Applying the Living Lab Approach for the Design of Public Spaces– A Living Lab Case Study

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Abstract

Living Labs approaches emphasise the importance of real life contexts in public spaces and service provision as an integral design component of the physical space including technological interactions. We report on the findings and outcomes of a Living Lab Project - the Waiting Room of the Future Project. This research focuses on a waiting room redesign for Access Health and Community, a partner of the Future Self and Design Living Lab both located in Melbourne, Australia. Waiting rooms are an example of a public space where the physical design is an integral part of the service provision. The emotions of staff and patients have a significant impact on service perception and a direct impact on overall patient satisfaction. Previous studies concerning healthcare waiting rooms provide little emphasis on current and desired emotional responses of stakeholders (e.g. staff, patients, and clinicians). This research focuses on patients' emotions and communication as an integral component for re-designing patient experiences. We place emphasis on how stakeholders would like to feel when engaging with future technology, spaces and services of a local community health care provider. We illustrate our findings concerning stakeholder experiences using goal models and how they can be translated into an innovative design. In considering the spatial, service, and technology layer in one study at the same time we are able to come up with a waiting room concept that has user needs permeating through all three layers truly addressing the complexity of designing such spaces. Lastly, we offer a variety of co-creative methods that are suitable to enable key stakeholder to communicate their emotions that connect strongly service and technology delivery in healthcare settings.

Keywords: Living Labs, Health technology design, spatial health care design, user-centered design, waiting room, co-creation

1 Introduction

Overview

The literature on Living Labs emphasizes co-creation with users, a focus on real-life setting, quadruple helix innovation, multi-method adoption and multi-stakeholder approaches (e.g. Eskelinen et al 2015; Veeckman et al).

Coorveits and Jacobs (2017) point toward the benefit of a Living Lab approach to capture "the uncontrollable aspects of real-life environment." (p. 26). Building on a model by Jumisko-Pyykko and Vainio (2012) they note different aspects of real-life contexts including: temporal, physical, technical / informational, social and task contexts. Nilsson and Ballantyne (2014) suggest a similar notion that the co-creation of value is embedded within a physical environment and that this "servicescape" incorporates aspects of the physical and virtual service environment. They also note temporal aspects of context, such periodic crowding in spaces such as airport check-in desks. "This means that the provider firm is not always able to influence the value-creation process in ways they would like, unless they recognize the underlying functional, technical, symbolic and social dimensions which frame the meaning of any particular servicescape and how people interact within that space" (Nilsson and Ballantyne, 2014, p.377). Heinonen et al (2010) argue that customers' "use all input, current and remembered to form an impression of value influenced by both cognitive and emotional perceptions" and these impressions act as "an emotionally charged market in the customers memory…" (p .537). In contrast, negative emotions can lead to value co-destruction between customers and service providers (Smith, 2013).

While emotions play a significant part in value co-creation and potential co-destruction they are often overlooked in the design process. Pedell et al (2017) demonstrate how emotional goals modelling can be incorporated effectively into a Living Lab process.

In this project, we map Jumisko-Pyykko and Vainio's context dimensions to a waiting room setting (Table 1) to identify value and areas. Waiting rooms display a diversity of considerations in the core dimensions of context and emotions in service provision When making services innovations in a waiting or similar public space it is likely that there will be changes to these aspects especially in the physical, virtual and emotional domains.

Temporal	Peak times, delays, priorities, limited time slots and user desires to have appointed time
Physical	Comfort, wider variety of user needs and capacities. Privacy and security needs
Social	Wide variety of age, cultures, different social expectations for service provision
Task	Variety of services and associated tasks.
Technical /Informational	Combination of information collection and dissemination. Virtual (computers boards, etc) and physical paper, noticed boards and so on.
Emotional	Anxiety, prior experience, anxiety based on current illness / problem, care for children, parents, etc.

Within the innovation context of a living lab, the "real-life context" is changing alongside the technology. Emotions also play a significant role for staff, patients and their supporters in waiting rooms and health care settings in general.

