Elements of Surprise: Industrial Designers' Strategies for Eliciting Surprise Through Interaction

by

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Abstract

Fascinating designs can break our expectations and elicit a sense of surprise that first invokes our interest, increases the emotional intensity of an experience and may affect how we interact with our surroundings. Design researchers have identified the importance of surprise. Valuable studies have been carried out on the role of surprise as a design strategy (Ludden, Schifferstein, & Hekkert, 2008), on how appearance elicits emotions including surprise (Desmet, 2002; Desmet, Porcelijn, & van Dijk, 2005) and on the role of sensory incongruity in eliciting surprise (Ludden, 2008). Some characteristics of eliciting surprise can be beneficial to a product's success. However, little research has been done into the strategies designers can use when attempting to elicit surprise through interaction, or how the experience of surprise affects how people interact with products.

My research addresses two main questions. The first question is: how can designers attempt to elicit surprise through interaction? Through a set of 30 interviews worldwide, participatory research through design at design studios and collaboration with design students, I have developed a set of strategies that address this question. The strategies are the result of an analysis following a Postmodern Grounded Theory methodology, namely Situational Analysis (Clarke, 2003, 2005). My research suggests that design organisations address surprise in interaction according to their main concerns. While large design organisations reported little interest in eliciting surprise, design studios with specific characteristics constantly attempted to elicit surprise through their products. I suggest 22 strategies that designers can use when attempting to elicit surprise. The strategies are presented as cards for easy access by practicing designers and design students alike.

The second question is, once surprise is elicited through interaction, how does the experience of surprise affect the way people interact with an object? I addressed this question through designing a number of products, testing them with people and assessing what different interactions resulted. My research suggests that through eliciting surprise, designers can support what people do, indicate unambiguously what ought to be done, subtly suggest what to do or attempt to persuade. The role of surprise varies for each of these intentions. Finally, my research suggests that surprise can be seen as a threat-detecting mechanism when trying to discourage people to engage in an activity; surprise can also be addressed as a sense-making process when attempting to persuade.

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Flow Diagram of Epistemological and Methodological Decisions

Section 1

Introduction

Chapter 1.1

Introduction

Motivation

My first job as a junior industrial designer was at Sismo Design in Paris (1999-2000). My university training in Mexico had involved a pragmatic approach to design. At Sismo, I was faced with a different approach that intended to find beauty, poetry, metaphors and surprise in our daily activities, and reflect them through the design of objects. For instance, we designed a set of coffee cups named “Puzzle” (figure 1.1.1) that reflect the “let’s get together for coffee” ritual in many western societies. The handles of the cups join together like puzzle pieces in order to reflect the social interaction of two people getting together. Since then, I have been interested in objects that not only offer functionality, but that also intend to surprise people by breaking their expectations of how objects ought to be.

Figure 1.1.1. “Puzzle” coffee cups by Sismo Design. Image courtesy of Sismo Design.

Situating the Research: When Industrial Designers Attempt to Surprise

Industrial designers often refer to their “intuition” as the paramount skill that gives them the ability to dream up surprising objects. Intuition seems to be a “magical” talent that is indescribable by the designers and unreachable by non-experienced designers. However, I believe that such “intuition” relies largely on an informed experience that builds over time and that there are strategies designers follow in conscious or subconscious ways when they attempt to surprise. I believe that such strategies can be described and even taught. For instance, we expressly knew at Sismo Design that connecting two unrelated objects together was often a starting point for designing. In the case of the coffee cups above, we connected coffee cups with puzzles. While some of the skills and aesthetic sensitivity of the designers may be hard to describe and do play a paramount role in the result of the product, some of the strategies that designers follow can be described and communicated.

My research investigates how industrial designers attempt to surprise through the interaction that objects offer. The coffee cup example illustrates a design that relies on its appearance and its interaction to surprise. The handles’ *appearance* makes them look like they could connect through the reference to a puzzle. They also invite people to engage in the actual physical *interaction* of connecting them together by sitting next to each other at the right distance on a Siamese saucer. The separation between appearance and interaction does not mean this research ignores appearance. The distinction is made to clarify that the research does not focus only on appearance as research on design and emotion (Desmet, 2002; Desmet, Porcelijn, & van Dijk, 2005) or design and surprise (Ludden, 2008; Ludden, Schifferstein, & Hekkert, 2008) have concentrated on in the past. My research sees appearance as part of interaction. While it may be possible to focus only on the appearance of products, it is much harder to investigate interaction without including appearance. In the example of the coffee cup, it would be difficult to offer the same interaction, to connect, without partly relying on sending the right initial message through the appearance of the object: it looks like it can be connected. Appearance is studied in this research when it is essential to the interaction that objects offer.

This dissertation investigates the relationship between surprise and interaction in industrial design in two ways. Firstly, it addresses question 1: *How can designers attempt to elicit surprise through the interaction their designs offer?* The research suggests a set of strategies constructed from interviews and participatory research through design approaches. Designers can use the strategies when attempting to surprise. Figure 1.1.2 shows the strategies developed in this research (middle column), the chapter that they relate to within this dissertation (left column) and a design example that relates to each strategy.

Industrial designers often rely on their informed experience to come up with solutions. Nevertheless, there are a lack of studies documenting what the approaches of practicing designers are and what strategies they may follow. In particular, little has been reported about when and how industrial designers use their informed experience for attempting to surprise people through the interactions their designs offer. While the approaches and strategies that industrial designers follow may be evident for practising designers, the lack of research on strategies for eliciting surprise can be what Zerubavel calls the “thousand pound gorillas sitting around that nobody has bothered to mention” (in Clarke, 2003, p. 561). Even after carrying out interviews with experienced designers who use strategies to elicit surprise on a daily basis, there were strategies that designers were not able to verbalise. It was necessary to carry out participatory research through design in order to dig deeper into the design process and unearth further strategies to elicit surprise. My research exposes those strategies that “are present but unarticulated” (Clarke, 2003, p. 561) by the designers.

The research suggests that when industrial designers elicit surprise, sometimes they do so when attempting to *affect the interaction* between a person and an object. In this scenario, designers may affect behaviour with the intention of suggesting interactions in subtle ways or even persuading people to perform specific activities. For instance, the “Puzzle” cup intends to suggest an interaction in a subtle way: people may choose to join the cups together or not; the interaction is not forced upon people. The intention to affect interaction can involve a much clearer objective, in which the designer’s goal is to encourage people to perform an activity. For instance, Fuseproject designed the Y water bottle (figure 1.1.2) with the very specific intention of encouraging children to drink its contents, as the drink includes ingredients for healthy bone growth. The design includes a surprising element as the bottles can be used for play, once empty, through building structures. The observation that surprise can be used to affect interaction led to

the second way in which the relationship between surprise and interaction is investigated. It is addressed through question 2: *How does the experience of surprise affect the way people interact with an object?* Section B: How surprising designs affect what people do, in figure 1.1.3 (pages 14-15) , illustrates this area of the research.

Figure 1.1.2. Y water bottle by Fuseproject. Image courtesy of Fuseproject.

Background

Surprise

Surprise has been described as an emotional response (Ekman, 1992, p. 170) to unexpected (Plutchik, 1991, pp. 105-106) or sudden stimuli (Frijda, 1986, p. 18). It differs from the startle reflex and is expressed behaviourally through wide eyes, short interruption of breathing and loss of muscle tone (Frijda, 1986, p. 18). While some authors do not consider surprise an emotion (for instance Ortony, Clore, & Collins, 1988) because it has no pleasure value on its own, many authors do consider it an emotion due to its arousal and valence (pleasant or unpleasant) values (Frijda, 1986; Plutchik, 1991; Schutzwohl & Borgstedt, 2005; Silvia, 2009).

Designed objects can be the stimuli that elicit surprise and some characteristics of a surprising experience are valuable to study in industrial design. The unexpected

characteristic of a stimulus means that it holds a novelty value. Novel, unexpected and complex stimuli that elicit surprise can also elicit high levels of arousal, curiosity, exploratory behaviour, interest and fascination (Frijda, 1986, p. 345; Plutchik, 1991, p. 102). Surprise has also been described as a threat-detecting stimulus (Schutzwohl & Borgstedt, 2005) and a sense-making process (Pezzo, 2003). Some of these characteristics make surprise a potential element for an aesthetic experience. For instance, Plutchik suggests that admiration is a combination of surprise, pleasure and a sense of approval (Plutchik, 1991, p. 102). The potential for eliciting surprise through incongruous characteristics of objects has also been suggested as an aesthetic experience (Hekkert, 2006, p. 168). Curiosity, interest, fascination, arousal and its impact on behaviour or interaction are characteristics that make surprise an important emotion to study in industrial design. Such characteristics can make objects interesting and fascinating at the purchase stage as well as fascinating to use. It will be discussed how such characteristics could be used even for encouraging people to engage in behaviour they desire but find difficult to perform (chapter 3.1).

Surprise and interaction as emotion and behaviour

The interaction a person performs with a product represents a stimulus that can elicit emotion. Such interaction can elicit an aesthetic experience and research into the beauty of interaction is increasing (see for instance Overbeeke, Djajadiningrat, Hummels, & Wensveen, 2000; Overbeeke & Wensveen, 2004; Wensveen, 2005). Some of the research on industrial design and surprise has focused on appearance (for instance Desmet, 2002; Ludden, 2008; Ludden et al., 2008). Whereas the research into industrial design, interaction and emotion has addressed emotions in a general manner (Wensveen, 2005; Wensveen, Overbeeke, & Djajadiningrat, 2006), has addressed emotion as part of an aesthetic experience in interaction with intelligent products (Ross, 2008; Ross & Wensveen, 2010) or has focused on joy, satisfaction and pleasure (Green & B. Jordan, 2002; P. W. Jordan, 1999; Popovic, 2002). Even in psychology, the focus of research on only surprise and beyond the traditionally researched emotion of pleasure in aesthetics is reasonably recent (Silvia, 2009). Some interesting studies into surprise and interaction in industrial design have suggested approaches from other disciplines, such as storytelling and the use of opposites (Grimaldi, 2006). Other studies have

offered frameworks for product experience that claim to apply “to all affective responses that can be experienced in human-product interaction” (Desmet, 2007, p. 57) and that include aesthetic experience, experience of meaning and emotional experience. While surprise is not explicitly mentioned in such a framework, it is referred to as “astonishment” (Desmet, 2007, p. 58). Unfortunately, the term “astonishment” misses some of the subtle surprises that designs can offer. It will be discussed how the intention of the designer can include subtle ways to surprise (chapter 2.2).

An investigation of the relationship between surprise and interaction needs to address the relationship between emotion and behaviour, as surprise is an emotion and interaction is the behaviour a person performs with an object. It has been suggested that “emotions exert a powerful influence on behaviour” (Lowenstein, Weber, Hsee, & Welch, 2001, p. 272), that emotions are dispositions to act in specific ways (Booth & Pennebaker, 2000, p. 560; Solomon, 1976, p. 2000), and that emotions are processes that involve action control (Frijda, 1986, p. 63). A dominant description of emotion and behaviour in cognitive psychology is the appraisal theory.

The appraisal and feedback mechanism theories

The appraisal theory suggests that if a stimulus is appraised to satisfy the concerns of a person, then the person is likely to experience a pleasant emotion and therefore an approach type of behaviour. If the stimulus is appraised to not satisfy people’s concerns, then unpleasant emotions and a withdrawal kind of behaviour can be expected (see for instance Demir, Desmet, & Hekkert, 2009; Ortony et al., 1988; Roseman, 1996; Smith & Kirby, 2009; Smith & R. S. Lazarus, 1990; Smith & Richard S. Lazarus, 2001). While an interpretation of the appraisal theory can be that emotion can have a direct effect on behaviour, research suggests a view of emotion not as a causal system, but as a feedback mechanism (Baumeister, Vohs, DeWall, & Zhang, 2007).

The feedback mechanism theory suggests that our decision-making process steers our behaviour towards those activities to which we relate desired emotional states, rather than the emotions steering our behaviour (Baumeister et al., 2007). For instance, if we experience guilt after betraying a friend, the feedback mechanism will elicit a tinge of

guilt the next time we face a similar situation, therefore guiding our behaviour towards a less likely repetition of the same actions.

The complexity of the emotion process means that no single theory can reduce it to a single explanation. The appraisal theory offers an initial explanation of the process of emotion. Nevertheless, it relies on a reductionist cause and effect approach that cannot explain all emotional experiences. For instance, not all emotions affect behaviour. One can watch a movie for two hours without moving from their seat. Also, when emotion affects behaviour, the results may be negative. For instance, one may risk their life when feeling angry. This is an untenable view from an evolutionary perspective (Baumeister et al., 2007, pp. 179-180).

Both the appraisal and the feedback mechanism theory of emotions are addressed in this research. The appraisal theory holds value in design as it explains the process by which emotions occur in a way that can be used by designers (Desmet, 2002; Ludden, 2008, pp. 19-20). In particular, it offers a connection between the concerns and expectations of people, the appraisal of novelty and the emotion of surprise (Desmet, 2002, p. 117). The emotion as feedback mechanism theory implies that there is a mutual affect between emotion and behaviour. This is particularly relevant for this research as it is investigated how surprise and interaction affect each other mutually. This is done through the two main questions of the research: 1) How can industrial designers attempt to elicit surprise through interaction? And 2) How can industrial designers affect interaction through eliciting surprise? Both questions are addressed with the idea that breaking expectations is the way to elicit surprise.

How Were the Research Questions Approached?

The research follows a constructionist approach (Crotty, 2003, pp. 42-65) through a grounded theory methodology that acknowledges the postmodern turn, namely situational analysis (Clarke, 2003, 2005). Given that part of the research includes designs in which I participated brings up the question as to what extent the researcher (third person) can also be the designer of the studied objects (first person). Chapter 1.2 below addresses the methodology and epistemological implications of such an approach and suggests that as long as my designing involves input from the world through assessment of designs with people, collaboration with other designers, interviews and expert reviews; as well as analysing the findings through a situational analysis approach, it abandons a purely subjective approach and moves into a constructionist framework. The research findings apply only to the data gathered, and while it did not seek to produce generalisable knowledge, it does propose more general industrial design methodologies.

Strategies to elicit surprise through interaction

The first question: 'how can industrial designers attempt to elicit surprise through interaction?' refers to the intention of the designers. There are few studies that document how industrial designers attempt to surprise. Ludden suggests some strategies to elicit surprise through visual-tactile incongruity: what the material an object is made from appears to be, and how it actually feels (Ludden, 2008; Ludden et al., 2008). While some designers were interviewed in Ludden's research, there were only a few and the strategies are based on an analysis that Ludden et al carried out mainly through Internet, magazine and book searches. This approach limits the findings to the interpretation of the researchers, as the designers have little voice in the results. My research suggests that interviewing designers and furthermore carrying out participatory research by working and designing with them can reveal further strategies that they use in practice. Therefore, the question 'how can industrial designers attempt to elicit surprise through interaction?' is investigated through interviews with renowned industrial designers,

design studios and teams. It is also further addressed through participatory research in which I collaborated with design studios, design students and research assistants.

The second question: ‘how can industrial designers affect interaction through eliciting surprise?’ is also addressed initially through the interviews with designers and through participatory research. As this question involves a suggestion of persuasion, there are some sub-topics that are important to address and are detailed below.

Surprise and persuasion

Firstly, little has been researched about the role of surprise in design and interaction, particularly when the intention of the designer is to affect the behaviour of people. It has been suggested that “pleasantness” can influence persuasion (Mano, 1997) and decision-making (Mano, 1992, 1994) by the pleasant mood working as an information mechanism. There are some examples of formal research into emotion and behaviour in design. For instance, Wensveen (2005) developed a project in which the emotions of people are assessed through the ways in which they interact with products. This project was carried out through the design of an alarm clock. It focused on the way in which the behaviour of people can inform products about their emotions, and how the product can respond to such emotional information. However, Wensveen’s research addresses a range of emotions and focus on surprise was not sought. When the goal of the designer is to affect people’s behaviour in order to persuade, Human-Computer Interaction researchers have led the way (see for instance Davis, 2009; Fogg, 2009a, 2009b).

An example of informal research on persuasion is presented by “the fun theory” (Volkswagen, 2010), which is an initiative that intends to encourage people to engage in environmentally friendly, socially or health conscious behaviour through offering surprising and amusing interactions. For instance, the project includes a glass bottle-recycling bin placed on the street. The bin simulates a games arcade, so that every time a person puts a bottle in, the bin lights turn on and the electronic screen displays points earned. Another example is a staircase in a subway station that intends to encourage people to use the stairs instead of the mechanic escalator. The standard stairs were made to look like piano keys. Every time a person steps on each step, an electronic system

with pressure sensors and speakers emits the sound of that piano key, allowing people to perform music as they use the stairs. These examples represent an intention to surprise people through humorous interactions in order to persuade them to engage in particular behaviour. Nevertheless, little research has been done about the role of surprise in persuasion in industrial design. Therefore, sub-question 2a of this research investigates: *What is the role of experiencing surprise when interacting with a product that was designed with the intention of persuading?* This question is addressed in chapters 3.1 and 3.2.

The balance between familiarity and surprise

The intensity of surprise declines every time a person is presented with a stimulus as the level of familiarity towards the stimulus increases. It has been suggested that there are principles for novel stimuli that people may find more acceptable. In particular, it has been suggested that a product needs to be “most advanced yet acceptable” for eliciting pleasant aesthetic experiences (Hekkert, 2006, p. 165). Surprise could relate to the level to which people find a product “most advanced”. On the other hand, “yet acceptable” could relate to the level of familiarity people feel towards the product. Question 2b investigates: *How does the balance between familiarity and surprise affect people’s willingness to adopt new designs?* Chapter 3.2 focuses on this question.

Expectations as cultural constructs

One of the reasons to design the coffee cup “Puzzle” described above and that reflects the interaction of two people getting together was that such activity was new and surprising to me when I first travelled to Europe. Coming from Mexico, meeting with friends over a cup of coffee was not part of my upbringing. Once in Europe, I experienced surprise based on a culturally different way to carry out an activity. When I mentioned such observation to the Sismo design team, it was decided to use it for designing.

Expectations are largely cultural constructs. In particular, social behaviour is culturally learned and many of our emotions are responses to dominant cultural tendencies and expectations (Markus & Kitayama, 2001, pp. 121-122). This dissertation does not

assume that all people will experience the same object in exactly the same way.

Individual, cultural and contextual factors will play a role in how each person experiences a product. Therefore, it is necessary for designers to have an understanding of culture and context in order to have the best chance to elicit surprise when they intend to do so.

Cultural differences have been studied in design in a number of ways. Desmet attempted to find universals in the process of emotion elicitation through studies that include Japanese, Dutch and US participants (Desmet, 2002, pp. 111-124). It has been suggested that there are aspects of the process of emotion that are universal to all cultures, including facial expressions (Biehl, Matsumoto, Ekman, & Hearn, 1997; Ekman, 1994; Ekman & Keltner, 2003; Ekman & Oster, 1979). However, the stimuli that elicit emotions can vary greatly across cultures. Tomico et al (2009) applied the Repertory Grid technique from a personal constructs perspective to investigate the different perceptions and reactions to designs of pens from Japanese and Dutch participants. However, none of the aforementioned studies focuses on the study of surprise and whether involving elements from different cultures may help designers with their intention to elicit surprise. This raises sub-question 2c: *How can designers investigate expectations from different cultures in order to intend to encourage interaction in a defined culture?* This question is addressed in chapter 2.3.

Thesis Structure

Section 1. Introduction

Motivation, background, epistemology, methodology and thesis structure

Section 2. Finding strategies to elicit surprise

2.1 Designers' *explicit* strategies for attempting to elicit surprise

2.2 Designers' *implicit* strategies for attempting to elicit surprise

2.3 Surprising by breaking cultural expectations

Section 3. How surprising designs affect people

3.1 The role of surprise when attempting to persuade people: Designing mousetraps

3.2 Surprise and persuasion: The balance between familiarity and novelty

Section 4. Conclusion

4.2 Conclusion, application and further research

research about design

research through design

research for design

Findings

A. Strategies for attempting to elicit surprise

I. Observing my world and attempting to elicit surprise as a motivation for designing

- I.1) Observations beyond my personal experience
- I.2) Observations of my direct experience
 - I.2.a) Behavioural level: How I use objects
 - I.2.b) Cognitive level: How I understand objects
 - I.2.c) Emotional level: How I emotionally experience the world
- I.3) Issues in my world
- I.4) Observations of surprising experiments

II. Applying my tacit knowledge during the design process to elicit surprise

- II.1) The smart doubling of things
- II.2) Breaking expectations by challenging assumptions of appearance
- II.3) Use of magical interactions
 - II.3.a) Conceal expected elements
 - II.3.b) Use of unexpected movement
 - II.3.c) Use of new technologies
- II.4) Use of archetypes in unexpected contexts/objects
- II.5) Use of unexpected scale
- II.6) Address idiosyncratic behaviour
 - II.6.a) Address idiosyncratic behaviour that people recognise as their own
 - II.6.b) Address behaviour using elements from external cultures
- II.7) Address the qualities of the object's components
 - II.7.a) Emphasise or exaggerate the qualities of components
 - II.7.b) Use the perceived weaknesses of components
- II.8) Use unexpected and slow growth

B. How surprising designs affect what people do

- I. Support what people do
- II. Unambiguously indicate what to do
- III. Suggest what to do in subtle ways
- IV. Encourage actions attempting to persuade

examples

existing designs

Design is developed during the PhD research

Thesis Structure

The thesis is divided into four sections (figure 1.1.3 above). Section 1 presents my motivations, background, research questions, thesis structure, methodology and epistemology. In section 2, the thesis addresses question 1: *How can designers attempt to elicit surprise through interaction?* Chapter 2.1, Designers' explicit strategies to surprise, reports on 30 interviews with renowned industrial designers. It is suggested that the intention to elicit surprise varies within design organisations according to their main concerns. While large design and manufacturing organisations focus on attempting to elicit joy and satisfaction, smaller design firms with a leading designer reported much stronger interest in eliciting surprise through their designs. The research focused on respondents who largely relied on their informed experience, given that they almost always held an intention to elicit surprise and therefore had developed a number of strategies to this effect. The chapter suggests a situational map of the intention of the designers to elicit surprise that includes strategies that designers use as motivation for starting a design project, as well as strategies used during the design process. Finally, the section initiates an investigation of question 2: *How does the experience of surprise affect the way people interact with an object?* It suggests four categories in which people are affected through designs that elicit surprise.

Chapter 2.2, Designers' implicit strategies to surprise, used a participatory research through design approach as it was assumed that the explicit responses of the designers to the interviews were only part of the story. Participatory research gave me the opportunity to work with designers to further investigate the intention to surprise from within the design teams. I collaborated with Studio Santachiara in Milan in the development of a number of products. The study further explains some of the strategies developed in chapter 2.1 and suggests more strategies that designers use when attempting to surprise.

The final case study in section 2 investigates question 2c: *How can designers investigate expectations from different cultures to attempt to encourage interaction in a defined culture?* This is investigated through studying how designers can intend to surprise through challenging people's cultural expectations about an activity or product. A group of design students from New Zealand carried out observations of Mexican culture through a fieldtrip. They used such observations to build personal constructs and design interactions that intended to elicit surprise within a New Zealand context. The interactions ranged from public benches to installations on the street. The study suggests that the individual personal constructs that designers created from the fieldtrip served as starting points for designing surprising interactions. It also suggests that the designers needed further skills, potentially from Anthropology, to make more in-depth observations of other cultures. The case study concludes by suggesting one more strategy for eliciting surprise through interaction.

Section 3 focuses on question 2: *How does the experience of surprise affect the way people interact with an object?* Chapter 3.1 investigates the role of surprise in persuasion and question 2a in particular: *What is the role of surprise when interacting with a product that was designed with the intention of persuading?* Sets of mousetraps were designed according to different concerns people have towards the activity of catching mice. The resulting designs were tested and participants reported the level of surprise the objects elicited and how willing they were to use the trap. The study suggests that surprise can be seen as a threat-detecting stimulus and a sense-making process. In such cases, surprise was useful in holding people's attention towards a stimulus. It is also discussed how in undesirable situations, it may be better not to elicit surprise in order to persuade people to carry out certain activities. Regardless of this the study of people's mental images, which are a combination of expectations, memory and imagination, gave designers starting points for designing and intending to persuade.

Chapter 3.2 studies question 2b: *How does the balance between familiarity and surprise affect people's willingness to adopt new designs?* This is investigated through studying the role of surprise in persuasion when radical concepts are involved. It was assumed that radical concepts, in this case home appliances designed for use ten years into the future, would elicit higher levels of surprise in people. The study suggests that there needed to be a balance between how much surprise and familiarity people reported towards the concepts in order for them to report higher levels of willingness to adopt a radical

concept. If the concept was too radical and the report of surprise was too high, people tended to have lower willingness to adopt the concept. If people reported high levels of familiarity and low levels of surprise, the concept became too boring.

Finally, the conclusion section brings all strategies developed throughout the research together. It suggests a set of strategies to elicit surprise. The conclusion suggests that further research could investigate the suggested strategies in more depth. It could address surprise over a long-term relationship with products, through longitudinal studies that investigate the response of people to surprising objects over months and even years. Further research could also address the intention of designers to elicit surprise through intelligent objects and through objects that can be “grown” through emerging rapid prototyping technologies, as the intention of the designer is harder to define in such projects. Finally, the research suggests that surprise can be a tool to help people achieve their goals, whether they are health, environmentally or socially responsible, through offering fascinating ways to engage with objects.

The following section discusses in detail the approach followed in this research. In particular, it is discussed how participatory research through design was approached and analysed through situational analysis. It also suggests seven protocols for producing explicit knowledge in research through design. Such protocols form the basis of the methodology used in my research.

Chapter 1.2

Epistemology and Methodology

Introduction

The research involves two questions that address relationships between surprise and design: how can designers attempt to elicit surprise through interaction?, and how can designers affect interaction through eliciting surprise? The methodology followed in this research involves flexible methods following a postmodern epistemology. This allowed me to find explicit strategies to elicit surprise that designers use and can communicate, as well as implicit strategies that they did not communicate directly. While interviews were a valuable method for constructing the explicit strategies, other methods were used for uncovering and constructing the implicit strategies. The latter included research through design, which in this research is seen as the practice of design as a method for gathering data. This includes my own designing as a participatory researcher within design organisations or with design collaborators, the designs of students and my own designs as topics for discussion.

There is on going discussion in design research as to whether, and how, the practice of design can be considered research. It has been argued that the practice of design lacks an epistemological base (Friedman, 2008, p. 155), that it does not produce explicit knowledge (Friedman, 2008, p. 154) and therefore should not be considered research (Cross, 1993, p. 226). On the other hand, some design practitioners have intended to classify their practice as research. In such cases, the practice of design forms part of a research through design approach (Frayling, 1993). The practice of design that engages in systematic enquiry can follow a set of protocols and allow for an analysis of findings through a postmodern grounded theory approach. This will help designer-researchers produce explicit knowledge. The chapter suggests seven protocols for approaching design projects and producing new and explicit knowledge from a postmodern and Constructionist perspective. I use the protocols during my research through design methodology. Such protocols emphasise the complexity of reality, the intentionality of the designer-researcher, the flexibility needed in research through design and the construction of explicit knowledge.

Background

The lack of an epistemological base and explicit knowledge

It has been argued that the practice of design is not a valid way to carry out research, even when reflective practice is involved. For instance, Cross states “I do not see how normal works of practice can be regarded as works of research” (1993, p. 226). He adds that “the whole point of doing research is to extract reliable knowledge from either the natural or artificial world, and to make that knowledge available to others in re-usable form” (Cross, 1993, p. 226). Cross refers to the lack of explicit and transferable knowledge as a product of design practice. Cross’s view of research comes from an epistemological view that leans towards Positivism, given that he expects knowledge to be “extracted” from the world, rather than constructed. Friedman finds that the main problem with research through design is “that tacit knowledge and reflective practice are not the basis of research and theorizing” (2008, p. 157). Therefore, the sole practice of design lacks the explicit knowledge necessary in research. Friedman argues that some of the problems with the term “research by [sic] design” stem from the misreading –or lack of reading– of Christopher Frayling’s paper *Research in Art and Design* (1993). Friedman calls the term “research by design”, although Frayling’s paper refers to it as “research through or for design”. Friedman calls for a use of grounded theory in order to include the practice of design as an element of research. He says that “rather than developing theory from practice through articulation and inductive inquiry (through grounded theory), some designers mistakenly argue that practice is research. From this, they claim that practice based research is itself a form of theory construction” (Friedman, 2008, p. 154). The lack of an epistemological base, the lack of the production of explicit knowledge, and the use of grounded theory for constructing knowledge from the practice of design deserve further discussion. This chapter will seek to address these three points and will focus on offering seven protocols that allowed me to carry out research through design and produce explicit knowledge.

Can design practice be considered research?

Research through design can be a success if it suggests ways in which designers and design researchers can incorporate practical knowledge into their work. Lindsay suggests, “it seems self-evident that practical engagement in an activity should be a prerequisite to having a knowledge of that activity” (1996, p. 197). Research through design is an approach that gives more importance to the construction of knowledge through practical engagement in the activity of designing. It has been suggested that the practice of design can be part of rigorous academic research as long as critical theory can be demonstrated and the design project is included as a case study (Thomassen & van Oudheusden, 2004). This chapter suggests seven protocols as to how to analyse and approach the designing part of the research.

If the organisation reviewing the work demands explicit knowledge in the form of text, which is the case for many academic organisations, then design practice on its own cannot be considered research. In such a case, the designer-researcher faces the challenge of needing to analyse the design work and construct explicit knowledge from it. The double role of the designer-researcher represents an epistemological dilemma. How can the producer of the data (the subject of observation) also be the analyst (the observer)? Friedman suggests grounded theory (2008, p. 154) resolves such a dilemma. However, it will be argued that traditional grounded theory is in principle objectivist and reductionist. The double role of the designer-researcher cannot fit within an objectivist perspective, as there is a considerable amount of subjectivism from the input of the researcher as designer. This thesis argues that a grounded theory approach from a postmodern perspective, namely Situational Analysis, is more appropriate for the task from an epistemological perspective.

Seven Protocols for Research Through Design

Research through design relates to Art in the way that its methodology is not completely transferable, in particular because practice is involved. Gray and Malins mention the idea of “protocols”, in which basic principles or roles of conduct allow for a “clear understanding of procedure (transparency), but acknowledging that complete transferability is not achievable, nor perhaps desirable” (2004, p. 18). The discussion below is an attempt to set some protocols that can guide the designer-researcher through the research process. The results of a design project are not replicable, as any design project intends to produce new objects, not to replicate existing ones. However, the knowledge produced can be transferable. In order for designer-researchers to gain insights into their own designing experience that produces valid research outcomes, they have to gain insights into their own mental phenomena.

Protocol 1: Thy shall state your motivations

If the act of designing produces objects that serve as data for, illustrate the findings of, or represent the research project, then there is a subjective input to the research as the design is produced through the subjective creativity of the designer-researcher. Such subjectivity needs to be made apparent, so that readers can place the subjective view of the designer-researcher and make their own interpretations of the findings. A way to lean towards making such subjectivity apparent is by the designer-researcher stating their motivations, for which approaches such as Phenomenology can help.

Phenomenology suggests that there is always intentionality. This means that all mental phenomena are about something. Therefore, consciousness (or any subjective thought) cannot be separated from the object of thought, even though they are two different entities (Crotty, 2003, pp. 42-45; Jackson, 1996, pp. 1-24). This inseparability and interaction between the object and subject suggest that gaining insight into one’s own mental phenomena cannot be an objective endeavour, as people’s understanding will

always be plagued by their own subjectivity; but it also cannot be totally subjective, as the object of thought is always there, inseparable.

Phenomenology as described by Husserl requires us to break with our familiar view of the world and see it from a fresh perspective (in Crotty, 2003, pp. 79-80).

Phenomenology attempts to be objective (focused on the phenomenon) and critical (tries to move away from cultural assumptions, motivations and prejudices). This view of Phenomenology has been called Transcendental Phenomenology (Rajan, 2002, p. 11). This stands in contrast to Existential Phenomenology, which is a philosophy of experience, of sense and of subject. Existential Phenomenology has become a method of research, and has been placed within a dominating research problem concerning human insertion into the world (Rajan, 2002, p. 11). According to Stewart and Mickunas, “Husserl saw the task of Transcendental Phenomenology to be that of describing the lived world from the viewpoint of a detached observer, Existential Phenomenology insists that the observer cannot separate himself from the world” (1990, p. 63).

In research through design, the experience of the subject goes beyond an understanding or construction of meaning of the object. Either as an observer or as an interpreter of the world, the designer-researchers cannot separate themselves from the world. The experience of the subject includes the creation of the physical designed object, which will be assessed and analysed in order to obtain insights from it. Therefore, the description of the characteristics, motivations, background, mental thoughts, and even emotional experiences that the subject goes through are important to be described and narrated. This way, the reader of the research can make their own interpretations and even construct their own meaning, as the motivations of the researcher are made apparent.

Protocol 2: Thy shall connect your intuitive and subjective designing to the world

It has been suggested that any representation of our world is inevitably incomplete, given that it is impossible to make an exact copy of reality. For instance, Lyotard suggests that at best “it is our business not to supply reality but to invent allusions to the

conceivable which cannot be presented” (Lyotard, 1984, p. 81). In a way, designing is an “allusion to the conceivable”, as it is always alluding to possible futures. The suggestion that reality cannot be presented is also common to some Phenomenologists, who say, “we shouldn’t reason about reality, we should listen to it” (Crotty, 2003, p. 211). Marcel offers a poetic description of Existential Phenomenology: “As musicians might listen to voices joined with them in producing a symphony, we listen to what is for us a grand symphony of being” (1963, pp. 82-83). Designer-researchers can play the role of musicians while designing and the role of listeners of the bigger symphony while analysing the research. The challenge is that their work produces a symphony and not simply a solo. To achieve this, designer-researchers can move away from a subjectivist approach and towards a constructionist approach by connecting their designing to the world. This can be done, for instance, through expert reviews, user testing, focus groups, comparisons with other designs and interviews.

A postmodernist approach can be applied to an investigation based on research through design. This implies a qualitative approach to research. Qualitative research calls for some forms of validation that are not necessarily based on statistical analysis. One of the most common forms of validation for qualitative research is triangulation (Hoepfl, 1997; Ireland, 2003; Quinn Patton, 2002). Triangulation means that an argument can be defended if it is shown that it applies in several different instances. Such triangulation can occur by comparing the findings produced by the act of designing, with other data from the world, such as user testing, expert reviews, interviews, questionnaires or any other relevant form of data gathering.

Protocol 3: Thy shall describe your case studies (stories and struggles) in detail

Designer-researchers are in a privileged position to report on areas of the design process that are inaccessible to other researchers: the design process from within. It remains difficult to find case studies of design projects. Case studies can help the design discipline understand the process of designing, its values and potential flaws.

Postmodernism suggests that the world is at once one of massification and fragmentation. MacLure suggests that the grand narratives (Modernism, Marxism,

progress) are fragmenting “into disorderly array of little, local stories and struggles, with their own, irreconcilable truths” (in Crotty, 2003, p. 212). Local stories and struggles become important in postmodern research. Swann suggests that designers should systematically record their process and reflect on it. Swann mentions “the recording of design practice as systematic case studies has been comparatively rare in the design field, and a substantial number of new case studies will add to the body of knowledge in design” (Swann, 2002, p. 60).

Protocol 4: Thy shall describe your personal experience as designer

Another area of design knowledge to which designer-researchers have privileged access is the experience of working as a designer. This involves an opportunity to interact with other stakeholders and the responsibility of producing creative outputs. Reporting on the experience of designing can be a valuable contribution to design knowledge.

Phenomenology can help with such a task. According to Schultz, “the domain of Phenomenology is being in the world, commonly mistaken to be a kind of intuitive or introspective philosophy that repudiates science” (in Jackson, 1996, p. 1). On the contrary, Phenomenology can be “above all a method of direct understanding of the object of research and in-depth description... It is the scientific study of experience” (Jackson, 1996, p. 2). Jackson describes the position of the subject in this approach to Phenomenology:

Even if one tried to expunge the subject from one’s discourse, it is one’s own subjectivity which accomplishes such expulsion... After structuralism and post-structuralism the subject will never again be foregrounded in the heroic manner of romanticism and modernism, but it is equally true that never again will the subject be banished from discourse (Jackson, 1996, p. 22).

Similarly, reporting on the experience of the designer can include the subject in the discourse.

Protocol 5: Thy shall embrace your intuition and inspiration

If the researcher is engaged in the act of designing, objectivist approaches to research need to be denied. Intuition and inspiration are inseparable to the act of designing and hold a considerable amount of subjectivity. This should be seen as a valuable quality that needs to be emphasised and described, as they are part of the complexity of reality. Dewey suggests that a mode of experience focused on “deep interiority, of inward sensibilities based on soulfulness, love, passion, genius, inspiration, suffering” (in Jackson, 1996, p. 24) is limiting. However, from a postmodern perspective that emphasises the complexity of reality, it is also limiting a conception of experience that “isolates, selects and decontextualises immediate, sensible experience” (Jackson, 1996, p. 24). The subject is always necessary to bring knowledge through insight, intuition and inspiration; based on what information it can get from the world.

Overbeeke emphasises that while the work of his team is based on research, “the methods used must be rooted in design practice... intuition and common sense should be high on the agenda... they should be exploited to the maximum” (2007, p. 4). Designs produced through intuition and inspiration based on systematic approaches, which are then analysed through methods that ground them back into the discipline, can be objects of, and media for, research. These can be particularly useful when they are a way to gain insight into the intention of the designer.

Protocol 6: If the organisation demands it, Thy shall construct explicit knowledge

If constructing explicit knowledge is necessary in design research, the practice of design holds some characteristics that can lead it towards specific explicit knowledge-producing approaches. At the beginning of a project, the problems that design addresses tend to be broad, poorly defined, need exploratory approaches, lack hypothesis to be tested and need flexibility to use mixed methodologies as the project advances.

Grounded theory is a qualitative research methodology that helps with similar challenges. It seeks to construct theory from analysing data and finding concepts that explain the gathered data. Grounded theory is most useful when the research questions tend to be broad:

Underlying the use of this qualitative method is the assumption that all of the concepts pertaining to a given phenomenon have not been identified, or aren't fully developed, or are poorly understood and further exploration on a topic is necessary to increase understanding (Corbin & Strauss, 2008, p. 25).

Such points bear similarities to the beginning of design projects, where the research or design questions are still broad, not all of the concepts pertaining to the question have been identified, and further exploration on the topic is necessary. The few existing examples of using grounded theory in design research use a traditional approach (see for instance Hohl, 2006; Karapanos, Zimmerman, Forlizzi, & Martens, 2009; Konar, 2007; Seshagiri, Aman, & Joshi, 2007).

Traditional grounded theory follows a positivist, and therefore objectivist, approach. The researcher gathers qualitative data, analyses it searching for concepts and theoretical explanations for the phenomenon, and constructs theories that explain the data gathered. This process is done through specific tools such as coding, memoing and sorting (Clarke, 2003; Corbin & Strauss, 2008). Traditional grounded theory seeks to create a reductionist explanation of reality. However, research through design needs to include diverse and complex factors of reality that affect the designing of an object. Further developments in grounded theory have situated it within a postmodernist theoretical perspective –namely situational analysis–, which acknowledges the complexity of reality (Clarke, 2003, 2005). Situational analysis can address the complexity and fragmentation that occurs in research through design projects, as well as the double role of the designer-researcher.

In situational analysis, “The situation of inquiry itself broadly conceived is the key unit of analysis” (Clarke, 2005, p. XXXV). According to this approach, knowledge is empirically constructed through the making of three kinds of maps that help visualise different relationships between the participants in the situation:

situational maps –strategies for articulating the elements in the situation and examining relations among them

social worlds or arenas maps –cartographies of collective commitments, relations and sites of action–, and

positional maps –simplification strategies for plotting positions articulated and not articulated in discourses (Clarke, 2005, p. 86)

The goal of this research is to find strategies that designers can use for eliciting surprise through their designs. Therefore, positional maps are the most relevant for this research. Firstly, the construction of positional maps can help formulate design strategies that are articulated in discourses. Interviews can be used for accessing such articulation in the discourses of designers. Secondly, positional maps can help construct strategies that are not articulated in discourses. A participatory research through design approach in collaboration with other designers can help me uncover those strategies that are not yet articulated in discourses.

