Designers' Understanding of Changing Human Behaviour

This thesis is submitted to the University of Cambridge for the Degree of Doctor of Philosophy

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- This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the Preface and specified in the text.

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Abstract

A review of design models for behaviour change established that although design with an intent to change human behaviour is a topic under discussion, there is a need to understand better the perceptions that professional spatial designers hold on human behaviour and how to influence it. Therefore this thesis aimed to **identify designer's perceptions on what can change human behaviour** [RQ1], to **isolate what may inform their perceptions** [RQ2], and to **establish in what ways these perceptions compare with existing human behaviour theory** [RQ3]. Multifaceted interviews were conducted with spatial designers who self-identified as practising in Design for Behaviour Change [DfBC]. Within method triangulation and thematic analysis identified nineteen distinct *experiential concepts* which indicate how designers think that user-occupants might experience intentional design. These concepts have been connected to *human behaviour theory* to identify some theories that can inform design for behaviour change. In addition the analysis identified four *mitigating factors* and five *perception determinants* that inform real world design strategies for behaviour change. Synthesis of these findings represents an entirely different way of thinking about the phenomenon of DfBC in that it separates "what" (the experiential concept) from "why" (human behaviour theory) to make sense of it. Coupling an experiential concept with an applicable human behaviour theory creates a *behavioural lever* that better targets specific behaviour. Some of the theories can influence more than one behaviour factor depending upon the experiential concept that is applied in the design. It is the behavioural levers (the combination of an experiential concept with a human behaviour theory) that creates a more complete understanding of DfBC. The results are diagrammed in a framework for designers and researchers to use.

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Table of Contents

List of Tables

List of Figures

1 Design for Behaviour Change

1.1 Introduction: The Value of Design for Behaviour Change

Winston Churchill acknowledged that the built environment wields a degree of power over public behaviour when he said, "we shape our buildings, and afterwards our buildings shape us." Municipalities are realising the potential of shaping environments to encourage behaviour that promotes public health and well-being and recent projects include such objectives. UK Ministers have created a Behavioural Insights Team to inform government policies using psychology and economics (Wright, 2015). Designers are being called upon purposefully to influence user's behaviour yet designing spaces for behaviour change is a relatively new field under development. These conditions result in designs for behaviour change that do not reliably produce the desired effects.

It is the behaviour of people that determines whether interventions for economic, social and environmental issues succeed. One example is found in a number of communities that are being built to increase social and environmental awareness, in hope of helping people adopt sustainable practices (Williams & Dair, 2007; Hadfield-Hill, 2013). Yet recently the daily workings in a flagship sustainable community reveal that establishing ecotechnologies is not sufficiently changing people's behaviours when the occupants are passive rather than actively engaged with the context. The study further notes that there is a gap between ecofriendly technologies and users (Hadfield-Hill, 2013). It goes on to assert 'that the built environment has a significant role within [the knowledge-action gap]' and can even inhibit sustainable behaviours, acknowledging that the built environment impacts people's behaviour (Hadfield-Hill, 2013).

In another example from 2013, 221 people fell onto train tracks in Japan. This was an increase of 100% over the previous 10 years. Experts assumed that the accidents occurred when an inebriated traveller walked parallel along the edge of a platform, lost their footing and fell onto the tracks. The West Japan Railway Company conducted a 2-year study to verify the particulars. They found that the assumption of experts accounted for only 11% of the incidents. In the other 89% the victims had been sitting on benches that faced the tracks before getting up and walking forward over the edge. One data scientist reported that victims fell onto the tracks within seconds of standing up (Johnny, 2016). It appeared that they were inebriated and that their forward momentum coupled with their slowed reaction time propelled them onto the tracks. Train stations throughout Japan plan to retrofit barriers on platforms to prevent such accidents; however this is a slow and expensive process. They needed a more immediate solution. Since victims began walking forward from benches facing the tracks, designers reoriented the benches 90° so they were no longer perpendicular to the tracks, giving travellers time to get their bearings before approaching the train. This example illustrates that we need to reconsider our assumptions about human behaviour when it comes to design.

Another example can be seen in managing traffic congestion in the United States. In an effort to relieve overcrowded roads many cities expanded their freeways by adding more lanes. It was an expensive and time-consuming solution based on the assumption that more lanes would provide more room for vehicles thereby speeding up traffic. However the same congestion if not more resulted. Multiple studies have since shown that there are two human behaviours responsible. With additional options available drivers change lanes more often, and in anticipation of clearer roadways more people drive more often (Handy,

2015). Human behaviour is again the determining factor in the success of the design solution.

Design aims to solve the problem of how to get from an undesired to a desirable situation (Simon, 1996). How people interact with their surroundings has a direct impact on whether a situation is desirable. In the above examples: sustainable technologies in the UK, freeway expansion in the United States and orientation of benches in Japanese train stations, design solutions were based on faulty assumptions. The assumptions seemed reasonable, but human behaviour produced unintended consequences.

1.2 Scope of this Research Project

In some ways designers already address human behaviour. Examples can be seen when ropes trigger orderly cuing, turnstiles prompt payment before embarking on a train, and car park lines effectively organise vehicles within the available space whilst allowing cars to come and go. Since designers bear the sobering responsibility of affecting people's behaviour (Jelsma, 2006), it would be good to better understand what practitioners know and how that compares with what is known in design research and study of human behaviour.

Designing spaces for behaviour change draws from the understanding of both human behaviour and design. It is not that human behaviour lacks research. Psychology has been building an understanding of human behaviour and how to predict it for over a century; however, this information is not readily accessible in the design domain. Translating concepts derived from established theories of human behaviour into physical design

requires additional understanding. Thus design researchers have been developing models to guide designers and improve designs that target behaviour (Norman, 1986; Fogg, 2009; Michie, van Stralen & West, 2011; Lockton, Harrison, Holley & Stanton, 2009; Tromp & Hekkert, 2014). However there has been little inquiry into the understanding that informs the strategies used by practising spatial designers' especially architects.

This thesis aims better to understand what informs designers' perceptions of how to affect behaviour. It seeks to produce a framework that includes practitioner understanding and its relationship to human behaviour theory and design research. It does not try to produce a coherent model of behaviour. It does not look at the design process nor behaviour change strategy efficacy. This study will explore the perceptions of practising spatial designers (specifically architects) concerning how to target a behaviour. It aims to **identify designer's perceptions on what can change human behaviour** [RQ1], to **isolate what may inform their perceptions** [RQ2], and to **establish in what ways these perceptions compare with existing human behaviour theory** [RQ3].

1.3 The Researcher

The researcher "has a background in sustainable design, business management, community outreach, computer programming, and building construction. She studied Architecture at the University of New Mexico (US), where she chaired the energy conservation team for the Sustainability Studies Program, attended professional AIA state board meetings as the Student Liaison, and served as president of Tau Sigma Delta" (Institute for Manufacturing, 2016). She practised design professionally for one year, experience which confirmed that human behaviour contributes to people's quality of life

and safety, and it impacts the success of potential solutions to such challenges. She continues to examine how design can help people change their behaviour in order to better their individual lives and the collective future.

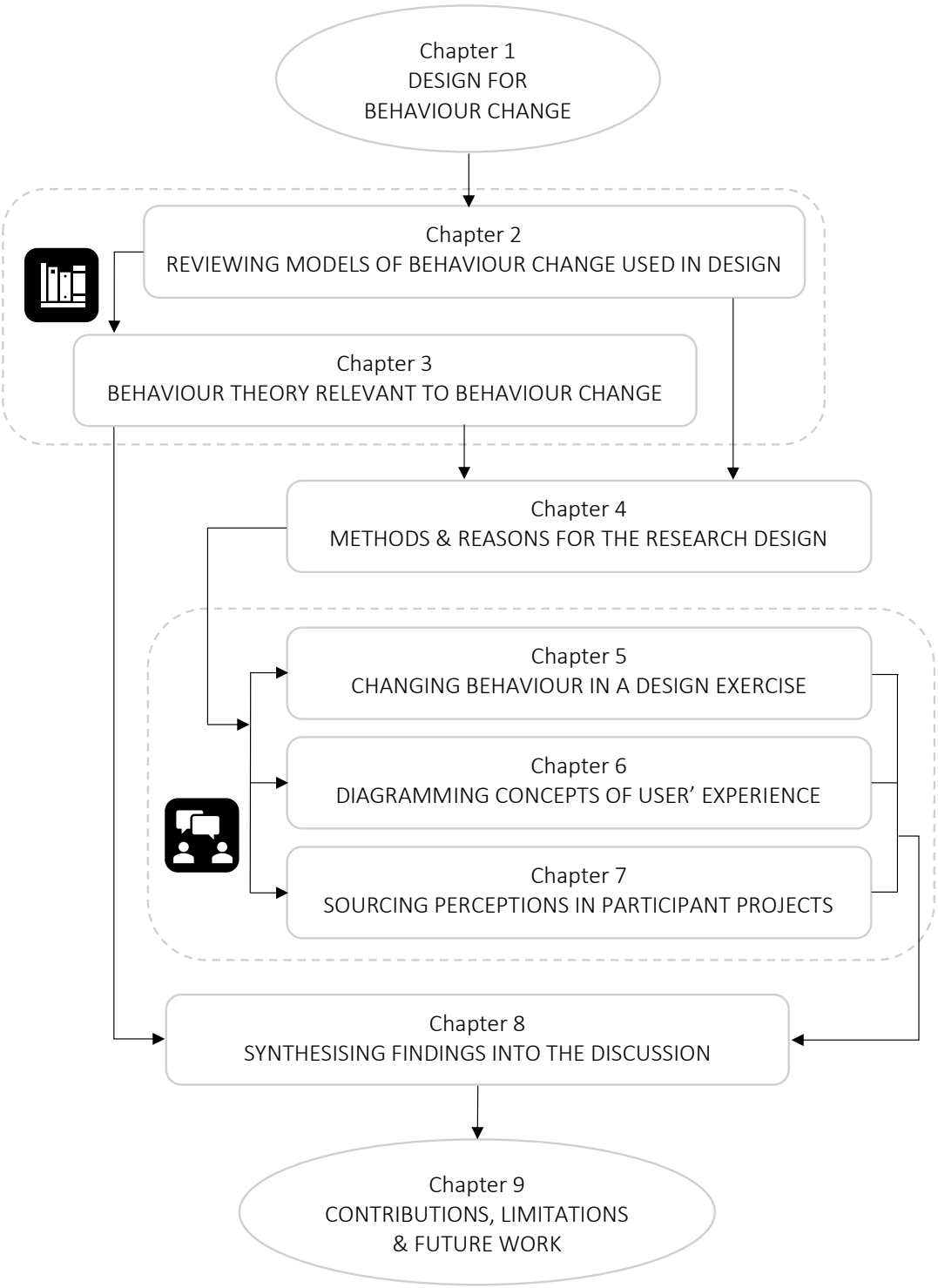

Figure 1.1 **Conceptual Map of Thesis.** Each chapter is integral to the final framework.

1.4 Overview of the Thesis

The thesis is divided into nine chapters as shown in *Figure* 1.1. Chapter one explains the need for a study. Chapter two reviews models that address design and human behaviour which establishes a definition for behaviour and informs the research questions. Chapter three identifies 16 human behaviour theories with potential to inform design for behaviour change. Chapter four describes the methods used to answer the research questions. Chapters five through seven present findings from three different interview phases. Chapter five presents a design exercise which finds four concepts that describe how users experience intentional design from a designer's point of view. Chapter six uses a visual method with the four concepts from chapter five plus four more from theory found in chapter two. It finds 23 potentially distinct concepts to describe what practitioners think their users experience from intentional design. Chapter seven presents findings from practitioner projects which confirm contextual aspects and identify perception determinants and mitigating factors that inform design practitioners' strategies for behaviour change. Chapter eight synthesises all of the above work into a comprehensive framework that examines the phenomenon of design for behaviour change in a novel way. Chapter nine concludes the study by presenting contributions, limits and potential future work.

2 Reviewing Models of Behaviour Change Used in Design

2.1 Introduction: Chapter Content and Layout

The first chapter established that people's environment affects their behaviour. It presented a need to improve our understanding of how to design objects and spaces that positively influence behaviour. An increased interest in how to use design to change behaviour has stimulated a relatively new field of research, Design for Behaviour Change [DfBC] (Niedderer et al, 2014). Models and approaches are being developed that may help designers change peoples' behaviour. This chapter introduces five key models that address design and human behaviour. It examines their contributions and what can be further added to the discussion.

Databases	Scopus, Web of Science, Google Scholar
Search Terms	Human Behaviour, Human Behavior, Design, Design for Behaviour Change, Design for Behavior Change
Filters	Engineering, Business, Computer Science, Environmental Science
Models	User-Centred Design (Norman, 1986) Emotion Design (Desmet, 2002) User-Centred Design for Sustainable Behaviour (Wever, van Kuijk & Boks, 2008) Design for Sustainable Behaviour (Lilley, 2009) Fogg Behaviour Model (Fogg, 2009) Design with Intent (Lockton, Harrison, Holley & Stanton, 2009) The Behaviour Change Wheel (Michie, van Stralen & West, 2011) Mindful Design (Niedderer, 2013) Socially Implicated Design (Tromp & Hekkert, 2014) Design for Healthy Behaviour (Ludden & Hekkert, 2014)

Table 2.1 **Database Searches.** The search terms and filters were supplemented by reverse referencing key articles.

Models were found by first searching databases such as Scopus, Web of Science and Google Scholar using a variety of relevant search terms and filters (*Table* 2.1). Once a model was found others were cross-referenced until models were no longer forthcoming. It should be noted that the term model is used here to also include methods. Both are applicable because the latter might inform the former. At the time of this search there were few models or approaches to design for behaviour change. Several of the models/methods focused on specific types of behaviour or were not as applicable to spatial design. Five of the models were chosen for their contribution to influence human behaviour in general, rather than concentrating on specific types of behaviour. Each model was chosen for complementing the discussion of how to use design to change behaviour from a slightly different point of view (*Table* 2.2).

Model	Point of View	Reference
User-Centred Design [UCD]	Usability of products	Norman (1986)
BJ Fogg's Behaviour Model [FBM]	Human Computer Interface applications, Persuasive technology	Fogg (2009)
The Behaviour Change Wheel [BCW]	Behaviour change interventions in healthcare	Michie, van Stralen & West (2011)
Design with Intent Method [DwI]	Industrial design of products	Lockton, Harrison, Holley & Stanton (2009)
Socially Implicated Design [SID]	Design to address social problems	Tromp & Hekkert (2014)

Table 2.2 **Five Models Addressing Design & Behaviour.** Key models or methods intended to aid design for human behaviour.

Chapter two is divided into seven parts:

2.1 Introduction: Chapter Content and Layout

2.2 User-Centred Design: Behaviour Facilitated

2.3 BJ Fogg's Behaviour Model: Behaviour Simplified

2.4 The Behaviour Change Wheel: Behaviour Identified

2.5 Design with Intent Toolkit: Practical Design Suggestions

2.6 Socially Implicated Design Method: Behaviour and Societal Needs

2.7 Observations in Prior Work and Gap in Knowledge

The chapter then compares these models to explore their cohesion, and findings are compiled in a preliminary framework.

2.2 User-Centred Design: Behaviour Facilitated

Industrial design engineer and cognitive scientist Donald Norman applied the theory of affordances (taken from psychology) to fostering the usability of products. According to Norman, Gibson's theory of affordances can help designers communicate the proper use of an object or environment. The underlying theory will be explored in chapter four (*Chapter* 4.4 The Adaptive Unconscious and Human Behaviour). The term User-Centred Design [UCD] or User-Centred Systems Design [UCSD] became widely used for a design process that considers the user's perspective when designing (Norman & Draper, 1986). In his book *The Design of Everyday Things*, Norman stressed that designers need clearly communicate to users how to interact with an object or environment (Norman, 2002).

> *'Well-designed objects are easy to understand. They contain visible clues to their operation. Poorly designed objects can be difficult and frustrating to use. They provide no clues – or sometimes false clues'* (Norman, 2002).

To illustrate imagine approaching a door with a pull handle. Although the handle can be used in other ways, most people intuitively grasp and pull to open the door (Norman,

2002). This behaviour is automatic. Likely seeing the handle and what action it affords happens without conscious thought. The door handle affords pulling which is appropriate if the door swings towards the user; however something else occurs if a door does not respond as expected when pulled. Now the user must direct conscious thought to opening the door. The individual moves from natural interaction within their environment to consciously figuring out the next step. Norman stressed that good design communicates to the observer how to use it. In the case of door handles, good design would specify pull handles on doors that open towards users and push mechanisms on doors that swing away from users (Norman, 2002). Norman emphasised that "good design requires good communication" (Norman, 2013).

Whether designers are conscious of it or not their designs are communicating with users, hence their design decisions can influence whether or not people understand an object or are even able to use it. In 2004 Crilly, Moultrie and Clarkson established a framework within which to model that communication from designer through the physical world to the user and their response (2004; *Figure* 2.1). Although it was designed for a single product and does not attempt to explain behaviour nor how to change it, this framework delivers a visual way in which to consider how behaviour is influenced by design decisions.

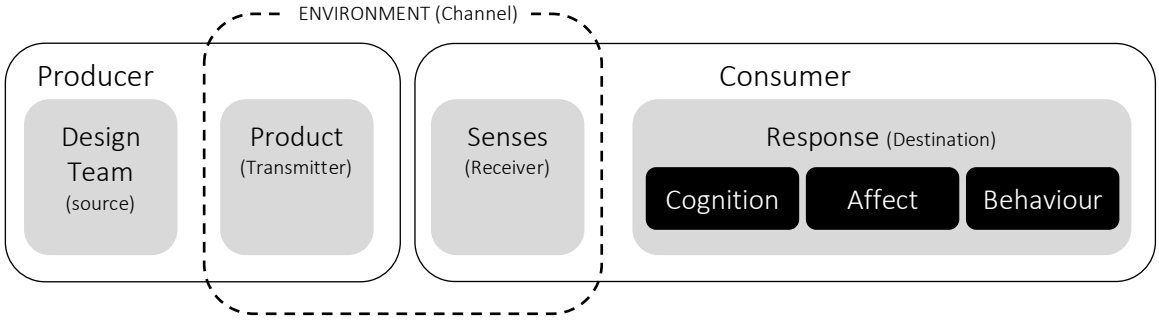

Figure 2.1 **Basic Framework for Design as a Process of Communication.** This framework shows the consumer receiving a design team's communication through a single product (Adapted from Crilly, Moultrie & Clarkson, 2004).

Norman proposed that applying affordances and constraints can communicate possible user interactions at any given time. He recommended that designers consider four principles to create products that people can understand and use: [1] make the state of the device and possible user actions visible, [2] provide a consistent conceptual model of use, [3] make relationships between actions and outcomes obvious, and [4] give user continuous feedback on the results (Norman, 2002). According to Norman in addition to communicating evidence of its uses, good design gives feedback to the operator on what has transpired or is currently happening (Norman, 2002). A user needs feedback to understand the present situation in the real world. This feedback is especially important when things go wrong since it is difficult for the user to know how to proceed if they inaccurately comprehend what happened or how the design works. In theory a designer should be able to use affordances and constraints effectively to make a behaviour more or less troublesome and therefore more or less probable. For example a constraint can communicate user difficulty, like caps on medication bottles to make it less likely that the medication will be consumed unwittingly by a child (Norman, 1986). However applying such concepts to design is not as straightforward as it would seem.

Norman observed that designers might assume an affordance is obvious to observers, even when their design does not directly indicate it. For example a push mechanism does not communicate clearly enough if it does not indicate on which side of the door to push (Norman, 2002). Thus Norman later clarified that affordances must be perceived to be useful, calling them *perceived affordances* if the possible interactions are obvious. If an affordance is not evident, he suggested designing a *signifier* to depict the affordance to an observer (Norman, 2013). For the push door having a right or left-handed push mechanism

indicates where to apply pressure to open the door (Norman, 2002). Norman also presented ideas on how to design visibility, conceptual models, mapping and feedback into a product. He recommended that designers take advantage of the knowledge available in the environment as well as what users already know; that designers make tasks simple, design for when things go wrong, and "when all else fails, standardize" (Norman, 1986). He suggested that designers thoughtfully consider what is needed to successfully execute an intended action (Norman, 2002).

Norman devised a seven-stage action cycle approximating how people 'do things' to help designers think through their design and how to communicate affordances to their users (*Figure* 2.2). First someone has [1] a need which informs the goal. Then the execution phase can happen without conscious thought. The person [2] decides how to satisfy their need, [3] the order of what to do to get from where they are to where they want to be, and then [4] they act on it. In the final phase a person evaluates whether they have achieved their intended outcome by [5] sensing the situation, [6] interpreting what they find, and [7] comparing it with their goal. He labeled the three phases [1] goal, [2] execution, and [3] evaluation. By reflecting on the user's perspective at each stage of use, a designer can determine when and what needs to be communicated to the user.

User Centred Design directs designing for the way the human mind works to reduce cognitive load on users. It has been compared with Human-Centered Design (HCD), which is "an approach that puts human needs, capabilities and behavior first, then designs to accommodate those needs, capabilities and ways of behaving" (Norman, 2013). Both UCD and HCD help designers apply the concept of affordances to their products and systems to

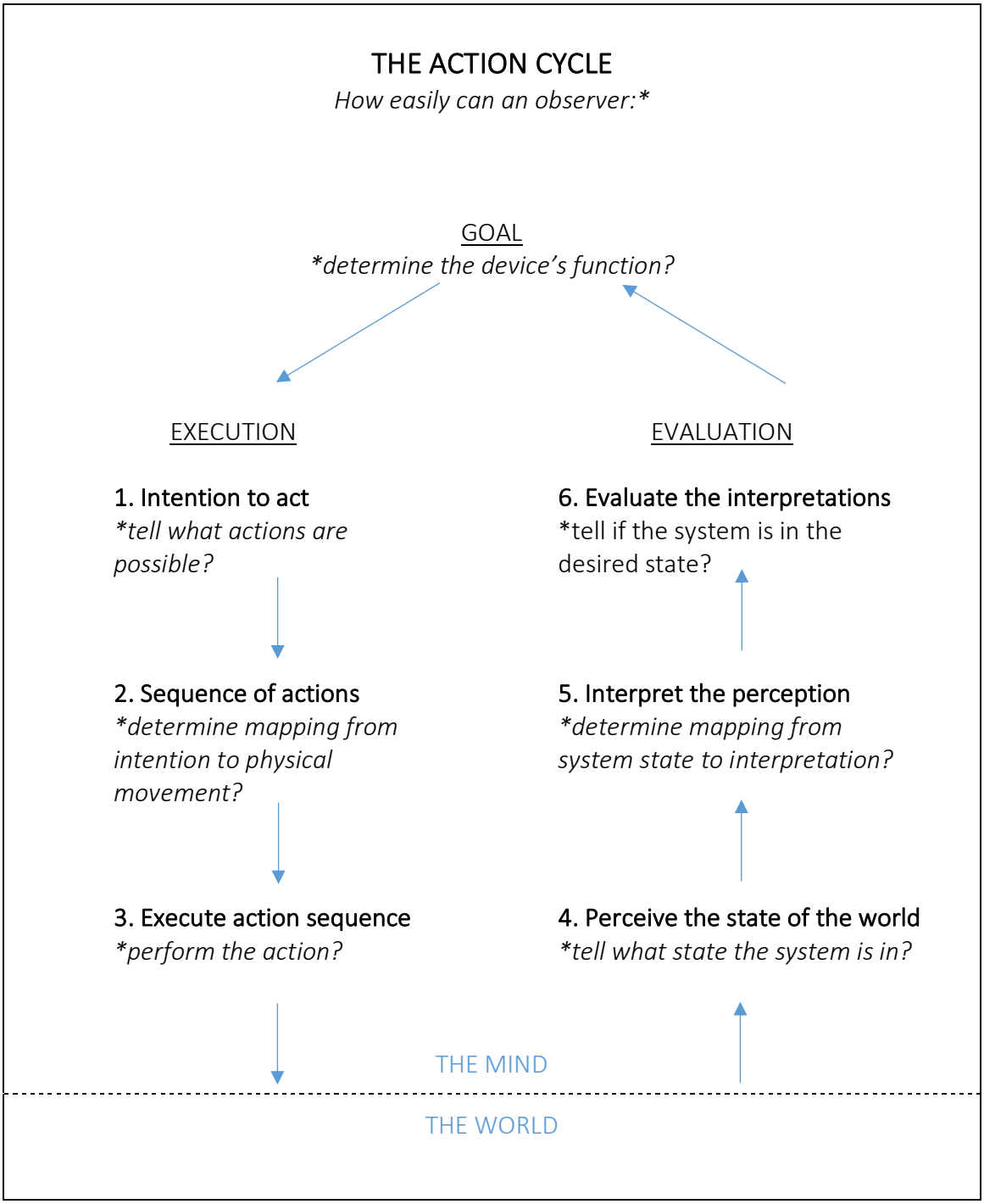

Figure 2.2 **The Seven Stages of Action.** The left column presents the Stages of Execution and the right the Stages of Evaluation. *Questions to check for clarity in a design's communication (Adapted from Norman, 2002).

make them user friendly. Although UCD considers the perspective of the user, the process is again focused on physical objects and making the interaction simpler for the user. The focus is not to change behaviour of users, but rather to improve the natural interaction

within their environment. However applying affordances might be employed to change behaviour. From a design perspective it would necessarily focus on the physical objects and how well their intended use is understood by observers. Convenience coupled with understanding might not be enough to cause a change. There might be mechanisms beyond affordances to influence human behaviour.

2.3 Fogg's Behaviour Model: Behaviour Simplified

In 2009 behaviour scientist B. J. Fogg devised a behaviour model to help designers influence user' behaviour (Fogg, 2009). Fogg's Behaviour Model (FBM) indicates that a behaviour is a result of a sufficient level of three converging factors: [1] motivation combined with [2] ability to perform a specific behaviour, and a [3] trigger to set things in motion. In his model adequate motivation and ability in a given behaviour are correlative (*Figure* 2.3). The easier a behaviour is to perform, the less motivation is necessary to act. Fogg suggested that ability is determined by the relationship between six elements of simplicity, each representing different attributes of the individual's self and context: [1] time, [2] money, [3] physical effort, [4] brain cycles, [5] social deviance and [6] non-routine.

There can be trade-offs between the attributes. For example someone may spend money to save time or vice versa. As a behaviour becomes more difficult greater motivation is required to overcome the challenge of performing it. Fogg proposed three possible kinds of motivation, each with a positive and a negative aspect: [1] sensation (pleasure/pain), [2] anticipation (hope/fear), and [3] belonging (acceptance/ rejection). An individual's level of motivation naturally cycles up and down. Rather than trying to adjust motivation levels

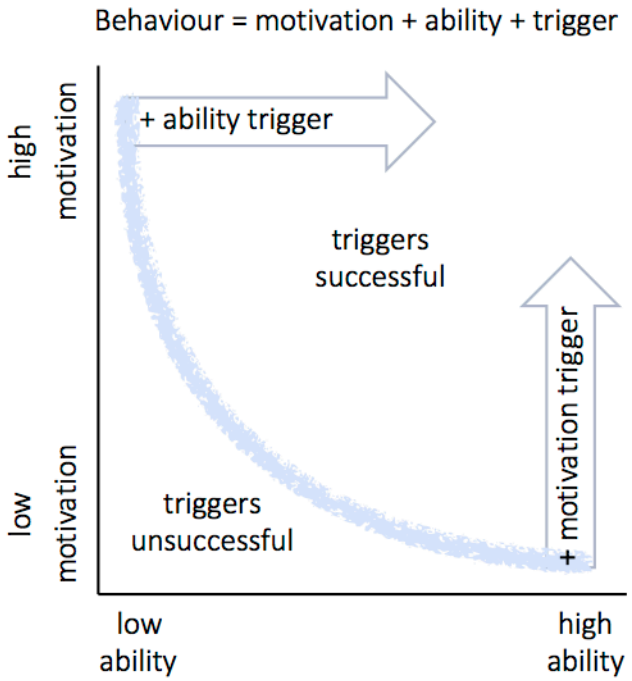

Figure 2.3 **The Fogg Behaviour Model.** When motivation and ability are sufficient a trigger will begin the behaviour. (Adapted from Fogg, 2009).

Fogg recommended working within these cycles to make change successful. When motivation is high a person can tackle more challenging behaviour changes than when motivation is low. For example if a child has low motivation to get dressed, that is not the time to teach a new behaviour like shoelace tying. Wearing slip-on shoes seems accomplishable whereas putting on shoes that require learning a new behaviour like how to tie laces may require too much effort. The time to learn the more difficult task of tying shoelaces is when the child's motivation is high. Fogg stressed that using periods of high motivation to create the structure for a behaviour will increase propensity to perform the behaviour even when motivation is lower. He further stated that a trigger is necessary to initiate the behaviour (Fogg, 2009). He defined three types of trigger: [1] spark, [2] facilitator, and [3] signal. A spark is a stimulus associated with motivation, a facilitator is one related to ability, and a signal is a reminder to perform the behaviour when motivation and ability are already suitable. According to Fogg even when motivation and ability are sufficient the behaviour will not proceed without a trigger.

Fogg and Hreha later developed a behaviour grid that classified behaviours into 15 types according to two factors: [1] whether the behaviour is new and unfamiliar or familiar

(represented by colours), and [2] for how long in the future the behaviour is to be performed (represented by symbols) (*Table* 2.3). The grid also accounts for intensity or duration of behaviours. The intensity or duration of a familiar behaviour can be increased (purple), decreased (grey), or a behaviour can be stopped altogether (black) (Fogg & Hreha, 2010). Fogg later added Echo Behaviours as an additional qualifier to represent an ongoing commitment, and any of the 15 behaviour types can also fall within this category (Fogg, 2015). For example signing up to go to the gym is a dot behaviour, whilst the ongoing membership commitment becomes an Echo Behaviour. The grid provides a way for designers to define a behaviour to determine the best approach for changing it. If the target behaviour was to stop smoking, the designer could first set a behavioural goal to decrease intensity or duration (grey) before moving on to quitting altogether (black). In the case of a child's tying her shoelaces for the first time, a designer would define whether the behaviour was new and unfamiliar (green) or familiar (blue). The designer would also need to know whether this behaviour was to be performed once (dot), temporarily more than once (span), or whether it would be a permanent change (path). A difficult behaviour can be made easier by changing the environment or by defining achievable steps, which can give a person the satisfaction and confidence to continue making progress. Fogg called it forming "tiny habits" (Fogg, 2015). Not all behaviours are the same and simplification for one may be different from simplification for another.

Fogg has developed and continues to develop a variety of tools to help designers use persuasive technology to target behaviour change. He has introduced the Fogg Method as

a systematic way to use his various tools (Fogg, 2013). The Fogg Method prescribes three steps: [1] get specific (define the behaviour), [2] make it easy, and [3] provide a trigger (Fogg, 2013). His website offers additional tools to walk designers through each of these steps.

Fogg's overall strategy for changing behaviour seems to focus on simplifying the behaviour by either breaking it down into manageable parts or changing the environment or both. The Behaviour Grid appears to categorise behaviours in a way that clues designers in to whether it requires greater motivation or ability. Simplifying the desired behaviour increases user' ability to perform it. The combination of ability and motivation seem to

FOGG BEHAVIOUR GRID	Green behaviour New unfamiliar behaviour	Blue behaviour Familiar behaviour	Purple behaviour Increase behaviour intensity or duration	Grey behaviour Decrease behaviour intensity or duration	Black behaviour Stop a behaviour
Dot behaviour one-time	GreenDot Do new behaviour one time	BlueDot Do familiar behaviour one time	PurpleDot Increase behaviour one time	GreyDot Decrease behaviour one time	BlackDot Stop doing a behaviour one time
Span behaviour has duration	GreenSpan Do new behaviour for a period of time	BlueSpan Do familiar behaviour for a period of time	PurpleSpan Increase behaviour for a period of time	GraySpan Decrease behaviour for a period of time	BlackSpan Stop a behaviour for a period of time
Path behaviour from now on, permanent change	GreenPath Do new behaviour from now on	BluePath Do familiar behaviour from now on	PurplePath Increase behaviour from now on	GrayPath Decrease behaviour from now on	BlackPath Stop a behaviour from now on

Table 2.3 **B. J. Fogg Behaviour Grid**. Mapping 15 types of behaviour change. (Adapted from Fogg, 2010).

suggest a level of readiness to perform a behaviour. Plotting a behaviour on the FBM indicates a potential level of readiness to perform so that an appropriate trigger can set events in motion. Although Fogg associates his model with psychological theories, the connections are not detailed (Fogg, 2016). His strategy for changing behaviour is related to the theory of affordances by establishing possible interactions, and the focus is again on making a behaviour easy to perform. Besides simplification through affordances, there may be other strategies for changing human behaviour.

2.4 COM-B and the Behaviour Change Wheel: Behaviour Identified

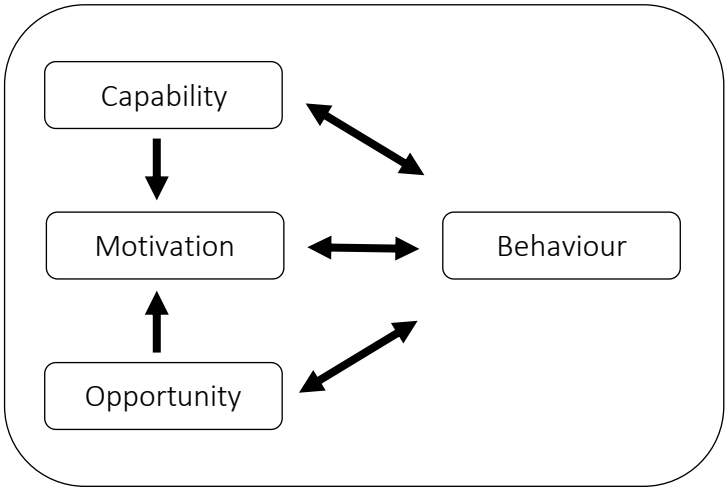

Figure 2.4 **COM-B Model.** The arrows indicate directions of possible influence. (Adapted from Michie, van Stralen & West, 2011).

In 2009 healthcare needed "a consistent and generalisable framework within which to gather evidence" of behaviour change interventions (Michie, Fixsen, Grimshaw & Eccles, 2009). The Behaviour Change Wheel [BCW] began as a classification system for healthcare interventions and policy. It is included here because it was developed as "a framework of behaviour change interventions" that is comprehensive and general enough to be used "by intervention designers and policy makers" (Michie, van Stralen & West, 2011). BCW is founded on a behaviour model – COM-B. According to COM-B, a behaviour is a function of three factors: [1] capability, [2] opportunity, and [3]

motivation (*Figure* 2.4). These factors are established from the United States Penal System and a Theorist's Consensus Conference in the United States; both recognised capability, motive and opportunity as the combination of factors considered essential and adequate to performance of any behaviour (Michie et al., 2011). The COM-B behaviour model represents the conditions required for a "volitional behaviour to occur" (Michie et al., 2011). It indicates that motivation can be influenced by opportunity and/or capability. A behaviour also has the potential to influence any of the three factors of its performance, and each of the factors of performance has the potential to influence the behaviour.

Capability, opportunity and motivation comprise the foundation of the BCW. They are central to the wheel and each is subdivided into two categories (*Figure* 2.5). Capability is

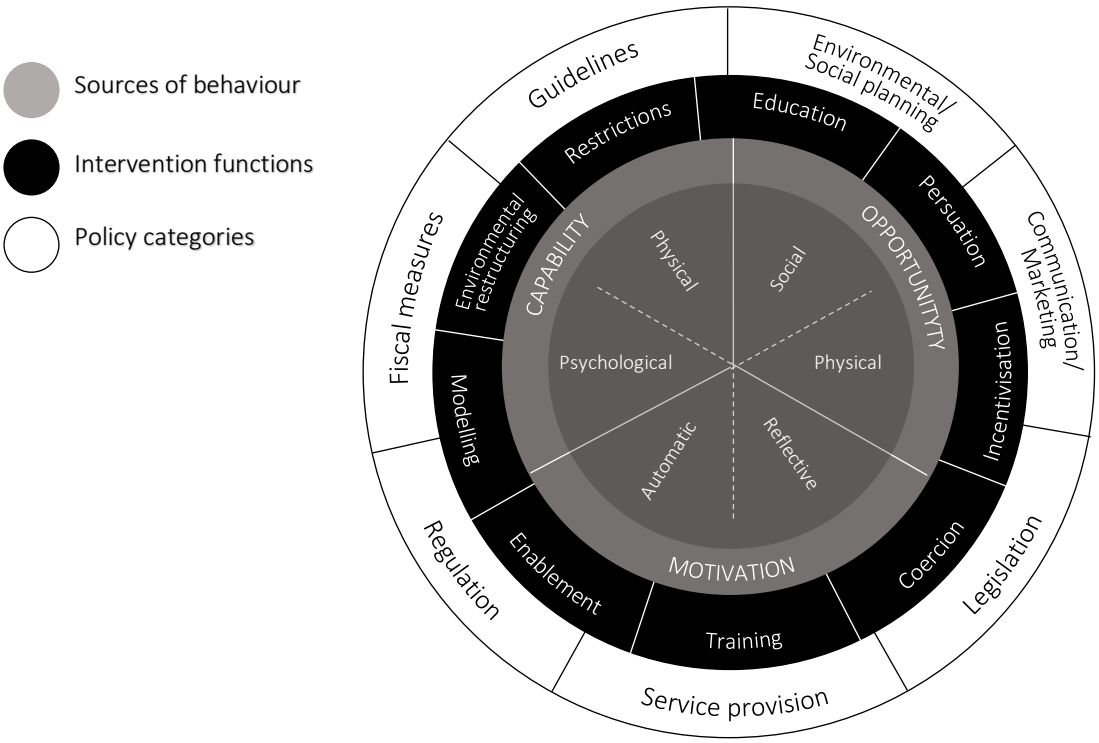

Figure 2.5 **Behaviour Change Wheel.** The outer ring includes seven policy categories that enable or support the nine intervention functions of the middle ring. The interventions are meant to cause the target behaviour. Behaviour, the innermost ring, is a combination of three factors from COM-B, each with two subcategories. (Adapted from Michie, van Stralen & West, 2011).

made up of an individual's physical and psychological faculties. Opportunity comprises external social and physical elements that prompt or enable behaviour. Motivation is defined by the BCW to incorporate non-volitional behaviour as well as volitional, though COM-B includes volitional behaviour only (Michie et al., 2011). For the BCW motivation can be automatic or reflective and includes "all those brain processes that energize and direct behaviour, not just goals and conscious decision-making. It includes habitual processes, emotional responding, as well as analytical decision-making" (Michie et al., 2011). Next the outermost ring is made up of seven policy categories that can enable or support interventions to target a desired behaviour. Finally nine intervention functions compose a ring that links the outer ring of policy categories with the behavioural performance factors in the centre of the wheel. Intervention function categories are not meant to overlap; hence applied interventions might include more than one of the intervention functions.

BCW Intervention		Definition
[1]	training	imparting skills
[2]	education	increasing knowledge or understanding
[3]	modelling	providing an example for people to aspire to or imitate
[4]	enablement	increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)
[5]	restrictions	using rules to reduce the opportunity to engage in the target behaviour
[6]	environmental restructuring	changing the physical or social context
[7]	incentivisation	creating an expectation of reward
[8]	persuasion	using communication to induce positive or negative feelings to stimulate action
[9]	coercion	creating an expectation of punishment or cost

Table 2.4 Behaviour Change Wheel Intervention Definitions. (Definitions from Michie, 2012).

The authors define a few of the intervention functions in the article. The definitions of the education and training illustrate the separation between functions. The education function is defined as "imparting knowledge and developing understanding" whereas training indicates the "development of skills" (Michie et al., 2011). Hence an intervention that involves skill development and increasing knowledge or comprehension would use both the teaching and education functions. The modelling function engages "our propensity to imitate as a motivational device" (Michie et al., 2011). The enablement function "refers to forms of enablement that are either more encompassing (as in for example 'behavioural support' for smoking cessation) or work through other mechanisms (as in for example pharmacological interventions to aid smoking cessation or surgery to enable control of calorie intake)" (Michie et al., 2011). At a 2012 conference Michie presented definitions of all nine interventions. (*Table* 2.4). The nine intervention functions have since been mapped onto the central behavioural factors (Lefevre, 2016; *Table 2.5*).

Although Michie et al. intended to produce a simplified framework within which to classify behaviour change interventions in healthcare, it might contain too many components to

Behavioural Factor	Category	Possible Intervention Functions
capability	physical	training and enablement
	psychological	education, training, and enablement
opportunity	physical	training, restriction, environmental restructuring, and enablement
	social	restriction, environmental restructuring, modelling and enablement
motivation	automatic	persuasion, incentivisation, coercion, training environmental restructuring, modelling and enablement
	reflective	education, incentivisation, persuasion, and coercion

Table 2.5 **Mapping Intervention Functions onto Behavioural Factors.** (Table adapted from Lefevre, 2016).

simplify designing effective behaviour change products and spaces. Likely the most applicable section is the intervention functions from the middle ring: [1] education, [2] persuasion, [3] incentivisation, [4] coercion, [5] training, [6] enablement, [7] modelling, [8] environmental restructuring, and [9] restrictions. If the definitions are taken strictly, the design of objects and spaces would be limited to environmental restructuring. However, the concepts from the other eight intervention functions might inspire design intention. Although meant to be separate from environmental restructuring, the principles behind enablement and restriction align with affordances and constraints. Enablement is meant to increase means or decrease barriers, and restriction is meant to apply rules to reduce the chances of performing a behaviour. In this way enablement and restriction can inspire physical design interventions. Although the BCW is from health psychology the other models in this review relate to it, lending confidence to parts of these models from design disciplines.

2.5 Design with Intent Toolkit: Practical Design Suggestions

In 2010 Lockton et al. released the Design with Intent (DwI) toolkit "for translating theorists' valuable work into practical design suggestions for tackling particular briefs" (Lockton, Harrison. & Stanton, 2009; Lockton, Harrison & Stanton, 2010a). The DwI toolkit assumes that user behaviour is already influenced by design; therefore it aims to inspire designers to think in a more nuanced and less simplified way about designing for behaviour change (Lockton et al., 2010a). The authors collected 101 design solutions from a variety of disciplines where inspiration for design concepts can be gleaned through examples printed in card format (Lockton et al., 2010a). In v.1.0 of the toolkit from 2010, the

techniques are categorised into eight design 'lenses': [1] architecture, [2] error proofing, [3] interaction, [4] challenges and targets, [5] perceived affordances, [6] cognitive, [7] Machiavellian and [8] security (lenses). Each lens contains a variety of examples and suggestions for stimulating behaviour change design ideas. The toolkit "encourage[s] designers to think about behaviour change from different perspectives" by presenting techniques from a variety of design disciplines (Lockton, Harrison & Stanton, 2012). The DwI Method suggests using the cards to prescribe and/or inspire design solutions (Lockton et al., 2009). The solutions from DwI offer three ways to influence behaviour: [1] enabling, [2] motivating and [3] constraining. Enabling makes the target behaviour the most convenient. Motivating involves incentives, education and attitude adjustment. Constraining discourages other behaviour options by making them difficult, which leaves the target behaviour as the natural choice.

The DwI Method has been tested with both students and some practitioners, and findings have informed improvements. An early version of the toolkit was more prescriptive; eleven target behaviours were divided into three groups [1] path, [2] flow and [3] locks (*Figure* 2.6). The path group indicated behaviours in which there is a sequential process for users to follow. The flow group was for managing the movement and interaction of users. Finally, the lock group was made up of behaviours to be prevented (Lockton et al., 2009). This feature appears to have been removed from the v.1.0 toolkit because designers did not like working in such a prescribed manner (Lockton et al., 2010a). The prescriptive method was simplified so that one of the eleven target behaviours could be chosen from a table, and the corresponding patterns could help generate design ideas (Lockton et al., 2010b). In the 2012 update eleven target behaviours were divided into two groups of "abstract

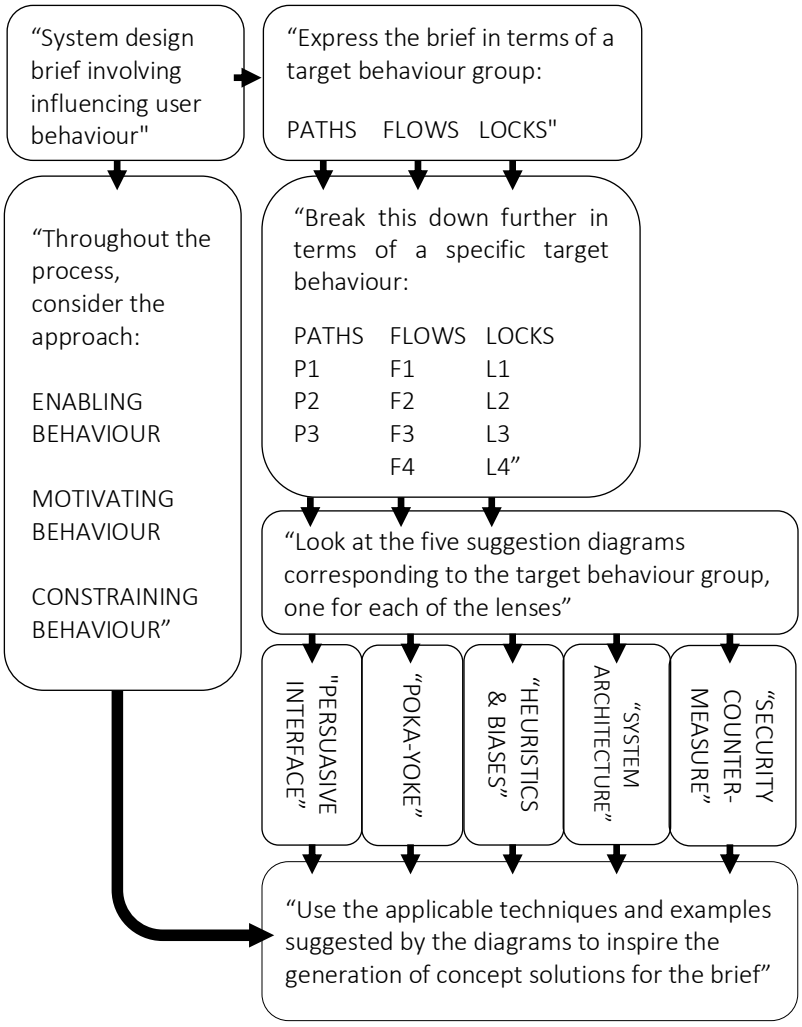

Figure 2.6 **Design with Intent Prescriptive Instructions.** (Adapted from Lockton, Harrison, Holley & Stanton, 2009).

classification(s) for behaviours, expressed as goals:" [1] user-system (S1-7) and [2] user-user interactions (U1-4) (Lockton et al., 2012). Users are typed in three ways: [1] pinball, [2] shortcuts, and [3] thoughtful, and the toolkit suggests approaches for each. DwI suggests that people may fit into different user types at different times depending upon a variety of factors that are not specified. For example, when people are expected to be engaged with their environment and interested in learning new things, a designer can look at patterns of behaviour from the "thoughtful" user type card. "Shortcuts" indicate reliance on heuristics in making choices, and "Pinballs" are patterns expected from "basic reflex responses" (Lockton et al. 2012). Lockton noted that more analysis was needed, but that this might not be the direction the toolkit goes.