Physical, Temporal and Social aspects in the waiting room

Wait time has been identified as a barrier to accessing health care (Pomey, Forest, Sanmartin, DeCoster, Clavel, Warren, Drew, & Noseworthy 2013). The 'wait' also has a negative impact on patient satisfaction as perceived waiting time increases (Yeddula, 2012). Also, the perceived wait time is affected when patients are waiting for unknown reasons, with anxiety, in discomfort or in an unproductive state for an unspecified time (Karaca, 2011). While Joseph et al. (2009, p. 9) outline that "distractions reduce anxiety" there is often little thought into how this waiting time can be utilised meaningfully. The pressure of mounting queues also permeates through to physicians, who in turn need to deal with acute and chronic conditions from patients within a limited timeframe. Sherwin et al. (2013) highlight that limited consultation timeframes can lead to patients feeling rushed resulting in unanswered questions or incomplete information. Furthermore, staff can experience low morale (Knight et al., 2005) derived from the difficulties in managing patient wait times, queues, and complaints. Here, healthcare services are presented with a challenge to improve patient and staff satisfaction, presenting an opportunity to study the role of emotions within the space of the waiting room. Opportunities for redesigning the space and implementing innovative technologies services are also presented.

Previous research surrounding the healthcare setting waiting room focuses on patient

perceptions of waiting room environments in relation to perceived quality of care (Arneill, 2002), staff efficiency (Ulrich et al. 2008) and the influence of design to create functional environments that communicate brand attributes (Cooke, 1983). Gaps in the literature reveal a limited focus on the role of emotions within the space of the waiting room. There are further gaps where research does not discuss the practice of designing waiting rooms from the perspective of end users emotions both in relations to access to services and spatial design. The consequences of omitting how users feel when engaging with medical practice service can result in dissatisfied experiences that do not reflect ideal emotional user experiences.

Technology in waiting rooms

Self-service technology is widely integrated in service-oriented industries to reduce operating costs (Castillo-Manzano & López-Valpuesta, 2013) and improve efficiency for both consumers and providers (Gelderman et al., 2011). Health providers have started adopting similar check-in style kiosks touted as offering "greater convenience and privacy to patients, while liberating staff to do more meaningful work" (Fallis, 2012, p. 339).

Furthermore, displaying waiting times on digital signage can help alleviate anxiety generated by unknown wait times (Karaca, 2011; Nemschoff, 2015). Ideally this signage should be prominently positioned in multiple locations (Labarre, 2011) so it is easily visible for everyone in the waiting room Some health clinics are now allowing patients to check-in for an appointment using a smartphone application (Kennedy, 2016). Technology can also be used to educate patients about their health while waiting (Stripling and Richardson, 2016). Providing wireless tablets in the waiting room, they found that patients were more likely to be satisfied with their visit when they used their wait time educationally.

2 Waiting Room of the Future

Methods for Understanding Emotions in the Waiting Room

This section reports on the methods used to gain insights about existing and preferred emotions surrounding service, technology use, information flows and spatial arrangement in the waiting room. A multidisciplinary team consisting of a Human-Computer Interaction (HCI) specialist, a digital media designer, a service designer and an architect collaborated and worked closely with Access Health and Community. Multiple methods were used to develop an understanding from patients and staff about current problems and future desires across the different aspects of the servicescape. This resulted in a proposed design for a waiting room of the future that integrated all inputs. Table 2 summarises the methods used in each stage, whether they examined current state issues or desired state and their relationship to context and the emotional elements in table 1.

Table 2: Methods used and their relationship to context and emotional elements.

Method	Temporal dimension	Context and Service Element Combination
Snap-it	Theme 1 Efficiencies and Inefficiencies - Current Issues	Informational flows Technology Spatial Issues Service barriers
	Theme 2 Ideal Patient Service - Current issues and desired future state	Spatial Technology
	Theme 3 Towards the Future – Desired future state	Technology Spatial Emotional
Focus Group & Rich Picture	Desired future state	Spatial Technology Emotional goal
Survey	Desired future state (patients only)	Technology Emotional
1: 20 Model	Current state	Spatial Emotional
Action research through design	Future State	Technology Spatial Information Emotional

SNAPIT* (Method 1)

A photo documentation kit named SNAPIT* (Figure 1) was distributed to Access Health and Community staff members. SNAPIT* was used as an early exploratory tool, uncovering issues which staff members thought needed to be addressed by using photography as a way of capturing stories and building narrative. Theme 1 asked staff members to capture images concerning efficiencies and inefficiencies within the work place including barriers to workflow. Theme 2 asked staff members to document images that prevent Access Health and Community from giving their patients an ideal service, while Theme 3 looked toward the future; focusing on how a patient should feel when engaging with Access Health and Community. A total of seven SNAPIT* photo-documentation kits were returned after a period of 2-3 weeks. The participants ranged from reception staff, through to upper management. The results, especially in relation to spatial features, were a key element for the redesign of the space.