Clarke mentions, “perhaps the radical reflexive act we perform as mapmakers is to reveal ourselves in and through analysing what ‘we’ do as well as what ‘they’ do” (Clarke, 2005, p. 31). In research through design, what “we” do is the act of designing. What “they” do can be an account of interviews and participatory research with experts, designers, and students, input from literature, user testing, and other ways to connect the construction of knowledge to the world.

The postmodern turn brings some key changes to grounded theory:

- It calls for construction of meaning rather than discovering of truths
- It reports on multiple positions and heterogeneous representations, including visual data
- It allows for hearing multiple voices, perspectives, intensities

- It is doubtful; its representation is ambiguous (Clarke, 2005, p. 32)

The points above position situational analysis as a very promising methodology to use for this research. Moreover, given that Situational Analysis allows and encourages the reporting of heterogeneous representations that include visual data it is useful for the analysis of designs produced in the research project.

Protocol 7: Thy shall use flexible methods

One of the main arguments of postmodernism is that it acknowledges the complexity of reality. According to postmodernism, such complexity cannot be grasped and reduced. There is no single method of research that can offer an account of the intricacy of the world. Therefore, in order to offer as in-depth descriptions as possible of slices of reality, the research project needs to be open to using flexible methods of research according to the way the project progresses.

PhD dissertations in industrial design have shown the potential benefits of involving mixed and flexible methods. Stephan Wensveen's thesis (2005) investigates how affective interaction may be approached through tangibility. He uses design as a medium of investigation by studying the connection between how people feel towards the activity of going to sleep, setting up an alarm clock, and waking up, and how the alarm clock should behave in response. The design of the alarm clock was essential for Wensveen's investigation. In this case, the design worked as a medium to address the research question by producing the objects that needed to be tested. Beyond purely producing a designed artefact and claiming that it was research, Wensveen carried out a number of user testing experiments with his designs of alarm clocks in order to investigate, for instance, the operationalisation of affective states (Wensveen, 2005, pp. 117-124). At each stage of the project, Wensveen selected an appropriate method of investigation.

Similarly, Philip Ross's PhD thesis investigates the connection between ethics and aesthetics in design through flexible methods (Ross, 2008). He suggests that it is possible to incorporate in the design process an intention to affect socially relevant behaviour in people. He investigates this issue through design workshops, choreography workshops, the design of lamps, user assessments, and expert reviews, amongst other

methods. In his thesis, Ross uses the medium of designing as a research tool for investigating people's values, and how objects may elicit such values.

The mixed methodologies that Wensveen and Ross use represent a flexible approach to research: they study what the best approach may be for the next stage in their research, and apply it according to the research needs.

Conclusion

Through having a strong contact with the world, research through design can avoid being purely subjective and attempt a balance between the object and the subject. A critical approach is necessary to avoid only personal and subjective construction of knowledge. Research through design requires flexibility in its approach. In part of the research the researchers are designers who personally produce the media of investigation. In other parts of the research they become critical judges that attempt to produce knowledge through analysing the insights from their own experience and from the analysis of the designed objects. A postmodernist approach allows for this flexibility, as long as the designer clearly states their motivations, background, and offers an in-depth description of the experience and decisions that they went through.

According to this discussion, at least seven points can be made about a postmodernist Constructionist approach to research through design. These seven points can be used as the protocols that allow for transparency and validity of the research. If I am going to design in order to address a research question:

- 1) I need to state my motivations;
- 2) I need to describe my personal experience as a designer in detail, in particular when such description can offer new insights to design's body of knowledge. For points one and two, I can use an existential phenomenology approach;
- 3) I need to embrace my intuition and inspiration in the act of designing and value them as potential contributors to knowledge;
- 4) I need to connect my intuitive designing to the world (the subject to the object) through different media in order to avoid a purely subjectivist approach. For instance, it can be done through user testing, interviews with other designers and

researchers, critical discussions with experts;

5) I need to describe the designing process of the case studies in detail and how I came to each of the decisions;

6) Once the objects are designed, if explicit knowledge is necessary, I can analyse the findings and learning from the designing process with a postmodern grounded theory approach, which will see such learning as part of the data and compare it with other data gathered from the world. I have to analyse the produced designs to attempt to gain insights from their being. Even when their creation occurred through my thinking and activity of designing, the final product always holds something else, unexpected, that gives us that much more information to gain further insight, create more questions, experience new events and interactions, define new research problems;

7) Finally, this kind of methodology is responsive and therefore I need to use flexible methods. After each stage of the process it is necessary to reassess the overall research and find adequate methodologies and approaches to address the resulting research questions.

This chapter defines the postmodern epistemological position of this research. It also defines situational analysis as the main methodology to follow in the research. It clarifies that while there is one main methodology, flexible methods will be used according to each stage in the process of the research. When research through design is part of the method of research, this chapter defines protocols that will be used for ensuring that research through design is carried out systematically, with transparency and that it produces explicit knowledge. This combination of methods will allow for finding strategies that are explicit in the discourse of designers, but it will also allow for uncovering implicit strategies that designers use but do not communicate explicitly.

The following chapter represents the first approach at finding explicit strategies that designers use when they attempt to elicit surprise. The chapter reports on the results from a set of 30 interviews with design organisations worldwide.

Section 2

Finding Strategies to Elicit Surprise

Section 2 investigates how designers attempt to elicit surprise through two main approaches. The first approach studies the *explicit* strategies that designers use when intending to surprise. This is investigated through interviews with internationally recognised designers and is reported in chapter 2.1.

The second approach investigates the *implicit* strategies that designers use for surprising through their designs and is reported in chapter 2.2. This is investigated through participatory design research, in which I collaborated with design studios and developed a number of objects that attempted to surprise. This approach brought up several more strategies that had not been made explicit through the interviews.

Chapter 2.1
Designers' *Explicit*
Strategies for Attempting
to Elicit Surprise

Introduction

This chapter reports on strategies industrial designers use when attempting to elicit surprise. Thirty senior representatives from influential design organisations were interviewed. The analysis of the responses suggests that the way in which the organisation addresses surprise varies according to the main concern of the organisation. Such concerns include “to express myself”, “to solve my client’s needs”, “to reduce business risks” and “to produce knowledge for the discipline”. The main argument in this section focuses on the design organisations concerned with “to express myself”. This section focuses on designers that fell within the category “to express myself” because they expressed an explicit intention to surprise people through their designs. These designers therefore offer the most potential for studying strategies to elicit surprise in design. The strategies include personal experiences of the designers that they use as motivation for *starting* a design project. They also include ways that designers apply for eliciting surprise *during* the design process.

Designers also use surprise as a medium to affect what people do. Designers mostly attempt to support what people do by satisfying people’s needs. However, in some instances they also attempt to encourage people with the goal to persuade.

I conclude this section by suggesting that the interviews reflect strategies that designers use when attempting to elicit surprise that they are able to verbalise or communicate through the interviews. This means that the interviews are explicit ways in which designers attempt to surprise. Chapter 2.2 shows how there are also some implicit strategies that designers use to elicit surprise that were uncovered by using a participatory research through design approach.

Background

Surprise has often been used in design as an element for eliciting an experience of amazement (Desmet, 2003, p. 8), to create a sense of novelty (Desmet, 2002, p. 117),

“to increase interest or prolong the attention value of a product” (Hekkert, 2006, p. 168), to “engage the user” (Grimaldi, 2006, p. 3), and to elicit curiosity and further exploration of the object (Ludden, 2008, pp. 17-18). Designers have often relied on their intuition and informed experience to produce objects that elicit experiences through the appearance and interaction that their designs offer.

This chapter investigates how designers attempt to elicit surprise through the interaction that their designs offer. Some researchers have investigated how designers surprise through appearance (Desmet, 2002, pp. 116-117) or the incongruity between appearance and the perception of the design through other senses such as visual-tactile (Ludden, Schifferstein, & Hekkert, 2008), visual-auditory and even visual-olfactory incongruities (Ludden, 2008, pp. 61-106). This research focuses on interaction and sees it as the conversation between an object and a person in which messages, embedded in the object by the designer, can be identified by the person, who in turn experiences an emotion and physically interacts with the object, establishing a *conversation*. This process is illustrated in figure 2.1.1, which is one of the designs produced in the research through design in chapter 2.2. Appearance is included in this research as long as it implies an interaction. It is harder to avoid appearance when talking about interaction, in particular when appearance can elicit behaviour. On the other hand, it is easier to disregard interaction when talking about appearance, as appearance is more easily defined as only what our vision perceives. Interaction involves our motor skills, but the perception of the stimulus can also come from our vision when we talk about interaction.

Interaction between an object and a person seen as a conversation: A feedback system of emotion and behaviour

Figure 2.1.1. Definition of interaction as an emotion and behaviour-based conversation between a person and an object.

This chapter reports on interviews with 30 representatives of design organisations internationally. The analysis of the data was done through a situational analysis approach (Clarke, 2005). Interviewees were asked about what kind of experience they intend to elicit through the design of their products. Interviewees were given the freedom to mention surprise and interaction or not. The research found that when respondents referred to the experience they intended to elicit, they often referred to people's emotion and behaviour. Respondents' ways to address surprise and interaction related to their main concern as an organisation. This was divided into four main concerns: to express myself, to solve my clients' needs, to reduce business risks, and to produce knowledge for the discipline.

The rapid interest in research in industrial design involves a move towards rigorous and systematic research, in particular in academia and large design organisations. In the interviews, the less systematic research the organisation reported to involve, the more it depended on informed experience. The analysis of the interviews brought up two main ways in which organisations that depend more on informed experience, and less on

research, address surprise: finding relevance in my world and applying my tacit knowledge.

This section focuses on an account of how the interviewed designers who depend on informed experience intend to elicit surprise through interaction. It offers detailed examples of when the designers' attempted to elicit surprise and the resulting designs. This section concludes by emphasising that informed experience is a design intelligence that is actively applied in the act of designing new products that elicit surprise through interaction.

Methodology

There were 30 interviews with senior representatives from design organisations (see table 2.1.1). All interviewees were senior designers, design managers or CEOs of design companies. The interviews were semi-structured and in-depth. The interviews were analysed through a variation of Grounded Theory with a postmodern turn, namely situational analysis (Clarke, 2005, p. 87).

The interviewees included 19 designers (including owners who practice design in their own organisation, design directors, design employees, and independent designers), two design researchers, three design managers, and six design academics. The interviewees included seven females and 23 males. Europe, the USA and Asia were represented, with seven interviewees from the USA, eight from South Korea, six from Italy, four from The Netherlands, two from France, two from Germany and one from Sweden. All interviewees, except two, held a senior or managing position, or were the owners of the organisation. All interviews were conducted in person, in the offices of the interviewees, except Ingo Maurer and Axel Schmid who were interviewed via video-conference. All interviews were carried out by myself and were one-on-one. Where possible, the interviews were video or audio-recorded. Some interviews were recorded through note-taking. The interviewees signed a consent form according to Victoria University of Wellington's Ethics Committee Approval number 16059.

I intended to select interviewees who have had an impact on the design discipline. As this can be a subjective quality and there are no methodological studies that report on

the impact of particular designers or design organisations on the discipline, the research initially made a comparison of available informal lists of “influential designers” (see Appendix 2.1.1). The sources included Businessweek magazine (Walters & Wong, 2004), Forbes Magazine (Meyers, 2005), designboom.com, core77.com, designer.com, Icon Magazine (Icon, 2005), and the book *Designing the 21st Century* (C. Fiell & P. Fiell, 2005). The list included 140 designers, design studios, and large corporations. They were contacted via email or telephone, 48 replied, and 23 interviews were arranged through this process with the designer, or a senior representative of the organisation. The other seven interviews were arranged through personal contacts, often suggested by the initial interviewees as relevant people for the topic. While the list intends to represent influential designers and design organisations, it needs to be mentioned that the findings only apply to an analysis of the responses from the interviewees and universal generalisations from the findings were not sought. There are a proportionally large number of representatives from South Korea, as I worked for Samsung Electronics in Seoul and had access to a considerable pool of suitable interviewees. All of the interviews took place between July 2004 and October 2009.

	Interviewee	Organisation	Position	Location
1	Ahn, Kyoung Mo	LG Electronics	Senior Designer	Seoul, South Korea
2	An, Yongil	Samsung Electronics	Manager, Design Research	Seoul, South Korea
3	Bangsund, Krista	Lunar Design	Interaction Designer	San Francisco, USA
4	Bellini, Claudio	Atelier Bellini	Design Director	Milan, Italy
5	Brezet, Han	Technical University of Delft	Professor	Delft, The Netherlands
6	Cho, Jaekyung	Ewha Womans University	Professor	Seoul, South Korea
7	Cho, Youngsik	LG Electronics	Senior Designer	Seoul, South Korea
8	Crasset, Matali	Matali Crasset	Founder, Owner & Design Director	Paris, France
9	Desmet, Pieter	Technical University of Delft	Assistant Professor	Delft, The Netherlands
10	Hekkert, Paul	Technical University of Delft	Professor	Delft, The Netherlands
11	Jegou, Francois	O2 France, ENSCI Les Ateliers	Designer, lecturer	Paris, France
12	Kang, Han-Joo	Samsung Electronics	Design Strategist	Seoul, South Korea
13	Kyffin, Steven	Philips Design	Senior Director Design Research & Innovation	Eindhoven, The Netherlands
14	Lee, Young-sun	Korean Institute of Design Promotion	Executive Managing Director	Seoul, South Korea
15	Manzini, Ezio	Politecnico di Milano	Professor, Head of INDACO	Milan, Italy
16	Marcelis, Sabine	FRONT Design	Designer	Stockholm, Sweden
17	Margolin, Victor	University of Illinois at Chicago	Professor	Chicago, USA
18	Maurer, Ingo	Ingo Maurer Design	Founder, Owner & Director	Munich, Germany
19	Meda, Alberto	Studio Meda	Director	Milan, Italy
20	Morenstein, Josh	FuseProject	Design Director	San Francisco, USA
21	Oliver, Joanne	IDEO San Francisco	Design Director	San Francisco, USA
22	Pezzini, Gabriele	Max Design	Industrial Designer	Milan, Italy
23	Polinoro, Laura	Alessi workshops	Designer	Milan, Italy
24	Santachiara, Denis	Studio Santachiara	Founder, Owner & Director	Milan, Italy
25	Schmid, Axel	Ingo Maurer Design	Senior Designer	Munich, Germany
26	Sunggu, Joe	LG Electronics	Senior Researcher, Design Research	Seoul, South Korea
27	Valdes, Annie	IDEO San Francisco	Senior Designer	San Francisco, USA
28	Villareal, Alberto	Lunar Design	Industrial Designer	San Francisco, USA
29	Webb, Bill	Astro Studios	Creative Director	San Francisco, USA
30	Yoon, Day-young	Korean Institute of Design Promotion	Director Design Promotion	Seoul, South Korea

Table 2.1.1. List of interviewees, their organisation, position and location.

The interviews intended to elicit descriptions of how the respondents address surprise and interaction through their designs. The interviews were semi-structured (Hesse-Biber & Leavy, 2010, pp. 102-108), in-depth (Hesse-Biber & Leavy, 2010, pp. 93-101; H. J. Rubin & I. Rubin, 2005, pp. 12-14) and lasted between 40-60 minutes. The interviews

were carried out in English, French and Italian. The designers were not directly questioned about the connection between how they intended to address surprise and interaction. Instead, they were questioned about their design process and how they intended to offer an experience to people. It was then that the interviewees would indicate whether they attempted to address surprise through interaction or not. A copy of the interview structure and initial questions are located in Appendix 2.1.2.

Grounded Theory is a qualitative research methodology that seeks to construct theory from analysing data and finding concepts that explain the gathered data (Crotty, 2003, p. 78). Traditional Grounded Theory is based on a positivist and reductionist approach. Situational analysis is an approach that uses some elements of Grounded Theory from a constructionist and postmodern perspective. This means that instead of trying to reduce reality to a single explanation, situational analysis seeks to describe relationships and complexities of reality. Such a description only refers to the data gathered. It avoids creating universal generalisations.

Firstly, the interviews were transcribed using a selective transcription approach (Gilbert, 2001, p. 135; Poland, 2003, p. 281). The transcriptions were printed and used for coding and memoing (Clarke, 2005, p. 84; Strauss & Corbin, 1998, pp. 101-161). There were several stages of interviews following theoretical sampling and opposite sampling approaches. The codes and memos were used as raw data to build situational maps. The questions necessary to build situational maps are: “Who and what are in this situation? Who and what matter in this situation? What elements make a difference in this situation?” (Clarke, 2005, p. 87). Once the maps were constructed, they were used to find and describe relations between the important elements in the situation (table 2.1.2). In particular, the analysis focused on creating “positional maps”, which help develop “strategies for plotting positions articulated and not articulated in discourses” (Clarke, 2005, p. 86). Finally, the discussion below offers a description of the most important elements that were found from the analysis. The discussion is mainly based on the data obtained from the interviews. However, relevant existing literature is drawn on to strengthen the argument, or to suggest alternative ways of viewing the phenomenon.

*Design intelligence:
Leaning towards rigorous research*

Table 2.1.2. Situational map constructed from the analysis of interviews. The map shows elements that were important for the design organisations and that made a difference to how they approach surprise and interaction.

The area that this section focuses on is highlighted with a blue background.

Design Organisations' Main Concerns

The respondents' interest, ways to investigate, and intention to affect surprise and interaction appeared to depend on the main concern of their organisation. The interviews brought up at least four different concerns: "to produce knowledge for the discipline", "to reduce business risks", "to solve my client's needs" and "to express myself as a designer". Each of the four concerns corresponds to a type of organisation and a way to investigate surprise and interaction.

To produce knowledge for the discipline

Academic institutions share the concern “to produce knowledge for the discipline”. Design organisations interviewed in this category include Technical University of Delft, Politecnico di Milano, University of Illinois at Chicago and Ewha Women’s University. These institutions carry out systematic research, produce explicit knowledge, and share it with the discipline. Table 2.1.2 above illustrates how much design organisations engage in systematic research, what their main concern is, and which design organisations belong to each group.

Academic institutions’ understanding of surprise and interaction is more theoretical and explicit. Interviewees from these institutions were the only ones who explicitly verbalised some form of connection between emotion and behaviour. For instance, Pieter Desmet and Paul Hekkert from Technical University of Delft (TU Delft) referred to the Appraisal Theory. There are specific research projects on surprise being carried out at TU Delft within the ID Studio Lab. In particular, Geke Ludden has published on how sensory incongruity can elicit surprise (Ludden, 2008; Ludden et al., 2008). Ludden’s work is very relevant for this research as has been discussed in Chapter 1.1.

A different area of TU Delft, the Design for Sustainability section (DfS), has developed projects that relate to emotion and indirectly to surprise. Han Brezet mentions *Refuse* as one of the projects DfS has developed. Refuse is about creating durable form. DfS hypothesises that “if products develop emotional connections with people, then people will keep objects for longer and therefore their environmental impact will be reduced” (H. Brezet, personal communication, September 10, 2004). Brezet adds that “some of the products [from the Refuse project] are radical innovations”. Radical innovation is an interesting concept to consider within this research, as the definition of radical innovation involves “having to cope with a new and unfamiliar domain” (Berchicci, 2009, p. 28). This brings up the question of how radical innovations are experienced and accepted by the public. If the public is faced with an unfamiliar domain, then they are likely to experience a sense of surprise. TU Delft investigated radical innovation through a PhD project. Berchicci designed for Nike a three-wheeled bicycle that tried to have the comfort of a car. It had some electric power and a roof for protection against rain. Brezet mentions that “it was successful as a design experiment, but it was a failure as an

innovation for the market. Nike rejected it because it was too complicated” (H. Brezet, personal communication, September 10, 2004).

Berchicci then compared his design with some entrepreneurs that started new bicycle devices, small companies with three or four people. They also did some radical innovation, but in a more regulated way, using a step-by-step approach that introduced smaller innovations that in total constituted the larger, more radical innovation. They found this to be a more successful approach. Radical innovation means to discard the old or current system. There are two ways of achieving this: step-by-step, or a breakthrough: “although it is not a law, radical innovation step-by-step holds better chances of success” (H. Brezet, personal communication, September 10, 2004).

There is potentially a strong connection between the study of radical innovation and surprise. Nevertheless, neither Berchicci nor other researchers investigating radical innovation nor surprise have connected such topics yet. Chapter 3.2 of this thesis investigates how radical innovation needs to find a balance between the levels of familiarity and surprise that people report towards the concepts to be willing to adopt them.

To reduce business risks

Large organisations with an in-house design studio and manufacturing facilities shared the concern “to reduce business risks”. Steven Kyffin, worldwide director of Design Research at Philips, pointed out that Philips’ main concern “for carrying out research on people is to reduce business risks” (S. Kyffin, personal communication, July 12, 2004). These organisations involve dozens, sometimes hundreds, of designers. Instances of design organisations that shared this concern in the interviews include Philips, LG and Samsung Electronics.

While this research focuses on interaction, the interviewees often referred to it as “user behaviour”. The resources these organisations invest in human research have focused on user behaviour. I include their responses about how they study user behaviour as it often relates to the interaction between a person and an object, rather than a person’s behaviour in isolation. Similarly, respondents often referred to “users’ emotions” and their description of how they address emotion bears relevant elements to the study of

surprise. Kyffin mentions that Philips Design uses a myriad of tools to investigate human behaviour. Kyffin adds “I don’t even know all of them... and many tools are specific to particular projects” (S. Kyffin, personal communication, July 12, 2004).

Large organisations need to make their theoretical understanding of design explicit in order to share it throughout the organisation. Under this perspective, such organisations do share characteristics with academic institutions carrying out rigorous research. Two of the largest design organisations interviewed, Samsung Electronics and LG, held their information confidentially. The other large company interviewed, Philips Design, shared more of their theoretical understanding of people’s behaviour in design. Kyffin mentions that Philips Design uses similar methods to other design studios to study people: ethnographic tools, shadowing, scenarios and personas. However, Philips Design is clear about dividing their understanding of people into three levels: societal, cultural and personal.

Kyffin suggests that their slogan “sense and simplicity” involves “two clear and specific values” (S. Kyffin, personal communication, July 12, 2004). This suggests that objects should make sense. Giving sense to objects suggests a level of intelligence; not only scientific intelligence or functional intelligence, but also cultural intelligence” (S. Kyffin, personal communication, July 12, 2004). There is a cultural response that is sensible and fits in a meaningful and relevant way. Philips Design is trying to understand the changes in societies around the world to find sense in the things that they make at the systemic level. They try to keep things simple because of the daunting complexity of today’s world. In a way, this could imply that their main intention is to support what people do and avoid surprising people too much, as this could add to the aforementioned complexity.

Kyffin stresses the importance of research for reducing risks in the company. In fact, the only reason for research to exist in Philips is to reduce market risks. The better they understand what is happening in society at the moment, the better solutions they can develop with the certainty that people will accept them.

I asked Kyffin about the advantages Philips Design offers over competitors with similar design processes, such as IDEO. Kyffin says that “on one level IDEO are more efficient and on another level they take shortcuts, which enables *them* to be more

efficient”. Philips Design “probably spends considerably more time for their clients trying to understand people”. Philips Design does not make so many assumptions. Kyffin arrives at these conclusions considering how much money Philips Design has to spend on behalf of their clients. Kyffin admits that either Philips Design does research in far more depth, or is far slower. Kyffin prefers the first alternative. That can lead to two possible conclusions, “either Philips Design does not need to carry out in-depth research, or we do need to and IDEO manages to convince their clients to make decisions without the same level of detail on the research” (S. Kyffin, personal communication, July 12, 2004).

Studying emotion is a relatively new area of investigation for the interviewed large design organisations and is not yet as developed as the study of behaviour. Nevertheless, there are now significant efforts to study emotion in a more rigorous way. For instance, Samsung Electronics hired British design firm Seymourpowell to search for design strategies to follow within the 2005-2010 period. Mr Kang from Samsung mentions that Seymourpowell’s directives emphasised the need for Samsung Electronics to focus on “users’ emotions”. Since then, Samsung has won dozens of major design prizes (H. Kang, personal communication, October 6, 2006). For instance, Samsung is the first non-American or European company to win the most prizes in the Industrial Design Excellence Awards (IDEA).

Ways in which Philips Design has investigated emotion can be seen through the projects Fractal, VIBE and SKIN. In such projects, Philips Design investigated how objects can sense the emotional state of people and react accordingly. For instance, the VIBE necklace (figure 2.1.2) involves sensors that record some biometric reactions of the wearer and communicate them to other accessories and other people through changing lights and colours. The designers attempt to elicit surprise as the concepts go beyond our expectations of a piece of jewellery. Nevertheless, the study of emotion focuses on sensing what a person feels, rather than trying to elicit specific emotions. Furthermore, science is still far from developing technology that accurately identifies people’s emotions. So far, scientists can measure some biometric responses that relate to emotion, such as heartbeat, skin conductivity (galvanic response), skin temperature and breathing rates (for instance see Castro Silva, Vinhas, Reis, & Oliveira, 2009; Conati, 2002; Mooney, Scully, Jones, & Smeaton, 2006, p. 570). However, such responses relate to levels of arousal, rather than to specific emotions. Information from biometric

measures are “usually not sufficient to recognize a specific emotion” (Conati, 2002, p. 561). The projects that Philips showcases as more surprising and innovative correspond to research projects that do not necessarily make it to the market.

Figure 2.1.2. VIBE necklace by Philips Design (Philips, 2010).

While large organisations produce new knowledge that relates to emotion and behaviour, not surprisingly such knowledge is normally shared only within the organisation and not with the discipline. Philips Design publishes some of their research. However, there is a vast amount of research that the company keeps confidential.

None of the organisations interviewed in this category explicitly mentioned that they had an intention to elicit surprise in their potential customers or users of their products. The mention of specific emotions involved “satisfaction”, “joy”, and “pleasure”. The lack of explicit interest in surprise may be in part due to the intention of these companies to sell products to a large amount of people. Such interest requires them to avoid producing designs that are too risky for the market. This is in line with their main concern of reducing business risks. In order to do this, large organisations look for a balance between familiarity and innovation. This point will be further investigated in chapter 3.2.

To solve my client's needs

Medium design studios shared the concern “to solve my client’s needs”. These studios normally work as consultancies for manufacturing companies and in the samples for this research involved between ten and 30 designers; except IDEO, which employs hundreds of designers worldwide. Instances of studios in this group include IDEO, FuseProject, Lunar Design and Astro Studios. It should be mentioned that all studios interviewed that fall in this category come from the San Francisco area in the USA, and many of their clients are from Silicon Valley. This means that many of their projects are in the consumer electronics market.

No respondents share all characteristics from each category. For instance, FuseProject shares similarities with the “to express myself” group, as their director, Yves Behar, is internationally acclaimed and they can follow a more individual sense of expression through their projects. On the other side of the spectrum within the category is IDEO, who claims to carry out systematic human research for their clients. However, it will be discussed how IDEO’s main goal is to satisfy their clients’ needs, and that while they do carry out research on behaviour, their research on emotion appears to fall within a more intuitive form of designing, given that they do not have a formal approach to addressing emotion.

The relationship that design consultancies develop with their clients is beyond the scope of the research. Nevertheless, literature suggests that design consultancies’ main challenge is to “identify the intentions of the client organization, and to take action finding means that are practicable in the client’s situation” (Tuulenmäki, 2004, p. 25). Hakatie and Ryyänen report on the challenges faced by the design consultant and the client through an ethnographic study of Finnish design consultancies (Hakatie & Ryyänen, 2006). They suggest a gap analysis approach for identifying such challenges. Their study suggests that design consultancies need to be able to produce “client- and user-oriented solutions, along with innovations aesthetically distinct from those of competitors... in a cost-efficient way” (Hakatie & Ryyänen, 2006, p. 28). In their paper, Hakatie and Ryyänen emphasise how client-oriented solutions are essentials for design consultancies. Kolko mentions that one of the main challenges for design consultancies is to develop a meaningful relationship with their clients and their needs.

He suggests that clients would need to see the relationship between design research, design ideas and design synthesis for valuing the work of the designers (Kolko, 2009, pp. 16-17).

Design consultancies in this category often referred to satisfying the customer as one of their goals. When consultancies reported to attempt to elicit surprise, it was because of the clients' own strategies. For instance, IDEO designed the Hera skincare packaging for AmorePacific from discussions with the client, a study of the brand identity and user behaviours associated with the products. They used "gold accents to create an element of surprise" (IDEO, 2010) in the design of the packaging.

The main goal of this section is to report on how designers use their informed experience to intend to elicit surprise through interaction. The following type of design organisation bases their process almost purely on informed experience. Nevertheless, studios in the "to solve my clients" needs' category share some characteristics in their approach. Therefore, the common characteristics between the "to solve my clients' needs" and the "to express myself" categories are discussed next.

To express myself

"To express myself" relates to design studios where there is a well-known individual designer or small group of designers. The studios in this category employ between 4 and 15 designers. Instances of studios interviewed in this group include Ingo Maurer, Denis Santachiara, Meda Studios, Matali Crasset, Atelier Bellini and FRONT Design. There was generally a commercial goal in the projects produced by this group, but there was also a strong emphasis on trying to find a unique way of expressing their view of the world. For instance, Ingo Maurer and Denis Santachiara mention that they do not intentionally observe how people use objects. Rather, they try to express ideas through their objects. Ingo Maurer mentions: "I do what I feel, what I want... I don't analyse things... I like to see things grow freely... It's good when you can see the person behind the design" (I. Maurer, personal communication, September 21, 2009). Design organisations in this category openly denied any interest in systematically researching how people may behave with their products, or emotionally engage with them. They suggested that they rely on intuition and personal experience.

Most respondents in this category explicitly mentioned attempting to elicit surprise through their designs. This is in stark contrast to the large organisations more concerned with research, which rarely mentioned surprise during the interviews. A quote from Fuseproject summarises such a difference: “studios that focus on research, such as IDEO, are not known for producing exciting, surprising, emotional, game-changing designs” (J. Morenstein, personal communication, November 10, 2008). The category “to express myself” is the most relevant for this project, as they make use of many strategies for attempting to elicit surprise.

The less design organisations reported to rely on systematic research for addressing surprise and interaction, the more they relied on what they initially called “intuition”. In the interviews, designers often referred to “intuition”, having “an acute eye”, “instinct” and an “ability to digest everyday experiences”. Ingo Maurer even referred to “doubt and insecurity” as the sources for such informed experience (I. Maurer, personal communication, September 21, 2009). He claims that he needs doubt and insecurity in order to keep him interested in always developing new projects and observing how objects work and how they may surprise people. He expands this idea to say that he is “suspicious of young designers who are too self-confident”, given that such self-confidence will limit their potential to see new things with fresh eyes. Too much self-confidence would mean that the designer keeps producing ideas under the same framework, and has no chance to explore new paradigms. Overbeeke emphasises that while his team is based on research, “the methods used must be rooted in design practice... intuition and common sense should be high on the agenda... they should be exploited to the maximum” (Overbeeke, 2007, p. 4).

This research suggests that rather than only intuition, designers’ approach falls within a specific kind of design intelligence. Designers develop an informed experience that is not only static accumulated knowledge. It is an informed experience that is actively applied to design problems in order to offer new solutions, and that is why this research calls it *design intelligence*.

The discussion about what “intelligence” entails is still a contentious debate. Nevertheless, a report by 52 scientists in 1997 suggests that intelligence is

a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and

learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings — “catching on”, “making sense” of things, or “figuring out” what to do (Gottfredson, 1997, p. 13)..

I define design intelligence as the process of applying the designer’s tacit knowledge and informed experience, to make sense of design problems and “figuring out what to do” in the act of designing. Heylighen, Cavallin and Bianchin describe tacit knowledge as “cultural know-how” (Heylighen, Cavallin, & Bianchin, 2009, p. 103). Rust suggests that “the original tacit knowledge held by individuals is unique to them, a product of their whole experience, and not a direct source of generalizable knowledge” (Rust, 2004, p. 79). Rust describes a project in which designers were stuck in a problem where they needed to develop solutions for a screen set up. They needed to use cardboard prototyping to rapidly compare options, which helped them to unlock their tacit knowledge by making it applicable through the act of designing (Rust, 2004, p. 79). The designers had to learn from experience. This suggests that tacit knowledge can be a passive kind of knowledge. It is during its active application that we can expect it to be useful. Such active process is what I call design intelligence. As the above definition of intelligence suggests, it is a mental capability for making sense of things *through experience* and figuring out what to do. Any designer makes use of their design intelligence, working for small or large organisations. I suggest that there is a difference in the extent to which designers rely solely on their individual capacity to apply their tacit knowledge. While large organisations relied on research, many smaller teams with a lead designer would rely more on their tacit knowledge and informed experience.

The results of applying design intelligence are designed objects, as opposed to explicit verbal or written knowledge. Most of the interviewees in the “to express myself” category do not produce knowledge in explicit form, neither verbal nor written. Nevertheless, their designs are often a source for investigating design knowledge. Heylighen, Cavallin and Bianchin suggest that making tacit knowledge explicit is not part of the design process (Heylighen et al., 2009, p. 103). They refer to making it explicit from an academic perspective through written articles. Rust sees this differently. He suggests that as soon as tacit knowledge is applied, it becomes explicit knowledge embedded in the physical configuration of the designed and produced object (Rust, 2004, p. 79). My point of view is that whether the embedded knowledge in designs can

be considered explicit depends on the observer. A design professional can “read” many of the characteristics of an object and its embedded knowledge without needing to read or hear an explanation of what such knowledge entails. This would be different if the observer is a person with little previous knowledge of the characteristics embedded in the design. Nevertheless, a layperson would also be able to read at least some part of the embedded knowledge. They may not be able to figure out a complex production process that made a particular chair’s configuration possible, but they might figure out that it is an object for sitting, how much weight it may bear, whether it is going to scratch their floor, and so on.

Relying on their design intelligence has advantages and disadvantages for designers. It means that designers save a lot of effort and time by not carrying out systematic research, and therefore base their decisions on their own understanding of the world. This allows them to offer individual interpretations of the world through their designs. On the other hand, it also means that sometimes they make too many assumptions. For instance, Bill Webb from Astro Studios mentions the example of a helmet for hockey players developed for Nike. The team designed some concepts based on their own understanding of how the game is played, without investigating the players. They later found out that “hockey players are very self-conscious about the way they look, so the aesthetics of the helmet needed to take this into consideration” (B. Webb, personal communication, October 6, 2008). The new design attempted to elicit a sense of pride in the players.

The following paragraphs focus on describing characteristics found within the group “to express myself”, that are also shared by some organisations from “to solve my client’s needs”. From a tacit design intelligence perspective, there are three main areas in which interviewees address surprise and interaction: finding relevance in the world, making my understanding explicit, and applying my tacit knowledge.

Strategies Used for Observing the World: Finding the Potential to Elicit Surprise as a Motivation for Designing

The strategies found in this category refer to the observations designers have in the world that elicit or inspire design projects. There were several ways in which designers found relevance in their worlds, and these could be seen as “observations beyond my personal experience”, “observations of my direct experience”, and “issues in my world”. These observations have the common denominator of having such a strong impression on the designers that motivate them to start and carry out full design projects, from concept to manufacture, based on such observations alone. This suggests that the observations are meaningful. It will be discussed how observations of friends or family using or needing objects can sometimes bring such meaning to designers. It is perhaps this meaningfulness that represents a strong motivation for designers to follow up on what at times may appear to be banal observations. This section relates only to those observations that are strong enough to drive the designers to commit to a project.

Observations beyond my personal experience

“Observations beyond my personal experience” refer to observations that designers have of how other people use objects, what they do in their daily activities, what they need. There seems to be a difference between observations of people close to the designers, such as family and friends, and strangers. Observations of family and friends seemed to be more meaningful for the designers. For instance, Matali Crasset mentions how she designed a range of furniture based on observations she had of her friends. The range is called *Les Amis de Matali* (Matali’s friends). One of the projects develops from the observation that some of her friends often visit Paris, where apartments are small, and the friends they stay with often lack appropriate furniture for sleeping guests. In this case, Crasset designed furniture for her friend Jim who often visits her in Paris. *Quand Jim monte à Paris* (when Jim goes to Paris) is a structure of everyday furniture that could become a small private space and bed in a small apartment (Figure 2.1.3). It

attempts to elicit surprise by normally being a piece of furniture for storage, and becoming bedroom furniture when Jim visits. Another project in this line was *Il Capriccio di Hugo* (Hugo's caprice), based on a materialistic guy who needed furniture to fit his lifestyle full of electronic gadgets (Figure 2.1.4).

Figure 2.1.3. Quand Jim monte à Paris by Crasset. Image courtesy of Matali Crasset.

Figure 2.1.4. *Il Capriccio di Hugo* by Crasset for Domodinamica. Image courtesy of Matali Crasset.

Crasset took the idea behind *Quand Jim monte à Paris* further through the system *Chambre d'ami* (Friend's bedroom) (figure 2.1.5). The system initially offers a coat rack for visitors. At night, the system is unfolded and becomes a mattress, coat rack and bedside table. On her website, Crasset affirms that “the behavioral slant in the realm of home rituals is undoubtedly what has always been my synergist for designing furniture” (Crasset, 2010).

Figure 2.1.5. *Chambre d'ami* by Matali Crasset for Campeggi. Image courtesy Matali Crasset.

Bill Webb mentions the example of designing an alarm clock for Barbie based on the observations he had of her nine year old daughter. He mentions:

I have a daughter, inevitably I start to see through her eyes and what she might want and understand. Kids' products or toys are challenging, trying to get into their mindsets does not come as naturally. You want to keep the energy alive. You want to be as passionate about you doing [sic] a Barbie box as you are when doing a Nike watch (B. Webb, personal communication, October 6, 2008).

Webb talks about seeing the world through his daughter's eyes in order to keep a high level of interest in the project as well as to better understand the potential users. In order to achieve this, he turns to people close to him, as Crasset turned to her friends. On the other hand, designers mentioned that they have had ideas for products through observing strangers, but did not have the same level of personal interest. For instance, Ingo Maurer mentions that one of his observations of people's behaviour and emotion is that he has seen how some lighting in restaurants can be too stark and therefore inadequate for patrons. However, the observation did not have any further development or interest for him (I. Maurer, personal communication, September 21, 2009). Observations from people close to the designers involved a stronger sense of meaning for them.

Observations of my direct experience

Designers also described finding relevance in their worlds through “personal experience”. In this case, it is not an observation of something happening to someone else. It is something that happens directly *to* them. Personal experience can be at the behavioural level “how I use objects”, at the cognitive level “how I understand objects” or at the emotional level “how I emotionally experience objects and the world”.

Behavioural level: How I use objects

At the behavioural level, designers mention that how they use objects themselves is sometimes the deciding factor as to how to approach the design project. This category refers specifically to how they interact physically with objects. While it is inevitable that the cognitive level is involved in how designers use objects, this research found that a different category is how designers understand objects, which is further discussed below.

An example of “how I use objects” is the lamp On/Off by Santachiara (figure 2.1.6). The design of the lamp originated as a response to accidentally knocking over the bedside lamp when falling asleep and trying to turn it off. The lamp is turned on or off by shifting its weight from one side to the other. The lamp attempts to surprise people by not having a standard switch. Such observation was a personal experience of how the designers use objects, and the actual design solution came about from the intention of the designers to give a sense of magic to the object. In this case, the motivation for designing came from a behavioural observation.

Figure 2.1.6. *Lamp On/Off* by Santachiara, Meda and Raggi for Luceplan. Images courtesy of Denis Santachiara.

Cognitive level: How I understand objects

“How I understand objects” can also be expressed as how designers personally interpret objects. This is the area in which designers verbalise a theoretical description of their design activities and approaches. Some designers emphasise this category in their work by developing their own theories about the interaction between people and objects. It was to be expected that theory construction is much more common in academia and large design organisations. Nevertheless, individual designers also create their own theories of design. In academia and large organisations, theory construction comes from systematic research. Individual designers create their theories based on their informed experience and apply them to their designs. Their theories are highly workable, which means that they are meant to be applied in practice. Most of the designers mentioning their own theories would use them as starting points in their process.