An updated toolkit offers more suggestions to facilitate "discussion about the behaviour change" (Lockton et al. 2012). An individual or group can examine the techniques "lens-by-

lens" and relate the solutions to their brief. They can assess existing designs by using the cards to help identify what principles might have informed the solution(s). They can partner up to generate and defend design solutions proposed for each type of user – ergonomics, heuristics or provoking thought. Two cards chosen randomly can be paired to inspire design solutions by applying the mechanisms separately and together (Lockton et al., 2012). The authors also suggest that a design office could choose a card of the week for inspiration and discussion (Lockton et al., 2012).

The DwI toolkit attempts to categorise techniques that have been applied to behaviour change into a single model. There are 101 techniques grouped into eight loose lenses that may not be equally abstracted. It exemplifies the innate challenge of design for behaviour change as Lockton acknowledges that "the grouping of patterns is not rigorously defined theoretically" and "many cards would happily fit into other lenses" (Lockton et al., 2010b; Lockton et al., 2012). The method might encourage designers to think about what type of influence – stimulus-response, heuristics or provoking thought – might produce the target behaviour. It might inspire application of patterns in new situations to achieve that target behaviour. There is more depth to the evolution of this method that may be explored for a more complete picture of the pros and cons of the different stages. It is created from practice and tested by students and some professionals, but the theoretical connections to behavioural psychological perspectives have not yet been pursued. It paves the way for more exploration into design for behaviour change.

2.6 Socially Implicated Design Method: Behaviour and Societal Needs

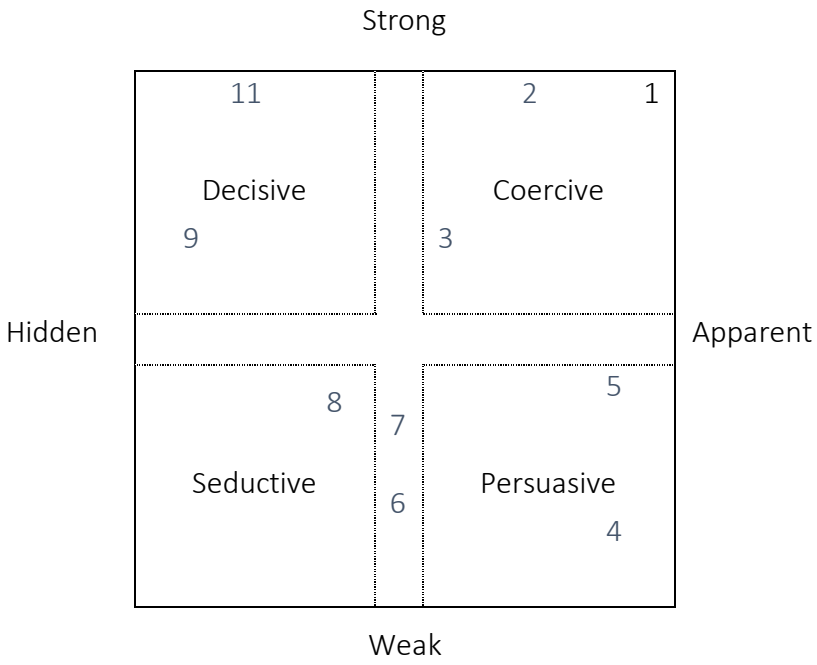

Figure 2.7 **Product Influence Classifications.** The user's experience of the artefact. The numbers correspond with the design strategies from *Table* 2.5. (Adapted from Tromp, Hekkert & Verbeek, 2011).

In 2011 Tromp, Hekkert and Verbeek argued "that the choice of [design] strategy needs to be based on the intended user experience, because it plays an important role in the strategy's effectiveness" (2011). The authors classified ways in which users experience the influence of a design based on two dimensions [1] force (amount of pressure felt) and [2] salience (awareness of the influence) (Tromp et al., 2011). Each quadrant is labelled accordingly (*Figure* 2.7).

For example, bus stops might be strategically spaced to cause people to walk further. The societal aim might be to decrease the economic strain of poor health. Most people would respond without realising the design intention. The force to comply would be strong as options are limited, but the strategy would be hidden. This type of strategy is placed in the decisive quadrant. A seductive strategy is not evident to the user, and the force to the behaviour is weak. A persuasive strategy also feels weak to the user, but they are aware of

it. When a user is aware of and feels a strategy strongly, it is coercive. The authors acknowledged that users will experience designs in different ways. For example a persuasive design might be appreciated by one individual but feel invasive to another, or the same individual may experience that design differently the next time they interact with it. Tromp et al. proposed "that design strategies be assigned to these categories" because

	Design Strategy	Example	Influence
[1]	*create a perceivable barrier to undesired behaviour (pain)*	bollards prevent cars from driving into building	coercive
[2]	*make unacceptable user behaviour overt*	bathroom sink in hallway reminds users of hygiene	coercive
[3]	*make the behaviour an activity to performance of the product function*	"Social Cups" by Niedderer require cooperation to set down	coercive
[4]	*provide the user with arguments for specific behaviour*	warnings on cigarette packages to change attitudes	persuasive
[5]	*suggest actions*	gear shift light on car dashboard to signal when to shift	persuasive
[6]	*trigger different motives for the same behaviour*	trash bin that looks like a basketball hoop to encourage proper waste disposal	seductive-persuasive
[7]	*elicit emotions to trigger action tendencies*	smiley face on slow down sign thanks drivers for understanding to promote goodwill	seductive-persuasive
[8]	*activate physiological processes to induce behaviour*	standing conference table to induce active mood	seductive
[9]	*trigger human tendencies to automatic behavioural responses (instinctive or learned)*	light switch dial marks line up when off to trigger turning off the lights	decisive
[10]	*create optimal conditions for specific behaviour*	coffee machine in hallway to encourage talk between colleagues	seductive
[11]	*make the desired behaviour the only option (possible behaviour to perform)*	spacing bus stops to force people to walk	decisive

Table 2.6 **Eleven Design Strategies.** The user's experience of the artefact. (Created using information from Tromp, Hekkert & Verbeek, 2011).

they believed that "certain strategies increase or decrease chances of exerting a particular influence" (2011). The authors listed eleven strategies that designers can use in products to influence both behaviour and society (*Table* 2.6).

Tromp and Hekkert continued to explore design that elicits a desired social effect (2014). Although the scale is social change, it is presented here because the authors suggest that designers can influence social problems by designing for individual behaviour. Yet the interests of the collective often do not coincide with individual interests. Designers need to be able to identify: [1] what individual behaviour is likely to produce the desired social effect, and [2] what interests or intentions designers can target to produce the desired behaviour.

The authors devised a process to help designers think back from a social problem to an appropriate design intervention (Tromp & Hekkert, 2014). It necessarily assumes that the design can remain conceptual for most of the process since social change is the foremost goal (Tromp & Hekkert, 2014). The Social Implication Design method (SID) has five steps where the designer moves through the social problem from three perspectives: [1] social realm, [2] behaviour, and [3] interaction (*Figure* 2.8). Designing for group interests requires the designer to design to influence individuals. The challenge becomes knowing what concerns of an individual might elicit a target behaviour that results in the desired social change. First, from the social perspective, the designer reframes the problem as "a situation in which social and/or temporal concerns are conflicting" (Tromp & Hekkert, 2014). Within this frame the designer states the intended social contribution or "the desired social implication he or she wishes to foster" (Tromp & Hekkert, 2014). From the

behaviour perspective the designer then defines what kind of behaviour(s) causes the desired user experience. Finally the designer takes the interaction perspective. It is not until this stage that the designer considers "what kind of relationship with an artefact" might promote the desired experience (Tromp & Hekkert, 2014). The designer then investigates or tests whether "the design leads to the predefined behaviour and social implication" (Tromp & Hekkert, 2014) Finally "a preliminary idea" for a product or service to accomplish the aim is presented as a design proposal. At this point the design is still in its infancy and will need to be "further developed into a mature concept and detailed design" (Tromp & Hekkert, 2014).

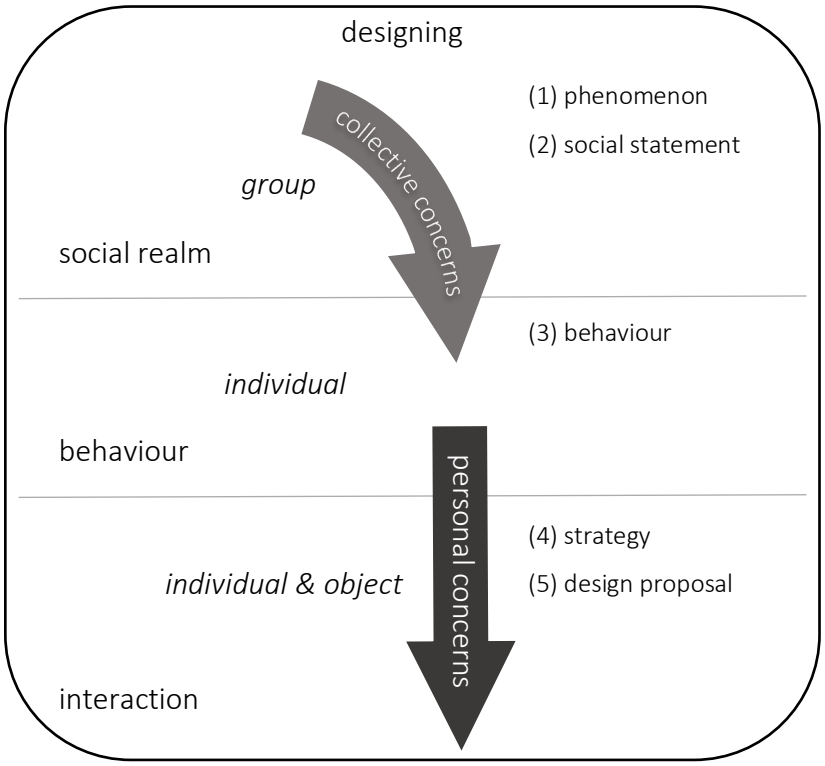

Figure 2.8: **Socially Implicated Design Model.** Showing 3 perspectives on the left and the 5 steps on the right. (Adapted from Tromp, Hekkert & Verbeek, 2011).

Tromp and Hekkert assert that the SID method may help designers "exploit the hidden and indirect influence of design" (2014). They believe that although there are other design movements to realise social change, the SID method is different in that it aims to design artefacts that connect a personal concern to the desired behaviour. The desired behaviour

would not result from the personal concern without the designed artefact; hence the authors' claim that "fundamental human concerns" can be a source of behaviour change (Tromp & Hekkert, 2014). SID applies the Vision in Product design method to behaviour change which allows the design to remain a 'black box' to give designers an opportunity to reason from the targeted social effect to a design proposal (Tromp & Hekkert, 2014; Hekkert & Van Dijk, 2011). One student who followed the method explained that SID gave him more awareness of the social implications of products, but that not enough time was devoted to benefitting the user (Tromp & Hekkert, 2014). The authors present the SID method as a work in progress.

The SID method explores how designers can leverage personal concerns to cause social change. It aims to align the interests of the user with behaviour that ultimately produces a social change. Although the authors admit that following the steps resulted in less time being devoted to the individual or immediate benefits of the design than to the social impact, the method is in its infancy and further adjustments may solve this issue. It highlights another difficulty in the field of human behaviour change – addressing the immediate needs of the individual whilst focusing on the long-term needs of the group.

2.7 Observations in Prior Work and Gap in Knowledge

There are similarities among the models reviewed in this chapter (*Table* 2.7). They all agree that the behavioural outcome is affected by how users experience a design. This perspective makes the concepts of affordances and constraints suitable to design for behaviour change. Many of the models focus on enabling the behaviour, making it evident, and/or disabling unwanted behaviour. Although they each have a slightly different perspective, all the models suggest that designers can apply affordances and constraints to influence behaviour. User-Centred Design aims to facilitate an intended behaviour. The Fogg Behaviour Model intends to simplify performance of a desired behaviour. The Behaviour Change Wheel includes enablement and restriction as possible functions of behavioural intervention. Design with Intent recommends enablement and constraint as

Model	Explanation	Implementation
User-Centred Design UCD	Designing objects for usability to enable users to interact with them naturally	7 stages of action Affordances Constraints
BJ Fogg's Behaviour Model FBM	Influencing ability whilst providing a trigger to perform the intended behaviour	Facilitate Ability (simplify) Provide a Trigger
Design with Intent Method DwI	A compilation of design examples used by multiple disciplines to serve as inspiration	Enabling Constraining Motivating
Behaviour Change Wheel BCW	Designing policies that enable interventions to work	Examine Capability, Opportunity, & Motivation for intervention options
Socially Implicated Design SID	Incorporating social impact from individual user behaviour	Coerce Seduce Persuade Decide (Constrain)

Table 2.7 **Model Explanation & Implementation**. Each of the models contributes to our understanding of design for behaviour change (Norman, 1986; Fogg, 2009; Michie, van Stralen & West, 2011; Tromp, Hekkert & Verbeek, 2011; Lockton, Harrison, Holley & Stanton, 2009)

approaches to behaviour change designs, as does Socially Implicated Design. It might seem that the models assume removing barriers to a behaviour and making it evident are all that are needed to cause a change in behaviour, but there are other factors. This is evidenced by many people's having well-designed gym sets wasting away from non-use.

A behaviour is composed of three main factors. Two of the reviewed models the Fogg Behaviour Model and the Behaviour Change Wheel, prescribe what makes up a behaviour. At first their factors of behaviour might appear to be similar if not the same. The models seem to agree on motivation and the sum of the three factors from the FBM or the three factors from BCW total a behaviour. Both FBM and BCW subdivide each factor into available resources; however ability in the FBM includes internal and external elements whilst the BCW separates internal faculties as capabilities and external enablers as opportunities (*Table* 2.8). Also in BCW opportunities include prompts which appear to align with the FBM triggers. Terminology aside both FBM and BCW agree on three behavioural components: [1] capability – personal/internal resources; [2] motivation – emotional directive; and [3] opportunity or trigger – contextual/external resource to enable or prompt to action. It may be supposed that although supplying a means to facilitate a specific activity can increase the likelihood of performing a desired behaviour, it does not ensure the behaviour since this does not address motivation.

The FBM acknowledges that motivation is more difficult to influence, and it relies on user laziness. The FBM asserts that simplifying a behaviour increases user ability; therefore also increasing the likelihood that it will be performed when triggered. SID attempts to bypass a lack of motivation by finding individual needs that produce socially responsible behaviour.

Behaviour Change Wheel		Fogg Behaviour Model	
capability (internal- faculties)	physical	physical effort non-routine	ability
	psychological	brain cycles non-routine	
opportunity (external- prompt or enable)	physical	time money	trigger or ability
	social	social deviance	
motivation (brain functions- energise and direct behaviour)	automatic	sensation (pleasure/pain) anticipation (hope/fear) belonging (acceptance/rejection)	motivation
	reflective		

Table 2.8 **Comparing BCW & FBM Factors of Behaviour.** It might appear that capability and ability align; however external enablers are categorised as opportunities in the BCW. FBM's triggers, spark and signal, might be physical or social opportunities. (Information adapted from Michie, van Stralen & West, 2011; Fogg, 2009).

SID is concerned with the effect of the physical and/or social environment on people's unconscious or automatic processes. SID implies that there is more to performance than providing the right conditions. The designer is expected to think of the interaction that will produce individual behaviours with societal outcomes. Affordances and constraints can then be applied to increase or decrease the propensity of the behaviour. UCD assumes that users generally operate automatically and offers questions to help designers facilitate each stage of a behaviour. DwI considers the level of user engagement by classifying a target behaviour as automatic, taking shortcuts or engaged and thoughtful. Design with Intent compiles examples to inspire behaviour change designs. The examples are meant to enable, constrain or motivate the desired behaviour. Although the five reviewed models seem to account for motivation, the fundamental strategy appears to be using affordances and constraints.

This chapter has identified behaviour and found five models that address design and behaviour. Excepting the BCW, they explain little if any of their theoretical foundations in human behaviour. There appears to be a need for design more fully to consult behaviour theory or to be more transparent in detailing the connections. In addition to a need for clear theoretical foundation, there is little information regarding what practising designers understand about human behaviour. Although some approaches may come from design practice, what designers understand about how to influence behaviour is not discussed. In an interview engineer and psychologist Donald Norman spoke of his certainty that there is a design practice-research gap, because practitioners are looking for solutions whereas researchers are looking for knowledge. He states that "design studies are often clever, engaging, and entertaining. But *the relationship between the knowledge gained and the design of the product is often forgotten*" (Norman, 2011 italics added). To create effective solutions it is important to understand what knowledge designers are applying to cause behaviour change, and how this compares with theoretical knowledge on influencing behaviour. This study proposes a step back to look at [RQ1] **what spatial designers perceive can change human behaviour**, [RQ2] **what informs their perceptions,** and [RQ3] **in what ways this compares with existing theoretical knowledge**. Chapter four proposes how these questions may be answered and the reasons for doing so, but first chapter three examines existing theoretical knowledge.

3 Behaviour Theory Relevant to Behaviour Change

3.1 Introduction: Purpose and Scope of Review of Behaviour Theory

Designers create physical objects and spaces, the context of the physical world where people live and act. Their choices of environmental features can impact how people use those objects and spaces and thus stimulate or curb specific behaviours. Developing objects and spaces to support certain behaviours requires knowledge of how to design for behaviour change. Regardless of intention people's behaviour is influenced by the design of their surroundings. Hence the authors of *Nudge* argue that "there is no such thing as a 'neutral' design" (Thaler & Sunstein, 2009). This indicates that all types of designer bear the sobering responsibility of influencing human behaviour. Yet as shown in Chapter 2 there is limited literature on how to design for behaviour change and even less about how to do so in context. Even though some design scholars have looked at behaviour (Norman, 1986; Fogg, 2009; Lilley, 2009; Lockton, Harrison, Holley & Stanton, 2009; Tromp, 2014), there is not a comprehensive layout of the underlying theories to guide what designers do.

Understanding of human behaviour developed over decades of study has produced a "large and sometimes overlapping array of psychological theories and component parts of theories" (Michie, Johnston, Abraham, Parker & Walker, 2005). Such theories are discussed extensively in psychology, but they are not presented in a form that designers can easily access or understand without reading widely. This chapter seeks to establish a comprehensive theoretical foundation for understanding human behaviour from a designer's perspective. It is divided into six parts:

3.1 Introduction: Purpose and Scope of Review of Behaviour Theory

3.2 Physiology and Human Behaviour

3.3 Conscious Cognition and Human Behaviour

3.4 The Adaptive Unconscious and Human Behaviour

3.5 Behaviour Change in Psychology

3.6 Summary and Implications for Framework

The chapter then reviews and interprets these identified theories to explore their relevance to design by applying the key principles and concepts. Throughout, each of these key elements will be described and illustrated by considering an example from the behaviour associated with voluntarily depositing money in a museum donation box. The findings are summarised in preparation for synthesis with findings from interviews.

3.2 Physiology and Human Behaviour

Psychologists have repeatedly grappled with the challenge of determining what to measure to test their hypotheses. In the 1890s a breakthrough in physiology by Ivan Pavlov pioneered ***classical conditioning*** with stimulus-response models of behaviour which allowed psychologists to advance their methods (*Table* 3.1; Pavlov, 1910; Bandura, 1974). Stimulus-response theorises that behaviour only happens in response to a stimulus; therefore behaviour will not happen unless it is stimulated.

For example if a donation box is in the middle of the room (the stimulus), visitors might reflexively go around it as if it were an obstacle (the response).

Pavlov placed food before dogs and recorded their physiological salivation response. He then rang a bell each time he placed the food before the dog. After conditioning the dog to associate the sound of the bell with food, Pavlov then rang the bell without putting out any food. He again measured the dog's salivation. By measuring the salivation response to

the food and then to the bell sound after conditioning, Pavlov could demonstrate that a new stimulus could be conditioned to produce the original involuntary reflexive response.

> *For example if patrons received candy with every donation, they might begin to associate donating with candy.*

Pavlov also discovered that such conditioning does not last indefinitely, because eventually the dogs no longer associated the ringing bell with food and did not salivate. These experiments demonstrate that even if psychologists did not fully understand the internal workings of a behaviour, they could measure the external manifestations.

Psychologists began using quantifiable observation to measure and test their hypotheses about behaviour. Psychologist Edward L. Thorndike continued classical conditioning studies. He believed that repetition, engagement and time spent all influence whether a

Behaviour Theory	Explanation
Stimulus-response (Iversen, 1992)	involuntary reflexive behaviour is the response to a physical stimulus and cannot occur without a stimulus
Classical conditioning (Pavlov, 1910; Watson, 1913)	involuntary reflexive behaviour is learned from actual consequences of past behaviours
Law of effect (Thorndike, 1927)	likelihood of repeating behaviour correlates to the degree of personal satisfaction from the outcome
Law of exercise (Thorndike, 1927)	strength of associating behaviour with a situation is in proportion to the frequency, intensity and duration of that behaviour
Theory of behaviourism (Behaviorism, 2002)	behaviour is based on physical responses and can be measured and predicted from objective evidence
Operant conditioning (Skinner, 1938)	voluntary behavioural responses are learned when people receive a desired outcome, thereby strengthening the behaviour

Table 3.1 Explanation of Behaviour Theories part 1 of 3. These theories concern physiological responses that contribute to human behaviour.

behaviour will be repeated in a similar situation. Thorndike introduced the ***law of effect***, which claims a behaviour is more likely to become a learned pattern in a similar situation if it is followed by an effect that satisfies the performer. Whereas it will likely be abandoned if the effect is unsatisfying. Simply put, the degree of personal satisfaction derived from a behaviour correlates to conditioned learning (*Table* 3.1; Thorndike, 1927).

To illustrate when a patron feels personal satisfaction in contributing, that person is more likely to contribute when presented with a similar situation in the future.

Thorndike added ***the law of exercise*** which claims a behaviour will become more strongly associated with a situation in proportion to the frequency, intensity and duration of that behaviour (*Table* 3.1; Thorndike, 1927).

For example if the above patron donates on the first few visits, they are more likely to continue donating.

The above systematic experimental methods are known as ***behaviourism.***

Behaviourism is an approach that endeavours to understand behaviour using only objective evidence, the measurement of "externally observable phenomena" (*Table* 3.1; Behaviorism, 2002). Watson notes that "psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior" (Watson, 1913). External manifestations of a behaviour provide behaviourists with a measurable way to study the results of internal functions. Since both the stimulus and response are externally manifest, both can be measured. Behaviourists believe that people learn from past experience that then influences future behaviour.

The above are all examples of behaviourism.

An individual's future behaviour is based on the outcome of past behaviour. However, the theory of behaviourism is limited because it only examines the objective evidence of a person's behaviour and is not directly concerned with the individual's subjective thoughts and feelings.

Following up on these laws in relation to Pavlov's experiments, psychologist B. F. Skinner correlated consequences to actions by rewarding the desired behaviour. When the behaviour is rewarded, the one performing the behaviour – the operant – would repeat it in expectation of that reward. This came to be called ***operant conditioning*** (*Table* 3.1).

> *For example if a visitor receives a satisfying thank you from a museum employee when donating, that visitor is more likely in the future to donate in anticipation of a thank you.*

As in classical conditioning the behaviour is gradually extinguished when the reward is not received (Iversen, 1992; Skinner, 1938; Skinner, B. F., 2002). Skinner used methods which allowed him to measure the phenomenon under study, but he acknowledges that cognition plays a role in human behaviour (Iversen, 1992). He eventually "rejected the stimulus-response tradition by demonstrating that eliciting stimuli play no role in operant conditioning" (Iversen, 1992).

3.3 Conscious Cognition and Human Behaviour

Human behaviour theorists became interested in the role cognition plays in behaviour. People can learn from the experiences of others, which implies that cognition influences behaviour (Bandura, 1974). To generate a more complete picture of behaviour, sociologists Thomas and Thomas pioneered an iterative research method where they

compare subjective case studies with objective statistics (Thomas & Thomas, 1951). They theorised that a person will act according to their subjective perceptions of the world, thereby actualising the situations that they believe will happen (Thomas & Thomas, 1951). Eventually the idea of ***self-fulfilling prophecy*** developed where people behave in a way that causes their former untrue beliefs to become reality (*Table* 3.2; Merton, 1948).

> *For example if a museum curator believes that no one will contribute money in donation boxes, that person may locate the boxes in dark corners or obscure places. People cannot see the hidden boxes and their opportunity to donate which causes fewer donations, thereby reinforcing the curator's belief.*

If cognition influences behaviour then personal views might indicate behaviour, consequently theorists began considering a person's attitude.

How attitude influences behaviour has been debated, and many possible explanations have been theorised. Classical conditioning, accepted by behaviourists, posits that the existent consequences of a person's behaviour would help predict future action. This assumes that people learn behaviour from the outcomes they experience – as discussed previously with the theory of behaviourism. In contrast ***cognitive theory*** contends that it is people's belief in their ability to achieve the intended outcome of a specific behaviour that is significant (*Table* 3.2; Cognitive theory, 2002).

> *To illustrate if a someone wants the museum to restore a specific piece, that patron would be more likely to donate when confident that their donation would result in the restoration of that piece.*

By taking into account what an individual thinks about the behaviour, cognitive theory acknowledges that a person's attitude can affect behaviour. Bandura summed up conditioning in the context of cognition when he observed:

> "So-called conditioned reactions are largely self-activated on the basis of learned expectations rather than automatically evoked. The critical factor, therefore, is not

Behaviour Theory	Explanation
Self-fulfilling prophecy (Merton, 1948; Thomas & Thomas, 1951)	people can behave in ways that cause their own untrue beliefs to become reality
Cognitive theory (Cognitive theory, 2002)	behaviour predicted by person's confidence in personal ability to produce the intended outcome
Social cognitive theory (Bandura, 2001)	people can learn from observing other's behaviours and their outcomes
Health belief model (Hochbaum, Kegels & Rosenstock, 1952)	people will act to avoid repercussions over acting to gain advantage
Value-expectancy theory (Hochbaum, 1958; Wigfield, 1994)	behaviour predicted by belief in personal ability to produce the intended outcome of behaviour is tempered by the value personally placed on that outcome
Theory of reasoned action (Ajzen & Fishbein, 1977)	at-will behaviours are predicted by intention which is determined by beliefs about the behaviour and its social acceptance
Self-efficacy (Bandura, 1977, 1989)	a person's confidence in personal ability to produce the intended outcome
Theory of planned behaviour (Ajzen & Madden, 1986)	at will behaviours predicted by intention which is influenced by the beliefs about the behaviour, its social acceptance and belief in personal ability to produce the intended outcome

Table 3.2 **Explanation of Behaviour Theories part 2 of 3**. These theories of conscious cognition apply to human behaviour change because they might help identify reasons for action. Some theories like cognitive theory and self-efficacy informed others as they developed.

> that events occur together in time, but that people learn to predict them and to summon up appropriate anticipatory reactions" (Bandura, 1974).

According to Bandura people cannot be controlled through conditioning because cognition is involved in the process.

Social cognitive theory expands on cognitive theory to encompass a collective view of experience by observing and learning from others (*Table* 3.2; Bandura, 2001).

> *Continuing with the donation example, an individual decides to contribute because they have seen others donate.*

The ***Health Belief Model*** attempts to use both stimulus-response and cognitive theories to explain behaviour (*Table* 3.2; Hochbaum, Kegels & Rosenstock, 1952). The model advances the hypothesis that people will act to avoid repercussions rather than acting to gain advantage.

> *In the case of museum donations, an individual is more likely to donate to prevent museum closure rather than simply to maintain it.*

Value-expectancy theory also focuses on a person's perception of whether an action will cause the intended outcome, tempered by how much that outcome is valued compared to other factors (*Table* 3.2; Hochbaum, 1958; Wigfield, 1994).

> *To illustrate people may not bother to give to the museum if they think that their donation is not essential. Yet if people realise that the museum needs the funds to remain open, and this is valuable to them, they may decide to contribute*.

Although these explanations advance the hypothesis that behaviour results directly from a person's attitude, they are inadequate for predicting behaviour.

Repeated studies reveal that more is involved in predicting behaviour than attitude alone. In the late 1970s social psychologists Icek Ajzen and Martin Fishbein examined the literature to discover the reason why attitude does not adequately predict behaviour. To determine whether the studies compare the same elements of attitude and behaviour, they divided attitude and behaviour into four parts: "[1] The action, [2] the target at which the action is directed, [3] the context in which the action is performed, and [4] the time at which it is performed" (Ajzen & Fishbein, 1977, numbers added). Ajzen and Fishbein found that behaviour can be reasonably predicted when both the action and target elements are related in both attitude and behaviour. When one of the elements did not match then results became inconsistent (Ajzen & Fishbein, 1977). Additionally, if neither the action nor the target directly corresponded, then the attitude-behaviour relations were low, making prediction unreliable (Ajzen & Fishbein, 1977).

> *To illustrate whether someone donates using a museum donation box cannot be predicted by that person's attitude towards throwing a football. The actions of giving and throwing do not relate; neither do the targets of donation box and football. But if the person's attitude towards risk is known, then this might be a better predictor of behaviour.*

Ajzen and Fishbein conclude that behaviour is not predicted by attitude alone: it also involves the relationship of the action, target, context and time elements to the behaviour. This further complicates human behaviour theory.

Eventually Ajzen and Fishbein introduced the ***theory of reasoned action***, positing that – excepting inability – intentions not attitude directly result in intended behaviour. The theory of reasoned action aims to predict behaviour that a person can perform at will. At-

will behaviour is "under volitional control," which means that its performance does not depend upon unavailable opportunities or resources (*Table* 3.2; Ajzen & Madden, 1986; Ajzen, 1991). In this case intention is the predictor of the behaviour, and intention is determined by the person's internal beliefs about the behaviour and its social acceptance (Ajzen & Madden, 1986). What a person believes others may think of the behaviour needs to be considered (Ajzen & Fishbein, 1969). That behaviour can be affected by external social pressure is reflected in the theory of reasoned action.

> *For example an individual may intend to donate because they believe the museum needs funds, and it is socially acceptable to give*.

Even so it became evident that a person's intention, based on their attitude towards the behaviour and its social acceptance, was not a reliable predictor of behaviour. It became necessary to consider whether there might be another influencing factor.

In 1977 psychologist Albert Bandura demonstrated that whether people will perform an action can be reasonably predicted by whether they think they will be successful. An individual's confidence in their ability to produce the intended outcome is termed ***self-efficacy*** (*Table* 3.2). If a person has a low self-efficacy, then motivation may not be enough to prompt action.

> *For example a patron may want to help the museum but may not bother to give because they do not believe their donation would make a difference.*

The likelihood of performance is in proportion to people's perception of their ability to get the desired result. Bandura noted that visualizing a positive outcome can help regulate motivation and consequently action (Bandura, 1989). There is greater incentive to act

when an individual can see themselves performing the behaviour well. Motivation is affected by belief in personal ability (Bandura, 1977).

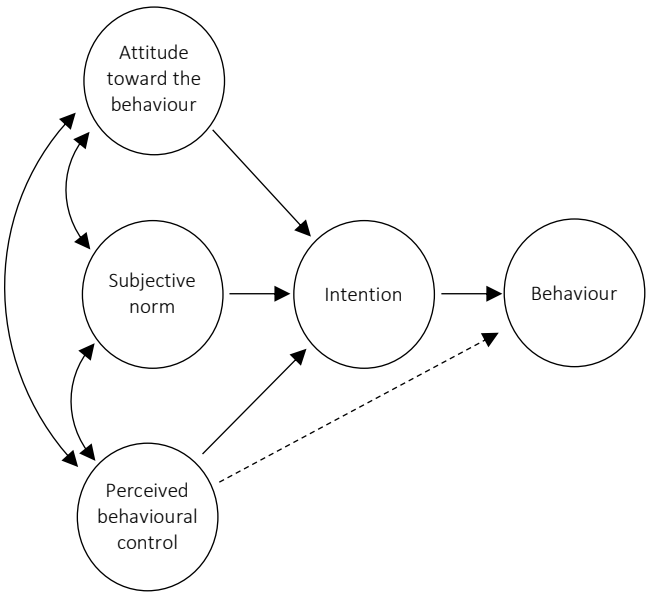

Figure 3.1 **Diagram of Theory of Planned Behaviour**. (Adapted from Ajzen, 1991).

In 1985 Icek Ajzen presented his ***theory of planned behaviour***, which takes into account self-efficacy. His theory attempts to encompass the complexity both of the internal and external factors influencing human behaviour. Self-efficacy was then added to the theory of reasoned action to become the theory of planned behaviour (*Table* 3.2). Ajzen proposed perceived behavioural control as a third influencing factor, with the person's internal attitude towards the behaviour and its external social acceptance. He referred to Bandura's studies showing that the level of confidence that people have in their chances of success influences their actions, thereby reasoning that people will be more likely to perform a behaviour if they think they can do it (Ajzen, 1991).

> *For example an individual may intend to donate because they believe the museum needs funds and it is socially acceptable to give; they will be more likely to donate if they believe their contribution will make a difference.*

In the theory of planned behaviour intentions are directly influenced by three beliefs: [1] attitude towards the behaviour, [2] subjective norm – social acceptance of the behaviour, and [3] perceived behavioural control – self-efficacy (*Figure* 3.1). The theory can predict

intentional behaviours, but habits are unaccounted for and there remains the question of how the unconscious mind affects behaviour.

3.4 The Adaptive Unconscious and Human Behaviour

Unconscious thought has been a subject of recent attention. Malcolm Gladwell's *Blink* refers to the adaptive unconscious, a term applied by psychologist Timothy Wilson to the part of our mind that "quickly and quietly processes a lot of the data we need to keep functioning as human beings" (Gladwell, 2005; Wilson, 2009). It is the ancient part of our brain designed for pattern recognition which quickly detects threats in the environment and initiates action to avoid them (Wilson, 2009). Since the adaptive unconscious makes snap decisions without the input of conscious thought, it can be lifesaving, causing a person instinctively to jump out of the way of an oncoming truck (Gladwell, 2005; Wilson, 2009). This section introduces two important concepts involving the adaptive unconscious that have been appropriated by designers: Nudge and the Theory of Affordances (*Table* 3.3).

In ***Nudge*** Thaler and Sunstein use the example of a kindergarten lunchroom. They observed that children tend to take the food that is at eye level, regardless of whether it is fruits and vegetables or soda and candy. They also noted that if the food is laid out at random, the

Behaviour Theory	Explanation
Nudge (Thaler & Sunstein, 2009)	people tend to opt for the intended behaviour if it is the most convenient option
Theory of affordances (Gibson, 1979)	the form and abilities of an observer in context with the properties of their environment generate possible interactions

Table 3.3 **Explanation of Behaviour Theories part 3 of 3**. These observations help explain how the unconscious mind influences behaviour.

children's diet is left to chance. They concluded that if the healthy food is placed at eye level it becomes the default option, even though the children were still free to choose the soda and candy. It is a matter of ease and convenience, a strategy found in choice architecture (Thaler & Sunstein, 2009). Thaler and Sunstein argue that 'nudge' does not limit personal choice; rather it prompts the unconscious mind to choose a specific behaviour.

> *Continuing the museum donation example, placing the donation box at the gift shop register to receive change or offering a choice of set amount donations on credit card transactions simplifies the task, making donations more likely.*

Nudge is defined as "any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives" (2009). According to the authors choice architecture is "the context in which people make decisions" (Thaler & Sunstein, 2009). They argue that regardless of intention people are affected by their environment. Remember, "there is no such thing as a 'neutral' design'" (Thaler & Sunstein, 2009). Thaler and Sunstein believe that nudge theory is about making the default choice the one that is best for society. They suggest the use of nudge theory to make the easiest choice also that which is in people's best interests. However it raises the question of who should decide what is in society's best interests.

When everything works properly, people often make instantaneous choices about their behaviour in an environment without consciously thinking through every undertaking. For example a person may walk to the other side of a room reflexively going around obstacles without consciously noticing their surroundings. In this case the unconscious mind is navigating the body. People unconsciously interact with objects in their environment all

the time (Norman, 1986). It is in this interaction that behaviour is defined. It is necessary that design for behaviour change include the context of the intended behaviour.

It is important to note the ethical concern of whether design should be used to change behaviour. It may seem as if the designer can control the behaviour of individuals without their consent, but Bandura makes an important distinction. He argues that Pavlov's dog experiment merely demonstrates that people are affected by experience, but not that they can be controlled like puppets (Bandura, 1974). People tend to resist being manipulated. Bandura calls this resistance reciprocal consequences. Design for behaviour change cannot change an unwilling public (Bandura, 1977). However designers can make it intuitive for people to perform certain behaviours over others by applying such concepts.

In the late 1970s psychologist James Gibson conceptualised the relationship between behaviour and the environment. Gibson established that when people look at their environment they recognise what behaviours are made possible by that environment (Gibson, 1979). Materials, surfaces, the way objects are arranged, tools and fire all suggest various types of use when seen. Such possible interactions are termed ***affordances***. For illustration a flat horizontal surface – like a coffee table – may suggest to someone that it could afford stepping up or sitting and possibly reclining. Depending upon its dimensions and the abilities and size of the observer, the same flat surface may look like a place under which to hide for someone else.

> *In a similar example a tall donation box with the money slot up high may afford putting in money for a tall visitor, but that same box may not afford donating for a child.*

Gibson noted that "there is only one environment, although it contains many observers with limitless opportunities for them to live in it" (Gibson, 1979).

"Affordance" refers to the possible behaviours that an environment allows an individual. It is relevant to the discussion of design for behaviour change because affordance explains how the physical environment can have an influence on human behaviour. Sight makes it possible for an individual to perceive what interactions the features of an environment will afford. To illustrate as noted before, when most people see a pull handle on a door even though it can be used in other ways, they unconsciously grasp and pull it (Norman, 1986; *Chapter* 2.2 User Centred Design). This behaviour is unplanned. Gibson proposed that the observer and the environment are both necessary for affordances (Gibson, 1979). Although the senses make it possible for individuals to perceive what interactions the features of an environment will afford, Gibson reasoned that affordances are inherent in the ecology. Observers do not add value or meaning by recognising an affordance.

> "Affordances are properties of things taken with reference to an observer but not properties of the experiences of the observer. They are not subjective values: they are not feelings of pleasure or pain added to neutral perceptions" (Gibson, 1979).

Naturally, people more readily perceive affordances when they are "commensurate with the body of the observer" than when they are disproportionate (Gibson, 1979). Yet, affordances are dependent upon the observer's form and movement.

Psychologist James Greeno proposed that individual abilities combined with affordances make up the conditional constraints for a behaviour to succeed. The behaviour is an interaction between "some properties of the agent along with some properties of the other

system" (Greeno, 1994). He associated affordances with the environment and ability with the individual, both enabling the interaction to occur (Greeno, 1994). Neither the affordance nor the ability can be defined without the other; they are dependent upon one another. Greeno suggested that "the concepts of affordance and ability" can be used to analyse any activity (1994). For instance, take the behaviour of putting on and tying shoes with the desired outcome of wearing the shoes. The activity is made up of the affordances of the shoes with laces and the abilities of the user.

action by individual → desired outcome

put on and tie shoes → wear shoes

Whether the shoes afford this interaction depends upon the size and shape of the shoe. Whether the size and shape are right for this interaction depends upon the user. The user's ability is contingent upon seeing how to use the shoes with laces and having the coordination to put them on and tie the laces. If the individual and the shoes do not match up, then the task cannot advance. The behaviour is complete when the individual successfully puts on, ties and begins wearing the shoes. Greeno clarified that "affordances and abilities can be thought of as conditions in which the constraints of successful performance hold" (Greeno, 1994). When thought of in this way, it is possible to use this concept in design. In effect the function of the design is conveyed through a language of physical affordances and constraints.

The challenge is for designers to understand how to communicate through physical affordances and constraints, to know what features of an environment or object afford or constrain which behaviours. Surface treatment, arrangement and substance of objects can suggest various types of use. Like the flat horizontal surface that affords sitting or lying on

by observers. As previously noted there are many observers with unending possible interactions with one environment (Gibson, 1979). Changing the environment would also change the possible interactions with it. Determining how successfully to convey the possibilities to a variety of observers is the task of the designer.

3.5 Behaviour Change in Psychology

The above theories were mostly used by psychologists to "explain behaviour but not to *change* behaviour," making it difficult to determine how theory might be applied to behaviour change interventions (Michie, Johnston, Francis, Hardeman & Eccles, 2008). In the medical field design for behaviour change models have the potential to guide behaviour change recommendations to improve people's physical and mental health, but to be successful practitioners need to know what prevents the desired behaviour. Therefore a group of theoretical psychologists posited the need to clarify and simplify psychological theory "to maximise the accessibility and usefulness" for behaviour change applications (Michie, Johnston, Abraham, Parker & Walker, 2005). The authors warned that drawing from too many theories increases the chances of overlooking the most applicable theories. They aimed "to identify those theories and component parts of theories" that relate to behaviour change and decode the behavioural determinants (Michie et al., 2005). From a consensus of thirty-three foundational theories, the panel created an exhaustive list of 11 behavioural determinants with questions to help clarify a design for behaviour change problem (A copy of the table can be seen in *Appendix* A). Behavioural determinants are defined as the conditions necessary to succeed in performing a desired behaviour (Michie et al., 2005).

3.6 Summary and Implications for Framework

Several human behaviour theories have been examined in this chapter that might support design for behaviour change (*Tables* 3.1, 3.2, & 3.3). These theories have been illustrated with behaviour associated with contributing funds in a museum donation box (*Table* 3.4). Further implications of these theories on design for behaviour change will be discussed in chapter eight. Next chapter four presents the research design.

Behaviour Theory	Example
Stimulus-response (Iversen, 1992)	*a donation box is in the middle of the room – the stimulus – visitors might reflexively go around it – the response – like an obstacle*
Classical conditioning (Pavlov, 1910; Watson, 1913)	*if every time visitors donate they receive candy, they might begin to associate the act of donating with that candy.*
Law of effect (Thorndike, 1927)	*when a patron feels personal satisfaction for contributing, that person is more likely to contribute when presented with a similar situation in the future*
Law of exercise (Thorndike, 1927)	*if the above patron donates on the first few visits and feels personal satisfaction each time, that person becomes more likely to continue donating*
Theory of behaviourism (Behaviorism, 2002)	*the above are all examples of behaviourism*
Operant conditioning (Skinner, 1938)	*a visitor receives a satisfying thank you from a museum employee when donating, that visitor is more likely in the future to donate in anticipation of a thank you*
Self-fulfilling prophecy (Merton, 1948; Thomas & Thomas, 1951)	*if a museum curator believes that no one will contribute money in donation boxes, that person may locate the boxes in dark corners or obscure places. People cannot see the hidden boxes and their opportunity to donate, resulting in fewer donations thereby reinforcing the curator's belief*
Cognitive theory (Cognitive theory, 2002)	*if a someone wants the museum to restore a specific piece, that patron would be more likely to donate when confident that the funds would result in restoration of that piece*

Behaviour Theory	Example
Social cognitive theory (Bandura, 2001)	*an individual decides to contribute having seen others donate*
Health belief model (Hochbaum, Kegels & Rosenstock, 1952)	*an individual donates to prevent museum closure rather than simply to maintain it*
Value-expectancy theory (Hochbaum, 1958; Wigfield, 1994)	*people may not bother to give to the museum if they think that the donation is not essential. Yet, if people realise that the museum needs the funds to remain open, and this museum is valuable to them, they may decide to contribute*
Theory of reasoned action (Ajzen & Fishbein, 1977)	*an individual may intend to donate because they believe the museum needs funds, and it is socially acceptable to give*
Self-efficacy (Bandura, 1977, 1989)	*a patron may want to help the museum, but may not bother to give because they do not believe their donation would make a difference*
Theory of planned behaviour (Ajzen & Madden, 1986)	*an individual may intend to donate because they believe the museum needs funds, and it is socially acceptable to give; they will likely donate if they believe their contribution will make a difference*
Nudge theory (Thaler & Sunstein, 2009)	*placing the donation box at the gift shop register or adding a tick box to donate a set amount on credit card transactions simplifies the task making donations more likely*
Theory of affordances (Gibson, 1979)	*a tall donation box with the slot up high may afford putting in money for a tall visitor, but that same box may not afford donating for a child*

Table 3.4 **Examples for Behaviour Theories**. These examples are a hypothetical case study of behaviour associated with donating in a museum.

