Co-designing Behaviour Change in Healthcare

JOHN Kieran*; FLYNN Daphne and ARMSTRONG Mark

Monash University
* Corresponding author email: kieran.john@monash.edu

An emerging challenge in our research is that of understanding mindset and how it directs human behaviour. Literature reviewed of prominent models for the design of health behaviour change has been applied to two collaborative healthcare research projects, conducted in the context of a co-design methodology. The first focuses on the design of remote care for chronic heart and liver disease patients; the second on reducing the rate of hospital-acquired infection through changing hand hygiene behaviours. Issues that are collectively responsible for the deaths of tens of millions of people per year. Empathy studies highlight ingrained social norms, poor attitude, disengagement, low aptitude, disorganised and chaotic environments, and a strong motivational deficiency as drivers of adverse behavioural intention. It is suggested that this is a collectively consistent narrative, exposing a systematic behavioural breakdown between need and desire. Designers should be wary of the complexity and theoretical nature of behavioural intervention while understanding its ability to address interventional design’s susceptibility to resistance and misuse. This paper situates these theories through the case studies and discusses how designers can better inform their practice when working within complex healthcare environments.

behaviour, co-design, health, empathy

1 Introduction

Why should behavioural change be a designer’s problem? In a more generalised context, behaviour change is a foundational construct to improve the design and implementation of interventions addressing societal issues (Michie, van Stralen & West, 2011). Therefore, if we consider human-centric design, one of our key priorities should be to understand and design for behaviour. This paper will explore design for behaviour change in the context of designing healthcare devices and services. The first half of the paper will focus on establishing various prominent theories for health behaviour change, particularly Albert Bandura’s social learning theory. Other theories – including Irwin Rosenstock’s Health Belief Model and Ronald Rogers’ Protection Motivation Theory – will also be introduced and discussed in the context of two current design research projects relating to healthcare delivery. The paper will discuss collective versus individual design, and the implications on outcomes and desired use. For example, if there is an expected pattern of use to achieve a
desired result then it needs to be considered that this pattern can vary greatly across populations due to diverse cognitive learning models affecting the drivers and motivators from one individual to another. Design should involve consideration beyond the object or intended function, and how that object or function influences optimal or intended operation. Regardless of any segmentation, the diversity of individuals should be considered to design outcomes that achieve desired use for as large a population as possible. Through two health design research projects, we discovered that many of the issues were deeply ingrained matters of behaviour. This led us to design for health behaviour change, through exploring how we can apply these theories and methods to our ongoing practice in healthcare. The second half of this paper will investigate how two current design research projects – undertaken within the author’s healthcare design laboratory – have used the findings from co-design-based empathetic research studies to recognise behavioural problems associated with: (1) compliance in hand hygiene, and (2) remote healthcare for chronic illness. The co-design methodology utilised by this lab applies empathy building as a tool to recognise and pursue systematic problems. The initial findings from these studies have led us to hypothesise that some design interventions misidentify the problem with causation that is symptomatic of a more complex problem. Further, behavioural intervention is discussed as a response to a deeper problem that is thought to influence the efficacy of any intervention. These ongoing projects have both benefited from this shift to an approach informed by behaviour change theory. With this paper detailing these approaches through the literature and these examples from practice, suggests the contribution that these case studies can make to other designers working in the design of healthcare systems, services and products.

Figure 1: hand hygiene co-design workshop including clinicians, nurses, behavioural scientists, designers, engineers, and industry partners.

2 Literature review: design for health behaviour change

Design for health behaviour change is not a new concept, yet our experience reveals that for many designers it is yet to feature prominently in their everyday toolkit. A review of various theories shows the prominence of behavioural intention and how change is strongly influenced by attitude, aptitude, social norms, self-efficacy, environment and motivation. Martin Fishbein and Marco C. Yzer’s integrated theoretical model combines aspects from the theory of reasoned action (Fishbein & Ajzen, 1975), and social cognitive theory of self-efficacy (Bandura, 1991) in a more efficient
manner to assess aptitude and intent in behavioural development (Fishbein & Yzer, 2003). Fishbein and Ajzen’s theory covers individual intent and estimated behavioural outcomes in relation to oneself, whereas Bandura’s theory is a psychocentric approach that looks at how the environment, personal factors and aptitude all influence one another. Comparatively, Fogg’s behavioural model is relatively simplistic, focusing heavily on motivation and strategies to minimise ability barriers (Fogg, 2009). While other more modern theories exist, this paper focuses on the application of Bandura’s original social learning theory and four-pillar model as a relevant means to measure the ability of a designed outcome to effect desired behavioural change. Each model represents an underpinning of design and cannot guarantee success; therefore an initially speculative, and then iterative, design phase will equally allow for the modification of a behavioural design strategy. This section will review Bandura’s social learning theory and discuss the impact of a number of design strategies, including Bandura’s four-pillar model and various persuasion tools, on design practice. It should be noted that the following theories and tools are well established in discussion between design and behaviour – for example, in Monique Boekaerts Handbook of Self-Regulation. This paper relates these tools and strategies to examples from our own design practice, while assessing the efficacy of a co-design methodology as a tool to drive design for health behaviour change.