Findings SNAPIT* Theme 1: Efficiencies and Inefficiencies

Technology of different kinds is key to daily work routines. For various reasons, multiple patient information technology systems do not communicate with each other which means that staff members are required to manage appointment requests for patients requiring multiple services. One participant noted that the 'appointments on multiple systems don't talk well to each other' leading to confusion and time taken away from servicing patient requests.

Spatial features including the corridor width from the reception to the medical suites made access difficult for people using prams and wheelchairs. Further, reception staff often direct patients to the bathrooms, out of view from the reception desk. Staff suggested that the 'relocation of the reception desk to the far back wall' will open up the space more to reduce congestion while reducing the need for reception staff to direct and navigate patients. Distraction was also presented as a spatial inefficiency for reception staff who 'have to watch the door slowly close to ensure no one else enters'. Lastly, it was noted that reception staff need to ensure that patients do not access restricted areas: 'Patients are easily able to walk through the building unattended if unnoticed by reception staff", putting them into the secondary role of 'security'.
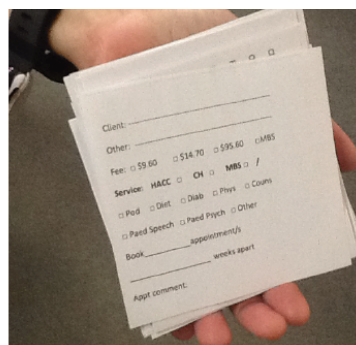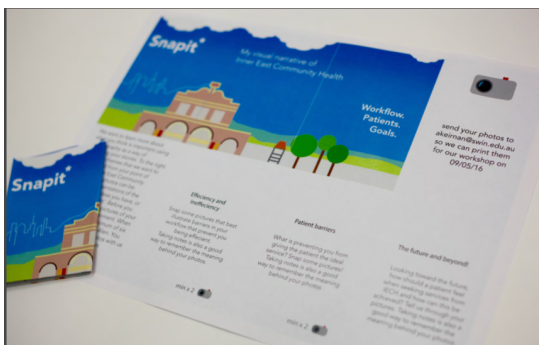

Figure 1. The SNAPIT* photo-documentation kit instructions.
Figure 2. An image of a low-tech communication tool returned in the SNAPIT* data.

Service (in)efficiencies were also discussed. One staff member presented an efficient paper-based communication system between patient, doctor, and reception staff (see Figure 2). After each appointment, the clinician writes fees, funding source and care provider on a card as well as details for booking the next appointment. They pass it to reception to process, thus facilitating communication between the clinician and reception staff (i.e. clinicians are using their time for patient care, rather than admin tasks). It was also presented that patients can be put on multiple waiting lists to access services based on the length of the waiting list, rather than the patients' priority need.

Findings SNAPIT Theme 2: Ideal Patient Service

Information Provision refers to types of information shared between Access Health and Community and their patients. It is common practice for health care waiting rooms to make health related brochures available to their patients. The SNAPIT* activity revealed 'brochures and information that is scattered and poorly organized makes it difficult for patients to find information relevant to them" (Figure 3). One staff noted that "Brochures and flyers need to represent the diversity of patients that access services", and "there are number of irrelevant or out of date brochures". Reception staff are also put under a great deal of pressure to help patients locate services that are often difficult to find, for instance, one participant commented on regularly being asked to find the call number cards for nursing services.

Spatial Barriers can also prevent ideal service delivery. One staff member noted that the height of the reception desk excludes people in wheelchairs and that the spatial location of the reception desk enables other patients who are waiting for an appointment to overhear private patient details. It was also expressed that "there is no private room in the reception area for a distressed or unwell patient to wait in, away from other patients" and that the only private waiting area doubles as the Needle and Syringe Room (NSP). This is "however not ideal for an individual experiencing trauma given the potentially confronting nature of the NSP information and disposal bin" as stated by one clinician. Flow of people was indicated as problematic given narrow pathways from the waiting area to GP suites (Figure 4). The narrow space does not allow people who are using prams, walkers, or wheelchairs to use the narrow hall simultaneously. It was reported that the door to the reception area opens straight onto a busy road, causing concern for the safety of toddlers and pre-schoolers.