There were several examples of theory construction by designers among the interviewees. Most of them referred to interaction as a relationship between people and objects and involved surprise in some way or other. A few of the respondents had a theoretical description specifically related to surprise. However, generally it seemed that designers let their own experience address emotional factors in their designs.

Matali Crasset views the relationship between a person and an object as the *sens-comment* (the sense of how). Crasset first wonders what an object suggests to people, she says:

“sometimes it may be a behaviour” (M. Crasset, personal communication, July 22, 2006). The *sens-comment* is the way that many people use and relate to the object. Crasset comes to this concept by trying to make sense to as many people as possible through her designs. She mentions that this can work like an interstice. It is something that intervenes between the person and the object: “it can be an activity or a change in the object”. Such a theory is similar to the theory of affordances (Gibson, 1979; Norman, 1990, 2004) and of objects suggesting activities (Robinson, 1992) and conversations (Rodríguez Ramírez, 2006).

Crasset is particularly interested on finding the *sens-comment* that tells everybody the meaning of the object. She admits that the task may seem impossible, as every person may interpret objects differently. Nevertheless, Crasset is adamant that people have more cultural similarities than differences. She mentions that she has directed many design workshops in different countries. While the formal resolution of the projects, their sense of aesthetics, is different across cultures, “the level of interests, concerns and behavioural proposals are surprisingly alike” (M. Crasset, personal communication, July 22, 2006).

Another example of a designer with a very specific theory about how people are surprised by objects is Gabriele Pezzini. Pezzini suggests that people have filters of memory with which

They recognise objects thanks to the construction of an icon. To unleash emotions, the icons need to be taken away, at least removed. Changing the priority of the perception of objects does this... Then the user can perceive the new emotions and be surprised thanks to the instability created by the new product (G. Pezzini, personal communication, 3 October, 2007).

The main characteristic to Pezzini's approach is that he explicitly intends to elicit emotion, specifically surprise, by playing with the expectations of people. Such expectations relate specifically to the icons of objects that people construct. This icon is sent backwards and another one is put in its place, thus destabilising the perception of the user. Pezzini and Max Design have used this concept of destabilisation with the design of a stool that is reminiscent of the shape of a bucket, the “Moving stool” (figure 2.1.7). There is even a metal handle to strengthen the visual perception of a bucket, but attempting to be as simple as possible. Pezzini stresses the importance of simplicity to

achieve the destabilisation of the perception. Lack of simplicity may drive the perception of people to confusion where both objects are not perceived as they should. The filters are conditioned by social and cultural factors, and thus they are learned. This implies that such a system of filters may be changed, because it is people who create and modify the icons that are perceived as particular objects. Pezzini adds that “we are conditioned by our culture, and in part by the artificial environment in which we live” (G. Pezzini, personal communication, 3 October, 2007).

Figure 2.1.7. “Moving stool” by Pezzini for Max Design. Image courtesy of Pezzini.

Denis Santachiara also offers a theoretical description of how he sees the relationship between object and person. For him, the most important thing that his designs can do is to surprise people. This means people realise that objects and activities can be done in a different way than they are used to. People then understand that things can be done not only in this new way, but also in other ways. The final realisation is that people might understand that things, in general, can be made in a different way. It will be discussed in the Discussion section below how Santachiara’s description may relate to the relationship between the intention to elicit surprise, the kind of design organisation carrying out the project and their target market.

The theoretical ways to describe the relationship between object and person increase in complexity as the design organisation grows. Astro Studios often starts a project with what they call Phase Zero. In this stage of the project, they define a scenario of use for a product, without defining the product. Such scenario specifies a context that will be used later on for defining the product. This is not a new approach, and has been well documented in the design literature (for instance see Manzini & Jegou, 2003). An example of theoretical explanations of people's behaviour in design that grow in complexity can be seen with IDEO. The studio has extensively published their approach to design, which has a strong emphasis on observing people's behaviour (for instance Brown, 2008; Kelley & Littman, 2005; Myerson, 2001; Nussbaum, 2004). Nevertheless, IDEO is still to publish a comprehensive account of their view on emotion. Interviewees from IDEO declared that the organisation lacks a coherent view about emotion that is shared across the organisation (J. Oliver and A. Valdez, personal communication, November 6, 2008). This suggests that the approach IDEO follows when they attempt to elicit emotion is based on their informed experience.

Emotional level: How I emotionally experience the world

Bill Webb offers a description of “how I emotionally experience the world”. He mentions that

designers are pretty emotional people, there is a lot of passion in the work that we do that hopefully comes through the work that we do... Research can be very instinctual to us as designers being part of the culture, whether it's sports, consumer electronics, housing, gaming... Just because we live and breathe as much as we can every day, we have our point of view as consumers and designers (B. Webb, personal communication, October 6, 2008).

Lunar Design expresses similar ideas by saying that “our concepts reflect how we feel and what we think is cool” (A. Villareal, personal communication, October 7, 2006).

Ingo Maurer offers a more specific example of how an emotional experience of the world can lead to a specific design. Back in 1975, Maurer was in Lake Constance in Germany. He saw a fisherman pulling a net full of fish, and the drops of water falling from the net looked like tears. There was a strong light from the morning sun reflected

on the drops. He kept this observation for 35 years and designed the *Lacrime del pescatore* (Fisherman's tears) installation (Fig. 2.1.8). The design consists of a series of layered nylon nets with 350 crystals illuminated by a halogen light bulb. The nets move slowly and give a sense of breathing. The illuminated crystals represent tears. Maurer admits that the installation was very close to his own emotions, and his intention was to express those emotions. He even mentions that the design “was a bit on the edge, it may be seen as kitsch, but I am comfortable with it because the final result, including the movement and composition, express what I felt 35 years ago” (I. Maurer, personal communication, September 21, 2009).

Figure 2.1.8. *Lacrime del Pescatore* by Ingo Maurer. Images courtesy of Ingo Maurer.

Issues in my world

Another way in which designers find relevance is “issues in my world”. This involves mainly current social issues that are important for the designers. Matali Crasset mentions that she often develops ideas from reading newspaper articles (M. Crasset, personal communication, July 22, 2006). Ingo Maurer offers an interesting example of this category. Maurer says that for him the incandescent light bulb is “the most wonderful object made by human beings”. He was irritated by the law introduced in Europe in 2009 to ban frosted incandescent light bulbs. His team designed the *Euro Condom* (figure 2.1.9) in response. The design involves a silicon cover that diffuses light just as the frosted incandescent bulbs do.

Figure 2.1.9. *The Euro Condom* by Ingo Maurer. Image courtesy of Ingo Maurer.

Gaining design knowledge through surprising experiments

The designers have developed the projects described above through an observation of the world. A different category of intending to elicit surprise *as a motivation* for designing is through experimenting. The designers set up the experiments, but they do not know what may come out of them. The results of the experiments are then modified in order to make them final functional products.

Examples of projects that are the result of experimenting and where the designers intend to elicit surprise come from Swedish design studio Front Design. In the “Design by Animals” project, Front put different animals to the task of affecting their material environment. In one experiment, they gave a roll of wallpaper to a rat. The rat gnawed its way through the wallpaper, creating a pattern of holes that become smaller and smaller (figure 2.1.10).

Figure 2.1.10. Rat wallpaper by Front Design. Image courtesy of Front Design.

In another project in the same series, Front placed a boa constrictor on a rod of clay. The boa rolled itself over the rod and started to compress it, creating unique forms. The designers then used such form to design clothes hangers (figure 2.1.11). They also mapped the movement of a fly around a light bulb in order to design a lamp (figure 2.1.12). Finally, they created a mould from the cavity of a rabbit's burrow and used it to design a lamp (figure 2.1.13). In another well-known project, Front Design used motion capture technology to sketch pieces of furniture in mid-air, capture them on computer 3D files and then rapid-prototype them (figure 2.1.14). The common denominator in these projects is that the designers wanted to break the expectations not only of the potential customers, but also of the design project process.

Figure 2.1.11. Snake hangers by Front Design. Image courtesy of Front Design.

Figure 2.1.12. Fly lamp by Front Design. Image courtesy of Front Design.

Figure 2.1.13. Rabbit lamp by Front Design. Image courtesy of Front Design.

I would argue that the design process normally involves some degree of experimentation, where the designer sets up experiments with materials, textures, colours, interactions or other media and cannot fully anticipate the final result. For instance, the lamp Titania by Alberto Meda and Paolo Rizzato incorporates interchangeable coloured filters. The light from the lamp changes colour when the user changes a filter (figure 2.1.14). Meda mentions that the initial intention in designing Titania was to explore the form of a plane's wing (A. Meda, personal communication,

September 15, 2006). They found the property of changing the colour of the light from experimenting with different materials attempting to decide in which colours of plastic they should offer the lamp. They found that including only one coloured sheet of plastic was enough to change the colour of the whole lamp, which was an unexpected finding. The difference with projects such as the ones described above by Front Design is that Meda did have an intention to design a lamp with particular characteristics and he found a particular feature –changing colour through changing filters- during the design process. On the other hand, Front Design did not know what the actual object or formal result would be at the start of setting up their experiments. The full result of the experiment becomes an object, rather than simply a feature of the object.

Figure 2.1.14. Titania lamp by Alberto Meda and Paolo Rizzato. The lamp changes colour by changing only one piece in the middle. Images courtesy of Alberto Meda.

The category of design experiments holds some resemblances to other approaches such as Critical Design (Dunne & Raby, 2005) or Discursive Design (B. M. Tharp & S. M. Tharp, 2010). Projects from such approaches hold experimental characteristics that move them away from more marketable approaches. For instance, Dunne and Raby wanted to raise awareness about the many kinds of electromagnetic waves surrounding us through the design of the Compass Table. Its top surface has been embedded with 25 navigational compasses. When, for example, a mobile phone sitting on the table rings, the compass needles begin to dance and make visible the electromagnetic waves that surround people. While there is an experimental element to such an approach, Critical and Discursive Design are about making a statement or investigating a social issue from a critical theory perspective. The examples above, by Front Design and Alberto Meda, focus on the physical and aesthetic characteristics of the project.

Strategies Used During the Designing Stage of a Project: Applying my Informed Experience

As opposed to “strategies at the observation stage of a design project”, this category does not focus on observations by the designers; it represents the synthesis of their research into a designed object. It occurs during the design process, as opposed to being a motivation for starting a project. The process has been described as design synthesis (Kolko, 2009) and the designers' spark (Robinson, 1994; Robinson & Hackett, 1997). “Applying my tacit knowledge” refers to the implicit understanding of designers about materials, textures, proportions, colour and forms; but mainly about how such material aspects relate to their design brief, and how they attempt to elicit surprise through interaction.

It is important to note that some designers seem not be able to verbalise the properties of objects that will perform their intended effect on emotion. For instance, Laura Polinoro from Alessi states that what they look for in new projects is “to create a resonance, an affinity”, and that “objects need a personality, an identity” as well as “a semantic value to create emotion” (L. Polinoro, personal communication, September 25, 2004). It is impossible to tell how to achieve this, as every object needs to be new, and therefore there are no recipes to achieve such goals. As creative director, Polinoro can only tell that such goals have been achieved when she sees the finished project, but she is unable to explicitly say what those characteristics are.

Some interviewees clearly differentiated between two ways of creating an aesthetic experience: through appearance or through interaction. Polinoro highlights that the aesthetics of Alessi's products are based on their appearance and that they are “objects to contemplate” (L. Polinoro, personal communication, September 25, 2004). The aesthetics of interaction are not as important for Alessi.

This section reports on specific strategies used by the interviewees during the design process in order to surprise through interaction. These strategies do not mean to be exhaustive. Some designers are quoted more often as they seemed to be able to verbalise

their intentions more clearly. For instance, Josh Morenstein from Fuseproject offers clear examples of how they intend to use “the smart doubling of things”. The other categories were constructed from the Grounded Theory analysis of the interviews. Appearance is included only where it worked as an element to affect interaction. The paragraphs below also report on experiments that designers set up for finding unexpected ways of working with objects. In such cases, the designers use their design intelligence to set up the experiments and are surprised themselves at the results. Then they apply their design intelligence to find a practical application for the results of their experiments.

Josh Morenstein, Design Director at Fuseproject, offers some good examples of how their projects attempt to create an aesthetic experience, and elicit surprise, through both appearance and interaction. The first example is the One Laptop Per Child (OLPC) project (figure 2.1.15). It is interesting to analyse the details of this project as they clarify why some features intend to elicit surprise. The idea was to produce a low-cost (under US\$100) laptop that would “lower the barriers that impede access to education, information, and communication for the world’s most needy children” (J. Morenstein, personal communication, November 10, 2008). Fuseproject participated in all phases of development, from strategy and product design to production. The firm now realises that the design of the laptop had to convey the optimistic spirit of the project. However, Morenstein admits that:

The first iterations that we did didn’t work out. We came across concepts and products that looked like [sic] if they had fallen off the back of a jeep. It was for kids in the developing world and it looked like a little tool, like a little radio (J. Morenstein, personal communication, November 10, 2008).

Figure 2.1.15. OLPC laptop by Fuseproject. Image courtesy of Fuseproject.

Morenstein declares that the first iterations taught them that the product needed to be physically resilient and visually suggest strength. At the same time, it had to involve a balance between “very cheap manufacturing, playfulness, advanced technology, and that its appearance needed to give a sense of optimism appropriate for children no matter what socioeconomic situation is” (J. Morenstein, personal communication, November 10, 2008), as the project’s main goal was to offer equal access to technology and information. The following iterations developed a number of details to achieve such balance. Firstly, the design of the handle follows a number of constraints (figure 2.1.16). Morenstein explains that the handle is there because

pretty much everything is here [on the screen side] except the keyboard. So you end up with a very heavy top part. So the handle is both a foot to balance the weight and a place for the batteries to sit, otherwise it flips over. But the handle ends up driving the aesthetics (J. Morenstein, personal communication, November 10, 2008).

Figure 2.1.16. OLPC laptop by Fuseproject. Image courtesy of Fuseproject.

The smart doubling of things

Morenstein asserts that “it is ‘the smart doubling of things’ that I think people discover and enjoy” (personal communication, November 10, 2008). This observation strongly relates to their intention to produce a sense of aesthetics through the emotions of surprise (at this discovery), and joy, particularly through interaction. For instance, the idea behind the antennae is that “if you are in a remote village with Wi-Fi, these guys daisy chain or connect to each other, you can see all the Wi-Fis near to you” (J. Morenstein, personal communication, November 10, 2008). The antennae double up as covers for the USB and other connectors. This is because “you want to keep the antennae up as much as possible”; so covering the connectors with them is a way to encourage people to keep the antennae up (figure 2.1.17). The latching mechanism is very sturdy and based on a door’s latching system so kids won’t break it. The mechanism also allows closing the lid whether the antennae are up or down. The XO logo is a strong part of the business model. It is also applied as a texture on the areas that imply touchable interfaces, such as the handle (figure 2.18). It was intended to gradually transform the dotted surface of the body into the logo. Also, the logo and the handle come in a combination of colours that make more than 400 variations, so that kids can tell each laptop apart (figure 2.1.19). Such details give the design a level of attention that “increases its aesthetic value and moves beyond being a purely functional tool that falls off the back of a jeep”, adds Morenstein. The “smart doubling of things” can also be seen in Matali Crasset’s projects above. The furniture system *Quand Jim monte à Paris* has double functions when there are visitors or not (figure 2.3).

Figure 2.1.17. Details of the OLPC laptop by Fuseproject. The antennae up allow for accessing connectors.

Image courtesy of Fuseproject.

Figure 2.1.18. Details of the OLPC laptop by Fuseproject. Image courtesy of Fuseproject.

Figure 2.1.19. Fuseproject used a combination of colours to tell the laptops apart. Image courtesy of Fuseproject.

Another project by Fuseproject exemplifies an intention to address surprise through “smart doubling of things”. Fuseproject was involved in the branding and product design for the Y water bottle (figure 2.1.20). Morenstein states that “it is a very emotional product, and that it had to appeal to children” (J. Morenstein, personal communication, November 10, 2008). The clients wanted to brand a healthy drink with special ingredients for bone and muscle growth, which also tastes good. They wanted to elicit surprise through the aesthetics of appearance reminiscent of the form of bones through the form of the bottle.

Figure 2.1.20. Y water bottle by Fuseproject. Image courtesy of Fuseproject.

In the same project, Fuseproject approached aesthetics of interaction through the form in which the bottle is held, which offers a playful interaction for children (figure 2.1.21). The design goes beyond an aesthetic interaction during the consumption of the drink and includes literal playfulness by using a biodegradable rubber band that serves to join

bottles together (figure 2.22). This feature incorporates an environmental factor that is achieved through creating an appealing use after consumption. Fuseproject claims that the use after consumption is only possible because the object produces an emotional connection with children. This feature is the clearest illustration of the “smart doubling of things” in the Y water project.

Figure 2.1.21. The way in which the Y water bottle needs to be held implies a playful interaction. Image courtesy of Fuseproject.

Figure 2.1.22. The design of the Y water bottle becomes a toy after consumption. Images courtesy of Fuseproject.

A last point to be made about the smart doubling of things is that it does need to be “smart”. Doubling of things can be seen in many gadgets. An extreme example is the series of *Chindogu* concepts of products (Kawakami, Papia, & Fearnley-Whittingstall, 1995). Chindogu is a type of design originally from Japan that represents an “un-useless invention”. The Chindogu designs attempt to elicit surprise through interaction, but are strangely practical, rather eccentric and are only meant to work as prototypes for humour’s sake. They normally double up functions. For instance, there is a pair of glasses with a funnel embedded so that the user can put eye drops in easily. There is also a baby’s coat that can also work as a rug to clean the floor as the baby crawls.

Breaking expectations through challenging assumptions of appearance

This strategy refers to projects in which designers change what could be seen in the industry as an assumption of how a specific object should look. For instance, computers were expected to be boxy and beige for a long time, until Apple introduced the iMac in the 1990s. Under this category, designers challenge established forms and offer new ones. It seems that the more *established* an assumption of appearance, the more surprising a challenging design can be.

Morenstein mentions the Jawbone Bluetooth headset (figure 2.1.23) as an example of a project attempting to challenge assumptions of appearance. He states that previous Bluetooth headsets looked like “blobs” as they were designed with the premise that “if we are going to design something for your face, let’s make it organic, so that it’ll blend in” (J. Morenstein, personal communication, November 10, 2008). Fuseproject’s way to address this issue was to design beyond an expected assumption: that a Bluetooth set needs to look organic. By addressing the expectations, the designers attempted to elicit surprise. Morenstein adds: “I don’t put a chicken wing on my face, that’s organic. We said: things people wear on their face are jewellery. They have to have details and materials selection... that was [sic] complementary to the way that I look” (figure 2.1.24).

Figure 2.1.23. Jawbone Bluetooth headset by Fuseproject. Image courtesy of Fuseproject.

Figure 2.1.24. Jawbone Bluetooth headset by Fuseproject worn. Images courtesy of Fuseproject.

Surprising through magical interactions

There were at least two studios that explicitly claimed to attempt to elicit surprise through magic. Denis Santachiara attempts to develop products “that surprise the user, that are magic” (D. Santachiara, personal communication, July 12, 2004). In order to achieve surprise, Santachiara claims that not only does he not carry out “user testing”; he tries to consider the object by itself. For Santachiara, “the object is the user of itself” (D. Santachiara, personal communication, July 12, 2004). Santachiara aims to surprise people by developing products that are “alive, animated, transformers, performers, that assume diverse identities, that are magic with non-banal technologies” (D. Santachiara, personal communication, July 12, 2004). Denis Santachiara referred to a project on paranormal phenomena he designed for the *Triennale di Milano* in 2000. He designed lamps that turn on through “the black magic of electromagnetism” (D. Santachiara,

personal communication, September 26, 2006); a table that seemed to fly by imitating wood with Styrofoam; and a mirror that made images disappear by using liquid crystal glass that can be turned on and off. Front Design has also incorporated magic in an attempt to elicit surprise. For instance, they developed a range of products in collaboration with magicians. The designs are created with what would seem “impossible characteristics that defy the laws of nature” (Front, 2010). The results include a lamp that levitates (figure 2.1.25); a chest of drawers that separates and floats away (figure 2.1.26); and another chest of drawers with fronts that disappear, revealing an empty inside (figure 2.1.27).

Figure 2.1.25. Levitating lamp by Front Design. Image courtesy of Front Design.

Figure 2.1.26. *Separating drawers* by Front Design. Image courtesy of Front Design.

Figure 2.1.27. *Disappearing drawers* by Front Design. Image courtesy of Front Design.

There are other examples of designs that involve some kind of *magic* interaction that intends to elicit surprise and where the designer does not necessarily describe them literally as magic. For instance, the Leaf lamp by Fuseproject for Herman-Miller features a touch-sensitive area on which it is necessary to run one's finger along the surface of the base to dim the light up or down (figure 2.1.28). There is no visible moving switch. The lamp offers a choice of warm mood light or a cool work light. By using LEDs, the

lamp is very energy efficient. Such features were innovative when the lamp was released, and intended to offer a sense of surprise, in particular the touch-sensitive dimmer switch and the form of the structure. The design of the form was driven by its business starting point, which was the need to use LED technology, as dictated by the client. The form of the lamp functions as a cooling area for the heat-producing LEDs and results in what has been qualified as “a surprising form” (J. Morenstein, personal communication, November 10, 2008).

The lamp On/Off described above by Santachiara is another example of a lamp that intends to offer an unexpected interaction through a touch of magic, but that does not necessarily intend to literally involve magic. In many of these examples, it is the use of a new technology that brings about the sense of magic. Wensveen suggests, “Electronic products instill moments of magic and surprise as they seem to surpass the laws of nature and physical causation” (2005, p. 157).

Figure 2.1.28. Leaf lamp by Fuseproject. Image courtesy of Fuseproject.

Surprising through using archetypes in unexpected contexts/objects

Under this category, designers used an archetype for an object and translated it into unexpected situations. Pezzini's theories of eliciting surprise mentioned above refer directly to this category. His design of the moving stool reflects the use of an archetype –a bucket– used in a different context: as a stool (figure 2.1.7).

Designers have often used this strategy in the design of lamps. The archetype used is the form of a trapezoid to signify a lamp. For instance, Santachiara's workstation desk "Angel" includes doors that when closed make it look like a giant lamp (figure 2.1.29). This project also connects to the strategy below "Surprising through unexpected scale". The design includes another identical but smaller lamp inside the bigger one, as a medium to emphasise the changes in scale.

Figure 2.1.29. Workstation/lamp *Angel* by Denis Santachiara for Naos. Image courtesy of Denis Santachiara.

Sismo Design from Paris often uses archetypes in different contexts. For instance, they used the form of a wine glass to design the vase *Verre* ("glass", figure 2.1.30). They also used the shape of a key as an element to turn switches on and off (figure 2.1.31).

Figure 2.1.30. *Vase Verre* by Sismo Design. Image courtesy of Sismo Design.

Figure 2.1.31. *Switches Les référents* by Sismo Design. Image courtesy of Sismo Design.

The use of an archetype in a different context can sometimes allow only a very literal interpretation: once the new connection is understood, there may be very little more about the object that is interesting. As mentioned in the introduction, the emotion of surprise is very short lived and may be a single experience. Fox-Derwin suggests that some projects are “one-liners”, which means that they hold an interesting feature, but once that feature is experienced there is not much more to the design (E. Fox-Derwin, personal communication, May 26, 2010). To express the idea of a “one-liner”, Fox-Derwin refers to the “crushed” ceramic cups by Rob Brandt that imitate what a crushed plastic disposable cup would look like. In her research, she explores the idea of incongruity and tries to find ways to take designs beyond “one-liners” (Fox-Derwin, 2011).

Surprising through unexpected scale

Designers referred to the use of scale for intending to surprise people. For instance, Santachiara's workstation/lamp *Angel* uses the form of an archetypal bedside table lamp on a much bigger scale (figure 2.1.29). Sismo Design uses unexpected scale in the form of changing the proportions of an object. The design of their *Chaise longue* (long chair) plays with words to offer exactly that: a long chair (figure 2.1.32). The design plays with the scale of the length of the chair.

Figure 2.1.32. Chaise longue (long chair) by Sismo Design. Image courtesy of Sismo Design.

Surprising through addressing idiosyncratic behaviour

By designing for particular behaviour, Crasset offers unexpected pieces of furniture. Idiosyncratic behaviour can be defined as “peculiar to an individual” (Princeton, 2008). IDEO interviewees for this research referred to the book *Thoughtless Acts* by their colleague Fulton-Suri (2005) when asked how they address behaviour in their design process (J. Oliver & A. Valdes, personal communication, 9 November, 2008). Fulton-Suri's book includes a series of photographs of how people use objects in unexpected and idiosyncratic ways. For instance, there are images of electronic gadgets stuck to motorcycles, or photographs of how passers by leave their disposable cups on the same

table in a subway station, even though it is not supposed to be a rubbish bin. Fulton-Suri does not report on design cases that have taken such observations further. This is an interesting category as it relates to how people do things, and potentially to how people interact with objects in idiosyncratic ways. However, not much more was found about this category during the interviews. I address this category further in a theoretical sampling approach (Clarke, 2005, pp. xxxi,xxxiv, 185) in Chapter 2.2, in which I carry out participatory research by designing a series of objects that attempt to address idiosyncratic behaviour in collaboration with Denis Santachiara's design team.

Using Surprise to Affect what People do: From Helping to Persuading People

Interviewees were generally adamant that their intention was to help people achieve their goals and help them carry out their everyday activities in the easiest and most enjoyable ways. Nevertheless, as the discussions about how their designs affect interaction went on, there appeared examples of projects in which designers attempted to change the way people do things. Such intention could go from a very subtle intention to offer a new object-person interaction, to a very strong intention to persuade people to do things differently. The categories below explain at least two ways in which designers attempted to affect people's interaction with objects, and ultimately their behaviour.

Supporting people's behaviour

In the vast majority of examples mentioned by respondents, designers intended to support what people normally do. The designs intend to help people achieve their goals in either easier or more enjoyable ways. In these cases, surprise was used as a medium to make the interaction with the object more enjoyable. Features of objects in this category often attempt to support people's actions with the least possible involvement of people. Philips Design and IDEO have scores of tools to assess how people perform their everyday activities. One of their main goals is to identify areas in which objects are not

offering people an adequate experience to achieve their goal; they then design to improve such an experience. Many of their approaches are well documented on the Internet or in books, and this dissertation focuses more on subtle differences as to how to suggest new interactions with or without the intention to persuade. Such differences will be explained in detail in chapters 3.1, 3.2 and 4.2.

Encouraging behaviour intending to persuade

Some designers mentioned that there are instances in which they have tried to encourage people to engage in specific behaviour. In particular, designers mentioned projects in which they attempted to encourage environmentally friendly behaviour, or behaviour that is beneficial for the individual or for society.

Matali Crasset mentioned that she is not interested in persuading people. She admitted that there are situations in which designers may intend to persuade, in particular when encouraging environmentally friendly behaviour. She mentioned attempts to address environmental problems in design, but the suggestions remained at the technical level. For instance, Crasset mentioned that when she was working at Thomson Electronics she suggested designs that would use less toxic paints and glues for the design of TV sets, but manufacturers refused to implement the ideas, as they were more expensive than the standard products.

Fuseproject openly claims that at least a couple of their designs have been developed with the explicit intention of persuading people. The first project is the Y bottle described above (figures 2.1.20-2.1.22). The designers intended to persuade people not to throw their bottles away after use, which represented an environmental goal. Interestingly, the client did not originally intend to offer such a feature. The other example is the New York City (NYC) condoms distribution system, which involved the design of graphic elements such as billboards (figure 2.1.33), as well as products including vending machines (figure 2.1.34) that were supposed to elicit a pleasant surprise in people by allowing them easy access in unexpected places, such as in street corner diaries (figure 2.1.35). The main goal of persuading in this project was given by the client, the NYC Mayor, and involved a social, political and healthcare goal of encouraging people to use condoms.

Figure 2.1.33. Billboard design for NYC Condom by Fuseproject. Image courtesy of Fuseproject.

Figure 2.1.34. Vending machine design for NYC Condom by Fuseproject. Image courtesy of Fuseproject.

Figure 2.1.35. Vending machine for NYC Condom by Fuseproject in situ. Image courtesy of Fuseproject.

Academic institutions were more interested in persuasion. Brezet mentioned the project *Eternally Yours* as an example of intending to persuade people to engage in environmentally friendly behaviour. *Eternally Yours* suggests a range of products that involve “features to make them more attractive or that create emotional connections to be kept for longer and avoid short product life spans” (H. Brezet, personal communication, September 10, 2006). The research from Brezet’s team suggests concepts such as appropriation, customisation and designed *wear and care* –instead of *wear and tear* - to produce objects with a longer life-span (van Hinte, 2004). Interestingly, *Eternally Yours* suggests that designed wear and care is a way to avoid surprise, as people would know to expect something beautiful as objects age (van Hinte, 2004, p. 129). I assume the authors refer to unpleasant surprise and they try to avoid people finding that, for instance, when the shiny aspects of the camera wear off, it is revealed to be made out of plastic rather than metal. I wonder if that has to be the case, or whether surprise does not need to be avoided and can play other roles in encouraging environmentally friendly behaviour or in persuasion in general. This is an interesting area of study, and it is further investigated through participatory research in Chapters 3.1 and 3.2 through case studies.

The two categories above, supporting what people do and intending to persuade, seem too general and black and white. What about projects that offer new interactions, and therefore are not necessarily supporting what people do, but are neither trying to persuade people to do something different? Chapter 2.2 investigates more subtle

differences between eliciting surprise intending to suggest a new interaction, but without trying to persuade people.

Discussion

This section serves as a snapshot of how designers who rely on their informed experience intend to elicit surprise without the help of rigorous research. From a postmodern perspective, it is important to include an account of specific phenomena in social life, in particular through the view of the individuals. As Michael Jackson puts it,

Any theory of culture, habitus or lifeworld must include some account of those moments in social life when the customary, given, habitual, and normal is disrupted, flouted, suspended, and negated... never again will the subject be banished from discourse (Jackson, 1996, p. 22).

The discourse put forward in this section offers an account of the subjects –designers– and their intention to elicit surprise through interaction. The account is very limited to their projects and responses: it does not intend to be a universal view of design. As I followed a situational analysis approach, the findings are situated to the specific context of the interviewees and it should also be seen as an account of a specific time period.

The discussion above suggests a description of the design organisations' main concerns and how they relate to the way in which they approach surprise and interaction. This can be helpful for design organisations, their clients, manufacturers and even their customers, for understanding what the motivations of the design organisations are. It can also help design students by clarifying what design organisation a graduate may like to work for, so that the students can prepare their skills and target their education towards their preferred approach.

This chapter offers a perspective on the ways in which designers attempt to elicit surprise through interaction as a motivation for starting a design project or during the design process. This can help designers approach projects when they intend to elicit surprise by situating different approaches at different stages of the design process.

Therefore, designers can choose an approach for starting a design project, or a different one when they have already begun the project.

This chapter offers specific strategies to use when attempting to surprise through interaction during the design process that are directly applicable to design projects. The strategies are specific enough to be workable, but general enough not to dictate recipes that limit creativity. Finally, there was a discussion about how designers can intend to elicit surprise to affect interaction. It was mentioned that designers can either attempt to support what people do or attempt to persuade them to do otherwise.

Design organisations' main concerns and how they approach surprise and interaction

The intention of designers to elicit surprise seemed to be related to their target market. Large design organisations were more concerned with satisfying the needs of the market. They invest vast amounts of money in their products and therefore they cannot afford to introduce designs that are too risky. Whenever they mentioned that they had an intention to elicit emotion, they referred to “satisfaction” or “joy”. Small design studios with a well-known individual designer had a more open intention to elicit surprise. They sell fewer products which are often more expensive—in part due to the production numbers—, which reduces the target market to people who can afford them. Perhaps Santachiara's theory about how his customers experience products can in part explain the relationship between the intention to elicit surprise, the kind of organisation and the target market. Santachiara says that he attempts to elicit surprise so that people realise that a specific interaction can be carried out differently to what they are used to. Then, people may realise that other things and other interactions can also be carried out differently. Finally, people may realise that things in general can be done differently. Such an approach can be seen as the designer's way to create his or her own market base by increasingly educating people as to what they can expect in products. Santachiara's target market comprises those people who have figured out that things can be done differently. Large organisations may not necessarily depend on such target markets. The design studios in the middle seemed to move both ways. If the client was a large organisation, then they were inclined to satisfy their clients through satisfying

customer needs. If the project was coming from within their own teams, or as an idea from the lead-well-known designer, they were more inclined to offer surprising designs.

Attempting to elicit surprise through interaction as a motivation for designing or during the design process

The ways in which designers apply their informed experience could be put into two categories: as a motivation for designing or as strategies to use during the design process. The first category refers to the inspirational observations of the designers' world. These could include observations of other people's experiences, or observations of their own experience. When the observations related to the designer's own experience, projects were discussed that came from a behavioural level: how the designer uses objects; from a cognitive level: how the designer understands objects; or from an emotional level: how the designer emotionally experiences the world.

The second category refers to strategies through which designers intend to elicit surprise through interaction. This section reported on six specific strategies: smart doubling of things; breaking expectations through challenging assumptions of appearance; use of archetypes in unexpected contexts/objects; use of magical interactions; use of unexpected scale; and addressing idiosyncratic behaviour. It should be remembered that these categories relate only to the findings from the Grounded Theory analysis of the interviews. There are many more strategies that designers use. Ludden et al refer to at least six strategies to elicit surprise specifically through visual-tactual incongruity (2008). These include using a new material with unknown characteristics; a new material that looks like a familiar material; a new appearance for a known product or material; combination with transparent material; hidden material characteristics; and visual illusion. Ludden also reports other strategies to elicit surprise through visual-auditory and visual-olfactory incongruities (Ludden, 2008).

Two of the visual-tactual strategies offered by Ludden et al (2008) resemble strategies from this research. The first one is "a new appearance for a known product or material" (Ludden et al., 2008, p. 34). It is similar to the strategy "breaking expectations through challenging assumptions of appearance" from this research. I specifically refer to it as "challenging assumptions" as this implies that an assumption has been formed about

what the appearance of an object should be like. This is important, as it may seem that the more established the assumption of an appearance is, the more surprising a challenging appearance would be. Josh Morenstein reinforces this idea when he says “we found that people thought that *all* Bluetooth headsets needed to look organic... so we challenged that notion” (J. Morenstein, personal communication, November 10, 2008). Ludden refers to this characteristic by mentioning that the strategy refers to a “familiar” or “well-known” product (Ludden et al., 2008, p. 34). The second strategy that resembles the findings from this research is “visual illusion” (Ludden et al., 2008, p. 36). The strategy connects to “use of magical interactions” from this research. It also relates to and involves “visual illusions”, but expands such a notion by allowing more than just visual illusions and allocating other potential ways to use *magic*. An example of this can be seen in the use of technology and touch in the Leaf lamp by Fuseproject (figure 2.1.28), which uses tactile sensors to turn on and off, dim the light, and change colour through an RGB controller, all without moving or visible switches.

The categories described above do not intend to be exclusive or exhaustive. As previously discussed, some designs served as an example for two or more categories. For instance, the project for the On/Off lamp started from a behavioural observation by the designer – knocking over bedside lamps with one’s arm. The solution relates to the specific way in which the designer understood objects, and involved an intention to elicit surprise through magic and unexpected movement.

Affecting what people do by eliciting surprise

The analysis of the interviews suggested that designers’ responses as to how they affect interaction focus on supporting what people do. In much fewer cases, designers attempted to persuade. Further research is necessary into the role of surprise in persuasion. As mentioned above, this research will investigate the role of surprise in persuasion in chapters 3.1 and 3.2 through case studies. Chapter 2.2 will suggest how there are other ways in which designers affect what people do.

Interaction as a conversation

The interest of viewing the interaction between a person and an object as a conversation in this research needs to be discussed with intelligent systems in mind. Most of the work in this thesis relates to projects in which the intention of the designer can be mapped as the script of a conversation: the designer offers the script through the physicality of the product, and the script gets interpreted during the interaction person-object. This approach implies that the conversation can be pre-defined to a degree. Such an approach is not universal and can be challenged. For instance, digital technology offers the opportunity to design starting points of interaction without knowing what the final interaction –or conversation between object and person– may be like, by creating random or unforeseeable ways to interact. For instance the Design for Quality in Interaction group at Technical University Eindhoven (TU E) focuses on designing intelligent systems, which are “characterized by adaptive behaviour based on a situation, context of use and users’ needs and desires” (Overbeeke, 2007, p. 11). Such intelligent systems involve a degree of uncertainty on the part of the designer. The intention is to set up an interaction in which the system responds to the behaviour of people, but the designers do not define the script of the conversation to the extent that the designers interviewed in this section claim to do. Examples of Intelligent systems from TUE include a lighting system for a wardrobe that responds to the movement of people by lighting areas that are being used according to the speed of movement and other behavioural factors. The LivingLab in Eindhoven intends to house research on intelligent systems related to the home (P. Markopoulos & Rauterberg, 2000; Panos Markopoulos, 2001), many of which interact with people in ways designers cannot necessarily foresee. In such cases, the conversation script reflects less and less what the final interaction is like, and the designer’s intention starts to move towards one that enables flexibility. I can see advantages in such flexibility, such as offering exciting interactions and responding in more detail to people’s behaviour. There are also challenges, such as the need for objects to deal with massive amounts of data from sensors that try to read the behaviour that people are performing and what their needs may be. Overbeeke suggests that technological solutions often overload the cognitive system of people (Overbeeke, 2007, p. 8). He calls for a change and an inclusion of exciting and beautiful interactions that do not need to rely on the alternative, boring solution of standardisation. Such interactions need physicality that engages people in

beautiful interactions, so that they relate to the motor, cognitive and emotional levels of people (Overbeeke, 2007, pp. 8-10). This research centres on such physicality. I purposefully avoid investigating intelligent systems for several reasons. I intend to offer an account of how physicality can be the medium to elicit surprise through interaction. Hopefully, researchers working on intelligent systems can also learn from this research, from physical conversations, when they relate their intelligent systems to people's emotions and bodies. The research therefore focuses on projects that attempt to define the interaction people will have with the designed objects. In this instance, defining what the designer hopes the interaction will be like takes on importance.

Limitations of this chapter

The limitations of this research include that the suggested strategies, of how designers attempt to elicit surprise through interaction, are based solely on the responses from the interviews. Such an approach gives depth to the analysis and assures that the intentions of the designers are accounted for, which is the main goal of this research. It also allows me to be able to make claims for which I have evidence. However, it should be pointed out that there are other categories that could be found through analysis of existing designs without directly talking to the designers. Such categories were omitted in the analysis, as I had no further information about the original intention of the designers. An example of other categories of how designs can elicit surprise is reported by Ludden et al (2008) –mentioned above–, who suggest different ways in which designers can intend to elicit surprise through incongruity. They talked to a few designers, but their research does not concentrate on reporting on the original intention of the designers as stated by the designers. The main body of their work was based on analysing designs from pages in books, in particular the International Design Yearbooks 1999-2003, as well as some designs from fairs, the internet and shops (Ludden et al., 2008, pp. 28-29). Their work focuses on finding ways to elicit surprise through incongruity and the strategies suggested are as perceived by the researchers. Describing the intention of the designer was not as relevant as it is in this research.

It was mentioned in the introduction of this dissertation that surprise has the characteristics of drawing people's interest towards stimuli and that it relates to familiarity. Designers either moved away from the familiar to elicit surprise, or used

familiar elements in a different context to elicit surprise. However, further discussion about familiarity is necessary. For instance, how do we establish what is, and for whom something is, familiar? How far away can designs step from familiarity and still elicit a pleasant surprise? Using unexpected contexts seemed to be a common strategy for designers. Nevertheless, an unexpected context could be anything that is not *the* expected context. How do we know that an unexpected context may work in a favourable way for eliciting surprise? Such questions go beyond the answers from interviewees. The balance between eliciting pleasant surprise and moving away from familiarity is further investigated in Chapter 3.2 *The balance between familiarity and novelty when attempting to elicit surprise and persuade*.