2.1 Bandura’s Social Learning Theory and how empathetic research can reveal a different design problem:

Our projects in healthcare design have all employed an empathic co-design methodology, a methodological approach that can be further informed by Bandura’s social learning theory. Co-design methodology is strongly interdisciplinary, so as ‘to bring the people we serve through design directly into the design process in order to ensure we can meet their needs and dreams for the future’ (Sanders & Stappers, 2012, p. 14). Empathy building is an ethnographic research tool that can help designers define problems. A key pillar of empathy building is storytelling through stakeholder interviews and environmental observations, enabling us to draw a rich picture of individual and collective circumstance. Self-immersion into people’s lives generates insights, questions, and issues distinct from the elicitations of any quantitative data. We find co-design to be particularly suited to healthcare design since the object of design (a service, experience, product, system or environment of healthcare) is generally unfamiliar to a designer. Designers do not use surgical tools on a daily basis, consult with inpatients and outpatients, nor understand the operational flow of a surgical theatre with any strong authority. Peter Lloyd discusses the limitations of participatory design in the context of need fulfilment and value creation. Lloyd argues that democratisation of groups will result in averages, and therefore the value in ‘meeting an average need to a consumer is questionable’ (Lloyd, 2004). Lloyd’s ideas are strongly premised on the design of consumer objects – such as electronics – and are perhaps less pertinent in this context yet it could be argued that the role of iteration in any methodology should provide a sharp reduction in the average and therefore a higher likelihood of value creation. In this instance, it is through this process that a complex problem emerges that is easily overlooked by other problem-solution methodologies.

Albert Bandura’s social learning theory suggests that behaviour is controlled by learning as a cognitive process taking place in a social context (Bandura, 1977). Learning may occur through direct observation, direct instruction, or through vicarious reinforcement – that is, under the guise of consequence as reward or punishment (Grusec, 1992). For example, if behaviour is continually rewarded, it is more likely to continue; whereas if behaviour is persistently punished, it is more likely to cease (Renzetti, Curran, & Maier, 2012). This lends itself to the role of motivation and the drivers that help decide whether any passive or impassive cognitive action is taken. Without motivators, or the drivers of desire to take action, anything expected or intended can be susceptible to failure (Keller, 1987). Yet, as Bandura and Richard Walters conclude, the principles of social learning theory show that learning may still occur without any change in behaviour. Therefore, we might suggest that just because a person identifies with or understands the intention, purpose and aim of a particular design through observed learning, in the short or long-term they may still lack the
behavioural influence to act as intended by that design. For example, our empathy research has shown that despite strong intentions and procedural understanding of the ‘five moments of hand hygiene’, planned behaviour can fail to translate into reasoned action. In alignment with more recent findings, we hypothesised that an intention to act does not necessarily lead to an act (Sax & Clack, 2015); and suggest that design should focus on motivation and habitual behaviour. The indication is that behaviour is distinct from learning and instead is influenced by reinforcements (Bandura & Walters, 1963). We might add that behaviour is in fact a product of desire and motivation, and if neither of these exist to perform a particular action then occurrence will reduce or cease entirely. Accordingly, if the aim is to improve behaviour over time – particularly addressing negative habits and routines – then the emphasis should revert back to the underlying learning model of the design to help identify what is leading to failure. The empathy study identifies a pool of causal areas – it is these determinants of optimal short and long-term interaction with any product, system or process that need to be understood (Michie, Johnston, Francis, Hardeman & Eccles, 2008). Nevertheless, the ensuing interventional design is unlikely just a learning or behaviour, but rather a product, system or process that is designed in such a way as to affect learning or augment behaviour. Causal learning and behavioural issues should be articulated as a set of ‘call-to-actions’ that stipulate what is required of the design. Effectively, these can be treated as functional requirements within the design specification.