Figure 3. Information overload   Figure 4. Narrow pathways

Findings SNAPIT Theme 3: Towards the Future

Towards a digital future. Staff presented an idea to include self-check in technology as a preferred digital intervention: "The idea of this would be to reduce wait lines at reception and to give individuals an element of privacy when communicating details". Participants refined

the idea of the check-in kiosk, so that it could also be available for those who are unable to use the digital check-in [iPad], or would prefer to speak with the receptionist by including the dual option for both digital and face to face check-in. An interactive display was also considered by participants as ideal for "keeping children entertained without having small toys left around" (see Figure 5 and Figure 6), as well as making Wi-Fi available for all patients. Not knowing how long a patient needs to wait and changes in scheduling can cause anxiety and unnecessary stress for patients and (consequently) staff so digital tools can reduce stress levels in patients and give them more control.

Towards a refined spatial future. Participants noted that one goal for Access Health and Community should include furniture that "has been approved by Occupational Therapists for people with different mobility needs". This was an important guiding principle for the designers. Furniture should also include "self-soothing items (such as stress balls) which can help to reduce anxiety and distract people as they wait". As activities at the reception desk can be overheard in the waiting room, one participant suggested that the reception desk should be moved away from the waiting room, to enhance privacy. One participant even suggested that a varying level reception desk would give patients who might not be able to view the staff behind the counter, an opportunity to do so comfortably. As a result, the design and location of the reception desk was the primary focus of the re-design (Figure 15). It was also suggested that the nearby corridor be widened better lit to allow people to see who is behind and in-front of them. When security was discussed as a future goal, it was indicated that installing "a swipe security door between the main reception area and clinical rooms" would limit the number of patients who may become lost when trying to find the toilets and also reduce theft of personal staff belongings.

Towards an ideal future service for patients. It was recommended that "a needle and syringe disposal bin and vending machine for individuals to access sterile equipment could be fixed to the outside of building". All staff participants preferred a more accessible model that moves away from the largely 'one size-fits-all approach' to a more tailored service. According to participating staff a future goal for Access Health and Community should be that "Patients can access the services in a number of ways and receive care for their priority need in a timely way" (See Figure 8 opposed to a 'waiting in one-line model'). Also, patients who need to see multiple care providers should receive coordinated, and integrated care that prioritized patients based on their needs. Lastly, one participant noted that "the service must provide equitable access to health care for population groups who are marginalized and those who experience poorer health outcomes".

Figure 5. Existing childrens' waiting space   Figure 6. An example of an interactive child space

Figure 7. Dual use of needle syringe disposal room can cause anxiety in some patients
Figure 8. Vision of patients accessing services in a flexible way in the future – ducks representing patients.

Focus group (Method 2)

Participants and approach. After identifying important themes from the SNAPIT* photo documentation kit, a focus group with five staff members was held to better understand the context where the themes were placed. Discussions were framed around two activities: The first asked participants to share their ideas, feelings, and emotions with specific focus on service delivery, technology adoption and goals for the future. The second saw these ideas, emotions and feelings represented on a large floor plan of the waiting room area at Access Health and Community.

The focus group, with emphasis on "do", "be" and "feel", supported the development on the emotional goal model (Figure 9). Goal model 1 presents a broader landscape of preferred emotions experienced at Access Health and Community. The key stakeholders are: patients who access the service and their supporters (e.g. family), the management team who are responsible for co-ordinating and planning (or 'back of house'), the reception staff who are

the crucial 'front of house' and then the nurses and clinicians. The function of the waiting room is to provide a welcoming environment for all patients to access services. It is important to note that a welcoming environment, as referenced by one participant is one that "is supportive, encouraging, non-judgmental, and empowering. [Where] we embrace human diversity and welcome and support all people". The need for a welcoming environment was later a key consideration when choosing floor materials and wall treatments. To support ideal service delivery for patients, reception staff expressed the need to have flexible patient intake and appointments that feel simple to manage and are responsive to change. Further, a consolidated health record that is streamlined and up-to-date will support the role of reception staff in delivering an ideal service to patients. Similarly, nurses can help facilitate the flexible patient intake through communicating between appointments, reassuring the patient and providing helpful information.