The goal of this chapter was to report on *explicit* ways that designers use to elicit surprise. The following chapter investigates *implicit* strategies to elicit surprise through interaction. The research follows a participatory research approach, as I worked as a designer with design studios, students and research assistants attempting to uncover strategies that designers do use but were not able to verbalise through the interviews.

Chapter 2.2

Designers' *Implicit* Strategies for Attempting to Elicit Surprise

Introduction

This chapter reports on a number of case studies in which I carried out participatory research through design at Studio Santachiara in Milan, Italy. My research objective was to further investigate strategies that designers use for attempting to surprise. The previous chapter 2.1 reported strategies that were found through the explicit responses of designers to interviews. This chapter uncovers further strategies that designers did not verbalise during the interviews.

The analysis of the projects presented in this chapter also illuminated ways in which designs affect what people do by eliciting surprise. I suggest that designers can affect what people do in at least four ways: support what people normally do, suggest interaction in subtle ways, indicate what interaction needs to be performed and encourage specific interactions intending to persuade. While designers do not dictate what people do or how they interact with objects, they can have a specific intention that can be seen as the draft script of a conversation.

I carried out participatory research within a design team by working as an industrial designer at Studio Santachiara in Milan. The research objective was to investigate how the team attempts to elicit surprise through interaction in ways that were not expressed through interviews. My assumption was that there were strategies throughout the process that were significant and that designers took them for granted, were not consciously aware of, or omitted them in their responses to the interviews reported in chapter 2.1.

There were a few reasons for choosing Studio Santachiara to carry out this part of the research. The studio has a strong interest in eliciting surprise as stated in the interview with Denis Santachiara reported in chapter 2.1. Also, the studio forms part of the category “to express myself”, which is the group of design organisations that the research focuses on. The group “to express myself” uses informed experience for designing, rather than rigorous research. It also seeks to express ideas and feelings through their designs, rather than focusing on satisfying their clients' needs, reducing business risks or producing knowledge for the discipline, which are other concerns that

design organisations can have according to chapter 2.1. After discussing my research objectives, Denis Santachiara extended an invitation for me to work with the studio after interviewing him.

It was discussed in chapter 2.1 that interviewees responded that they either attempted to support what people do or, in rare occasions, to persuade people. The objects produced at Studio Santachiara suggest more subtle differences and fall within the category of objects that support people's activities, objects that indicate interaction unambiguously and objects that suggest interactions in subtle ways. The following case studies suggest that designers can support existing behaviour and still attempt to elicit surprise. One way to achieve this is through finding idiosyncratic behaviour that has not been supported before. The case studies suggest further strategies to elicit surprise. For instance, case study 2 shows an example of using unexpected movement through the design of doors that need to be rotated to open and close. The structure of the doors becomes the handles. Subtle interactions can also be suggested through concealing expected elements. Case study 3 shows the design of a lamp that has no visible light bulb. Case study 4 suggests that unexpected movement can also suggest interaction through the design of coffee tables that expand and collapse moving along a non-concentric axis. The fact that the same object can affect interaction through surprise and elicit surprise through interaction suggests that the relationship between surprise and interaction can be seen as a feedback system, rather than as a causal mechanism.

Methodology

I followed a participatory research approach to investigate the case studies in this chapter. Participatory research “focuses on a process of sequential reflection and action, carried out with and by local people rather than on them” (Cornwall & Jewkes, 1995, p. 1667). The local people in this chapter are the designers from Studio Santachiara, their clients and manufacturers. The methodology in this chapter is similar to Action Research as suggested by Swann (2002). However, the approach in this chapter particularly follows the Research through Design protocols as suggested in the Epistemology and Methodology section of this thesis –chapter 1.2. The protocols include: 1) I need to state my motivations; 2) I need to describe my personal experience

as a designer in detail, in particular when such description can offer new insights to design's body of knowledge; 3) I need to embrace my intuition and inspiration in the act of designing and value them as a potential contribution to knowledge; 4) I need to connect my intuitive designing to the world (the subject to the object) through different media in order to avoid a purely subjectivist approach. For instance, it can be done through interviews with other designers and researchers, and critical discussions with experts; 5) I need to describe the designing process of the case studies in detail and how I came to each of the decisions. As explicit knowledge is expected in this thesis, 6) I need to analyse the findings and learning from the designing process with a Postmodern Grounded Theory approach –namely Situational Analysis (Clarke, 2005). Finally, 7) this kind of methodology is responsive and therefore I need to use flexible methods.

The investigation was carried out through five projects that were commissioned to Studio Santachiara during the period July-December 2004. The clients included Naos, FontanaArte and the Architecture Biennale in China. All clients contacted the Studio of their own accord, which suggests that they had an interest in the approach that the studio follows. Denis Santachiara agreed for me to work as a designer attempting to design surprising objects in collaboration with him and the other three industrial designers in the team. I was given the lead role in the five projects described below. My input into the projects included suggesting concepts, sketching ideas, modelling designs in 3D computer software, building scale models, building and testing mechanisms and talking to manufacturers directly about the specifications of the designs. The input from the other designers and Denis Santachiara included suggesting concepts and some sketching at the beginning of the projects, discussion and thorough critique as the projects progressed and putting together graphic presentations for the clients. While I was in charge of a substantial part of the design tasks, there was also close collaboration with the other designers, in particular at the beginning of the projects, which meant I could investigate the intentions of the Studio as a team. Furthermore, the projects were part of larger projects that followed the approach of the studio. This means that my designing was heavily influenced by the approach of the studio and the way they attempt to produce surprising designs. The studio agreed for me to use some of the process documentation in the form of images. However, many of the discarded concepts remain confidential, as the studio prefers to keep them for future projects.

I analysed the process followed in the projects and the actual designs through a Situational Analysis approach. In this case, Situational Analysis was most useful as it is more easily applicable to visual material than traditional Grounded Theory. Clarke (2005, pp. 205-256) argues that there has been a change in the study of material culture and that visual discourses are essential to the understanding of culture. Clarke also suggests a methodology for mapping visual discourses. Under a Situational Analysis approach, two concepts need to be clarified. Firstly, a visual discourse necessarily involves a gaze, which “involves a power relation between gazers and gazees” (Clarke, 2005, p. 210). As a researcher, I play a role of gazer, as I observe and investigate the culture of designing for surprise within the design studio. My role as a designer also makes me a gazee, as my design work is analysed in this research. Becoming the gazee can involve a sense of “being objectified, subordinated, or threatened” (Clarke, 2005, p. 210). There can be a conflict of interests as I play the role of both gazer and gazee. However, this is unavoidable in a participatory research approach. It is also a necessary condition in order to access the knowledge that would be otherwise inaccessible without a participatory research approach. Such knowledge is the implicit strategies that designers use to elicit surprise. Whyte emphasises that without participatory action research, there is “substantial knowledge and theory that would have been unlikely to emerge” (Whyte, 1989, p. 367). In order to minimise the conflict of acting as a designer and researcher, I include a description about the design work carried out as a team, and not only as an individual designer. Also, the analysis of the design work was carried out in collaboration with three Senior Lecturers and a Professor in Industrial Design from the School of Design, Victoria University of Wellington, New Zealand. Such collaboration represented an expert review of the projects.

Secondly, every social world has its own “signs, symbols, and cues that will work in particular ways in its own conventions of visibility that frame meaning making” (Clarke, 2005, p. 219). By working from within the design studio, I had access to such conventions of visibility and could report on how they were used to elicit surprise. Clarke (2005, p. 224) suggests that there are three levels for analysing visual material: the contents of what is explicitly there; what it refers to; and its contexts or where it occurs and how it is used. Coding and memoing were carried out looking for such levels of analysis. The nature of the activity of designing meant that there was more focus on “the contents of what is explicitly there” –the resulting designs; and “how it is used” –

the strategies that designers use and how they use them. A situational map (figure 2.2.1) was produced from the memos and is described through each of the projects below.

Figure 2.2.1. Situational map that shows the relevant relationships between the intention to elicit surprise, affect interaction and the clients' concerns in the Studio Santachiara's case studies.

The Design Approach at Studio Santachiara

When asked about how his studio designs for people, Santachiara pointed out that he does not normally apply usability studies as starting points for designing. He considers first the object by itself. The first step for Santachiara is to search and analyse the potential performance of the object. Then he judges how aesthetics may be included (D. Santachiara, personal communication, July 12, 2004).

When Santachiara takes people into consideration, it is not from an ergonomic or a marketing point of view as a starting point for a project. It is more a philosophical consideration in which the aesthetic use of the object is considered. He aims to develop products that become alive, animated. The designs are seen as performers and transformers. He wants his designs to “assume diverse identities, to surprise the user and to be magic with the use of non-banal technologies” (D. Santachiara, personal communication, July 12, 2004). He often uses observations of how people close to him, or himself, use objects and tries to find a surprising application of such observations.

He has observed changes in behaviour after people use his designs. The most interesting thing for Santachiara is that the object surprises people. This means people realise that objects and activities can be done in a different way than they are used to. They then understand that things can be done not only in this new way. The final realisation is that people might understand that things, in general, can be done in a different way. Santachiara suggests, “Design has the ability to influence the quality of everyday life. It influences the way people perceive the world and interact with it” (D. Santachiara, personal communication, July 12, 2004).

Santachiara follows his designs after their market launch. He finds it important to test whether people have the reaction he wanted to accomplish. Analysing reactions is also a valuable way to find ideas for new products. However, this is not done in a systematic way. The observations are scattered and done almost by chance. They are also focused on friends and acquaintances who are often designers or professionals related to the design industry.

Santachiara agrees that designers can attempt to encourage behaviour through the use of objects. However, many different people would be expected to use the same design. Santachiara clarifies that people give a different and unexpected use to objects.

Santachiara does not work with ergonomists or marketers. The main contact he has with industry when developing a project is with the production engineers. This is because he is always in search of new languages and believes that ergonomics and marketing limit his creative process. The contact with engineers allows him to explain to them that new ways to make things are possible. Santachiara believes that thorough ergonomic studies are only necessary in complex workstations, such as plane and car command controls. In the household setting however, ergonomics are not as important.

The analysis of the initial interview suggests that Studio Santachiara:

- attempts to elicit surprise in most projects
- attempts to use *magic* through its designs for eliciting surprise
- involves family and friends for observation of idiosyncratic behaviour
- avoids rigorous research such as ergonomic or usability studies
- works closely with manufacturers in order to attempt to break assumptions of how technology or manufacturing techniques should be used.

The five points above were used as guidelines during the design process of the following case studies.

Case Study 1: Surprising Through Supporting an Idiosyncratic Interaction: Design of a Laid-back Sofa

The context for the first three projects was the Architecture Biennale 2004 in Beijing, China. Studio Santachiara was invited to design the interiors and furniture –which would later be manufactured and commercialised– of an apartment amongst another 11 internationally renowned designers as part of the exhibition. The apartment assigned to Studio Santachiara covered a full storey in the 12-storey building. This first case study involves the design of a sofa for watching television.

Design brief and criteria

This project falls within the strategy “to support an idiosyncratic interaction”. It was designed under the following constraints:

- The designers will intend to elicit surprise through interaction and particularly through *magic*.
- According to the categories of how designs affect what people do –support people’s activities or persuade them to engage in interaction– the object needs to clearly *support* a specifically defined interaction.
- The definition of the behaviour needs follow an approach similar to what the studio would normally follow. In this case, the behaviour to be supported will be defined from observation of idiosyncratic behaviour of family members and friends.
- The design should attempt to elicit surprise by addressing the expectations of people.
- In order to keep its relevance for industry, the project should be part of a “regular” brief for the studio.

- The brief for the sofa stipulated that it should portray a “western lifestyle”. The clients indicated that it should be a sofa for watching television.

Design process

The studio discussed a number of potential interactions or behaviour that the sofa could address. The list included having pockets and surfaces for food, drinks and remote controls; having a backrest that becomes a blanket; having individual footrests that surface from the sofa –similar to having several recliners into one; among other ideas. The discussion revealed that several people in the team start watching television by sitting up straight and then slowly begin to lie back, ending up in a semi-sitting, semi-lying position. While a recliner allows people to lie back, the behaviour observed refers to slowly sliding down. This needs a backrest that slides back, which also allows people to have more horizontal surface area for supporting their lying bodies. Dozens of concepts were sketched to address this behaviour and an internal discussion within the team decided on one concept that was taken to production.

Initial concepts

The first discussion concluded with the concept of a sofa with a backrest that allows for slowly leaning backwards. The initial sketches suggested sliding backrests (figure 2.2.2) that can be in different configurations (figure 2.2.3), a backrest that can roll back and forward to offer different seating and lying positions (figure 2.2.4) and a sofa with a backrest that slides inside the fabric, creating a movable landscape on the sitting surface (figure 2.2.5).

Figure 2.2.2. Concept of a sofa with a sliding backrest.

Figure 2.2.3. Sliding backrests with different configurations.

Figure 2.2.4. Rolling backrest.

Figure 2.2.5. Design of sofa with a sliding backrest inside the seat fabric that creates a movable landscape on the seating surface.

Final design

The final design consists of a sofa that allows people to slowly slide back and down while watching television (figures 2.2.6-2.2.9). It was decided that separate backrests were necessary in order to allow for different people to have varied positions. The form of the sofa and backrest remained simple in order to emphasise the interaction rather than the form. That is the reason why options shown in figures 2.2.3 and 2.2.4 were

discarded. The design of the sofa is low to give a clear message that it is an object for lying down on, rather than just for sitting. The manufacturers in China solved the mechanism for the sliding backrests.

Figure 2.2.6. Back view of the final design.

Figure 2.2.7. Other objects were designed to complement the design of the sofa, such as a footrest to allow for lying down and coffee tables that can slide away as the person lies down.

Figure 2.2.8. 3D computer model of the final design in context.

Figure 2.2.9. Surprising through supporting an idiosyncratic interaction: Design of a sofa for slouching-reclining.

Discussion

Interestingly, the team of designers was fascinated with the concept that involved a sliding backrest inside the fabric that created a movable landscape on the seating surface (figure 2.2.5). However, even though the studio is highly interested in surprise, the concept was deemed too radical and beyond a marketable idea. There was also the technical challenge of moving the backrest inside the fabric. It seems that the team was looking for a balance between surprising ideas that would not move too far away from familiar concepts. This can be emphasised by the fact that the team was given *carte*

blanche by the clients, in this case the Architecture Biennale organisers. Despite the fact that the client was expecting to be surprised and to appreciate whatever the team were to suggest, the team still decided to balance surprising ideas with familiar concepts. The relationship between familiarity and surprise is further investigated in chapter 3.2.

The main strategy used for intending to elicit surprise was “through addressing idiosyncratic behaviour”. The main way in which it was intended to affect what people do was “to support people’s behaviour”. The expert review with senior lecturers and a professor from Victoria University of Wellington suggested that it was fair to expect the design to elicit surprise in people at the moment in which they first find out about the functionality of the sliding backrest, but part of the surprising element was to hear the story about people slowly sliding down their seats while watching television. This case study did not bring up any new strategies or ways to address interaction compared to the interviews. However, the following case studies show new strategies as well as more subtle ways to see how interaction can be affected through surprise.

Case Study 2: Design of Doors for *Indicating* or *Suggesting* Privacy

Design brief and criteria

This case study was also a project for the Architecture Biennale in Beijing, and reports on the design of two sets of doors. The first set represents a design that “unambiguously indicates interaction” and is part of the wall between the master bedroom and the studio. The second set of doors represents a design that “suggests interaction in subtle ways”, and is the division between the studio and the hallway that connects to the living room. The brief stipulated that a “western lifestyle” needed to be portrayed, which includes professionals working from home. In particular, the brief mentioned that something needed to indicate whether the person is working and prefers not to be disturbed. At the same time, it needed to offer easy interaction between the

family members when appropriate, and therefore full isolation through physical walls was not desired. The following criteria were used for the project:

- The object needs to suggest a specifically defined behaviour.
- The behaviour needs to have been found through studying people. This needs to follow an approach similar to what the studio would normally follow.
- The design should intend to elicit surprise through interaction by addressing the expectations of people.
- In order to keep its relevance for industry, the project should be part of a regular brief for the studio.

Design process

The concepts were developed from discussions within the design team as to how we would prefer to have access to our families while keeping privacy when needing to work from home. The first scenario –case study 2a—was when people need to work late, and their partners are already sleeping in the bedroom. In that case, it was decided that full privacy for both parties was necessary. Several concepts were sketched and modelled on the computer. It was decided to have shelves on the walls between both spaces. The shelves incorporate a small door that can be slid to open or close (figure 2.2.10). When open, the doors indicate that communication is possible between both spaces (see figure 2.2.12 for a view from the studio). When closed, the doors indicate that communication is not desirable. Each side of the wall has a door, so both need to be open or closed for the communication to work. The team believed that the doors did address the behaviour under discussion: to allow for communication or privacy. However, the analysis of the design did not find any characteristics in the design that would have a chance to elicit surprise. It was a very straightforward solution without any level of subtlety: it was either open or closed.

Figure 2.2.10. Case study 2a: Design of doors that allow for communication or indicate the need for privacy between the bedroom and the studio.

The second set of doors, case study 2b, intended to elicit surprise as well. They also tried to suggest the behaviour in more subtle ways. The person working at the apartment's studio would need privacy and this would need to be expressed to the rest of the family. However, it was preferred to avoid complete isolation through closing the room with doors and walls, which opened the opportunity for a more subtle solution.

A set of round-rotating doors was suggested to separate the studio from the corridor (figures 2.2.11 and 2.2.12). This would allow for potential and easy communication between both sides of the doors, but it would also suggest privacy when required. If the doors were shut, this would suggest to other members of the family not to disturb. Nevertheless, family members would still see and hear through the membrane of the doors and the spaces around their circumference. The team attempted to indicate the use of the object in a subtle way, without emphatically indicating it. It was assumed that the use of knobs, handles, or plates to push, is necessary for most doors (see discussion by Norman, 1990). The doors designed in this project lack any of these features as an attempt to play with the expectations of people and elicit surprise. This configuration

suggests that the only thing people can do is to use the metal structure of the round doors themselves. This suggestion helps people figure out that the doors rotate, as opposed to slide.

Figure 2.2.11. Case study 2b: Concepts for rotating doors from floor to ceiling that have no handles and suggest privacy. People need to move the whole wheel to open and close them.

Figure 2.2.12. Case study 2b: Surprising through suggesting unusual interactions: Design of doors for suggesting privacy.

Discussion: Distinctions between “indicating” interaction and “suggesting” interaction

The expert review suggested that the set of doors between the bedroom and the studio indicate that the person on the other side is willing to communicate. They do so in a very direct and unambiguous manner: the doors are either open or closed. The position of the doors indicates a yes or no interaction. There were no features in the design that the panel found would evoke surprise. On the other hand, the set of doors between the studio and the corridor suggest the interaction of communication in a more subtle way by not putting a physical barrier between the spaces. The design also makes use of the following strategies to elicit surprise: avoid the use of expected elements (handles), unexpected scale and unexpected movement.

Case Study 3: Surprising Through Concealing Expected Elements of an Interaction: Design of a Lamp

All of the objects described above intended to support people’s activities. However, there were also examples in which the design indicated an interaction in an unambiguous way or suggested an interaction in a more subtle way. I was interested in exploring such subtlety further given that it offered a new category within the research. I used the brief of designing a lamp for Italian company FontanaArte for this purpose. FontanaArte required the design of a pendant lamp, preferably made of aluminium. Beyond that, FontanaArte trusted the studio to define the rest of the brief, which in turn allowed me to define the design as follows, for the purposes of this research:

Design brief and criteria

- The object needs to *suggest in subtle ways* a specifically defined interaction.
- The interaction needs to have been found through studying people. This needs to follow an approach similar to what the studio would normally carry out: observation of friends or family, or personal experience.
- The design should intend to elicit surprise by addressing the expectations of people.
- In order to address the subtle difference between indicating and suggesting interaction, the design of the object should avoid unambiguously indicating the behaviour.
- In order to keep its relevance for industry, the project should be part of a regular brief for the studio.

Design process

Once again, the design team through observation of own behaviour, and that of family and friends performed the study of behaviour. In this case, it was possible to observe strangers in public spaces such as bars, and restaurants, although informally. Informal searches in magazines and the Internet also took place.

Amongst the observations initially listed, one was selected. The team discussed that we would expect to see a light bulb inside pendant lamps, especially if they have a large opening at the bottom. It was decided to use this expectation to suggest to people to look inside and surprise them. We attempted to produce a sense of surprise by concealing the light bulb. Once the person looked inside, they would not see the light bulb, although light would be emitted from inside the lamp.

Final design

The final design consists of a lamp that plays with the expectation of having a light bulb inside lamps. The light bulb is a ring-shaped fluorescent tube hidden inside the outer aluminium layer and the inner white plastic layer (figure 2.2.13). The intention is that people look inside and are surprised by not knowing where the light is coming from (figure 2.2.14). The minimalist form of the lamp emphasises the suggested interaction and the expected emotion. In this case, it was expected that interaction would follow emotion (surprise), as people would be looking for the light bulb after being surprised. However, it is also expected that emotion would follow interaction, given that people would experience satisfaction and appreciation for the design once they figure out where the light bulb is.

Figure 2.2.13. Surprising through concealing expected elements of an interaction: Design of a lamp.

Figure 2.2.14. People looking up inside the lamp at the Milan Furniture Fair.

Discussion: Suggesting interaction in subtle ways and the relationship person-object as a conversation

The design of the lamp made use of concealing an expected element to elicit surprise. It suggests interaction in a subtle way by not imposing an indication of what needs to be done: the person interacting with the lamp is invited to look inside and be surprised, but such interaction is not forced upon people. The subtle design means that its intention could easily be missed and not appreciated. Perhaps this fact adds to its value once the trick in the design is understood: it gives people a sense of achievement and understanding.

The design of this lamp raised the idea that the same object can both elicit surprise and affect what people do. The introduction to this dissertation discussed the appraisal theory (see for instance Desmet, 2003; Frijda, 1993; Roseman, 1996), which suggests that an emotion is elicited by a stimulus that addresses our concerns and expectations. If the stimulus is appreciated as positive according to our concerns and expectations, we will probably experience a pleasant emotion and an approach type of behaviour. If the stimulus is appreciated as negative, an unpleasant emotion is likely to be experienced as well as withdrawal-type behaviour. However, such a linear process has been questioned and researchers have suggested that the relationship between behaviour and emotion – in this case surprise– can be seen as a feedback mechanism (Baumeister, Vohs, DeWall, & Zhang, 2007). The experience of designing the lamp fits within such an approach and suggests that the interaction between a person and an object can be seen as a feedback in the form of a conversation (figure 2.2.15). Such a conversation can be the script that the designer puts forward and that is reinterpreted by the person and the object engaging in a conversation. It represents what the designer hopes will happen, regardless of whether the interaction actually occurs as anticipated.

Interaction between an object and a person seen as a conversation: A feedback system of emotion and behaviour

Figure 2.2.15. Interaction seen as a conversation and a feedback system between emotion and behaviour. This diagram represents the intention of the designer as the script for a conversation.

Case Study 4: Surprising Through Unexpected Movement, Unexpected Scale and Using Archetypes in Unexpected Contexts and Objects: Design of a Stand for a Flat-screen Television

Design brief and criteria

This case study reports on the design of a stand for a flat-screen television. The client was Naos from Italy. Naos has a long tradition of designing furniture with moving elements. The brief specified that it should be a self-standing piece of furniture that would accommodate a home-theatre system and a flat-screen television. The constraints given by Naos included the use of materials common to their manufacturing facilities, in particular steel.

Design process

The design team decided that the design would attempt to use the light coming out of the television as a source for a giant lamp (figures 2.2.16-2.2.18). The team decided to use a material used by Naos, thermographed frosted metacryl, for the doors of the stand. As the doors need to be open to watch television, the team decided to use the door movement as a design element. The challenge was to design a mechanism that could open and close the doors with minimum effort and in an elegant manner. Many scale models were produced to test mechanisms (figure 2.2.17). When the doors are closed, the stand serves as a giant lamp with light coming from the television. When the doors are open, they serve as a white background for the television (figure 2.2.18). People only need to use one finger on one door for both doors to move simultaneously (figure 2.2.19).

Figure 2.2.16. 3D computer models of the design of a flat-screen television stand.

Figure 2.2.17. Scale model showing the technical process of designing a mechanism for movement that intends to elicit surprise.

Figure 2.2.18. Final design of the Dadaumpa television stand shown at the Milan Furniture Fair. When the doors are closed, the stand serves as a giant lamp with light coming from the television. When the doors are open, they serve as a white background for the television.

Figure 2.2.19. Dadaumpa television stand. First column (read top to bottom): doors working as background; second column: doors closing; third column: light from television changing colour to make the stand work as a lamp with changing mood light.

In this case, the team used an archetype –the shape of a lamp– in an unexpected context – as a television stand. The team also used unexpected scale when the object works as a lamp and unexpected movement with both doors moving simultaneously as strategies to elicit surprise. In this case study there was no clear intention to affect interaction.

Case Study 5: Surprising Through Unexpected Movement: Design of Coffee Tables

Design brief and criteria

The client Naos asked Studio Santachiara to design a set of tables, including coffee tables. Naos gave specific technical constraints: the tables needed to include surprising movement and the materials had to be glass-surfaces and galvanised-steel bases, which are some of the materials that Naos uses in manufacturing.

Design process and initial concepts

It was decided to work with two movable surfaces, as it was expected that the movement of both surfaces could relate to each other and create unexpected relationships. Concepts were originally sketched and modelled through 3D software to emulate and assess the aesthetics of movement (figure 2.2.20). The concepts intended to use two perpendicular axes of rotation, one for each surface, and make one move in a different direction, speed or plane to the other. It was intended that such asynchrony would differ from the expectations of people and therefore elicit surprise.

Figure 2.2.20. Design of a table with two positions allowed through unexpected movement.

Final design

The team used the experimentations on movement described above to create the final design of the Tutu coffee table. The table uses two surfaces. Each one revolves around its own axis (figures 2.2.21 and 2.2.23). Both surfaces are interconnected so it is only necessary to use one finger to rotate one surface, which will allow both surfaces to move. The asymmetry in the size and direction of the axes means that the movement of a side of the table is different to the other, but they end up meeting and encasing each other. The same mechanism was later used for manufacturing similar products.

Figure 2.2.21. Tutu coffee table in open position. It allows for a range of settings through an unexpected and surprising movement.

Figure 2.2.22. Tutu coffee table closing, shown at the Milan Furniture Fair.

Figure 2.2.23. Still-frames of Tutu coffee table opening.

Discussion: Conceptual maps and expectations

The design team intended to work against the expectations of people: if rotating one surface suggests that a second surface would move similarly, then the team intended to design a movement that defied such expectation. Norman (1990) suggests that design should work with the expectations of people. He suggests mental models or conceptual maps as ways to make sure that the interaction with products follows the same way that people believe the product should behave. For instance, Norman uses the example of stove knobs, suggesting that the position of the knobs should clearly map the position of the heating elements. While such a proposition is useful in more functional features of objects, this case study suggests that going against mental models or conceptual maps can help elicit a sense of surprise through the interaction with objects.

Discussion

Strategies for attempting to elicit surprise

My assumption and motivation for engaging in a participatory research approach was that there might be strategies to elicit surprise throughout the design process that were significant and that designers had taken for granted, were not consciously aware of, or omitted in their responses to the interviews I carried out in chapter 2.1. One of the main goals was to uncover such strategies from within the studio by working alongside designers. Also, I had the intention to understand in more detail the way in which interaction was affected through surprise, after having found through the interviews that designers had the intention to either support interaction or persuade people to carry out other activities. Finally, Studio Santachiara claimed in the interviews that it intends to elicit surprise in people through magic. However, the word *magic* does not offer a clear understanding as to what it really means in practical terms. By working with the studio, I intended to clarify the way in which at least some products can elicit surprise through magic.

There were three strategies to surprise found during the participatory research approach that were not mentioned during the interviews. Such strategies include: unexpected movement, conceal expected elements and deviate from conceptual maps. Interestingly, these strategies answer a further question from this section by representing strategies that intend to use magic in order to elicit surprise.

There were three strategies to elicit surprise found in the interviews that were also applied during the participatory research process. These include: address idiosyncratic behaviour, unexpected scale and using archetypes in unexpected contexts or objects.

How surprising designs affect what people do

The analysis of the interviews in chapter 2.1 suggested that designers intended to affect interaction by supporting what people do or persuading them to do it differently. The participatory research process in this chapter suggests that there are varying intensities in the intention of the designers to affect interaction. While support and persuade sit on opposite extremes, designers can also indicate unambiguously what interaction needs to occur and suggest interaction in subtle ways. The doors between the bedroom and the studio indicate that communication is either possible or not. On the other hand, the doors between the studio and the corridor suggest in a more subtle way whether the person working in the studio is willing to establish communication with the rest of the family. In both cases, it was the physical configuration of the objects that permitted such communication. In the bedroom doors, the physical barrier was total and forced when the doors were closed. In the studio-corridor doors, the physical barrier does not stop sound or vision getting through. The barrier is represented by a position of the doors that suggests an idea without forcing it. In a similar approach, the design of the lamp suggests a playful interaction –to look inside– with the intention to surprise, but there is a flexible margin of interpretation as many people may not appreciate such intention and therefore will not be surprised. In this case, an idea is suggested without needing to physically force it.

Interaction between a person and an object seen as a conversation

The concept that interaction can be suggested in subtle ways reinforces the idea that the intention of the designer to elicit surprise through interaction can be seen as the script of a conversation. The designer can have a clear intention for something to happen. Nevertheless, designers can only hope to write the script and put the right elements on the design for such a script to happen. As in any conversation, the conversationalists –in this case an object and the person using it– will interpret the original script and modify it in their own ways. As figure 2.2.15 suggests, the physicality of the object represents the message that the object can contribute to the conversation. In the case of the lamp, the fact that it simulates the shape of common lamps sends the message that we can expect a light bulb inside. A person can enter into a conversation with the lamp and read such a message. The person then sends a message through the action of looking inside. This gives the lamp the opportunity to send the following message: there is no light bulb inside. The person can then interpret the message and think: that is strange, where is the light coming from? It is here where surprise can occur as the appraisal of the interaction.

The participatory research carried out in this section brought up three new strategies to elicit surprise that further clarify what the designers meant by “using magic” in their designs. It also suggested that the intention of the designers to affect interaction through surprise can have varying intensities: support, indicate unambiguously, suggest in subtle ways or intend to persuade. However, this section did not produce any projects that attempted to persuade people to engage in interaction through surprise. The research has not yet studied how such intention is experienced from people's perspective. The designers have so far defined what the expectations of people may be and designed from such assumptions. How can we define the expectations of people? How can we design from such expectations? How does eliciting surprise affect an interaction in which the designers attempt to persuade people? These questions will be addressed in chapter 3 through the design and assessment of a number of objects.

Chapter 2.3

Surprising Through Breaking Cultural Expectations

Introduction

In order to elicit surprise, designs need to break people's expectations. Expectations can be cultural constructs. This chapter reports on a case study in which designers attempted to break expectations from their own cultures by studying other cultures and applying the expectations found into their own designs. Investigating expectations according to personal constructs was the basis of the project.

Chapter 2.1 of this thesis suggested that designers apply their tacit knowledge during the design process. Also, designers carry out experiments without a functional goal in mind and apply the results to a functional project. Such experiments may involve the creation of abstract forms or interactions. This case study uses a similar experimental methodology. A group of designers from New Zealand produced a series of interactions that intended to elicit surprise within their own cultures. Studying differences that the designers perceived between New Zealand and Mexican cultures inspired the interactions. The designers used a constructivist approach to personal constructs to define what their own expectations were and how they perceived the expectations would change in the Mexican context. The personal constructs were defined according to Kelly's theory of personal constructs (Kelly, 1955; Tomico, Karapanos, Levy, Mizutani, & Yamanaka, 2009).

The designs produced in this case study were analysed according to how they relate to the strategies to elicit surprise suggested so far in this thesis. The designers were not aware of the strategies. It will be discussed how some strategies suggested in the research can be applied across cultures, a difference being that the unexpected stimulus that intends to elicit surprise is in this case an observation from a different culture.

Background

Cross-cultural studies in Design

In design, there is still a large area of opportunity for studies that investigate how designers can attempt to elicit surprise through addressing different cultures. The literature includes for example studies that have sought to find universals in the process of emotion elicitation by comparing responses from Japanese and Dutch participants (Desmet, 2004, pp. 111-124). Ekman suggests that there are aspects of the process of emotion that are universal to all cultures, including facial expressions (Ekman, 1994, 2007; Ekman & Keltner, 2003; Ekman & Oster, 1979). However, the stimuli that elicit emotions can vary greatly across cultures. Tomico et al (2009) applied the Repertory Grid technique from a personal constructs perspective to investigate the different perceptions and reactions to designs of pens from Japanese and Dutch participants. None of the aforementioned projects focused on the study of surprise or on how studying other cultures may help designers with their intention to elicit surprise.

Expectations are cultural constructs

This research has explained how, in order to elicit surprise, a stimulus needs to break the expectations people hold about other people, events or objects (Desmet, 2002, p. 117; Frijda, 1986, p. 72; Ludden, 2008; Ludden, Schifferstein, & Hekkert, 2008). The expectations that we create about how things in our world ought to be rely largely on our cultural upbringing (Markus & Kitayama, 2001, pp. 121-122). This study suggests that designers can find differences amongst cultures that can help them with their intention to break expectations and elicit surprise. This section considers how designers can challenge an expectation from one culture by introducing a surprising element from a different culture. A way to investigate how we perceive cultural differences is described by the theory of personal constructs (see for instance Kelly, 1955; Morrison, 1982; Tomico et al., 2009).

Personal constructs theory suggests that people depend on sets of opposite dimensions to interpret behaviour (McDonagh & Webber, 1987, p. 81). Such opposite dimensions can be an understanding of aspects of the world. For instance, several of the designers expressed a preconception of Mexico as “dangerous”, as opposed to New Zealand as “safe”. Personal constructs are context and individual based. For instance, the designers who considered Mexico as “dangerous” also considered some areas of the country as “safe”. Also, while a designer felt “at risk” around a group of individuals in Mexico, she later became “comfortable” around them and even “friendly”.

The theory of personal constructs offers a starting point for studying two different cultures, as the designers can attempt to establish observations from Mexico that are reasonably different from what they expect an activity to be like in New Zealand. How people perform an activity in each culture can be at each extreme of a range of opposites. Therefore, in order to design interactions that intend to elicit surprise, an opposite element may be used from such a range.

The theory of personal constructs was originally suggested by Kelly (1955) and has been widely used by social scientists and also criticised by theoreticians and researchers. One of the main critiques is that the theory of personal constructs is limiting by claiming that our understanding of the world relies solely on opposites (Morrison, 1982, p. 76), given that the complexity of the world is not black and white and includes patterns of interaction between different elements. For instance, Morrison suggests that an opposite of alcoholism could be interpreted as completely forbidding the sale of alcohol in an attempt to address the problems its consumption produces, but this is hardly a solution given the complex relationships between elements that the problem entails (Morrison, 1982, p. 76). Also, the theory of personal constructs has been criticised for its subjective fragmentation of the world, which can lead to an understanding of the world that forces everything to fit within our own personal view (Morrison, 1982, pp. 79-80).

Both issues, the complete reliance on opposites and the purely subjective fragmentation of the world, are addressed in this study. While the designers created lists of semantic opposites, they tried to find relationships between different actors in the topic of their research, rather than only establishing opposite differences between the cultures. Also, their observations go beyond a subjective fragmentation of the world by having interviewed people from both cultures around their topics of investigation. The

interviewees included people performing the activity they observed in Mexico and New Zealand, as well as Mexican students. The interviews represented exploratory conversations with different people for starting the definition of their design concepts.

Methodology

General approach

A group of 15 designers from New Zealand took part in the project. The group included third and fourth year Industrial Design, Digital Media and Architecture students from Victoria University of Wellington (VUW). The designers started the project by establishing starting points about some of their own daily activities and how they expected to carry them out. This involved a series of photographic essays and videos that documented a day in their lives. The designers were given a set of three two-hour lectures about theories of emotion and design, which included short exercises in which the designers were asked to apply the theoretical literature in the design of an object. In particular, the appraisal theory of emotion and the book “Designing Emotions” (Desmet, 2002). The designers were not made aware of the strategies for eliciting surprise suggested in this dissertation as the intention was to find out what strategies they would use when intending to address different cultures.

The designers participated in a fieldtrip to Mexico during which they carried out participatory observations and in-depth documentation of diverse aspects of Mexican culture and daily activities of Mexican people. Back in New Zealand, the designers executed an analysis of their observations through development of personal constructs. The personal constructs were aspects of Mexican culture that they found unexpected and surprising compared to their own culture. The personal constructs were defined according to Kelly (1955) and Tomico et al (2009). Designers used the personal constructs in order to create a scale of semantic opposites in which the activities observed in Mexico would be opposite to the expectations of the designers from New Zealand. The designers used such opposites to design abstract interactions (without a defined functionality) that intended to elicit surprise in people who shared the New

Zealand expectation. Some of the interactions became functional objects, as was the case with the PDA bench. The interactions were built and exhibited at the School of Architecture and Design at VUW, where feedback was gathered from visitors to the exhibition.

The field trip to Mexico lasted three weeks and included the following cities: Mexico City, Querétaro, Guanajuato, Guadalajara and Puerto Vallarta. The group spent three to five days in each city. Part of the trip included tourist type interactions, which explains some of the observations made by the designers. For instance, one designer focused her research on crafts. Nevertheless, the designers also had access to first-hand Mexican culture with locals in several ways. The students worked with other industrial design and architecture students and professors from Mexican Autonomous University of Mexico (UNAM) and Technologic Institute of Superior Studies Monterrey (ITESM) Campus Querétaro through workshops. Students and professors from such institutions suggested some of the topics that the designers investigated. For instance, students from ITESM pointed out the idiosyncratic way to park cars in Mexico. Such interactions helped them to have closer contact with some aspects of Mexican culture. Three of the designers had a basic understanding of Spanish. Most of their interactions with Mexican people occurred in English.

Initial expectations from New Zealand

The study followed two approaches. The first approach involved defining specific expectations around a daily activity in the original culture, in this case New Zealand, and then attempting to find unexpected and surprising elements about the same activity in the second culture, Mexico. The second approach involved looking for a surprising aspect of life in Mexico, and then defining what the original expectation was from New Zealand. The surprising elements were then used to suggest interactions with the intention to elicit surprise in the original culture based on what was found and observed during the fieldtrip.

Before the fieldtrip to Mexico, designers were asked to produce a video clip that expressed a day in their lives. The clips lasted between one-three minutes. The intention was to have a datum that the designers could come back to after the fieldtrip to Mexico.

If their assumptions of a specific aspect of life had changed, they may find the video clips useful to remember what that aspect was like for them. This could be a big task, as it was reasonable to expect that the aspects that designers found interesting in Mexico would not exist in their daily lives in New Zealand.

The clips included aspects such as waking up, having a shower, having breakfast, walking to school, meeting with friends, cooking dinner and going to sleep. It was later found that indeed some of the designers had addressed the same activity in their videos that they ended up investigating during the trip in Mexico. These included parking cars, personal displays of affection and dancing among others.

Data gathering in Mexico

The designers carried out observations based mainly on the ethnographic approach within design as described by Plowman (2003, pp. 30-38). The designers participated in workshops with Mexican students at two universities. The workshops involved focus groups in which the designers expressed their observations of Mexican culture and discussed them with their Mexican peers.

The designers documented their experience and observations in Mexico through video, photographs, journals and sketches. They used such material to start sketching design concepts during the fieldtrip in Mexico. The activity of designing during the fieldtrip was intended to help them investigate what other issues around the topic they may need to investigate in order to further develop their design concepts.