4 Methods and Reasons for the Research Design

4.1 Introduction: The Content and Layout

Chapter two revealed that although design that intends to change human behaviour is a topic under discussion, there is a need better to understand the perceptions that professional spatial designers – in this case those working in architecture – hold on human behaviour and how to influence it. The literature contains little information on what spatial designers perceive can change human behaviour. Without this knowledge it is difficult to improve designs for behaviour change. Perhaps designers already apply the strategies defined in human behaviour theory or designers may know how to affect human behaviour in a way that is not yet discussed in the literature. This study intends to add professional spatial designer perceptions to the discussion about design for behaviour change. This chapter explains how the study aims to do so.

The research design will be ***qualitative*** and iterative, using both ***inductive and deductive*** reasoning. Data will be collected by conducting ***semi-structured interviews*** and will be analysed using ***thematic analysis*** (*Table 4.1*).

Philosophical approach	Qualitative research using both inductive and deductive reasoning
Methods	Data collection→Semi-structured interviews
	Data analysis→Thematic analysis

Table 4.1 **Research Design.** The reasons for these choices are explained in this chapter.

Each of these choices is discussed in turn in the following sections which clarify how and why this design was chosen. The chapter is divided into six sections.

4.2 Philosophical Approach: Inductive and Deductive Reasoning

Research involves systematic collection and examination of data, interpretation of which provides verifiable findings capable of testing and building upon accepted knowledge of a phenomenon. There is still debate on the subtleties of paradigms (Guba & Lincoln, 1994), but for clarity this section presents the generally accepted descriptions. There are three approaches: quantitative, qualitative and mixed-methods (Bloomberg & Volpe, 2016; Creswell, 2014). Quantitative research largely falls within a Post-Positivist paradigm, which means that reality exists apart from the observer who is neutral, and objective universal truth can be found (Flick, 2009a; Rubin & Rubin, 2012). Variables are predefined and measured in controlled conditions to test theory using a linear deductive research design (Creswell, 2014). Qualitative research tends towards a Constructivist paradigm, which holds that reality exists and is experienced uniquely by each observer, whose perception affects their view of what is truth (Flick, 2009a; Rubin & Rubin, 2012). The aim is to understand meaning of a phenomenon by exploring real world experience. The research design is often inductive, flexible and iterative. Data gathered are considered subjective in that they are not measurable by the senses; and the researcher takes an active role in collection and analysis (Creswell, 2014). Mixed methods are more pragmatic (Rubin &

Rubin, 2012). They adopt both quantitative and qualitative approaches in a complementary research design (Creswell, 2014). Research is linear as in a quantitative approach, and different types of data can be triangulated the more fully to understand a phenomenon. Whether quantitative, qualitative or mixed methods are appropriate for a study can be determined by an examination of the following three factors: [1] data collection and analysis, [2] the research aim in relation to theory, and [3] the method of reasoning (*Table* 4.2). These are discussed in more detail below.

	Quantitative	Qualitative	Mixed Methods
Type of Data	Numbers; Statistics & Mathematics	Words & Images	Combination
Relationship to Theory	Typically Testing & Validation	Typically Exploration & Development	Combination
Type of Reasoning	Typically Deductive	Inductive & Deductive	Inductive & Deductive

Table 4.2 **Selection Criteria.** Quantitative, qualitative and mixed method approaches in relation to this study.

4.2.1 Data collection and analysis.

First whether to generate and analyse the data in a qualitative, quantitative or mixed way depends upon what type of knowledge is sought. Each research approach produces data with a set of characteristics. Aligning methods that are best suited to achieving the specific data needed helps ensure that the research questions can be answered by the resulting data set (Braun & Clarke, 2006; King & Horrocks, 2010; Yin, 2009). This study aims to understand design professionals' perceptions of human behaviour and what can influence it, and in what way that knowledge compares with human behaviour theory. It seeks to determine some of the variables of the phenomenon by ***identifying what designers perceive can change human behaviour*** [RQ1],

by ***isolating what may inform their perceptions*** [RQ2], and by determining ***in what ways these perceptions compare with existing human behaviour theory*** [RQ3].

When the phenomenon in question can be reduced to a few precisely measurable variables quantitative data can be collected and analysed, or alternatively qualitative data can be quantified and analysed (Bernard, Wutich & Ryan, 2017; Miles et al., 2014). Quantitative and to an extent mixed methods research relies on numeric data that can be analysed using mathematics or statistics (King & Horrocks, 2010). It suits research of cause and effect relationships and correlations by working with numbers. The numbers can be collected directly or reduced from qualitative data for analysis (Flick, 2009a). The knowledge sought by this study is not easily quantified. Words and images are collected not numbers. This type of data requires a qualitative approach to find patterns and interpret meaning (Willig, 2013). The value of "thick descriptions" would be lost if they were reduced to numbers (Geertz, 1973). Qualitative methods can collect and analyse rich data to find meanings that answer the research questions (Braun & Clarke, 2006). Therefore this study benefits from both qualitative data collection and analysis.

4.2.2 Relationship to theory.

Next a study's research aim in relation to theory can suggest a quantitative, qualitative or mixed methods approach. This study reasons on data collected from individual cases and compares findings with existing theory to create a conceptual framework. The research seeks 'perceptual information' to understand the relationship between the perceptions of practitioners, what informs these perceptions, and how the perceptions compare with existing theory (Bloomberg & Volpe, 2016). It does not aim to test the validity of the theory. Quantitative methods best suit testing the validity

of hypotheses and theories; whereas qualitative research accommodates generation and comparison of theories (Yin, 2014). Mixed methods employ a bit of both. In relation to theory the study is best served by using a qualitative approach.

4.2.3 Type of reasoning. Finally consideration of whether the research has a top-down or bottom-up approach to reasoning helps define methods. A deductive approach is often used in quantitative studies where the researcher aims only to test a hypothesis; whereas both qualitative and mixed methods often employ an inductive approach to explore more complex issues like design for behaviour change. This study aims to identify spatial designers' perceptions on what can change human behaviour [RQ1], to establish what may inform their perceptions [RQ2], and to determine in what ways these findings compare with existing human behaviour theory [RQ3]. Both deductive and inductive reasoning are needed in such an iterative approach. Qualitative research serves an exploration study like this by being adaptable. Collection methods can be modified to accommodate new findings as they develop. Found patterns and anomalies can inform and focus consequent data collection. As understanding improves adjustments can be made to the research methods (Miles, Huberman & Saldaña, 2014; Rubin & Rubin, 2012), and the researcher is free to pursue unexpected discoveries. Qualitative research allows the researcher to toggle between inductive and deductive reasoning as the study progresses. This flexibility is valuable when developing an understanding of spatial designers' perceptions and establishing a conceptual framework for future research in the phenomenon under study. Thus this study benefits from using both inductive and deductive approaches to reasoning.

4.2.4 Summary: the philosophical approach. The strengths of qualitative research serve this study well. First a qualitative approach can find meaning from words and images that is contextually substantiated. Next the study aims to understand professional spatial designers' perceptions of human behaviour and compare these with existing human behaviour theory to create a conceptual framework to help progress research in design for behaviour change. It is not concerned with the validity of the theory. This focus indicates a qualitative approach. Finally the flexibility of qualitative research permits both inductive and deductive methods. Inductive reasoning can build from the bottom up to construct a theoretical understanding from individual cases, and deductive reasoning can focus in from the top down to test ideas in specific instances. A qualitative approach can adapt method to pursue unexpected discoveries as they develop. These strengths of a qualitative approach suit building a conceptual framework for further qualitative and future quantitative research (*Table* 4.3).

Strengths of a Qualitative Research Approach
analyses the substance of words and images
uses both inductive and deductive reasoning
adapts to unexpected discoveries

Table 4.3 **Strengths of a Qualitative Research Approach.** These strengths of a qualitative approach suit building a conceptual understanding of an unexplored phenomenon.

4.3 Methodology: Reasons for the Methods

This section presents an overview of how and why the "procedures of inquiry" were chosen (Creswell, 2014; King & Horrocks, 2010). In recent decades there has been an abundance of literature on qualitative research methods. An April 2017 search for "qualitative research" and "methods" from 1990 to the present on Google Scholar resulted in 538,000 articles, whereas the same search from 1700-1989 produced 8,630 results.

Creswell admits "there is a baffling number of choices of approaches [*sic*]" (2013), and Miles et al. acknowledge there is "no current standardization of [qualitative research] practice" (2014). However there are qualitative research methodologies that position the intentions, the kind of information collected and steps in analysis in an appropriate way to solve specific types of problems (Creswell, 2013). For example grounded theory aims to develop new theory, but this study is not grounded theory since it intends to compare findings with existing theory. Nor is it phenomenology which proposes to understand a lived experience. Nor does the study seek to tell a life story (narrative research), nor intend to understand group interaction within a culture (ethnography) (Braun & Clarke, 2006; Creswell, 2013). It is not a case study because it does not follow a case to gather data from different sources of evidence that can be triangulated (Creswell, 2013; Yin, 2014). This study aims to "develop an in-depth understanding" of perceptions held by professional spatial designers; therefore this section develops a sensible research design based on recommendations from applicable literature.

4.3.1 Research design: the how and why.

Research design has been described as "the 'blueprint' for your research," a logical sequence of methods by which to secure answers to the research questions (Yin, 2014). First there are benefits and drawbacks of both "tight" and "loose" research designs. A "tight" approach is recommended for inexperienced researchers, but "loose" designs are suggested to investigate phenomena where there are few theoretical concepts and constructs to follow (Miles & Huberman, 1994). A study is considered more scholarly and easier to follow when the research methods are designed beforehand and detailed for the readers, though some qualitative research is carried out without first identifying the approach (Braun & Clarke, 2006;

Creswell, 2013). Given this information the study attempts to balance “tight” aspects of research design to guide the researcher and her readers, but to also employ “loose” qualities that enable exploration of new ideas. Next the literature recommends clarifying key components: [1] research questions, [2] data collection – unit of analysis and method of collection, and [3] data analysis – interpretation strategies (Creswell, 2013; Yin, 2014). Creswell suggests beginning with the intended outcomes of the study – or answers to the research questions – in relation to the methodology. This study intends to secure an improved understanding of spatial designers’ perception on what can change human behaviour [RQ1], what may inform their perceptions [RQ2], and in what ways their perceptions compare with existing human behaviour theory [RQ3]. With these aims in mind the following sections examine competing methods of data collection and analysis.

4.3.2 Data collection: the unit of analysis and method. The unit of analysis and method of data collection are chosen to generate data from which answers to the research questions can be found. According to Yin a unit of analysis is what is examined to gather data, and it is closely tied to the options for data collection (2014). One method of collecting data for this study would be to examine existing designs for examples of designers’ application of knowledge of human behaviour theory. Here the unit of analysis would be existing designs, and the method of collection could be observation of the design’s effect on human behaviour. Although this may seem a good option it would merely determine how the designs influence behaviour, but it would not disclose what designers understand about behaviour, on what perceptions their understanding is based, nor from where they were informed. An examination of existing real-world designs does not account for accidental outcomes nor any changes made by others before the final product is

completed. It is inadequate for this study for two reasons: [1] the outcome of examining designs in this way might reveal effects of a design on behaviour but not what effects the designer intended, and [2] a design that is realised may be compromised by external constraints. The method has a relevant disadvantage in that it assumes examining a design reveals the designer(s)' intention(s). It would be unreliable to attribute the source of the designer(s)' perceptions on human behaviour without their input. To overcome these failings the original designers would need to be involved in the study.

Designers could be involved in an experiment monitoring their process whilst they are designing to change behaviour. The design brief could be the same for all participants to generate data that are directly comparable, and the researcher could observe as each designer talks through his/her reasoning. Though professionals may be reluctant to participate because of time constraints (Flick, 2009a; Rubin & Rubin, 2012), the experiment could be set up with students. The design process would be the unit of analysis of the experiment, and the method of collection would again be observation. Another drawback of an observation experiment is that it assumes participants would disclose the needed information without inquiry, and Saldaña asserts that "observation is primarily the researcher's take" on the phenomenon whilst an "interview is the participant's" (2011). This weakness could be overcome by questioning the participants. It would add a form of interview to the method of data collection where the unit of analysis would be the participant. Although a modified approach – with interview questions – may seem a good choice, it has two drawbacks: [1] it does not account for real-world design situations that may affect designer(s)' use of strategies, and [2] student participation would not answer

research questions that seek knowledge of experienced professionals. Perceptions of experienced spatial design professionals are vital to this study.

The last two paragraphs have identified that professional spatial designers are a relevant unit of analysis for this study, and the method needs some form of questioning. Thus the rest of the section compares three possible elicitation methods: survey, focus group and interview.

A survey has the advantage of a large pool of participants, and it generates a lot of data in a relatively short time. If a representative sample participates the findings can be generalized to the population (Flick, 2009a). However the advantage of generalising findings is not significant for this study; rather the study aims to create a conceptual framework for future research. In a survey participants answer a pre-set questionnaire designed to target specific information, so the answers are limited due to the format. Surveys sacrifice the ability to probe for clarification or query unexpected lines of thought, which makes it necessary to know the right questions to ask before conducting a survey or the resulting data might be too general. It is a critical weakness for this study because the phenomenon needs more exploration before a useful survey can be achieved.

Greater exploration is possible with a focus group as it enables the researcher to adapt questions to the situation, overcoming one disadvantage of the survey. Nevertheless a participant might revise his or her opinion whilst discussing ideas and concepts, and peer pressure might skew the data towards the opinions of one or two dominant participants in the group (Bernard et al., 2017; King & Horrocks, 2010). The group setting becomes

counterproductive to a study that needs in-depth individual input. Additionally it is ideal to have both an observer and a moderator in a focus group setting, which may not be feasible for only one researcher (King & Horrocks, 2010). Another disadvantage is that it can be difficult to coordinate an agreeable time and place for 6-12 professionals to participate in a focus group (Flick, 2009a). For these reasons a focus group is not the right method for this study.

The third candidate interview overcomes the relevant disadvantages of both surveys and focus groups. Interviews can be conducted with each participant separately and can afford flexibility to query designers' statements. The interactive nature of some interview formats would offer freedom to follow unanticipated threads and gain unexpected insight into the phenomenon under investigation (King & Horrocks, 2010; Rubin & Rubin, 2012). Designers could be given a design problem to change behaviour with their design. The interviewees could then be probed about their proposed interventions to investigate their understanding of human behaviour, and how they use design to affect it. Although it resolves weaknesses of the other methods, there remain two obstacles to overcome: [1] the desired participants would be considered 'elites' – leaders and experts in their field (Kvale, 2007; Rubin & Rubin, 2012) making access "one of the crucial barriers" (Flick, 2009a), and [2] processing interviews is time-consuming, which limits the number that can be conducted (Flick, 2009a). The researcher has connections with spatial design professionals – architects – that should help overcome the access barriers (Flick, 2009a). Answering a few questions may seem less of a commitment than being monitored whilst designing. Likewise limiting the number of interviews is not as critical to this study since the aim is not to generalise the findings. It is to produce a first conceptual framework to

support further research in design for behaviour change based on in-depth information. Considering all the information interviews will be pursued for this study.

There are three different forms for a standard interview: [1] structured, [2] semi-structured and [3] unstructured. Each of these has its strengths and weaknesses. Depth and richness of data must be balanced within the resources available. Ideally every type of designer would be interviewed in depth, but this is unrealistic. The richness of collected data is affected by the breadth of the study or number of interviews conducted. Depth of data and time involved are inversely related to generalisability and ease of analysis. The more interviews conducted the less time available per interview resulting in less opportunity to be thorough. Fully structured interviews save time in collection and analysis at the cost of richness in data content. Equally unstructured interviews produce rich data that is better used for ethnographic studies since the data are difficult to categorise and compare across interviews. It is challenging to determine the correct number of interviews necessary as most studies simply describe what was done, but not why the numbers were chosen. There are tables to indicate what representation would be statistically indicative of a population. However given the depth of data needed, randomized sampling large enough to be generalisable is not possible for this study. For studying such a relatively new conceptual topic semi-structured interviews are the most balanced option. A semi-structured interview format offers enough organisation to generate comparable data whilst allowing for flexibility to probe for reasoning behind the interviewee's responses to explore relevant unexpected and new areas of interest as they become manifest. (Rubin and Rubin, 2012). Given these advantages semi-structured interviews with professional spatial designers – those working in architecture – will be conducted to generate data for this study.

4.3.3 Data analysis: the steps to finding meaning.

Appropriate methods of analysis are vital to interpreting findings from collected data. Although the criteria for interpretation are not always prescribed by the method of data collection, the research methodology, the choice of how and what kind of data to collect, along with the aim of the study point towards compatible methods of analysis (Yin, 2014). There are a variety of strategies qualitatively to analyse data. The following four steps are consistently found in the literature: [1] gather data points, [2] assign a meaning to each statement, [3] group the meanings into categories, and [4] look for patterns (Arksey & Knight, 1999; Bernard et al., 2017; Braun & Clarke, 2006; Gibbs, 2012; Moustakas, 1994; Rubin & Rubin, 2012). These steps make clear that identifying themes is a fundamental skill for many methods of qualitative data analysis; thus qualitative researchers should learn how to conduct thematic analyses (Braun & Clarke, 2006; Gibbs, 2012; Ryan & Bernard, 2003). Thematic analysis is flexible, offering a method that can make comparisons within a case and across a rich data set, while still being able to "generate unanticipated insights" (Braun & Clarke, 2006; King & Horrocks, 2010). Both features are appropriate to this study. Accordingly the researcher uses thematic analysis to interpret the data.

4.3.4 Summary: the research methodology.

To determine some of the variables of design for behaviour change this study aims to identify designers' perceptions on what can change human behaviour [RQ1], to isolate what may inform their perceptions [RQ2], and to establish in what ways these perceptions compare with existing human behaviour theory [RQ3]. There are many prospective ways to gain a better understanding of what designers know about human behaviour and how to influence it. After systematically examining relevant data collection and analysis methods, this chapter establishes a

research design specific to answer the research questions (*Table* 4.4). The methods have been chosen for features that are important for the study as summarised in the table, whilst the areas where the methods have weakness are not as relevant. Data are collected through interviews with professional spatial designers to uncover perceptions of what changes human behaviour as it influences design. The findings are interpreted using thematic analysis.

Research Questions	Information Needed to Answer	Method of Collection	Method of Analysis
RQ1. What do spatial designers perceive can change human behaviour as it influences the design of objects and spaces?	Spatial designers' perceptions about the design of objects and spaces to influence human behaviour.	Interviews: Hypothetical Design Participant Project Conceptual Diagram Direct Questions	Within-method Triangulation: What did designers say they would do? What did designers do? What did designers say they believe?
RQ2. What may inform designer perceptions about human behaviour as it influences the design of objects and spaces?	The reason(s) why participants perceive what they do about human behaviour in relation to objects and spaces.	Interviews: Hypothetical Design Participant Project Conceptual Diagram Direct Questions	Within-method Triangulation: To what did participants relate or attribute their strategies? What did they say in context?
RQ3. In what ways do these perceptions compare with existing human behaviour theory?	Spatial designers' conceptual knowledge of human behaviour. Human behaviour theory from the literature.	Interview findings Literature	Findings from RQ1, RQ2 and Literature

Table 4.4 **Overview of Research Methodology.** (Adapted from Bloomberg & Volpe, 2016 https://study.sagepub.com/sites/default/files/03%20Bloomberg%203e%20Appendix%20H.pdf).

4.4 Collection of Data: Participant Selection and Interview Questions

The following paragraphs detail selection and recruitment of the study participants and the structure of the interviews. There are two sets of interviews to allow time to perform analysis and adjust the format before the second set of interviews is conducted.

4.4.1 Demographics: the selection and recruitment of participants.

The data for this study were collected via two sets of interviews conducted a year apart with distinct participants (*Table* 4.5). Findings from the first set of five interviews informed structural changes for the second set of eight interviews (*Chapter* 4.4.2). For both sets of interviews participants were purposefully chosen for their expertise in the field to generate rich relevant data (Flick, 2009a). All participants had at least five years' professional experience in spatial design, held a design degree, and consented to the interview on a consent form (A copy of the consent forms can be seen in *Appendices* B & C). The first set of interviews [series A] was conducted by video call whilst the participants were in their place of business for the interview. The second set of interviews [series B] was conducted in person at participants' places of business with two exceptions: one at a hotel lobby and another at a neutral office. All participants had given written consent to record audio for later transcription. This enabled the researcher to concentrate on the participant's responses in real time.

Series A interviews were conducted over a period of three weeks. All participants came from spatial design disciplines. Designers were purposefully chosen from design backgrounds where the environment is considered in the design process. All participants

have design experience, were known to the researcher and willing to participate. Four reside in the United States and one in the United Kingdom. All have master's level educations. Their design experience ranges from 7 to 31 years with an average of 19.2 years. One specialises in healthcare environments and one in corporate interiors. Two are

#	Time	G	Start	XP	Specialization	Degree	Education Type	Country	State or Region
A1	35 min	M	1997	17	Project Management	MArch	Architecture	United States	California
A2	53 min	F	2007	7	Corporate Interiors	MSci	Design; Arch Interiors	United States	Arizona
A3	67 min	M	2002	12	Healthcare Facilities	MArch	Architecture	United States	Arizona
A4	90 min	M	1983	31	Urban Design	MArch	Architecture	United States	New Mexico
A5	75 min	M	1985	29	General Architecture	MArch	Architecture	England	London
B1	186 min	M	1989	26	Residential & Commercial	BArch	Architecture	United States	California
B2	93 min	M	2013	2	Commercial	MArch	Architecture	United States	California
B3	74 min	F	1999	16	Education K-12	BArch	Architecture	United States	California
B4	80 min	F	1996	19	Education University Campuses	Design Cert.	Interior Design PhD Psychology	United States	California
B5	118 min	F	2008	7	Sustainability	MA	Interior Architecture BA Psychology	United States	California
B6	71 min	M	2012	3	Commercial	MArch	Architecture	United States	California
B7	127 min	M	1989	26	Education K-12	BArch	Architecture	United States	California
B8	146 min	M	2000	15	Education K-12 Retail	BArch	Architecture	United States	California

Table 4.5 **Participant Demographics.** A Interviews were conducted first. B Interviews were conducted after adjusting the interview structure.

in the employ of large corporations, one has his own practice, one is between positions and one is a university professor. Three are architects, one is an urban planner and one is a change management designer. There are four men and one woman. The first set of interviews totalled 320 minutes of recording, an average of 64 minutes each.

The second set of interviews was conducted over a period of two weeks. All participants were purposively chosen from spatial design professions. Only one of the designers was known to the researcher. Four were cold contacts through email and three came from snowballing. All eight reside in the United States and were willing to participate. All have university degrees. Their design experience ranges from 2 to 26 years, an average of 14.25 years. Four specialise in educational facilities, three in commercial properties and one in sustainable design. All participants are in the employ of large firms. Six are architects and two have backgrounds in psychology. The second set of interviews totalled 895 minutes of recording, an average of nearly 112 minutes each.

4.4.2 Interview format: the themes. As indicated above interviewing spatial designers would generate a representation of their perceptions of human behaviour. Since the research aims to identify what spatial designers perceive of human behaviour as it influences design and what may inform these perceptions, the first set of interviews is structured for 60 minutes around a hypothetical design exercise (A copy of the series A interview questions can be found in *Appendix* D). Restricting the questions to one design problem permits more specific follow up questions, giving designers an opportunity to expand on reasons for their design choices. The interview can be managed using probes to keep data relevant, confirm a point, ask for clarification or encourage the designer to

continue. It is noted that successful qualitative interviewing is not merely a matter of asking a list of questions or topics. Several skills can improve the quality of information obtained, as noted by Kinsey, Pomeroy and Martin (1948/1998):

> *Learning how to meet people of all ranks and levels, establishing rapport, sympathetically comprehending the significance of things as others view them, learning to accept their attitudes and activities without moral, social or esthetic evaluation…are the elements to be mastered by one who would gather human statistics.*

The interviewer's response affects what kind of data is collected, and it is vital actively to listen to what and how participants answer (Brinkmann & Kvale, 2015). Categorization during data analysis can be challenged by not knowing exactly what was meant by a participant's answer, because people express themselves differently. As the information develops follow-up questions can explore concepts or viewpoints brought up by the interviewee. When skilfully applied they can help clarify and/or discover more subtle and nuanced information (Rubin & Rubin, 2012).

What was learned from the first interviews can inform adjustments to interviews that follow. The template was restructured for the second set of interviews to help clarify participant perceptions and enable within-method triangulation for greater reliability (Flick, 2009b). Although ambitious the structure was streamlined to limit the interviews to 90 minutes (A copy of the series B interview questions can be found in *Appendix* E). Interviews of the second set covered three main themes to keep a single focus for questions in each section: [1] a hypothetical design (comparable with that of the first

interviews), [2] a conceptual diagram, and [3] an existing project from the participant. Each theme is discussed in detail below (*Figure* 4.1).

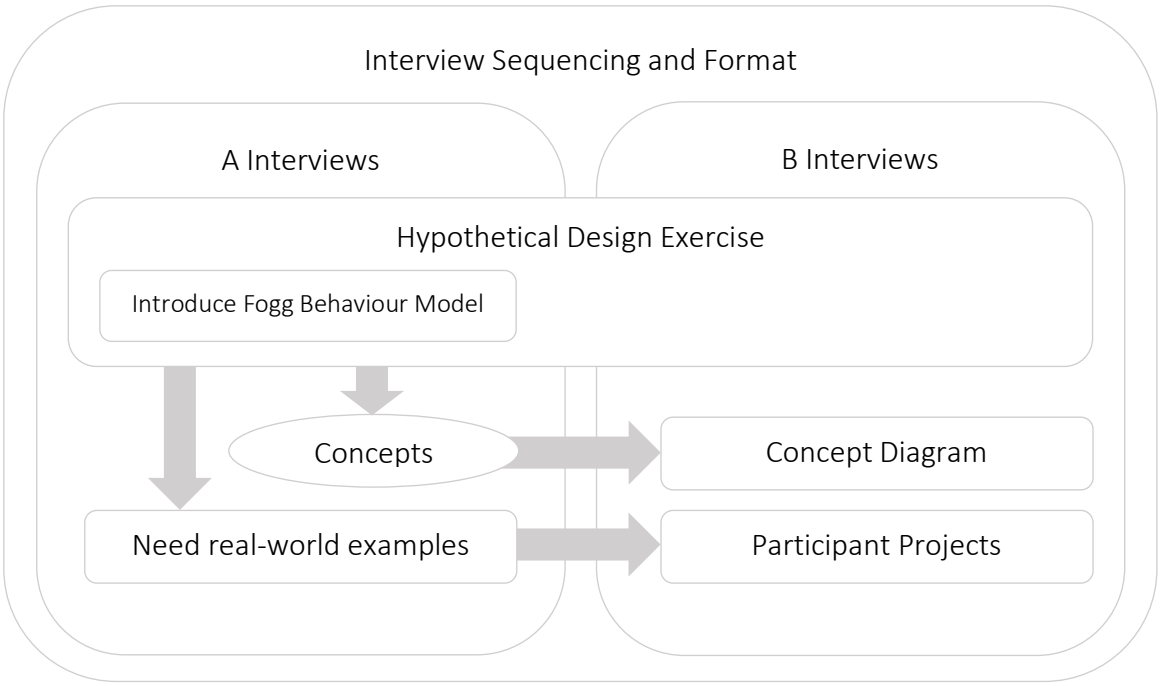

Figure 4.1 Interview Layout. The findings from series A interviews inform the format for series B interviews.

The first theme is a hypothetical design problem which was presented in all 13 interviews. In this section participants share design interventions they believe will elicit a specific behaviour. The researcher chose that of contributing money to museums through donation boxes. This is a useful behaviour to examine because both objects and context are involved, giving designers the opportunity to choose what scale to address. The setting and circumstances are fairly consistent since it occurs in a controlled public environment. The behaviour can be objectively measured as it occurs naturally in its environment; and if further studies are undertaken the behaviour is quantifiable through existing museum records. Additionally it is an individual behaviour with clear social consequences. For continuity across interviews, one week in advance of their individual meetings the

interviewees were sent identical packages containing four photographs and a floor plan for the design question. The images are of a museum lobby containing a donation box, one from each of four axial perspectives to give the designers information from which to work (A copy of the plan and photos sent to participants are in *Appendices* F & G). The question posed is, 'What would you do to elicit more donations?' with a follow up question, "Why do you think [the proposed intervention] would work?" For the first series interviews the Fogg Behaviour Model (FBM) is introduced and explained once the participant has exhausted their suggestions. The researcher then asks the participant a question for each of the three FBM factors: "What would you do to increase people's [motivation or ability] to donate?" and "How would you trigger or initiate the act of donating?" in case any new strategies surface. For the second series of interviews once the participant's interventions are exhausted, the researcher moves on to introduce the next theme.

The second theme is a concept diagram used in place of the FBM for series B interviews. A visual aid is presented during the interview to facilitate talk about intangible concepts. The exercise involves participants placing cards on a diagram to represent how users might experience the type of design strategies each concept implies. The concepts are taken from series A interviews and product influence classifications from theory (Tromp, Hekkert & Verbeek, 2011; A copy of the Diagram and Concepts are available in *Appendices* H & I). Designers think visually and the diagram may help participants clarify their thoughts on intangible impressions. It targets their "comprehension of specific concepts," specifically how they perceive a user experiences each behaviour change concept (Brinkmann & Kvale, 2015).

The third theme is a participant project as part of series B interviews. For continuity across interviews the participants are asked to choose one of their projects with features that they perceive influence human behaviour. The designer's choice of project may reveal what they think is relevant to the topic of designing to influence human behaviour. It facilitates a discussion of real-world design situations that may affect designers' use of interventions; and it gives an indication of what the designer does in reality, not just what they say they will do.

4.4.3 Summary: data collection.

Data are collected directly from spatial designers whose work is in architecture and who are purposively chosen because they believe that they have experience in designing for human behaviour. The researcher begins with those known to her for the first set of interviews, then branches out to cold emails and networking for the second set. The interviews are semi-structured with themes that focus on design for human behaviour from different perspectives to create rich data that can be triangulated.

4.5 Analysis and Synthesis of Data: Finding Meaning

This section details how data are analysed and then synthesised to understand the perceptions spatial designers may have on what can change human behaviour [RQ1], what may inform their perceptions [RQ2], and in what way their perceptions compare with human behaviour theory [RQ3]. There are countless subtle choices that affect data analysis (Ryan & Bernard, 2003). This section covers the most significant and relies heavily on Braun & Clarke's outline of phases to achieve quality thematic analysis (2006; *Table* 4.6). The next

General Steps	Braun & Clarke's Phases	Tasks to Perform
gather data points	become familiar with data	transcribe interviews reread transcriptions note initial ideas
	generate initial codes	code statements related to research aim collate coded statements
assign a meaning to each statement	search for themes	collate codes into potential themes group relevant data into themes
group into categories by meaning		
look for patterns	review themes	check whether themes work at level of codes and across all data generate a thematic analysis map
	define and name themes	refine details for each theme refine details of analysis' overall story generate clear definitions and names for each theme
	produce a report	select compelling text examples relate analysis to research questions and literature write a scholarly report

Table 4.6 **Braun & Clarke's Phases of Data Analysis.** (Based on information from Braun & Clarke, 2006).

paragraph explains how the data are managed. Indexing, finding themes, interpreting meaning and synthesis of data are then discussed in turn. Finally techniques are restated in summary.

First the researcher needs to get to know her data. "Familiarisation with the data" involves immersion: actively listening and re-listening to the interviews whilst noting "meanings and patterns" (Braun & Clarke, 2006). As discussed previously words are not reduced to numbers, so there needs to be a system to handle this type of data. Computer Assisted Qualitative Data Analysis Software (CAQDAS) facilitates bookmarking sections of audio or

video recordings to make retrieval easier and can be used to bypass transcribing recordings to text (Friese, 2014; Gibbs, 2012). Nevertheless data must be in an accessible format (Ryan & Bernard, 2003). At least parts of the interviews need to be transcribed verbatim to be able "to quote [the] interviewees" (Rubin & Rubin, 2012). Whilst verbatim transcription is time-consuming – taking as much as five hours for each hour of audio recording – it helps to determine the level of detail needed to answer the research questions (King & Horrocks, 2010; Brinkmann & Kvale, 2015). Since this study seeks new information unanticipated parts of the interviews may become important as analysis progresses which suggests a verbatim record. The transcription process also presents a valuable opportunity to become familiar with the data, and it is recommended that the researcher transcribe at least one interview (Maxwell, 2013; Saldaña, 2011). Accordingly the interviews were transcribed verbatim.

It is best to transcribe at the earliest opportunity whilst the interview is easily recalled, in case there are parts of the recording that are difficult to make out (Rubin & Rubin, 2012). Thus the interview recordings were transcribed by the researcher within days of each respective interview. Some of series B interviews were transcribed professionally. Following the response interview method the transcriptions were verbatim with some minor colloquialisms omitted. Both transcripts completed by the researcher and those interviews that were transcribed professionally were verified for accuracy by the researcher, who listened to each interview in its entirety whilst reading along, pausing, replaying and making corrections whenever there was a discrepancy (Rubin & Rubin, 2012). The transcripts were then sent to the respective participants for comments (Brinkmann & Kvale, 2015). Finally each interview transcript was read to get an overall sense of the

information gathered. The following sections discuss indexing, finding themes, interpreting, and synthesis of data.

4.5.1 Indexing: note relevant data segments and generate initial codes.

Coding is a useful management and analysis procedure to bookmark and label data that are relevant to the research questions for retrieval and sorting (Gibbs, 2012). Whilst coding aids data management the choices made are part of the analysis (Bernard et al., 2017; Miles et al., 2014; Rubin & Rubin, 2012; Saldaña, 2011). A working list of defined codes is created as part of the process and the highlighted segments of texts are collated by code. Both paper and computer-aided processes can be used for data analysis. Saldaña recommends "working manually or 'by hand' for your first project so you can focus exclusively on the data and not on the software" (Saldaña, 2011). Therefore analysis of the first set of interviews [A] was completed 'by hand' before collecting more data. The findings informed changes to the structure of the second set of interviews [B]. Once these interviews had been conducted, the corresponding portions were manually treated in the same way as set A for compatibility. Both sets of complete interview transcripts were then uploaded into the software. Then manual and software methods were used together, depending upon which tool best satisfied the means to interpretation. The manual analysis informed how the Computer Assisted Qualitative Data Analysis Software – in this case Atlas.ti – was used. CAQDAS facilitated coding and collation of text significantly reducing the time needed to manipulate data (Friese, 2014).

Once transcribed (as detailed above) data in the form of text facilitated "initial code generation" or "descriptive coding" (Braun & Clarke, 2006; King & Horrocks, 2010). The

transcripts were read through and coded in several passes. Both inductive and deductive methods were employed. Each interview was read whilst highlighting sections of text that relate to the research aim. The three main sections of the B interviews were treated separately, and the codes are indicated in their respective chapters (*Chapter* 5, 6 & 7; The codebooks can be found in *Appendices* K, L & M). For example in the hypothetical design exercise segments, the researcher highlighted any text in which interviewees indicate interventions to elicit more box donations (*Chapter* 5, *Appendix* K). The researcher then re-read each interview, noting all the interventions the designer suggested to find any approaches that may have been missed in the first pass. These quotations were labelled with general codes taken from the participant's wording during another reading of the transcripts to ensure that context was considered. Some codes might be en vivo – exact phrasing – and some may be descriptive. To Illustrate if an interviewee recommends relocating the donation box near the exit, the label might be "relocate box near exit." Each strategy from the interviews that appeared after the behaviour model had been introduced was noted in the analysis text by revisiting the interview transcripts. This order was observed to lessen the researcher's influence on this aspect of the data write-up. For the concept diagram portion of the interviews the eight concepts were used as deductive codes throughout the section (*Chapter* 6, *Appendix* L). Inductive codes were generated from additional concepts that were suggested by the participants. The participant projects portion was coded inductively for the behavioural change that was discussed (*Chapter* 7, *Appendix* M). Adjustments to codes were made or new codes were created as necessary. All codes were clearly defined for consistency (Definitions can be found under comments in *Appendices* K, L & M). The descriptive phase took several passes of the text to ensure

that the codes were defined and applied systematically before moving on (King & Horrocks, 2010).

4.5.2 Search for themes: assign meaning and group into categories.

Gibbs identifies three levels of code: [1] descriptive, [2] categories, and [3] analytic. After indexing and collating portions of text that are believed relevant to the research aims, the descriptive codes are analysed for patterns and organised into groups of related ideas or categories (Braun & Clarke, 2006; Gibbs 2012). Moving from descriptive to analytic coding "involves careful reading of the text and deciding what it is about" (Gibbs, 2012). During this phase the list of descriptive codes is printed for reference, and the codes are manually sorted and resorted to establish patterns. The researcher decides which codes relate to one another in overarching themes and gathers them into categories to create a hierarchical map of how the codes and categories relate to one another (Braun & Clarke, 2006; Gibbs, 2012; King & Horrocks, 2010).

The researcher began to formulate ideas for possible categories based on meaning by considering the context of the quotes. This step took several passes. At this point the researcher looked for the rationale behind suggested interventions. For example in the hypothetical design portion if the context of codes "relocate box to cafe" and "relocate box to museum shop" were related to visitors' accessing their money, these codes might be grouped and labelled "move box to points of sale." If there was an outlier code it might be relabelled according to perceived intention. In the A interviews each quotation was noted according to whether it came before or after the concepts of motivation and ability from the Fogg Behaviour Model had been introduced and explained. The codes were also sorted

into deductive themes indicated by the Fogg Behaviour Model: motivation, ability and combination. The outcomes were several descriptive codes grouped into larger categories with individual quotes noted "before FBM" or "after FBM" (*Chapter* 5 *Tables* 5.1, 5.2, 5.3 & 5.4). For the concept diagram portion all quotes were read through by concept, and key statements were compiled to determine the general understanding for each concept. For example quotes from all participants labelled "coerce" were read together, noting and compiling the definitive statements (*Chapter* 6). The participant project portion of the interviews was compiled by behavioural outcome and then type of behaviour to find meaning (*Chapter* 7).

4.5.3 Look for patterns: review, define and refine themes. Once a conceptual hierarchy of codes has been satisfactorily created, categories are reviewed and refined (Braun & Clarke, 2006). Themes are examined for meaning. The hierarchical map of themes and codes can help identify meaning. If a section of text fits more than one code, or a code fits more than one theme, possible reasons are noted and scrutinised. Which codes overlap consistently? Do all codes appear in every interview? If not, why not? What does this reveal about the phenomenon? Braun and Clarke suggest "re-reading the entire data set" to find and code any missed items and to make sure the interpretation is appropriate (2006).

At this point the researcher looked for patterns that indicate possible perceptions of what can change human behaviour [RQ1] as well as patterns that indicate the basis for the perception [RQ2]. In the case of the hypothetical design exercise, a careful look at the suggested interventions helped tease out what participants think changes human behaviour. The interventions that participants devised to increase museum box donations

might indicate what strategies the designer thinks will influence that behaviour. The strategies were compiled into lists according to similarity of type (*Chapter* 5 *Tables* 5.1, 5.2, 5.3 & 5.4). These themes were categorised into principles to be compared with human behaviour theory in chapter eight. The following themes were recognised in the series A interviews: convenience strategies, information strategies, influencing attitude and/or emotion, addressing the space and alternative strategies. Yet there were still overlaps of categories (*Chapter* 5 *Figures* 5.5 & 5.6). Some of the information strategies were also priming, and some were also making the intended behaviour evident. Likewise some of the spatial strategies were also priming and some were also making the intended behaviour evident. Thus the following concepts were used in the diagram exercise portion of series B interviews: convenient, emotion, evident and priming (Definitions can be found in *Appendix* I). For the concept diagram exercise it became apparent whether a concept was understood singularly by the participants, or whether the word indicated more than one or different concepts depending upon the participant's statements. Diagrams for each concept were created by recording each participant's concept placement (*Chapter* 6 *Figures* 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9 & 6.10). This demonstrated visually the placement clusters and outliers. Comparing the diagrams with participant statements indicated 23 concepts were represented in the participants' understanding (*Chapter* 6 *Figures* 6.12, 6.13, 6.14 & *Table* 6.1). The real-world project portion of the interviews were challenging to code since they did not compare directly; however the designer's projects revealed more of RQ2 than did the other two interview sections (*Chapter* 7 *Tables* 7.1 & 7.2). Examining the behavioural outcomes and type of behaviour did not reveal anything meaningful, consequently the projects were grouped and regrouped into various categories by similar traits to find meaning. Five separate determinants were found to inform designer'

perceptions on changing human behaviour (*Chapter* 7 *Table* 7.1). Additionally four mitigating factors appear to have significant impact on design outcomes including whether the intended behaviour is manifest (*Chapter* 7 *Table* 7.2). All this analysis is compiled and included in chapters five, six and seven where the original participant statements can be examined.

4.5.4 **Synthesising findings: developing the framework.** Qualitative research is an iterative process that involves the researcher's determining what is significant to the research questions, finding patterns, determining meaning and – in this case – synthesising the findings in a framework. An explorative study like this aims to find themes and patterns to "build initial models of how complex systems work – that is how themes are related to one another" (Bernard et al., 2017). At this point the findings from all three portions of the interviews are compiled into a complete picture (*Chapter* 8 *Figure* 8.8). When the thematic map fits and explains the data well, the researcher isolates and summarises what and why each theme is of interest. These findings are compared with human behaviour theory by reviewing the key theories that are relevant to behaviour change in chapter four. Finally the researcher writes a report that presents "an argument in relation to your research question" (2006). This part of the analysis can be found in chapter eight.

4.5.5 **Summary: making sense of the data.** All interviews were recorded and transcribed for accessibility. The researcher highlighted, labelled and sorted transcribed text to identify what designers perceive on changing human behaviour [RQ1], and to isolate what may inform their perceptions [RQ2]. By considering the context every effort was made to remain true to each participant's meaning and intention. Once the thematic map

fit the data, the researcher compared the interview findings with existing human behaviour theory. The results are compiled into a refined framework (*Chapter* 8 *Figure* 8.8).

4.6 Mitigating Potential Limitations

Research design requires a fine balance between a variety of factors. The desired design is one that is effective in the focus area whilst the effects of limitations are minimised. This study intended to explore what practising spatial designers can contribute to the design for behaviour change discussion. Gathering the appropriate data limited the data collection to one method: interviews. Instead of triangulating different methods to validate the findings, within-method triangulation was applied to check for inconsistencies and uncover meaning. Additionally in-depth data limited the number of interviews that could be conducted and analysed so a purposive sample was taken. Spatial designers who self-proclaim considering human behaviour in their designs were chosen to participate; thus the interviews are not representative of all spatial designers or psychologists practising design. The interviews establish a working set of variables relevant to design for behaviour change. The next step would be to use the framework of findings from this study to conduct a survey of a representative sample of spatial designers. The framework can also be used to conduct surveys of other types of designers to widen application of the findings in design for behaviour change.

5 Changing Behaviour in a Design Exercise

5.1 Introduction: Purpose of a Hypothetical Design Exercise

This portion of the interviews aims to find out what strategies designers think they would use when designing to influence behaviour by considering a hypothetical design challenge. The purpose of the hypothetical design exercise is threefold: [1] it provides a design project that is paralleled across participant interviews for direct comparison, [2] the findings can be compared with those from both the concept diagrams and participant projects, and [3] the overall findings can be related to behaviour theory. The intention is to collect data that can be analysed to answer the research questions. It is hoped that the strategies and context of the discussions will provide clues indicating what designers perceive can change human behaviour [RQ1] and what informs their perceptions [RQ2]. The findings can then be compared with human behaviour theory [RQ3].

This interview exercise takes advantage of the limited restrictions of a hypothetical situation and has a comparable and measurable behaviour. One advantage of exploring design for behaviour change through a hypothetical situation is that it frees up constraints encountered in a real-world project. In real-world projects designers face implementation challenges, addressing and balancing building codes, client needs and wants, material and cost considerations, and possibly other constraints. The donation behaviour serves as a vehicle to give designers an opportunity to consider a set of strategies they believe would change behaviour. Donating is a measurable behaviour that can deliver objective evidence of outcomes for any future applied intervention. The museum setting may also offer insight

into the level(s) that designers address behaviour change – individual, group, and/or population.

The chapter is divided into eight sections. An introduction to and explanation of the exercise are followed by the strategies that participants suggested. The first two strategies presented are in the order they were addressed by participants. The rest of the strategies are presented in the order of their prominence in the interviews:

5.1 Introduction: Purpose of a Hypothetical Design Exercise

5.2 Description of the Design 'Brief' or Problem

5.3 Strategy: Programming

5.4 Strategy: Address the Lobby

5.5 Strategy: Donation Box Placement

5.6 Strategy: Inform Visitors

5.7 Strategy: Donation Box Redesign

5.8 Summary: Discussion and Implications for the Framework

5.1.1 Series A and B interview formats. The hypothetical design project was conducted in two separate series of interviews (*Table* 5.1). A preliminary set of interviews was first completed. Series A Interviews had two parts: [1] hypothetical design exercise before theory, and [2] hypothetical design exercise after introducing the Fogg Behaviour Model. In part 1, the hypothetical design project was introduced, and participants shared their design solutions. Once participants had exhausted their ideas, motivation and ability were introduced from the Fogg Behaviour Model. Participants were then asked if these concepts engendered any new design solutions. It is important to note that for the A set of

interviews several of the targeted design strategies were generated after the behaviour model was introduced. It is evident that prompting designers to target ability and motivation using the Fogg Behaviour Model engendered additional and creative solutions. Whether these solutions are effective needs to be tested. However this suggests that a framework for designing to change behaviour in context might be useful to designers. Consequently, more time was given to a theory portion of the interviews for series B. Only Part 1 of the hypothetical design project was presented to series B participants. It was immediately followed by a concept diagram exercise (*Chapter* 6) designed to find out more about how theoretical concepts fit into designer thinking. The first four theoretical concepts considered came from Tromp et. al.'s user perception diagram (*Chapter* 2). The second four concepts came directly from series A interview findings (*Tables* 5.5 & 5.6).