When providing a health care service to a patient, it should feel 'caring', while also presenting Access Health and Community as having 'best practice' qualities. To provide health care services that accommodate qualities of 'caring' and 'best practice' it is recommended that general practitioners and specialists operate with unified and shared care plans that feel interactive, are patient centered and individually tailored.
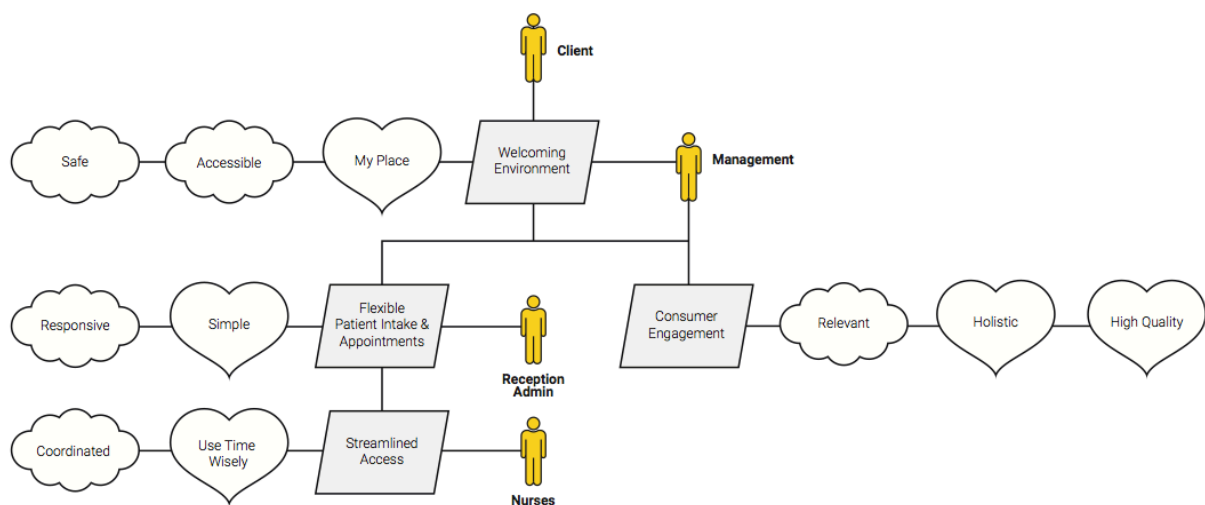

Figure 9. Goal Model 1 - Emotions in the Waiting Room

Findings of the SNAPIT* Photo-documentation kit showed that a consolidated, shared health record was an integral goal towards reducing barriers. Hence, the workshop discussed the preferred emotional goals of a consolidated health record (Goal model 2). The key feature of a consolidated health record is to function as a 'patient access point' allowing patients to access their own health history. The consolidated health record should be helpful in sourcing the information that a patient requires, be secure, and should empower a patient while also re-assuring them of their health history and private information. For staff, a consolidated health record would enable all medical staff to create and provide unified and shared care plans that can be accessed by designated health professional linked to the patient. These care plans should feel holistic, enabling medical staff to include and access data pertaining