Analysis of observations from the trip to Mexico: Personal constructs and semantic opposites

The designers were required to write a report about their observations in Mexico. While the designers were not trained social scientists and their observations lacked stringent scientific rigour, it was intended that the reports would represent more than a “travelog” as described by Dann (1992, pp. 59-60). Dann suggests that travelogs are “impressionistic and evaluative post-trip... account[s] of one or more destination areas”

(Dann, 1992, p. 59). The report in this study intended to avoid some of the common shortfalls of travelogs, such as denigration of locals (Dann, 1992, p. 60). Instead, the report intended to be a tool for the management of unfamiliarity from a perspective of a visitor who, as Cohen puts it, “wished to savor the life of the destination people” (in Dann, 1992, p. 60). The observations and the reports should be seen as the raw material for the designers to construct a personal interpretation of the unfamiliarity experienced overseas that could later be used for designing.

Results

Observations from Mexico and tables of opposites

The following tables (2.3.1 to 2.3.5) describe five of the projects carried out during the case study. It presents how the designers created personal constructs about specific aspects of Mexican culture that they found surprising and how they compared them to their own expectations from New Zealand. The rest of the projects are not presented because they were either not completed by the designers or the observations about Mexican culture were unclear.

Topic: Dancing	
By Rebecca Gordon	
Initial expectations from New Zealand	Aspects that elicited surprise in Mexico

Individual dancing is more common	Dancing with a partner is more common
The individual defines his or her own movements	Male leads and manipulates the female's movements
No touching involved	Touching is required
If there is touching it represents intimacy	Different ways of touching define level of intimacy. There can be touching with complete strangers and represent no intimacy
If there is touching it represents flirtation	Touching and dancing can be completely flirtation-free

Table 2.3.1. Observation of opposites in the activity of dancing.

Topic: Public displays of affection	
By Ally Probert	
Initial expectations from New Zealand	Aspects that elicited surprise in Mexico

Public displays of affection are very limited and not physical	Public displays of affection are very physical and common
Society may take offence at public displays of affection	Society accepts public displays of affection and there are spaces such as parks and objects such as benches where people expect public displays of affection to occur
People feel uncomfortable experiencing and seeing public displays of affection	People feel comfortable experiencing and seeing public displays of affection
People may experience guilt when experiencing public displays of affection	People seem to be at ease and look for public displays of affection

Table 2.3.2. Observation of opposites in the activity of displaying affection in public.

Topic: Sense of public safety	
By Kerryn Little	
Initial expectations from New Zealand	Aspects that elicited surprise in Mexico

There is a general sense of safety when walking in the city	There is a general sense of risk when walking in the city
People often leave their belongings unattended in public	People always have their belongings next to them
Females wear more revealing clothes in public	Females wear non-revealing clothes
Males very rarely verbally abuse females in public	Caucasian female tourists with revealing clothes are prone to verbal abuse by males
People very rarely create friendships with strangers in the street	Verbal abuse can become friendly greetings by the same group of males
People's attitude in public is relaxed, as they feel safe	As a female tourist, I sometimes felt defensive as I found threats in the environment, such as verbal abuse and potential pick pocketing
Society is more pragmatic and less focused on religion. Religion does not make a big difference about how safe people feel in public.	There is a great respect for religious symbols, in particular towards the Virgen of Guadalupe and people feel safe around religious images.

Table 2.3.3. Observation of opposites in the activity of a sense of public safety.

Topic: The culture of purchasing interactions	
By Rachel Parker	
Initial expectations from New Zealand	Aspects that elicited surprise in Mexico

Goods are most often offered in shops	Goods can be offered in the street
Prices for goods are fixed	Prices for goods can be bargained. The seller normally starts offering the goods for a price higher than expected to sell
I feel uncomfortable to bargain	Bargaining is expected
There can be some, but limited, human contact when buying goods	Bargaining is an activity that highly increases human contact: it encourages friendly and polite interaction and may end up in friendships

Table 2.3.4. Observation of opposites in the activity of purchasing goods.

Topic: Car parking	
By Tania Robertson	
Initial expectations from New Zealand	Aspects that elicited surprise in Mexico

Rules about parking are clear and enforced	Rules about parking depend on context and people offer to look after your car
People trust parking lots	People who offer to look after your car, <i>franeleros</i> , expect to be paid a tip. If they are not paid, they are likely to damage your car
Only official signs are used to mark parking and reserved spaces	People use objects such as buckets and bricks to reserve parking spaces
People don't help each other park their cars	Strangers help each other park their cars through established codes that include whistling and rhythmically hitting the car to indicate stop or go

Table 2.3.5. Observation of opposites in the activity of parking cars.

Design of Interactions that Intend to Elicit Surprise

Designers used the sketches produced during the fieldtrip in Mexico to further refine and produce a prototype of their designs over a period of four weeks back in New Zealand. The process involved further sketching, sketch models, scale models, and a final functional prototype. The following paragraphs explain five designs produced in the study.

“In between us” by Rebecca Gordon

“In between us” is an object (figure 2.3.1) that intends to express the different approaches to dancing between Mexico and New Zealand. The object consists of a body-height panel with hundreds of squares that are connected to both sides of the panel through rods that slide back and forward. If a person pushes her body from one side, the shape of her body is copied and felt on the other side, similar to a “pin art” board.

Figure 2.3.1 “In between us” is an object that intends to elicit surprise through reacting to the dancing movements of each person.

The object attempts to elicit surprise in both cultures. In the New Zealand context, where physical contact is *not* expected, the installation intends to surprise by offering the couple a way to feel each other's body and movements through a physical interface that works as a connection. In the Mexican context, where physical contact *is* expected, the object intends to surprise the couple by offering a way to keep both bodies separate through a physical interface that works as a barrier. From both perspectives, the object works as an interface that expresses and highlights approaches to dance from the other culture.

This design relates to some of the strategies to elicit surprise suggested in this dissertation. It offers unexpected movement through the sliding of the rods that communicates movement from one person to the other. It conceals expected elements by not allowing full view of the dancing partner. It addresses idiosyncratic behaviour by being based on observations of activities from both cultures. The design also affects interaction: it constrains interaction by stopping direct physical contact between the couple.

“PDA” bench by Ally Probert

This bench (figures 2.3.2-2.3.4) intends to address the different ways to engage in public displays of affection (PDA) in Mexico and New Zealand. It is directed towards a New Zealand audience that normally refrains from displaying affection in public through physical contact (figure 2.3.3). It brings in the close proximity and contact that Mexican couples perform. The bench is made out of slats of wood. The central slats sit on an elastic band that makes the bench curve when a couple sits on the centre of the bench. Such curvature forces the couple to fall in and sit closer and their bodies to touch (figure 2.3.4). The result is a position more common in Mexico in which couples have a leg on the lap of the other person.

The strategies for eliciting surprise that this design relates to include addressing idiosyncratic behaviour. As in the previous example, it does so by addressing activities observed in both cultures. The design offers unexpected movement through the slats that collapse and bring the couple together. Such movement means that the design also affects interaction by intending to encourage New Zealand couples to be more intimate by forcing them to be physically closer together.

Figure 2.3.2 Initial concept of the “PDA bench”, which is an object that intends to elicit surprise through bringing New Zealand couples physically closer together.

Figure 2.3.3. Dramatisation of the New Zealand way to use a bench. The couple sits apart and no physical contact occurs.

Figure 2.3.4. The “PDA bench” surprises New Zealand couples by bringing them physically closer together.

Garment “Protect me Lupita”

“Protect me Lupita” (figure 2.3.5) is a garment closer to wearable arts than to a more pragmatic piece of clothing. It addresses the observation that females sometimes need physical protection from male harassment in Mexico, for instance in congested subway stations. The garment intends to surprise potential harassers by suggesting that the person wearing it is protected through the spikes of the garment. It reinforces the message by holding visual commonalities with the Virgen of Guadalupe (*Lupita*), a highly respected figure in Mexico.

This design relates to the strategy for eliciting surprise of “how I emotionally experience the world” as the inspiration came from the personal emotional experience of the designer. She intends to surprise by using archetypes in unexpected contexts. In this case, the designer uses visual elements from the icon of Lupita in order to give the message that respect should be given. This design uses observations of idiosyncratic behaviour as the concept came from observations of different cultures. The design affects interaction by being an aggressive item that would hurt potential attackers if they get too close to the wearer.

Figure 2.3.5. “Protect me Lupita” is a garment that protects the wearer through its aggressive physicality and its visual reference to the Virgen of Guadalupe (Lupita).

Bargaining interaction “Lo menos?”

“Lo menos?” (“Is that your best price?”) is an interaction-object (figure 2.3.6) that reflects the balance that both seller and buyer intend to achieve when haggling. The object intends to surprise New Zealanders by introducing the all-common haggling in the street with hawkers from Mexico. The participants need to respond to each other’s movements and try to find a balance: the final price.

The design relates mainly to three strategies to elicit surprise suggested in this research. It finds inspiration from an observation of the designer’s personal experience and in particular how she emotionally experienced the world, in this case hawkers offering her goods in the street and the initial discomfort at their insistence. The designer uses unexpected movement in her object. Finally, there is again an understanding of idiosyncratic behaviour as observed in a different culture.

Figure 2.3.6. “Lo menos” is an interaction that intends to surprise by getting people to agree through their movements and interaction.

Installation “Viene, viene”

“Viene, viene” (come, come) is a set of installations (figures 2.3.7-2.3.10) that intend to surprise a New Zealand audience by incorporating elements and representations of Mexican ways to park cars in the street. “Viene, viene” is the common saying in Mexico that a person uses when helping a driver to park a car. The person gives directions and indicates whether obstacles such as other cars are too close. One of the installations uses such indications and brings in a similar element from a different context: aviation

(figure 2.3.7). The installation involved a person helping people in the street park their cars through the use of flags similar to those used by workers on the ground in airports indicating to pilots where to move the plane.

Figure 2.3.7. This installation used elements from aviation to help people park their cars in the street.

Two installations addressed the idea that people in Mexico can “save” a parking space for future use by putting objects such as buckets on the street. One of the installations (figure 2.3.8) uses an unexpected element, a dinning table with cutlery, wine, glasses and so on, to save the space and surprise people who were trying to park.

Figure 2.3.8. This installation used unexpected elements, a dining table, to save a parking space and to intend to elicit surprise.

Often, it is family members or friends who save parking spaces for each other. Another installation (figure 2.3.9) used such observation and “saved” parking spaces by using wrapping paper and a giant ribbon, so that the parking space was then offered as a present to a friend (figure 2.3.10).

Figure 2.3.9. This installation used unexpected elements, wrapping paper and a bow, to save a parking space for a friend.

Figure 2.3.10. The parking space is then offered to a friend as a present.

The main strategies used in this project include addressing idiosyncratic behaviour and using archetypes in different contexts; for instance, by using the archetype of a wrapped present or a dining table in a parking space context.

Discussion

Individual and contextual observations

The observations about Mexican everyday activities made by the designers should be considered individual and pertaining to specific contexts. The research does not suggest that the observations are universal and apply to all Mexican people, nor does it suggest that all New Zealanders would react as expected. The projects presented here represent an individual observation and personal construct by each of the designers that were then constructed according to further observation, interviews and discussion. The designs also represent an individual attempt to elicit surprise in people who would share the original expectation that the designer had about that specific activity.

The social science value of the project

It should be clarified that the project made use of some ethnographic tools to gather information about Mexican activities that could be used for designing. A social science description of Mexican culture was not the goal and the designers did not possess social science skills. Some of the observations made by the designers could even be considered superficial or based on stereotypes. For instance, the PDA Bench project speaks about how common personal displays of affection are in Mexico. This is something that can readily be seen in the main squares of Mexican cities. However, it does not describe the context. For instance, it could have discussed how the family structure in Mexico means that young adults live with their parents often until well into their 30s and often until they get married. This means that couples may lack a more private space for intimate contact. In most of the projects, there were crucial factors behind the behaviour observed that were not studied or further discussed. Some of the projects did involve more thorough research. For instance, the installations regarding parking spaces discuss and explore different situations in which parking a car involves relationships between different people (a person saving a space, people looking for a space, strangers helping each other, authorities, official signs). The depth of investigation depended on each of

the projects, but the main goal was always to identify a factor from Mexico that could elicit surprise in a New Zealand context.

Strategies for eliciting surprise

All of the designers found at least a few activities during the trip to Mexico that they not only found interesting, unexpected and surprising, but that also represented raw material for starting and defining a design project. During the design process, it was more a matter of which observation to use, given that the designers had several observations and concepts that had potential to be developed into interactions.

The strategy of observing idiosyncratic behaviour seems to have appeared in all of the projects as they were all based on an observation of a different culture. In chapters 2.1 and 2.2 of this dissertation, observing idiosyncratic behaviour was suggested as a way to propose objects that address those little activities in life that existing objects do not address. The results from this research are different as the designs address issues that are altogether unfamiliar to the target audience, rather than small issues that people will be familiar with. For instance, the sofa designed in chapter 2.2 addresses the idiosyncratic behaviour of sliding down the sofa while watching television. It is expected that the person interacting with the sofa is aware of the anticipated action, they know they slide down in the couch, and the sense of surprise happens because the person realises that an idiosyncratic behaviour is actually supported by the object.

The designs in this case study represent a different way to address idiosyncratic behaviour. It can be considered idiosyncratic behaviour because the observations that the designers made represent very particular activities that are currently not addressed by any products. However, in the case of bringing elements from other cultures, the target audience is not aware of such idiosyncratic activity. The sense of surprise came from seeing something they are used to addressed in a very different way by the object. For instance, many New Zealanders would be very surprised to see their bench collapse and bring them closer to their partner. This is an action they are not used to. However, the same action might be seen as an actual and recognisably idiosyncratic behaviour by a Mexican couple, as they would be used to being very close to each other.

This suggests that the strategy “addressing idiosyncratic behaviour” involves two separate strategies. The first strategy as suggested in chapter 2.1 can be proposed as “addressing recognisable idiosyncratic behaviour”. “Recognisable”, refers to an action that the people perform and would recognise that the object supports it. The second strategy is “addressing idiosyncratic behaviour using elements from a different culture”. With “different culture”, the research refers to any attitudes, values, goals or actions outside of the person’s normal life. This means the idiosyncratic behaviour could be found within the person’s own country, but stemming from a culture that the person does not directly relate to. For instance, there may be idiosyncratic behaviours from skaters in New Zealand that would elicit surprise if they were applied to objects for a rest home for the elderly.

It is interesting to note that several designers suggested observations that represented a strong emotional experience for them while in Mexico. The study suggests that working with personal constructs was a valuable method to use in order to analyse personal and emotional experiences of the designers during the fieldtrip. These include the PDA bench, as the designer felt initially uncomfortable at watching couples in public, but then she longed for having such freedom in New Zealand. Also, the Lupita project started from discomfort at comments from a group of males at the designer outside her hotel, but within a few days they had become her friends. With this in mind, it seems it was difficult for the designers to separate the strategy of “addressing how I emotionally experience the world” from “addressing idiosyncratic behaviour from another culture”. Perhaps a downfall of using personal constructs is that the designers assumed that they had to find radically opposite differences between both cultures, which may have encouraged them to define cultural differences as “good” or “bad”. Contrary to this, the goal of the research was to find differences that could elicit surprise in a positive way, and not to provide a moral judgement. Being part of this study clearly affected the designers’ view of a culture different to theirs. They became more tolerant and accepting of difference. So much so, that they used observations, from what in some cases were negative experiences, and converted them into objects that intend to elicit beautiful and surprising experiences.

Section 3

How Surprising Designs Affect People

Section 3 investigates how surprise affects what people do. In particular, it studies the role of surprise in persuasion. It includes two case studies. The first case study is reported in chapter 3.1, which involves the design of a number of mousetraps that attempted to encourage people to use them for trapping mice. The chapter suggests that surprise can be used as a threat-detecting mechanism when it is necessary to discourage people to engage in an activity. Surprise can also be used as a sense-making process for grabbing people's attention and delivering a persuasive message. It is suggested that it may be better to avoid surprising people in undesirable situations.

The second case study investigates the balance of familiarity and surprise when introducing radical concepts and is reported through chapter 3.2. The chapter suggests that there needs to be a balance between familiarity and surprise for people to be willing to adopt radical concepts.

Chapter 3.1

The Role of Surprise When Attempting to Persuade People

Introduction

There are situations in which designers are required to encourage people to engage in specific activities or interactions. For instance, people may want to achieve a goal, such as lose weight, save resources or trap a mouse, but they may need some encouragement to do so. This section reports on two projects that involve an element of persuasion through design and surprise. The first project involves the design of mousetraps that intend to encourage people to engage in the activity of trapping mice. The second project involves the design of appliances that intend to encourage people to save natural resources. The research suggests that surprise can play different roles in encouraging interaction. On the one hand, pleasant surprise can increase the level of attention people pay to an object as the experience of surprise induces a sense-making process. This can be useful for introducing a new interaction or a message that encourages saving resources. Nevertheless, it was found that in undesirable situations, such as using a mousetrap, it was helpful to reduce the sense of surprise in order to encourage people to perform the activity. This may be due to surprise acting as a threat-detecting mechanism that elicits a withdrawal type of behaviour. Finally, this section suggests that there needs to be a balance between how surprising new designs are, and how familiar people feel towards new designs in order for people to be willing to adopt them.

This study investigates the relationship between surprise and persuasion. A number of designs of mousetraps were tested to assess the emotional response of people, including surprise, and how willing people were to use the mousetrap in the future. The concepts of “mental images” and “emotional feedback” were studied as important aspects to address when designing persuasive products. Mental images are the images that people picture in their minds about themselves performing an activity in the future. Emotional feedback is a response built into the design of the object that attempts to elicit an emotional response in people at a specific point of the interaction person-object. New designs that address mental images and incorporate emotional feedback were developed and compared to current products, by testing them on participants. Mental images were assessed before and after performing the tasks of setting up, checking and disposing of a mousetrap, with an emphasis on the accompanying emotion. This study suggests that

mental images can be studied as part of the expectations of people, and that addressing them can help designers with the development of products. Mental images differ from the expectations of people in that the mental images are everything that people imagine about an interaction, while people do not always expect all of those images to actually occur. The study found that studying the mental images gave the designers observations that were valuable for designing and that were not part of the actual expectations of people. The study suggests that the traps that were most successful at persuading people to use them were the ones in which the lowest intensity of emotion was reported. Also, the study suggests that the lower the level of surprise people reported towards the task with each trap, the more willing they were to use that trap if they found the situation undesirable; unless surprise was accompanied by other pleasant emotions, in which case participants were more willing to use it. This study suggests that if people found the situation undesirable, they preferred traps that failed to elicit strong emotions in them, in particular surprise. On the other hand, if people did not find the situation undesirable, the increased report of surprise also increased their willingness to use the traps. A final design iteration – following an opposite sampling approach – developed a mousetrap that elicited surprise in this undesirable situation and also elicited pleasant emotions and a willingness to use it by participants. Nevertheless, the final trap divided the responses dramatically among a group of people that shared the same expectations, which suggests that there were subsets of expectations that were important for the design team to consider. As the research studies the relationship between an emotion – surprise – and behaviour in the form of interaction, this study further discusses the relationship between emotion and behaviour as a feedback mechanism.

Background

Design and persuasion

The use of persuasion carries ethical implications. For instance, who has the right to persuade people to engage in a particular behaviour? This is especially true when the person being persuaded does not desire to perform that behaviour. Some authorities claim the right to encourage, or even force behaviour. Examples of this can be seen in a

society's laws, or with parents deciding what is best for their children. In these cases, the decisions are often made with the overall well-being of the society, or family, in mind.

On the other hand, there are people who desire to achieve certain goals, but cannot find the encouragement to do so. Weight loss and fitness are strong examples in contemporary Western society. There are also smaller tasks in our everyday lives that we know should be carried out, but require a big effort to do them. Why is sorting out the recycling so hard for many of us? Why is setting up and getting rid of a mousetrap so daunting for some people?

This study suggests that designers can address people's expectations about a situation so as to design products that elicit surprise and offer people encouragement to carry out an activity. In order to elicit surprise, an object needs to break what people expect that object to be like. Designers can address what people expect from a product by studying people's "mental images". Mental images refer to all the images we create in our minds, a mix of imagination, expectation and experience about activities that we perform. This can be an image about a past experience, or an image about a potential future experience. The relevance of the concept of mental images for this research is that they are connected to surprise as mental images seem to be always related to emotion and that they involve people's expectations (Damasio, 2000, 2003). For instance, consider the event of needing to get rid of a mouse. Even before buying a mousetrap or poison, we are busy creating an image of ourselves setting it up in dark parts of the house, and having to deal with a dead animal that might be bleeding, bloated, smelly, or not quite dead. This image of a potential behaviour may be accompanied by emotions of anxiety, fear and disgust. If the mental image is strong enough, we will probably do our best to avoid engaging in the behaviour that might bring the image to fruition.

However, there are two important points that may change this account. The negative image that we create in our minds might not relate to the real outcome of engaging in the required task. For instance, we might create an image of exercising as overwhelming, but we might actually enjoy it once we do it. Secondly, there may be external stimuli that reinforce the negative image, and there may also be stimuli that lessen it. For instance, what if the mousetrap helps us avoid all the fears we have about dead mice by offering us a pleasant, or at least less unpleasant, actual experience of the activity?

If we create a positive mental image of a future activity, or lessen the negative one, we may expect the chances of the desired behaviour to increase. This may be done in several ways. For instance, if the actual outcome of performing the task does not relate to the negative mental image, making this “visible” to the user may lessen the negative image.

The ultimate goal of persuasion is to convince people to make a decision or engage in an action with a desired outcome. Designers who intend to persuade need to understand the decision-making process. The following paragraphs discuss the role of mental images and emotion in the decision-making process, in particular through the way in which emotion may affect behaviour. This will help investigate how surprise may affect interaction when intending to persuade. It is discussed how making a decision is not only a rational process, but one in which emotion plays an important factor. In particular, it is considered how the expectations of people affect the decision-making process and elicit surprise.

Mental images

Our expectations are formed by our memories of past experiences. It would be overwhelming to store in detail every stimulus and experience we encounter during our lives, including sounds, images and tastes. Damasio (2000) suggests that when we recall memories, we experience attempts at replicating stored patterns of reality (p.100) through images. Damasio emphasises how important such images are for decision-making, which is essential when addressing persuasion: “the factual knowledge required for reasoning and decision making comes to the mind in the form of images” (Damasio, 2000, p. 96). Such images can be present or recalled, but are always connected in the early cortices to an emotion. If a person looks around, and focuses her attention on a lamp and the patterns that it makes on the wall, or touches and enjoys the texture of a mobile phone, her brain is processing “perceptual images”. Perceptual images are created through a bottom-up process in a “body loop”, which is a loop that receives information from the body (Damasio, 2000, p. 96).

By looking at the shadows a lamp creates, a person’s thoughts may flow on to remember the texture of a landscape, or she may picture herself interacting with the

lamp on specific occasions, such as when entertaining or reading. She pictures herself performing activities and experiencing the sensations such behaviour and events would bring. These pictures are “recalled mental images”. Recalled mental images are created through a top-bottom process in an “as if loop”, in which the recreation of a mental image and its accompanying emotion occurs purely from thought processes and physical perception through the senses is not involved (Damasio, 2000, pp. 96-97).

Objects hold the potential to elicit emotion in both loops. Consider a person setting up a mousetrap. The moment she needs to dispose of the trap with a dead mouse inside, she may feel disgust. She may prefer to avoid the experience altogether. This would be a body loop in which the interaction with the trap is producing actual changes in the body that result in the emotion of disgust. On the other hand, if she describes the way she had to deal with a dead mouse to her friend, she may describe the feeling of disgust and recreate a mental image that represents an as if loop.

In the example of the mousetrap, the potential interaction may produce a negative mental image in the user. What if the trap attempts to reduce the strength of the negative mental image and therefore intends to persuade people to use the trap? For instance, the trap could reduce the physical closeness to the mouse and the direct sight of the corpse in order to attempt to reduce the negative reaction of the body loop. It could also try to bring a more pleasant message through the trap attempting to produce a pleasant as if loop. This could assist in creating the situation for a more pleasant experience and hopefully for affecting the decision-making process when attempting to persuade people to use the trap.

Emotional feedback

The appraisal theory says that if a stimulus is appraised to satisfy the concerns of a person, then the person is likely to experience a pleasant emotion and therefore an approach type of behaviour (see for instance Demir, Desmet, & Hekkert, 2009; Frijda, 1993; Roseman, 1996; Smith & Lazarus, 2001). If the stimulus is appraised not to satisfy people’s concerns and expectations, then unpleasant emotions and a withdrawal kind of behaviour can be expected. While an interpretation of the appraisal theory can be that emotion can have a direct effect on behaviour, research suggests a view of emotion as a

feedback mechanism (Baumeister, Vohs, DeWall, & Zhang, 2007) rather than a causal system. The feedback mechanism theory suggests that our decision-making process steers our behaviour towards those activities to which we relate desired emotional states, rather than the emotions steering our behaviour. For instance, if I experience joy when interacting with a mobile phone, I will be more likely to steer my behaviour towards interacting with the mobile phone that produces such joy. The view of interaction as a conversation as discussed in chapter 2.2 (figure 2.2.15) can support such a view. The conversation needs to start with an interaction between the person and the object, even if the interaction only involves the person looking at the object. This produces an emotion –for instance pleasant surprise– and then another interaction can take place, which results in another emotion. This can be seen as a feedback mechanism, in which the messages from person to object, and vice-versa, are read and interpreted over and over.

Interaction between an object and a person seen as a conversation: A feedback system of emotion and behaviour

Figure 2.2.15. Interaction seen as a conversation between the person and the object.

Regarding the role of emotion in persuasion, it has been suggested that “emotions exert a powerful influence on behaviour” (Lowenstein, Weber, Hsee, & Welch, 2001, p. 272),

that emotions are dispositions to act in specific ways (Booth & Pennebaker, 2000, p. 560; Solomon, 1976, 2000) and that emotions are processes that involve action control (Frijda, 1986, p. 63). However, there are several arguments against the idea of emotion as a direct cause of behaviour. Baumeister et al carried out an extensive review of the empirical evidence available that relates emotion to behaviour (Baumeister et al., 2007). They suggest that “much behaviour is emotion regulating, insofar as it attempts to bring about a desired emotional state later on” (Baumeister et al., 2007, p. 173). From this perspective, emotion does not necessarily affect behaviour in a causal way. The relationship between emotion and behaviour is indirect. Emotion is seen as a feedback mechanism that contributes to updating a process of if-then rules.

The if-then rules theory elaborated by Gullitzer (in Baumeister et al., 2007, p. 173) suggests that we have patterns of contingencies. Our actions are dependent on if-then rules that we create throughout our lives. For instance, “if tomorrow is a nice day, I will go for a run”, or “if your parents visit us today, we will use the new teapot”. Emotions give us feedback as to how the action turned out, and they either reinforce the stored pattern (if we experience a pleasant emotion), or modify it (if we experience an unpleasant emotion).

Baumeister et al mention that many emotions do not cause behaviour. For instance, people may experience a broad range of emotions while watching a movie, without moving from their seats for two hours (Baumeister et al., 2007, p. 179). In design, a product may make us feel frustrated every time we use it, but we may keep using it. However, according to the feedback theory, every time we feel frustrated with the object, there is a left over feeling of frustration that eventually will influence our behaviour, perhaps towards buying a different brand next time.

Another argument against a causal effect of emotion on behaviour is that when emotion does influence behaviour, the consequences may be negative. For instance, if we feel too angry we may enter into situations that risk our lives. This is an untenable view of emotion from an evolutionary perspective, as a process that brings up negative consequences would have been disfavoured.

The feedback mechanism theory separates automatic responses that affect behaviour more directly, with slower acting ones that serve the main purpose of assessing patterns of behaviour. The experience of guilt offers an example for the slower acting responses.

If I upset a friend, and then feel guilty, the sense of guilt will help my cognitive system reassess my behaviour, and will correlate an unpleasant emotion to that type of behaviour. When a similar situation arises, I am likely to experience a twinge of guilt, and then my behaviour may be corrected.

The feedback mechanism theory suggests that the expectation of the emotion may be more important than the emotion itself. Emotion gives clear feedback about one's behaviour, but the “function of this feedback is mainly to help the person learn a lesson and leave a strong affective cue that may guide future behaviour” (Baumeister et al., 2007, p. 174). If the role of emotion is to help people learn lessons and leave affective cues, how does that affect the role of emotion, and in particular surprise, in persuasion?

Surprise and persuasion

Research suggests that surprise serves as a mechanism for detecting threats and that the mechanism initially searches for a threat-related stimulus (Schutzwohl & Borgstedt, 2005, p. 583). From this perspective, surprise may effect persuasion in design if the person experiencing surprise from the interaction with an object detects a threat in the object. In this scenario, we could expect people to withdraw from the object if they recognise it as a threat. Persuasion may work here as a way to detract people from performing an activity.

The role of surprise as only a threat-detecting stimulus has been questioned. In particular, it has been suggested that surprise facilitates a sense-making process (Müller & Stahlberg, 2007; Pezzo, 2003). A sense-making process can be useful when people's concentration on an item is required. Surprise can facilitate such focused concentration. This view is in line with the lamp outlined in section 3.1 as explained above (figure 3.23). The lamp elicits surprise by concealing the light bulb in between a sheet of metal and a sheet of plastic. Concealing the expected light bulb elicits a sense-making process, as people wonder where the light comes from. Under this perspective, surprise may be useful in persuasion if it serves as an initial introduction that brings attention to the stimulus so that a persuasive message can be communicated.

Surprise has also been related to hindsight bias, which is the “almost ubiquitous tendency of people to falsely believe that they would have correctly predicted the

outcome of an event once the outcome is known” (Müller & Stahlberg, 2007, p. 168). It can be described by the phrase: “I knew it all along”. It has been shown that more often people would not have guessed the outcome. The higher the sense of surprise, the stronger the hindsight bias reaction is. Nevertheless, there seems to be a tipping point at which a very strong sense of surprise affects hindsight bias in a diametrically opposite way, switching the response to an “I would have never guessed it” kind of reaction. This effect may explain in part the “one-liner” idea in design, in which some objects that elicit surprise are disregarded as a one-off interaction, as they do not offer further value once the surprising mechanism is understood (Fox-Derwin, 2011). If the surprise is not meaningful or strong enough, people may disregard it as “I knew it all along”. However, if the surprise is strong enough, or the mechanism to achieve it is meaningful enough, there may be a “I would have never guessed it” kind of reaction.

Elements of surprise are its high level of arousal and its double valence of either pleasantness or unpleasantness. It has been suggested that “pleasantness” can influence persuasion (Mano, 1997) and decision-making (Mano, 1992, 1994) by the pleasant mood working as an information mechanism, that is, the information mechanism delivers a message to the person. From this perspective, designing objects that induce pleasant surprise towards an interaction could persuade people to engage in such interaction by offering an information mechanism. This concept is in line with the idea that surprise elicits a sense-making response, as the surprised person looks for information: if the information results in a pleasant mood, persuasion is more likely to occur. Therefore, designs can intend to elicit pleasant surprise *and* offer the necessary information to people in order to engage them in the desired interaction.

In summary, the hypotheses for this study are that *a) unpleasant surprise may be used as a threat-detecting process that deters people from an interaction; while b) pleasant surprise can work as a trigger for a sense-making process that uses the interest created towards the object to offer information with the goal of persuading.* These two issues, according to the feedback mechanism theory of emotion’s effect on behaviour, could be translated into giving negative feedback (suggesting a threat) and positive emotional feedback (inducing pleasant moods for sense-making) through the design of objects. The hypothesis will be assessed by designing mousetraps that intend to persuade people to engage in the activity of trapping mice. The mousetraps will be then tested with participants. It will be assessed how the participants’ expectations and emotional responses towards using the traps

affect their willingness to use them in the future. What a threat that elicits unpleasant surprise or a stimulus that elicits pleasant surprise can be should be defined according to what the expectations of the people interacting with the objects are.

Tools to transcribe behaviour and to script the intention of the designer to affect behaviour

This research suggests that designers can write down how they hope the interaction between a person and an object will be like. This can be done through a music-like script. Such a script will be used in this case study's methodology. Love highlights that one of Damasio's research methods for identifying "the essential observable metrics of core consciousness used an ongoing behavioural music-like score comprising parallel performances in the dimensions of verbal report, specific actions, specific emotions, focused attention, low-level attention, background emotion and wakefulness" (Love, 2003, p. 8). Love does not elaborate on the ways in which such methods may be extrapolated to design research.. An initial music-like score of the intention of the designer to affect behaviour through emotion was suggested in chapter 2.2. The same tool will be used for scripting how the designers hope that people will interact with the new designs.

Case Study: Designing Mousetraps Attempting to Persuade

The case study in this chapter attempted to test the potential of studying people's mental images with the intention to elicit surprise and persuade. A specific task to be encouraged was selected and stimuli around it were changed in order to strengthen or weaken the mental image and to provide emotional feedback. It is hypothesised that addressing mental images through emotional feedback can help designers approach projects in which they intend to elicit surprise and persuade. Attempting to encourage people to use a mousetrap tested this.

Methodology

I , .T .E .T , .A .T .F , .C .T .N Z .A D C , (DOC, 2006). G , .

Original mental images

T ,5 5 , 21-33 , .T S A D ,V U W , .T . *expect* .T , : , , .T .

The initial interview was semi-structured and open, as opposed to using a questionnaire, because it is assumed that the mental images of each person were different, and it was desired to collect as much different data as possible at this stage. A number of common mental images were identified from the interviews by constructing memos following a Situational Analysis approach (Clarke, 2003, 2005). Some common emotions were also identified.

In the second step, the participants were asked to set up, check and dispose of a mousetrap. The study was carried out at the School of Design facilities. The participants had to set up the trap in the kitchen of an office setting. The trap used for the initial assessment was a plastic trap found in a local supermarket (figure 3.1.1). The sessions were video-recorded. A rubber mouse was used to simulate having trapped a real one.

Figure 3.1.1. Existing trap sourced from a local supermarket and used as a control group for testing the design of new mousetraps.

The report of emotion was first recorded using the Feeling Out Loud (FOL) technique. FOL is a variation of the Talking Out Loud (TOL) tool (Van Den Haak, De Jong, & Schellens, 2003; Dumas & Redish, 1999, pp. 273-280; Gould, Marcus, & Chavan, 2006) and helps researchers recognise the emotions a person experiences while performing a task (Rodríguez Ramírez, 2006). As opposed to TOL in which participants are supposed to verbally describe the task they are performing while they perform it, FOL asks participants to focus on verbally expressing the emotions that they experience during the task. This requires some training, but most users become comfortable with it after a couple of attempts at using it, similar to TOL sessions (Gould et al., 2006).

Furthermore, TOL has also been suggested as an effective tool for retrospective reporting, in which users watch a recording of the performed task and talk about the

problems they faced and suggests solutions that the design team can consider for implementation (Van Den Haak, et al., 2003). This study also involved retrospective reporting while participants watched videos of their interaction with the mousetraps.

Other tools to assess emotion were discarded for this case study as tools that are based on physical responses to stimuli do not define specific emotions with accuracy and are still at a “nascent stage” (Ekman & Keltner, 2003, p. 414). Some other tools require participants to write down their feelings, or stare at a screen and interact with a computer in order to record the emotion they experience. An example of this is Premo, which is software that displays animations expressing different emotions. Premo is designed to assess the emotional response of users to the appearance of products (Desmet, 2002). FOL has the advantage of allowing participants to express their feelings without needing to stop the task. This makes it suitable for the assessment of interactions in which as little disturbance as possible is desired. It has been suggested that TOL is a non-intrusive tool, even if participants need to carry out a task such as talking, which is not normally included in their activities, as long as participants are given the chance to practice before the actual task is carried out (Van Den Haak et al., 2003). Two short training tests were performed in order to make people comfortable and practised with the technique. The practice tests were unrelated to the actual task under study.

The Geneva Emotion Wheel (GEW, figure 3.1.2) was used at the end of each task in order to gather more detailed information about the emotions people reported. FOL offered open information that people felt they could mention while performing the task, but such freedom of reporting means that there may be emotions people could have reported but did not think of mentioning them out loud or might have not had time to mention them. The GEW allows for reporting emotions and their intensity. It comprises a set of emotions divided in two axes. The vertical axis goes from high control (for instance pride) to low control emotions (for instance surprise). The horizontal axis involved a range from pleasant to unpleasant emotions. One of the advantages of the GEW is that it allows for reporting intensity of emotions, which can be considered as the level of arousal. Low intensity lies in the centre of the wheel and high intensity towards the outer rims. The GEW was selected as a tool to assess emotion as it offers a wide range of specific emotions. This helped assess whether participants experienced surprise without directly asking them or mentioning the word

“surprise”. The reported mental images and emotions were mapped following a Situational Analysis approach (Clarke, 2003, 2005).

Figure 3.1.2. Sample of the Geneva Emotion Wheel.

Results of initial interviews

In the initial round of interviews participants reported their original mental images. Examples included “I picture myself setting up the trap behind the rubbish bin. It’s probably very dirty back there, and disgusting!”; “I don’t think I want to get rid of the trap, is the mouse going to be dead? Bleeding? What if the head came off? What if it’s not dead and bites me?!”; “I can picture the mouse wobbling off the trap and touching my hand when I’m getting rid of it, yuck!”; “I’d immediately go and wash my hands, but I reckon it’d be one of those things where it doesn’t matter how much you wash, you don’t feel clean for a while”; “it’s going to be so good to see the little bugger trapped”; “I don’t want to get my fingers snapped with the trap!”.

The emotions reported included disgust, relief, anxiety, pleasant and unpleasant surprise, sadness, despair, remorse, satisfaction and fear. A discomfort about killing the mouse was reported by eight out of ten participants.

Groups of expectations

Three main groups of expectations were identified as described in table 3.1.1 below. A questionnaire was designed based on the three main expectations. The questionnaire was applied to the participants in the second phase of the study in order to identify whether they related to such expectations.

The expectations were categorised into three groups. The first group was called “humane”. This group represents people that did not want to kill the mouse and reported remorse, sadness and despair if they were asked to use a lethal trap.

The second group was named “hunters”. People who shared these expectations were not only willing to kill the mouse; they even wanted to kill as many as possible. This can go beyond a necessity to get rid of a pest becoming a sport. Hunters felt challenged and competitive towards the task. They did not report fear or disgust. They reported frustration if they did not catch the mouse.

“Paris Hilton” represents the third expectations group. In this group there was a high reporting of fear and disgust. They did not necessarily have a problem with killing the mouse. In fact, most participants in the group wanted the mouse dead, but found the experience too daunting. They would have preferred someone else to do the task.

Groups of expectations resulting from the interactions with existing mouse traps		
Humane	Hunter	Paris Hilton
<p>Emotions: disgusted at having a mouse in the house; sad and remorseful at the prospect of killing it</p> <p>They would prefer to trap the mouse alive and put it outside</p> <p>Willingness: Unwilling to kill mice</p>	<p>Emotions: excited at the prospect of trapping a mouse, frustrated if not able to</p> <p>Sees trapping a mouse as a sports challenge</p> <p>Willingness: Wanting to kill as many mice as possible</p>	<p>Emotions: Scared, frustrated, disgusted</p> <p>Strong want to get rid of mouse, but unwilling to do it themselves</p> <p>Wanting to be as far away as possible from mouse or trap</p> <p>Expecting someone else to do it for them</p> <p>Disregard as to whether the mouse lived or died</p> <p>Willingness: Unwilling to use the trap</p>

Table 3.1.1. The three main groups of expectations according to the original mental images of participants.

The expectations described above were mixed amongst the participants. While none of the participants expressed only one of the expectations, it was relatively easy to differentiate participants in the second stage through a questionnaire.

Questionnaire

The identified expectations and emotions were included in a questionnaire. Participants in phase two were asked to express to which degree they shared such characteristics to assess which group they related to.

The questionnaire was set up in a scale of opposites with a range of 1 to 7, 1 being “I do not share this image at all” and 7 being “I strongly share this image”.

The last part of the questionnaire assessed the participants’ willingness to use the trap. The sentence read “I am willing to use this trap to kill a mouse and dispose of it”. This was qualified from 1 “I fully disagree” to 7 “I completely agree”.