5.2 Description of the Design 'Brief' or Problem

Participants were given a design brief containing the floor layout and four elevation photos of an unidentified museum lobby (Copies of the plan and photos can be seen in *Appendices* G & H). The plan and photos were taken from the Fitzwilliam Museum on Trumpington Street in Cambridge because the lobby is nondescript. The room is roughly square with a southeast-facing bank of windows on the left side when entering through the exterior doors. There is a reception counter in front of the windows and a square donation box on wheels placed in the centre of the lobby. On the right or northwest side of the room, lies the main gallery entrance. Opposite the exterior doors is a room of storage lockers with a stairwell on the left that leads to other galleries. The lobby has little architectural detail. When facing the northwest main gallery entrance there is a dominant square column on the left, well set in from the west corner of the room. The walls are white

and the floor is covered with large square tiles of a yellowish stone. The view through the windows is obstructed by drawn mini-blinds of an off-white tone.

To allow possible unknown avenues of discovery, the participants were asked a general question about the floor plan and donation box photos provided for the discussion: “What would you do to elicit more donations?” The question was open-ended to avoid limiting participant responses, thereby making it possible for designers to introduce unexpected concepts or themes (Rubin & Rubin, 2012). Participants were encouraged to share the reasons for their choices with a follow-up question: “Why do you think [the proposed strategy] would work?” For the A set of interviews, once the interviewees had exhausted their suggestions, the Fogg Behaviour Model was introduced with a focus on motivation and ability. The designers were then again prompted for interventions. Interventions that participants suggested after motivation and ability from the FBM had been introduced are indicated in the tables by an asterisk *. The interview recordings proved invaluable because the researcher could concentrate on what the participants were saying to decide where to probe for more information. The recordings were transcribed to preserve the context and phrasing which presented a repeated opportunity to revisit the data. The codes generated during analysis are listed as interventions that have been grouped into the strategies of *Tables* 5.1, 5.2, 5.3, and 5.4 (*Chapter* 4.5). Although none of the designers directly mentioned behaviour theory during the interviews, they suggested strategies that might be comparable with behaviour theory.

5.3 Strategy: Programming

5.3.1 **Determining the "need behind the need."** There was a definite order to how the participants addressed this design brief. Nearly all the designers interviewed began with an examination of the problem that the question presents. However, B8 went directly into his suggestions, which might be related to a visceral reaction: "I have a pretty strong opinion about [donation boxes]." B8 admitted that being asked for a donation makes him uncomfortable, and he often avoids donation boxes "generally act[ing] like they don't exist." A5 called donation boxes "the white elephant in the room." Most designers wanted more information. A1 said, "I'm going to interview you a bit too, because it might help."

In the professional world this step is called programming. It is "a process leading to the statement of an architectural problem and requirements to be met in offering a solution" (Peña & Parshall, 2001). A4 phrased it this way: "It's really important to understand exactly what the full question is. What really are the goals of the museum in this design case?" A5 said "it has to be dealt with holistically" because "you can't solve a problem piecemeal…it's just sensible design to consider the whole context, especially the people that are most affected by your choices." Most participants wanted first to determine what the source of the design problem was, or "what's the need behind the need?" (A2). A4 put it this way: "I would in a sense want to question this question to make sure I really understood it, and that [the stakeholders] really understood it." He went on to say, "often these things come with multiple kinds of questions within them if you really sort them out." For example, "is the goal to maximise the amount of money or is the goal to maximise the number of people who give money?" A3 said "what I would start first is with existing data." Participants wanted to know what works and what does not. A4 suggested "otherwise you might just

go to 'okay, our goal is to maximise the number of pennies that come into this box,' and miss the opportunity to actually educate people and maybe get bigger donations later."

B2 maintained that "the question of designing a donation box to be more profitable for a museum...has a larger context that would need to be addressed before you could even begin looking so microscopic[ally] at the space itself." He explained, "it would really depend on what the public that visits the museum is really interested in." B6 stated "it *always* depends on the context, right?... that's why you - I think you always need to target based on context." A4 observed "this is an interesting case you chose, because it's kind of a half-way [between a product and an architectural] piece in that in a way, it's a repeated piece, right? We see it in multiple museums, but it's also, I would say, fairly context-dependent." He gave an example, "the Holocaust Museum is a good example of how you could take this exact same piece and put it in different museums, and it would mean different things." In the Holocaust Museum "maybe the donation box wants to embody hope. Right? 'You've experienced all of this, now here's a way to try to deal with it in some way'" (A4).

Most of the designers suggested using observation, interviews, surveys, and data mining to gain a better understanding of the current situation, examine the source of the problem, and acquire understanding of how this issue had been addressed elsewhere. Participants asked many questions: What kind of museum is it? Who are the people going into the space? How long do they stay? What is their experiential expectation? Does the museum charge for admission? Many of the designers were not content merely to observe people, they wanted then to interview them to find out internal motives for their behaviour. A5 supposed "that what it really comes down to is understanding the people who are going to

be using [the design] on a daily basis." B6 claimed, "we are also interested in humans as architects." All recommended a search for information from existing projects and printed material. A2 said "that it would be beneficial to figure out how successful non-profits also ask for money." B4 would "study retail design" because she saw this project as a "closet retail situation" where "you are trying to capture their attention" and "make them part with their money." B7 advised investigating online as well as checking whether there were "any experts at universities that are doing or have done studies about this [behaviour]." The designers were looking for evidence in light of which to shape the project.

One of the architects provided a reason for all this investigation in addition to determining 'the need behind the need.' A4 suggested not constraining the question only to what is asked. He reasoned that since it is a human environment, a designer needs to be open to going in entirely different directions that may not yet be fully understood. He said that he would observe whilst people naturally interact with the space to find whether there were "behaviours that users generated." The existing donation box might be used in unintended ways that might also need to be addressed by the design. For example, people might "put their purse on it while they're doing something else" (A4). He suggested that the box might direct traffic or serve as a rendezvous point. "You just have to look with an open mind, and not just about your single variable" (A4). A2 disclosed that "the biggest thing I have to tell clients is design is not one size fits all."

Participants took these preliminary steps to improve their understanding of the issue at hand and the context in which it occurs before advancing their design proposal. "The first step isn't to go straight to the architecture. The first step is to say all right, how do humans

– what emotion do we need to tap into in order to get them to [perform this behaviour]?" (B1). A5 pointed out that the initial concept is abstract; it is "not paint and wood and metal; it's not materials yet," and "getting from here to there is critical to the solution." It seems that for the participants laying the groundwork of their design solutions was the most common first strategy in changing behaviour. B6 declared "it's all about testing, and I think – the thing is – it works out, maybe it doesn't work." Since this project was hypothetical, the participants were unable to complete their first strategy which was intended to inform the rest of their proposed solutions; however, they were willing to share their initial ideas for the sake of the study. A4 acknowledged, "I almost don't want to do the next part saying, 'okay here are some ideas,' but, in reality I would bring those ideas to the table." This might benefit the study because the participants' proposals for changing behaviour came from their own expectations before any investigation.

5.3.2 **Summary: possible rationale behind programming.** Participants seemed to believe that part of their job is to determine what it is that their client truly needs solved. Although in this case the design brief specified what problem needed to be addressed, the designers expected there might be unspecified contributing factors. Participants wanted to investigate the source of the problem before determining their solutions. Thus it might be beneficial also to **question designers about their real-world designs in relation to behaviour change** to further identify what informs their interventions. Although it would be difficult to compare the findings, how designers overcome real-world challenges might reveal subtleties in their understanding of human behaviour. This finding is considered when preparing the format for series B interviews.

5.4 Strategy: Address the Lobby

5.4.1 **Setting the scene.** Most of the designers first addressed the lobby "to figure out how [to] satisfy [the requirement]" (A5). For example, participant A2 had a total of eight interventions intended to address the lobby; three of which he suggested after the Fogg Behaviour Model concepts of motivation and ability had been introduced (*Table* 5.1). In total, series A participants averaged 5.0 lobby space strategies each, 3.8 before and 1.2 after FBM. Participants rearranged the lobby to create a logical use and flow of the space towards the galleries. This involved moving and reprogramming the reception desk to handle information and donation boxes. B4 said, "I would move the reception desk over there [towards the galleries] because people have to go to that anyhow." "As an architect I would think about how people interact with the space" and "this reception counter is just a big barrier" (B7). He recommended replacing it with something "less imposing" and "more welcoming," and A3 described "round...open, transparent, not so uh tucked away." They suggested a receptionist might greet you to make the experience more personal. B7 remarked, "that feeling of being welcomed is going to open up the wallet much quicker." A1 explained that it becomes "this flow of information, requesting donation, and going into the space for the purpose that you are there." A3 suggested mapping out what patrons could experience at key points to inspire the design. B2 felt the experiential aspect was important, "there is very little about the design of this space to me that would affect me donating money, other than my experience of it."

Most of the participants suggested making the lobby experience more comfortable and welcoming. The lobby needs to look "like a loved space." B5 said that "subconsciously

it would make [people] feel like someone else was investing in this too." B1 admitted "comfort is such a hard thing because it deals with all the senses and the psyche." Both A2

	Series A Interviews					Series B Interviews								Totals
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B8	A&B
Average Address Lobby Strategy	5.0 (3.8 + 1.2*)					1.75								**3.0**
participant total interventions	4	8	4	0	9	2	1	0	1	5	0	5	0	**39**
Intervention Total After FBM	0	3*	2*	0	1*									**6***
open window blinds	1	1	0	0	1	1	1	0	0	1	0	1	0	**7**
move reception	1	1	1	0	1	0	0	0	1	0	0	1	0	**6**
evident wayfinding	1	1	0	0	1	1	0	0	0	0	0	0	0	**4**
add generosity moving music or scent	0	1*	1*	0	0	0	0	0	0	1	0	1	0	**4**
add plants or exterior views to nature	0	1*	0	0	1	0	0	0	0	1	0	0	0	**3**
donor recognition: bricks or plaques	0	1	1	0	1	0	0	0	0	0	0	0	0	**3**
exhibit in lobby	0	0	0	0	1	0	0	0	0	1	0	1	0	**3**
use colour to brand the space	0	1*	1*	0	1*	0	0	0	0	0	0	0	0	**3**
seating near windows	0	1	0	0	1	0	0	0	0	0	0	0	0	**2**
remove clutter	1	0	0	0	1	0	0	0	0	0	0	0	0	**2**
raise feel of ceiling height	0	0	0	0	0	0	0	0	0	1	0	1	0	**2**

Table 5.1 **Address Lobby Space Strategy.** 1 = participant suggested the intervention. 0 = intervention was not mentioned. * = participant suggested intervention after Fogg Behaviour Model motivation and ability had been introduced (Series A only). Series A interviews averaged double the strategies to address the lobby space suggested in series B interviews.

and B7 talked about the possibility of playing "music that is, you know, scientifically shown to increase generosity." A2 also wondered about scents that might inspire a generosity. In the context of comfort and feeling fear or anxiety A3 acknowledged that "colours, use of materials are definitely important tools that I would use to stir up, or to stretch that whole emotional feel." A5 felt that warm colours draw people, so he would use them in the reception kiosk area. B1 said "I want them to feel welcome and feel safe...so there's going to be a lot of light, light and a lot of windows." Most participants disliked the closed blinds. "It feels a little bit enclosed...if you could see through these windows. If it was all open to the outside...it would have a more open feeling" (B7). Participants said they would open the blinds to let in the daylight. A5 noted that the drawn blinds were "essentially cutting you off from the outside, and you could sort of see through it that there's green stuff out there." A2 wondered whether introducing aspects of the natural environment, like a window view of a garden or adding a potted plant, would influence box donations because "nature makes humans feel more at ease, it relaxes us." B5 also wanted to add plants to give more life to the space. Some suggested relocating the seating area next to the windows. A5 recommended that 2/3 of the lobby be allocated to patrons' comfort, even offering nibbles and a cuppa. The participants endeavoured to create a place where people would "want to linger" (B7) or "a nice area for people to go and mingle" (A3).

A3 and A5 presumed that if visitors felt as if they were receiving something of value, they will reciprocate by donating. A2 observed the effect architecture can have on a person's emotional state when she recalled her experience of the Jewish Museum in Berlin. She said it is "awkward and slanted and you don't know where you're going…but you really feel, for all of the individuals' items that you're seeing, that they died in the holocaust." She felt that

the architecture was appropriate because it "tie[d] back to [their] overall identity and brand." She recommended using aesthetics to brand the space, which helps people "to understand where [they] are." She added, "I mean people have emotion evoked when they go to a really well-designed place...If it has an identity, and it's memorable and distinguishable, I think people are more apt to discuss it in the future and discuss how it is important, or how it was perceived from their experience. I think it's all based on experience." B7 reasoned that "although it's not an architectural solution I really think that the biggest thing is to actually celebrate what you are, what you are there for, and that is art." B7 explained people's desire to contribute to something they appreciate: "in this case I would think of it in that way, that if you've got some really outstanding art in this lobby that it's going to psychologically influence people to donate more because they are appreciating what they see around them." A2 wanted "to make the space a great experience for all versus catering towards one specific demographic."

5.4.2 Summary: possible rationale behind addressing the space.

Participants first went about setting the scene. The designers seem to understand that people are emotionally affected by their environment, even when they are not conscious of it. Participants indicated that people would be more inclined to donate if they felt secure and welcome. The strategies imply that people are more likely to donate if they are in a space that makes sense to them, and makes them feel more at ease, more comfortable. There seem to be underlying themes of priming and emotion to what the designers addressed in the space.

5.5 Strategy: Donation Box Placement

5.5.1 **Relocating the box.** Participants were all interested in the best placement of the donation box (*Table* 5.2). A2 suggested learning from proximity maps of existing contribution strategies. A3 proposed collecting data on people's travel patterns in the museum to help with donation box placement. He reasoned, "if there is one focal point, like you know, where every person comes to that one reception point no matter what, then that automatically is a great place for that box for donation." Conversely, A3 wondered whether a more private anonymous setting might increase donations received from certain personality types. A2 mentioned "incorporating the flooring leading up to [the donation box] to celebrate the idea of [giving]." A4 wanted to "put a really elegant rug underneath" the box to say "'this is a special place.'" He pointed out that the colour and type of rug would depend upon the context because "those subtle things can make differences."

A3 and A4 made sure there was enough space around the donation box to allow people to donate, considering groups and traffic flow. A3 suggested, "let's talk about space requirements. Uh, people come, there's interaction with that reception desk kiosk – how long it takes – and so not really tying into the aspect of giving, but using that behavioural pattern as a design tool to size that room." The act of donating "may take more [space] than I would expect" (A4). They avoided placing the box in the centre of the room, as B2 commented "a donation box is kind of a passive-aggressive kind of thing, especially if it is located in the middle of the room like that. It's very stand alone." A4 called the central box placement in a symmetrical room an "in your face entry kind of piece." And B4 warned against "taking people aback" by having a donation box be the very first thing they see. A1

	Series A Interviews					Series B Interviews								Totals
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B8	A&B
Average Box Placement Strategy	6.6 (6.0 + 0.6*)					2.5								**4.1**
participant total interventions	10	5	8	5	5	2	4	2	7	2	2	0	1	**53**
Intervention Total After FBM	0	0	3*	0	0									**3***
move box to exit	1	1	1	1	0	0	0	1	1	0	1	0	0	**7**
box not in middle of room	1	1	0	1	1	0	1	0	0	0	0	0	1	**6**
test box near entrance	1	0	1*	1	0	0	0	0	-1	0	1	0	0	**5**
box visible	1	0	1*	0	0	0	1	1	1	0	0	0	0	**5**
box near reception	1	0	1	0	1	0	1	0	0	0	0	0	0	**4**
move box near galleries	1	0	0	0	1	0	1	0	0	1	0	0	0	**4**
move box near gift/café	1	1	1	0	0	0	0	0	1	0	0	0	0	**4**
multiple boxes	1	0	1	0	1	0	0	0	1	0	0	0	0	**4**
ensure enough space to perform donation	0	1	1*	1	0	0	0	0	0	1	0	0	0	**4**
box on right	1	0	0	1	0	0	0	0	1	0	0	0	0	**3**
constrain flow past box	1	1	0	0	0	1	0	0	0	0	0	0	0	**3**
place box within circulation patterns	0	0	1	0	1	0	0	0	0	0	0	0	0	**2**
install barrier at box (turnstile)	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
do not place box at entrance	0	0	0	0	0	0	0	0	1	0	0	0	0	**1**

Table 5.2 **Move Box Strategy.** 1 = participant suggested the intervention. 0 = intervention was not mentioned. -1 = participant specified not to apply the intervention. * = participant suggested intervention after Fogg Behaviour Model motivation and ability had been introduced (Series A only). Participants generated the most ideas for placing the donation box.

imagined that "everybody kind of ignores [a donation box in the centre of the room] and pretend[s] like it doesn't exist because I can just walk into the galleries where I was headed." He assured me that "having it in the middle of the room like this is definitely a design issue."

Some of the participants considered using the architecture to constrain people into a tight space where you cannot miss seeing the donation box. B1 suggested using a turnstile or similar constraining arrangement as "a reminder trigger" because "we're all used to paying to get in." He supposed "it's the architectural solution to what is a cultural expectation. And it's using that reinforcement." B8 confirmed that successful donation boxes are those he has "to intentionally walk around" when entering the building or gallery because he "feel[s] compelled almost like it's the ticket taker at the door." A2 imagined constraining in another way: "if you make the exit difficult to get out of...'where do we go? Oh, there's a box' versus something they can ignore."

Many of the designers considered whether people are more likely to give if the donation box is located at the entrance or exit. A1 sited some boxes near the entrance to the galleries since he assumed that the exhibits are why people visit. He stated, "as you're about to enter the thing you're going there for, there's the donation box." He placed it on the right, "because people look right for whatever reason." Conversely, B6 indicated that people would be more likely to give after they had enjoyed the museum's exhibits than before because "they don't want to take the risk" and "give first." He reasoned "you'd probably get more donations at the very end when everybody is satisfied of [*sic*] what they've seen." B4 agreed: "they come out. They are entranced. They think it was wonderful. They are

talking with their friend about 'how great this was, we have to come back,' and now they confront your little pitch." As B3 proposed: "and now they want to give back."

Some of the participants considered locating donation boxes near the café or gift shop. A1, A3 and B4 figured that proximity to points of sale might make it easier to donate because people would already be reaching for their money. B4 suggested putting a donation display "in the little café that you have. That would help because now they have slowed down, and they are taking out some money anyhow because they are going to pay for their lunch."

5.5.2 Summary: possible rationale behind donation box placement.

The designers considered ease and visibility when deciding where best to locate the donation box. They seemed to figure that people would be more likely to donate if it was evident that it was expected and convenient to do so. Some participants considered the feeling that the box location might evoke. Personal experience aided their choice. Perhaps making the area around the box feel special and appreciated would elicit more donations. These strategies imply that people are more likely to donate if it is obvious that it is expected, if it is easy to do so, and if it feels appreciated. There appears to be underlying themes of making what is intended evident, convenient and evoking emotion.

5.6 Strategy: Inform Visitors

5.6.1 **Install signage.** Giving patrons enough information was another theme of the participants' strategies (*Table* 5.3). A2 indicated that the space should have identity "tying into way finding...You're at the lobby of xyz museum." She imagined people might be traveling and visiting more than one museum in a day, and it could all become a disorientating blur. B4 declared she "would create a display on these walls so people can walk in and immediately – before going to buy a ticket – they are looking at what is going on." People need to "be convinced that this is worthy of their support" (B4). B5 suggested relating "some history about the museum and how it got to be from where it was to where it's going." Some participants specified that the signs be placed just below eye level. A1 indicated the precedent of bus stops and subway stations where the informational and directional signage is placed at shoulder height. "It's all in that five-foot band." Some signs were meant to inform patrons why the museum needed funds, and how their donations were going to be used. A1 believed that if patrons are given "a reason to feel like 'hey it is important that you do this,'" people would be more likely to donate. "I certainly would be." People might "just assume that somebody else is paying for all of this" (A1). Signs can explain how the museum supports itself, and what exhibits are forthcoming (B5). A2 recommended graphic representation of the need for donations, where the money goes and who has donated. "Visually displaying that on a wall somewhere would be beneficial," because "people are visual learners" and understand things better and faster when it is represented graphically.

A2 pointed out that "it's important" that people know how their money will be spent. She gave an example where people felt betrayed when they found out that the Susan G. Comen Breast Cancer Research spent around 70% of their donations on administration. She said it was upsetting to people because they had felt good "donating towards breast cancer, and helping save lives," only to find out later that most of their contribution was not spent as

	Series A Interviews					Series B Interviews								Totals
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B8	A&B
Average Informing Visitors Strategy	4.6 (4.0 + 0.6)					1.6								**2.8**
participant total interventions	3	7	2	5	6		0	0	4	6	1	1	1	**36**
Intervention Total After FBM	0	2*	0	1*	0									**3***
museum identity	1	1*	0	1	1	0	0	0	0	1	0	1	1	**7**
how museum is supported	1	1*	0	1	0	0	0	0	1	1	0	0	0	**5**
psychology of donation request wording	0	1	1	0	1	0	0	0	0	1	1	0	0	**5**
upcoming exhibits	0	1	0	0	1	0	0	0	1	1	0	0	0	**4**
sign where money goes	0	1	0	1	1	0	0	0	0	1	0	0	0	**4**
thank donors	0	1	1	1	1	0	0	0	0	0	0	0	0	**4**
people like you	1	1	0	1*	0	0	0	0	1	0	0	0	0	**4**
current exhibits	0	0	0	0	1	0	0	0	1	1	0	0	0	**3**

Table 5.3 **Inform Visitors Strategy.** 1 = participant suggested the intervention. 0 = intervention was not mentioned. * = participant suggested intervention after Fogg Behaviour Model motivation and ability had been introduced (Series A only). Participants seemed to want to ensure visitors had enough information to make the decision to donate.

they imagined. The designers suggested evoking emotion by informing them of something the museum uses money for that they can feel good about. "You helped fund summer school programs" or "you're helping to build habitat." A3 also suggested having a "donor wall to describe why the donations are important."

When considering how to ask for money A5 stressed "I think it's important to understand the psychology of presentation, presenting a request for money to people." B4 said "I would have something really fabulous and interesting right at the point where I was going to be asking for the money." B7 suggested putting "a sculpture right next to the donation box" with "a plaque there that tells about the artist and what they are trying to achieve and personalises it, and psychologically you would want to donate to support that artist." A2 called it "pull[ing] at the heartstrings of people." B4 proposed "it's got something interesting in it, it asks you a question perhaps; it gives you something more than all the stuff that you just saw and then in that is your donation box." B4 advised involving the patrons by saying, "this museum is a project of the such-and-such county, whoever, or whatever it is, and it's supported by both Government funds and private donations and – [x]% of the donations that we get are from people who come to visit the museum."

A2 said that "it's always nice to thank" people for donating. She went on to mention that ball parks and high schools use bricks with people's names in recognition of their donations. "It's nice to see your name there, and [you might] pay xyz amount of money to have your name there indefinitely. Humans like that kind of stuff." A3 agreed that "people love to be proclaimed." The designers imagined architectural, visual and graphic ways to show appreciation for donations.

5.6.2 **Summary: possible rationale behind informing visitors.** The designers endeavoured to share information with visitors that would offer them a reason to donate. Some participants referred to themselves, suggesting that personal experience helped inform their design choices. Participants placed signs based on precedents from other venues. Many of the suggested reasons were designed to evoke emotion. Some tried to give visitors a sense of belonging. Others aimed to reassure visitors how their donation would be spent. Still others cited people's vanity. It seems participants reason that people are motivated by emotion, so introducing feelings of shared values and a sense of being part of something worthwhile might increase visitor propensity to donate. This approach partially attributes donation behaviour to people's values. It is again apparent that evoking emotion and making the intention evident are themes underlying the suggested strategies.

5.7 Strategy: Donation Box Redesign

5.7.1 **Change the box.** Participants gave some consideration to the design of the box itself (*Table* 5.4). Shape, colour and opacity were all discussed in differing measure. B2 illustrated the need for balance when he said, "you could make this donation box a big glowing red thing that says, 'give me money or you are going to have a shitty time,' and you know, that's going to affect people in some way. Like that's design that's giving a very clear message. Conversely you could make the donation box so small that nobody sees and therefore nobody does anything because they can't see it." All participants established that for people to donate they need to realise they have the opportunity. Hence the box needs to be noticeable.

	Series A Interviews					Series B Interviews								Totals
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	B8	A&B
Average Changing the Box Strategy			4.6 (3.4 + 1.2*)						1.4					**2.6**
participant total interventions	2	4	6	6	5	0	3	2	0	0	0	2	4	**34**
Intervention Total After FBM	0	1*	2*	1*	2*									**6***
staff request donation	0	1	1	0	1	0	1	0	0	0	0	1	0	**5**
attract attention: shape of box/add exhibit	0	1	1	0	1	0	1	0	0	0	0	1	0	**5**
entertainment	0	0	1*	1	1*	0	0	1	0	0	0	0	1	**5**
exchange (get something in return)	0	0	1*	1	1*	0	0	0	0	0	0	0	1	**4**
cashless electronic donation or credit card add-on	1	1*	1	0	1	0	0	0	0	0	0	0	0	**4**
accessible money slots	1	0	0	1	0	0	0	1	0	0	0	0	0	**3**
anonymous	0	0	1	0	0	0	-1	0	0	0	0	0	0	**2**
elevate box	0	1	0	1	0	0	0	0	0	0	0	0	0	**2**
transparent	0	0	0	1	0	0	0	0	0	0	0	0	-1	**2**
opaque	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**
offer choice of what to fund	0	0	0	1*	0	0	0	0	0	0	0	0	0	**1**

Table 5.4 **Change Box Strategy.** 1 = participant suggested the intervention. 0 = intervention was not mentioned. -1 = participant specified not to apply the intervention. * = participant suggested intervention after Fogg Behaviour Model motivation and ability had been introduced (Series A only). Several of these interventions were prompted by FBM.

A4 envisaged a transparent donation box that is seeded so patrons can mimic what they see. “A more convincing message is what other people have done.” Yet B8 cautioned *against* showing the donations because “you can see all the piles of money” and think “it looks like they have enough.” Or conversely, if patrons think that there is not enough money, they might “feel like, well why isn’t anyone else donating?” A4 suggested that the slot in the box be “more evident and more gracious.” He explained “that it feels dignified, that in some ways the built form was crafted by people to ‘thank you for doing this,’ not just to make it instrumental.” He gave a negative example of having to “put your hand in a dark place” because it might be dangerous, which “would be ungracious.” A4 asserted that donating should not require fine motor skills, and recommended “the old coin slots in the subway...they’re like dishes that slope down to the slot. Right, so you can miss, and still actually get there. You don’t have to be precise. So that would be a little bit of graciousness.” Even though it is not a typical donation box, many participants envisaged an optional donation add-on for credit-card receipts. A4 suggested having an envelope handy for people to mail in donations later. Although outside the scope of this project, A2, A3, and A5 specified having a donation option on the museum website.

Some participants explored play and fun in the design by making the act of donating interesting. B8 suggested “some sort of immediate gratification for donating the money, like...one of those inverted funnels or whatever where you could drop the money in and it spins around and starts going horizontal and makes ‘zzzz’ and it’s very interactive...There’s kind of the entertainment aspect to it.” B4 planned to “make it so great and try to bring in some sort of real interactive thing.” A4 advised making that playful aspect evident in the box design. After the Fogg Behaviour Model had been introduced, three of the

interviewees conceived of a kiosk where patrons could tap their phone or credit card to make a set donation, for example £2. After motivation and ability had been presented A5 suggested that patrons could choose an image printout of their favourite exhibit. He explained that the museum could partner with local businesses; a patron donates with their card and "in exchange you've got this thing, and it's got marketing blurbs on it on the back, but on the front, you've got the image that you're after, the exhibit." He explained that the kiosks could be located next to the corresponding exhibit, and there could be a notice in the lobby to "'please look for these opportunities to donate and get something throughout the museum.'" It becomes a treasure hunt. A5 further devised an interactive donation box system to be placed in the galleries whereby people could vote for their favourite exhibits by donating, or they could donate and receive a colour souvenir printout of that exhibit. Similarly getting people more involved, A4 suggested a contest to guess how much money is in the donation box. A4 also envisioned creating a narrative book about donating to museums, made available to patrons.

Several designers encouraged human interaction, in which employees simply ask for a donation. B2 said: "maybe you could integrate the donation box with the reception and the receptionist just asks you – they say, 'hey, would you like to donate today? Like were you pleased, how did you like your visit today?'" A5 imagined an elderly grandmother-type person asking people who pass the box without donating, "do you think this is free?" as she hands them coins to donate. Although A5 was half joking, A4 believed in doing what the project requires to create a great place; "if all of the sudden it makes sense to bring in a mime troop, then bring in a mime troop."

5.7.2 Summary: possible rationale behind redesigning the donation box.

Although the box is the first thing that people might consider, this category of strategies elicited the least variety from the participants. Some of the strategies implied social pressure would affect visitor donation behaviour. Mimicking and anonymity were both mentioned by participants. After the FBM had been introduced, designer suggestions had a more playful aspect to them. Many of the ideas were related to entertaining visitors, even with a little of the unexpected. Possible designer rationale concerning behaviour was that guilt, social acceptance, and altruism all might motivate donating behaviour. Evoking emotion recurred as an underlying theme, along with priming and making the intention evident.

5.8 Summary: Discussion and Implications for the Framework

5.8.1 Findings: designer perceptions, the four strategic themes or concepts.

None of the designers directly mentioned behaviour theory during this portion of the interviews, but neither are they naïve to its implications. Participants suggested strategies that show their understanding of influencing behaviour. They mentioned some perceptions outright, and others can be inferred. These themes were categorised into principles to be compared with human behaviour theory in chapter eight. The following strategic themes were recognised in series A interviews: [1] convenience, [2] information, [3] influencing attitude and/or emotion, [4] addressing the space and [5] alternative strategies. However two of the categories were not exclusive and the alternative strategies category was not specific enough (*Chapter* 5 *Tables* 5.5 & 5.6). Some of the information strategies were both

priming and making the intended behaviour evident. The same for some of the spatial strategies. Thus the themes were rearranged until a suitable group was identified.

Participants first set about laying a foundation for a giving environment. This is reminiscent of priming. People's behaviour is unconsciously affected after exposure to "certain sights, words or sensations" (Cabinet Office and Institute for Government, 2010). B1 emphasised that "human's response to daylight and spatial quality, safety and way-finding – that's innate." The participants addressed the lobby space to make people feel welcome, and to feel that they receive something of value. The perception is that people would be more inclined to give if they felt reciprocity.

The designers perceived that making donation behaviour convenient would increase donations. A1 stated "It's all about convenience. You want to make it as easy as possible to do," "because if it's hard and mandatory people won't do it." Participants devised a variety of strategies to make donating simple and expedient for museum patrons. Strategies involved relocating the box according to situations where people might want to give, ensuring there was enough space around the box for access, and redesigning the box to make giving accessible to a variety of people. Participants even suggested offering a credit card tap in case people do not have cash on hand.

Designers also perceived that touching people's emotion could motivate more donations. They considered the experience, feelings and emotions of the user. It seems that there were two approaches to evoking emotion: [1] through the body (senses) and [2] through the mind (reasoning). Participants changed materials and layout to appeal to the senses

and stimulate feelings of value and appreciation. All the participants considered making the donation area feel special by creating an environment that says, “this is important,” “we value this” and “we appreciate your donation.” Specifically, they suggested raising the box on a pedestal, lighting it or changing the flooring around it – e.g. with an exquisite carpet to draw attention – and even scenting the area and/or playing music. A2 talked about celebrating the act of giving by making people feel appreciated and consequently generous. Signage was also employed to generate feelings that compel people to give. A2 believed that graphically representing how donations are used and thanking donors would be effective. A3 suggested offering patrons who might not have much money another way to contribute by “liking us on our Facebook page.” A5 advised “the design goal is to sell the idea of the museum’s commitment to caring for the community’s common cultural heritage,” the underlying perception being that people would be moved to give if they felt they were making a difference, and it was appreciated.

The designers deliberated how to make it **evident** to visitors that donations were accepted. They guessed that people are in the museum by choice, and then assumed that since visitors want to be there, letting them know the needs of the museum and the available options to contribute might prompt donations. All the interviewees envisioned clarity as key to obtaining donations and applied informative signage.

Four principles were apparent in the designers’ strategies: [1] priming, [2] ensuring convenience, [3] making the intention evident, and [4] evoking emotion. These can all be related to behaviour theory (For discussion please see *Chapter* 8). The designers considered the senses and what attitudes and emotions are engendered. They used

Employ Priming	Evoke Emotion
make it special, celebrated	visitors feel appreciated
change flooring	visitors feel needed
music	visitors feel part of a community
lighting	include their needs in the design
establish permanence (the donation box not look temporary)	share the museum's goals and objectives
do not overdo it though	visitors feel some control
	their contribution is making a difference
	offer them a choice of what their donation goes towards
	visitors think the act looks fun or interesting

Table 5.5 **Employ Priming and Evoke Emotion.** Concepts and strategies in design for behaviour change that are repeated in the participants' interviews.

graphics, colour, lighting, music and change of materials to indicate the museum's value and an appreciation of donation. If people are unaware of the need for donations or option to donate, the behaviour is not triggered and unlikely to happen. Making the need evident supplies a trigger. What people believe about a behaviour and its social acceptance contributes to performance. People are more likely to act when they believe that their intention will be satisfied. This concept was addressed by providing information about where a donor's money would go. If the intended behaviour is evident in the environment and is convenient, it becomes a more likely option. This concept was addressed by placing the boxes where people could see them, and it would be a convenient time and place to donate. The designers also considered making the behaviour simple for a variety of visitors.

This study demonstrates that although the interviewed designers may not have direct knowledge of behaviour theory, they are aware of what influences behaviour. The participants' interventions expressed the following four concepts about human behaviour: [1] Employ Priming, [2] Evoke Emotion, [3] Ensure Convenience, and [4] Make Intent

Ensure Convenience	Make Intent Evident
near gallery entrance because that is why visitors are there	why it is necessary
near gift shop or café because visitors are already going to spend money	that it is important
on the right because people look to and go right	that it is appreciated
easily accessed	where the box is and how to donate
easy to perform behaviour	how the donation will be spent
doesn't feel hazardous to operate, is comfortable	on the right because people look to and go right
envelope for later	

Table 5.6 **Ensure Convenience and Make Intent Evident.** Concepts and approaches in design for behaviour change that are repeated in the participants' interviews.

Evident. The concepts appeared in the series A interviews which informed the concept diagram exercise in the second set of interviews. Thus convenient, emotion, evident and priming were the findings presented as concepts for the diagram exercise portion of the B interviews (Definitions can be found in *Appendix* I). These findings help establish what designers perceive can change human behaviour [RQ1] (*Tables* 5.5 & 5.6). The hypothetical design exercise part of series B interviews aligns with series A interviews. Consequently the results of series B interviews are shown next to series A interviews in this chapter. There are fewer interventions per participant in series B. This is likely because series B spent only 8.25 minutes on average for this portion of the interview. Also, series B interviews had a concept diagram instead the Fogg Behaviour Model motivation and ability; consequently, there are not any interventions that follow an FBM introduction.

5.8.2 **Findings: perception determinants.** In both sets of interviews, designer perceptions were largely based on ***personal experience***, ***prior reading*** and familiar ***precedents***, although participants indicated that if this were a real design situation they would first investigate the problem [RQ2]. Thus interviewees are also asked about real-

world projects in series B interviews to further establish what informs their perceptions about human behaviour.

5.8.3 Summary: designer perceptions and determinants. This chapter presented findings from interviews with spatial designers around a design exercise. It identified four potential designer perceptions on what can change human behaviour [RQ1] (*Table* 5.7) These four perceptions appear to indicate how a user might experience a design intended to influence their behaviour which may be supplemental to the classifications of product influence from SID (*Figure* 2.6). Hence chapter six presents interviews which use these findings along with four concepts from theory to further identify designer perceptions.

This chapter also found three determining sources for designers' perceptions [RQ2] (*Table* 5.7), whilst identifying programming, an important step that influences designers' real-world projects. To gain a more accurate understanding of what may inform designers' perceptions, chapter seven examines designers' real-world projects where participants have had time to determine the "need behind the need." Finally, although the designers did not directly reference it, the findings are compared with human behaviour theory in chapter eight [RQ3]. Next chapter six builds upon these initial four perceptions with findings from the diagram exercise portion of the interviews.

Perceptions [RQ1]	Determinants [RQ2]
designer perceptions of user experience	*what determines designer perception*
Priming	Personal Experience
Convenient	Prior Reading
Emotion	Precedents
Evident	

Table 5.7 **Design Exercise Findings.** Designers perceived that user' experience of an intentional design is what causes the target behaviour [RQ1]. Preliminary findings indicate three possible determinants of designer perceptions [RQ2].

6 Diagramming Concepts of User' Experience

6.1 Introduction: The Purpose of a Conceptual Diagram Exercise

Analysis of data from chapter five's design exercise determined that strategies designers prescribed to influence behaviour can be grouped by concepts of user' experience. This portion of the interviews aims to find out what designers perceive about changing human behaviour using specific experiential concepts. The topic is participants' conceptual understanding of how a user experiences design for behaviour change. User experience of a design is important because it can affect behavioural outcomes. The purpose of the conceptual diagram exercise is threefold: [1] designers are visual thinkers, and a diagram facilitates thinking about abstract concepts that influence human behaviour; [2] the findings can be compared with those from both the hypothetical design exercises and the participant's projects; and [3] designer understanding of the concepts can be compared with human behaviour theory. The intention is to help establish designer perceptions about changing human behaviour [RQ1], and on what these perceptions are based [RQ2], to relate the findings to human behaviour theory [RQ3].

Interviewees may process abstract concepts more readily by having the opportunity to use their visual strengths as designers. Thus a visual method is employed to encourage productive monologue about abstract concepts to indicate users' experience of design for behaviour change. The concepts are taken from series A interview findings and from an article classifying product influence (Tromp, Hekkert, & Verbeek, 2011). The article also informs two axes on a quadrant diagram that represents a user's potential experience of a

design. Participants read the concept definitions and place each card on the diagram to indicate what type of user experience they think the concept would trigger. As intangible concepts become realised in a visual format, designers can further explore their ideas. The visualisation helps participants to think through their responses and make refinements as they see and talk through the associations from their choices.

The chapter is divided into sections according to the concepts that are examined. An introduction and explanation of the diagram exercise are followed by the findings of each of the eight concepts:

6.2 Description of the Process to Capture Data

Participants were shown a diagram about 50 cm square divided into quadrants by x and y axes (A copy of the diagram can be seen in *Figure* 6.1 and in *Appendix* H). The x axis represents the user's level of awareness of the design intention, and the y axis represents how strongly the user feels the pressure to comply with that intention. At the intersection of the axes there is a human head and brain outlined in profile. The profile faces right towards the labels "explicit" and "conscious mind" on the x axis. Behind the profile to the left the x axis is labelled "implicit" and "subconscious mind." The y axis is labelled "strong pressure" and "weak pressure" above and below the profile respectively. In addition to the diagram participants were given eight concept cards (Copies can be seen in *Appendix* I). These concepts were introduced whilst explaining the diagram. Participants were encouraged to read the definitions and then position each card on the diagram to indicate how a user might experience that type of design (*Figure* 6.1). The first four concepts presented to participants were taken from design for behaviour theory. Then the next four concepts were those established from the analysis of series A interviews in chapter five.

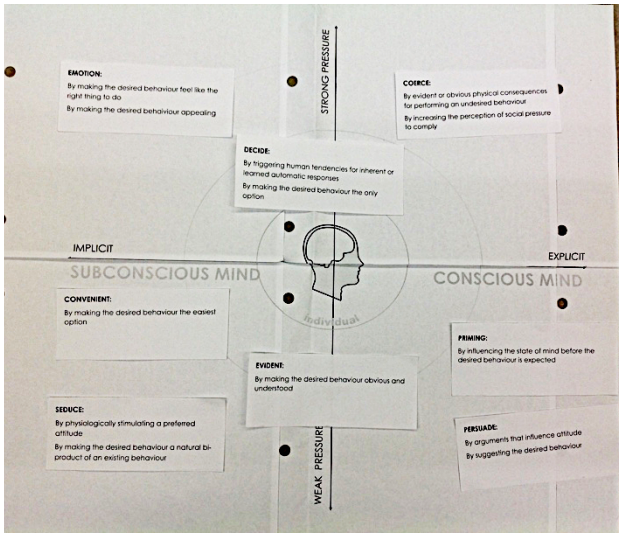

Figure 6.1 **Completed Concept Diagram. Participant** positioned the eight concept cards on the diagram to indicate the user's experience for that type of design.

The intention of the diagram exercise is to facilitate talking about these abstract concepts by using a visual method. The diagram is divided into quadrants that relate to [1] how aware

a user is of the design's behavioural intention, and [2] how strongly a user feels the pressure to perform the intended behaviour. There are four experience possibilities beginning in the upper right quadrant and moving clockwise: [1] the user is aware of the design's intention and feels strong pressure to perform the intended behaviour; [2] the user is aware of the design's intention and feels weak pressure to perform the intended behaviour; [3] the user is unaware of the design's intention and feels weak pressure to perform the intended behaviour; and [4] the user is unaware of the design's intention but feels a strong pressure to perform the intended behaviour. Once participants had exhausted their comments, a photo was taken to capture each participant's completed diagram. (*Figure* 6.1; Diagram photos can be seen in *Appendix* J).

6.3 Concept: Coerce

COERCE:

By evident or obvious physical consequences for performing an undesired behaviour

By increasing the perception of social pressure to comply

To familiarise participants with the exercise they were given a design example for the concept coerce. A coercive design was described where bollards prevent cars from driving into a glass building. There appear to be two types of coercion when the participants' placement of coercion is synthesised: [1] explicit with strong pressure, and [2] implicit with strong pressure (*Figure* 6.2). Placement consistency suggests that coerce is a clear concept for the participants.

6.3.1 Coerce 1: Explicit with strong pressure.

With only two exceptions, all participants positioned coerce in the explicit, strong pressure quadrant. "I think coercion would probably be explicit and strong." B8 explained, "You are actively trying to force them,

and that's a strong pressure kind of thing because if it were – coercion is not subtle, and if it isn't strong then it isn't effective. It might not even really be termed coercion." B6 also placed coerce in explicit, strong pressure. All participants agreed that users would feel strong pressure to conform. B4 stated, "Coercion is strong pressure, certainly." When asked, she explained "because you are – you are making obvious consequences for...doing the thing you don't want the people to do...I think that is among the strongest pressure there is because you would be *motivated to avoid the negative consequences*." B4 also rated it "very conscious." B3 felt coerce exerted strong pressure like seduce and would be on the explicit side like emotion. B1 affirmed, "It's all those triggers I'm telling you about. It's coercion: feeling it emotionally, right? You know 'emotional bully'?" He used a design with "spikes on a fence" to describe coerce as "very explicit, and it's very strong pressure." Then he considered the negative consequences, "I don't think what you are talking about here is anything learned. When I see the barbed wire, I don't go over because I'm going to get hurt." The comments of participants suggest they perceive that *avoiding negative consequences can be a successful motivator to change behaviour*.

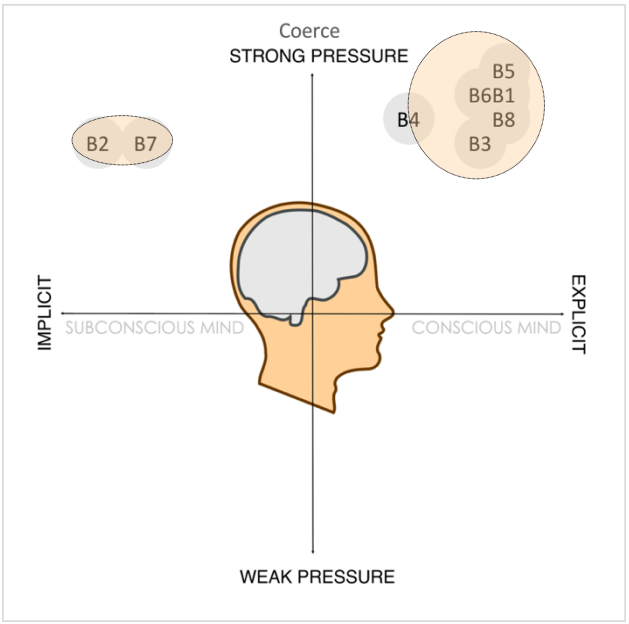

Figure 6.2 Coerce. How participants imagine users would experience a design where there were obvious negative physiological or social consequences from the undesired behaviour.

B5 remarked, "I know what the word coerce means, but then I'm reading the definition 'by increasing the perception of social pressure to comply'-- so it depends on how someone values social pressure...because I know some people who if they knew social pressure was pressuring them, they would choose the opposite. So their personality becomes a piece of it." This comment suggests that the pressure felt might be dependent upon what the *user values*, which *influences their response to the design.*

6.3.2 Coerce 2: Implicit with strong pressure. Although everyone agreed that coercion would exert strong pressure, two of the participants indicated users would be unaware of the intention. Both compared coerce with seduce. Regarding the definition 'perceiving increased social pressure to comply,' B7 noted, "there's a subconscious aspect to perception." He explained, "You can act a certain way just because your subconscious is telling you, 'well they are going to laugh at me if I don't do that.'" He associated a design standard called Crime Prevention Through Environmental Design [CPTED] with his impression of coercion. "You're not even giving them the opportunity to think about certain misbehaviour because you are not – you are designing in a way that it just doesn't give them the opportunity to think that way." B7 continued, "subconsciously they wouldn't even think to [misbehave], and it's a very passive thing. I would say it's passive, and it's subconscious. It's implicit." He first placed coerce in implicit weak pressure, but when placing seduce, he decided that "coerce is more forceful [and] seduce is less forceful." He replaced coerce with seduce and moved coerce up to strong pressure, but he maintained that "they are both subconscious." B2 positioned coerce on the implicit side. He felt that coercion is often malicious because people would not realise what they were getting into.