2.2 The four pillars of observational learning and how to utilise this effectively for design:

If we are to design for behaviour, then we need to recognise the mental processes that control observation as the impetus for change, and understand how these processes are translated into design strategies. As already alluded to, observation is fundamental to learning, and there are numerous mechanisms that dictate whether observation of exhibited behaviour will occur or not. Again, Bandura and Walters identify four key cognitive and behavioural processes that dictate our ability to learn through observation including attention, retention, reproduction and motivation (Bandura & Walters, 1963). The four pillars are co-dependent and rely on other factors such as cognitive ability. For example, pillar two’s reliance on memory is possible to the extent of the individual’s capacity for, and ability in, memorising information. This model could be embedded within the co-design methodology as a scoring matrix to pre-emptively assess the validity of a design prior to testing and implementation. Weightings may be applied to each criterion depending on the nature and emphasis of the proposed intervention. Although the principles collectively remain the same, it is important to recognise that each individual’s needs and desires are different, and, despite granular segmentation, it is often difficult to cluster due to the infinite variance of individual motivation and desire. Therefore, choice and optionality via mass customisation can provide users with more personalised and engaging experiences.

2.2.1 Sensory priming:

More collectively, users must be drawn to interact with a design (attention), and then guided or persuaded to act in the way that is intended (motivation to remember and reproduce). Sensory priming could utilise any of the human senses, but needs to be used in a manner that directs the desired behaviour. ‘Psychological priming is the process by which the exposure to certain cues (e.g. words, smells, or images) alters behaviour without the person being aware of the impact of the cue on their behaviour’ (Bargh, 1992). This process causes a certain reaction in memory immediately before carrying out a task or action. Two examples of this relate to our hand hygiene research. In one instance, the aim was to artificially mimic the physical auditing process, which we knew from our hospital study, formed feelings of being watched (attention, retention and motivation). King et al. recreated this by placing stickers printed with a set of human eyes on alcohol based hand rub (ABHR) dispensers around the hospital ward as a visual prompt to hand wash. Since there was no auditor present, nor any way to track actual performance, the design relied on the user’s vicarious reinforcement system around consequence to elicit compliant action (motivation and reproduction).
This study was extended to test the olfactory system using a citrus smell emanating from ABHR dispensers that can cue association with a feeling of cleanliness. The results showed a 31.9% improvement in use above the baseline compliance rate of 15% (King et al., 2016). The issue with auditing – whether real or artificial – is that it is a form of forced compliance. The design of interventions for hand hygiene and the virtual hospital must gravitate towards unforced action that is driven by understanding and motivating desire, otherwise it can be susceptible to resistance.

2.2.2 Emotional motivation:
Emotional motivation is another approach that aims to elicit a cognitive response via the vicarious reinforcement system. Prominent examples such as QUIT smoking, Worksafe, Drinkwise and the Transport Accident Commission (TAC) road safety campaigns tend to effect social change via shock visual media – a strategy known colloquially as shockvertising. The long-term success of this strategy has been well documented by the TAC’s prominent, long-term seat belt safety campaigns (attention and retention through long-term reiteration). Since legislative inception in 1970 to 2014, seat belt use has risen to 98% (TAC, 2014). The TAC slowly changed unsafe behaviour through memorable media, reinforcing the notion that humans are vulnerable and susceptible to mistakes. Some of the hand hygiene interviews identified strong self-interest and an affinity to immediate family rather than the wider population. The opportunity here is to use media in a manner that highlights the potential impact of poor hand hygiene practices on an individual’s own interests (self and family). Our virtual hospital research found poor diet to be a major contributor to the perpetuation of disease. Barriers include education, cultural dynamism, and accessibility. We can learn from past examples – such as the Heart Foundation’s ‘tick of approval’ labelling system – to constructively educate and change strongly ingrained habits. The assumption is that any ensuing motivated action could not only reduce the risk to themselves but their family and, in some instances, the wider community.