Design of new mousetraps

Two research assistants (Industrial Design graduates) and myself designed new mousetraps that attempted to elicit surprise and persuade people to use the traps by addressing their expectations and by intending to address emotion as a feedback mechanism. A number of concepts were sketched and the ones that the design team believed showed more potential to persuade were built into prototypes and tested with participants. The designs were developed in three phases. After each design phase the mousetraps were tested and then redesigned. The designs were based on the found original expectations as described in table 3.1.2. The designs intended to address emotion as a feedback mechanism by giving positive emotional feedback intending to address surprise as a sense-making process and negative emotional feedback intending to address surprise as a threat-detecting process. Table 3.1.2 below describes the brief set for each of the mousetraps.

Concepts for new designs of mousetraps based on analysis of original expectations of participants			
Concepts for all expectations and all types of feedback: Decrease disgust by: <ul style="list-style-type: none"> • offering an enclosure that avoids potentially spilling blood on floors and need to clean up afterwards • offering a way to hold the trap that distances the hand from the mouse • offering a way to know that the mouse is trapped without needing to see the corpse. 			
Concepts for specific expectations and specific type of feedback			
Emotional feedback	Paris	Hunter	Humane
Positive	Elicit sense of achievement and therefore pride if mouse is trapped.	Emphasise sense of achievement and pride by enhancing visual contact with mouse.	Address an opposite emotion or concern: pride by saving native wildlife.
Negative	Emphasise frustration if mouse is not trapped.	Emphasise frustration if mouse is not trapped.	Emphasise remorse and sadness by highlighting that mice will kill native wildlife.
Positive and negative	Elicit sense of achievement and pride if mouse trapped and emphasise frustration if mouse not trapped.	Emphasise sense of achievement if mouse trapped and emphasise frustration if mouse not trapped.	Elicit pride by saving native wildlife and remorse by highlighting mice kill native wildlife.
Neutral	Straightforward information about what steps to follow to use the trap.		

Table 3.1.2. Description of groups of expectations and how the new designs will try to address them.

Design Phase 1 (DP1)

The mousetraps from the design phase 1 (DP1) attempted to:

- a) decrease the sense of disgust and fear during the setup, checking, and disposal of a mortal trap
- b) persuade people to choose a mortal trap
- c) this should be attempted through offering feedback intending to surprise.

The emotional feedback included positive feedback for trapping the mouse, negative feedback for not trapping it, neutral feedback and a combination of positive and negative emotional feedback. The same neutral feedback trap was used for all concern groups. The first phase produced ten different designs. Table 3.1.2 above explains each of the designs, the mental image that it attempted to address, what type of feedback it attempted to offer and what type of emotion it attempted to elicit.

All of the designs in the first phase were based on the same product configuration (figure 3.1.3) from which the rest were developed, which suggested that the usability of all the designs would be the same. The actual existing plastic trap studied in the first phase was used as the mechanism to kill the mouse by placing it inside the new card traps.

Design Phase 1 Main Product Configuration

The box goes around an existing plastic mousetrap. When a mouse is trapped, the box conceals it. A handle comes up with two purposes: give feedback about the state of the trap, and serve as a handle to avoid direct contact.

Mental images addressed: Fear and disgust to see the mouse. Disgust to see and touch the mouse.

Behaviour addressed: It is expected that users will report an increased willingness to use these traps to kill a mouse than existing designs.

Interactions: Set up, check, disposal.

Figure 3.1.3. Main product configuration for the design of mousetraps in DP1.

Resulting designs

The designs attempted to reduce the level of disgust and fear at the checking and disposing phases by concealing the dead mouse. Putting the trap inside an easy to assemble cardboard box that allowed minimal visual contact did this (figure 3.1.4). There was just enough visual contact to know there was a dead mouse. This design avoided making a mess or the need to clean up following the trapping of a mouse. It also held the mouse still once dead, as opposed to current traps that allow the mouse to hang off or swing when lifted. In order to provide feedback, a handle comes up every time the trap is activated. The handle is also useful to reduce disgust by offering a handle that is situated further from the mouse than the existing trap offers.

Figure 3.1.4. Design of card mousetrap.

Figures 3.1.5 to 3.1.8 below illustrate the designs of the traps for DP1, the concern and emotions addressed, and the ways in which feedback was provided. This was attempted, in the example of the traps for the humane group, by incorporating emotional feedback regarding the positive effect the trap would have on local endangered birds. The trap with positive emotional feedback indicated that it had been activated by lifting a handle with an image of a living Kaka, which is an endangered and endemic bird to New Zealand. This would suggest that by killing the mouse, the participant was helping to save endangered wildlife. On the other hand, the trap with negative emotional feedback showed the image of a dead Kaka if the trap was not activated, and then concealing the image once the mouse was caught.

**Concern group: All
Neutral Feedback**

Concerns addressed:

Not wanting to see, touch or get near the mouse.

Feedback:

Instructions about how to set up the trap step by step. The appropriate instruction appears at the appropriate time. For instance, “throw away” appears when mouse has been caught.

Figure 3.1.5. Neutral trap for DP1 tested with all participants.

**Concern group: Paris Hilton
Positive Emotional Feedback**

Mental images addressed:

Not wanting to see, touch or get near the mouse.
Not wanting to let the mouse "get the better of them".

Feedback:

A picture of the mouse behind a cage shows success.
Therefore, the mouse did not get the better of them.

**Concern group: Paris Hilton
Positive and Negative Emotional Feedback**

Mental images addressed:

Not wanting to see, touch or get near the mouse. Not
wanting to let the mouse "get the better of them".

Feedback:

Negative: The mouse is shown "still at large" as a
reminder of the lack of success at catching it.

Positive: A picture of the mouse behind a cage shows
success. Therefore, the mouse did not get the better
of them.

Emotions expected:

Frustration from not catching the mouse, and
satisfaction from catching it.

**Concern group: Paris
Negative Emotional Feedback**

Mental images addressed:

Not wanting to see, touch or get near the mouse.

Not wanting to let the mouse "get the better of
them".

Feedback:

The mouse is shown "still at large" as a reminder of
the lack of success at catching it.

Negative feedback is only given before trap is
activated by the mouse.

Emotion expected:

Frustration from not catching the mouse

Figure 3.1.6. Card traps for the Paris Hilton group.

**Concern group: Humane
Positive Emotional Feedback**

Mental images addressed:

Not wanting to see, touch or get near the mouse. Not wanting to kill the mouse. Caring about not terminating a life.

Feedback:

A picture of an endangered native bird appears when the mouse is killed. It suggests that by killing mice, the user is saving native wildlife.

Emotion expected:

Decrease in the report of regret, and increase in satisfaction, or relief.

Behaviour expected:

Increase in willingness to kill mice.

**Concern group: Humane
Negative Emotional Feedback**

Mental images addressed:

Not wanting to see, touch or get near the mouse.

Not wanting to kill the mouse. Caring about not terminating a life.

Feedback:

A picture of a dead endangered native bird appears when the mouse is NOT killed. It suggests that by not killing mice the person is not saving native wildlife.

Emotion expected:

Decrease in the report of regret, and increase in satisfaction, or relief.

Behaviour expected:

Increase in willingness to kill mice

**Concern group: Humane
Positive and Negative Emotional Feedback**

Mental images addressed:

Not wanting to see, touch or get near the mouse. Not wanting to kill the mouse. Caring about not terminating a life.

Feedback:

A picture of a DEAD endangered native bird appears if the mouse is NOT killed. The bird appears alive when the mouse is killed. It suggests that by killing mice, the user is saving native wildlife.

Emotion expected:

Decrease in the report of regret, and increase in satisfaction, or relief.

Behaviour expected:

Increase in willingness to kill mice.

Figure 3.1.7. Card traps for the Humane group.

Concern group: Hunters
Positive Emotional Feedback

Mental images addressed:
Wanting to kill as many mice as possible.

Feedback:
The trap has a window through which the user can see the dead mouse. The user receives a congratulatory message when the mouse is trapped. It attempts to increase the sense of competition and accomplishment.

Emotion expected:
Increase in the report of satisfaction and pride.

Behaviour expected:
Increase in willingness to kill mice.

Concern group: Hunters
Negative Emotional Feedback

Mental images addressed:
Wanting to kill as many mice as possible.

Feedback:
The window to see the mouse is blocked by an "Empty" sign, emphasising the lack of success.

Emotion expected:
Frustration.

Behaviour expected:
Increase in willingness to kill mice.

Concern group: Hunters
Positive and Negative Emotional Feedback

Mental images addressed:
Wanting to kill as many mice as possible.

Feedback:
The trap has a window through which the user can see the mouse when trapped. The window is blocked by an "Empty" sign if mouse not trapped.

Emotion expected:
Frustration and then satisfaction.

Behaviour expected:
Increase in willingness to kill mice.

Figure 3.1.8. Card traps for Hunters group.

Testing the designs

The new designs were tested with 26 participants, selected out of an initial group of 36. Participants were selected from the pool according to their responses to the questionnaire. Only participants who fitted clearly within a concern group were asked to test the traps. The participants included 12 females and 14 males. Their ages ranged between 19 and 33. They were not paid. They were enrolled through public advertising in the form of posters in the VUW's Schools of Architecture and Design facilities and all of them were students.

The designs were tested in a kitchen in the School of Design, Victoria University of Wellington. Initially, participants were asked to fill up the concerns questionnaire developed in the first phase of this project. According to their responses (figures 3.1.9-3.1.12), they were placed in one of the three groups: Humane (n: 8), Hunters (n: 11), Paris Hilton (n: 7). As the goal of the test was to assess how people with an expectation responded to a trap designed for that specific expectation, the participants who scored less than two points for every expectation or had the same score for two or more expectations were not asked to participate in the testing of the traps. In total, ten participants did not continue with testing of the traps. Figure 3.1.9 shows a visualisation of the responses to the questionnaire by all 26 participants who remained in the test. Figure 3.1.9 shows no clear patterns. Figures 3.1.10 to 3.1.12 are divided by groups and show clearer patterns. Respondents allocated into the Paris Hilton group (figure 3.1.10) leant towards "I don't want to get anywhere near a mouse", "it's disgusting to use a mousetrap" and "I'd rather someone else deals with the mousetrap". Respondents in the Humane group (figure 3.1.11) leant towards "I respect any kind of life" and "I prefer not to kill mice", while there was a low response towards "Mice should be killed" and "I want to kill as many mice as possible" as expected. The Humane group (figure 3.1.12) had a varied response to "I don't want to get anywhere near a mouse" and "It's disgusting to use a mousetrap". The Hunter group had opposite responses to the Humane group, scoring highly with "mice should be killed" and "I want to kill as many mice as possible". Surprisingly, respondents in the Hunters group also scored highly to "I respect any kind of life" as most respondents did. The regularity among responses within each group suggests that the mental images constructed for this study from the initial interviews were relevant expectations that people shared in the proposed groups.

Figure 3.1.9. Visualisation of the responses to the mental images questionnaire by all participants.

Figure 3.1.10. Visualisation of the responses to the mental images questionnaire by participants selected under the Paris Hilton group.

Figure 3.1.11. Visualisation of the responses to the mental images questionnaire by participants selected under the Humane group.

Figure 3.1.12. Visualisation of the responses to the mental images questionnaire by participants selected under the Hunters group.

The traps related to each of the groups were tested with all the participants from that group. Five traps were tested with each participant. These included the existing plastic trap, three designs targeted to that group and the neutral design. In order to diminish a carryover effect, the traps were tested in random order.

The testing sessions followed the order described below:

1. Participants were welcomed into an office, the research project was explained, information sheet was given, questions about the research were answered and the consent form signed.
2. Assessment of initial expectation: participants were asked to imagine they had mice at home and needed to use a lethal mousetrap. They were asked to picture the activities this would entail and respond to the questionnaire developed in the earlier part of the project. Participants were asked to fill up a GEW expressing the emotion they imagine they would feel at three stages: a) setting up the trap; b) checking the trap; c) disposing of the trap. Participants were assigned into a group according to their responses.
3. Participants who were assigned into a group were given the first trap and asked to set it up at the kitchen while reporting through FOL. The order of the traps was randomised. After testing the first trap, participants filled up a GEW regarding their experience at set up. Meanwhile, a research assistant placed a realistic-looking rubber mouse in the trap.
4. Participants were asked to go back to the kitchen and check if they had caught a mouse. They were asked to dispose of the mouse if they had caught one. In the cases of positive and neutral feedback, a mouse would have been placed in the trap. In the case of negative feedback, no mouse would have been placed. In the case of negative and positive feedback combined, no mouse would have been placed the first time the participant checked, and a mouse was placed for the second time the participant checked.
5. Assessment of emotional response (including surprise): participants were shown the video recordings and asked to describe the experience focusing on what they felt. A GEW was filled up while watching the video.
6. Assessment of willingness to use the new mousetraps: After the test, a final questionnaire was given to participants. The questions included “I would use this trap in the future at home to kill and dispose of mice”, with a 7 point scale of opposites rating from 1 “I completely disagree” to 7 “I fully agree”. This question attempted to assess the willingness of people to use the trap in order to kill mice. The report of ease of use was assessed through a simple question

stating “This trap is easy to use” on a scale from 1 “I fully disagree” to 7 “I completely agree”.

The same process was repeated for the subsequent traps from step 3. The participants were free to report whether they would dispose of the mouse in a way not available at the kitchen office. For instance, some participants reported they would throw the mouse in the garden.

Results from testing the mousetraps developed in DP1

Figures 3.1.13 to 3.1.15 below show the responses of participants to the existing trap and the new designs.

Figure 3.1.13. Visualisation of the average responses from the Paris Hilton group to each of the traps.

Responses from the Paris Hilton group (figure 3.36) included a reduction in the reporting of disgust in comparison with the existing trap. Amusement and pride were higher for the negative feedback and positive and negative feedback traps. The report of amusement can be explained by the playful images from those traps, which include a mouse emphasising that it is “still at large”. Pleasant surprise was high in the positive feedback trap, which was reasonably expected as participants received a congratulatory message for trapping the mouse. The neutral trap received a low intensity of responses, which was expected. It also received the lowest response for surprise. However, it was not expected that the neutral trap would receive the highest score for willingness to use the trap in the future. This was a similar case for the other two groups.

Figure 3.1.14. Visualisation of the average responses from the Humane group to each of the traps.

Within the Humane group (figure 3.37), the existing trap scored highest for report of disgust and remorse, while both traps that involved negative feedback scored highly for amusement and interest. There was a report of unpleasant surprise for the existing, positive, and negative traps. Expectedly, pleasant surprise was significant in the positive feedback trap. As in the Paris Hilton group, the neutral feedback trap resulted in low intensity responses. Again unexpectedly, the neutral trap scored highly in participants’ willingness to use it in the future, as it did with the Paris Hilton group.

Figure 3.1.15. Visualisation of the average responses from the Hunters group to each of the traps.

Within the Hunters group (figure 3.1.15), the report of disgust to the existing trap was highest compared to the other traps for this group. This group reported pleasant emotions higher than the other two groups. In particular, pleasure was rated highly in the positive feedback trap. As in the Humane and Paris Hilton groups, the report of amusement was high for both traps that involved negative feedback. Relief was reported highly in both traps with positive feedback. Unpleasant surprise was reported with higher intensity for both traps with negative feedback, which can be explained by the fact that when the trap was checked for the first time there was no mouse trapped. The neutral trap had the lowest intensity of reports and again unexpectedly was rated highest in the willingness of participants to use it in the future.

The general analysis of all groups suggests that all of the new traps decreased significantly the report of disgust, which suggests that the main architecture of the

product was successful to address the expectations of people that related to disgust. Such expectations included the possibility of a bleeding mouse, seeing it and feeling its weight. Concealing the trap and the mouse within a box addressed such issues.

Two main design-relevant observations were made. The first one was that the trap that scored the lowest intensities of emotions, the neutral trap, was also the one that scored the highest for participants' willingness to use it in the future. This may be due to the fact that the trap was successful at reducing the report of unpleasant emotions, regardless of the fact that the report of pleasant emotions was lower for the neutral trap. While other traps scored highly for amusement, this may be due to participants finding the visuals amusing. The observation that the neutral traps were most successful in persuading people to be willing to use a lethal trap drove design phase 2. In particular, the traps in design phase 2 intended to use the form of the product to give feedback and avoid using graphic-based messages such as pictures of mice and birds.

Design Phase 2 (DP2)

Design phase 2 attempted to offer the same kind of feedback as DP1, but through the physical form of the object rather than through graphics. The designers were the same team as in DP1: the researcher and two research assistants. The concerns of each group were again the starting point for designing and the traps offered feedback in the following categories: positive, negative, and a combination of positive and negative feedback. The success of the neutral trap in DP1 was common to all concern groups, which suggested that there were factors from that trap that elicited a positive response amongst participants. Such success may have been due to the simplicity of the trap, which emphasised its efficiency in trapping the mice by concealing the corpse and offering a cleaner interaction in which cleaning up was not necessary and contact with the mouse, seeing it or being close to it, was minimised. The aesthetics of the trap may have influenced the participants' responses, as it was a trap that avoided over-decorative elements. The team intended to design another neutral trap that would make use of the learning from the process.

The intention of the design team was represented through music-like scripts, as explained in chapter 2.2 and 2.2.15. Figure 3.1.16 below shows an example of a script of the intention of the design team for one of the Hunters group traps.

The design team produced a set of ten traps. Figures 3.1.18 to 3.1.27 describe each of the traps, the expectations they addressed and the intention of the designer to elicit emotion. All traps intended to persuade people to be willing to use them in the future.

Figure 3.1.16. Music-like script that expresses what designers hope the interaction will be like. It sees the relationship between emotion and behaviour as a feedback mechanism. In this case, the design addressed the Hunters' expectations.

Concern group: Hunters
Positive Emotional Feedback

Mental images addressed:
Wanting to kill as many mice as possible.

Feedback:
The trap suggests a bear hunter trap in its use and form. When activated, the trap opens and the mouse is totally visible. The top lid serves as a handle.

Emotion expected:
Satisfaction and pleasant surprise.

Figure 3.1.18. Trap for the Hunters group with positive emotional feedback.

Concern group: Hunters
Negative Emotional Feedback

Mental images addressed:
Wanting to kill as many mice as possible.

Feedback:
The trap suggests a bear hunter trap in its use and form. When set, it shows that no mouse has been caught as it lays open.

Emotion expected:
Disappointment and unpleasant surprise from not catching the mouse by showing the empty trap.

Figure 3.1.19 Trap for the Hunters group with negative feedback.

**Concern group: Hunters
Positive and Negative
Emotional Feedback**

Concerns addressed:

Wanting to kill as many mice as possible.

Feedback:

The trap suggests a bear hunter trap in its use and form. When set, the trap shows no mouse has been caught. When activated, the trap closes and the mouse is completely visible.

Emotion expected:

Disappointment and unpleasant surprise from not catching the mouse by showing the empty trap. Then, satisfaction, pleasant surprise and pride from catching the mouse by having the lid transparent and showing it.

Figure 3.1.20. Trap for the Hunters group with positive and negative feedback.

Concern group: Paris
Positive Emotional Feedback

Concerns addressed:

Not wanting to see, touch or get anywhere near the mouse.
Wanting to get rid of the mouse.

Feedback:

When the mousetrap is activated, a piece pops up reminiscent of a mailbox flag to indicate success.

Emotion expected:

Pleasant surprise, pride and satisfaction when trapping the mouse.

Figure 3.1.21. Trap for the Paris Hilton group with positive feedback.

Concern group: Paris
Negative Emotional Feedback

Concerns addressed:

Not wanting to see, touch or get anywhere near the mouse.
Wanting to get rid of the mouse.

Feedback:

The material that the trap is made out of allows for a subtle view of the inside, which means the user can see they have not been successful, but it is not a full view of the mouse to avoid producing disgust.

Emotion expected:

Unpleasant surprise and disappointment at not catching the mouse.

Figure 3.1.22. Trap for the Paris Hilton group with negative feedback.

**Concern group: Paris
Positive and Negative
Emotional Feedback**

Concerns addressed:

Not wanting to see, touch or get anywhere near the mouse.
Wanting to get rid of the mouse.

Feedback:

The material that the trap is made out of allows for a subtle view of the inside, which means the user can see when they have not been successful.
When the mousetrap is activated, a piece pops up reminiscent of a mailbox flag.

Emotion expected:

Unpleasant surprise and disappointment at not trapping the mouse, and then pleasant surprise and satisfaction when trapping the mouse.

Figure 3.1.23. Trap for the Paris Hilton group with positive and negative feedback.

Figure 3.1.24. Trap for the Humane group with positive feedback.

**Concern group: Humane
Negative Emotional Feedback**

Mental images addressed:

Not wanting to see, touch or get near the mouse. Not wanting to kill the mouse. Caring about not terminating a life.

Feedback:

When no mouse is caught, the trap resembles a broken egg.

Emotion expected:

Decrease in the report of regret. Increase in unpleasant surprise and then satisfaction and relief.

Figure 3.1.25. Trap for the Humane group with negative feedback.

Figure 3.1.26. Trap for the Humane group with positive and negative feedback.

Figure 3.1.27. Trap DP2.10 intends to apply the learnings from the process to all concerns.

The ten traps developed for DP2 were tested with 22 participants. The participants included 12 females and ten males. Their ages ranged between 18 and 29. They were not paid. They were enrolled through public advertising in the form of posters in the VUW's Schools of Architecture and Design facilities and all of them were students. The testing process followed the same protocol as stated above for the card traps developed in DP1. There were originally 31 participants and nine did not clearly fit a group according to the results of the initial questionnaire. The remaining participants were

divided into the Humane group (n:7), Paris Hilton group (n:6), and Hunters group (n: 9). Each of the traps designed for each of the groups was tested with all participants from that group. Trap DP2.10 was tested with all participants.

Results from testing the mousetraps developed in DP2

Figures 3.1.28 to 3.1.30 show a visualisation of the responses of participants to the testing of the traps from DP2.

Figure 3.1.28. Visualisation of the average responses from the Humane group to each of the traps from DP2.

Figure 3.1.29. Visualisation of the average responses from the Hunters group to each of the traps from DP2.

Figure 3.1.30. Visualisation of the average responses from the Paris Hilton group to each of the traps from DP2.

Did eliciting surprise help persuade people?

Surprise on its own did not seem to play a significant role as to whether people were willing to use a trap. In more cases than not, a lower report of surprise was accompanied by a higher willingness to use the trap concerned. This may be due to people preferring to know what to expect in an undesirable situation such as using a mousetrap. However, the correlation between low report of surprise and higher report of willingness to use the trap was not significant. It is interesting that the traps that did not intend to elicit surprise, the neutral traps, were in both design phases more successful at eliciting persuasion. This is further discussed below.

Surprise accompanied by other pleasant emotions was related to persuasion

When a higher level of pleasant surprise was accompanied by a high report of pride, joy, wonderment and/or pleasure, and a low report of unpleasant emotions, the responses leaned towards a higher willingness to use that trap. Such is the case for mousetrap DP2.10, which scored the highest score for willingness. This may suggest that surprise was a factor in increasing the interest in a product, but other pleasant emotions such as pride were necessary to elicit persuasion in people.

Discussion

Further research into the relationship between surprise and other emotions in design projects where persuasion is a goal is necessary. In particular, collaborations with psychology researchers could give a stronger statistical analysis that could pinpoint how the relationship between different emotions affects persuasion. Nevertheless, the data gathered in this project was useful for the design team for designing products that increasingly elicited surprise and the willingness of people to perform an activity.

The results reported towards the mousetrap DP2.10 show that the design team slowly increased the willingness of people to use the trap. Trap DP2.10 reflects what this research suggests: surprise was related to other pleasant emotions when the report of willingness to perform the task increased. In the instances where there was a high report

of willingness to use the product in the Paris Hilton group, a report of surprise was accompanied by pleasure and pride. In the Humane group, there was a relatively high report of surprise and pride. In the Hunters group, pleasant surprise, pride, joy and pleasure were linked to a high willingness to use that trap.

Interestingly, the traps that used literal elements to give feedback, in this case the Humane traps with wings representing the saving of native birds, received a high report of amusement in a similar way that occurred in the DP1 results.

Neutral traps eliciting more persuasion than emotional feedback traps

Unexpectedly, the neutral traps in DP1 and DP2 elicited more persuasion than the traps with emotional feedback. At the beginning of the project, it was expected that either the traps with positive emotional feedback or the traps with positive and negative emotional feedback would be more successful at persuading people to use them. Some of the positive feedback and positive and negative feedback traps were more successful than the existing trap. However, the most successful traps were the neutral traps in both DP1 and DP2. Considering that there were 20 designs of new traps that intended to elicit surprise and persuasion, and unequivocally the most successful ones were the ones that did not intend to offer emotional feedback, this may suggest that either surprise was not the best tool for intending to persuade people, or that the emotional feedback that the traps incorporated was not the most appropriate to intend to persuade people. In either case, an understanding of the complexity of the context and of people's expectations seemed to have helped in eliciting surprise and willingness to use the product, as in general the new traps were more successful at eliciting surprise and willingness than the existing traps. Nevertheless, that same complexity of the context made it almost impossible to predict which trap was going to be more successful or to assess how surprise was related to persuasion.

Reducing the complexity of reality to a few concern groups

From a postmodern perspective, reducing the reality and personality of the participants into only three types of concerns may seem contradictory, as postmodernism calls for recognising the complexity of reality and for avoiding reductionism (Clarke, 2005, p. 553). However, the same complexity of reality in the design world means that time and resource constraints make it near to impossible to design a specific object for every person. The responses to questionnaires suggested that the participants who tested the traps shared the three main expectations under discussion; therefore the traps were designed with a relevant part of their specific realities in mind. The participants who responded to the initial questionnaire and did not fit within a concern group were not considered for the testing of the traps. Nevertheless, this study shows that the complexity of reality was hard to grasp. The outcomes sometimes matched the intentions of the designers, but prediction was not always achieved.

Generalisations should not be drawn from the results of this study. The research illustrates how a design team studied the expectations of participants and designed with an intention to address them, in a project where there was an intention to persuade people to engage in an activity. The study shows how in several of the design steps the intentions of the designers did not eventuate. For instance, the Paris Hilton traps for DP1 threw worse responses than expected, and many participants still preferred to use the existing mousetrap. On the other hand, the research also shows that by testing how the traps addressed people's expectations, the design team gathered information that was applied in further designs that received better scores in people's willingness to use them. In particular, the trap DP2.10 was a good example of a product that embodied the learning from the process and was successful at partly eliciting the expected interaction in people. This was only possible by designing with context and people's expectations in mind, and going through a process of trial and error in which testing every design was necessary to understand the responses of participants.

Was the success or failure of the traps due to the design ability of the team?

It is debatable whether a design team could have arrived at similar or better results without the aid of research as depicted in this section. It has been suggested in this thesis that experienced designers have an ability to understand people's expectations and elicit surprise through their designs, and that they claim not to need rigorous research. A twin project could investigate this, in which two teams of designers set up to achieve the same goal, one with and the other without rigorous research. Such an approach can for now be a hypothetical testing ground. One of the biggest barriers would be to assess the creative ability of both design teams, so that it does not represent a deciding factor. It would be fair to say that a design team following another approach may have arrived at similar conclusions to this research. But a difference is that they would not be able to tell for sure which of the traps elicited more persuasion in participants, as the design team in this project was surprised to find that the neutral traps received better scores.

Investigating mental images and expectations in the design process

This case study suggests that investigating people's mental images was a valuable approach for a design team intending to persuade people to engage in an interaction. People's mental images gave the designers clues as to how to define participants' expectations to improve the design by first removing interactions that elicited unpleasant emotions and then offering interactions that intended to elicit pleasant emotions. Addressing people's mental images, which are a combination of imagination, memory and expectations, helped designers address issues that were important for participants even though participants would not necessarily expect such mental images to occur. Further research is necessary to further define flexible approaches to assess people's mental images. This research used open and semi-structured interviews, talking and feeling out loud techniques, participants' trials of existing products, video-review by the participants of their own interactions, emotion reports through GEW and interviews after assessment of existing products. A combination of these techniques gave the designers information to use in the design process. More research is necessary

to help future researchers define which methods are most useful in which circumstances.

The roles of surprise in persuasion according to the hypotheses

Surprise seemed to have opposite roles. When participants reported a high level of surprise and unpleasant emotions received a significantly high report, participants were not willing to use the product. When surprise received a high report and was accompanied by a low report of negative emotions and a high report of pleasant emotions such as pride and pleasure, then there seemed to be a higher report of willingness to use the product. This is in contrast with a high report of pleasant emotion without surprise, which did not clearly reflect a change in willingness to use the product. This can be explained by the fact that surprise seems to be an emotion that inevitably produces other emotions, such as joy if the surprise is pleasant or fear if the surprise is unpleasant (Filipowicz, 2006; Schutzwohl & Borgstedt, 2005).

The results suggest that when surprise was accompanied by pleasant emotions it elicited a sense-making process, which resulted in people paying attention to the design and being more open to the message the design was portraying. This then increased their willingness to follow the message. On the other hand, when surprise was accompanied by unpleasant emotions it was because it elicited a threat-detecting mechanism. In these cases, people entered a withdrawal type of behaviour and were therefore not willing to use the designs.

The role of emotions in our decision-making process

The role of emotions in the participants' decision-making process is vastly complex. It cannot be reduced to the simplistic expectation that the experience of a single emotion, in this case surprise, can have a definitive impact on persuasion. It seems that a combination of emotions, not always the same ones, were necessary for eliciting persuasion. It was a complex interrelationship between emotions that seems to have been more closely related to persuasion. In this undesirable situation, a reduced report

of unpleasant emotions, in particular disgust, seems to have been the main factor that accompanied an increased willingness to use the product. However, it is harder to claim that there was a direct correlation between the report of disgust by itself and persuasion, given that almost all new traps reduced the report of disgust compared to the existing trap, but not all of them received an increased report in willingness to use the product.

Emotion as a feedback mechanism

From a design perspective, the fact that the neutral traps were the most successful to elicit persuasion was the most unexpected result. This suggests that the intention of the designers to offer emotional feedback was not always successful. However, it was useful to consider the relationship between emotion and behaviour as a feedback mechanism. This was relevant mainly to transcribe the intention of the designer to affect emotion and behaviour as a conversation through a music-like script. The scripts helped designers organise their thoughts and intentions. They also helped define what stage of the interaction needed more thought in the design process. It helped define what the message of the object should be and what the message of the person could be in response, which in turn helped define what the following message of the object could be and so on.

A design for discussion: Design phase 3

The research found that avoiding disgust was a major factor for eliciting persuasion, and that surprise took a secondary role or needed to be accompanied by other pleasant emotions. Also, there were very low reports of “tenderness” throughout the testing of the mousetraps and the concern group that was harder to persuade was as expected the Humane group. In an opposite sampling approach, the design team set up the challenge to design a mousetrap for the Humane group that would attempt to elicit a higher level of surprise, keep a high level of disgust and elicit tenderness.

The design team developed trap DP3.1 (figure 3.1.31), which involves two different positions. In the first setting, the mousetrap lies horizontally and acts as a trap: the mouse goes in and triggers the mechanism which breaks its neck. In the second setting and once the mouse is trapped, the trap is turned vertically in order to act as a plant pot

and some earth is poured in with a swan plant seed. Swan plants (*Asclepias physocarpa*/*Gomphocarpus physocarpa*) are used for attracting monarch butterflies. When the trap is acting as a plant pot, the decomposing mouse still inside feeds the growing swan plant, which attracts monarch butterflies that lay their eggs on the plant, caterpillars grow and eat the swan plant leaves to become chrysalises and grown butterflies themselves. The plant intended to address the humane concern of respecting and looking after life.

Figure 3.1.31. Visual representation of mousetrap DP3.1, which also acts as a plant pot in which a swan plant and butterflies live fed by the decomposing mouse inside.

Ethical regulations suggested that the best way to test trap DP3.1 was through a simulation in which mice would not be killed or their corpses kept over a long period of time. The same steps to test traps from DP1 and DP2 were used with slight changes. Once the mouse was trapped, instead of disposing of the trap, participants were asked to pour earth and swan plant seeds into the pot. Later, they were shown a picture of their trap with a chrysalis and a monarch butterfly on it. The main disadvantage of using a simulation is that the interaction with the real trap would take place over a long period of time, as the plant grows and people would need to wait for a butterfly to come and

lay their eggs on it. The design team expected that this would increase the emotional connection between the person and the mousetrap/plant pot, as the person would need to look after the growing plant. The design team also expected that having the real corpse of a mouse inside the plant pot would increase the sense of disgust in people. It was expected that a simulation would not completely portray the sense of emotional connection over a long period of time or the sense of disgust. Both factors would go against the intentions of the designers, which meant that it was even more challenging for the mousetrap to elicit surprise and persuasion in such adverse testing conditions. The trap was tested with the same Humane participants from DP2 five weeks after they had tested the DP2 traps. The results are visualised in figure 3.1.32 below.

Figure 3.1.32. Visualisation of the results of the DP3 trap compared with the DP2 traps for the humane group.

Radically opposite responses for DP3: sub-groups of concerns and the role of surprise in radical concepts

The tests from the DP3.1 trap resulted in an expected higher reporting of the following emotions, compared to the results from DP2: tenderness, surprise and disgust. This suggests that the design team was addressing the expectations of people in an appropriate way. However, the following emotions also received a much higher report,

which were unintended: unpleasant surprise, contempt, anger and amusement. The design of mousetrap DP3.1 involved a more radical concept than previous designs by having a dead mouse inside and keeping it as a plant pot. According to the verbal report of participants, this was an issue that divided the humane group's responses. Even if they shared the concern of not wanting to kill mice, some respondents welcomed the idea of keeping the mouse inside the plant pot as long as it would sustain other forms of life, in this case a plant and eventually butterflies. However, other respondents found that the design of mousetrap DP3.1 was disrespectful to mice and their reporting of anger and contempt was higher towards the design. The report of willingness to use mousetrap DP3.1 was similar to the average for DP2, but the individual responses were radically different, with some participants reporting a very high willingness to use this trap and other participants reporting a complete unwillingness to use the trap.

The antagonistic responses of the Humane group to mousetrap DP3 suggest that one main concern cannot describe a group of people in-depth. While the concerns of not wanting to kill mice and respecting life were useful for the design of the traps in DP2, once a more radical concept was introduced the group of people was drastically divided. The high level of surprise, both pleasant and unpleasant, suggests that the participants found the concept to be radically new. Investigating people's mental images and their responses to designs was useful in this case study to understand better how to intend to persuade participants to engage in an activity, but an in-depth understanding of people's mental images and contexts was necessary when the responses were not expected.

The role of surprise as a response of people to radical concepts deserves further attention. In the following sections, I will report on a study in which radical concepts that intend to encourage people to save resources were developed. The role of surprise in radical concepts will be further investigated.

Chapter 3.2

Surprise and Persuasion: The Balance Between Familiarity and Novelty

Introduction

People can experience the surprise if a stimulus differs from their expectations or from what they are familiar with. Innovation-driven companies often struggle to decide whether to introduce radical innovations to the market (see for instance Dewar & Dutton, 1986; McDermott & O'Connor, 2002; O'Connor, 1998). Radical innovations involve “having to cope with a new and unfamiliar domain” (Berchicci, 2009, p. 28). Radical innovations break with the expectations of people and with familiar concepts and therefore elicit surprise (Karjalainen, 2006, p. 138). It has been suggested that firms often prefer to introduce incremental innovations because they represent low-risk investment for the company (McDermott & O'Connor, 2002, p. 424). From that perspective, it may seem that companies need to question whether their designs should be surprising or not. Previous chapters in this dissertation have indicated a need to investigate the relationship between familiarity, surprise and persuasion. In chapter 2.1, it was described how academic organisations, in particular Technical University of Delft, study radical innovations and how they are perceived by companies and by customers (H. Brezet, personal communication, September 10, 2004). Nevertheless, such studies have not yet investigated the relationship between surprise and familiarity in radical innovation. In chapter 2.2, this dissertation reported how the design team at Studio Santachiara selected a design of a sofa amongst a number of concepts for further production. The selected concept balanced familiarity with surprise. Despite the fact that the client was expecting to be surprised and to appreciate what the team were to suggest, the team still decided to balance surprising ideas with familiar concepts. In chapter 3.1, the final design of trap DP3.1 involved a radical concept that drastically divided the responses from the Humane participants, who had produced similar responses to other designs. The conclusion of chapter 3.1 called for a further investigation into the relationship between familiarity and surprise. This case study investigates the relationship between people’s familiarity with a concept, the level of surprise they report towards new and radical concepts and how willing they are to adopt the new concepts. The research assessed the report of participants towards a set of five designs of household appliances that intend to save water and energy.

The results suggest that, in order for people to be willing to adopt a radical concept, there needed to be a balance between how much pleasant surprise people reported towards the concept and how much familiarity. When people reported too little or too much pleasant surprise or familiarity, they were less likely to be willing to adopt the concepts. People who were most likely to be willing to adopt the radical concepts were those who shared the concern of saving resources, believed that the concept would address such concern, and reported a balanced level of pleasant surprise and familiarity towards the concepts. This is particularly important for concept designers (Keinonen, 2006, p. 34), as it seems that if a person shares the concern the concept is trying to address, the person will be more sensitive to the proposed design and either receive it in a highly positive or highly negative manner.

Background

Surprise and familiarity

This dissertation has indicated that surprise is elicited when a person experiences something unexpected. In design, it has been suggested that a combination of something new –or unexpected– needs familiar elements to elicit surprise (Ludden, 2008, p. 27). For instance, the lamp designed in chapter 2.2 of this dissertation uses the familiar archetypal shape of a lamp to suggest that it is a common lamp. This creates the expectation of having a light bulb inside. The lamp then uses the unexpected configuration of concealing the light bulb to intend to elicit surprise. The combination of familiarity and unexpected novelty is particularly necessary for attempting to elicit pleasant surprise.

It has been suggested that the combination of novelty and familiarity also relates to aesthetic preference. For instance, Hekkert suggests several principles for aesthetic preference. One of them is “most advanced, yet acceptable” (2006, pp. 167-168), which was also suggested by Raymond Loewy with the nomenclature MAYA (in Hekkert, 2006, p. 167). MAYA suggests that we aesthetically prefer items to which we have been repeatedly exposed and therefore are most familiar with. Martindale suggests that at the

same time, we are attracted to new and unfamiliar things, in part to “overcome boredom and saturation effects” (in Hekkert, 2006, p. 167). This means that there needs to be a combination of familiarity and novelty for people to develop aesthetic preference for an item. Similar principles have been suggested when aesthetic preference is based on knowledge emotions such as surprise, confusion or interest (Silvia, 2009). This suggests that when a product evokes a sense of familiarity and novelty at the same time, people may experience pleasant surprise and a preference towards the product.

Familiarity and radical concepts

The design of radical concepts is an area of design in which the level of novelty is pushed to the extreme, and where the level of familiarity could be considered low. This section investigates how surprise is elicited in such concepts and whether people report to be willing to adopt them.

Design companies increasingly give a high profile to design concepts. Design concepts are suggestions of products that fail to meet the full criteria of a commercialised object and do not make it into production. Design concepts normally focus on highlighting or investigating an area of design, disregarding some factors such as marketing or assuming that non-existing factors could be available, such as developing or new technologies. For instance, the Probes project by Philips Design focuses on investigating ways in which physiological states of people could be sensed and expressed through wearable artefacts that represent a combination of fashion and technology (Philips, 2010). However, the Probes project does not intend to be a commercial product. Keinonen suggests that concepts can have several functions: produce knowledge for future projects and motivate the internal team, increase visibility for the company and for the design team internally and “communicate new possibilities to customers to support investment decision processes” (Keinonen, 2009, p. 14). The concepts investigated in this case study were produced with the goals of increasing visibility for the company and motivating the design team of the partner company involved with the project, in this case Fisher and Paykel. Fisher and Paykel is a manufacturer of whiteware appliances based in New Zealand and exporting to the European, American and Asian markets.

The development of new products that offer incremental improvements works differently to products that involve radical change (Tuulenmäki, 2009, pp. 158-159). In particular, there is a higher level of uncertainty about new products that represent radical change, as many factors such as available technologies, the situation and potential responses of society and the market are harder to assess. Karjalainen suggests that incremental introduction of radical concepts to the market is often adopted by companies, with the objective of avoiding “too big a surprise for the market” (2006, p. 138). Tuulenmäki ascertains that the lack of knowledge about customer preferences is a key feature that results in the uncertainty around new and radical concepts (Tuulenmäki, 2009, p. 159). This chapter offers a study in which participants stated their preference towards radical concepts through reporting their willingness to adopt them.