He said seduce would be similar. B7's comments suggest that *removing opportunity to act influences behaviour.*

6.4 Concept: Seduce

SEDUCE:
By physiologically stimulating a preferred attitude
By making the intended behaviour a natural biproduct of an existing behaviour

Seduce did not end up as tightly clustered as coerce. Although most participants assigned seduce to implicit with weak pressure, a couple claimed that seduce exerts strong pressure. It is difficult to say whether the variance might be because participants were given a clear example for coerce, whereas there was not an example given for seduce. Neither were there examples given for the other concepts yet some of those diagrams are also clustered. With the exception of one outlier the findings suggest participants have an understanding of two types of seduce: [1] implicit with very weak pressure, and [2] very implicit with strong pressure (*Figure* 6.3).

6.4.1 Seduce 1: Implicit with weak pressure.

Most participants said that users would be unaware of the design intention and experience weak pressure. B6 positioned seduce well within that quadrant. He associated seduce with shopping. He described a buyer's being seduced into a purchase because the product "looks good," even if "it doesn't work." He said they were seduced by "the IDEA of what it could be, or what they thought at the time." B7 considered, "*Psychologically you are applying the pressure*. Without doing anything; you are not stimulating anything. So I'd say that is a pressure." He suggested, "There's an element of subconscious here. Seduce...is psychological. It's you know, there's depth of seduction. I think it has to go on the subconscious side." B7 assigned seduce to

implicit with weak pressure, but not the weakest. He also relocated coerce from implicit with weak pressure opposite to strong and explicit near where B3 had placed coerce. B8 positioned seduce in weak pressure "for similar reasons" to persuade, but on the subconscious side. B5 maintained that "if [seduce] is 'a natural biproduct,' it's passive." She positioned the card in the weak pressure and implicit quadrant. She continued "and then the subconscious piece of it – even saying 'I like this' happens much after you subconsciously experience it." Participants comments indicated a *subliminal quality to the experience*, but it is difficult to say what the design implication might be.

Whilst loosely grouped with implicit weak pressure, B1 supposed that seduce might also become explicit. "Seduce is here." B1 began gesturing towards explicit. Then he revised "Well maybe not, maybe not, maybe not! Because seduction can be done very, very – it can be very implicit." He clarified, "If the reward is that sense of feeling good, it's implicit; if the reward is a piece of candy at the end, that is explicit...but it's always weak or it's always very low pressure. I mean unless it's a date, and then maybe it might be strong." B1 ultimately positioned seduce between implicit and explicit in weak pressure. He made some comments in another part of the interview that are relevant here. As an exercise in behaviour change during the interview B1 designed a museum lobby "to show what Hitler had done to seduce an entire nation into criminal activity" because "it is so easy to dismiss the Germans as being idiots until you stand next to the Reichstag and look at those flags" and "understand physically why everyone was seduced." He described creating a power of architecture and using it to *make the user feel good as a reward*.

6.4.2 Seduce 2: Implicit with strong pressure. Although most participants considered seduce implicit, two of them indicated that users would feel strong pressure. B3 rated seduce at the same level pressure that she rated coerce, but she felt that seduce is implicit whilst coerce is explicit. B4's placement agreed, "If you've [designed] it well it will be compelling; you won't even know why you are doing it. But it's just like if you walk into a space and there's a view you are going to walk right over...and you're not questioning it." She continued, "[Seduce] is implicit, and you are trying to get [your users] to do something without making it cognitively – or making them aware in their cognitive – It's probably strong, a strong sense of pressure, but the pressure is coming from inside you. You want to do that. It's a desire." When asked if she would like to add or change a concept, B4 decided to add a separate card to the diagram for desire. "I think desire is important. You are trying to get people to desire to do the thing. So, you want them to want to do it. It is much better to have them want to do it than to have to decide or to force them to do it." B4 explained that "desire is the strongest pressure and the most implicit...because it's *coming from inside you*." She continued, "Seduction comes from the outside...but if it's desire...you are not questioning it" because "you also want to do it." There seems to be an implication to *align the design intent with the intentions of users*.

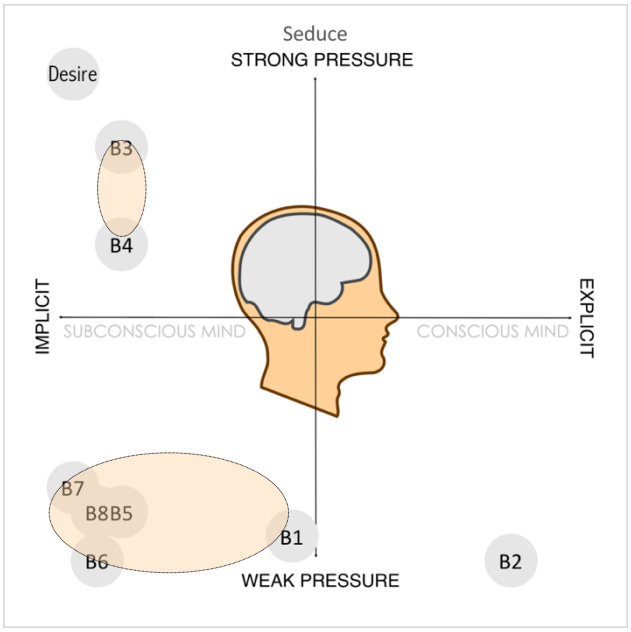

Figure 6.3 **Seduce**. How participants imagine users would experience a design where the intended behaviour is already their preference or a natural biproduct of their existing behaviour.

6.4.3 Seduce 3: Outlier – explicit with weak pressure. B2 was the only participant to consider seduce exclusively explicit; however he did agree with most participants that seduce applied weak pressure. He placed seduce almost directly opposite B3. B2 stated, "Seduce is complicated because seduce can be productive, but it can also be malicious." He felt that seduce was nearly as negative as coerce, but explicit rather than implicit.

6.5 Concept: Persuade

PERSUADE:
By arguments that influence attitude
By suggesting the intended behaviour

Like seduce, persuade was not as tightly clustered as coerce. Although most participants assigned persuade to varying degrees of explicit with weak pressure, three participants considered persuade to exert strong pressure. Yet each of the three positioned persuade differently for level of awareness. With the exception of one outlier which is near the first type, there appear to be two types of persuade according to the participants: [1] very explicit with weak pressure, and [2] implicit, neutral or explicit with strong pressure (*Figure* 6.4).

6.5.1 Persuade 1: Explicit with weak pressure. This form of persuade was a cluster of four participants. B3 talked about persuade in relation to decide. She said, "Persuade is going to be more conscious" than decide with centrally weak pressure. B5 said, "I think this would be explicit and probably weak pressure because the person is still deciding, making the decision for themselves. They are not feeling under pressure from the design of the space." His comment implies that the pressure users feel comes from themselves, but they are aware of it. B1 and B8 also brought up the concept of self-pressure. B1 stated that "persuade is – it's not necessarily strong or weak, and it's all explicit. You've got to seduce

them into – or ask them into. So architecturally this is great, you know, this is a great thing. But the term persuasion, the – the neat thing about using the term persuasion is there's no wrong answer, right? But you want them to experience something." B8 compared persuade with coerce, "Persuasion would be the opposite of [coerce]; it is still an explicit act but weak pressure." He imitated this type of design requesting users, "Please? But if you are not going to do it that's okay, but you should do it because it's kind of cool. But it's cool if you don't want to do it too." The design goal would be to *get the user to pressure themselves*, whether consciously or unconsciously.

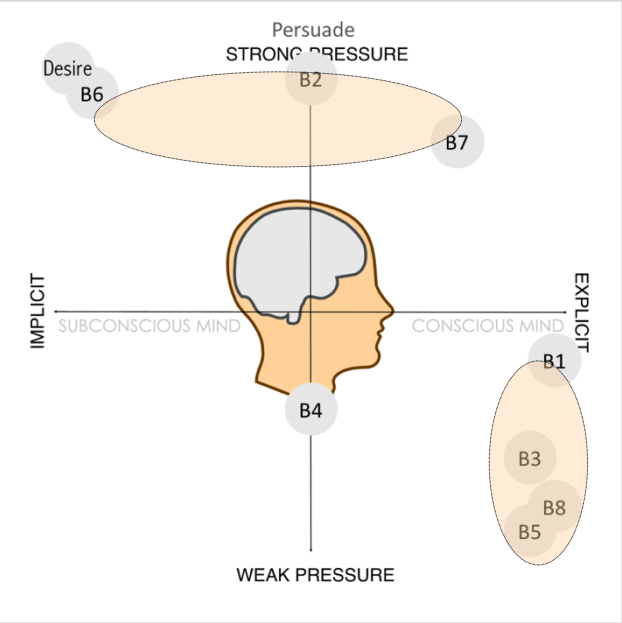

Figure 6.4 **Persuade.** How participants imagine users would experience a design that suggests the intended behaviour.

6.5.2 Persuade 2 : Strong pressure. There was a loose cluster in strong pressure. B2 indicated persuade applied the strongest pressure and was neither implicit nor explicit. Whereas B7 described persuade as "certainly explicit because you are actually *stating* – *you're suggesting*. So, it's very conscious." B7 continued, "On a scale, I would put that up here [above evident in strong pressure] because it is just a suggestion." B6 reasoned on persuade for a while before settling on placement. He said that a person "could be subconscious about the situation of actually being – completely clueless that he is being persuaded." He explained that "some people go and buy things," but after they get home

they cannot say why they bought it. "They were completely persuaded to buy it. 'You NEED it.'" He reasoned, "That's probably a combination of these because you are being seduced and persuaded." B6 decided that persuade was subconscious, strong pressure. He clarified that the user "didn't MAKE that decision, it's the opposite of making that decision." He unknowingly placed persuade nearly where B4 had created and put her concept card labelled "desire."

6.5.3 Persuade 3: Outlier – Implicit with neutral pressure.

B4 identified that "you are trying to get [your users] to get to here," gesturing to the desire card that she had created and placed in the implicit, strong pressure quadrant of the diagram. "You are trying to get them to want to do it." She stated that "Persuasion is more implicit [than decide], and it's less pressure." More implicit in this case meant neutral on the x axis for her.

6.6 Concept: Decide

DECIDE:
By triggering human tendencies to inherent or learned automatic responses

By making the intended behaviour the only option

Of the eight concepts the most variation was exhibited in the way participants indicated users would experience the concept of decide. Decide was positioned in every quadrant of the diagram. There was some consistency in that there were three clusters of two participants each. The positioning suggests that the majority of participants thought decide always exerts strong pressure. Decide could be implicit or explicit, depending upon the situation suggesting three types of decide: [1] implicit with very strong pressure, [2] either implicit or explicit with strong pressure, and [3] explicit with very strong pressure. These three types do however create a loose cluster of strong pressure (*Figure* 6.5). The term seemed

troublesome because interviewees assumed that it meant the user was deciding, rather than that the designer had made the decision for the user. After reading the definition B4 stated, "I wouldn't even call that deciding." When questioned she explained "If the desired behaviour is the only option, and you are triggering something, then I think of deciding as being a conscious, cognitive thing." B4 acknowledged, "This decide thing doesn't make any sense to me," which is not surprising.

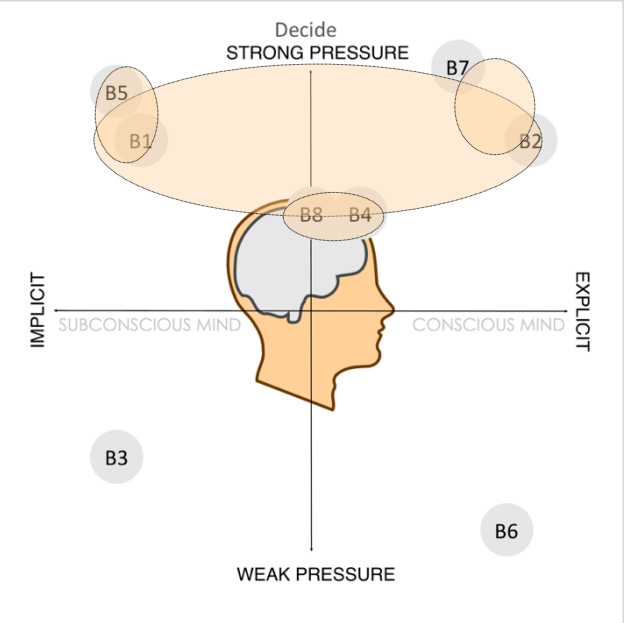

Figure 6.5 **Decide**. How participants imagine users would experience a design where the intended behaviour is an inherent or learned response or is the only option.

6.6.1 Decide 1: Implicit with strong pressure. Two participants placed decide in the implicit with strong pressure quadrant. B1 noted that decide is "a hard one to place because if it's – if you think about it, let's say it's the only way to go. That's just the way you are going to do, but that's very explicit, right? Well the action is explicit, but your reaction is implicit." He continued, "If I've made the decision, that's way up here – strong pressure. I'm making the decision for you, and you are just going to [follow] because you have no other options." B1 positioned decide in strong pressure on the subconscious side. B5 had a similar take on decide. She felt that users would "feel a strong pressure, but they would just be doing it. It's like walking down a hallway and walking into the bathroom when you see the restroom sign." For these designers *'the only way to go'* applies strong pressure to comply with the design intent but is not necessarily noticed by the user.

6.6.2 Decide 2: Strong pressure either implicit or explicit. Two more participants indicated decide exerts strong pressure, but that awareness level could go either way. B4 indicated that "you are creating a quasi-conscious situation and with a strong pressure because you are engineering the situation to make people do things in a certain way." She maintained that decide and persuade are related, although decide would be stronger pressure. "They've narrowed down the choices so that there is only one choice, and then you do that." B8 began reasoning differently, "I would almost say that decide would be up here...[explicit and strong] with coerce – it's just two sides of the same coin." He continued, "because deciding something for someone is to me an explicit act – so you are explicitly saying, 'no, this is what it's going to be.'...There's nothing subtle about it." Then he reconsidered, "I can see that being a decision type of thing, but it may be split between the two [implicit and explicit]. *It really depends on whether...the results of the decision are obvious.*" B8 explained, "If I'm walking down a path, and I see two doors in front of me, but the path doesn't go to one of the doors...then someone has already made the decision for me, but it's very obvious." When prompted with a single door scenario, he answered if there's only one door, "Well then it isn't obvious that there might have been another option. So the decision will still have been made for me, but I'm not going to see it as a decision necessarily." In the end he placed decide in strong pressure, between explicit and implicit because he felt decide could go either way. Later he likened decide to evident with stronger pressure.

6.6.3 **Decide 3: Explicit with strong pressure.** Conversely regarding the example of a single door, B7 stated, "It is very explicit...and I'm providing direct strong pressure that *that's their only path*." B2 agreed that deciding for people is "explicit, strong, strong pressure."

6.6.4 **Decide 4 : Outliers – explicit weak and implicit weak.** There were two outliers for decide. B3 was the only participant to position decide in the implicit with weak pressure quadrant; whilst B6 placed decide in explicit with weak pressure. From these placements it is difficult to determine the participants' unspoken design implications other than the given definition, which was unclear to them from the beginning.

6.7 Concept: Convenient

CONVENIENT:
By making the intended behaviour the easiest option

Convenient was somewhat clustered on the diagram. Nearly all the participants assigned convenience to the [1-3] implicit, weak pressure quadrant. The cluster suggests that convenient is a clear concept among the participants (*Figure* 6.6). Two in the cluster are treated separately in the text as they vary slightly [2-3].

6.7.1 **Convenient 1: Implicit with weak pressure.** Nearly all participants depicted users' feeling low pressure whilst being unaware of the design intention. "I think convenience is subconscious." B1 commented, "we can get people to act however we want by making it convenient, and it will take no pressure." After reading the definition aloud, B7 said that "the easiest option conveys to me that it is not even something you really think

about. You just do it. So to me that would be on [the subconscious] side, and I think it would be...less pressure because you're, they are going to choose it without really much questioning." B8 claimed that "convenient and seduce are probably pretty similar," so he placed convenient in implicit, weak pressure with seduce. However he later clarified, "Some people are contrary, and they will pick the hardest one just because it's not the easiest – so I think that's kind of a weak pressure kind of thing. But it is a subconscious act – convenience tends to be *a subconscious recognition as opposed to people actually sitting down and planning out*." For example, "they just walk across the diagonal." B5 stated that convenient "would be weak pressure and...it could be subconscious or conscious." When prompted she clarified, "I mean there's a level of subconscious energy that goes into making a decision when it's convenient because you've kind of already made the decision, and then you're evaluating what your subconscious mind has processed to make the conscious decision. So to make something convenient you've kind of done part of it in your subconscious mind, and then you make the final decision in your conscious mind." B5 gave an example, "It really depends on what the value is...If the trash is closest to me, but I have a really conscious mind of recycling, I will walk. It won't be the easiest decision, but I'll walk to recycling." She suggested that "subconscious could even be called intuitive, because it's 'what is *the most intuitive thing* that you're creating?'" Like B8, B5 felt that *users' values influence their acceptance of the convenient option.*

B2 reflected, "The door handle is convenient to open in a certain way because it affords a certain type of movement. But at the same time that can be a conscious effort to do that or it can be an unconscious effort to do that." He clarified, "Are you using a door handle and trying to get people to open it and think about it? Or are you trying to get them to

open it and not think about it? The designer has the intentionality with what they do and how they choreograph these spaces." Yet B2 positioned convenient as very implicit and very weak.

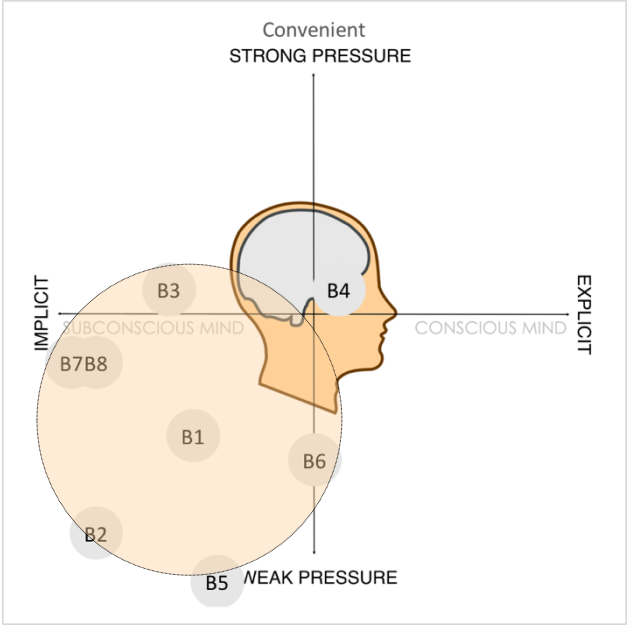

Figure 6.6 **Convenient**. How participants imagine users would experience a design where the intended behaviour is the simplest option.

6.7.2 Convenient 2: Weak pressure with neutral awareness.

Despite assigning the design experience within the main cluster, B6 felt that context was crucial to convenience. "It depends on convenient to whom, how, and convenient when. There're so many questions about convenience." Like B5 he indicated that it is unlikely that a user would be against something that is more convenient, unless there is a strong reason for them "to do the thing that they were going to do." He explained for example, "You make it more convenient to go to the back door than the front door," but "maybe someone is waiting for him" at the front door. Later B6 shared his experience of a tech gadget that seduced him because it was beautiful, but then it was inconvenient because it did not meet his use requirements. "Making it convenient mattered more" in the end, and he did not purchase the item. B6 implies that the *user's interests affect convenience*.

6.7.3 Convenient 3: Implicit with strong pressure. One participant in the cluster placed convenient just outside of weak pressure. B3 said, "Convenient. it would be subconscious, but I wouldn't say it's – it could be weak pressure. I don't think it could be – it has to be strong pressure."

6.7.4 Convenient 4: Outlier – explicit with strong pressure. B4 stated that "convenient is sort of in between [decide] and [persuade]...because you are making it easy to do. It's the line of least resistance, and so I'd say you are making it conscious, relatively conscious. ...You don't need to persuade them because it's [already] the easiest thing to do." She decided that "making it convenient is...probably fairly [emotionally] neutral" on her z axis (See 6.11.2 Modifying factors suggested by participants).

6.8 Concept: Priming

PRIMING:
By influencing the state of mind before the intended behaviour is expected

Priming was loosely clustered on the [1-2] implicit side of the diagram suggesting that it is a fairly clear concept to the participants, even though it runs from very weak to low strong pressure (*Figure* 6.7).

6.8.1 Priming 1: Implicit with weak to strong pressure. B1 picked up the priming card. "This goes hand in hand with what I was telling you about in regard to *setting the stage*. So that is all implicit. You know it's in here. I don't think it's necessarily really strong because if it's too strong you're not driving them you're just flooding them." He assigned

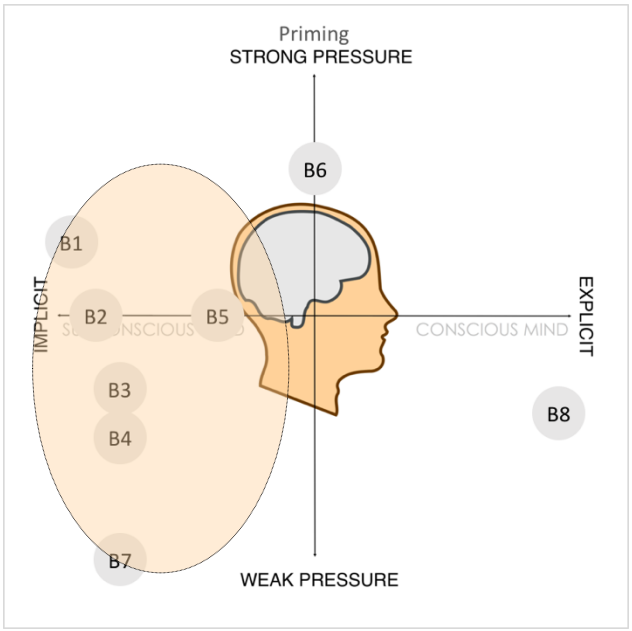

Figure 6.7 **Priming**. How participants imagine users would experience a design that influences their state of mind before the intended behaviour is expected.

priming to the low side of strong pressure well into implicit. B2 placed priming on the weak side of his diagram in the middle of strong and weak pressure opposite where he had evident. B5 said, "I would put [priming] in subconscious and passive or weak pressure because...you are kind of *setting the framework of how someone is going to have a thought process* about something before they are even conscious of [it]." B4 suggested, "Priming I would say is more subconscious, and it's not totally weak, but it's not totally strong. You are *making a suggestion to people...that might catch hold for them*." B3 considered, "if you are priming somebody for something, if you are kind of influencing them, it's kind of subconscious; and it kind of could be in between weak and strong because depending on – you know, it could be a weak pressure if you built it up, *if you prepared them, then they won't realise that it's – just isn't natural*." She suggested that "museums are really good for priming" because an exhibit builds and leads "you somewhere. Like a movie bringing you to the ending, telling that story."

Whilst reading the definition B7 commented that 'state of mind' is "already subconscious." He placed the card in the far corner of subconscious, weak pressure as he continued, "That's way over here in my mind because you're – to me this is truly subliminal...You're influencing behaviour by doing things that the person might not even be aware that you're

doing. So I think that would be weak pressure. It's very subtle, and it's very implicit or implied."

6.8.2 Priming 2: Outlier – strong pressure and neutral. B6 put priming between implicit and explicit in the middle of strong pressure. He said that the influence aspect of priming "is definitely tied to persuasion." B6 continued, "You're being influenced...even though you're making the decision; maybe it's a decision that you're not making on your own...your state of mind has been influenced by [being persuaded]."

6.8.3 Priming 3: Outlier – explicit with weak pressure. B8 explained, "I'm not convinced that priming is always effective; like I mean it kind of relies on the receptiveness of the recipient to the priming. So in that sense it's kind of a weak pressure kind of thing because otherwise it becomes coercion." He placed priming with persuade in explicit, weak pressure. When asked why he thought a user would be aware of it he said, "Maybe, maybe not. I would hope that I would recognise being primed...so that's I think why I put it [in explicit]." B6 and B8 believed that *people must be receptive to priming for it to influence their behaviour.*

6.9 Concept: Emotion

EMOTION:

By making the intended behaviour feel like the right thing to do

By making the intended behaviour appealing

None of the participants indicated that emotion exerted weak pressure. There were two clusters of emotion: [1-2]

implicit with strong or weak pressure, and [3] explicit with strong pressure. None of the participants assigned emotion to weak pressure (*Figure* 6.8).

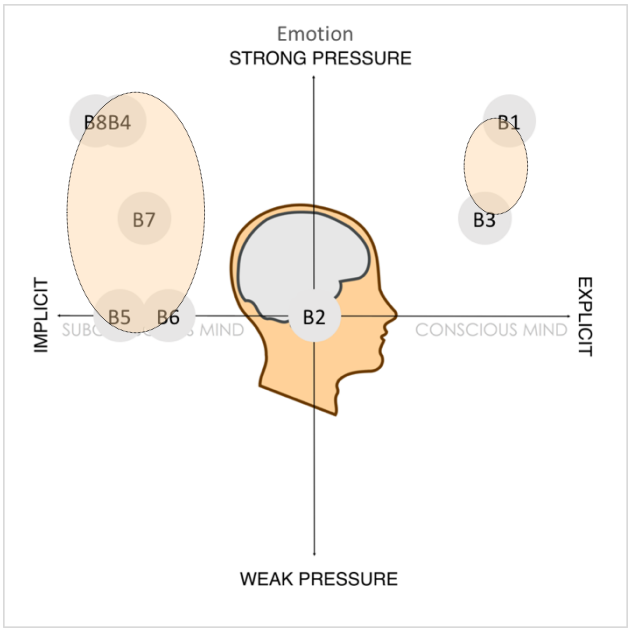

Figure 6.8 **Emotion**. How participants imagine users would experience a design where the intended behaviour feels appealing or like the right thing to do.

6.9.1 Emotion 1: Implicit with strong pressure.

B4 explained that "in the field of psychology we are recognising the very important role that emotion plays in the experience of the physical environment." She felt that emotion would be strong pressure but implicit. "Emotion and what I call desire are similar kinds of thing." She later clarified that "They are not the same because *emotion could be positive or negative*, and desire is positive." Emotion is "just pure heart." B7 considered, "I'm trying to interpret [emotion] in the sense of pressure. So you're feeling it...to me it's more implied, and you are making it appealing [*sic*] – my gut tells me it goes in [strong pressure]." He explained, "There's some pressure, emotional pressure that it's the right thing...When somebody talks about 'just do the right thing,' there's this implied struggle that you might do the wrong thing, and *it might be tough to do the right thing*...So, to me *there's pressure involved*." B8 said that "emotional things tend to be where it is subconsciously driven, but they are a stronger pressure than say seduction. To me seduction is relying more on the willingness to be seduced whereas triggering an emotional response is more like relying on some kind of basic human nature as opposed to appealing

to a higher thought function." B8 describes emotion as '*basic human nature*,' and B4 believes *emotion is a third dimension to user experience*.

6.9.2 Emotion 2: Implicit with strong or weak pressure.

B6 positioned emotion in implicit, in between weak and strong pressure. B5 reflected that "we just naturally do these things." Emotion could "create ways that people need to make the least amount of decisions to do what you want them to do." She stated that emotion "will be weak pressure and subconscious," but then she supposed that emotion could also be strong pressure. "The weak pressure – strong *pressure is so subjective because it really depends on how someone approaches life*." B5 positioned emotion on the x axis to indicate that it could be either, weak or strong pressure.

6.9.3 Emotion 3: Explicit with strong pressure.

B3 felt that emotion "is probably going to be lots of pressure, very conscious." B1 agreed, "I think emotion is strong pressure, and it's very, very explicit." Later in the interview when describing why a single horizontal window is more humane than a single narrow window in a prison cell he explained, "We're modern in every way. We're very smart. We're very intelligent, but we are armed with the same emotional and intellectual basis of a person on the Serengeti...Our sight was the most important to us...We are comfortable when we can scan the horizon because we learn about our safety. So right there, number one – safety...*if a person does not feel safe, they will not be comfortable in that space*."

6.9.4 Emotion: Outlier – completely neutral. B2 compared using emotion to influence behaviour with his belief that using coerce or seduce has "malicious undertones...I don't feel like emotion is the best either because sometimes I'm not in control of my emotions, and sometimes I don't know why I make the decisions that I do. Like sure the desired behaviour can be appealing, but is it in my best interests to do something?" Later B2 commented, "I put emotion at the centre because that's kind of like the balanced point...but again it's so complicated. It's hard for me to categorically determine where these things fit because there are different situations where they'd be differently used." This comment underscores the challenge of designing to change behaviour and thus the difficulty of representing these concepts in a framework.

6.10 Concept: Evident

EVIDENT:
By making the intended behaviour obvious and understood

None of the participants placed evident squarely in the implicit, strong pressure quadrant. Placement on the diagram suggested some question whether evident exerts strong or weak pressure. Of the two clusters the first cluster is dominant: [1-3] explicit with strong to weak pressure, and [4] implicit with weak to neutral pressure (*Figure* 6.9).

6.10.1 Evident 1: Explicit with strong pressure. "Evident is definitely conscious, and there is some pressure to it," B7 said. "Since the definition includes 'obvious and understood,' "that tells me that it's clearly stated...You are *not leaving it to chance that they'll read between the lines*. And in doing so, I think it takes stronger pressure than weaker pressure to do that because otherwise that would be implying." He decided to add

imply to the concept cards with the definition "suggesting the desired behaviour, but leaving it to interpretation, less obvious." B7 placed imply in the conscious, weak pressure quadrant. After he had completed the diagram he exclaimed, "Oh how funny!" when he realised that he had imply on the explicit side. "I didn't even notice that...By the same logic that I had with all of these, this would be subconscious as well. But I took this as more of a statement, but it's not really." B7 moved imply opposite evident to the implicit, weak pressure quadrant. He confirmed that "implication was the word I was looking for, but by the very nature of implication you are being implicit – you are *not just coming right out and telling somebody*. So it has to go on [the subconscious] side." His comments suggest that *stating the intention might influence behaviour more readily than merely implying it*.

6.10.2 Evident 2: Explicit with strong or weak pressure. B5 and B6 placed evident on the explicit side of the x axis. B5 noted that evident "would be conscious and maybe explicit. It could be either weak or strong." B6 felt that evident is to coerce and decide what emotion is to persuade and seduce (see *Appendix* J). He explained that coerce and decide "are more evident in the sense...you know that that's what you have to do and...there is repercussion if you don't." Evident is "rational" where emotion is "just pure heart." B2 began by saying, "It's strong, and it's explicit because you're both *telling the subject what they need to know in a clear way*, it's evident. It's clear, it's both – it's the conscious mind exerting a sort of pressure on its intention. So it's like intentionality. It's like the most clear form of intentionality." He deliberated, "It's complicated though because there are other aspects maybe that would reflect the decision-making process that are not necessarily evident. But I am looking at evident in kind of just this – it's like – it's not – Well I mean it's just clear to me." B2 went on to explain, "We interact with our environment all the

time...and I very rarely think about [it]. In that sense it's like completely evident, but completely subconscious." Yet he positioned evident as very explicit and neither weak nor strong pressure. It might be that explicit indicates how understandable the intention is for B2, rather than the user's level of conscious awareness of their interaction with the design.

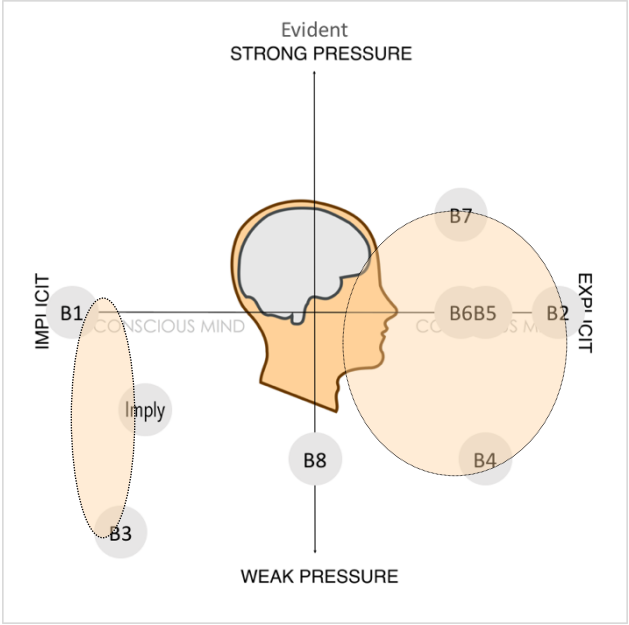

Figure 6.9 **Evident**. How participants imagine users would experience a design where the intended behaviour is obvious and understood.

6.10.3 **Evident 3: Explicit with weak pressure.** B4 began by contrasting evident with convenient. "You could think that these two [evident and convenient] are the same, but there's a difference between making something evident and making something convenient." She clarified that "making something evident is *more cognitive. It is not tapping into the emotion as muc*h, and you still have a choice here. ... I would say it's kind of weaker. It's down here somewhere [explicit, weak pressure]."

6.10.4 Evident 4: Implicit with neutral to weak pressure. B1 did not hesitate. "Evident ... it's just implicit and neither weak nor strong." As B3 positioned evident she observed, "Obvious sometimes is probably weak pressure, and it's not conscious because it's *obvious so you just kind of do it*." Her observation suggests that *propensity to perform*

the intended behaviour is not dependent upon the pressure the user consciously feels, providing the behaviour is understood.

6.10.5 Evident 5: Outlier – weak pressure and explicit or implicit. B8 first assigned evident to explicit with weak pressure. He noted that, "explicit versus implicit is almost like subtle versus obvious." However after he placed priming in explicit, he moved evident to the middle of implicit and explicit to indicate that the user might potentially experience either. He likened evident to decide, but with less pressure. "Because in the same way that the decision can be either implicit or explicit, I feel like making the desired behaviour obvious and understood could either be something that people either don't realise that it's obvious, it just is at a subconscious level. Or it could be something like you put the giant arrow pointing to the door you want them to go through...it could go either way."

6.11 Participants' Suggestions for the Concept Diagram

DESIRE:
By getting users to want to perform the intended behaviour

IMPLY:
"Suggesting the desired behaviour, but leaving it to interpretation...less obvious [than evident]"

TEACH/INFORM/LEARN:
By showing users how the design works with signage

6.11.1 Concepts participants added. All of the participants were asked if they recommended any additions to or subtractions from the diagram. Three created new concept cards for their diagrams. These three additions are mapped in *Figure* 6.10. Two of the concepts – desire and imply – are presented above in the context of their creation. B4 added desire to the concepts when she contemplated seduce because she felt that unlike seduce, desire indicates an internal intention (See 6.4

Concept: Seduce). When B7 placed evident he considered that it would be stated in words to be 'obvious and understood,' whereas design might make a suggestion that is open to interpretation and is therefore evident. He added imply to the concepts to represent this definition (See 6.10 Concept: Evident). It appears to align with evident 4.

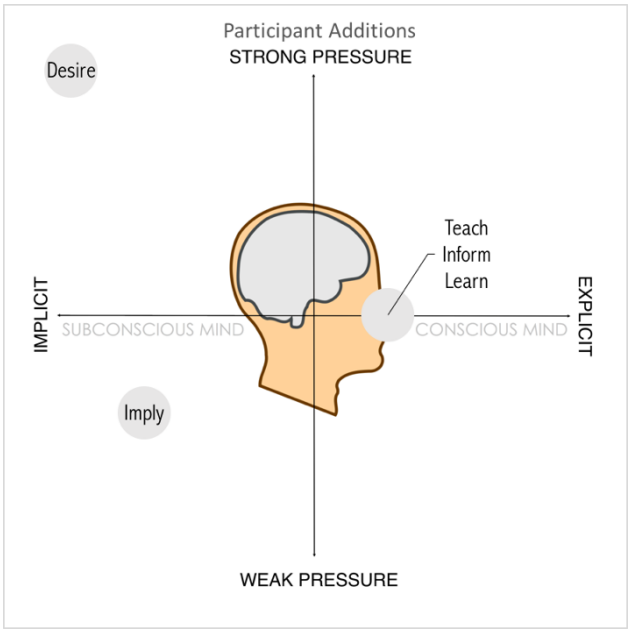

Figure 6.10 Participant Additions. When asked if there was anything they would add, three participants separately proposed these concepts: Desire, Imply, and Teach/inform/learn.

Teach/inform/learn is presented here since it was added by B1 after he completed the diagram. B1 commented that "this matrix is really interesting because it would be fun to take what we do and place it. So let me think, what would be a strong pressure?" He then added a 'teaching or informing' card acknowledging, "There's a better term." He explained, "Signage. So depending on the wording of the signage – could be anything – but it's very much being explicit. It's being very clear, and you are reading it and taking it in, and I'm going to put it in the middle here." B1 placed the card on the explicit side between strong and weak pressure. He gave an example, "This is where the exit sign works. So it is something as implicit as that, but it's telling you...I am informing people where the entry is, and I am informing where the exit is." Later when reviewing the completed diagram he commented on his addition [informing/teaching], "Maybe this doesn't belong, maybe this is – well no, it's more. Teaching/informing can be more than just signage. I'm thinking too basic." He recalled

learning how to ride the train every day. "I know what to do on a train because I've taught myself what the – certain things to do. Where to sit. How – where the noise – all that stuff." So B1 added the word learning to the teaching /informing card. "I mean the signage, the learning, right – that's learning, you read it, that's – Well maybe there's, well there's different ways of doing – that's why it's more like, that's why I put learning in there." Teach/inform are external and learn is internal to a person as seduce is external and desire is internal to a person.

VALUES:
A mitigating factor that indicates a user's perception of the intended behaviour's alignment with their needs or intentions

EMOTION:
A third dimension, the z-axis, where each concept can be experienced by the user on a spectrum of positive to negative

6.11.2 Modifying factors suggested by participants.

In addition to the three concepts, two more defining factors arose: [1] emotion and [2] value. Emotion was one of the concepts given to the participants. B4 felt that emotion was more significant than the other concepts in that they all have an emotional element. Similarly although none of the participants created a card for value, it was repeated throughout the diagram exercise by B5. It is notable that these two participants are the only two that hold degrees in psychology.

B5 indicated that personal values play another role. "Someone could still feel weak pressure about it if the consequences weren't of high value to them." She continued, "I think that [value] has a huge part of it, and that's why it's so hard to design for masses of people who are coming from all different walks of life." She repeatedly emphasised that how a user experiences the design "depends upon the values of the person." For example if a person has a "really conscious mind of recycling, I will walk," implying that the value of

recycling is greater than the inconvenience of walking. Similarly B3 recalled a situation where a "stupid elevator that...was right there" became less convenient than "those stairs" because the lift "was slow...and was always packed." This also implies that the user's values modify their behaviour. There were also comments made by other participants about the influence of values (See 6.3 Coerce and 6.7 Convenient).

Although **emotion** is already one of the diagram concepts, B4 felt that it plays a more significant role. She suggested adding emotion as a third dimension on the diagram (*Figure* 6.11). She maintained, "I feel very, very strongly that emotion is the key to almost everything, and it is the key when you ask people about the physical environment." She supported her statement by citing examples of emotive phrases that people use to describe their physical space. "'It feels very relaxing. I feel like I don't have anything to worry about.' 'It feels really tense here; I think that everybody is after my job.'" If emotion was a z axis on the diagram, B4 said that "starting with the negative and the positive, just looking at what you've got here – I would say that coercion is the most negative and this evident thing is next." She explained, "You see it, but you know, you might think 'well I'm not going to just do what they say.'" She continued, "Convenient is...probably fairly neutral." She felt that persuasion would belong on the negative side of her emotion axis. "Persuade then is also a little bit like you could get persuaded, but you didn't necessarily want to be persuaded." She said that "when they talk about priming in the psychology literature, it's something that you are

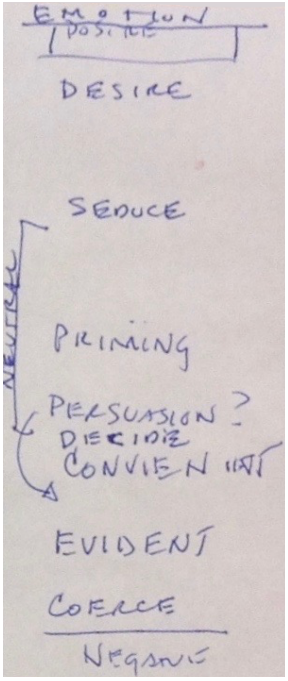

Figure 6.11 **Emotion Dimension.** Ordering concepts from positive to negative on an axis for emotion. Participant B4.

not necessarily all that aware of." She figured priming would be a neutral emotion on her z axis. Then she started on the positive. "I would say desire is at the top for sure. You want it and you – so it's very positive. 'Yes, I want that. I need that. I have to have that.'" And seduction, "you have allowed yourself to be pulled along. You may or may not be aware of it. If you are not aware of it then it – you are just going to do it and you are probably not going to have any emotion related to it." Again decide was problematic, "Decide doesn't seem to make sense to me. That's in the neutral in here somewhere." She moved persuade to the negative side; however she clarified that "persuasion is more positive [than coercion]."

Other participants made comments concerning emotion and the other concepts. B1 used the phrases "feeling it emotionally" and "emotional bully" to describe coercion. Although B2 did not use the term emotion for it, he said that if he "were to put [the concepts] on a kind of a spectrum of worst to best...[coerce] would be the worst being the...low, or the most malicious because I don't feel like that person knows what they are getting into. Seduce – similar." Though he felt that seduce could also be productive. He reasoned, "I don't think coerce can be constructive. I think coerce is strictly malicious. Well maybe..." He considered as he observed his placement, "No, I don't agree with that. I don't feel comfortable saying that coerce is all one and not the other." He changed his mind and stopped his spectrum placement. B6 tied emotion and evident to the design fundamentals, beauty and function. He said that "people tend to do more emotional design...and when you do something more evident sometimes...it's not beautiful enough." He cautioned against extremes. "Sometimes it goes out of hand. Sometimes it's just beautiful, and it's

completely useless." He said he "feel[s] that pure functionalism is always tied to emotion." He reasoned that is why designers "try to find a balance in between."

6.11.3 Participants' Comments on the Diagram Exercise.

Participants had definite opinions about the diagram exercise and outcome. "Let's see here..." as B2 began placing the cards on the diagram he commented, "I am going to rearrange these probably. This is tricky... I might have to rearrange these." At several points in the diagram exercise B5 remarked, "This is hard." It "definitely pushes your mind." She likened it to "that challenge in your mind that you don't necessarily practise every day." Such observations might suggest that these concepts are not often discussed in their designs. After placing all the cards B6 began to see relationships between the concepts. "I just put these [concepts] in here. They make sense in each quadrant individually, and all of the sudden I can start making some connections." For example, "I have priming, and what – how does it get affected by persuasion and coercion?" Using his reasoning from evident, priming would be to persuade and coerce what convenient is to seduce and decide because priming and convenient straddle implicit and explicit like emotion and evident straddle weak and strong pressure (see *Appendix* J). He said that priming is "definitely tied to persuasion [because] you're being influenced." B1 considered his completed diagram and noted, "But this is all individual based by the way. I don't think, I don't know how I can do it for [a group]. I'm sure at some level it's the same because what's a group, but a group of individuals. But there's a different herd mentality, and we react differently when we're in a group. So, I don't know." Considering the social aspect, B3 remarked that "these are all kind of, you know, peer pressure kind of words." B2 observed, "Design will always be tapping into that kind of realm where you are making these conscious decisions to design things a certain

way, and they are not always entering people's minds in the kind of way that you anticipate." B1 summed up the exercise, "Strategies, right. We can coerce them, and they get a one-way street. We can seduce them and make it really beautiful at the end. We could make it convenient – leave the door unlocked. Make it evident – there's the door. We can prime them, and there's a lot of different ways to do that. We could just decide for them; put them on a conveyor belt and send them through the door." This comment indicates he had a clear understanding of the intended meaning of decide.

6.12 Summary: Discussion and Implications for the Framework

The participants' observations indicate some designers' perceptions of how users might experience intentional design. A composite findings diagram was created by positioning the significant cluster from each of the concept diagrams into a single diagram (*Figure* 6.12). The single composite diagram shows a tangle of overlapping user experience concepts. Although this diagram looks busy, close inspection reveals notable patterns.

Examining the dimensions that the concepts span indicates that priming, emotion, decide and persuade all have more pressure variance and fairly consistent awareness levels, whereas coerce, evident and convenient seem to vary in both dimensions of pressure felt and awareness levels. Only seduce varies in levels of user awareness whilst remaining weak in pressure. If the majority of decide placements are included despite the definition discrepancies, then the dimension variance in decide would change from pressure to awareness level. However given the theoretical understanding, this diagram implies that when it becomes apparent to the users that their options have been reduced – that their choice has been made for them – then decide is felt to be coercive.

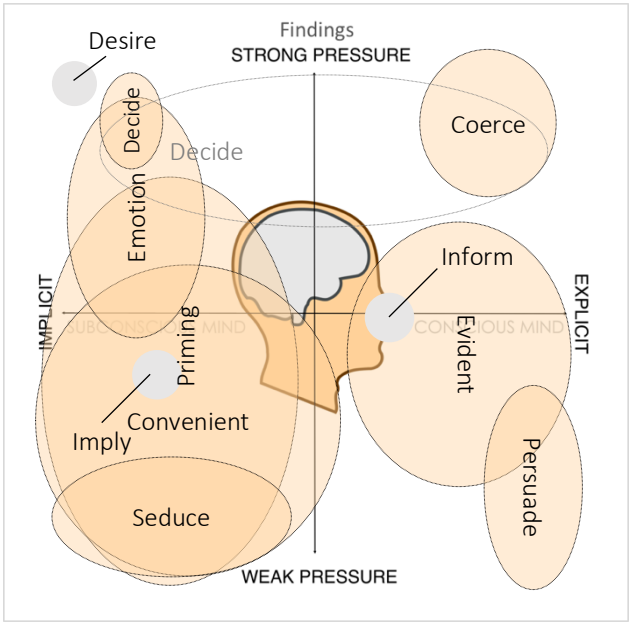

Figure 6.12 **Findings: All Concepts**. This composite diagram demonstrates the overlapping quality of these concepts of user experience of design for behaviour change.