2.2.3 Behaviour and unintentional outcomes:
Similarly, mindful design, design for healthy behaviour, community or collectivist social marketing, and socially responsible design each utilise more altruistic and collectively-minded persuasion techniques, but can be altered to integrate underlying individual, political and social agendas. Even the unintended effects of a design – those beyond the immediate use and function (Tromp, Hekkert, & Verbeek, 2011) – can, to the general user, be unknowingly deliberate to serve another ‘higher purpose’. Langdon Winner’s topical paper discussed this phenomenon using the now well-known example of the low hanging overpasses in Long Island, New York, that are thought to deliberately obstruct public transit buses from accessing Jones Beach. The consequence fell on those who relied on public transport – a higher majority from low socio-economic backgrounds. The suggestion is that this was a political manoeuvre to restrict access to Jones Beach to car-owning individuals, who at the time were from predominantly white, middle to upper class neighbourhoods. The darker underlying purpose was to perpetuate inequality (Winner, 1980). To use a less negative example, Bruno Latour describes the varying collective and individualised effect of inscriptions on more unassuming objects in the context of prescriptions (affordances or actions intended by the object) and subscriptions (how users interpret the prescriptions) (Latour, 1994). The ‘slow down to be responsible’ inscriptions on speed bumps are thought to lead to a collectivist ‘slow down to be safe’ prescription, and an individualised ‘slow down to avoid damaging my car’ subscription (Tromp et al., 2011). The park bench is another example that highlights the seemingly innocent object as a source of social contention, in this case around unintended use and the ability of homeless people to utilise the bench as a bed (Rosenberger, 2014). Our own research into hand hygiene compliance auditing showed how a Hawthorne effect can lead to false positives.

2.2.4 Managing collectivism:
The notion of collective versus individual strategies brings to bear the associated consequences of pursuing one over the other. Despite the lack of personalisation – which will not appeal to some – a collectivist approach could have a herding effect. While society is made up of individuals, the
Collective power of small individual contributions towards a mutual goal can be a powerful tool for political and societal change. Conformist influence is a persuasive tool that reinforces the behaviour of a larger group via the actions or directions of a higher entity – perhaps a political entity (Simons & Jones, 2011). Therefore, the strategy is to persuade a larger majority to conform to certain behaviour by highlighting the value of small individual successes as part of a larger collective success. This may galvanise interest and desire, aiding longer-term assent to better behaviour (Izuma, 2013). Similar to the findings of a 2010 study, the design of social campaigns, including direct or indirect messaging to promote certain actions and behaviours (Wakefield, Loken & Hornik, 2010), may be pertinent to our hand hygiene and virtual hospital research. Alternatively, this can result in mindless and disassociated imitation that is devoid of learning or motive understanding.

At the very least, a common good approach such as this is consequentialist and still highly subjective. What is positive to some may not be to others, and therefore such a strategy is strongly susceptible to more utilitarian and egoist views of self-interest, and should therefore be expected and addressed. Further, reliance on heuristic and bias-based strategies are weak since it takes only a few influential leaders to change direction and turn their own and others’ positive behaviour into negative behaviour. We have seen prominent examples of hierarchical leadership in the hospital environment and susceptibility for one’s negative behaviour to influence personnel down the chain. Change needs to be underpinned with learning that enables people to understand the reasons why their behaviour is positive or negative. It is therefore advantageous to utilise herding secondarily as an attention strategy only, and instead focus on changing behaviour individually in a manner that is resistant to pack mentality and less dependent on what others think, say or do. We might leverage the tendencies of some people toward self-interest via the use of persuasion tactics, such as mutual benefit or vicarious reinforcement.

3 Design case studies:
The literature points to the potential of health behaviour change models to contribute to and inform approaches to co-design projects in healthcare. This is investigated through the application of these theories to two healthcare design projects; a project exploring hand hygiene compliance, and another investigating hospital care in the home.