The high level of uncertainty around radical concepts applies to the company producing them and to people experiencing them. Radical concepts have the potential to evoke a strong sense of surprise in people by offering highly-unexpected design proposals. In chapter 2.1 of this dissertation it was discussed how radical concepts involve the need to cope with an unfamiliar domain (Berchicci, 2009, p. 28). At the same time as dealing with unfamiliarity, it has been suggested that radical innovation is more likely to be accepted by the public if it follows a step by step approach, in which each incremental improvement serves as a familiar step (Berchicci, 2009, p. 28; H. Brezet, personal communication, September 10, 2004). This suggests that there needs to be a balance between how familiar a concept is to people and how innovative it is. This case study reports on how familiar people felt towards radical concepts and how much surprise they reported towards them.

It has been suggested that some of the properties of a radical concept include that it is “anticipatory, well-founded, focused, understandable” (Keinonen, 2009, p. 28). A concept needs to be well-founded to be believable. Even if the concept suggests the use of non-existing factors, such as technology that are still under development, it should suggest that such factors could be within reach in certain circumstances. The research in this chapter suggests that people who share the concerns that a concept addresses, and believe the concept to be well-founded, were more likely to report a willingness to adopt the concept in the future.

The Design Led Futures programme

The Design Led Futures programme (DLF) at Victoria University of Wellington (VUW) offers companies the design of radical concepts through visions of the future. It explores possible scenarios for ten to 80 years into the future. It attempts to expand the range of possibilities that a company can see by challenging what the company currently does. It entices companies to study new visions by offering surprising but believable future scenarios. Five projects developed through DLF were presented to the public in order to gather responses about the level of familiarity, surprise and willingness to adopt the concepts in the future.

Methodology

The research chose five product-concepts from DLF. Twenty-five fourth year Industrial Design students were given a topic related to the client's brand. The brand was Fisher and Paykel and the topic "Inside-out". During the first stage, the students worked in teams of four to six people. Each group developed a brand philosophy. Under the brand umbrella, each student worked on a single product. The project took 16 weeks.

In order to offer new ideas, the company client was not part of the briefing process. The students had no contact with the clients until the very end of the group project, at the final presentation to the clients. There was a simple reason for disregarding client input at the initial stage of the process. DLF works under the assumption that if the client defines the brief and has constant contact and input with the students, the final results will reflect their involvement. Further to this client involvement can lead to results that may be very similar to their existing portfolio in capability and not to the same quality. DLF attempts to open the client's perspective by offering a broad range of provocation in the more radical concepts that students develop.

In order to keep people's concerns as a constant variable, all of the concepts chosen to be assessed in this research related to saving resources. The concepts were exhibited in model (scales 1:1 and 1:5) and video form at The Dowse Art Museum in Wellington. Visitors to the exhibition were asked to fill out a questionnaire that intended to assess:

their familiarity towards a concept, the level of surprise they experienced towards a radical concept and their willingness to adopt the radical concept. One existing product from the partner company Fisher and Paykel was included in the questionnaire and exhibition as a control group and to assess the difference people would report towards an existing and familiar product and the new concepts. The project was carried out according to the Victoria University of Wellington's Ethics Approval: No 18/2007.

Designs to test

Pipette, by Kylie Baker (models 1:10 and 1:1)

A six-metre long shower shaped like a giant pipette (figure 3.2.1) uses rainwater and water pumped from a filtering garden to slowly fill the bulb reservoir throughout the day. The design uses the strategy “use of unexpected scale”. As the bulb fills, the balance changes visually, expressing the stored potential and opportunity for a shower. While people shower, they can see the bulb emptying, resulting in visual feedback about the use of resources. The pivoting boom of the shower expresses only minimal movement over its entire length. This, combined with the slow filling of the bulb, is a visual element used to show the ebb and flow of the water throughout the architecture. The six-metre shower can rotate over a showering area that ranges from indoor to outdoor, through private enclosures and public spaces

Figure 3.2.1. “Pipette” shower, by Kylie Baker.

Puff'r by Oliver Moon (model 1:10)

Puff'r gives the appearance of a decorative tile set into the wall (figure 3.2.2), but is in fact a clothes washing machine. The tiled machine uses the strategy “use of unexpected movement”: it inflates and deflates the textured silicon walls with compressed air to create the motion required to agitate the water and clothes contained within. The wall tiles come in three sizes, the choice of which is determined by how much and how often the clothes are washed. This facilitates the conservation of water, space, and energy. Like changing tastes in fashion, Puff'r allows customisation of the pattern on the tiles to reflect preferences in interior decoration.

Figure 3.2.2. “Puffr” multiple-compartments washing machine, by Oliver Moon.

Flutter, by Andrew Gillespie (model 1:10)

Every year, hundreds of children in New Zealand are admitted to hospital with scalds and burns that happen within the kitchen. Flutter is a cooking system that uses an embedded induction lattice to adjust the size and shape of the workspace. It offers the advantage of heating only the cooking utensil that is required, thus saving energy and reducing the likelihood of accidents. Flutter's special feature is its set of rotating "fingers" that can lock in position to become a convenient and practical work surface (figure 3.2.3), and a safe zone between children and the cooking area. The fingers incorporate the strategy "use of unexpected movement". Flutter can be easily moved along a track between interior and exterior spaces. The fingers allow for an efficient use of energy by permitting the heating of very specific areas, thus constraining waste of energy.

Figure 3.2.3. "Flutter" stovetop, by Andrew Gillespie.

Air Wheel, by Tom Neilssen (model 1:10)

Inspired by the form of a water wheel (figure 3.2.4), Air Wheel uses recycled water from the products in dwellings on floors above to provide the rotational motion required for drying clothes. This water then flows downward to power the products on the level below, and so on. The small outer cavities or paddles that catch the water are sealed off from the dry internal segments where the laundry is inserted. The large diameter of the wheel allows the clothes to tumble through the air for the maximum time, offering efficient drying. The wet laundry is placed into adjustable segments, each of which contains a heating element and a sensor. The sensor calculates the amount of heat required to dry the clothes. The translucency allows sunlight to help dry the clothes and uses the strategy “challenge assumptions of appearance”. The opening into the dryer can be adjusted to a comfortable height for any user as it spins around its central axis. A motion sensor controls this.

Figure 3.2.4. “Air Wheel” drier, by Tom Neilssen.

Ice³ by Adzrina Mona Ibrahim (models 1:10 and 1:1)

Ice³ is a six-metre long, modular refrigeration system that is embedded in the wall (figure 3.2.5). It uses the strategy “use of unexpected scale”. It can be slid inside or outside. The containers come in two sizes and are made of corundum transparent ceramic (external layer), maize plastic (internal layer), and LCD tint glass. These components provide for the individual temperature control of each unit, which makes an efficient use of energy by cooling only the necessary space. It allows removing individual containers and taking them to a picnic or to a different house. The LCD glass also allows monitoring and maintaining the chill while travelling. It acts as a support host in social gatherings, allowing the food to be displayed in a visually enticing way, thus encouraging friends and family to help themselves.

Figure 3.2.5. “Ice³” refrigeration system, by Adzrina Mona Ibrahim.

Questionnaire

The questionnaire was divided into three steps. In the first step, participants were asked to describe and/or draw how they picture themselves performing five different activities ten years into the future. Each activity was related to each of the concepts. This first part attempted to gather information about the expectations and mental images people have of themselves performing the activities in the future. As described in chapter 3.1, mental images are closely connected to people's expectations, are normally connected to emotions and can be about future events (Damasio, 2000, 2003). The activities were: washing oneself, keeping food fresh, drying clothes, washing clothes and cooking.

The second step assessed to which extent participants shared the main concerns that the products attempted to fulfil. One main concern was identified for each concept. The concerns were assessed on a scale of -3 to 3: 3 being "I completely agree" and -3 being "I fully disagree". The concerns included the amount of energy and water used by each appliance, as well as safety of gas stove cook tops. It was expected that people who shared the concerns would be more willing to adopt the concepts in the future.

The third step in the questionnaire asked participants to answer six questions about each project. A copy of an answered questionnaire is presented in Appendix 3.2.1. The first question asked how radically different the project is to the participant's current lifestyle. This question assessed the level of change that people perceive towards the concepts in relation to their current lifestyle. The second question assessed the emotion that the concept elicits in the person. For ease of assessment and to avoid overburdening visitors to the exhibition, the emotions were confined to "pleasant" and "unpleasant". The third question assessed the level of surprise that participants reported towards the concept. The fourth question asked to which extent participants believed that the concept would satisfy the concern. This turned out to be essential. It will be discussed in the results section that the extent to which participants shared the concern and the extent to which they believed the product actually satisfied it were crucial factors to connect their emotional response to their willingness to adopt the concepts. The fifth question assessed participants' report of willingness to adopt the product. The final question asked participants whether they were familiar with specific aspects of the concept, such as the technology, appearance, interaction and functionality.

The projects were amongst a total of 20 exhibited over a period of three months. Questionnaires were gathered over a period of two weeks. The concepts were presented in 1:10 scale models. There was a 1:1 model of two projects: Pipette and Ice³. Each project was also explained through an interactive animation in a computer, which can be accessed at www.dlf.com. The animation mentioned the way in which the products work, how people would interact with them, how they would save resources and showed an animated interaction.

Follow up

In order to assess how the report of familiarity, surprise and the concept being radically different would change over a period of time, participants were asked to fill the questionnaire again one month after the exhibition. Twenty-four of the original 60 respondents agreed to be contacted via email for this purpose. It was expected that the report of familiarity would increase, and that the reports of surprise and of the concept being radically different would reduce. However, there was no clear expectation as to what to expect regarding the report of pleasantness or willingness to adopt the concept. One possibility was that people would increase their willingness to adopt the concept if they felt more familiarity towards the concepts. On the other hand, participants may have reported less willingness to adopt the concepts if the novelty factor had decreased.

Results

High reports of surprise and concepts being radically different related to low report of familiarity

As expected, the results from the responses of participants to the questionnaires during the exhibition suggest that surprise was related to how radically different people found the concepts (figure 3.2.6). The more radically different participants reported that the concepts were with reference to their current lifestyle, the stronger the report of surprise

was. There was a strong report of the concepts being radically different and of surprise. This was oppositely related to the report of familiarity, which was low.

Figure 3.2.6. Visualisation of the reports of participants to the questionnaire during the exhibition.

Willingness to adopt the concepts

The design team intended to elicit pleasant emotions and produce believable concepts. Both goals were achieved and reflected in the responses by participants. The appraisal

theory would suggest that if a stimulus elicits pleasant emotions, the person experiencing the stimulus would be likely to show “approach” behaviour (Desmet, 2003; Smith & Lazarus, 2001). This would suggest that a report of pleasant emotion would be reflected in a willingness to adopt the concepts. This expectation was also found in the reports from participants. However, the research did not expect such a high reportage of willingness to adopt the concepts. It was discussed in the background to this study that radical concepts have a better chance of success and being adopted by potential customers or society as a whole if they represent step-by-step increments, rather than radical changes. Given that the report of the concepts being radically different was high, there was a big chance of finding a low report of willingness to adopt the concepts, given that they did not involve step-by-step increments.

The report of “willingness to adopt the concept” suggests but does not necessarily mean that people would actually buy and use the products if they were on the market. The reports from this research may be interpreted as a positive attitude towards the concept, rather than a behavioural result. This is in line with the appraisal theory, which suggests that “attitudes” are a kind of concern that if satisfied would elicit pleasant emotions (see Desmet, 2002, pp. 115-119 for a detailed explanation of the different types of concerns). Attitudes can be defined as appraisals of pleasantness, in which a person evaluates a stimulus and appraises it to be pleasurable or not. Attitudes can also be called dispositions, sentiments or taste and represent predispositions or preferences towards stimuli (Desmet, 2007, p. 62). From such a perspective, it makes sense that the “attitude” of being willing to adopt the concept is related to a pleasant report of emotion, even if the concept is radically different to people. This research cannot claim that a behavioural change was achieved. However, a willingness to adopt the concept can be considered as a start towards a behavioural change (see for instance Cornelissen, Pandelaere, & Warlop, 2006; Fazio, 1986; Toates, 2009).

Surprise and radical innovation through incremental steps

It is interesting to compare the results from the reports during the exhibition with reports that occurred after the exhibition took place and reports towards existing

concepts (figure 3.2.7). With respect to existing designs, participants reported a high level of familiarity, low levels of surprise, low willingness to adopt the concept and low radical change, as well as almost neutral report of surprise and belief that the concept would satisfy the concern towards the existing product. This is in stark contrast to the reports toward the new concepts, but reaffirms the positive relationships between surprise and radical concepts, as well as opposite reports between surprise and familiarity.

Figure 3.2.7. Visualisation of the reports towards existing designs and the new concepts during and after the exhibition.

There was a strong change in responses between the reports during the exhibition and the reports one month later, in particular towards the radical scale, familiarity and surprise. Participants did not find the concepts as radically different one month later, their report of familiarity moved into the positive area, and the report of surprise reduced drastically. The decrease on the report of surprise after a person is faced with a stimulus for the second time is well documented, even through neurobiological findings. Itti and Baldi suggest that “neural responses greatly attenuate with repeated or prolonged exposure to an initially novel stimulus” (Itti & Baldi, 2009, p. 1295). Nevertheless, there is evidence that suggests that even if the level of surprise decreases, its value remains as a novelty-detector (Itti & Baldi, 2009; Li, Cullen, Anwyl, & Rowan, 2003). Furthermore, it has been suggested that potential elements of surprise, such as humour, interest or fascination remain after a person has been exposed several times to a stimulus (Ludden, 2008, p. 152).

The balance between surprise and familiarity

The report of emotion and belief in the concept satisfying the concern it addressed were almost unchanged between the reports during the exhibition and one month later. Nevertheless, participants reported a slight increase in their willingness to adopt the concepts in their follow up reports. Exposing participants to the same concepts again can be seen as a way to introduce a radical innovation through a step-by-step process. The results suggest that the incremental exposure to the concepts reduced surprise and increased familiarity to a level in which the balance between surprise and familiarity was slightly more likely to elicit a stronger willingness to adopt the concepts.

The fact that participants reported some willingness to adopt the concepts even with a relatively high report of surprise and low report of familiarity may suggest that the concepts were not radical enough to evoke a strong enough level of surprise that would elicit a low report on willingness to adopt the concepts by participants.

Highest willingness to adopt the concepts: Share concern and find the concepts believable

Participants who shared the concerns that the concepts intended to elicit and that also believed that the concepts would actually work and fulfil such concerns (n: 22) were the most likely to report pleasant emotions towards the concepts and a high willingness to adopt the concepts (figure 3.2.8). This is in contrast to the results gathered from all participants who shared the concern of saving resources (n:38), regardless of whether they believed the concept would actually work. There were many participants (n: 16) who did not believe the concepts would work in reality (figure 3.2.9). The inclusion of participants who believed the concepts would not work drastically changed the results towards more negative emotion and lower report of willingness to adopt the concepts. The report of surprise was also higher amongst participants who believed the concept would work in reality.

Figure 3.2.8. Visualisations of the responses from participants who shared the concern that the concepts intended to address and believed that the concern would satisfy such concern.

Figure 3.2.9. Visualisations of the responses from all participants who shared the concern that the concepts intended to address.

Conclusion

Sharing a concern and believing a product satisfies such a concern

The fact that participants who shared the concern but did not believe it would work reported such low levels of pleasant emotion and willingness to adopt the concept is a very important aspect to discuss in design. Their report was even lower than the total averages towards the new concepts and towards existing products. This suggests that the concepts were less successful in eliciting a willingness to adopt them than with participants who did not share the concern. This may suggest that participants who share the concern are more likely to have a stronger reaction towards the concept, either positive or negative, than participants who do not care so much about the topic the concept is trying to address, in this case saving resources. The fact that the concepts were trying to address an environmental issue may also suggest that the topic itself was a more sensitive area to address. Regardless of the exact case, this suggests that there is a big challenge for designers in that they should be very careful to address sensitive issues through thoroughly believable concepts and proposals, as it may be counterproductive if people do not believe them to be feasible.

The balance between surprising innovation and familiarity

The results from this research suggest that there needed to be a balance between surprise and familiarity in order to achieve the maximum report of willingness to adopt the concepts. While the reports to the new concepts during the exhibition included a reasonably high willingness to adopt the concepts, such willingness increased one month later when the report of surprise decreased and the report of familiarity increased. This suggests that the concepts involved a high level of novelty the first time that participants experienced them and that such novelty was positive given the report of willingness to adopt them.

The findings from this research reinforce the expectation that step-by-step increments have a better chance of success, as the responses one month after the exhibition were slightly more positive than during the exhibition. However, the response of participants during the exhibition already involved a much higher willingness to adopt the new concepts than existing designs. This suggests that at least in this case, the new concepts already enjoyed a positive reception by participants.

While one month later the responses improved, the improvement could be ignored if a company intended to introduce the concepts to the market. For instance, if the immediate response from the potential market is already positive, the company may decide to introduce the concepts straight away instead of opting to introduce them through a step-by-step approach. This could give the company an advantage over their competitors if being the first to introduce a concept was an important step to take, instead of having a slightly better reception if they opted for the slower process of a step-by-step approach. The slower introduction may give a slightly better reception, but this may be counterproductive if it allows other companies to introduce new concepts earlier.

The need for a balance between surprise and familiarity is emphasised by the fact that the reports towards the existing designs involved a low level of surprise and a high level of familiarity, which resulted in an almost neutral report of willingness to adopt them. This suggests that the existing designs lacked the novelty factor that the new concepts offered. From this perspective, the surprise that novelty involved was related to a preference for the concepts.

Further research could investigate surprise and the behavioural response of people towards radical concepts with tools that assess actual behavioural change. As mentioned in this study, the willingness to adopt a concept suggests potential behaviour, but does not necessarily mean that behaviour will actually change. Such research could help elucidate whether the report of willingness to adopt a concept is closer to behavioural change or to attitudes as described in the appraisal theory of emotion. It could also help investigate more in-depth whether the positive attitudes towards a product and the level of surprise it may produce are related to aesthetic preference and emotional responses.

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Section 4

Conclusion

Section 4 brings together all the designers' strategies for eliciting surprise found and constructed during the research. It presents them in the form of cards (Appendix 4.1.1) that designers can easily access during the design process. The set of cards can also work as a teaching tool. The section offers examples of how design students have used the content in the cards. Finally, the conclusion poses further research questions. In particular, it offers a final design, "Grow: Your Own Table", that serves as a visualisation of where further research could go.

Chapter 4.1

Conclusion

Introduction

Surprise is a basic emotional response (Ekman, 1992, p. 170) to an unexpected, sudden (Frijda, 1986, p. 18) or uncharacteristic event or stimulus (Gabbay & Woods, 2005, p. 81). Surprise is a response that allows us to enter an alert state and increase our interest towards unexpected situations or stimuli, so that we can make sense of the situation (Pedgley & Wormald, 2007) and assess whether the unexpected stimulus implies a threat or brings benefits. The surprise mechanism has been explained as a discrepancy between perceptual input and cognitive schemata (Schutzwohl & Borgstedt, 2005, pp. 583-584). Under this perspective, surprise allows stopping current activities in order to analyse the discrepancy with the goal of making sense of the situation and remove the discrepancy (Schutzwohl & Borgstedt, 2005, p. 584). The sense-making state that surprise brings about increases the intensity to which something is experienced. If a person experiences a pleasant and surprising event, the fact that there is a sense of surprise involved will increase the pleasantness of the event, and conversely the opposite is true (Grimaldi, 2006, p. 2; Schutzwohl & Borgstedt, 2005, p. 588). Furthermore, it has been suggested that surprise evoked by designs elicits interest and other pleasant emotions (Ludden, 2008, p. 124).

In design, surprise holds the potential to increase the attention people hold towards objects and to improve the experience the objects offer by eliciting pleasant emotions. This is particularly important for the initial experience of the object and its potential acquisition. While surprise fades over time, objects that elicit surprise can still persist and evoke surprise over a long period of time (Ludden, 2008, p. 125) therefore improving the experience of the person interacting with the object, as well as eliciting sentiments of interest and amusement (Ludden, 2008, p. 127).

My research presented an investigation into how designers attempt to elicit surprise when a person interacts with a designed object. It addresses two main questions: how can designers attempt to elicit surprise through interaction and how do surprising designs affect what people do?

The first question, “how can designers attempt to elicit surprise?”, was investigated initially through interviews with renowned international designers in order to assess the *explicit* ways in which they attempt to elicit surprise. This approach uncovered ten strategies or approaches that designers use consciously during their process. However, it was necessary to carry out participatory research through design during which I collaborated with a design studio in order to expose six more strategies that designers use and were not reported during the interviews. Furthermore, it was necessary to work with students on design projects that attempted to elicit surprise in order to reveal four more strategies to elicit surprise.

The second question, “how do surprising designs affect what people do?”, investigated the role of surprise in supporting or affecting what people do. The reports from the initial interviews concluded that designers mostly attempt to help people achieve their goals by supporting their behaviour. Only in rare instances do designers attempt to persuade people to carry out specific activities. However, further studies through participatory research through design found that there is a continuum in which designers do attempt to affect the interaction between people and objects in subtle ways.

This section offers a final discussion of the strategies suggested in this research. Given that the strategies were found through three different methods –interviews, participatory research through design and working with students—this conclusion presents the entire set of strategies (table 4.1.1) and suggests how designers can use them in practice. I chose cards as the medium to communicate the findings of my research to designers and design students. Each card explains one strategy, its characteristics, what designers can do if they want to use the strategy, what they should be aware of, and offers an example drawn from my research. When the designers’ goal is to affect what people do through surprise, for instance persuade, the cards explain the role of surprise in behaviour and offer examples from my research. Finally, this chapter clarifies limitations of this research and offers suggestions for further research.

Table 4.1.1 Strategies for eliciting surprise through design and the affect on people.

Validating the Research

My research used a Situational Analysis methodology (Clarke, 2003, 2005) for assessing the results gathered from the interviews and participatory research through design. The result of the analysis is a map of strategies for attempting to elicit surprise. Clarke (2003) suggests that a map is “good enough” when it has reached *saturation* (p. 570) –a term common in Grounded Theory analyses. Saturation means that the explanations offered in the thesis include all the relevant knowledge that can be constructed from the data gathered and such explanations have been analysed many times and are not changing substantially anymore (see for example Strauss & Corbin, 1998, p. 570). Saturation in my research was reached by having worked on the map of strategies many times over a few years, adding and deleting strategies, combining strategies with other common strategies, breaking strategies down into sub-categories, and reaching a point at which I believe that all the strategies that matter –and that can be derived from my research— are addressed. There are of course other strategies that designers use for eliciting surprise. However, the methodology I used –Situational Analysis—requires researchers to base their findings only on the data gathered by the research. With this in mind, the map of strategies for eliciting surprise constructed during my research represents an analysis that reached saturation. Also, the analysis of each strategy was triangulated, which means that there were at least three examples from different sources that illustrate the strategy. The sources include the interviews with the designers, background research into existing objects and participatory research through design.

How Can Designers Attempt to Elicit Surprise Through Interaction?

Firstly, my research found through a series of interviews with international designers that the way designers attempt to elicit surprise depends on the main concern of their organisation. There were four main groups of design organisation interviewed: academic design organisations; large design companies; design consultancies and small design studios with well-known lead designers whose main concern was to express themselves.

Design organisations' intention to elicit surprise based on their main concerns

Academic design organisations reported that their main concern was to produce knowledge for the discipline. They had a strong interest in addressing design through research and rigorous approaches. They only mentioned surprise when it was part of their research, in particular Technical University of Delft.

Large organisations with manufacturing capabilities and in-house design studios –such as Samsung Electronics and Philips Design— were mainly concerned with reducing business risks for the company. They reported to be more interested in eliciting emotions such as joy and satisfaction and did not mention surprise in the interviews. They believed that objects that elicit surprise also increase risk in the market. They had a high level of interest in design research and their approach was systematic.

Design consultancies –such as Fuseproject, IDEO and Astro Studios—reported that their main concern was to satisfy their clients' needs. If the client was a large organisation, they were more likely to attempt to reduce business risks, in which case they had little or no interest in eliciting surprise. If the project was coming from within the studio and represented an expression of the studio's philosophy, they were more likely to attempt to elicit surprise. These studios involved a combination of a small amount of research and their informed experience and intuition. Finally, small design studios with well-known lead designers whose main goals were to express themselves, almost always reported that they attempted to elicit surprise in people through the design of their products. None of the studios reported to be interested in research and they largely relied on their informed experience and intuition. This group of designers held valuable knowledge about how to elicit surprise. While the designers in this group mentioned some strategies openly, their knowledge about surprise was often implicit. My research focused on investigating how these designers who rely on their informed experience and intuition attempt to elicit surprise. I decided to focus on this group of designers as they reported the greatest number of strategies for eliciting surprise and there is a gap in the design literature that offers an analysis on these designers' approaches. The strategies constructed in this research are mainly based on approaches by design studios whose goal is to express themselves. However, they could be

incorporated by any of the other design organisations mentioned in this thesis when they attempt to elicit surprise. The following section presents the complete set of strategies that my research constructed. The strategies are presented in the form of cards. Designers and design students from any design organisation are able to use them when they attempt to elicit surprise.

Strategies for attempting to elicit surprise: A set of cards

The set of strategies (table 4.1.1) for eliciting surprise represents the conclusion of my research. They are divided into two categories reflecting the two research questions that began this research. The first research question posed was “how can designers attempt to elicit surprise through interaction?” and is addressed by category A: Strategies for attempting to elicit surprise. The second research question posed was “how do surprising designs affect what people do?” and is addressed by category B: How surprising designs affect what people do.

Why a set of cards

The strategies are presented in the format of cards (Appendix 4.1.1). They are targeted to an audience of practicing designers and design students. I chose the medium of cards to express the final constructed strategies because:

- They can be carried around and exist within a design studio or classroom: books are harder to move around.
- They are self-sufficient and do not need a screen, computer, portable device or power. Nevertheless, I plan to develop a digital application and a website that are more interactive and allow for connections between different strategies as well as showing a growing number of examples.
- Cards are a familiar medium to industrial designers and researchers in the area, in particular because of the IDEO Method Cards.

- Designers can use only one card at the time, or lay them all on a desk and have a wider view of all the options the cards offer.
- Teams can share them and individuals can work on specific strategies at the same time.

The cards offer a portable format for easy access in design situations and allow quick reference to the strategy with a description, example, aspects to consider, what to do when using each strategy and some bullet points to check whether the designer is on the right track. The cards neither claim to be exhaustive nor to be the only way to approach surprise. They do not attempt to be a strict formula for designing. They offer starting points and some guidelines for designers who wish to elicit surprise or affect what people do through eliciting surprise. Throughout their own design process, designers are likely to find their own ways to adapt the approaches that the cards present. In order to emphasise such flexibility, the set of cards includes a few blank cards for the designers to include their own approach, potentially found after using this set of cards. Given that the cards suggest potential approaches to surprise, it is the designers' choice whether they need to use other tools to assess whether people actually experience surprise through the designs.

The first category –strategies for attempting to elicit surprise—includes strategies that can be applied in two stages of the design process: as a motivation to start a design project, or during the design process once the project has begun.

Strategies to find inspiration and motivation for starting a design project

The research found four main strategies that designers use for finding inspiration and motivation for *starting* a design project and three sub-categories for one of the strategies. These strategies involve observations by the designers that are carried out during their everyday activities and are not normally related to projects in which the designers are working on at the time.

Designers reported to carry out at least four kinds of observation: observations beyond their personal experience, observations of their personal experience, observations of

issues in their world and observations through experimenting. The cards A.I in Appendix 4.1.1 explain this category.

Strategies to elicit surprise through interaction used during the design process

The research also found eight main strategies –and seven sub-categories—that designers use *during* the design process. Initially, six strategies –with no sub-categories—were found through the series of interviews with international designers. The other strategies were found through four case studies that involved participatory research through design. The cards A.II in Appendix 4.1.1 explain this category.

The use of the “unexpected”

The strategies suggested in my research often refer to an “unexpected” stimulus. In the design of products, the stimulus can be the characteristics of the product, such as its appearance, the interaction it offers, textures, weight, colour, forms, technology it uses, and so on. How the “expected” is defined depends on each individual person experiencing the object. Designers often rely on their informed experience to make assumptions about what some people may expect an object to be like, including its scale, movement, elements, context or appearance. The informed experience is not bulletproof. Fuseproject for instance reported projects in which the assumptions or guesses of the designers were completely off target. These included the design of a helmet for hockey players that ignored the players’ preferences.

What the expected is also depends on a timeframe. Once a new design breaks an existing expectation, that new surprising element will probably soon become expected. This is explained by the concept of “extinction”, which describes the fact that a stimulus that originally creates an emotional reaction slowly decreases its intensity until the response stops. In the case of surprise, extinction can occur after only one exposure to the stimulus. Nevertheless, it has been suggested that the remaining reaction still produces a sense of humour, satisfaction and joy (Ludden, 2008).

It is the designers’ responsibility to assess in which projects they can rely on their informed experience and when they need to carry out further research to understand their audience. Chapter 3.1 of this dissertation shows a number of methods that can be

used for assessing people's expectations. The methods were used to assess people's responses to using different designs of mousetraps. The methods include interviews, questionnaires, ethnographic observation of interactions with products, self-report of emotions experienced during the interactions through Talking Out Loud and filling out the Geneva Emotion Wheel, people watching their own video-recordings, analysis of recorded data through conversation analysis and situational analysis, among other methods. The use of these methods in the appropriate stage of the design process can help designers refine their understanding of people's expectations and therefore improve their chances of producing surprising designs.

How Can Designers Affect Interaction When Eliciting Surprise?

The second question that my research addressed was "how do surprising designs affect what people do?" The research found four ways in which designers affect what people do. This research found examples in which designers attempted to support what people do, suggest interactions in subtle ways, unambiguously indicate what interaction ought to be performed and attempt to persuade people. The cards B in Appendix 4.1.1 relate to this category.

The Role of Surprise in Persuasion

The research presented in this dissertation addressed persuasion through two case studies. The first study investigated how designers can attempt to elicit surprise in order to persuade people to use mousetraps. The second study addressed people's reaction to radical concepts that attempted to encourage people to save resources. The research found that surprise can be used in at least two ways when trying to persuade people to perform specific tasks. Firstly, it can be used as a threat-detecting mechanism when people need to be discouraged. Secondly, it can be used as a sense-making process that

helps people focus on a stimulus—in this case the object designed—that portrays a persuasive message.

If you want to discourage people, use surprise as a threat-detecting mechanism

It was discussed in Chapter 3.1 how the research could not find a strong correlation between the level of surprise people reported towards the mousetrap designs and the level of persuasion achieved. The design team produced traps that attempted to offer positive emotional feedback when people engaged with the trap; negative emotional feedback if they did not engage with the trap or did not trap a mouse; and neutral feedback as a comparing group of designs. Surprisingly, the traps with an attempted neutral feedback were the most successful in receiving reports of willingness to use them in the future. This finding could suggest that in this undesirable situation, it was better to avoid surprising elements for people to be willing to engage in the activity. This is in line with the theory that surprise is a threat-detecting mechanism (Schutzwohl & Borgstedt, 2005, p. 583). The high report of surprise could have been more related to the activity of catching a mouse than to the actual designs. If people found the activity threatening, they would have reported high levels of surprise but low willingness to carry out the activity. Such low willingness could have been then related back to the designs.

If you want to encourage people, use surprise as a sense-making process

The findings from traps DP2.10 and DP3.1 suggest that there can be designs that reduce the reports of negative emotions—in this case disgust—increase the report of pleasant emotions—in this case satisfaction and joy—include a high report of pleasant surprise and are successful in receiving reports of willingness to use them. In these cases, the reports could have been related to the theory that relates surprise to a sense-making process that increases the level of interest in a stimulus (Itti & Baldi, 2009; Müller & Stahlberg, 2007; Pezzo, 2003). The changing form of the design DP2.1 and

the surprising characteristics of relating a mousetrap to a plant pot and looking after a plant in design DP3.1 might have elicited a sense-making process. It seems that seeing surprise as a threat-detecting mechanism when activities want to be stopped and as a sense-making process when activities want to be encouraged, could be valuable approaches for designers working in persuasion-related projects.

The importance of testing designs

The mousetrap case study highlights the relevance of assessing designs with people. Section 2 of this thesis highlights how experienced designers develop an informed experience that helps them assess what the potential responses of their customers may be. However, such informed experience is not bulletproof and making assumptions without testing can mislead designers, in particular when persuasion is the goal. The design team was often surprised at the results of the assessments, as they often expected different results. Testing the designs gave the designers further knowledge about each of the groups of concerns that the designs attempted to address. It should be highlighted that as the project went on and after assessing many designs, the later designs were more successful at achieving the attempted reactions in people. This would not have been possible without the input that the assessment of people's responses to the designs brought to the project. As Forty puts it “no design works unless it embodies ideas that are held in common by the people for whom the object is intended” (in Lloyd & Snelders, 2003, p. 237).

Concern groups and mental images

Concerns are aspects that people find important because they affect them. According to the Appraisal theory, people appraise stimuli according to how they satisfy their concerns (see for example Demir, Desmet, & Hekkert, 2009; Frijda, 1993; Smith & Kirby, 2009). If the stimulus is beneficial for the concerns, a pleasant emotion is likely to be experienced. In the projects where persuasion was the goal, it is suggested that investigating people's concerns and assigning people to concern groups was vital. While every person is different, this research showed that design teams could find some characteristics and concerns that people share and that can serve as an indication of

what reaction we can expect from people who share the same concern. Some concerns were more significant than others. For instance, in the first two sets of designs of mousetraps it was easier to predict what the response of people from the Humane group was going to be like. People in the Humane group shared the concern of not wanting to kill mice. Nevertheless, depending on the depth of the project, the individuality of each person can bring unexpected results. The same Humane group had very different results for the trap DP3.1, in which a dead mouse is left in the trap which becomes a pot plant where the plant is fed by the decomposing mouse. The trap DP3.1, which divided the group into opposite interests: some people found amusing that a mouse would be left in the trap feeding a plant and a butterfly, whereas the rest from the same group found the design offensive. This shows that even when people share the same concern, there were sub-sets of concerns that needed to be understood for this particular design. Testing the designs gave the design team the necessary knowledge to work with such differences.

Finding a balance between familiarity and surprise

Studying people's concerns in order to establish sets of expectations can be a starting point for designing. This is particularly important for defining what people's expectations are, what people find familiar and how such expectations and familiarity can be challenged in order to elicit surprise. It was discussed in the research how there needs to be a balance between familiarity and surprise for people to be willing to adopt radically new concepts. In this research, new concepts for appliances that attempt to save resources were preferred when respondents found a balance between the level of familiarity they perceived towards the concept and how much surprise it elicited.

It is difficult to define what the balance between familiarity and surprise is for every individual experiencing any object in any context. Nevertheless, the case studies suggested that testing a number of concepts could help determine how people with specific concerns respond to the concepts. Such testing helped designers define which concepts are closest to the balance between familiarity and surprise. Such balance would also change depending on the intent of the organisation. For instance, large design organisations may find that the balance for their products lies closer to familiarity, while smaller design studios may attempt to find a balance closer to surprise.

Applying the Strategies

The conclusion of a thesis in mathematics may offer an equation, in the social sciences a situational map, or in chemistry a structural formula. My research offers a set of strategies that can be used by designers and design students. In order to offer an example of how the strategies suggested in this research can be used for designing, I include designs as illustrations of how a group of design students used the strategies suggested in my research. In other disciplines, the conclusions and final discussion may rely solely on text. In Design, I feel that part of the final discussion should be visual and experiential. This can benefit practising-designers and design students who can find it useful to see the conclusions of a research project through visual applications and illustrations. Pedgley and Wormald (2003, 2005) emphasise that designing can “successfully be integrated into a Ph.D.” (p.84) as long as there is an “essential research function of the design projects” (p. 84). They go on to suggest models contingent on the researcher carrying out a design project. The designs shown below relate to the models “finding out about design practices... to help uncover decision-making processes” and “devising improvements in design methods” (Pedgley & Wormald, 2007, p. 85). In particular, the designs that I include below help illustrate and assess the design methods suggested by my research. The designs are not presented as results to be admired. Rather, the designs represent an illustration of how designers may benefit from using the strategies, and what difficulties they may face with the strategies. It was chosen to carry out the assessment with design students as they have little or no informed experience. This gives a good opportunity to assess how inexperienced designers can benefit from applying the strategies, but also what difficulties they may find.

Design students applying the strategies

A second year industrial design course at Victoria University of Wellington was carried out following the strategies suggested in this research as guidelines. The students were given a brief that worked as a way to assess the usefulness of the strategies suggested in this thesis. The brief asked students to develop lamps that attempt to elicit surprise by using the strategies from this research. The second year industrial design course was chosen as the medium to assess the strategies as it was assumed that the students would

have little or no informed experience –it was the first course in their degrees in which they would design a functional object. It was assumed that the design results would reflect to some degree the usefulness of the strategies.

The students were given a 2-hour lecture and paper-based information including the strategies and some examples. They were given a set of components for making a lamp. The components included LEDs, LED strips (both rigid and flexible), halogen light bulbs, transformers and cables. The students were given six weeks to study the components and use at least one of the strategies to attempt to elicit surprise through the design of a lamp. The final design had to be a fully functional prototype.

The following lamps are examples of how students interpreted the brief and the strategies to elicit surprise suggested in this research. The students were interviewed at the end of the course and asked how they used the strategies and how their approach reflected in their projects. The research was carried out under the Victoria University of Wellington's Human Ethics Approval #18081. The assessment criteria for the final designs included the “You know you are on the right track when...” bullet points from the Strategies for Eliciting Surprise cards. Three experienced staff members from the School of Design, Victoria University of Wellington, assessed the projects. Their joint assessment was summarised and presented below.

Toaster lamp by Shiping Toohey (figure 4.1.2)

Shiping Toohey chose the strategies: using archetypes in unexpected objects/contexts and unexpected movement. She was interested in combining the two and started by analysing movement from contexts that are not normally related to lamps or lighting. Her final design uses visual references and the movement of the interaction of a toaster in a lamp. The design includes “slices” of plastic that close the circuit and turn the lamp on when pushed in, as a piece of toast. She used LED strips in order to achieve a thin design that fits within the archetype of a toaster. The “toast slices” can come in different colours and exchanging them changes the light quality of the lamp.

Figure 4.1.2. Toaster lamp by Shiping Toohey.

Assessment

The design successfully brings an unexpected archetype—a toaster—to a lamp by using the proportions of the toaster and an element in the form of a slice of bread that slides inside the lamp. The light coming out of the lamp is also reminiscent of the light produced by the heating elements of the toaster. Furthermore, the use of the new archetype has a justified purpose: when the slice is slid into the lamp the light turns on. Also, the slices of different colours of plastic allow for changing colours of light and creating different moods.

Including a popping mechanism for extracting the slices would have connected the design even further to the archetype of a toaster. While the light is reminiscent of the

light emitted by the heating element of the toaster, it could have included a red tinge in order to make that connection stronger.

Blue Hansel by Zoe Saville-Wood (figure 4.1.3)

This project uses the strategies: unexpected scale and using archetypes in unexpected objects. The lamp involves an electroluminescent wire enclosed in a glass container that works as a night light for children. The wire is very long (20m) and can be pulled out of the glass container as the kid walks from his/her room and to the toilet in the middle of the night. The wire still attached to the power mains creates a trail that illuminates the path the child follows. The shape of the container is that of an incandescent light bulb. Such form brings in a sense of familiarity as the object is also related to lighting, but it is an unexpected archetype as the lamp does not include an incandescent light bulb and instead is illuminated through the electroluminescent wire. The lamp also emphasises and exaggerates the length-quality of an electroluminescent wire and uses it in order to leave a trail from the child's room to the bathroom.

Figure 4.1.3. Blue Hansel by Zoe Saville-Wood.