to the patient, while also having a patient centered quality. Similar to goal models 1 and 2, a consolidated health record should enable reception staff to facilitate flexible patient intake, make appointments that feel simple to manage and are responsive to change. Further, a consolidated health record that is streamlined and up-to date will support the role of reception staff in delivering an ideal service to patients. This information was crucial for the interaction design students when putting together the App.
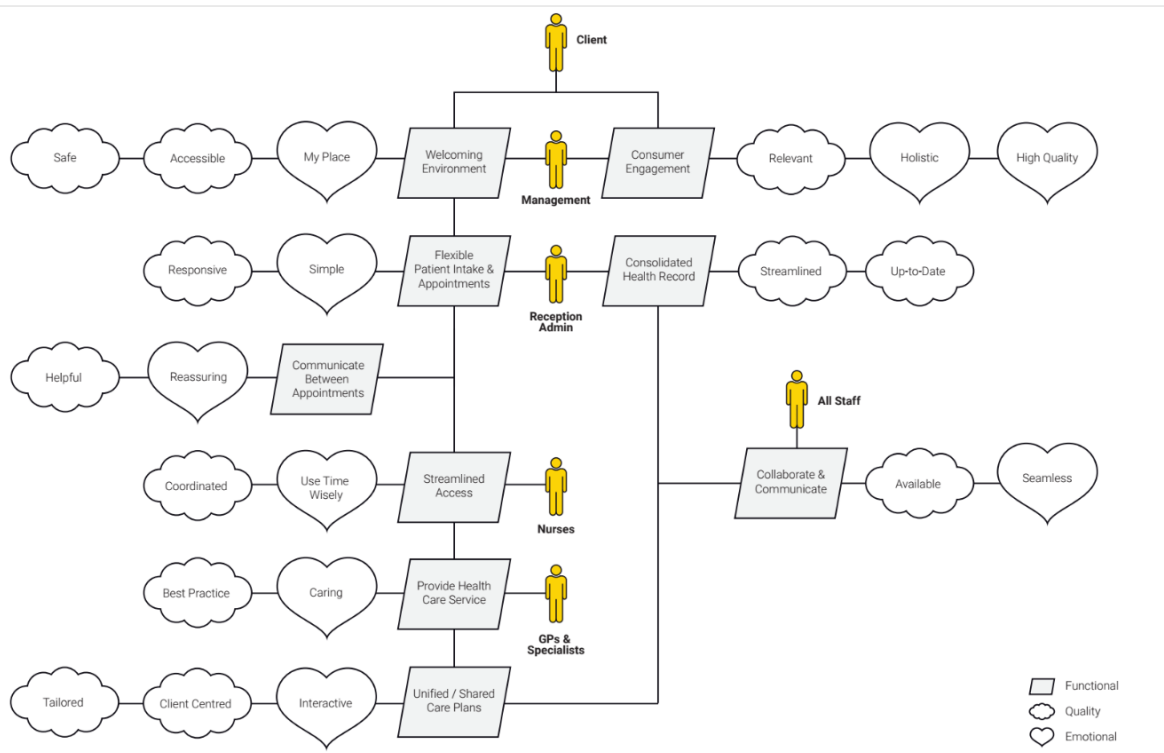

Figure 10. Goal Model 2 – Emotions and Patient Information Systems Goal Model

The waiting room paper and online survey with patients (Method 3)

A total of 70 paper and 26 digital surveys were completed by patients about (i) current and preferred emotions and technology use in the waiting room and (ii) giving and receiving information from Access Health and Community. The results from these surveys provided important data for the students and researchers to explore both technological and spatial solutions.

Patients wanted to feel welcomed and comfortable (Table 3 left). The survey revealed that a more private waiting room would facilitate this. Staff suggested that self-check-in technology was considered a faceless option, suggesting that many patients appreciate personal interactions within their overall waiting room experience (Table 3 right). It was concluded that if technology were introduced in the waiting room, it should support face-face interaction rather than replace it.

Some participants wanted to do nothing while waiting, others preferred to be productive by using technology such as smart phones to do work, use apps, or watch television, preferably with free Wi-Fi. This information guided the interior design students to create different zones such as the 'Zen Zone', the 'Work Zone' with hot desks, the 'Family Zone' and the central seating zone. In its current state, participants mostly used their phone or read magazines in place of alternative activities (Table 4 left). Participants placed strong emphasis on technology to alert patients about changes or delays in their appointments (Table 4 right).

Table 4. Key themes from paper survey: Spending time while waiting (left) and technology use for updates (right)
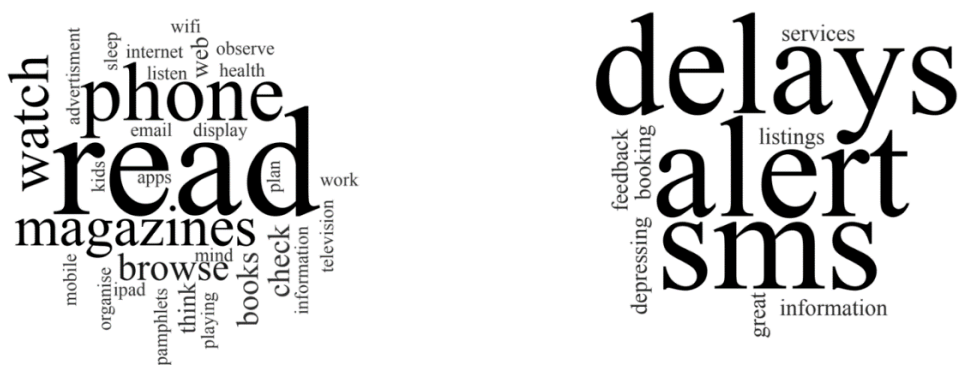
Tailoring Information for Access Health and Community patients was an important insight. Currently, information is provided as brochures or information pamphlets that have been described as 'out of date' and largely 'one-size-fits all' in accordance with staff comments. An

overwhelming 85% of participants expressed that they would like to have information tailored to their health needs, including the types of services that are relevant to their needs.