3.1 Hand hygiene project:
3.1.1 Project background:
Evidence indicates the global cost of hospital acquired infection (HAI) is between USD$35.7–45 billion (Scott, 2009), and the World Health Organisation estimates that there are 80,000 deaths per year attributable to HAI in the United States alone (WHO, 2017). In perspective, HAI accounts for 5-10% of admission complications in developed countries and, in contrast, this figure increases between two and twenty times in developing regions, with some countries experiencing an HAI child death rate of 4,000 per day (WHO, 2017). Numerous approaches have sought to address hand hygiene compliance including: education and awareness, monitoring, product and system improvements, environmental initiatives and infrastructure (Pantle, Fitzpatrick, McLaws & Hughes, 2009). Yet the problem shows no signs of abating (Pincock, Bernstein, Warthman & Holst, 2012), and the socio-economic burden of HAI persists.
3.1.2 Research and methodology:
Our work on hand hygiene stems from a larger issue surrounding infection control, and how design-led research can identify problems and affect improvements through enhanced user experience, product or service design. Nevertheless, the discovery phase of the project provided greater insight and re-directed the thinking to a foundational problem of behaviour. The research involved a qualitative hospital study to extract stakeholder insights that inform an ensuing design activity. The research team observed and interviewed staff in an intensive care unit (ICU) and several general medicine wards, focusing on traffic flows, clinical and administrative interactions, interface between people and objects, as well as infection control procedures involving clinicians, nurses, cleaners, administrative and management staff (see Figure 3). Auditing was heavily scrutinised since we knew from national compliance data which clinical demographics performed hand hygiene poorly (clinicians were least compliant with an average 72.5% (52,631/72,595 moments performed) (HHA, 2016). However, if you compare people to context the results are different. Compliance in invasive settings is almost flawless, while wards see a comparatively sharp fall. It is suggested in the aforementioned studies conducted by King et al. that due to the Hawthorne effect during the audit process these numbers only capture a small snapshot of compliance. The real compliance rate may be significantly lower. The cognitive effect of being watched is similar to other examples of sensory determinants of behaviour. While these examples can provide an explanation for falling compliance, it may reveal the learning model that can be actioned and integrated for a new design intervention to ameliorate compliance. Sensory determinants are triggered by stimuli in the surrounding environment; but from that point forward there are other mechanisms and drivers that determine whether any action is taken, either positive or negative.
A key insight from the hand hygiene research was one of the first and more consistent barriers relating to the use of mainstay hand hygiene methods including ABHR, and soap and water. While there was also confusion as to why one method was used over the other, an interesting aspect related to the visual determinants of behaviour, and why staff wash their hands regardless of method. The suggestion was that hand washing was dictated by a state of visual or tactile cleanliness. In this instance, the action of washing hands is controlled by a sensory primer – feeling or seeing soiled hands. The drawback is intermittence and failure to recognise the often unseen and unfelt bacteria carried into patient bed areas. Sensory priming is already an issue here, exposing the lack of learning and reasoning for hand washing, and emphasising that behavioural design strategies should be unique to each circumstance. Consequently, we could reactively design for greater visualisation, or challenge the problem of risk recognition. Further analysis of this account indicated a lack of accountability or traceability of infection transmission back to poor hand hygiene practices by specific individuals; leading to a breakdown of direct risk relationship, and making the enforcement of hand hygiene an acute compliance issue. The lack of traceability was a direct result of the invisible nature of bacterial transmission, breaking the visual feedback loop that relates to problem identification. This finding was consistent with Hand Hygiene Australia survey data that identified visual cleanliness as one of the five major barriers to hand hygiene.

A past intervention was revealed during the interviews with administrative staff. A long-standing ward-clerk described a one-time educational experience conducted by the infection control team in 2010. A group of nurses and administrative staff were given a hand washing demonstration and asked to replicate. When complete, they shone a blacklight over each participant’s hands to reveal missed areas. Consistent with the Hawthorne effect, many exerted extra cleaning effort due to peer
scrutiny — yet, in almost all cases, the blacklight still revealed suboptimal cleaning. Many participants reported their disgust knowing this result has likely persisted for some time. The behavioural shift was an almost obsessive compulsive desire to hand wash. In this instance, we can hypothesise that visual and experiential shock has created a link between action and consequence driving a change in behaviour. This is an example of the complete embodiment of the four pillars, including attention (shock), retention (visualisation of the bacteria), reproduction (shock and disgust), and motivation (desire to improve safety for themselves and others). This hypothesis is further substantiated in a 2016 study, which tested the long-term change in compliance of individual wards by comparing a grown culture sample from each staff member’s hands (collected prior to commencement) to a graphic book of cultured bacterial images (Gregory, Chami, & Pietsch, 2016). Each ward group was exposed to the comparative images over a 10-day period with compliance rates actively audited. At the conclusion of the study the wards showed average improvements between 8.3% and 38.9% (see Figure 4). Yet the most significant finding was the post-test compliance audit, conducted six weeks after the initial 10-day study. Ward 3 initially improved 16.7%, however post-testing revealed sustained improvement, rising by a further 30.9% at the end of the two months. Similar to the blacklight experience, it is likely that the visual imagery has had a memorable impact on habitual learning, by installing a cognitive trigger to hand washing linked to a shock memory. In turn, the shock memory has established bacterial transmission as a higher ranking threat, appealing to the vicarious reinforcement system associated with punishment, and leading to more positive engagement with hand washing procedures. Therefore, the mental model has become more ingrained as a longer-term improvement in hand washing behaviour (Gregory et al., 2016).

