. In addition to this inherent attitude, designers ground creative exploration with a generic design process that is open enough to support emergence and ambiguity whilst ensuring timely decisions are made.

The Labs bring together stakeholders from a range of backgrounds. This may involve the public, professionals, academics and businesses. It is therefore important for the designer to ensure that the tools and artefacts employed are supportive of the collaborations. When working with different stakeholders it is important to establish a common language and way of understanding, often supported through the tools and artefacts, which can break down barriers and provide a platform for communication. Within the Lab it is important that participants are made to feel comfortable and are encouraged to be collaborators engaging in open dialogue (Maxwell, Woods & Prior, 2013). It is also important that the researchers within the Labs have the ability to navigate roles (Maxwell et al. 2013) and alter these in response to the Lab activity e.g. facilitate, observe or become an active participant.

The Lab team employ an asset-based approach to empower participants to be creative, share their skills and experience, towards identifying opportunities for healthcare innovation. Asset based approaches aim to promote health through the identification of health assets such as skills, capacities, interests, and networks, which foster health and wellbeing in individuals and communities. Participants are encouraged to become active agents in the process, tackling the challenges as opportunities rather than focussing upon problems and deficits (Foot & Hopkins, 2010; Morgan & Ziglio, 2007).

3.3 Evaluating the process

In addition to developing digital, service and social innovation for healthcare challenges, the Experience Lab team document and research the design processes, methods and tools that contribute to effective collaboration and user-centred design. Within one current strand of inquiry we are exploring the role of artefacts within the Experience Lab to understand and share the key attributes of effective tools to enable non-designers to meaningfully participate in the design process.

4. Situating the tools and artefacts in context

Designing the tools and making material artefacts plays a vital part in documenting the learning and helping to shape new and better questions, while at the same time embodying the new knowledge created and future opportunities for design. Whether an object functions as a tool or an artefact depends on the stage in the design process that it is being used. Design tools offer some structure to facilitate the design process and hence tend to possess a level of clarity and precision, while an artefact represents knowledge that does not yet exist and has a level of abstraction or vagueness. Tools help to set a common goal and offer a general direction for the co-creation process, and artefacts embody the outcomes that represent the lived experiences, shared knowledge, recognised needs and desires and mutually agreed opportunities. In order to illustrate the types of artefacts and tools that are used within the Experience Lab, examples are situated within the context and purpose they were designed.

4.1 Scenario-based design

An effective way of bringing concepts to life is through storytelling. Scenario-based design is widely used within software development teams to make concepts 'concrete' and allow understanding of the activities that need to be supported, then allowing these activities to drive the design (Carroll, 2000). Within Experience Labs scenario-based design is used to illustrate a real life or mock scenario, which acts as a stimulus to generate discussion. Scenario-based design or 'stories' can also be a way to demonstrate proposed ideas, which may be unimaginable to participants (Muller, 2003). For example, a set of scenario cards presented possible options for a new system to assist older adults to remain independent at home (Figure 1). The illustrated scenarios brought options for system functionality to life and enabled meaningful conversation with the intended end users to explore usefulness and desirability. The concept is embodied through the stories, which are told through the scenario card artefact (Sanders & Stappers, 2014). The learning that occurs through this process is twofold. Through the sharing of the scenarios the research team are able to understand which scenarios were most appropriate to take forward to the testing phase for the system. For the participants, the scenario cards were able to make tangible the types of scenarios the system would be able to assist with.

Figure 1   Participants reviewing and voting on scenario cards describing options for system functionality (photo: Jeroen Blom).

4.2 Prototyping

In Experience Labs, participants are often introduced to low fidelity prototypes to test a potential solution. Participants can be engaged both in testing the innovation, and in designing the innovation collaboratively. When designing and creating prototypes with

participants we may use a variety of techniques or tools (Figure 2), including bespoke templates, or off the shelf equipment (e.g. electronic components, model making kits, dolls houses and toys).

Figure 2   Materials for collaborative prototyping in the early stages of concept development (photo: Jeroen Blom).

Both creating prototypes with participants and designing in advance as a provocation involve a significant amount of collaborative Pre-Lab work and preparation. Innovation projects often involve a series of Experience Labs in order to gain context, test the concept and iteratively develop the prototype to the required level of resolution to enable commercialisation and secure further funding for software development. Prototypes help participants to think through doing and can be iterated to provide alternative ideas to be trialled. Learning about the desired functionality, physical attributes and interactive qualities of the concept explored and embodied in the prototype is obtained from studying the prototype as an artefact alongside transcripts of conversations during the prototyping activity and subsequent discussion.

4.3 Participatory bodystorming

'Bodystorming' (Oulasvirta, Kurvinen & Kankainen, 2003) or simply designing in context, involves designers acting out technology scenarios and ideating products or interactions in the place where they are intended to be used. Experience Labs use role-play and bodystorming techniques to design and make prototypes with intended end users as participants. One example of such an activity involved embedding a co-design session within a role-play activity. Participants were first asked to enact a scenario of an ambulance attendance using current working practice. The facilitator then asked them to role-play it

imagining they were using a new application to search for information to support them in determining where to transport the patient and describing the content of each screen they would access in order to find the necessary information; meanwhile a designer sketched the screens on paper. The deck of hand-sketched sequential paper screens were then inserted into a simple plastic frame creating a mock tablet, and the scenario was acted out once more using the low fidelity prototype (Figure 3). By breaking this user scenario down into individual steps and screens the participants were able to move from a vague concept to a well-defined prototype within one short session. It was possible to take this process a step further by using a software application to take photographs of the screens and link these together on a tablet. This made the application appear to work as intended (i.e. sketched buttons linked to the correct next page) and this functional prototype was used in another role-play activity to test whether the application met the needs of participants. The act of making in this example involved the construction of meaning by participants through enabling the participants to experience the way in which the concept could then be implemented (Sanders & Stappers, 2014). Learning about the structure, content and ordering of information, alongside requirements for navigation, interaction and system functionality were embodied in the prototype.