When asked about what role Access Health and Community should play in supporting patients on their health journey, three quarters of the participants reported that they would like support in taking a more active role. This was considered in the technology design. However, participants did not feel as strongly when compared to the provision of tailored health information with one third partially agreeing and 20% neither agreeing nor disagreeing on this topic.

Concerning privacy and access to sensitive patient information, four participants responded that not all health services provided by Access Health and Community should have access to their personal medical data. Potentially highlighting a desire for more unified health care (and less repetitive questioning).

There was consensus amongst 80% of participants that if they knew the reason for appointments running late they would not mind as much (Figure 11). This is consistent with the literature (Karaca, 2011). Two participants strongly disagreed with the statement, perhaps wanting action (text message, displayed wait times) rather than just a reason.
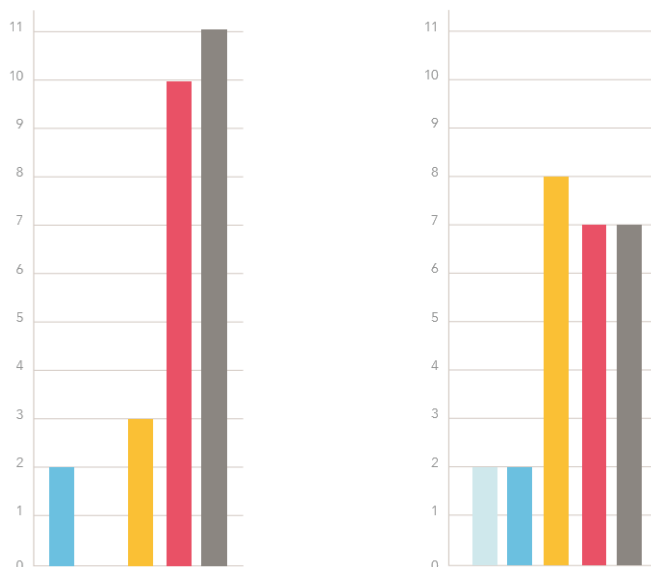

Fig. 11. Communication of reasons for running late ("strongly disagree" left to "strongly agree" right).
Fig. 12. Information provision on health via iPad ("strongly disagree" left to "strongly agree" right).

The use of iPads in the waiting room to provide and receive information about health and health data received a somewhat positive result with just over 50% of participants wanting to use technology for this reason (Figure 12). However, there was a large amount of indifferent responses with 30.77% of participants neither agreeing nor disagreeing.

Finally, participants were asked to rank five statements in order of priority. Using ascending mean value "Taking an active role in my own health journey" ranked as the most important (2.4 mean, 21 votes) followed by "Receiving information tailored to my health needs" (2.65 mean, 23 votes). "Using technology to provide and receive information about my health data" ranked lowest (3.4 mean, 25 votes). "Knowing why my scheduled appointment is running late" yielded mixed results. It was the highest priority for 7 participants (equal with "Taking an active role in my own health journey"), but the lowest priority for 9 participants being at third position (3.1 mean, 26 votes).