<table>
<thead>
<tr>
<th>Unit</th>
<th>Benchmark Goal</th>
<th>Pre-Intervention Compliance Rate for Last 2 Months of Data</th>
<th>Mid-Way Compliance Rate (8/21/2015)</th>
<th>Completed Compliance Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
<td>80%</td>
<td>47.4% (June &amp; July)</td>
<td>58.3%</td>
<td>58.3%</td>
</tr>
<tr>
<td>F6</td>
<td></td>
<td>50.0% (June &amp; July)</td>
<td>58.3%</td>
<td>68.4%</td>
</tr>
<tr>
<td>G6W</td>
<td></td>
<td>33.3% (May &amp; July)*</td>
<td>50%</td>
<td>80.9%</td>
</tr>
<tr>
<td>B1</td>
<td></td>
<td>50.0% (April &amp; May)*</td>
<td>88.9%</td>
<td>68.8%</td>
</tr>
</tbody>
</table>

Figure 4 Education and Competencies. Source: Gregory et al., 2016

We can suggest that most people are influenced by visual stimuli that can alter their mental models. Yet the notion of selective perception theorises that ‘individuals select, organise and evaluate visual stimuli from their environment to provide meaningful experiences for him or herself’ (De Mooij, 2013). This might indicate that conscious visual awareness is subject to individual perception; and by extension what is impactful to one may not be to another. Exploring this further, if you have a universal problem that is not isolated to any person or group, then there are strategies aimed to elicit a collective reaction and, by extension, the opposite is possible for minorities or individuals. The shockvertising method uses violent, repulsive, confronting, lewd, terrifying, controversial, offensive, or politically incorrect images, scenes or videos to illustrate a negative outcome or a worst case scenario brought on by dangerous habits or antisocial behaviour (Parry, Jones, Stern, & Robinson, 2013). The example discussed in Figure 4 – while leading to a positive result – is not a practical means to change behaviour across a collective healthcare environment. The key insight from these examples is not shock imagery but rather the use of certain stimuli to attract attention and influence learning. The next step in the design phase is to experiment with varying stimuli and feedback methods to test behavioural resistance to hand hygiene.

Distinguishing between present (sub-optimal) and future (optimal) patterns of behaviour can affect the method and application of behavioural design. For example, hand hygiene compliance at present may be forced or unforced, and may or may not be performed regularly. We can see multiple issues here, and this can be the case for all design problems. Therefore, strategies for the design for health behaviour change need to be adjusted and applied to the correct problems.
3.2 Virtual hospital project:

3.2.1 Project background:
The Virtual Hospital Project aims to develop remote care for chronic heart and liver disease patients. The current healthcare system is not adequately equipped to digitally manage the needs of rural patients, and therefore the burden on the system and patient is significant. The WHO estimates that as of 2010, heart disease accounted for 17 million deaths per year with an associated annual global healthcare cost of $863 billion (Kelland, 2011). Using compound annual growth rate (CAGR) modelling – this cost is forecast to rise to $1.044 trillion by 2030 (WHO, 2017). To add significance, the sum cost over the next 20 years could exceed $20 trillion. For liver disease, the burden stemming from cirrhosis, hepatitis, and cancer accounted for more than two million deaths in 2010 (Byass, 2014), with some estimates that in Australia alone more than six million people are affected by liver disease, with the direct and indirect costs exceeding $51 billion in 2012 (Economics, 2013). This paper will introduce some key insights from an in-depth empathetic study that reveal unique challenges associated with a confronting illness. Analysis will introduce other concepts, including Ronald Roger’s protection motivation theory that will assess the notion of threat appraisal relative to declining health and the barriers to recognition, acceptance and positive control.

3.2.2 Research and methodology:
Similar to the hand hygiene project, our design research into remote healthcare – virtual hospitals – needs to draw on an understanding of behaviour change. The virtual hospital project – in collaboration with a major Australian hospital – is an experiential initiative to identify how to design remote care for chronic disease patients and the scope of this study was limited to chronic liver and heart disease patients. Analysis of the early background and competitive landscape findings helped categorise existing offerings into four segments, ascending in order of complexity and efficacy:

1. virtual information and diagnostic systems (access to online information, data libraries, blogs and forums);
2. online medical consulting services (greater accessibility particularly to rural and low socioeconomic areas);
3. discontinuous virtual monitoring (limited home monitoring supported by a central hospital hub); and
4. autonomous real-time virtual monitoring (full-time at-home virtual monitoring via smart devices that may digitally diagnose or provide real-time feedback on issues as they occur).