Figure 3   Participants using the hand-drawn paper screens in a plastic frame during the participatory bodystorming session (photo: Louise Mather).

4.4 Role-play

Designers often create realistic settings to allow participants to experience the prototype in its intended environment and enable them to embody the experience, recognising how the proposed system would work and identify in what ways it would meet their needs. Later in the project described in 4.1, we were able to bring further resolution to the system by building a 'wizard of oz' prototype to enable participants to experience what the chosen scenarios would feel like in a realistic home environment, encouraging feedback and drawing out requirements. 'Experience Prototyping' enables first-hand appreciation of existing or future conditions through active engagement with prototypes (Buchenau & Fulton Suri, 2000); in this case through role-play based on our user scenarios. Participants were asked to react to the prototype system and a touch-screen interface on a tablet. The role-play scenario was largely the same for each participant although some aspects were personalised based on our understanding of their daily activities. The role-play was recorded using a specialist camera and viewed by the project partners in a control room set up.

Through undertaking the role-play, participants were able to experience and envision how the concept would be implemented within the home environment. The tasks and actions within the mock home environment allowed participants to further understand the concept and their reactions to it (Vyas et al, 2009). The experience prototype enabled participants to embody the experience, and learning was obtained from both their instinctive reactions to the different system interactions and their reflections during group discussion following the role-play.

Figure 4   Role-play using 'wizard of oz' prototype recorded using specialist camera equipment (photo: Sanne Ree Barthels).

4.5 Design fiction

Members of the research team enacted user scenarios for a new system to support people living with dementia in a series of short films, which demonstrated possible options for system functionality. This approach is termed 'design fiction' and has been used effectively

in concept evaluation and development (Blythe, 2014). This approach can also be used as a generative tool by deliberately building ambiguity into the filmed scenarios to invite the participants to 'fill in the blanks' and articulate what they understand has taken place. Briggs et al (2012, p.534) term this approach 'Invisible Design' and argue that this technique creates "a space for critical and creative dialogue during participatory concept development". In this example, design fiction suspended disbelief by enabling participants to imagine what the proposed system could offer and allow them to give feedback and make suggestions. Designers observed that despite the introduction of unfamiliar new technology participants were able to understand what was being proposed and discuss options for implementation. This discussion created learning around who the system should be targeted at, and the desired split between functionality that should be delivered by the system and functionality that should be delivered by a person prompted and facilitated by the system.

5. Assessing the tools and artefacts

The design tools and material artefacts used in the Experience Labs provide the participants with a safe and creative way to engage in the design process. The tools and artefacts illustrated in the examples demonstrate the ways in which concepts can be embodied and ideas can be made tangible for participants. In addition, the tools and artefacts aid communication within the Labs through both allowing participants to externalise thoughts and feelings, and generate discussion. The examples also demonstrate the use of tools and artefacts at various stages of the Experience Lab approach. Vyas et al (2009) propose that material artefacts need to be assessed at three phases of design: exploration, at the early stage of design; communication, at the collaborative stage of idea and concept development; and use, where ideas are tested and evaluated with users.

Material artefacts used early in the Experience Labs, at the exploratory phase (e.g. 4.1) enabled a deep understanding of participant's experiences and everyday life. Visualisations used at this stage acted as a vehicle to allow participants to interpret, express, discuss and reflect their ideas (Sanders & Stappers, 2014), which allows the research team to take these insights forward into the design of the tools and artefacts for later stages of the Lab. Artefacts allow participants to consider challenges and turn these into opportunities for the future.

Material artefacts used as forms of communication in the Lab (e.g. 4.2) allowed a two-way form of communication. For the research team, the artefacts provided a way to convey experiential information (Vyas et al, 2009) about the proposed idea to participants. For the participants, the artefacts provided a way to externalise and communicate their thoughts and reactions to the idea, allowing them to give feedback in a meaningful way.

Finally, material artefacts used later in the Experience Lab approach, when ideas are tested with users (e.g. 4.3, 4.4), enabled participants to gain an understanding and experience using the proposed idea in a realistic environment. This allowed the research team to gain

feedback on the idea in addition to providing information on key user requirements and system functionality.

6. Conclusion

Experience Labs are a participatory approach to health and care innovation, involving stakeholders from across academic, business and civic organisations as co-creators in the process. Experience Labs use designers' capabilities and tools to detangle the *fuzzy front end* of the development process to enable non-designers to feel comfortable exploring intangible or ambiguous concepts for collaborative innovation.

The Labs involve designing a bespoke experience for participants using design tools and material artefacts, providing a platform for user-driven innovation. Material artefacts used within the Experience Lab embody the knowledge created from Labs but also build on our internal research processes, contributing to our understanding of what this means for the wider design research landscape. In the Labs we have completed to date, the benefits of using artefacts are already emerging, however we do not yet know the full extent of the possibilities of this approach.

Future research will involve exploration of the potential reusability and application of artefacts and tools in other Labs and contexts, e.g. for projects in different areas, to explore whether the tool or artefact can be used in other ways, by different people, or can be altered in some way. We are also interested in the role of the artefact in much later stages of the projects to determine the transferability of knowledge embodied in the artefact and the potential of the artefact to become a tool in further exploration of the concept by developers and during testing and implementation. This will allow us to evaluate the tools and artefacts in greater detail and contribute to our body of knowledge. Finally, we aim to build in opportunities in future Labs to gather specific feedback on the tools and artefacts to explore whether participants experience other benefits than those intended.

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