3 Outcomes

Technology Design

Four students (Alexandra Mold, Elléna Mills, Nicole Matthew, Sarah Morris (Bachelor of Design Honours) designed an application for mobile devices derived from the data collected across the multiple methods into a prototype. The Access Health and Community App aims to encourage patients to become more active in managing their personal health with the aim of improving overall communication with Access Health and Community. The result was as a fully functioning prototype based on the screen designs (Figure 13). In response to the data collected, this application would enable patients to view their appointment calendar, book, cancel and reschedule appointments. Patients are also able to input health statistics like weight and blood pressure to enable better communication with clinical staff. The main benefit to tracking personal health information is that patients can review their progress and feel motivated to change/continue their healthy habits. The 'Follow up Care' feature allows them to see referrals, access results and, most importantly, a written version of doctor's instructions as to address the concern of verbal instruction being forgotten, misunderstood or misinterpreted.
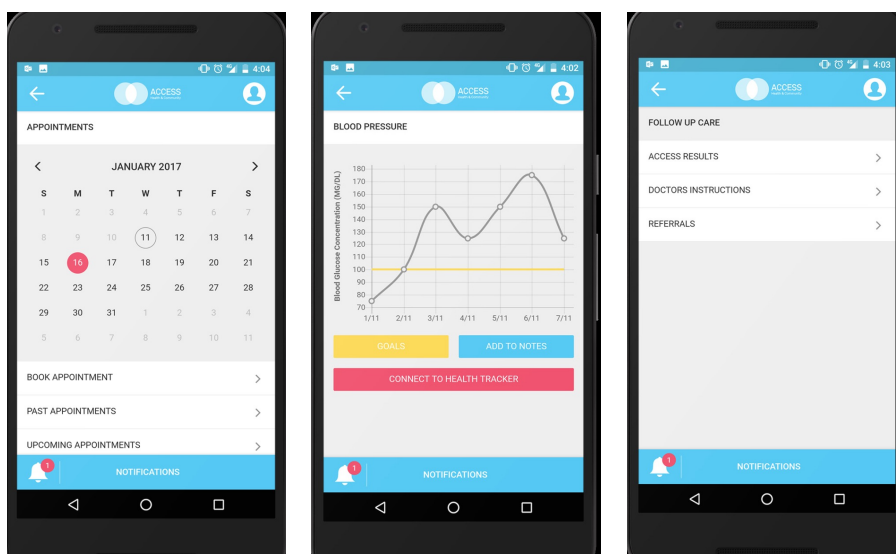

Figure 13: Appointments, Track Your Health
and Follow Up Care as main functions of the suggested app

Spatial Redesign

Based on the findings, two action research design studios undertook the task to re-design the waiting room space with students from the Bachelor of Interior Architecture (Honours) program.

Fig. 14: The entry view – final concept

In the first studio, 16 students developed individual concepts for the waiting room based on the SNAPIT* exercise, goal modelling, survey data and the published research report. Each student addressed the principal problems of flow and circulation (spatial layout), universal access requirements and the need to provide a welcoming atmosphere supported through use of materials and manipulation of light and shade. Staff then selected four schemes to be further developed in a second studio. Students worked in teams to refine the designs based on the outcomes of a co-design workshop with task that highlighted three key points: the position and accessibility of the reception desk, the integration of technology and the location of the Needle Exchange room. (see Figure 14). The reception desk designs feature different heights for accessibility, afford complete views of the room for security and separate sitting areas for privacy.

Students were given a set of empathy provoking exercises through mobility devices and ageing suits in a full-scale model of the waiting room that was set up in their classroom space. The students role-played being patient, carer and staff and reported that the emotions triggered by this exercise were fundamental to their understanding of the different user groups of the waiting room. The experience strongly affected their design approach. Staff and executives agreed on the strongest scheme but also indicated key features from the others that they wanted included.

Fig. 15: Final design – view from reception desk area (different heights)

Three students (Fiona Nowland, Chrissa Drosopoulos and Sarah Tucker) then worked in close collaboration with the architect to refine the design to a single project that was approved by management for execution (see Figure 15). It is anticipated that construction will commence in 2019.

4 Conclusions

Health care is an extremely personal and private practice. Individual experiences and expectations cause each patient to develop a unique perspective on their health, and what it means to visit a health care practitioner. This research focused on the emotions of both patients and designers, following a Living Lab approach in collaboration with our partner Access Health and Community. Perceived waiting time and the feeling of being welcome are key to improving patient experience and satisfaction and informed the new spatial design. Improved communication between the patient and their clinic leads to a stronger bond, forming a safe, trusting relationship which can be maintained via the suggested app solution. Understanding these influential factors in patient empowerment is a central component improving the individual experience in an innovative waiting room.

The description of the research of interactions within the "waiting room" did start and end at the waiting room doors. There are physical and virtual interactions outside the waiting room that this publication did not incorporate, but our research touched on such as missed appointments, patient information between visits provided by the app and parking. Future work will incorporate these aspects to further improve the experience of patients and staff within an innovative waiting room permeating further into the lives of the patients.

This research is unique in that it adds to a limited body of literature about emotions and design related to health care environments. Furthermore, it shows how to 'design for' emotions to improve efficiency and usability across spatial, technology and service delivery problems in

health environments.

5 Acknowledgements

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