This preliminary categorisation helped focus the attention towards finding failures and areas of opportunity in the ensuing empathetic research. The hospital-based empathy study was a deep dive into the lives of some highly complex patients. The issues extended beyond the directly related causal issues of their disease and include five key areas:

1. lifestyle (exercise and support systems, and diet including medically diagnosed intolerances as well as self-enforced dietary philosophies);
2. culture (varying ethnic and religious backgrounds are strongly interdependent on other problem areas listed here);
3. logistics (geographic circumstance, transportation and the added effect of disability);
4. cognition (capacity and capability – understanding and willingness to embrace one’s diagnosis – trust and rapport with medical support networks); and
5. language (varying across ethnic and cultural backgrounds and how this is managed and provided for in current practice versus the implications for remote healthcare).

The immersive experience was both visual and verbal, and provided access to clinic-based interviews within the hospital, as well as selected home visits (see Figure 5). The studies gave a state-of-life snapshot of each patient, giving detailed insight in to their lives as people and patients. The at-home environmental experience was different to the sterile, professional confines of the outpatient clinic.
where we had earlier conducted interviews. Their comfort and control at home was evident with evocative storytelling describing their ‘new normal’ in light of their changing health circumstance. This experience provided the foundational data to identify the drivers behind the four pillars of learning for a diverse group facing the common threat of a potentially life-limiting illness.

![Patient Case Study | Virtual Hospital Project](image)

Figure 5 virtual hospital empathetic research study – patient at-home interviews and observations producing journey maps and routine based touch point data.

### 3.2.3 Storytelling and empathy building:

A particularly illuminating opportunity presented itself via the lead clinical champion for this project and the lead clinician for a now deceased patient. The introduction was to the daughter of the deceased who had, during his illness, became his full-time carer. She described her experience in detail, sharing photos and stories. We learnt of the toll that caring for a parent had on her life. She had become an expert in her father’s chronic disease, and this had an interesting effect. In one way, she learnt to navigate the often complex and confusing doctor-patient experience that would become routine; in another, it was debilitating being the pseudo-medical translator for her family. Providing answers was an undesirable by-product of devoting herself to full-time care. Upon her father’s eventual transition to palliative care, he asked some simple yet poignant questions: ‘Why is the experience better when palliative care stepped in? Why do you have to die to have a better experience?’ She described the nuances surrounding public versus private care, with particular focus on the mutually frustrating experiences across healthcare. The lack of personalised care and empathy, the exasperation of exhaustingly long hospital visits that increasingly felt reminiscent of a factory. We extracted huge amounts of raw insight from her experiences; particularly what was difficult, trying and unsatisfying. The hospital aims to extend life and yet, in many instances, usurps much of this extra time in unnecessary inefficiencies, leading to frustration and disengagement in the system. At the core of this project is remote care and the ability to provide life-extending medical care with vastly reduced contact. Yet, just because technology exists, doesn’t mean people want to use it; rather, they must be willing and educated. If we do not address the willingness, desire, motivation and ability, then the current experience will be much the same as the future experience.
3.2.4 Behavioural design analysis:
The relative complexity of this project is strongly multifaceted, including the intricate natures of healthcare, systems and technology, as well as the endless behavioural variance among patients and people connected to healthcare. As discussed, the primary test is not just to identify and design for one individual, but rather designing individualised solutions for the collective. The empathetic research study highlighted numerous cases of ambivalence, disengagement, poor understanding, frustration, loss of trust and rapport, difficulty embracing or accepting diagnosis, and a loss of control and proactivity. There is an excessive reliance on the healthcare practitioner to manage the patient, with some patients reporting a state of detached agreement during consultations despite a complete lack of understanding. Yet, due to the complex circumstance of today’s healthcare system, the responsibility is difficult to place. Clinicians (in many of the cases observed) lack the time, drive, tools and ability to communicate on an individual level; while many patients fail to recognise that they must play a role in their own care. It is proposed in this paper that under a consumer-driven model, healthcare from a patient’s point of view should be transactional and treated like any other service. Self-regulation may be a helpful strategy to learn, accept and then take control of one’s disease management. Boekaerts defines self-regulation ‘as a sequence of actions and/or steering processes intended to attain a personal goal’ (Boekaerts, Zeidner, & Pintrich, 1999). In other words, the hypothesis posits that self-regulation is the process to control one’s behaviour over time and across different contexts to accomplish a set of goals (Boekaerts et al., 1999). This links to a slightly different model of health behaviour to that of Bandura. Rosenstock’s health belief model (Rosenstock, 1974) as well as Rogers’ protection motivation theory (Rogers, 1975), engages the significance of ‘threat appraisal’ when deciding to change behaviour. Boekaerts describes threat appraisal as ‘a combination of perceived susceptibility to a certain disease (e.g. lung cancer) when continuing the current, unhealthy, behaviour (e.g. smoking) and the perceived severity of that particular disease’ (Boekaerts et al., 1999). Yet, as observed during our research, there is a circumstantial breakdown in reception to a diagnosis, leading to delays or barriers to the strategy of self-regulation. Equally, there are ways to reimagine the doctor-patient relationship to reduce instances of disengagement and negate the loss of patient control. B.J. Fogg discusses persuasion technology as a
means to influence decision-making and engagement with design, and outlines the seven core persuasion tools: reduction, tunnelling, tailoring, suggestion, self-monitoring, surveillance, and conditioning (Behringer & Øhrstrøm, 2013). Increasingly, these persuasion techniques have become digitised and today feature prominently online. For example, Amazon utilises suggestion via their recommendation system to buy more books and other products; CodeWarrior.com uses a reduction strategy to simplify and promote learning how to write code; and various software companies use tunnelling during the user installation process to lead people through a series of stepped actions or events that often integrate advertising (Fogg, 2002). A reductive and tailored approach could be explored to address some of the initial and enduring side-effects of patient-doctor disengagement and misunderstanding that were prominently exposed during the virtual hospital research. These are examples of the broad areas of focus in remote care for chronic illness and how behaviour needs to play a significant role in the design of products, systems and processes.