The composite diagram has more of the concepts on the implicit than the explicit side. They might be read as a spectrum of possible user experience. Priming spans and overlaps most of the concepts. Within that span, seduce exerts the least pressure. It is almost contained within convenient, possibly indicating that designers intuitively understand that some forms of convenience are seductive for users. Emotion spans the more implicit, strong pressure area of priming up into the stronger pressure exerted by decide. The layout of these concepts implies that participants believe users feel more pressure the more that emotion is evoked. Also, removing people's options by deciding for them would engender more of an emotional response than making the intended behaviour convenient. According to this diagram neither priming, convenient nor seduce require eliciting emotion, although emotion and decide might. This finding seems contrary to B4's notion that all of the concepts have an emotional dimension, although it might be that the dimension has a neutral zone. However **emotion** seemed to have more significance than the other concepts, as participant comments implied positive or negative responses to the other concepts. This supports it as a possible third dimension to user experience.

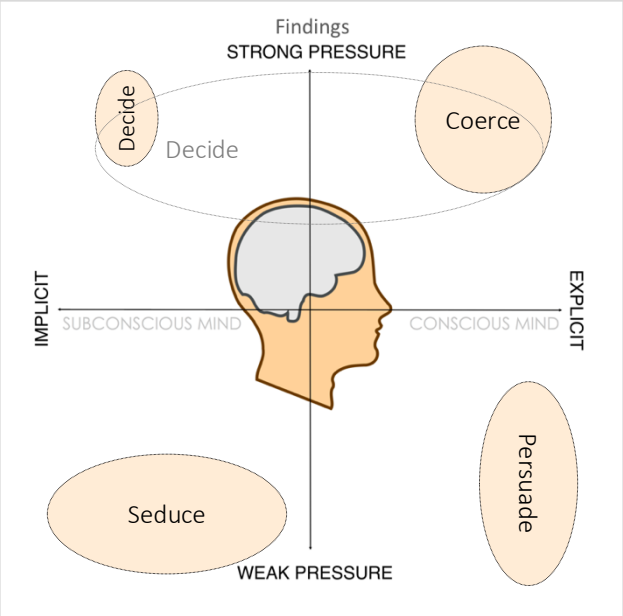

Figure 6.13 **Findings: Concepts from Theory.** This composite diagram shows the four concepts derived from theory, which are positioned consistent with the theoretical diagram (see *Figure* 2.6).

The concepts taken from series A interviews were confirmed by series B participants in the hypothetical design exercise; however **inform** was added in series B suggesting that evident does not cover the concept well enough. Either the two terms are interchangeable or inform is a subcategory of evident. Additionally, two new concepts were added by B participants: **desire** and **imply**. Similarly, participants mentioned that **values** mitigate a user's response to performing an intended behaviour. A user is more likely to perform the intended behaviour if they believe that it aligns with their values in some way.

For the most part the designers' placement of the theory-derived concepts seems to align with the theoretical diagram of the same concepts (*Figure* 6.13; compare *Figure* 2.6). They have an especially consistent perception of how users would experience coerce. However the participants' understanding of decide was not as clear, though most appeared to agree that this type of design would exert strong pressure. Again the difficulty seemed to come from the deciding. This might be due to problematic terminology and not the concept to which it refers. Notably the designer who had the clearest understanding of the definition placed decide in the same quadrant as theory assigns decide.

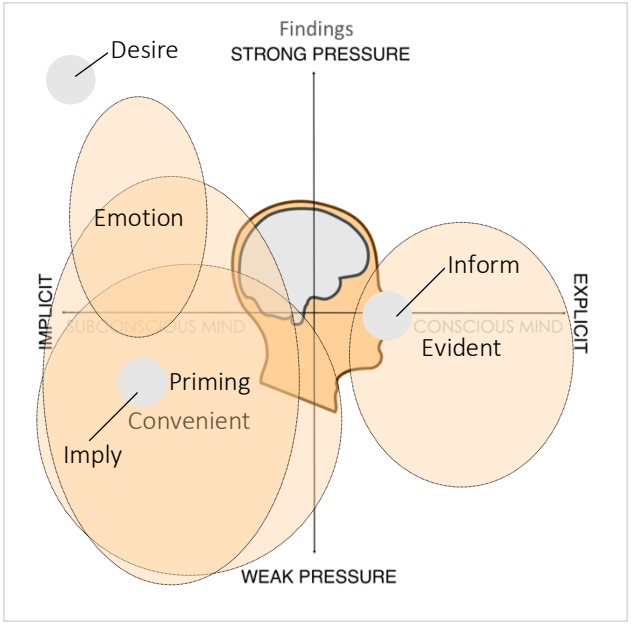

Figure 6.14 **Findings: Concepts from Interviews.** This composite diagram shows the four concepts taken from chapter five series A interviews as well as the three additional concepts indicated by the B series interviews.

Most of the concepts that came from the designers, both from series A interview findings and those directly suggested by series B participants, are concentrated on the implicit side of the diagram (*Figure* 6.14). It appears that designers are working primarily in this realm. Even when evident and inform are considered, there seem to be few strategies of which users are aware that exert strong pressure. Of the eight concepts that were available to place on the diagram participants' clusters produced 23 distinct concepts [RQ1] (*Table* 6.1). These 23 concepts of user experience build upon the initial 4 perceptions found in chapter five (*Figure* 6.14; see *Table* 5.7).

This chapter has analysed experiential concepts that interview participants perceived can change human behaviour. Chapter seven examines real world projects from the same designers for comparison with the findings from chapters five and six.

Concept	Pressure	Awareness	Participant's Implications and Comments
Coerce 1	strong	explicit	*avoiding negative consequences motivate behaviour change* *the users' values influence the response to the design*
Coerce 2	strong	implicit	*removing opportunity to act influences behaviour*
Seduce 1	weak	implicit	*there is a subliminal quality to this* *the pressure is psychological* *make the user feel good as a reward*
Seduce 2	strong	implicit	*align the design intent with the interests of users.*
Desire	strong	implicit	*coming from inside you*
Persuade 1	weak	explicit	*get the user to pressure themselves*
Persuade 2	strong	explicit neutral implicit	*you're stating – you're suggesting*
Decide 1	strong	implicit	*the only way to go*
Decide 2	strong	explicit implicit	*it depends on whether the results of the decision are obvious*
Decide 3	strong	explicit	*that's their only path*
Convenient 1 (all 3 clustered)	weak	implicit	*a subconscious recognition rather than consciously planned out* *the most intuitive course* *users' values influence their acceptance of the convenient option*
2	weak	neutral	*users' interests affect their acceptance of the convenient option*
3	strong	implicit	*It could be weak...it has to be strong pressure.*
Priming 1	strong weak	implicit	*setting the framework within which someone is going to have a thought process* *setting the stage* *making a suggestion that might catch hold* *the user does not realise they have been influenced*

Table 6.1 **Design Implications 1 of 2.** Perceptions of human behaviour found in the participants' comments. (*Continued on following page)*

Concept	Pressure	Awareness	Participant's Implications and Comments
Emotion 1 (both clustered)	strong	implicit	*could be positive or negative* *basic human nature* *it might be tough to do the right thing – there's pressure involved* *emotion is a third dimension to user experience*
2	weak	implicit	*pressure is so subjective because it really depends on how someone approaches life*
Emotion 3	strong	explicit	*if a person does not feel safe, they will not be comfortable in that space*
Evident 1 (all 3 clustered)	strong	explicit	*stating the intention might influence behaviour more readily than merely implying it* *not leaving it to chance that they'll read between the lines*
2	strong weak	explicit	*telling the subject what they need to know in a clear way*
3	weak	explicit	*more cognitive than convenient*
Evident 4	neutral weak	implicit	*obvious so you just kind of do it* *propensity to perform the intended behaviour is not dependent upon the pressure the user consciously feels providing the behaviour is understood*
Imply	weak	implicit	*not just coming right out and telling someone*
Teach Inform Learn	strong weak	explicit	*learning to ride the train every day*

Table 6.1 **Design Implications 2 of 2.** Perceptions of human behaviour found in the participants' comments. *(Continued from previous page).*

7 Sourcing Perceptions in Participant Projects

7.1 Introduction: The Purpose of Querying Participants' Real-World Projects

This portion of the interviews aims to find out what strategies designers have used to influence behaviour in real-world projects. The purpose of discussing participant projects is threefold: [1] it provides an opportunity to question designers about projects that have been realised in the real world; [2] the findings can be compared with those from the hypothetical design exercise and the concept diagrams; and [3] the findings can be compared with human behaviour change theory to see why the concepts work or not. The intention is again to collect data that can be analysed to answer the research questions. Participant observations and the context of the discussions might provide insight into what designers perceive can change human behaviour [RQ1] and into what informs their perceptions [RQ2]. The findings can then be compared with human behaviour theory [RQ3].

This section explores design for behaviour change through participants' realised designs. Real-world projects might offer additional insight into designer perceptions about changing human behaviour and into ways their perceptions influence design decisions. During the first set of interviews designers had suggested that they would further investigate the existing problem to find the "need behind the need" before creating a design solution for the hypothetical design exercise. Adding a participant project to the second set of interviews gives participants an opportunity to share such programming, which might provide insight into the basis for their design decisions. Moreover real-world projects have

implementation challenges such as: addressing and balancing building codes, client needs and wants, material and cost considerations, and possibly other constraints that might give rise to ingenuity. Although the projects will differ there will likely be similarities that can be examined in the analysis.

The chapter is divided into nine sections. The introduction is followed by project vignettes that participants presented as having influence on behaviour:

7.2 Description of the Process to Capture Data & of the Projects Presented

Participants were asked in advance of the interview to bring one of their projects that they believe had influenced behaviour. They were encouraged to relate how they chose the project for the interview, what behaviour change was intended or apparent, and what

it was about the design they claimed influenced behaviour. The questions were intentionally open ended to give designers a chance to introduce what they considered significant. Participants were also asked whether the behavioural outcome was an intentional part of the design, and if not, how they discovered the influence. If time permitted, they were also questioned whether they thought the design would be transferable or whether they used it again. The intention was to allow designers openly to express their views on design for behaviour change.

All the participants presented projects that they claimed had influenced human behaviour in some way. B1 introduced a project where the lavatory sink was placed in a public hallway due to space limitations, and the unintended consequence was that people regularly washed their hands. B2 related his experience of a building in which the front door was difficult for users to find and even after being shown, users had trouble getting their bearings. He also presented a design intended to facilitate chance meetings that was not well received because people seemed irritated by being forced to take a circuitous route to and from their offices. Finally, B2 introduced a recreation centre that gave users a sense of social belonging. B3 proposed that featuring words in a school hallway instilled their values in students because they used the words to identify each location. Her second design involved facilitating project-based learning in education. B4 created a housing design intended to help incoming university freshmen establish relationships and community by providing group spaces and reasons to leave their rooms. B5 presented a courtyard meant to encourage students and faculty to linger in which there was a lack of infrastructure to support the behaviour. B6 spoke about the potential for converging spaces to attract people by designing circulation configurations that facilitate lingering. B7

introduced a school designed to prevent undesirable behaviour by creating transparency throughout the campus grounds and buildings. B8 related how the building codes can help define the design problem, and in the case of his project saved important aspects of the building from being value-engineered out. The projects are ordered in the chapter by participant. Some relevant comments from other participants or portions of the interviews are presented with the project(s). Finally, a table at the end of the chapter summarises the findings.

7.3 Participant B1: Encourage Hand Washing

7.3.1 Project: lavatory sink in public hallway.

Perceptive designers can learn from unexpected outcomes. B1 related an experience where a decision in one of his projects unintentionally caused changes in behaviour. There was limited space in an office complex where they were adding lavatory facilities. Due to space limitations his firm had placed the lavatory sink in a hallway outside of the toilet area. He recollected, “We did it just to save space, but the plus was also every employee got to wash their hands.” If a person leaves the toilet room and skips washing their hands, it occurs out in the open where colleagues and others might notice.

At first the participant supposed that the behavioural outcome was the result of group pressure. B1 commented on the relationship between the effects of social pressure and design; “maybe everything I do as far as those signals I am sending to the users as to what to do and where to go are social, because they come out of 2,000 years of Western culture and not out of man’s need for shelter.” This same participant *used a cultural expectation*

to elicit the intended behaviour in the hypothetical design exercise (*Chapter* 5.5.1). When asked if he would locate a sink in the hallway to get people to wash their hands in the future, the participant observed that "getting people to do what's right; the first thing you do is *make sure there are no impediments to it*. You know one thing I learned is you are not – no one is going to do anything – no one is going to change if there's no reason to change and no one is going to do the right thing if it's too difficult...We are innately lazy so...no one is going to go out of their way to wash [their hands]" [italics added]. He cited a Health Department requirement "to place a sink on every wall" in restaurant kitchens. His statement implied that he might think that *a combination of convenience with social pressure caused the hand washing behaviour* in his project.

The comments of another participant on the topic of hand washing are relevant here. B2 lived in Jakarta for several months and noted that "people don't wash their hands there." This observation implies the question of whether behavioural designs are transferrable since context plays a crucial role. B2 commented on the challenge of design for behaviour change, "Every time we think we figure it out, we realise that we don't know. *It's all about specific circumstance where it becomes relevant*. Like with this, *what's important is if it's effective in its context*. If it works the way it should work in its context" [italics added].

7.3.2 Summary: unexpected behaviour and context dependency.

The sink hallway placement was not originally intended to change users' hand-washing behaviour; however when it did the designer took notice. Whether the same intervention could be successful in another project is undetermined. If the behaviour is prompted by peer pressure, it would be dependent upon the context of cultural values as well as whether the user thought their

behaviour would be noticeable. This project illustrates the existence of *different contextual elements*. In this case both the physical and social contexts of the design support the intended behaviour.

7.4 Participant B2: Take Advantage of Social Opportunities

7.4.1 Project 1: office building front door. B2 recalled a design example in which he had observed people's wayfinding behaviour. It's "a complicated scenario. Well it's not all that complicated, it's quite simple." He explained that he works in a shop on the same side of the building on which customers park their cars. His shop door – the office back door – seems to be the first entrance visitors see, or the only entrance they notice, because "visitors come through the back door." However "due to the security protocol of the Government project that we're working on, visitors have to enter through the front door...So when visitors come in through the back door we're – we have to escort them to the front and around." He continued, "And every single time that I do this, I've talked to them...'yeah, you know, front door, right? You'd think it would be so easy to tell where the front door was.'" Once they reach the front door – which is around the side of the building and camouflaged the same colour as the siding with "DOOR" painted on it in large letters that blend into the background colour – he directs them to reception in preparation to leave. He explains, "'The receptionist is just down here sitting at this computer.' And they are like, 'Where?'...'Okay, she's just – if you walk straight and look to your right, she's right there.' Thinking that I could...leave them... [to] walk like two steps. And they have no idea where they are going because it's so *nondescript as to where anything is*...So then I end up ultimately always walking them straight to the front desk...'Okay, this is the receptionist

and here's where the sign in sheet is.'...And then sometimes they'll say, 'Oh wow, that was the most difficult front door I've ever entered in my life!'"

Incidentally this is the building where the interview was taking place. The researcher also had difficulty finding the front door. B2 acknowledged that "people come here for their first day of work and...they can't find their way inside the building." Even after locating the door it opens through a short hallway into a sea of desks. We are culturally trained not to enter territorial spaces such as these, and the researcher felt out of place and uncertain. There was not a sign for reception nor any noticeable way to distinguish it from the 30 other desks in the space. When asked what he thought about it B2 replied, "I mean as a design provocation, as a design choice, it is something that *would be done differently in the future I would guarantee that*." Then he noted one of the challenges in design, "But it's also – it goes into the, you know – it's part of the whole picture where every project can't do everything." He continued, "Sure they'd do it differently in the future, but this is what it is now and they learn what they learned. And everybody in the office would agree I'm sure, that this reception area could be better, but that's not to say that there are other areas of the office that are far more tremendous than the front door would ever be." He appeared to have reservations, although he agreed that "the front door is important but it's – so in that regard I think that could be changed." When asked what he thought about the consequence B2 responded, "Well it's – I don't know. I mean it's interesting because it's, it's just a front door, right? You could look at it like that; you know it's kind of inconsequential with respect to like who they are on a day-to-day basis or what, you know, what they value in life." He continued, "I don't know – I think it's just kind of a minor hiccup in the modern machine." He then said, "It's actually...kind of nice to not know where the

front door is sometimes. It's kind of nice to kind of fall out of that system of just, you know, going from front door to front door." When asked if he would design that entrance intentionally, he presented an office project with a skip/stop elevator.

7.4.2 Project 2: office complex skip/stop elevator.

The office project intended to make the most of an energy-saving "skip/stop elevator" design. Rather than accessing every floor in a building, a skip/stop elevator only stops every other floor. If occupants need to access a skipped floor, they alight from the lift either one floor above or below the floor they need and take stairs for the remainder of the way. It changes behaviour in that people must walk up or down a flight of stairs they would not likely take otherwise. In this case it was "an intentional design...to conserve energy" by limiting the occurrence of stopping and starting the lift. B2 explained, "If you have a 30-storey building, you are effectively operating an elevator at a 15-storey limit because you only stop at every other floor rather than the frequency of stopping at every floor." Although the lift was designed this way to save electricity, the participant claimed that "it's also a social opportunity because you are able to promote these social interactions with other people who are also doing the same thing." Thus designers placed the stairs "through a public space in which there are tables to sit and chat." B2 was puzzled by the negative reception from occupants. "People get frustrated about that...it's so weird I find because *people* don't, they *don't want to walk up a couple of stairs to get to their office*." He commented, "They just want to go and go in and be there and get work done and leave." Their reaction is reminiscent of B3s comment about queueing for a slow lift, rather than seeing it as a social opportunity people considered it a nuisance (*Chapter* 6.11.2).

B2's experience of the social stair design intention was entirely different. "In architecture school some of the most interesting conversations that I had were just walking up the stairs. Like you'd stop in the stairwell, and you'd talk with your professor – you'd talk with your buddy about something that you just totally didn't expect. And it was just great. It's just like those types of social interactions that were sort of unexpected would happen in those moments." This phenomenon has been commonly called 'the water cooler effect.' The latter is a colloquial expression that refers to spontaneous insights and collaborations happening in locations where co-workers tend to mingle. B2 considered, "In a way, I wonder if that kind of design decision has enough impact on the people that inhabit that space to really embrace that or to take that on and to say, 'yes, I really enjoy moving through these spaces – going through a more circuitous route before getting to my office because I get to talk to my friends on the chance that they'll happen to know...'" The participant trailed off before observing that "the reception in that building is quite poor, and there are a lot of shortcomings to that building, and the occupants are mostly dissatisfied with it." Nine minutes later (in another context) he seemed to contradict himself when he said, "*You need to be specific with respect to the context that you are working in, in order to get the results that you want*." This apparent contradiction suggests that he might not identify the frame of mind of occupants as part of the context.

7.4.3 Project 3: university recreation centre. Conversely B2 presented a project that "was voted the best recreation centre in the United States [of] the year." He did not personally work on the project though he went to observe it in use. He exclaimed, "That recreation centre is the most amazing building that I've ever been in in my whole life – one of the most amazing. It is excellent." He called it "a very, very lively place...It feels good to

be a part of that – you are connected to a sort of social group when you're there." B2 attributed the dynamic to the "overlapping functions." He described the project, "[It] is a very complex programme as you would imagine. There are just lots of different functions going on at one time from cafeteria to a running track to a swimming pool to rock climbing." What makes this building dynamic in his view is that "the programme is just completely overlapped and interconnected so that there's just a lot of visibility...whenever you are in one area you are able to see all these other different activities going on." He appeared to think about the context and said, "[In] a campus environment...you have such a wide...user group" which exposes a design "to so many different forces that it will undoubtedly tell you a lot about whether or not [it] is successful." Then he reiterated that a designer "needs to be specific with respect to the context that you are working in." He believes that such understanding enables "design with intention, which means you can leverage design possibilities, design constraints to get the outcome that you want." This observation suggests that *perhaps the specifics of the context were not well understood in the first two projects*.

7.4.4 Summary: unexpected behaviour, precedent study/observation, context dependency and designer assumption. In the case of the hidden front door, it seems the designers assumed that people would know they were intended to walk around to the side of the building to enter. This type of assumption appears context-dependent since there would need to be sufficient clues for the users to indicate a side entrance. Although the outcome inconvenienced both visitors and occupants alike, B2 seemed attracted to the idea of 'falling out of the system.' Similarly in the elevator project the designers assumed that occupants would linger near the stairs and converse with colleagues. Again context is

crucial. Occupants who worked on floors in the office complex that the lift did not service were forced to take intermittent stairs. The obvious inconvenience likely primed them for irritation. People might be in a hurry when they use the lift, for example on their way to and from work, which is not conducive to mingling. This suggests the designers did not fully recognise their *occupants typical frame of mind*. The architecture school to which B2 referred has more than one means of circulation. The occupants are not forced to take a circuitous route, and likely the conversations that he remembered occurred when the parties were well disposed to it. The success of the recreation centre suggests that the specifics of the *context were better understood* by the designers or at least *the designer's intentions and those of the occupants aligned*.

7.5 Participant B3: Foster Project-Based Learning and Instil Values

7.5.1 Project 1: flexible classrooms.

B3 introduced changes to the way space functions in recent educational design. She said that "learning isn't any more like you and I are used to." She explained, "We're decentralising the library now...It's more of the genius board that you see at Google." She claimed that "education is going that way...we're opening up the classrooms...where you have these small media learning...area[s] and [students] work in groups." B3 said that designers are devising ways to facilitate students working as a group on their own to learn by discovery. "It's very hands-on." She showed images of mobile units containing books "so that you can bring these stacks to the class." When asked about the results – how this design has changed behaviour – B3 replied, "Well it's taking, I think, us adults longer for the change. So these kids, they are used to activity around them all the time...Because that's, this is all too distracting. There is no way a kid

could work this way – and yet they can." She continued, "So everything is about project-based, evidence-based learning...what we're doing in architecture now is we're giving these *flexible open spaces for teachers and students* to be in, instead of these very closed – you've only got 35 [feet] by 42 [feet]– classrooms and that's it."

B8 also commented on the value of flexible educational design, "It's important that we provide that kind of flexibility so that the teachers are not inherently forced to go to the new system because again no one likes to be forced to do something."

B7 related an observation that is relevant here, "I've heard that students learn differently and so we have to be designing to accommodate that." He explained, "I may be perfectly fine sitting out in an open space with my team and talking on the phone to a client and getting a little bit heated with the client. But I may not realise that the person sitting five feet away...not only is it very distracting but it is emotionally disturbing to them. They get uptight and it's not a comfortable environment for them. Actually I have a great example of what I'm trying to say." His firm sponsored a conference called 'the Student Innovation Challenge' in which they had a project-based learning session. He was moderating a group of four students and he recalled, "They zeroed in on this idea very quickly. And one of the four of them just immediately grabbed this computer and said, 'Okay, well I'll build a model of it.'" B7 encouraged the student to remain with the group since they "had only been talking about this for half an hour and they had an entire day." But this student "really, really needed to get into that computer and dive into building his model." So one of B7s colleagues showed the student "a few of the key ideas around" "a software he could build this [model] in." The student took to the software "because it was similar to other things

that he knew how to do." The participant commented, "After the whole thing was over I realised that I had just witnessed individualised learning and *how differently people work and learn*." The next day when his team presented their work an educator asked, "How did you guys work as a team and wouldn't you want to have that at school and every class be kind of like that, be project-based learning?" The student said, "Absolutely not!" B7 related that "[The student] explained that he is the type that works best individually. He can work with a team but he really needs to be on his own to develop his ideas and to think and process." This experience was significant for the participant as a designer, "It was such a good lesson for me. And so I've kind of taken that back to my team here...when we're designing." He understands now that "we have to be thinking about those people who don't work best in a large open room with a bunch of people. They may work collaboratively but *once they leave that collaborative group they really need to go off by themselves*." Although this student's behaviour was unexpected, B7's acceptance agrees with another comment in his interview in which he said, "I think it's critical that we get in the heads of the people that are using the space." His observation and response to it imply that he is not merely thinking what he would do in the space, but what those he is designing for would do, thus illustrating a significant difference of design for behaviour change.

In her interview in the context of tailoring the programme to the specific clients' needs, A2 brought up the Google office environment. It is notable that when clients request that "everything look like Google" she often tells them, "That's not gonna work for you...If you're a law firm, how are you going to function in a space like Google?" She said, "That's what a lot of non-design thinkers, they don't understand. They think they can just standardise something and throw it to it, and it makes sense. I mean, you can always have

guidelines, but that's also the role of [designers]." Her comment further exemplifies the challenge of context dependency.

7.5.2 **Project 2: wall art.** B3 presented part of her firm's project programming that helped inform the design choices, "One of the things we put together for every project that we work on is called the Guiding Principles, [which] we actually develop with the client. They are telling us what their goals are for that campus and so that becomes their core values for us." She explained, "Every decision we make is based on those guiding principles." B3 recalled this behavioural design during the concept diagram exercise when she was placing the concept emotion. The design came from merging a client's intention with aesthetic needs in an educational building project. B3 explained, "The district came to us and said, 'you know, we've got these twelve words that we want to instil in the kids.' These behaviour words that they wanted to help the kids to guide them." She also said, "We wanted to bring some graphics to the wall, and we weren't quite sure what we were going to do. And it had to be inexpensive." The need for graphics on the walls, the need to keep the cost down, and the school district's wanting to instil specific behavioural concepts in the students were consolidated in their design solution. "We used all these super graphics on the wall and just painted them. And so the kids see them every single day." Some of the words were courage, friendship, respect and pride. B3 recalled that she went to the first days of school to see how the children used the building. She overheard them "saying, 'I'll meet you at the friendship wall'!" She felt that the students "are interacting with the building, but [the words] are also influencing them. Because *they are seeing these words, and they are internalising these words*." B3 said, "Now they become those words. Those are great role models in a sense in a different way. So, with a little bit more

persuading them and a little bit of seducing – I think there's a lot of things." In her opinion this project is related to emotion, and her comment suggests that she would classify the effect of word wall art as both persuasive and seductive. This indicates that emotion is connected to persuade and seduce in B3's mind, which supports B4's opinion that emotion is an experiential dimension (*Chapter* 6.11.2).

7.5.3 **Summary: designer assumption, necessary infrastructure and context dependency.** B3 seemed willing to design for a 'new learning style' that she claimed adults do not understand. It appears that everyone in the younger generation is assumed to learn the same way. Yet B7's observation suggests that is not the case, and he realised that learning environments need to accommodate a variety of learning styles. Additionally A2 clarifies that different functions also require accommodation, and B8 felt that providing the infrastructure gives occupants options These observations indicate that flexible design needs to include *both group and individual learning opportunities*. In the case of the word art, B3 cited students' calling the wall by the word as indication that seeing these words in their environment was changing students' core values, implying that she assumes words can and did have significant behavioural influence.

7.6 Participant B4: Create Community

7.6.1 **Project: university campus student housing**. B4 designed "freshmen engagement housing" for first-year students on a university campus. The aim was to create "housing that would help support freshmen in this transition to college" and be responsible for themselves all on their own for the first time. She described incoming freshmen as

"people who had just graduated from High School, who have been operating in a very, very structured environment because...their parents have been telling them everything to do. And now...they are at college and they are by themselves and they are responsible for everything about themselves." B4 shared that "because of my own experience and because of the work that I do with my sister, who specialises in adolescent behaviour; she and I have also started to be interested in neurobiology and the brain stuff. So I started thinking these students need like structure in their housing environment and if you can provide some structure for them maybe that's going to help make some inroads on the problems related to students dropping out of school, not graduating, taking for ever to graduate or wandering around, never getting on." She used the Oxbridge residential colleges as a model for her new design.

The university was open to her investigations into "not only what the *optimal size of groups would be for like human interaction*, but equally and probably more important, what are the size of groups that universities can have because they have a resident assistant [RA] who is hired to be the care giver." When asked about her investigation into appropriate group numbers B4 responded, "There is somebody called...C. M. Deasy who talked about designing places for people, and a couple of other places like that" (1985). She added, "It's kind of long ago, but it's still very relevant." The university had been housing freshmen in four-bedroom apartments with eight occupants. B4 decided that was not good because "you might not get along with any of those people, and now you are isolated and stuck in this apartment with people that are not working for you." *Considering the needs of the university and the student needs*, "it came out to about 30 – 35 was a really good number" of people per unit.

The students would have individual rooms, but she felt that she needed to devise a way to get them out of their rooms to interact socially. "Don't put them in these little cubbies all by themselves. Don't have a bathroom where you and the next room are going to share, and then they'll never go out of their room." The university was against having large group bathrooms because people prefer private bathrooms. She commented, "I'm thinking, you can say all that, but none of it's true. Students will tell you they want that. Students come from homes where they have their own bathrooms so they need – no, it doesn't matter what they came from because they are here to...learn how to get along with a bunch of people." The psychologist-designer compromised by placing private bathrooms across the hallway from the student rooms. She pointed out that one bathroom is shared by "two rooms, but it's not between their rooms. It's across from their rooms." B4 also stressed that the students must have a community space for their unit. Taking ownership of "*a place which was group territory...would create them as a group*...They have to have a place" [italics added]. Therefore each unit of 30 – 35 students had their own living or recreation room where they could relax. She positioned that room "near the entrance so when you came in you could see if there was stuff going on there." She also provided study rooms for each unit.

That year incoming freshmen were housed in both the former units and the new "freshmen engagement housing" because there were not enough of the new units to accommodate everyone. The university allowed her firm access to conduct interviews and surveys with the freshmen and resident assistants from both types of housing. B4 used the Student Adaptation to College questionnaire because she wanted a standardised measurement. The results were positive. The students who lived in her new design developed close

relationships during that first year, and they applied to live together again the following year. The RAs reported, "'They are going out to parties together; they are going to games together, and they are taking each other home to visit their family on the weekends.'" By contrast the students in the original housing liked their private bathrooms, but the RAs "were saying, 'I have a really hard time getting my students to come out to group meetings. The students hide in their rooms. I can't really engage them, and they tend to go home on the weekends to visit their High School friends because they haven't really made friends here.'" B4 said, "That housing had an impact on the students living there; it also had an impact on the university because they said, 'Wow, this is working really well. We want to do more of this kind of housing.'" She felt positive about her contribution. "It is, I think, the most successful thing I would say I've ever done, really, in my career."

7.6.2 Summary: precedent study/observation, design investigation, necessary infrastructure and context dependency.

B4 presented an example of design that was informed by previous successful models, as well as her psychology education and recent personal experience as a student. She wondered whether the precedents would be transferrable when adapted to the new though similar context. A combination of investigation and client constraints informed her design choices. The combination of factors that informed the design is notable. The students wanted private bathrooms; the designer recommended large, public bathrooms. She compromised with private bathrooms that required the students to exit their rooms to use. Although the students liked the private bathrooms in the original apartments, they were likely unaware of the social opportunities that they missed. It is unknown whether large, public bathrooms would have been as successful in this context. It seems in this example that none of the

stakeholders (designer nor client nor occupant) unilaterally knew what would be best for the occupants' health and well-being. Rather a combination of needs and intentions comprised the successful outcome. This suggests that successful designs are informed by a variety of perspectives, which indicates that a *framework including these perspectives* would be useful.

7.7 Participant B5: Facilitate Lingering

7.7.1 Project: university campus courtyard.

B5 presented a campus project where she was commissioned to get more use from an existing "courtyard space that was designed to kind of be a hub of this business school within the university." It was a fairly new space because it was "recently finished, like two years ago." The participant "did research on this gathering space, and how you can create a place out of just spaces that are already real estate for the college, which again is an example of how it can be of financial benefit." She continued, "Because the school is already paying for the land, and the school is already paying for that space, but when you create like an additional place out of it, it changes the energy of the whole campus."

She went on to describe an existing "courtyard in the centre of three buildings": faculty offices, classrooms, and a lecture hall. There are paths going to and from each of the buildings. B5 observed that there was an intention to the layout. "This courtyard was designed to be a space where students would gather, and it would be a place where they would be passing through from class to class...The faculty would stay on campus more because there was a little café." B5 discovered that the space was not used because it did

not *contain the infrastructure necessary to support the intended behaviour*. To get students and faculty to stay, there was food provided by the café; however it lacked a comfortable place to eat. There was no seating, no shading. If the university wanted students and faculty to linger, they would also need outlets for computers and other electronic devices. It appeared that these parts of the design had been value-engineered out and/or were just not followed through.

B5 recommended that the university to supply seating, tables, a canopy and outlets. She said the result is that "the students are staying there more; they are studying on campus more. They have access to like their computers and outlets, and you know I mean it's like a library collaboration space. And it *makes them feel like they are at home* more than wanting to go back to their dorm or apartment or whatever. And then for the faculty –it makes them want to be on campus more than just for their office hours."

7.7.2 Summary: design investigation and necessary infrastructure.

B5's design investigation found that the original design had not been followed. This project exemplifies potential problems with value-engineering after the design phase of a project is complete. In this case the infrastructure that had been in the original design was not realised. Although value engineering might be a factor, lack of follow-through to complete the design intention might also. The outcome was that the intended behaviour was not supported and did not occur; which in this case negated the purpose of the design.

7.8 Participant B6: Facilitate Lingering

7.8.1 Project: multi-functional public spaces. During his interview B6 introduced spaces "where all the systems collide. And that includes not only geometrical built systems, but also people, functionality. So it's a more complex idea of what the atrium is." He presented the Cooper Union in New York as an example. "I remember visiting there a few months ago, and I was walking by and it was almost packed." He recalled the stairs in the large atrium where there "were people just reading and sitting." He indicated that "this circulation becomes something else. Becomes furniture, and people start occupying that." B3 had mentioned a similar design intention: "So one of the things we do with schools is we may have a staircase, but right next to that staircase we've enlarged it, and we've made the steps deeper so maybe for every two you have a [deeper] step you know, and it becomes a place to sit and talk and to congregate and have a social activity piece with it."

B6 noted that *people are drawn to multi-functional spaces*. "It makes it more exciting – it makes those spaces where all of the functions collide...get used the most. And you can see...they work really well." He compared the stairs of his project in Sydney with this intention. The outcome is that during "lunch break everybody goes and sits in those stairs, eating their lunch in the sun and they just, throw everything away, and they just keep working." He found this behaviour interesting and considered possible benefits from "stairs as something more than just circulation, just urban furniture." B6 hypothesised that when "you can bring people in that they didn't expect to get in to this building...and they get attracted to this building. And if you actually have retail or something, it will help them. You can help towards the narrative of the retail space." The outcome needs to be measured

because it is far “more expensive for them to create an atrium. It is not leasable space. In terms of numbers, it's just complete loss.”

B6 cautioned that he “cannot apply those stairs from Sydney to Buenos Aires, Argentina for example ... or Mendosa, in Argentina because...it’s a different culture.” He reconsidered “In Buenos Aires maybe it will work. It depends upon which areas.” When encouraged he explained “some people don't actually have time to sit or to have lunch, and they are just going from one place to another place. Some people actually don't – don't even care to spend time outside. They prefer to do something else – to go to a bar. Um in Mendosa, people have siestas.” His observations imply that *cultural habits affect the way people use spaces.*

7.8.2 Summary: precedent study/observation, necessary infrastructure and context dependency.

B6 implies that there is power in architecture to draw people which in turn creates a dynamic environment in which people want to stay. This agrees with B2’s positive experience of the recreation centre as well as the successful public reception of it. B6 is keenly aware of the difficulty designers face in trying to create the same type of dynamic in another location. His comments indicate that cultural habits need to be factored in to behavioural designs and the infrastructure needs to support the desired behaviour.

7.9 Participant B7: Ensure Safety & Security

7.9.1 **Project: primary and secondary school grounds.** B7 introduced a design standard to which he subscribes to prevent undesirable behaviour. The model is known as Crime Prevention Through Environmental Design (CPTED). The participant stated that "the whole premise of CPTED is...to focus [design] on preventing or discouraging bad behaviour." He introduced an educational project where he applied *transparencies to discourage bad behaviours* by both students and the public. B7 pointed out key elements in CPTED. "The three categories [are] surveillance, access control, and territorial reinforcement."

In the case of his school project "access control is absolutely the number one priority." The aim was to create a single point of entry so that visitors must "check in and be screened by staff before they can move into the areas where students are occupying." He created a "view ray that covers almost the entire front of the school." Visibility is kept clear in a horizontal band between one and two meters off the ground. Even plants are trimmed accordingly. "The front of the school is used as a barrier, and then the fencing comes off that and wraps around the play area." The visibility enables surveillance by staff. Upon entering the campus there are "very clean open views so you can see virtually anything that is going on in that space. But you are also able to look over the balcony and see what is going on in the library too." B7 pointed out that "seeing more than one space at a time is a very good thing" so that you can "see and be seen." Even in the library the stacks are kept below eye level to maintain an unobstructed view. He said, "It's very psychological,

and it's creating openness and transparency, and it's kind of like shining a light on evil. Don't give them the opportunity."

In answer to how he designs these spaces, B7 replied, "It's experience. *My own experience even*. You know, I was much more – I was less likely to misbehave if I knew my parents could see me." He expanded on the need to limit opportunity for bad behaviour. The participant explained "as a school designer I would do two things, I would put myself in the shoes of a high schooler – or you know, whatever grade level – and I would try to think, 'what I'm designing – is there something there that I would take advantage of to misbehave?'" He recalled when a school hired his firm to correct such a safety hazard. He described a multi-level area that had an open beam running alongside a stairwell railing "a full floor above grade." He said that he "was just absolutely stunned that a designer thought that was a good idea. Because I'm kind of a thrill seeker, even as an adult. How quickly do you think, how many minutes do you think it would take a high schooler to step over the rail because it wasn't tall enough and try to walk that beam?" B7 said "I think it's critical that we *get in the heads of the people that are using the space*."

7.9.2 Summary: designer assumption, design standard and context dependency.

Although in this case B7 presented a design standard of guiding principles, it seems that he must rely on his personal experience to guide him when it comes to human behaviour specifics. His comments on learning styles from above indicate that he does not allow his experience to supersede that of others once he is made aware of it (*Chapter* 7.5.1). This implies that a *framework including different behavioural tendencies* would be helpful to designers. Again context is a significant mitigating factor in design for behaviour change.

The tempting open beam might not be as tempting if it were not accessible. Thus B7's previous comments from the concept diagram interview section about removing the opportunity are consistent with his real-world design choices in this project (*Chapter* 6.3.2).

7.10 Participant B8: Prevent Counterproductive Value-Engineering

7.10.1 Project: shading school glazing from hot sun. B8 is an expert in another design standard, the building code, and he believes that the code can benefit the programming phase of a project. "I think the thing that architects are good at is defining the problem in the first place...it is hard to come up with a solution when you don't have a well-defined problem... the code is a great way to define the problem." The problem in the project he introduced was a client's rework of the design. Due to cost, many of the requirements for a fully functioning building would be value-engineered out before the project was complete. Value-engineering [VE] is a term used to describe editing or removal of parts of the design that funders think have less value than function. The participant explained, "The way that the bond funds and school funding is set up is that operational expenses are completely separate budgets from the new construction... So, it's whatever is the least expensive new construction. It could be the most – and usually is – the most horribly inefficient mechanical system, but that's what you have to use because that's what they can afford."

According to B8, his firm learned from their experience working with a previous school that the *funders are not concerned with operational costs*. He recalled, "We had originally designed [the school] with all these canopies...and little projections above windows...They

all got VE'd out so we ended up with what were very plain plaster boxes." It is difficult to calculate the amount of electricity that is saved by shading a window from the hot sun. They ended up having to install light film on the windows which was an inferior solution. B8 called it "lessons learned." He continued, "And so the trick is, you want this building with all these canopies and overhangs. So how do you make it so that you can't take them out? You invert the building." He described a school building where the classrooms were entered from the exterior of the building instead of from a central corridor going down the middle. The funders liked that because it meant they saved on the internal floor space, lights, air conditioning unit and so on. B8 "put an exterior walkway all the way round that becomes a horizontal projection, a canopy, and then you have to extend the roof over it for weather protection. So you can't VE out that." The overhang was *required by code* as weather protection for a walkway, and it shaded the classroom windows from the hot sun resulting in "less solar heat gain on the windows." He also pointed out that "it would actually cost more to build an air-conditioned corridor," which is another *client incentive* to keep the exterior corridor.

B8 revealed that "one of the things that they wanted to implement in this project from a design standpoint is that there is so much green open space; we really wanted to feel like the kids were going to be connected to the environment...so this idea of giving them even more connection to the environment by not putting them in the middle of an air-conditioned corridor where they can't see outside..." The exterior walkway is entered at ground level, but the ground slopes down, thus it becomes a level up near the back of the building. The grade change offered yet another benefit the participant has witnessed. "It has a fantastic view of downtown and kids just hang out and they just look. They just stare

out into space like it is a contemplative zone *because you are elevated above the activity, and so you are safe*" [italics added]. He also mentioned that "kids are certainly more active...because there's all these stairs and ramps to connect to levels so it's hard not to be active." He figures these are "serendipitous...behavioural modifications." B8 seemed pleased by the results of the design. "I'm really proud of that." Despite the "domino effect of benefit" to his inverted corridor design, he expected there would be difficulty justifying this technique to the clients for another location. "Other buildings don't have this kind of view; they don't have this kind of grade change."

7.10.2 Summary: value engineering, design standard, unexpected behaviour, precedent study/observation and context dependency.

This project is significant in that the designer intended to change the behaviour of the client to achieve a successful design outcome. His strategy was to *align his intentions with the interests of the client* in that his design provided the necessary window shading whilst cutting the client's costs. The design also had a positive effect on the students because they were more active.

7.11 Discussion and Implications for the Framework

This portion of the interviews showed that several factors inform participant perceptions on designing to change behaviour [RQ2] (*Table* 7.1). Real-world scenarios gave designers the opportunity to share challenges they have had to overcome in design for behaviour change in which additional mitigating factors were found (*Table* 7.2).

The researcher found five main determinants of participant perceptions on changing human behaviour: [1] **precedent study/observation**, [2] **designer assumption**, [3] **personal experience**, [4] **design standard**, and [5] **design investigation** [RQ2]. Design investigation is more thorough than precedent study. A precedent study looks for design examples with similar programmes, whereas design investigation includes that as well as contextual and behavioural considerations. The only design investigations were presented by the two designers with psychology backgrounds. This is significant for two reasons: [1] the psychologists press for this type of design investigation, and [2] spatial designers are merely taught how to conduct precedent studies. It might be that they then assume that a precedent study is their only investigative option. Although the designers intend to design in the best interests of their user-occupants, as B7's experience with the student illustrates they might not know the spectrum of user preferences/needs. Since the designer does not know that they are missing important information, a *framework that includes different behavioural tendencies* that designers can consult might be helpful.

The designers are aware of the difficulty of overcoming the mitigating factors. [1] **context dependency** was by far the most common mitigating factor raised in the projects the participants presented. The other three factors occurred less than half as often: [2] **necessary infrastructure**, [3] **unexpected behaviour** and [4] **value engineering**. These mitigating factors appear to be closely linked to the designer's perceptions of human behaviour. Although the designers interviewed seemed to see context as an important factor in their design's success, their understanding of context seems inconsistent. Context appears to have different elements of reference. There is the physical context: where the sink is placed in the building; the social context: whether people are expected to wash their

hands after using the toilet; and the individual context: the user-occupant's frame of mind and capacities. A *framework that includes the elements of context* might help designers consider context from the relevant perspectives for their project. This will be explored in the next chapter.

	B1	B2:1	B2:2	B2:3	B3:1	B3:2	B4	B5	B6	B7	B8	T
Perception Determinants												
Precedent study /Observation	0	0	1	1	1	0	1	0	1	0	1	**6**
Designer Assumption	0	1	1	0	1	1	0	0	0	1	0	**5**
Personal Experience	0	0	0	0	0	0	1	0	0	1	0	**2**
Design Standard	0	0	0	0	0	0	0	0	0	1	1	**2**
Design Investigation	0	0	0	0	0	0	1	1	0	0	0	**2**

Table 7.1 **Perception Determinants.** Factors found in the participants' projects that inform their perceptions on changing human behaviour.

	B1	B2:1	B2:2	B2:3	B3:1	B3:2	B4	B5	B6	B7	B8	T
Mitigating Factors												
Context Dependency	1	1	1	1	1	0	1	0	1	1	1	**9**
Necessary Infrastructure	0	0	0	0	1	0	1	1	1	0	0	**4**
Unexpected Behaviour	1	0	1	0	0	0	0	0	0	0	1	**3**
Value Engineering	0	0	0	0	0	0	0	1	0	0	1	**2**

Table 7.2 **Mitigating Factors.** Factors found in the participant's projects that influence the success of design for behaviour change.

8 Synthesising Findings into the Discussion

8.1 Introduction: Developing the Framework

Chapters five through seven presented findings from interviews with practitioners who self-identified as having experience in design for behaviour change. Design for behaviour change is a growing field in which literature contains little information on what practising designers perceive about how to change human behaviour or what informs their perceptions. Nor are the connections clearly outlined between the models and/or methods that address both design and behaviour and the theories of human behaviour upon which they may be based. Such lack of transparency is explicable since behaviour theory has focused on explaining and predicting behaviour rather than changing it. This research has intended to add designer knowledge to the discussion and to establish connections with human behaviour theory. To this end design for behaviour change and human behaviour theory literature has been reviewed and designers have been interviewed from three perspectives on the topic. The findings have been presented in the preceding chapters. Chapter eight aims to synthesise these findings into a comprehensive framework in which the concepts that can be applied to change behaviour are linked to the human behaviour theory that explains why they might work. This framework will begin to build the essential link between what and why to advance the field of design for behaviour change.