4 Conclusion

This research, while utilising mainstream design discourse, including co-design, is equally an exploration into behavioural design as an experiential practice of informed trial and error. By shifting the mindset of the designer to consider how observation leads end-users to learn (relative to cognitive ability), and the ensuing drivers and motivators to retain and implement better practices, the intended use of a design may be more successfully followed over the long-term. The correlation between forced action and the relative susceptibility to resistance, and thus the failure of a design, identifies that some people are less receptive to instruction. Therefore, following Bandura’s social learning theory, we can look at different ways to design such as persuasion, vicarious reinforcements, or the constructs of another theory for health behaviour change. Applying end-user empathy building as the data source is a provocation for change, through the exposure of shortcomings and the ambivalence and failure of existing solutions. The inclusive nature of end-user immersion leads to stakeholder engagement and relationship forming that can reduce siloing, and provide an opportunity to take people on a journey through the co-design framework. It is reassuring as an end-user to know that a fellow end-user was involved and given a voice in the design process, which – as suggested by several interviewees in our hospital studies – is a peculiar proposition to front-line staff in historically hierarchy-led organisations. Therefore, there is a strong argument that a co-design framework should form the overarching approach for experiential design to enable a robust behavioural investigation to take place. We speculate that using co-design methodology can more easily identify and distinguish problem from causation and, using key behavioural design methodologies, design solutions that fulfil a pre-determined and desirable outcome. This co-design approach can be meaningfully enhanced by understanding the fundamental behaviour change literature, to create a more robust approach for the design of behaviour change in healthcare.

5 References

Sanders, L., & Stappers, P. J. (2012). *Convivial design toolbox: Generative research for the front end of design:* BIS.

About the Authors:

**Kieran John** is a Project Officer in design at Monash University. His research covers medical devices and experiential design in healthcare with a keen interest in community impact and research translation.

**Daphne Flynn** is a Practice Professor and Director of Monash Universities Health Collab – a health and wellbeing design research lab focusing on devices, service and experiential design. She has considerable prior industry experience working as Design Lead for Philips Asia-Pacific.

**Mark Armstrong** is a Practice Professor and Creative Director of Monash Universities Health Collab – a health and wellbeing design research lab focusing on devices, service and experiential design. He has considerable prior industry experience as the Founder and former Director of Blue Sky Design Group.