Chapter eight is divided into sections that construct the framework:

8.2 Establishing the Framework Foundation

Whether conscious of it or not, designers communicate with users through their design decisions and influence whether or not people understand an object or are even able to use it (Norman 1986). Therefore research in Design for Behaviour Change requires understanding how these distinct variables relate to one another. In the case of this study, the findings from interviews with professional designers need to be synthesised with both theory from literature in design and in human behaviour; all three of which are similar in topic but different in perspective. This synthesis can be distilled into a framework

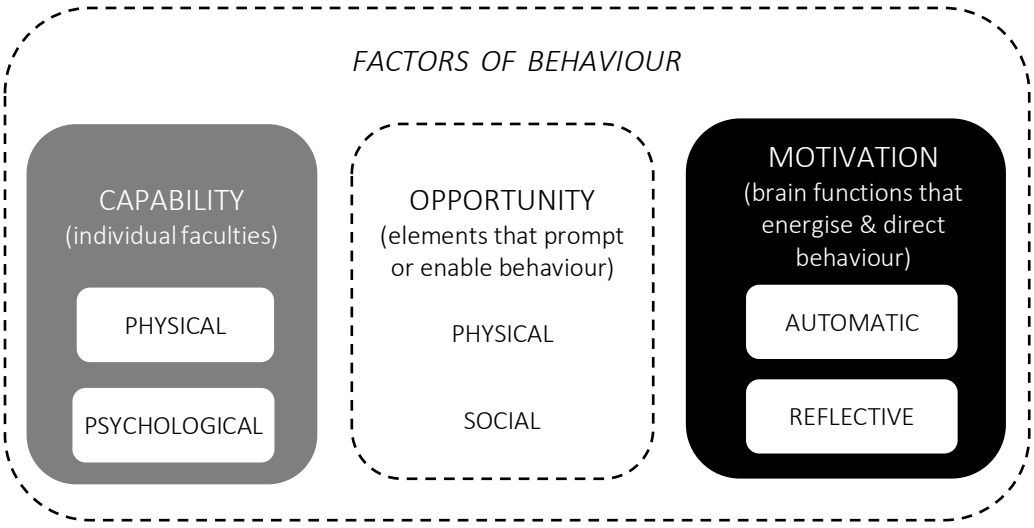

Figure 8.1 **Model of Behaviour.** A visual representation of the three essential factors of behaviour and their respective subcategories.

applicable to design for behaviour change by modifying the basic communication structure from Crilly et al. to feature behaviour (2004; see *Figure* 2.1). Chapter two established that behaviour is made up of three essential factors: [1] capability, [2] opportunity, and [3] motivation (Michie, van Stralen & West, 2011). Each of the three factors can be subdivided into two categories: [1] capability: physical & psychological, [2] opportunity: physical & social, and [3] motivation: automatic & reflective (Michie et al., 2011; see *Chapter* 2.4). *Figure* 8.1 models behaviour with all of these factors and their relationships.

Figure 8.2 features the above model of behaviour (*Figure* 8.1) in the setting of user and design interaction which clarifies how the distinct variables relate to one another. In addition to physical objects Environment/Context includes outside influencing circumstantial elements like policies and societal values. The interview findings agree that context is comprised of both physical and social elements. Findings also indicate that an individual would be another contextual element to consider since emotion and values are significant to their behavioural response. Therefore Opportunity exists outside the user,

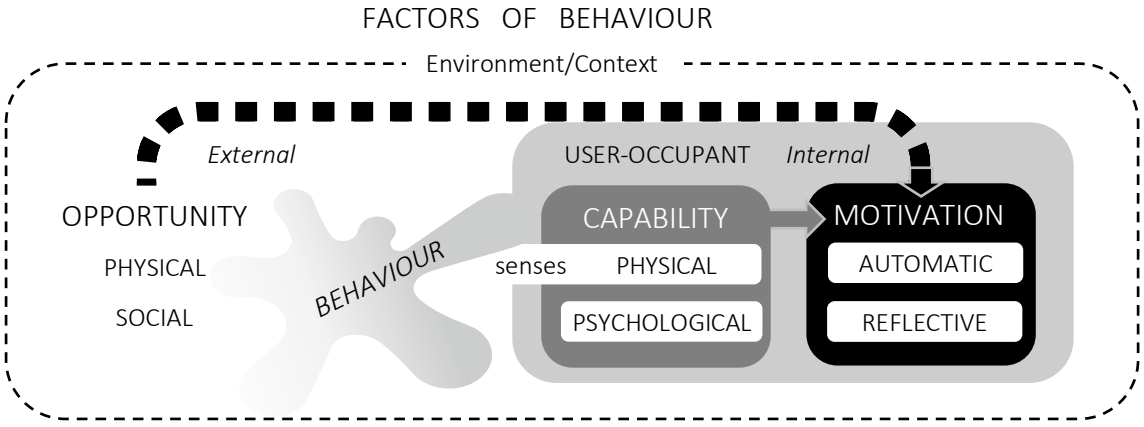

Figure 8.2 **Initial Thesis Framework.** This framework modifies *Figure* 2.1 by diagramming the three essential factors of behaviour [capability, opportunity & motivation] and their relationship with the three elements of context [physical, social & user-occupant].

whereas Capability and Motivation are internal. Although Opportunity is external to the user, the user occupies that external environment or context. For clarity users will be referred to as User-Occupants. It follows that the User-Occupant contextual element is subdivided into Capability and Motivation. Motivation can be influenced by both or either Capability and Opportunity as shown in the framework by arrows. To recap: User-Occupant represents the individual with their internal Capabilities and Motivations, and Environment/Context includes both external Opportunities and the User-Occupant which make behaviour possible. Behavioural context is an indispensable part of design for behaviour change.

Once a foundational framework was established, the 23 experiential concepts from the interviews were positioned by analysing participant comments and their corresponding diagram placements (from *Chapter* 6). In addition to the researcher performing this process, it was again completed in two separate sessions with two researchers: one from engineering design management and the other from education psychology. The three results were then compiled into one. Whenever there were discrepancies the most appropriate categorisation was assigned with reasoning noted in the text below. The following sections incorporate interview findings and human behaviour theory into the framework by building each piece. Participants' implications and comments inform the placement of each of the 23 concepts from the diagram exercise in chapter six. Those experiential concepts that influence opportunity are diagrammed in the next section.

8.3 Experiential Concepts that Influence Opportunity

Opportunity is defined as the elements external to the user-occupant that can prompt or enable behaviour. These elements can be physical and/or social. When determining whether a concept targets opportunity the following questions are asked: does this concept supply or remove an external physical or social reminder? Does it prompt the intended behaviour? Does it influence ability to perform a behaviour? Given this definition, the concepts for opportunity have been diagrammed in preparation for the thesis framework (*Figure* 8.3). It appears that influencing opportunity does not elicit an explicit-weak pressure experience for user-occupants. Each of the nine possible concepts that may target an individual's opportunity will be discussed in turn.

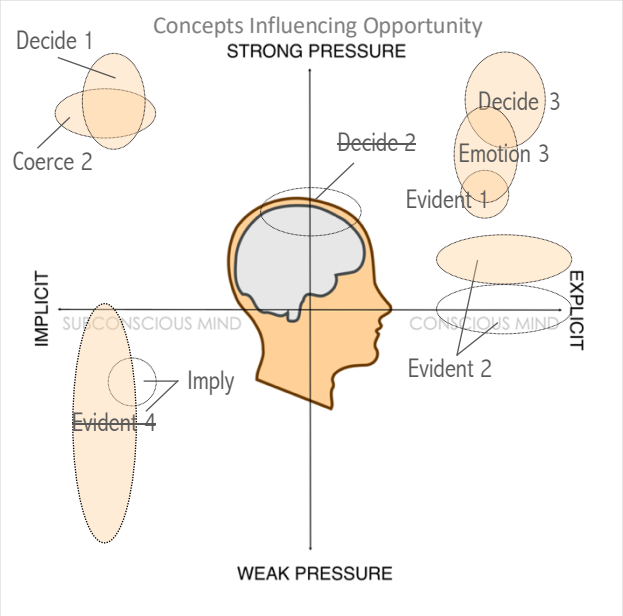

Figure 8.3 **Concepts Influencing Opportunity.** It appears that influencing opportunity is not experienced by user-occupants as explicit-weak. Imply is merged with evident 4, and decide 2 is removed; reducing the number of concepts to 21.

8.3.1 Imply, implicit – weak.

Not just coming right out and telling someone. Both the placement and definition of this concept appear to align with that of evident 4. Evident 4 might more accurately be labelled imply (*Chapter* 8.3.2).

8.3.2 Evident 4, implicit – weak or neutral. *It's obvious so you just kind of do it. Propensity to perform the intended behaviour is not dependent upon the pressure the user-occupant consciously feels.* This form of evident differs from convenient in that it does not have to be the easiest option, it only needs to be understood. It will merge with imply in the final framework, reducing the total number of concepts to 22.

8.3.3 Coerce 2, implicit – strong. *Removing the opportunity to act influences behaviour.* This form of coerce can include social pressure in which "your subconscious is telling you" the repercussions of non-compliance. It might simply involve making undesirable behaviours visible to onlookers by subtle changes in the environment. The goal is to discourage a behaviour by making any opportunity for it seem socially undesirable to user-occupants. Although positioned similarly to decide 1, coerce 2 operates in the social rather than the physical context.

8.3.4 Decide 1, implicit – strong. *The only way to go .* In this form of decide the pressure is there because there is only one option, but the individual is unlikely to notice the design intent. The location of a public restroom offers only one lavatory option, and people unconsciously comply. Although both coerce 2 and decide 1 are in implicit-strong, they differ in that decide 1 employs the physical context to apply the pressure whereas coerce 2 uses the social context.

8.3.5 Decide 2, implicit or explicit – strong. *It depends upon whether the result of the designer's decision is obvious to the user-occupant.* This form of decide accounts for both decide 1 and decide 3 by clarifying the difference. Decide 1 becomes decide 3

(explicit) when it is apparent to the individual that they are denied an option. Decide 2 will not be in the final framework, reducing the total concepts to 21.

8.3.6 Decide 3, explicit – strong.

It's their only path. Decide 3 applies whenever the individual is aware of the designers' choices for them. An example might be a ramp that provides access only to one of three doors. The other two doors are obvious options that are unavailable to the user-occupant's choices.

8.3.7 Emotion 3, explicit – strong.

If a person does not feel safe, they will not be comfortable in that space. Feeling fear is the negative aspect of anticipation, one of three kinds of motivation from the Fogg Behaviour Model (Fogg, 2009; see *Chapter* 2.3). The participant gave the example of a vertical versus horizontal prison cell window. He asserted that being able to scan the horizon for possible threats stems from an innate need to feel safe. The vertical window denies the user-occupant that option rendering the room uncomfortable. It seems significant that emotion 3 overlaps with coerce 1; they both have a negative aspect (*Chapter* 8.5.7). However the comments for emotion 3 refer to human nature and the need to feel safe. This differs subtly from coerce 1 in that it stems from an innate pressure within, whereas coerce 1 is an external pressure on user-occupant motivation. Given that these concepts are to help inform design choices, the designer's choice in window placement in the above example is a form of decide. The factor of behaviour that is being targeted then is opportunity. Again, both the engineer and education researchers were not privy to these participant comments when they indicated that emotion 3 influences motivation directly (*Chapter* 8.6.8).

8.3.8 Evident 1, explicit – strong.

Stating the intention might influence behaviour; not leaving it to chance that they'll read between the lines. Evident 1 applies language to the environment to indicate intention. This might be in the form of signage. It requires a user-occupant to be engaged enough to read which is often not the case. It is notable that decide 3 is felt more strongly than evident 1. This might be due to the higher brain function of language which engages a user-occupant on a conscious level, categorised as a 'thoughtful' user in Design with Intent (Lockton et al., 2012).

8.3.9 Evident 2, explicit – weak or strong.

Telling the subject what they need to know in a clear way. This form of evident may not involve words, but the intended behaviour is clarified by the environment. This differs from convenient in that the user engages consciously with the design: for example recycle bins that have an opening in the shape of the item intended to be recycled in them. However this example can be covered by evident 3. A design moves from evident 3 when the design does not align with the user-occupant's intentions; it then becomes evident 1 exerting more pressure. Therefore evident 2 will be relocated near evident 1 to indicate this distinction.

8.4 Experiential Concepts that Influence Capability and Motivation

The individual or user-occupant has both capability and motivational factors that influence their behaviour. Some of the concepts do not directly influence one or the other; hence the category of user-occupant in the framework (*Figure* 8.2). The same definitions for capability and motivation apply here as they do individually (*Chapter* 8.5 & 8.6 respectively). Capability is defined as an individual's internal faculties, both physical and

psychological. Motivation is the brain's way of stimulating and coordinating behaviour. Given these definitions, the concepts influencing both capability and motivation [the user-occupant] have been diagrammed in preparation for the thesis framework (*Figure* 8.4). Similar to influencing opportunity, it appears that user-occupants do not feel much pressure when both capability and motivation are influenced. The four concepts in this category are discussed below.

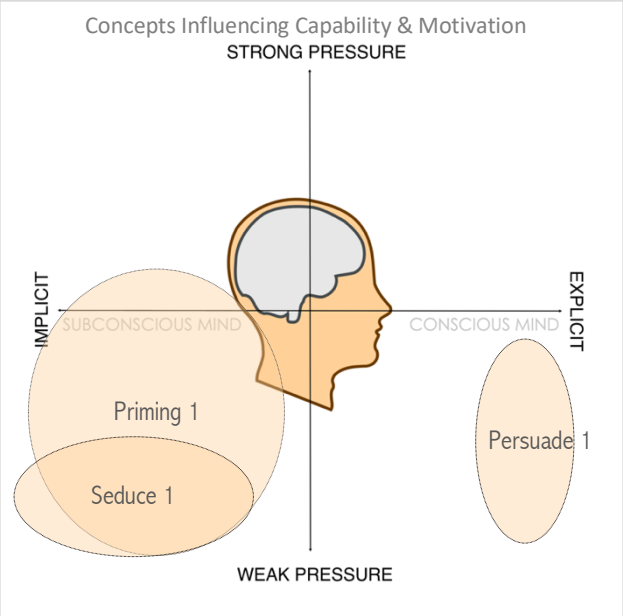

Figure 8.4 **Concepts that Influence Capability & Motivation.** Influencing user-occupants in this way does not appear to exert much pressure. Seduce 1 belongs here since it influences capability as well as motivation.

8.4.1 Persuade 1, explicit – weak.

Get the user-occupant to pressure themselves. The element of pressure in persuade 1 is self-induced, and the user-occupant is aware of it. Although both seduce 1 and 2 also intend to get the user-occupant to pressure themselves, persuade 1 differs in that the intended behaviour is explicit whereas in seduce 1 and 2 the intention is implicit.

8.4.2 Seduce 1, implicit – weak.

There is a subliminal quality to this concept. The pressure is psychological. Make the user-occupant feel good as a reward. The interviews reveal some subtleties about seduce 1 that the engineer and education researchers were not aware of when they assigned it to motivation alone (*Chapter* 8.6.1). Participants'

examples for this concept include marketing soon-to-be-released items and Germany's seduction by Hitler (*Chapter* 6.4.1). This form of seduce has aspects of both thinking abstract ideas which engages the psychological faculties of capability in addition to the feeling a user-occupant might anticipate which engages motivation. Anticipation is one of the aspects of motivation from the Fogg Behaviour Model (Fogg, 2009; see *Chapter* 2.3). For example a winding garden path plays upon a sense of discovery inducing the path-goer to continue around the bend. Therefore the researcher kept her placement of seduce 1 in capability and motivation. There are notable similarities between seduce 1 and priming 1, but they are not the same concept as priming may not involve positive anticipation whereas seduce 1 does (*Chapter* 8.4.3).

8.4.3 Priming 1, implicit – weak to strong.

Setting the framework for how someone will have a thought process. Setting the stage. Making a suggestion that might take hold. The user-occupant does not realise they have been influenced. B3 used the example of foreshadowing in a movie, building upon an idea until the reveal (see *Chapter* 6.8.1). It does not feel unnatural if the suggestion is accepted. Priming 1 and seduce 1 are closely linked, but there is a subtle difference. Seduce 1 is always a positive feeling, but the anticipation of priming can be negative or positive.

8.5 What Experiential Concepts Influence Capability

Capability is an individual's internal physical and psychological faculties. When determining whether a concept targets capability the question is asked: is this concept meant to influence an individual's internal faculties to perform the behaviour? If so then

does it affect the individual's physical or psychological capacity (capability)? Or is it an external physical or social tool influencing ability (opportunity)? Or does it influence "those brain processes that energise and direct behaviour" (motivation)? (Michie, van Stralen, & West, 2011). The concepts for capability have been diagrammed in preparation for the thesis framework (*Figure* 8.5). It appears that user-occupants do not experience much pressure when their capability is positively influenced. Each of the five concepts that target an individual's capability will be discussed in turn.

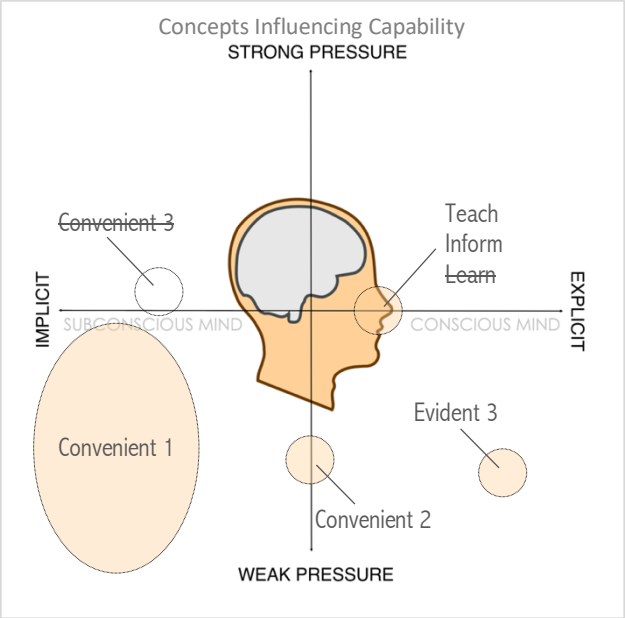

Figure 8.5 **Concepts Influencing Capability.** Influencing capability does not seem to exert strong pressure. Convenient 3 is covered by convenient 1 and 2 reducing the total number of concepts to 20.

8.5.1 Convenient 1, implicit – weak. *A subconscious recognition rather than consciously planned out. The most intuitive course.* The user-occupant's values influence their acceptance of the convenient option. This form of convenience is an unconscious intuition. An intuitive course is one that does not require the user-occupant to learn new skills or consciously think through the steps of execution. It is important to note here that Michie et al. place habits within motivation. However since design interventions function differently from those in psychology, the heuristics of unconscious interaction with the world are considered physical and psychological faculties in the thesis framework. User-occupants can successfully engage on a 'shortcuts' level with this type of design (Lockton,

Harrison & Stanton, 2012; see *Chapter* 2.5). It would be the unquestioned choice; for example entering a building through the nearest visible door (see *Chapter* 7.4.1). This can be compared with grasping and pulling the door pull (see *Chapter* 2.2), which is an automatic use behaviour informed by affordances. It directly relates to the user-occupant's ability to perform the behaviour. However if the convenient option is contrary to the individual's values, they may question and consciously engage another choice. Similar to B3's experience of a lift becoming the less convenient option when it was busy and slow. B3 valued her time more than the physical effort required to take the stairs (see *Chapter* 6.11.2).

8.5.2 Convenient 2, implicit or explicit – strong.

The user-occupant's interests affect their acceptance of the convenient option. The convenient option begins exerting pressure when it does not align with the user-occupant's interests. If the convenient option is to take the front door but an individual is meeting someone at the back door, then it is in his interest to question the more convenient option which engages pressure to work through a less convenient option (see *Chapter* 6.7.1). B3's decision to take the stairs when the lift was delayed is an example of this concept (see *Chapter* 6.11.2).

8.5.3 Convenient 3, implicit – strong.

It could be weak...it has to be strong pressure. In this case the participant waffled between weak and strong pressure. It still affects the ability to perform the behaviour. All of the forms of convenient target an individual's capability by naturally working with their faculties. Convenient 3 is covered by convenient 1 and convenient 2, reducing the number of concepts to 20.

8.5.4 Evident 3, explicit – weak. *More cognitive than convenient.* Although the other forms of evident target opportunity, evident 3 relates closely to convenient in that it is an intuitive interaction; hence its placement in capability. In this case, though the user-occupant engages consciously with the design, there is not an increase in pressure. If the design intent is disagreeable to the user-occupant, then the pressure strengthens and the concept becomes evident 2 (*Chapter* 8.3.9).

8.5.5 Teach / inform / learn, explicit – weak or strong. *Learning to ride the train every day*. There is a subtlety implied in B1's comments. More than "just signage" informs his capacity successfully to navigate the commuter experience on a train (see *Chapter* 6.11.1). This aspect of teach/inform/learn can involve mimicking behaviour in which the social context influences the user-occupant. Designers can orchestrate teaching and informing, but learn is the user-occupant response to that teaching or informing. Learn is not the kind of concept that a designer can employ and will not be in the final thesis framework, but teach/inform will remain, leaving the number of concepts at 20.

8.6 What Experiential Concepts Influence Motivation

It might be argued that since motivation 'energises and directs behaviour,' any design intervention ultimately influences motivation. This framework is intended to facilitate discussion on design for behaviour change and whether a concept influences motivation directly or indirectly is an important distinction. Therefore the aim is to determine what part or parts of the three behaviour factors are targeted. When considering motivation the question is asked: does this concept intend to influence

emotion or other brain functions that induce behaviour? Given this definition the concepts for motivation have been diagrammed in preparation for the thesis framework (*Figure* 8.6). Each of the eight possible concepts that may influence an individual's motivation is discussed in turn below.

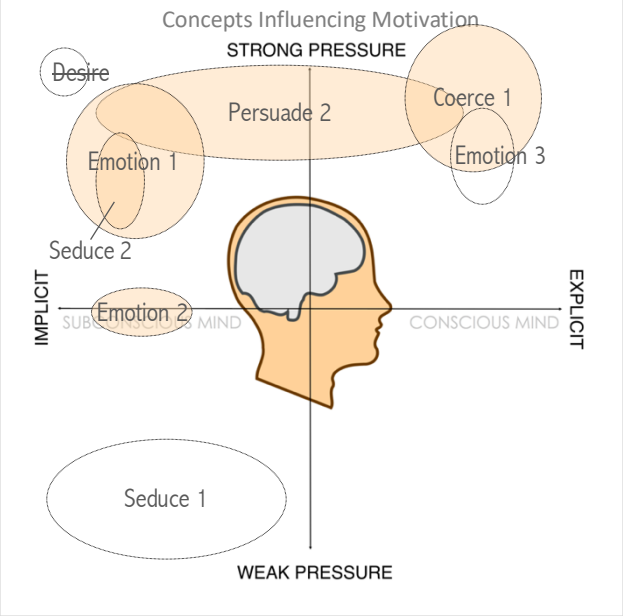

Figure 8.6 **Concepts Influencing Motivation.** All concepts for motivation exert strong pressure. Desire is removed reducing total concepts to 19; seduce 1 influences both capability and motivation.

8.6.1 Seduce 1, implicit – weak.

There is a subliminal quality to this concept. The pressure is psychological. Make the user-occupant feel good as a reward. The researcher asserts that seduce 1 influences both capability and motivation (*Chapter* 8.4.2). However, for transparency it is noted here that both the engineering and education researchers thought that seduce 1 affects motivation directly.

8.6.2 Emotion 2, implicit – strong or weak.

Pressure is so subjective because it really depends on how someone approaches life. Emotion 2 is comparable to convenient in that the intended behaviour can be easy. It seems to differ in that it is relevant to the user-occupant's values which touch motivation directly.

8.6.3 Emotion 1, implicit – strong. *Emotion could be positive or negative. Basic human nature. It might be tough to do the right thing – there's pressure involved. Emotion might be a third dimension to user-occupant experience.* Emotion 1 is not the same as seduce 2 because the user-occupant feels pressure to comply with the design intent that might be a "tough" choice. Although this implies some social pressure, it is more directly related to the individual's intentions than the opportunity's environment. Hence its placement in motivation rather than opportunity.

8.6.4 Seduce 2, implicit – strong. *Align the design intent with the interests of user-occupants*. Although it appears that seduce 2 might be the same as emotion 1, there is a subtle difference in that seduce 2 aligns closely with the individual's interests. This kind of design induces self-pressure in the form of a desire (*Chapter* 8.6.5). It appears that aligning with a user-occupant's interests creates stronger pressure than seduce 1. The qualities of their interests might explain why the participant indicated that desire is the most implicit with the strongest pressure. This suggests that the level of internal pressure is dependent upon the quality of the user-occupant's interest.

8.6.5 Desire, implicit – strong. *It is coming from inside a user-occupant.* B4's comments indicate an internal user-occupant response to the design. Once an individual is seduced then it would be labelled desire, so it is not the same kind of meaning as the other concepts which describe a designer's options. Therefore it will be removed from the final framework, reducing the total concepts to 19.

8.6.6 Persuade 2, implicit to explicit – strong. *You're stating; you're suggesting.*

This form of persuade can be implicit with a manipulative quality to it, according to B6 who used an example of people returning home with items they purchased without knowing why. Persuade 2 can also be explicit whereby the intended behaviour is suggested, in which case the user-occupant would know why they purchased an item.

8.6.7 Coerce 1, explicit – strong. *Avoiding negative consequences can motivate behaviour change*. *The user-occupant's values influence their response to the design.*

This form of coerce uses obvious negative physical consequences to discourage user-occupants from undesired behaviour. However an individual may disregard the consequences in order to uphold their values. For example bollards blocking a building will deter most from driving a vehicle into it. Yet the existence of car bombing demonstrates that a user-occupant's values might outweigh the consequences of performing the behaviour.

8.6.8 Emotion 3, explicit – strong. *If a person does not feel safe, they will not be comfortable in that space.*

Although both the engineer and education researchers indicated that emotion 3 influences motivation directly a deeper examination shows that it influences opportunity, which is reflected in the thesis framework (*Chapter* 8.3.7; *Figure* 8.2).

8.7 Introducing Human Behaviour Theory to Explain the Why

Whilst the experiential concepts were grouped into the behaviour factor that they influence initially, the applicable human behaviour theory was indicated by means of the definitions from chapter three (see *Chapter* 3 *Tables* 3.1, 3.2, 3.3 & 3.4). The theory definitions were written on A4 sheets for easy reference, and this task was also performed by the engineer and education researchers in which the definitions were aligned with the concept meanings. The results from these connections and the above concept analyses are modelled in *Figure* 8.7. The theories are discussed by behaviour factor in the following sections.

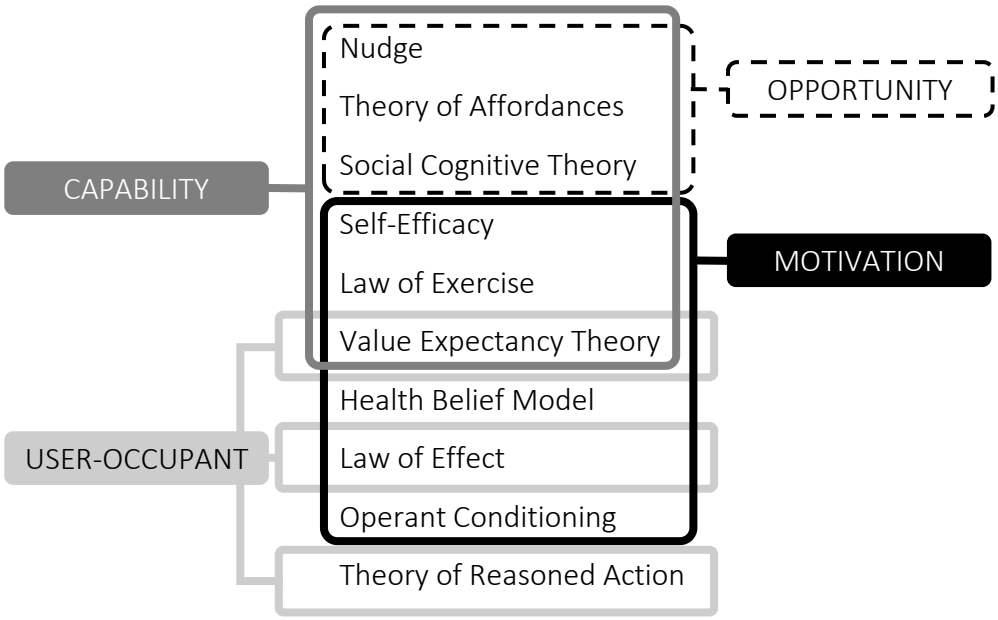

Figure 8.7 **Theories & the Essential Factors of Human Behaviour.** This model adapts *Figure* 8.2 to introduce the human behaviour theories that explain why the concept might elicit the intended behaviour. Some theories can target both/either Capability and/or Motivation as represented here by User-Occupant (*see* 8.7.2 *on the following page*).

8.7.1 Human behaviour theories that affect opportunity.

[1] Nudge, [2] Theory of Affordances, and [3] Social Cognitive Theory. Although nudge relates closely to convenient, it can be used in the environment by making the intended behaviour an implied default choice (*Chapter* 8.3.2). The influence of the environment is closely linked with the theory of affordances and relates to what was learned about human behaviour in the previous chapters. The concepts imply, decide 1 & 3, and evident 2 might be employed in the environment to make a behaviour possible for user-occupants. Although social cognitive theory involves the user-occupant's perceptions, it is included here in opportunity since the intended behaviour to mimic can be communicated by the environment. For example, in the hypothetical design exercise several participants suggested an intervention of graphics and images depicting people donating to indicate it is appropriate (see *Chapter* 5.6).

8.7.2 Human behaviour theories that affect the user-occupant (capability & motivation).

[1] Value Expectancy Theory, [2] Law of Effect, and [3] Theory of Reasoned Action. All three concepts influencing the user-occupant apply to value expectancy theory in which the user might pressure themselves because of the expected outcome, have a feel-good reward or be influenced to value the intended behaviour. The law of effect might be employed when the behaviour is intended to be repeated. The theory of reasoned action belongs here because it involves an individual's attitudes and beliefs about a behaviour.

8.7.3 Human behaviour theories that affect capability.

[1] Nudge, [2] Theory of Affordances, [3] Social Cognitive Theory, [4] Self-Efficacy, [5] Law of Exercise, and [6] Value Expectancy Theory. How difficult a person thinks it will be to perform an act can be a feature of the environment that influences the user-occupant's capability. A designer might nudge the user-occupant by using affordances to make the intended behaviour convenient. For social cognitive theory creating an example of the intended behaviour can be applied by moving the sink into the hallway where the performance can be witnessed (see *Chapter* 7.3.1). This also applies to how B1 was informed to ride the train every day increasing his sense of self-efficacy (see *Chapter* 6.11.1). A designer might increase the frequency, duration or intensity of a behaviour in order more firmly to establish its performance in a similar situation (see *Chapter* 3.2). This theory might be employed to increase the success of using a precedent in a new location. The concepts evident 3 and teach/inform can engage the user-occupant in a way that increases their sense of value on the behavioural outcome.

8.7.4 Human behaviour theories that affect motivation.

[1] Self-Efficacy, [2] Law of Exercise, [3] Value Expectancy Theory, [4] Health Belief Model, [5] Law of Effect, and [6] Operant Conditioning. To influence motivation more directly the design intent needs to align with the interests of the user-occupant. Visualising oneself successfully completing the action increases an individual's confidence of personal efficacy, which in turn heightens motivation to perform the behaviour in question (Bandura, 1989). It is notable that avoiding negative consequences (Health Belief Model) fits here as this motivation was mentioned by some of the participants (see *Chapter* 6.3.1).

8.8 The Thesis Framework

The research findings are distilled into a refined comprehensive framework that diagrams how the different components relate to one another (*Figure* 8.8). The thesis framework has been developed by building upon insights from models addressing design and behaviour, human behaviour theory, and findings from interviews with practitioners as explained in the previous chapters. The framework models how the three essential factors of behaviour relate to one another in context. It presents 19 distinct concepts that represent how a user-occupant might experience an intentional design. These experiential concepts are linked to the essential factors of behaviour through 10 human behaviour theories applicable to design for behaviour change. The links reflect different experiential outcomes based on which factor(s) of behaviour is targeted by the design. The framework shows possible user-occupant experience(s) linked to specific human behaviour theories and essential behaviour factors.

The thesis framework uncovers a novel perspective by synthesising the distinct variables in design for behaviour change whereby both the what (experiential concepts) and the why (human behaviour theories) are linked to behaviour in context. This perspective highlights why a seemingly similar design can produce different behavioural outcomes. This knowledge advances effective behaviour change solutions by better informing the designer. The next chapter will summarise the thesis, identify limits to the claims and present potential future work.

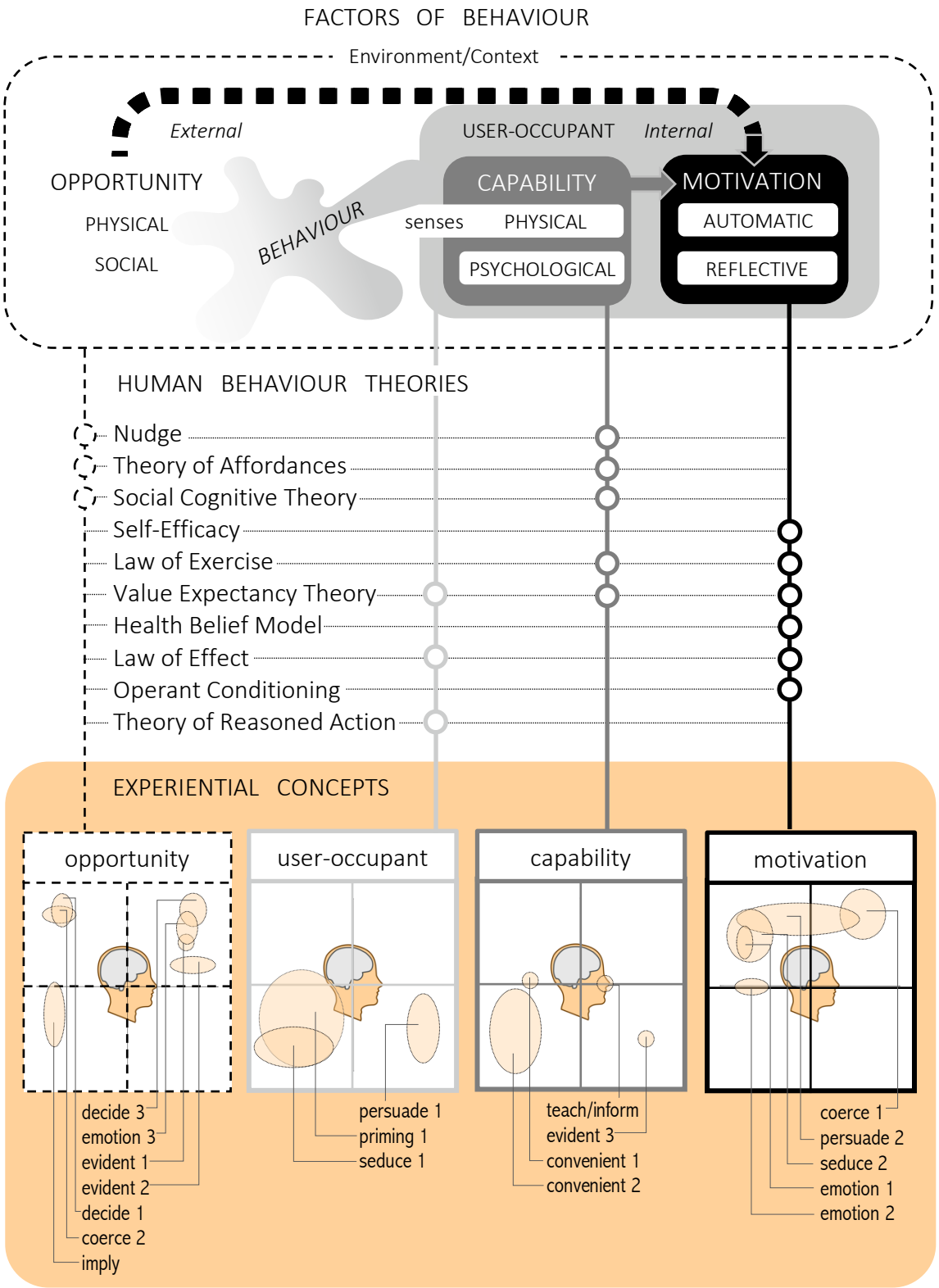

Figure 8.8 **Refined Thesis Framework.** The refined framework modifies *Figure* 8.2 by incorporating the experiential concepts along the bottom (see *Figures* 8.3, 8.4, 8.5 & 8.6). These concepts are linked to factors of behaviour through human behaviour theories (see *Figure* 8.7). Behavioural Levers come from the choice of an experiential concept plus a human behaviour theory to target a specific factor of behaviour.

9 Contributions, Limitations and Future Work

9.1 Introduction: Exploring Practice & Theory to Inform DfBC

This dissertation explored [RQ1] **what spatial designers perceive can change human behaviour**, [RQ2] **what informs their perceptions**, and [RQ3] **in what ways these findings compare with existing theoretical knowledge**. These three questions were addressed in the chapters noted below in *Table* 9.1. As explained in the respective chapters, an iterative research design built upon insights from models addressing design and behaviour, relevant human behaviour theories, and analysis of findings from interviews with practitioners. The research findings were distilled into a refined comprehensive framework that embodies the intangible components of Design for Behaviour Change [DfBC] and reflects their relationship to one another [see *Figure 8.8*).

Chapters	Research Questions		
	What do practising spatial designers perceive can change human behaviour?	What informs practising spatial designers' perceptions?	In what ways do these findings compare with existing theoretical knowledge?
Ch 2			✓
Ch 3			✓
Ch 4	✓	✓	✓
Ch 5	✓		
Ch 6	✓		✓
Ch 7		✓	✓
Ch 8	✓	✓	✓

Table 9.1 **Addressing Research Questions.** This table shows which chapters contribute to each research question.

Chapter nine examines thesis contributions to knowledge and practice, presents limitations and suggests potential future work. The chapter is divided into three sections:

9.1 Introduction: Exploring Practice & Theory to Inform DfBC

9.2 Contributions: A Comprehensive Framework to Manage Complex Variables

9.3 Advancement: Addressing Limitations through Future Research

9.2 Contributions: A Comprehensive Framework to Manage Complex Variables

This thesis contributes a refined comprehensive framework to manage the complexities of Design for Behaviour Change (see *Figure* 8.8). The framework diagrams three overarching components in Design for Behaviour Change and how they relate to one another: [1] clearly defined *factors of behaviour in context*; [2] practitioner described *experiential concepts*, and [3] relevant *human behaviour theories*. Distinguishing the overarching components uncovers a novel way to examine design for behaviour change whereby both experiential concepts and human behaviour theories are linked to factors of behaviour.

Design for Behaviour Change is poised to benefit from the transparent treatment of practitioner knowledge and human behaviour theory. The framework builds upon knowledge that design communicates intention through the strategies designers employ to influence user' behaviour (Norman, 1986; Crilly, Moultrie & Clarkson, 2004; Lockton, Harrison, Holley & Stanton, 2009). A comprehensive treatment of behaviour is necessary to untangle the complexities of Design for Behaviour Change. The framework foundation

clearly models the factors of behaviour which embody both the user and their physical and social context (Fogg, 2009; Michie et al., 2011; Tromp & Hekkert, 2014). It presents valuable practitioner knowledge about user experience. It assimilates relevant human behaviour theories to address the why (Thorndike, 1927; Skinner, 1938; Hochbaum, Kegels & Rosenstock, 1952; Hochbaum, 1958; Bandura, 1974, 1977, 1989, 2001; Ajzen & Fishbein, 1977; Gibson, 1979; Wigfield, 1994; Thaler & Sunstein, 2009). The following three overarching components of design for behaviour change compose levers to potentially influence human behaviour: [1] factors of behaviour in context, [2] experiential concepts, and [3] human behaviour theory. Behavioural outcomes can now be traced back to specific design decisions. This contribution advances effective design for behaviour change solutions by helping designers make informed choices. The next section will identify limits to the claims and present potential future work.

9.3 Advancement: Addressing Limitations through Future Research

The purpose of this study was to produce a first comprehensive conceptual framework to support further research in Design for Behaviour Change. The refined framework has been developed from literature concerning design and human behaviour, in addition to in-depth multi-faceted interviews with purposefully chosen designers. This thesis does not claim to represent all designers' perceptions, nor does it claim to be the only way to represent these findings. It presents to the design for behaviour change discussion ways in which some designers think about behaviour change and how these insights link to human behaviour theory. Such a framework offers a unique opportunity to advance research in Design for Behaviour Change.

The conceptual framework has been developed to mature through continued application and refinement. Now that the complexities of behaviour change have been diagrammed, a representative sample of spatial designers can be surveyed for generalisability. Interviews and surveys of other types of designers might confirm and/or add experiential concepts. Focus groups with professional designers from various fields might also refine experiential concepts. The researcher recommends deeper exploration into emotion and values to determine if they could be potential clarifications of the user-occupant in the framework. Other studies might include user-occupant engagement levels or similar ways of categorising people to better target capability and motivation. Experiments can test the efficacy of the Behavioural Levers in real world applications. Theory in the framework can be updated as psychology advances understanding of behaviour change. A review of sociology literature might uncover relevant social behaviour theories to add to the framework. It is an exciting time to conduct design research.

By developing the potential for designers to understand how their choices influence human behaviour, design can stimulate desirable behaviours to help relieve social, economic and environmental concerns. Designers need more support to successfully change people's behaviour, and research is progressively answering that need. It is intended that this study's framework will be used to further build understanding of Design for Behaviour Change.

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APPENDIX A. Table of Behavioural Determinants

Domains (Behavioural Determinants)	Constructs (component parts of theories)	Interview questions
(1) Knowledge	Knowledge Knowledge about condition/scientific rationale Schemas + mindset + illness representations Procedural knowledge	Do they know about the guideline? What do they think the guideline says? What do they think the evidence is? Do they know they should be doing x? Do they know why they should be doing x?
(2) Skills (Skills)	Skills Competence/ability/skill assessment Practice/skills development Interpersonal skills Coping strategies	Do they know how to do x? How easy or difficult do they find performing x to the required standard in the required context?
(3) Social/professional role and identity (Self-standards)	Identity Professional identity/boundaries/role Group/social identity Social/group norms Alienation/organisational commitment	What is the purpose of the guidelines? What do they think about the credibility of the source? Do they think guidelines should determine their behaviour? Is doing x compatible or in conflict with professional standards/identity? (prompts: moral/ethical issues, limits to autonomy) Would this be true for all professional groups involved?
(4) Beliefs about capabilities (Self-efficacy)	Self-efficacy Control—of behaviour and material and social environment Perceived competence Self-confidence/professional confidence Empowerment Self-esteem Perceived behavioural control Optimism/pessimism	How difficult or easy is it for them to do x? (prompt re. internal and external capabilities/constraints) What problems have they encountered? What would help them? How confident are they that they can do x despite the difficulties? How capable are they of maintaining x? How well equipped/comfortable do they feel to do x?

Appendix A **Behavioural Determinants.** Theoretical domains or component constructs also labelled behavioural determinants and the corresponding questions for evidence based practice. (Information from Michie et al., 2005). Equivalent determinants from theoretical consensus 1991 are in parentheses (Fishbein et al., 2001).

Domains (Behavioural Determinants)	Constructs (component parts of theories)	Interview questions
(5) Beliefs about consequences (Anticipated outcomes/attitude)	Outcome expectancies Anticipated regret Appraisal/evaluation/review Consequents Attitudes Contingencies Reinforcement/punishment/consequences Incentives/rewards Beliefs Unrealistic optimism Salient events/sensitisation/critical incidents Characteristics of outcome expectancies– physical, social, emotional; Sanctions/rewards, proximal/distal, valued/not valued, probable/improbable, salient/not salient, perceived risk/threat	What do they think will happen if they do x? (prompt re themselves, patients, colleagues and the organisation; positive and negative, short term and long term consequences) What are the costs of x and what are the costs of the consequences of x? What do they think will happen if they do not do x? (prompts) Do benefits of doing x outweigh the costs? How will they feel if they do/don't do x? (prompts) Does the evidence suggest that doing x is a good thing?
(6) Motivation and goals (Intention)	Intention; stability of intention/certainty of intention Goals (autonomous, controlled) Goal target/setting Goal priority Intrinsic motivation Commitment Distal and proximal goals Transtheoretical model and stages of change	How much do they want to do x? How much do they feel they need to do x? Are there other things they want to do or achieve that might interfere with x? Does the guideline conflict with others? Are there incentives to do x?
(7) Memory, attention and decision processes	Memory Attention Attention control Decision making	Is x something they usually do? Will they think to do x? How much attention will they have to pay to do x? Will they remember to do x? How? Might they decide not to do x? Why? (prompt: competing tasks, time constraints)
(8) Environmental context and resources (Environmental constraints)	Resources/material resources (availability and management) Environmental stressors Person 6 environment interaction Knowledge of task environment	To what extent do physical or resource factors facilitate or hinder x? Are there competing tasks and time constraints? Are the necessary resources available to those expected to undertake x?

Appendix A Continued 2 of 4.

Domains (Behavioural Determinants)	Constructs (component parts of theories)	Interview questions
(9) Social influences (Norms)	Social support Social/group norms Organisational development Leadership Team working Group conformity Organisational climate/culture Social pressure Power/hierarchy Professional boundaries/roles Management commitment Supervision Inter-group conflict Champions Social comparisons Identity; group/social identity Organisational commitment/alienation Feedback Conflict—competing demands, conflicting roles Change management Crew resource management Negotiation Social support: personal/professional/organisational, intra/ interpersonal, society/community Social/group norms: subjective, descriptive, injunctive norms Learning and modelling	To what extent do social influences facilitate or hinder x? (prompts: peers, managers, other professional groups, patients, relatives) Will they observe others doing x (i.e. have role models)?
(10) Emotion (Emotion)	Affect Stress Anticipated regret Fear Burn-out Cognitive overload/tiredness Threat Positive/negative affect Anxiety/depression	Does doing x evoke an emotional response? If so, what? To what extent do emotional factors facilitate or hinder x? How does emotion affect x?
(11) Behavioural regulation	Goal/target setting Implementation intention Action planning Self-monitoring Goal priority Generating alternatives Feedback Moderators of intention-behaviour gap Project management Barriers and facilitators	What preparatory steps are needed to do x? (prompt re individual and organisational) Are there procedures or ways of working that encourage x?

Appendix A Continued 3 of 4.

Domains (Behavioural Determinants)	Constructs (component parts of theories)	Interview questions
(12) Nature of the behaviours	Routine/automatic/habit Breaking habit Direct experience/past behaviour Representation of tasks Stages of change model (Transtheoretical model)	What is the proposed behaviour (x)? Who needs to do what differently when, where, how, how often and with whom? How do they know whether the behaviour has happened? What do they currently do? Is this a new behaviour or an existing behaviour that needs to become a habit? Can the context be used to prompt the new behaviour? (prompts: layout, reminders, equipment) How long are changes going to take? Are there systems for maintaining long term change?

Appendix A Continued 4 of 4.

APPENDIX B. Interview A Statement of Informed Consent

Jayné E Franck ▪ jef56@cam.ac.uk ▪ (0)1223 760 767
UNIVERSITY OF CAMBRIDGE

Dr James Moultrie ▪ jm329@cam.ac.uk ▪ (0)1223 764 830
IfM MANAGEMENT TECHNOLOGY POLICY

STATEMENT OF INFORMED CONSENT

About this research

- You have been asked to participate in an interview to find out how and to what extent designers think about and incorporate behaviour change strategies into their designs.
- This research aims to understand how design can be used for behaviour change.
- In this phase of the project, I will be focusing on the on the behaviour of giving money in museum donation boxes.
- I am also interested in what interventions designers would recommend for existing museum donation boxes and their context.
- The results will be used to record and improve design strategies for behaviour change.

The interview process

- I will ask some basic background questions relevant to this study (e.g. your design discipline and experience).
- The interview should be relaxed and informal, consisting of a few open-ended questions to allow the conversation to develop naturally.
- The whole discussion will take about 1-1.5 hours, but you can take breaks at any point if you like.
- I will send you some photos of donation boxes in advance of the interview for you to reference during our conversation.
- The interview will be recorded for me to transcribe.

Confidentiality and data use

- I will use the information you (and other participants) give me as part of my PhD Thesis.
- It may also be used in published papers, reports, and presentations.
- If you prefer to remain anonymous, I will not associate your name with your data.
- Please do not share anything that you do not wish to be published.

If you have any questions, please contact Jayné Franck at the above email address or telephone number.
If you are willing to take part, please sign and initial below and return this consent form. Thank you.

Date	Name in all Capital Letters
	I confirm that I understand the above information. I have had the opportunity to ask any questions, which have been answered to my satisfaction.
	I understand that my participation is willing, and I am free to withdraw at any time, without giving any reason.
	I agree to video and audio recording of the interview.
	I agree to take part in the above study.

DESIGN MANAGEMENT GROUP, INSTITUTE FOR MANUFACTURING, DEPT. OF ENGINEERING, 17 CHARLES BABBAGE ROAD, CAMBRIDGE DB3 0FS

Appendix B Series A Interview Statement of informed Consent.

APPENDIX C. Interview B Statement of Informed Consent

UNIVERSITY OF CAMBRIDGE
Department of Engineering

STATEMENT OF INFORMED CONSENT

_____
Participant Number

Purpose

You are invited to participate in an interview which has the aim of better understanding how architects use design to elicit desirable behaviours. This interview will contribute to the my PhD.

The overall aim of my research is to improve design for behaviour change.

Study Procedure

Firstly, I will explain the purpose of the interview, the procedure, your confidentially and rights to withdraw, data usage, and answer any questions you may have. If you are happy to continue with the interview I will need you to sign to give consent.

I will take a digital recording of all audio. The interview will consist of a few open-ended questions to allow the conversation to develop naturally. This should be fairly relaxed and informal and the whole discussion is scheduled for 90 minutes, and you can take a break at any point if you need to.

I will begin by asking some background questions about your design discipline, education and experience. Then I will ask about characteristics of your projects that you designed to facilitate specific behaviours. You will also be invited to explore possible strategies for a hypothetical design project. I will share recently developed design tools and ask your opinions on them.

When the interview is complete I will stop the recording and debrief you, asking if you have any further questions. I can give you an information sheet with some further information and contact details if needed.

Confidentiality

I will use the information you give me (along with the information from other participants) as part of my PhD thesis. It may also be included in academic papers. To ensure confidentiality, I will not associate your name with your data, but please do not share any information that you do not want published.

Appendix C. Series B Interview Informed Consent.

Freedom to Withdraw

You may stop at any time and you do not have to give a reason. You can also refuse to answer particular questions without withdrawing from the whole study.

Data Usage

All personal data will be held and processed in strict confidence. Data collected may be used in published books, papers, reports, presentations and my PhD Thesis. All data will be made anonymous.

Questions

Do you have any questions or concerns at this point? If you are still willing to take part, please may I have your signed consent:

Signed Consent

1. I confirm that I understand the information given above. I have had the opportunity to ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason without my legal rights being affected. ☐
3. I understand that data collected in the interview will be stored securely. ☐
4. I agree to a digital recording of all audio. ☐
5. I agree to take part in the above study. ☐

_____
Date

_____
Signature of Participant

_____
Please Print Name of Participant

_____
Signature of Researcher
Jayné E Franck

Page 2 of 2

Appendix C Continued 2 of 2.

APPENDIX D. Series A Interview Questions

A SERIES INTERVIEW QUESTIONS:

The purpose of this interview is to find out the underlying principles behind spatial designers' solutions when designing to influence behaviour.

What would you do to illicit more donations?		
prompts	1	**Why do you think that would do so?**
	2	**How would that work?**

there are multiple behavioural models. one in particular, the Fogg Behaviour Model, breaks behaviour into 3 parts: ability, motivation and a trigger to act.

What would you do to increase people's *ability* to donate?		
prompts	1	**Why do you think that would do so?**
	2	**How would that work?**

What would you do to increase people's *motivation* to donate?		
prompts	1	**Why do you think that would do so?**
	2	**How would that work?**

How would you *trigger* or initiate the act of donating?		
prompts	1	**Why do you think that would do so?**
	2	**How would that work?**

Appendix D Series A Interview Questions. The format for the first set of interviews.

APPENDIX E. Series B Interview Questions

B SERIES INTERVIEW QUESTIONS

RESEARCH OBJECTIVES:

1) **Gain a better understanding of what architects know about human behaviour in relation to design**
2) **Learn what designers assume will influence human behaviour**
3) **Determine on what information these assumptions are based**

Interview Script 6 phases (90 minutes):

1) Opening 10 mins: Introduction
2) Body one 20 mins: Existing project
3) Body two 25 mins: Hypothetical design brief
4) Body three 20 mins: Diagram Prompts
5) Body four 10 mins Direct questions
6) Closing 5 mins: Sum up

1. THE OPENING PHASE (10 minutes)– establish my credentials and methods to be used [recording, use of data to develop practical understanding of design of objects and spaces in relation to human behaviour].
    a. I am excited to have the opportunity to talk with you about design. Before we move on I'd like to give you information about my research and obtain some background information.
    b. I am studying for a PhD in Engineering at the University of Cambridge in the Design Management Group. I am interested in helping people change their behaviour to improve quality of life. I believe that design has something to contribute. The aim of this study is to better understand how spatial designers think about human behaviour in relation to design.
    c. May I ask, why did you choose architecture?
    d. What is your passion? What do you enjoy most about practice?

2. The main body of questions (20 minutes): PARTICIPANT'S PROJECTS
    a. I've been looking forward to understanding your project. May I ask how you chose it for today's discussion?

Appendix E **B Series Interview Questions.** The script for the second set of interviews.

b. What aspect of this design do you think has been the most influential on people?

i. How so? Has it caused any evident changes in behavior?

ii. Was the effect intentional?

NO- how did you discover the influence on people?

What do you think is the cause?

Do you think it would be transferrable to other projects? OR

How have you used this new knowledge?

YES What did you do to cause the effect?

From where did you get the idea? What made you decide to use that strategy?

Did it work?

NO What do you think was the reason?

YES Do you think there were other factors that may have contributed in addition to this strategy?

NO What measures do you take to rule out other influences?

YES….Can you name a few?

What part do they play in affecting the outcome?

3. The main body of questions (20 minutes): HYPOTHETICAL DESIGN EXERCISE

a. Did you have time for more than a cursory glance at the museum plan?

b. In this hypothetical situation the client is concerned with a lack of donations from visitors, and suspects it's related to the behaviour of patrons. These are the existing floor plan and photos.

iii. What would you do to increase box donations?

1. What would you do to accomplish that?
2. What about doing x do you think would increase spontaneous patron donations?

iv. What outcome would you expect?

1. Why do you think that would happen?
2. What about the design would cause that?

Appendix E Continued 2 of 4.

a. IF TIME PERMITS: This was a given situation, if you didn't have to work within a pre-existing structure would you do things differently?

4. The main body of questions (20 minutes): CONCEPT DIAGRAM
    a. This diagram is adapted from a researcher's study of how users experience design for behaviour change. Her name is Tromp, and she developed these two axes: salience and force. How aware is the user of the designer's intention for behaviour? and How strongly does the user feel like doing it? These words with definitions are strategies designers can use, and the fun bit is that you get to decide where they might fit on the diagram.
    b. Thinking back on the museum donations, do you think the strategies we discussed fit into any of these areas?
    c. Would anything in this group cause you to rethink any of your design strategies?
    d. What is your reaction to this list?
        i. Which do you think would be the most and least effective at changing human behavior?
    e. Is there anything that you might add?

5. The main body of questions (10 minutes): DIRECT QUESTIONS
    a. How much influence do you think design has on human behaviour?
    b. Do you believe that most architects take human behaviour into account in their designs?

YES What kinds of human behaviour do you address in your designs?

If a client asks for a behavioural effect, what happens in your mind to know what they mean or actually want?

    c. How do you think an architect can take into account differing human behaviour tendencies?
    d. How do you come to your conclusions about human behaviour?
        i. From where do you derive your perceptions of human behaviour tendencies?
        ii. Would you say that you are more influenced by Academia or Experience in this area?
    e. Which schools of thought would you say appear most often in your designs?
    f. How can design be used to intentionally influence people's behaviour?

Appendix E Continued 3 of 4.

g. What does it mean to you to design to influence/support behaviour or to change behaviour?

h. How would you define designing to change behaviour?

i. What would you say might be the biggest challenge in using design to change people's behaviour?

6. THE CLOSING PHASE (5 minutes)

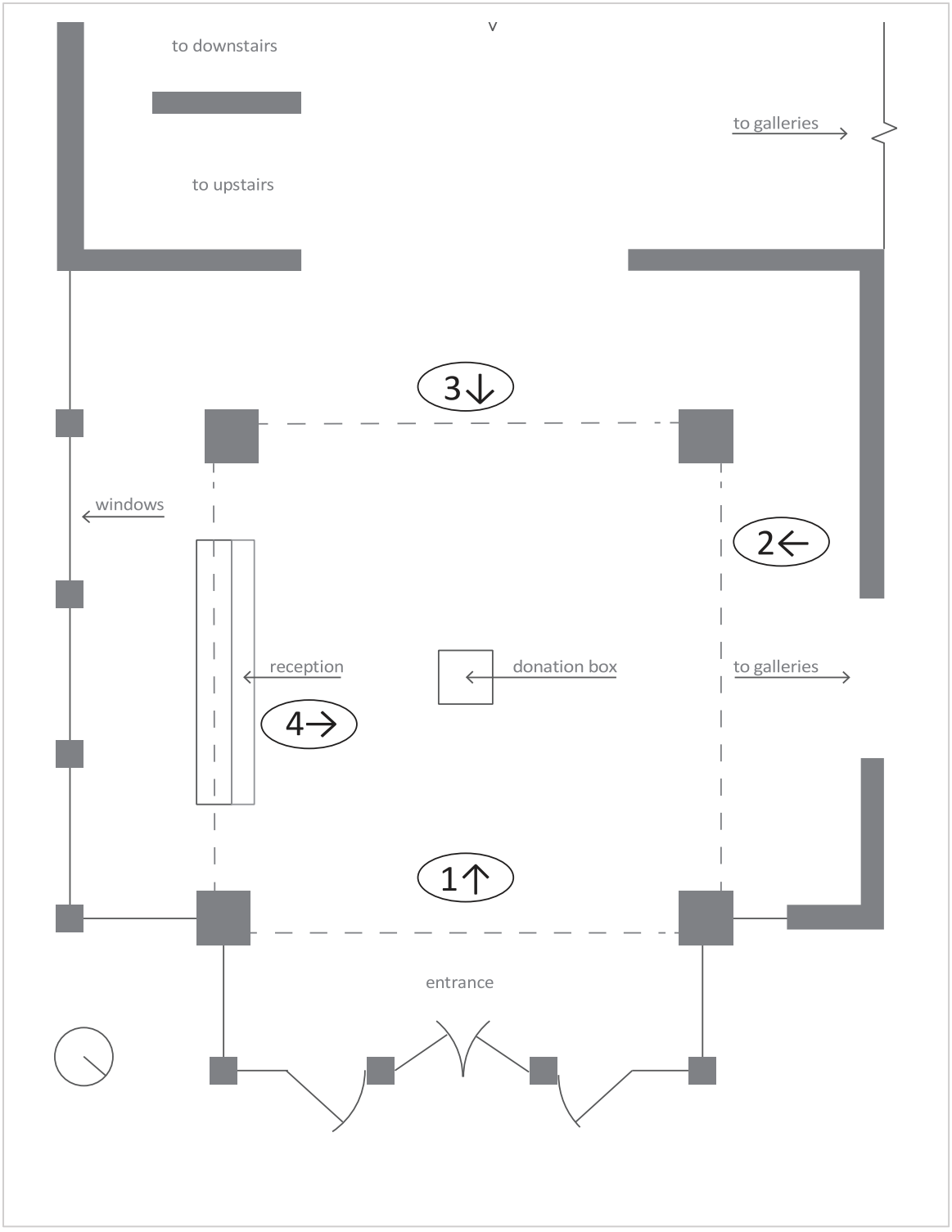
a. Thank you for sharing your insights with me. This has been extremely helpful.

b. Can you give me names of other architects whom I might interview that you think would like to discuss this topic?

c. May I have your mailing address for sending a package?

Appendix E Continued 4 of 4.

APPENDIX F. Hypothetical Design Floor Plan



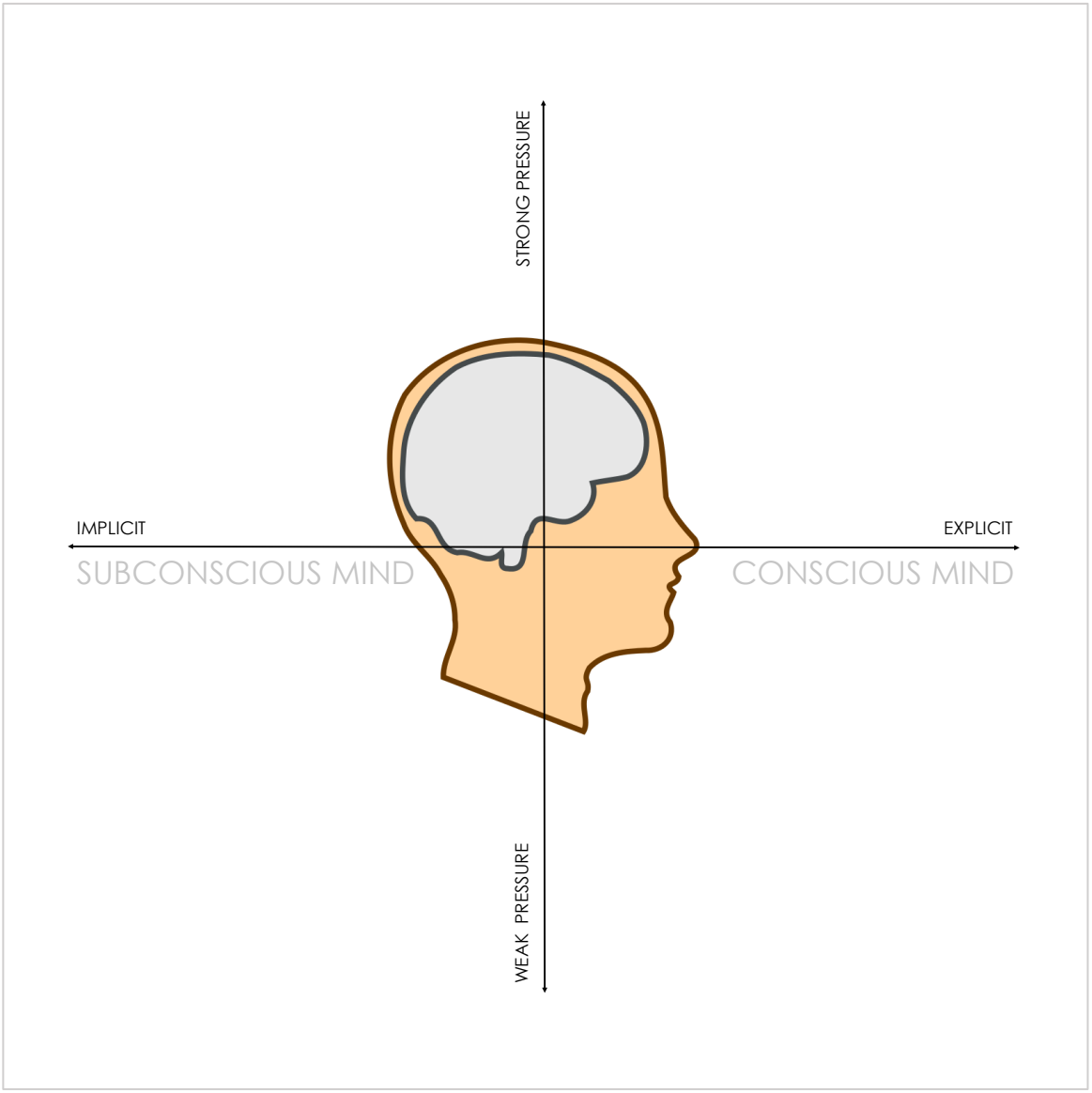
Appendix F **Hypothetical Design Floor Plan.** This is the floor plan given to participants for both Series A and phase 3 of B Interviews. (For corresponding photographs see Appendix F).

APPENDIX G. Hypothetical Design Photographs

Appendix G **Hypothetical Design Photographs.** Top: photo 1. Bottom photo 2. (For Corresponding floor plan see Appendix E).

Appendix G Continued 2 of 2. Bottom photo 3. Top photo 4. (For corresponding floor plan see Appendix E).

APPENDIX H. Concept Diagram



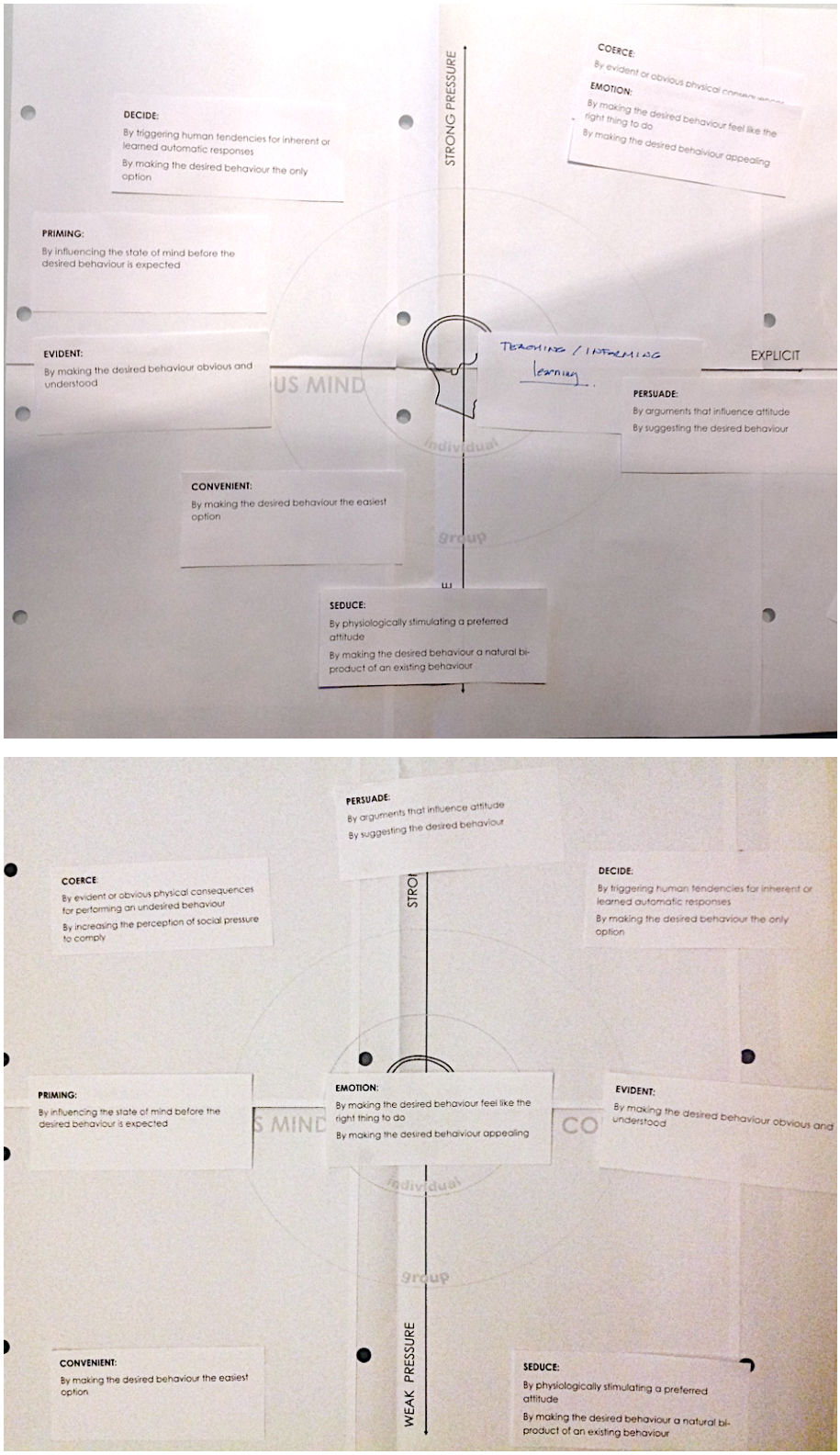
Appendix H **Concept Diagram.** Quadrant diagram used in phase 4 of series B interviews. Participants placed design concepts onto this diagram to indicate how they thought a user would experience each type of design concept. (Adapted from Tromp, Hekkert, & Verbeek, 2011; Design concept cards can be seen in *Appendix* I, and participant's completed diagrams in *Appendix* J).

APPENDIX I. Design Concept Cards

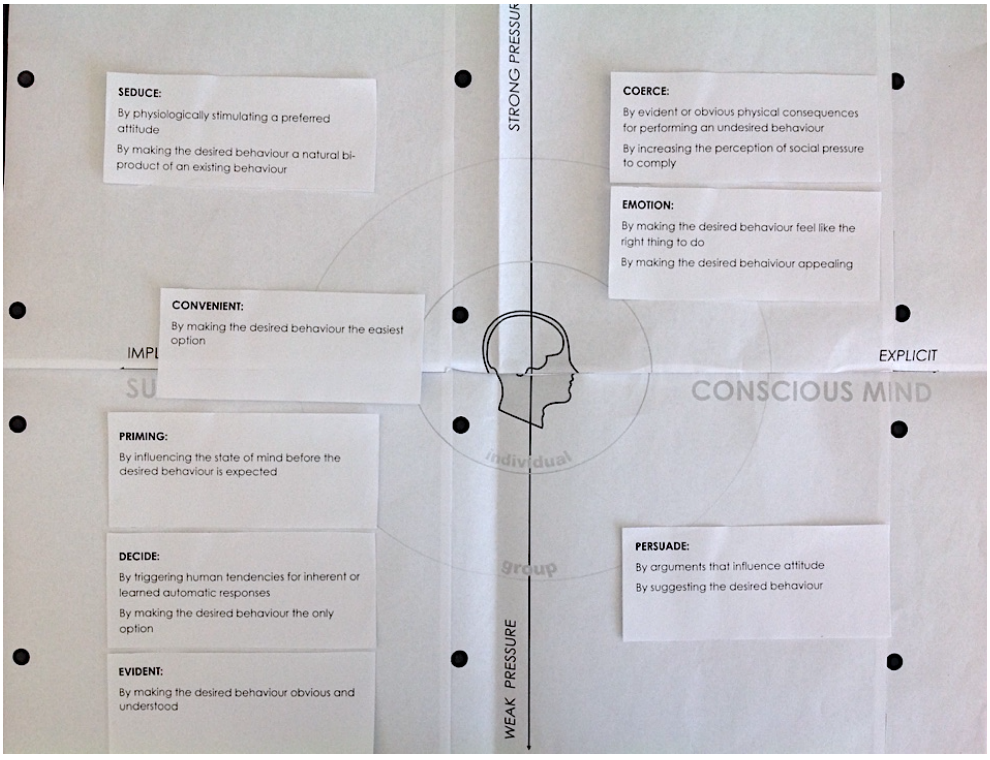
COERCE: By evident or obvious physical consequences for performing an undesired behaviour By increasing the perception of social pressure to comply	**CONVENIENT:** By making the intended behaviour the easiest option
SEDUCE: By physiologically stimulating a preferred attitude By making the intended behaviour a natural biproduct of an existing behaviour	**PRIMING:** By influencing the state of mind before the intended behaviour is expected
PERSUADE: By arguments that influence attitude By suggesting the intended behaviour	**EMOTION:** By making the intended behaviour feel like the right thing to do By making the intended behaviour appealing
DECIDE: By triggering human tendencies to inherent or learned automatic responses By making the intended behaviour the only option	**EVIDENT:** By making the intended behaviour obvious and understood

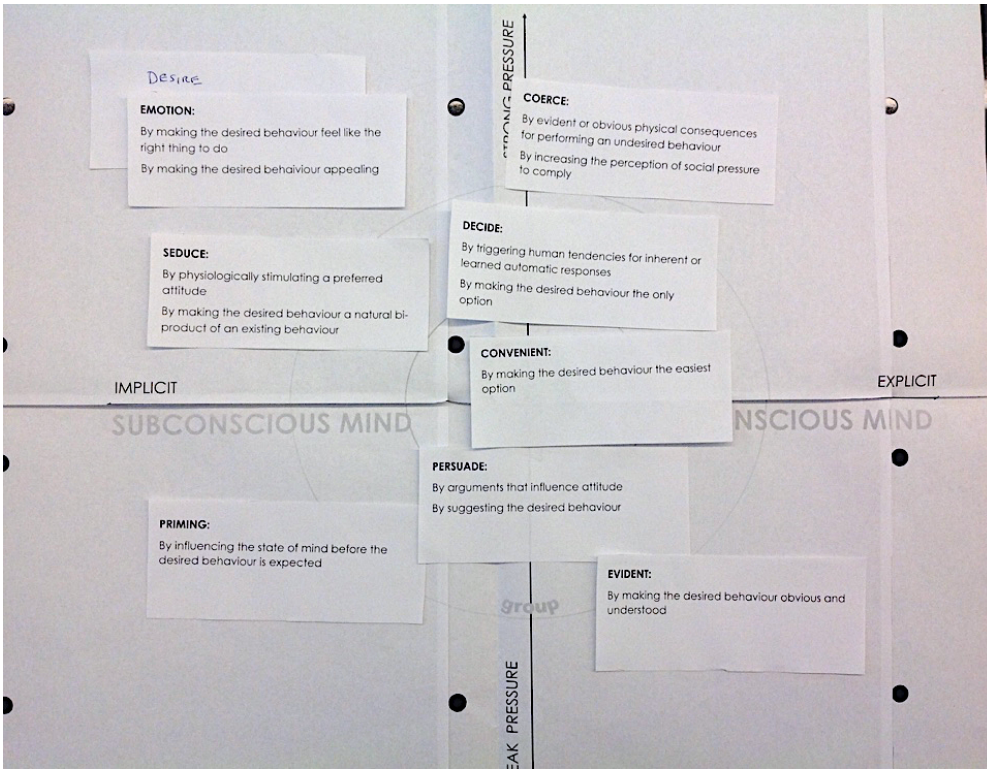
Appendix I **Behaviour Change Concept Cards.** Concept cards with their definitions that were presented to the participants of series B interviews to place on the concept diagram to represent what they think users experience from that type of design intention. The four on the left were introduced first with the questions "If you were to have a look at these concepts and their definitions, where do you think they might lie on this diagram?" (A copy of the concept diagram is shown in *Appendix* H, and photographs of participants' completed diagrams in *Appendix* J; Adapted from Tromp, Hekkert, & Verbeek, 2011). Then the participants were given the four cards on the right to place. (From findings of series A interviews).

APPENDIX J. Photographs of Participant's Concept Diagrams

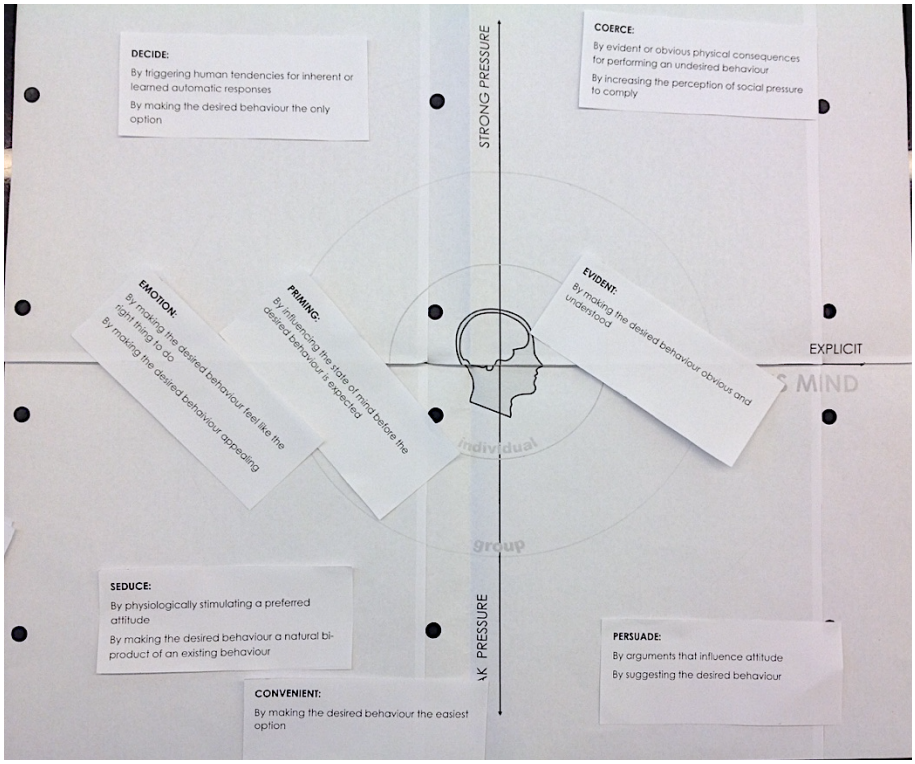


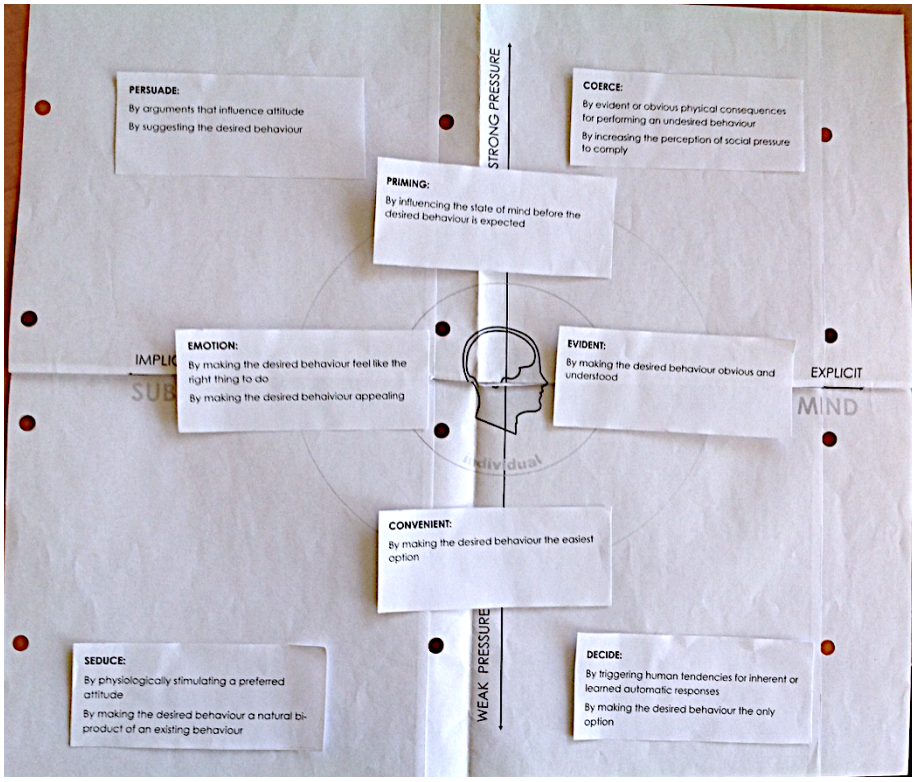
Appendix J 1 of 4 **Photographs of Completed Concept Diagrams.** Top B1. Bottom B2.



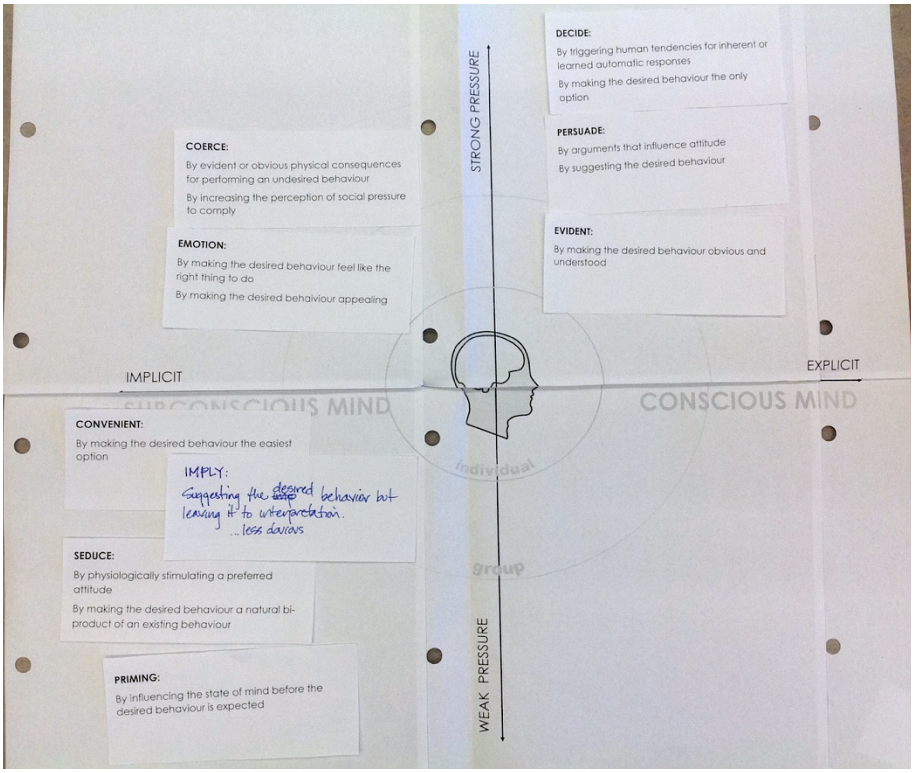


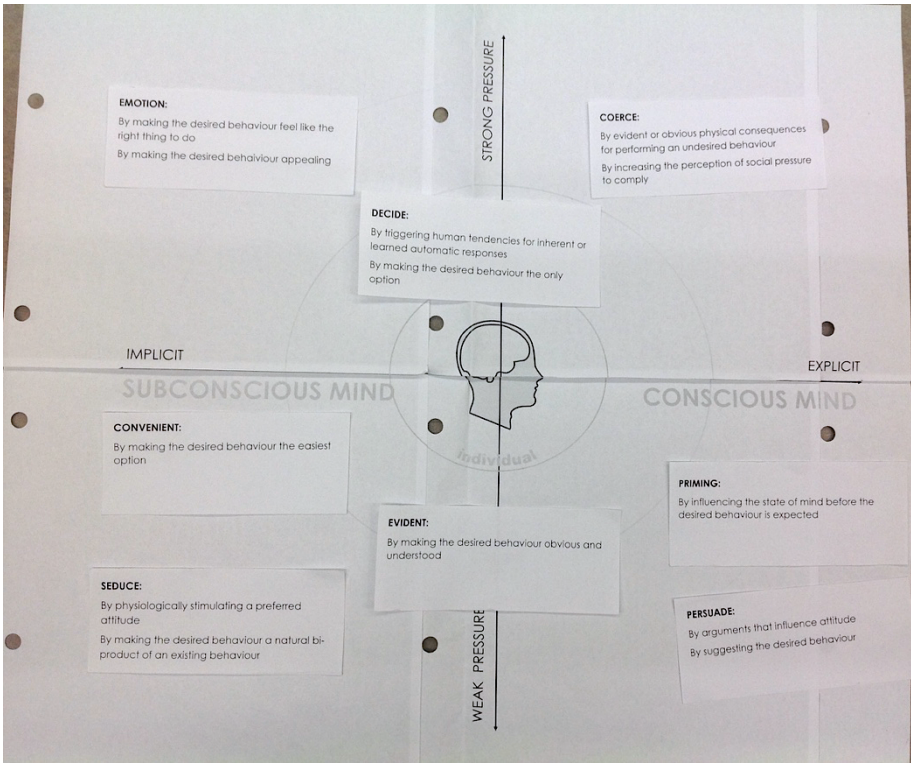
Appendix J Continued 2 of 4. Top B3. Bottom B4.





Appendix J Continued 3 of 4. Top B5. Bottom B6.





Appendix J Continued 4 of 4. Top B7. Bottom B8.

APPENDIX K. Code Book: Changing Behaviour in a Design Exercise

Codebook 1 of 3	
INTERVIEW SECTION: CHANGING BEHAVIOUR IN A DESIGN EXERCISE	
Codes	Comments
participant strategy*	interventions participant suggests to increase donations
THEME: Programming	
"determining the need behind the need"	participant indicates a process to identify the full extent of the issue at hand before finding possible solves for it do not rely on client's assessment of their needs
THEME: Address Lobby Space	
open window blinds	participant indicates using natural sunlight (not related to views)
move reception	participant indicates relocating reception desk
evident wayfinding	participant indicates making it easy for visitors to make their way to destinations
add generosity moving music or scent	participant indicates evoking a feeling of generosity in visitors using senses
add plants or exterior views to nature	participant indicates incorporating natural elements
donor recognition: bricks or plaques	participant indicates installing public display to thank donors
exhibit in lobby	participant indicates installing a preview of the exhibits in a public – free access area
use colour to brand the space	participant indicates colour can represent distinct product or company
seating near windows	make waiting or meeting up pleasant space
remove clutter	clutter detracts from clarity
raise feel of ceiling height	room seems oppressive
THEME: Donation Box Placement	
move box to exit	people appreciative on their way out
box not in middle of room	"island in a stream"
test box near entrance	participant suggests investigating efficacy of placing donation box at museum entrance
box visible	participant suggests ensuring donation box is visible
box near reception	participant suggests placing donation box near reception counter
move box near galleries	participant suggests this
move box near gift/café	participant suggests this
multiple boxes	participant suggests having more than one donation box in the museum

Appendix K 1 of 2 **Codes that Correspond to Chapter 5.** Codes from transcripts of both series A interviews and phase 3 of series B interviews. These include both deductive and inductive codes.

ensure enough space to perform donation	participant suggests this (space around box)
box on right	"people look right"
constrain flow past box	participant suggests forcing people to slow down when walking past the box
place box within circulation patterns	participant suggests this
install barrier at box (e.g.: a turnstile)	participant suggests this
do not place box at entrance	participant warns against placing box at entrance
THEME: Inform Visitors	provide information
museum identity	participant suggests making the museum distinct
how museum is supported	participant suggests visitors may not realise donations needed for support
psychology of donation request wording	participant suggests investigating psychology for how to properly word the donation request
upcoming exhibits	participant suggests signs of upcoming exhibits to stimulate interest
sign "where money goes"	participant suggests informing visitors how their donation will be spent
thank donors	participant suggests verbal and signs thanking donors
"people like you"	participant suggests signage targeting visitor demographic
current exhibits	participant suggests signs listing current exhibits
THEME: Donation Box Redesign	changing the box
staff request donation	participant suggests training staff to directly verbalise request for donation
attract attention: shape of box/add exhibit	participant suggests making the box stand out with a unique shape or incorporate box design into exhibit
entertainment	participant suggests making the act of donation entertaining "play behaviour"
exchange	"get something in return" donation for museum map or exhibit pictures etc
cashless electronic donation or credit card add-on	"people don't always carry cash"
"accessible money slots"	not difficult to perform the task
anonymous	make donating act less public
elevate box	suggest importance of donating
transparent	show other donations in the box
opaque	hide donations from visitor view
offer choice of what to fund	more than one box, proceeds go to different causes
*deductive code(s)	

Appendix K Continued 2 of 2.

APPENDIX L. Code Book: Diagramming Concepts of User' Experience

Codebook 2 of 3	
INTERVIEW SECTION: DIAGRAMMING CONCEPTS OF USER' EXPERIENCE	
Codes	Details
THEME: Concepts	indicates a participant's interpretation of the concept as defined on the diagram concept cards
coerce*	the specific word is used by the participant where the context indicates that they are specifying use within the concept card definitions
seduce*	
persuade*	
decide*	
convenient*	
priming*	
emotion*	
evident*	
THEME: Pressure Felt	the strength of pressure to comply with the design intent that the participant suggests a user/occupant will likely experience (not the probability that the user/occupant will comply)
strong pressure*	participant indicates that the user/occupant would experience strong pressure to comply with the behaviour the design intends
weak pressure*	participant indicates that the user/occupant would experience weak pressure to comply with the behaviour the design intends
neutral pressure	same as above except neither strong nor weak
THEME: Source of Pressure	external or internal to the user/occupant
environmental (equate with external)	participant implies that pressure experienced by the user/occupant comes from physical conditions external to that user/occupant
social (equate with internal)	participant implies that pressure experienced by the user/occupant comes from unspoken social norms
THEME: Awareness Level	how much a user/occupant would likely notice that the design has intention to influence their behaviour
explicit awareness*	participant indicates that the user/occupant is conscious of the design intent
implicit awareness*	participant indicates that the user/occupant does not consciously notice the design intent
"neutral" awareness	user's awareness depends upon alignment with design intent
THEME: Other code(s)	codes that do not fit into the above themes
value	a user/occupant's judgement of worth to them in relation to the design intent
participant observations	comments perceived by researcher as significant even though they do not fit into other codes includes any concepts the participant would add to the diagram cards (desire, imply, inform)
*deductive code(s)	

Appendix L **Codes that Correspond to Chapter 6.** Codes from transcripts of phase 4 of series B interviews. These include both deductive and inductive codes.

APPENDIX M. Code Book: Sourcing Perceptions in Participant Projects

Codebook 3 of 3	
INTERVIEW SECTION: SOURCING PERCEPTIONS IN PARTICIPANT PROJECTS	
Codes	Details
participant project/example*	participant relates an example of design that influences behaviour
THEME: Target Behaviour	behaviour the design intends to or does influence
encourage handwashing	lavatory sink in public view; social expectations
take advantage of social opportunities	skip/stop elevator forces occupants to take stairs through a lounge area
foster project-based learning and instil values	flexible, open plan classrooms inspirational words as wall art
create community	dorm rooms have private bathrooms located across the hall forcing occupants out of their room for chance encounters each block of rooms has a shared community lounge
facilitate lingering	campus courtyard provides infrastructure – seating, shade and outlets – to support study and discussion
prevent counterproductive value-engineering	by making the wanted infrastructure inherent in the design where it cannot be easily changed
THEME: Perception Determinants	factors found in the participants' projects that inform their perceptions on changing human behaviour
precedent study/observation	the design exists in other buildings with similar function
designer assumption	it seems intuitive
personal experience	how the designer imagines s/he would behave
design standard	codes or traditions of architectural practice
design investigation	purposeful reading, experiments or interviews
THEME: Mitigating Factors	factors found in the participants' projects that influence the success of design for behaviour change
context dependency	context influences efficacy of design intention
necessary infrastructure	limitations imposed by fixed conditions
unexpected behaviour	human factors
value engineering	design element cut at the discretion of the project funder
*deductive code(s)	

Appendix M **Codes that Correspond to Chapter 7.** Codes from transcripts of phase 2 of series B interviews. These include both deductive and inductive codes.