Assessment

The design successfully uses the strategy “exaggerating the object’s components” by exaggerating the length of the electroluminescent wire. This is done with a specific purpose: to create an illuminated trail for children to go to the bathroom. The assessment panel found that the strategy “using archetypes in unexpected objects/contexts” was not as successful, given that the archetype of the form of an incandescent light bulb is in fact very closely related to the use of the lamp. Suggestions from the assessment panel included involving the form of a loaf of bread, in order to strengthen the connection with the story of Hansel and Gretel leaving a trail of breadcrumbs behind them.

Lamp Mug Me by Tui Hurumeke (figure 4.1.4)

This lamp turns on when it feels the weight of a mug full of liquid on it. It has a dimmer that fades the light down as the weight decreases. Hurumeke made use of the strategy “observations beyond my personal experience” as a starting point for the project. She observed her partner always drinking a cup of tea when going to bed or a coffee in the mornings while reading. She realised there was a correlation between the lamp being on and her partner having a hot drink. She also used the strategy “archetypes in an unexpected object/context” by linking a cup and a lamp into the same object.

Figure 4.1.4. *Lamp Mug me* by Tui Hurumeke.

Assessment

The panel found that both strategies were used successfully. The “observation beyond my personal experience” strengthened the claim that observations will hold a stronger value when they are made for people close to the designer/s, in this case Turumeke’s partner. “Using an archetype from an unexpected object/context” was also successful by bringing a cup as part of the design and making its weight an essential element for turning the lamp on. The panel suggested that any other object with the same weight could be used for turning the lamp on and that making the top surface in a shape that would only receive cups would help make the connection between a cup and a lamp stronger.

Lamp Walk with Me by David Hargreaves (figure 4.1.5)

The design of this lamp is very similar to Blue Hansel by Saville-Wood described above. It also uses the strategies unexpected scale and using archetypes in unexpected objects. The lamp allows for a long cable to be twisted around forming the shape of an

incandescent light bulb. Such a cable allows the user to walk around with the lamp and use it much like one would use a fire torch. The lamp also exaggerates the length quality in this case of the cable to power the light source.

Figure 4.1.5. Lamp Walk with Me by David Hargreaves.

Assessment

The panel assessed this design in a similar way to the Blue Hansel lamp. The design successfully exaggerates the length of the cable, but the attempted use of an external archetype could have used an archetype that is not as close to the actual function of the product.

It should be mentioned that the lamps Walk with Me and Blue Hansel were developed during the same class but in two different tutorial groups, which means that the students did not know about each other's projects until well into the project when their concepts had been finalised and they were only solving the final material and production aspects. This suggests that the approach they followed led them to very similar results. Also, the course included a videoconference call with Ingo Maurer from Germany, who is very interested in the incandescent light bulb. This might explain why some of the students were interested in using the archetypal shape of the incandescent light bulb in their projects.

Lamp Vase Strip by Jamie Sims (figure 4.1.6)

This lamp uses the strategies of “using magic” and “using archetypes in unexpected objects/contexts”. The lamp consists of a number of rigid white LED strips that fit within a conical space inside a ring resembling flowers in a vase. The resemblance with the vase represents the unexpected archetype. When the strips are placed inside the vase, they “magically” turn on, as there are no cables or other visible plugs to carry electricity. The LED strips include a positive electric connection at their bottom tip, which touches the base of the vase. It also involves a negative connection on the back of the strips, which touches the inside of the vase’s ring. When the strips are positioned inside the ring, the contact closes the electric circuit and the individual strip is turned on.

Figure 4.1.6. Lamp Vase Strip by Jamie Sims.

Assessment

The panel found the use of an external archetype successful by bringing together a vase and a lamp. The minimalist design also reinforces this connection. The panel commented that it was refreshing to see a design that involves magic by having the light source independent from the lamp with no need for cables to be connected.

Lamp No Wires by Alex Buckman (figure 4.1.7)

This project uses the strategy “using magic” through “concealing expected elements”. The lamp conceals any electric connection between its base and the wires that support the light bulb. The only visible thing is a transparent plastic base that supports the lamp. It would seem there is no way for electricity to reach the light bulb. This is achieved by carrying the electricity through thin aluminium tape stuck to the sides of the transparent plastic piece.

Figure 4.1.7. Lamp No Wires by Alex Buckman.

Assessment

The panel found the “use of magic” successful in this design, in particular “through concealing expected elements” as it took them a very close analysis to figure out how the light bulb was powered –there were no cables visible. They praised the use of transparent plastic, which emphasised the lack of connections through its transparency. The only negative comment was that the light bulb chosen for this design was very stark, which is a comment beyond the scope of the strategies discussed in this research.

The Wax Lamp by Daniel Kamp (figure 4.1.8)

This lamp uses the heat produced by a halogen light bulb to melt its wax shade. As it melts, the wax's aluminium strip core pushes the wax shade outwards, opening the lamp and giving out more light. The wax is recovered and reformed in order to make a new shade.

Figure 4.1.8. The Wax Lamp by Daniel Kamp.

The Wax Lamp illustrates the strategy “address and use the perceived weakness of a component”. The heat produced by incandescent and halogen light bulbs is normally regarded as a problem and different solutions and recommendations are given in order to minimise its impact. The Wax Lamp makes use of such heat in a positive way and bases its main concept on it. Existing designs that make use of a weakness such as heat are the lamps Protea by Karl Zahn (figure 4.1.9) and Slow Glow by NEXT architects & Aura Luz Melis produced by Droog Design (figure 4.1.10). In order to let light through, Protea opens its heat sensitive wings and Slow Glow slowly melts its fat content as their light bulbs heat up.

Figure 4.1.9. Lamp Protea by Karl Zahn. Image courtesy of Karl Zahn.

Figure 4.1.10. Slow Glow lamp by NEXT architects and Aura Luz Melis. Image courtesy of Droog Design.

Assessment

The lamp successfully uses the perceived weakness of a component—in this case heat—in order to create a surprising interaction. The panel suggested that while using the heat to melt the wax was a great innovation, the system for reforming the wax and re-using it could have been simpler.

Discussion on the usefulness of the strategies

The panel concluded that “using archetypes in external objects/contexts” seemed to be a strategy that students addressed often with good aesthetic results, but that can also bring solutions that the panel found to have little aesthetic sensitivity when putting two archetypes together, as the two archetypes either clashed or had no beautiful or surprising connection between them.

The panel suggested that while “magical interactions” seemed to be a very successful strategy, it was probably also connected with the fact that lamps use electricity to produce light. Such a combination represents a factor that can lend itself to magical ways to turn lamps on or off. The panel suggested it would be interesting to investigate “magical interactions” in other type of objects. Similarly, “using the perceived weakness of components” is a strategy that seems to be easily applicable to lamps, as they have specific components that are easy to differentiate. However, it is arguable how useful this strategy would be in the design of objects with less visible components, such as touch-screen phones.

It was mentioned that “observations beyond my personal experience” and “addressing idiosyncratic behaviour” overlapped in the observation side of the strategies. It should be clarified here that “observations beyond my personal experience” refers only to observing people carry out their daily activities and using the observations as inspiration to start a design project. The observations can be about an idiosyncratic or about a much more common behaviour and the final solution may not be used during the performance of the observed behaviour. On the other hand, “addressing idiosyncratic behaviour” refers only to designing something specifically for people to use while performing an idiosyncratic —not very common—behaviour.

Beyond the comments above, the panel showed excitement towards the strategies and wished that there were examples of all of the strategies in the students’ work. Again, it appears that a lamp project would lend itself more to the use of specific strategies, which is an interesting aspect to investigate further.

Limitations of the Research

Generalisations

The first point to clarify is that the results and suggestions from this research relate solely to the interviews and case studies presented in the research. As I used a Situational Analysis (Clarke, 2003, 2005) methodology, which is derived from Grounded Theory (see for instance Strauss & Corbin, 1998), the findings can only be applied to and explain the data collected in the research. As Archer mentions, the results of some types of research can only be reliably applied to the context in which the described action happens (Archer, 1995, pp. II-III). The results are not meant to be generalised as absolute truths or indisputable facts, but can serve as situated knowledge and guidelines for similar situations. The strategies for eliciting surprise suggested in this research represent starting points for research teams for whom generalisation is important. The Further Research section below offers some examples of how the specific descriptions in this research could be taken further to investigate more generalised questions.

On Research through Design

In this research, I was part of the research process and also carried out participatory research by being part of the design teams that produced the work under investigation. This approach involves a level of subjective knowledge. Nevertheless, I attempted to make my contribution to all the projects as clear as possible –whenever there was subjective knowledge produced– to offer the transparency that Gray and Malins call for (Gray & Malins, 2004, p. 18). A constructionist approach admits that researchers inevitably construct knowledge subjectively in their minds, but also requires them to base such mental constructs on the data they gather from the topic of investigation (Crotty, 2003, pp. 42-63). The designs in which I participated were connected to the topic of investigation and beyond my own personal interpretation by being developed in collaboration with other designers and students. They also involved interviews, user testing, questionnaires and expert reviews, all of which help move this project towards a constructionist approach that involves my personal construction and understanding of

the topic of investigation as well as third-party elements from the topic. Such an approach is not dissimilar to the social scientist immersed in the context of study and through such immersion may affect how activities take place. The research offers an example of how research through design may be approached: research through design can help uncover methods that designers use in their everyday practice but that are not explicitly communicated to other audiences. In this case, research through design was necessary in order to make explicit the strategies that designers use for eliciting surprise. This approach is in line with the models of how to include designing in PhD projects suggested by Pedgley and Wormald (2007, p. 84-85).

The specific area of design addressed

The interviews carried out in this research, that embody the pillars for how the research was structured, studied a representation of a particular type of design organisation: one that has well-known leading designers who depend on their informed experience and develop products with the explicit attempt to express themselves and to surprise people. The main reason to select design organisations with these characteristics is that they explicitly attempt to elicit surprise through their designs. This means that it was the group with the most potential for offering strategies to elicit surprise. Also, there was a gap in the literature on analysis of how designers from these organisations work. In fact, within the profession there is mystique surrounding design teams with a famous designer (see for instance Forty, 1986; Lloyd & Snelders, 2003). Design magazines and manufacturers benefit from selling designs that are created by a famous designer whose “talent” is indescribable, unreachable to customers and non-transferable to other designers. For instance, Forty calls the designers’ focus on their own unexplainable creativity the “myth of their own omnipotence” (Lloyd & Snelders, 2003, p. 237). This research seeks to partly demystify such omnipotence and shows that in fact at least part of that “myth” can be explained and communicated to other designers and design students in the form of strategies to elicit surprise. It is not the intention of this research to claim that the projects developed by studios with a well-known designer are “better” or should be admired. Simply, those projects provided an opportunity to investigate how such design studios attempt to elicit surprise.

Assessing people's responses to the designs

A limitation on the scope of my research is that not every single design discussed in –or produced by–the research was tested in order to assess how surprising people found it. Such an approach was not the goal of this dissertation. The strategies reflect what designers do when they attempt to elicit surprise, rather than the actual responses of people towards the designs. Testing every design with a relevant amount of people would have limited the scope of this research to assessing only a few strategies given the time and effort necessary to carry out user-testing sessions that properly isolate the relevant variables. Instead, the goal of my research was to uncover a larger amount of strategies that designers use when they attempt to elicit surprise and communicate them to a design audience in a way in which the strategies could be used for designing. Because the strategies are intended to be used for designing, I offered illustrations of how inexperienced designers used them in a design project, what their achievements were, and what problems they found.

The strategies were not assessed independently of one another to determine how successful they are in eliciting surprise. Instead what was assessed was that the strategies reflect the approach used by the designers rather than the level of surprise elicited by each strategy.

Assessment of people using the designs was carried out in two case studies regarding persuasion. The testing was necessary to develop iterations of designs based on how successful the designs were in persuading people. This was particularly the case for the design of mousetraps. However, the testing was carried out with a small number of participants and the results do not attempt to be statistically valid, they simply represent the responses of the participants.

There are many areas related to surprise and interaction that would benefit from rigorous testing of designs with users, but such areas were beyond the scope of the research. Further research topics that arose from the research could be approached with more rigorous user testing and are described below.

Further Research

Strategies to elicit surprise through interaction

The research suggests four main strategies to use as inspiration for starting a design project and eight main strategies to use during the design process when attempting to elicit surprise. The strategies suggested are based solely on the results from the interviews and case studies developed during this research and are not exhaustive. Further research could investigate what other strategies there may be. The involvement of design students and the analysis of their designs and intentions is a potentially useful avenue. While design students often lack informed experience, they can come up with fresh ideas that are not influenced or biased by the pressures of working with clients, manufacturers, and so on.

Investigating each strategy in depth

This research offers a few examples for each of the strategies. Further research could investigate the characteristics of each strategy in more depth. For instance, the strategy “using archetypes in unexpected objects/contexts” seems to have been addressed more often when the strategies were presented to a group of design students. Is this because the strategy is easy to understand, because it is more simplistic or some other reason? Furthermore, we cannot expect that any archetype can be applied to any object or context and elicit a pleasant surprise. It seems that it is necessary to have a subtle level of familiarity between the archetype and the unexpected object or context. How close do the two need to be? How and when does a connection not work and instead elicits unpleasant surprise? Is this strategy more useful for specific types of design organisations or for specific design projects? Like these, there are many questions for each of the other strategies that could be addressed by further research.

The long-term effects of surprise

A specific characteristic of surprise is that it can be a single event: a surprising design can be surprising only the first time that it is experienced. Through a longitudinal study of surprising objects, Ludden suggests that surprising objects often elicit other emotions in the long-term, such as “interest, fascination, amusement, confusion, indignation and irritation” (2008, p. 120). Ludden’s longitudinal study was carried out over a period of up to 35 days (2008, p. 113). Further research should investigate the role of surprising objects over an even longer period of time. There are objects suggested in this research, including a mousetrap in chapter 3.1 and a table below, that are designed to elicit different experiences and surprise over a period of months and even years. Can objects elicit surprise after years of ownership? What other emotions accompany such experience? What are the characteristics of objects that are surprising over the long term? From a postmodern phenomenological perspective, what are the individual stories of people using surprising objects over a long period of time?

Surprise and intelligent objects

The main body of this research revolves around the designer’s attempt to elicit surprise. What the designers want the interaction between a person and their designs to be like can be defined and is finite. The music-like script described in section 3.2.3 to graphically represent what the designer wants to achieve offers a way for designers to write and draw what they want an interaction between a person and an object to be like. The intention of the designer is finite because in all of the examples shown there were no more than a few steps of interaction between the person and the object that the designer could visualise. For instance, the Aurea lamp involves four steps of interaction: looking inside the lamp, being surprised at the lack of a visible light bulb, trying to make sense of where the light is coming from and being satisfied at figuring out where the concealed light source is. Nevertheless, objects with more complex interactions may find the music-like script suggested in this research limiting. In particular, there is growing research about intelligent products that react through sensors and software to contextually input data that can include the behaviour of people. For instance, Ross and Wensveen suggest using aesthetic interaction as a mechanism for designing intelligent

products and systems (Ross & Wensveen, 2010). According to them, an aesthetic interaction has a practical use, social and ethical dimensions, dynamic form, and involves people's skills (Ross & Wensveen, 2010, p. 3). They illustrate their approach through designs of lamps that intelligently react to the behaviour of people. Intelligent objects' reactions to people's behaviour are sometimes unforeseen by the designers. This means that the designer has even less control at defining the conversation between the object and the person. The implications for investigating surprise are at least twofold. Firstly, it is harder for the designer to establish how surprise may be achieved if they do not know what the interaction will be like. Secondly, the on-going interaction with intelligent products brings up the issue of extinction, where the strength of a stimulus to elicit an emotion, in this case surprise, diminishes the more often the subject is exposed to the stimulus. How can the designers attempt to elicit surprise with intelligent products at unforeseen stages of the interaction? These issues hold strong potential for further investigation.

Similarly, another growing area of design is additive manufacturing. This involves the potential to "grow" objects in ways that react to their context. For instance, it has been suggested that it will be possible to 3D print human organs, food and objects in ways that react to their environment. Again, it is harder for the designers to establish what the final configuration of the object will be. In this case, further research could investigate, for instance, how designers can attempt to elicit surprise through different stages of a product's growth.

Persuasion and surprise

Persuasion and emotion as a feedback mechanism

Considering the relationship between emotion and behaviour as a feedback mechanism implies that the response to a stimulus leaves an emotional trace that influences future behaviour. For instance, if I feel guilt when betraying a friend, the feeling of guilt will leave a trace that will make me feel guilty the next time I encounter a similar situation. This will make me less likely to betray a friend again. This research and in particular the study of mousetraps suggests that it is important to consider emotion and behaviour as a feedback mechanism as the object and the person can engage in a "conversation".

This is a critical point for understanding interaction. The conversation can involve sending messages back and forth and each interaction can involve an emotion, potentially surprise. While the mousetrap study attempted to see emotion as a feedback mechanism through the music-like scripts of the potential interactions, future research could go further and study whether and how the emotional trace that an interaction leaves may affect the person's future behaviour when interacting with the object. Such research would need to assess the emotional response of people to objects and interactions and somehow elucidate whether an emotional trace was left. This kind of research would be useful for trying to establish what kind of interactions are more effective at establishing longer-term persuasion patterns in people.

Persuasion and surprise as a sense-making process

One of the relevant characteristics of surprise is that it can be seen as a sense-making process. This means that a surprising stimulus grabs people's attention while they try to make sense of what the stimulus is and means for them. This research suggests that when attempting to persuade, it seems valuable to use surprise as a sense-making process so as to seize people's interest and potentially deliver a persuasive message while the interest is strong. This hypothesis requires further research. Humour and surprise have been used in advertising in order to increase people's level of attention and interest in the advertised product and surprise has been considered as a necessary condition for humour in television advertising (Alden, Mukherjee, & Hoyer, 2000). The connection between how much interest a surprising interaction with an object awakes in people and how persuasive the interaction is also requires further research.

Surprise and persuasion and the broader world of design

The research in this dissertation focused on designers who attempted to elicit surprise. It was discussed in Section 2 how large design organisations rarely attempt to surprise their customers through the objects they sell, as they are more interested in eliciting joy, pleasure and satisfaction on their customers. Nevertheless, such organisations are increasingly interested in persuasion. For instance, Robert Fabricant –Vice President of Creative at Frog Design– affirms that “designers now are in the behavior business” (2009). Fabricant adds that “many of the challenges that businesses are facing cannot be addressed without a strategy for influencing behavior in a positive and sustained

manner”. He insists that “innovation comes from an intense collaboration with your customers through which you can influence the behavior that will keep you (and your products and services) relevant for a long time” (Fabricant, 2009). Fabricant mentions Project Masiluleke as an example of how they have attempted to catalyse behaviour change at Frog Design (Fabricant, 2009). Project Masiluleke is an effort to battle the spread of HIV in South Africa. The system makes use of mobile phones in order to encourage the use of low-cost diagnostic tools, to explain the testing process to patients, and to encourage preventative behaviours. The system also suggests a home HIV-testing pack (figure 4.11).

Figure 4.1.11. HIV testing system from the Masiluleke Project. Image courtesy of Frog Design.

Another company that has been developing a strong focus on behaviour research is Philips Design, which claims that good design “is about creating products and solutions that satisfy people’s needs, empower them and make them happier”. Stefano Marzano – CEO and Chief Creative Director– also admits that Design can influence people’s behaviour and reminds the discipline of its responsibilities: “Design can influence and affect the world in very significant ways – politically, socially, culturally and individually. It’s essential that design realizes its potential impact and steps up to its responsibilities” (Marzano, 2009). Marzano exemplifies his claims through the Ambient Hospital Experience (figure 4.1.12). The project attempted to offer a radiology room that would make people, in particular children, feel less anxious. The intention was to encourage children to undergo the process more efficiently and effectively. Among other features, the patient can choose their own preferred soothing environment, which includes

colours cast on the walls, animations and toys. The scanner is as open as possible, attempting to reduce claustrophobia.

Figure 4.1.12. *Ambient Hospital Experience by Philips. Image courtesy of Philips Design.*

The interest from Frog Design and Philips Design to encourage people to engage in behaviour illustrates how different design organisations address persuasion. The projects above are examples of design that attempt to persuade in order to improve people's health and lives. Large organisations such as Philips Design can benefit from studying emotion—in particular surprise—and behaviour from a persuasion perspective. If behaviour and emotion are strongly linked, it will be of great importance to study the relationship between the different emotions that products elicit and how they relate to affecting behaviour. Of specific importance to this research, the role of surprise in persuasion still has many areas that need further study. In particular, the role of surprise as a mechanism to encourage people to follow healthy lifestyles offers an opportunity to investigate ways of improving people's lives in potentially beautiful, poetic and surprising ways.

“Grow: Your Own Table”: A Design to Pose More Questions

From a constructionist perspective, the knowledge that a researcher contributes is inevitably partly subjective through its construction in the mind of the researcher. In the same vein, I wish to contribute to design by constructing explicit knowledge in the form of the strategies suggested, but also implicit knowledge that visually-oriented people can use for assessing the results of my research. From a postmodern perspective, Situational Analysis calls for presenting results that reflect the complexity and ambiguity of the world. In the design presented below, I used some of the strategies suggested in my research in order to offer a visualisation of the potential results, but mainly to pose further questions. The design explicitly attempts to be ambiguous by presenting people with the choice of two different objects in one.

The design involves a coffee table that attempts to establish a more complex conversation with the owner. The table grows its own legs over a couple of years. When the table is acquired, it is only a flat surface of machined wood without any legs (figure 4.1.13). The form of the surface also suggests that it has “grown”. The surface is laid on the ground, covered with earth and bamboo shoots are planted in it (figure 4.1.14). The owner establishes an on-going conversation with their soon-to-be table. The owner needs to care for the bamboo shoots, water them, and give them the appropriate light and ventilation (figure 4.1.15). The roots grow and interlock within the woven and machined surface of the table under the earth. After many months, and likely close to two years, the bamboo plant grows tall and strong (figure 4.1.16). The stem reaches 10mm in diameter. Four stems, the widest ones, are strong enough to hold the weight of the table. The owner needs to decide where the conversation needs to go. The object is now sending ambiguous messages. It is saying: I am a healthy plant and you should be proud of how well you looked after me. But it is also saying: I am strong enough now for you to make me into a table. The wooden surface can keep acting as a plant pot and maintain the well looked-after bamboo plant alive. Or, the owner can decide to prune the bamboo plant of all its leaves, essentially killing it, to cut all the unnecessary stems and roots, cutting the four strongest stems to the right length so that they can act as legs, and turning everything upside down to enjoy their new coffee table (figure 4.1.17).

The size of the table top emphasises the fact that it represents a conversation by allowing only two people to share it, face to face.

Figure 4.1.13. Machined-wood surface before it becomes a plant pot or table.

Figure 4.1.14. The bamboo shoots are planted and the wooden surface acts as a plant pot.

Figure 4.1.15. The bamboo grows and the owners care for it.

Figure 4.1.16. The bamboo reaches the desired length and so the owners need to decide whether they keep it as a plant or turn it into a table.

Figure 4.1.17. The bamboo stems are used as legs for the table.

Firstly, I used the strategy “use of unexpected and slow growth”, which derived from the mousetrap DP3.1. Using slow growth as a strategy for surprising is debatable. Surprise is an emotion that subsides rapidly once the stimulus is known and therefore stops being unexpected. Can we really elicit surprise over a long period of time with the same object? Is the surprise experienced only when the person hears the story about how an object can slowly grow or is surprise experienced slowly –over multiple surprising interactions—too? Or perhaps as the object changes, the interactions it offers also change, so the expectations can be broken precisely because of the growth that allows the object to change over time.

Secondly, I used the strategy “the smart doubling of things” making a plant pot that eventually becomes a coffee table. Given that the owner knows from the moment that they acquire the wooden surface that it has the potential to become a table, is this enough for considering the object to involve a smart doubling of things when in fact it can be only a plant pot or a table? Can the mere idea, rather than the function, of an unexpected double-object elicit surprise?

Thirdly, I used the strategy “issues in my world” by trying to portray an environmental message. The table emphasises the process of growth that a bamboo plant needs to go through before it is cut down and used as a raw material for manufacturing furniture. The flat surface that the object begins as, is also manufactured out of bamboo. The table attempts to slow the viewing and appreciation of where materials come from.

Fourthly, I used the strategy “challenging assumptions of appearance” by designing a table-surface that does not look flat. I attempted to make it look like it cannot hold a cup because of its woven-machined surface. However, cups can safely be placed on it. The form derives from creating woven spaces so that the bamboo roots can latch with the form and therefore become legs that physically lock with the top surface. By challenging the assumptions of appearance the table also challenges the assumptions of use. The table is probably harder to clean and small objects can fall in between the spaces. But these issues emphasise its goal of being used as a ritualistic object for two people to establish a conversation. It refers to the rituals associated with sharing hot drinks, mainly tea or coffee, in many western and eastern cultures. It is not an object for drawing or leaving your loose coins on. It is an object for conversing.

Finally, I wanted to reflect the postmodern ambiguity of the research results by showing how often what the designer intends people to do with their objects is not realised. In this case, the design offers two options, keep the plant alive or turn it into a table. The design refers to the strategy “suggesting interaction in subtle ways”. The form of the wooden surface and the stems of the bamboo suggest that it could become a table, however the designer cannot foresee what the owner of the object will actually do with it. And sometimes that is a good thing.

Final Remarks

When I have conversations with people, I have sets of expectations about how the conversations will go. If it is a close friend, I expect her to behave in a certain way. I know when she is sad or happy, I know when she has had a good or a bad day. Sometimes my friend behaves in different ways to what I expect. She may wear new clothes or have a new hairdo, and her new appearance surprises me (strategy: challenging assumptions of appearance). Her humour and wit awaken my interest and fascination. Sometimes the changes are more drastic. She might have a new partner, and the changes in her behaviour brought about by the new relationship in her life surprise me even more (strategy: new archetypes in unexpected contexts). She may have a new car or phone, which makes our interaction different (strategy: use of new technology). The way she behaves means that I have to react and adapt accordingly. But I also undergo changes, and what once surprised me about my friend does not anymore. Nevertheless, even if the surprise is not that strong any longer, I still feel close to my friend as she has been caring and thoughtful, and the ways she often attempted to surprise me and amuse me were indeed pleasant and helped us develop a strong bond.

When designers choose to involve surprise in their designs they need to do so in a responsible manner. When designers come up with new ideas and picture in their minds what the conversation between a person and an object could be like, they are imagining moments in people's lives. Even if the interaction lasts for a few seconds, those seconds represent valuable time in a person's life. The inclusion of surprise can have goals that are meaningful for those stretches of time in which a person has a conversation – interacts—with the object. Designers can use surprise for satisfying an aesthetic need for novelty, humour and unexpected experiences. Designers may try to persuade people and use surprise to this effect in order to help people achieve behavioural goals that they find hard to accomplish. In either case, the use of surprise in design has great potential for creating meaningful and beautiful conversations and interactions between people and objects.

Appendices

List of appendices

Glossary of Key Terms

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Appendix 2.1.1. List of designers contacted to be interviewed

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Chapter 4.1

Appendix 4.1.1. Set of cards with strategies for eliciting surprise

Appendix 1. Glossary of key terms

Behaviour

Behaviour is “anything that an organism does involving action and response to stimulation” (Merriam-Webster Dictionary, 2011a). In the case of this thesis, behaviour refers to the actions that a person performs as a response to the stimulus that the designed object presents.

Conversation

An interpretation of the interaction between a person and an object. Under this interpretation, the physicality of the object -its form, textures, colours, technology, etc.- sends messages to the person. The person recognises the messages and reacts accordingly sending a message back to the object in the form of behaviour. The object then has the chance to send a message back, and so forth. Under this interpretation of interaction, designers can attempt to offer a protocol for the conversation through the design of the object, but it acknowledges that it is impossible to enforce a pre-established script. As in any conversation, spontaneity is essential and unexpected results -in this case interactions- are bound to occur.

Expectation

A future belief of what is most probable to occur.

Familiarity

“Close acquaintance with something” (Merriam-Webster Dictionary, 2011b)

Industrial design

I refer mainly to the definition of industrial design from the International Council of Societies of Industrial Design (ICSID). This research refers explicitly to the design of products:

“Design is a creative activity whose aim is to establish the multi-faceted qualities of objects, processes, services and their systems in whole life cycles. Therefore, design is the

central factor of innovative humanisation of technologies and the crucial factor of cultural and economic exchange... Design concerns products, services and systems conceived with tools, organisations and logic introduced by industrialisation - not just when produced by serial processes. The adjective ‘industrial’ put to design must be related to the term industry or in its meaning of sector of production or in its ancient meaning of ‘industrious activity’.” (ICSID, 2011)

Interaction

The communication and physical exchange between an object and a person that allows for the object to be used by the person in expected and unexpected ways.

Knowledge

As this thesis works under a constructionist epistemology, it sees knowledge as a justified meaning constructed by the mind of the researcher through an “engagement with the realities in our world” (Crotty, 2003, p. 8). The justification behind knowledge comes from the evidence presented by the researcher, which represents the realities in our world. This thesis refers to two types of knowledge: tacit and explicit:

Tacit or implicit knowledge

“Knowledge that enters into the production of behaviors and/or the constitution of mental states but is not ordinarily accessible to consciousness” (Barbiero, 2011).

Explicit knowledge

“Articulated knowledge, expressed and recorded as words, numbers, codes, mathematical and scientific formulae, and musical notations. Explicit knowledge is easy to communicate, store, and distribute and is the knowledge found in books, on the web, and other visual and oral means” (Business Dictionary, 2011).

Novelty

A quality of being new, original or unusual (Merriam-Webster Dictionary, 2011c)

Persuasion

My definition of persuasion is mainly based on “a successful intentional effort at influencing another’s mental state through communication in a circumstance in which the persuadee has some measure of freedom” (O’Keefe, 2002, p. 5). However, it is to be noted that such definition has some aspects that may be not well defined. For instance, how successful or intentional does the effort need to be? In this thesis, the mention of “communication” in the definition of persuasion refers to the messages that the designed object portrays through its physical characteristics: form, textures, technology, the interaction it offers, etc. Furthermore, in this thesis the definition refers to “influencing another’s mental state”, when the influence over the mental state is reflected through their behaviour, in particular in the way in which they interact with the object.

Sense-making

An effortful mental search for finding out what caused or what is the unexpected stimulus that elicited surprise. In this research the stimulus is a surprising object. The sense-making process happens while the person has not yet figured out what produced the unexpected stimulus and has been suggested that is parallel to the experience of surprise (Pezzo, 2003, p. 424).

Strategy

A conceptual starting point for designing. A strategy is a guideline that gives designers elements to consider in the design process. It is not a set recipe for designing. As such, a strategy should be open enough to be interpreted in many ways and avoid reproducing the same results repeatedly.

Surprise

An emotional response (Ekman, 1992, p. 170) to unexpected (Plutchik, 1991, pp. 105-106) or sudden stimuli (Frijda, 1986, p. 18). It differs from the startle reflex and is expressed behaviourally through wide eyes, short interruption of breathing and loss of muscle tone (Frijda, 1986, p. 18). While some authors do not consider surprise an emotion (for instance Ortony, Clore, & Collins, 1988) because it has no pleasure value on its own, many authors do consider it an emotion due to its arousal and valence

(pleasant or unpleasant) values (Frijda, 1986; Plutchik, 1991; Schutzwohl & Borgstedt, 2005; Silvia, 2009).

Appendix 2.1.1 List of designers contacted to be interviewed

List "Tastemakers: Industrial designers", by Forbes Magazine (June 2005)	Contacted	Replied	Interviewed	Representative interviewed	Interview
Chris Bangle. Chief Designer. The BMW Group, Munich, Germany	Yes	No	No		
Yves Behar. Fuseproject, San Francisco, California, USA	Yes	Yes		Yes	Yes
Martin Fisher. KickStart International, San Francisco, California	Yes	No	No		
Jonathan Ive. Senior Vice President of Design. Apple Computers. Cupertino California, USA	Yes	No	No		
David Kelley. Founder. IDEO. Palo Alto California, USA	Yes	Yes		Yes	Yes
William McDonough. Principal. MBDC. Charlottesville, Vancouver	Yes	No	No		
Karim Rashid. Founder, Karim Rashid Inc. New York, USA	Yes	No	No		
Burt Rutan. President. Scaled Composites. Mojave, California, USA	No	No	No		
Philippe Starck. Founder. Starck Network, Paris	Yes	No	No		
Masamichi Udagawa and Sigi Moeslinger. Principals, Antenna Design. New York	Yes	No	No		

Businessweek Magazine list of "World's most influential designers" (released March 2004, updated 1 February 2010)	Contacted	Replied	Interviewed	Representative interviewed	Interview
Paola Antonelli, design curator, Museum of Modern Art, New York	Yes	No	No		
Janine Benyus, founder of the Biomimicry guild	Yes	No	No		
Tim Brown, CEO, IDEO	Yes	Yes		Yes	Yes
Bill Buxton, principa researcher, Microsoft Research	Yes	No	No		
Valerie Casey, founder of the Designers Accord	No				
Ivan Chermayeff and Tom Geismar, founders of Chermayeff & Geismar	No				
Hillary Cottam, Participle	No				
Choi Gee Sung, CEO, Samsung	Yes	Yes		Yes	Yes
Henrik Fisker, co-founder, Fisker Automotive	No				
Naoto Fukasawa, founder, Naoto Fukasawa Design	Yes	No	No		
Bob Greenberg, CEO, R/GA	No				
Zaha Hadid, founder, Zaha Hadid Architects	No				
Jonathan Ive, Senior Vice-president for Industrial Design, Apple Computers	Yes	No	No		
Larry Keeley, innovation strategist	No				
Rem Koolhaas	No				
Qingyun Ma, founder MADA s.p.a.m.	No				
Roger Martin, Dean, Rotman School of Management, University of Toronto	No				
Shigeru Miyamoto, Head, Nintendo's game design department	No				
Bill Moggridge, co-founder, IDEO	Yes	Yes		Yes	Yes
Jakob Nielsen PhD, distinguished engineer, Sun Microsystems	No				
Donald Norman, co-founder, Nielsen Norman Group	Yes	No	No		
Dieter Rams, designers, Braun	Yes	No	No		
Burt Rutan, founder, Routan Aircraft Factory	No				
Cameron Sinclair, co-founder, Architecture for Humanity	No				
Amy Smith, professor, MIT	No				
Philippe Starck, designer	Yes	No	No		

World's influential designers according to Designboom and Core77 (October 2005)	Contacted	Replied	Interviewed	Representative interviewed	Interview
Yves Behar	Yes	Yes		Yes	Yes
Philippe Starck	Yes	No	No		
Ora Ito	Yes	No	No		
Luca Trazzi	No				
Eero Koivisto	No				
Marcel Wanders	Yes	No	No		
Hella Jongerius	Yes	No	No		
Scott Adams	Yes	No	No		
Tokujin Yoshioka	Yes	No	No		
Shigeru Uchida	Yes	No	No		
Milton Glaser	Yes	No	No		
Naoto Fukasawa	Yes	No	No		
Maurizio Cattelan	No				
Mario Bellini	Yes	Yes		Yes	Yes
Dieter Sieger	No				
Fernando + Humberto Campana	Yes	No	No		
Helmut Newton	No				
Andrée Putman	No				
Ronan Bouroullec	Yes	No	No		
Daniel Libeskind	Yes	No	No		
Amanda Levete / Future Systems	No				
James Irvine	Yes	Yes	No		Yes
Dominique Perrault	No				
Ben Van Berkel	No				
Marc Newson	Yes	No	No		
Alberto Meda	Yes	Yes	Yes		Yes
Andrea Branzi	Yes	No	No		
Paolo Deganello	Yes	No	No		
Pierluigi Cerri	Yes	No	No		
Peter Cook	Yes	No	No		
Matali Crasset	Yes	Yes	Yes		Yes
Mira Nakashima-Yarnall	Yes	No	No		
Peter Eisenman	Yes	No	No		
Jasper Morrison	Yes	No	No		
Hani Rashid	Yes	No	No		
Oliviero Toscani	Yes	Yes	No		
Karim Rashid	Yes	No	No		
Toyo Ito	Yes	No	No		
Tadao Ando	Yes	No	No		
David LaChapelle	Yes	No	No		
Franco Maria Ricci	Yes	No	No		
Hugh M. Hefner	Yes	No	No		
John Maeda	Yes	No	No		
William Sawaya	Yes	No	No		
Ingo Maurer	Yes	Yes	Yes	Yes	Yes
Vladimir Kagan	Yes	No	No		
Giorgetto Giugiaro	Yes	No	No		
Paola Antonelli	Yes	No	No		
David Byrne	Yes	No	No		
Renzo Rosso	Yes	No	No		
Dieter Rams	Yes	No	No		
Ron Arad	Yes	No	No		
Tom Dixon	Yes	No	No		
Ross Lovegrove	Yes	No	No		
Ettore Sottsass	Yes	No	No		

World's influential designers according to Designboom and Core77 (October 2005) (continued)	Contacted	Replied	Interviewed	Representative interviewed	Interview
Alessandro Mendini	Yes	No	No		
Matteo Thun	Yes	No	No		
Antonio Citterio	Yes	No	No		
Konstantin Grcic	Yes	No	No		
Aldo Cibic	Yes	No	No		
Stefano Giovannoni	Yes	No	No		
Marc Sadler	Yes	No	No		
Elio Fiorucci	Yes	No	No		
Gaetano Pesce	Yes	No	No		
Li Edelkoort	Yes	No	No		
Denis Santachiara	Yes	Yes	Yes		Yes
Vico Magistretti	Yes	No	No		
FRONT Design	Yes	Yes		Yes	Yes
Droog	Yes	No	No		

Biggest Design firms according to Core77 (October 2005)	Contacted	Replied	Interviewed	Representative interviewed	Interview
Samsung Electronics Design (450)	Yes	Yes		Yes	Yes
Philips Design (400)	Yes	Yes		Yes	Yes
IDEO (370)	Yes	Yes		Yes	Yes

Influential Design firms according to Core77, Designboom and Dexigner (October 2005)	Contacted	Replied	Interviewed	Representative interviewed	Interview
IDEO	Yes	Yes		Yes	Yes
Frog Design	Yes	No			
Tom Dixon	Yes	No			
Smart Design	Yes	No			
Lunar Design	Yes	Yes		Yes	Yes
Fuseproject	Yes	Yes		Yes	Yes
Philips Design	Yes	Yes		Yes	Yes
LG	Yes	Yes		Yes	Yes
Matali Crasset	Yes	Yes	Yes		
IKEA	Yes	No	No		
Knoll	Yes	No	No		
Floss	Yes	No	No		
Vitra	Yes	No	No		
Alessi	Yes	Yes		Yes	Yes

21 people, ideas and organisations most influential in Design according to ICON magazine (March 2005)	Contacted	Replied	Interviewed	Representative interviewed	Interview
IKEA	Yes	No	No		
Rapid prototyping	No				
Easyjet	No				
Milan (Furniture Fair)	No				
Design Academy Eindhoven	Yes	No	No		
Alice Rawsthorne	No				
Copying	No				
Bouroullec Brothers	Yes	No	No		
Blogs	No				
Midsummer light	No				
Light transmitting concrete	No				
The readymade	No				
South Korea (KIDP)	Yes	Yes		Yes	Yes
Rei Kawakubo	No	No	No		

21 people, ideas and organisations most influential in Design according to ICON magazine (March 2005) (continued)	Contacted	Replied	Interviewed	Representative interviewed	Interview
Ora Ito	Yes	No	No		
Naoto Fukasawa	Yes	No	No		
Entropy	No				
Nintendo DS (designed by Astro Studios)	Yes	Yes		Yes	Yes
Dunne & Raby	Yes	No	No		
Murray Moss	No	No	No		
Yves Behar	Yes	Yes		Yes	Yes

Appendix 2.1.2. Interview structure

VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wananga o te Upoko o te Ika a Maui

School of Design
Te Kura Hoahoa

Interview structure

Design Studio: _____

Respondent: _____

Position: _____

Tick	Topic	Question	Relate to (user/emotion/methods/ experience/intuition/ design/surprise):
	ALL	1. Please describe briefly the design process that your studio follows	
	ALL	2. How do you assess the needs of the potential users of your designs?	
	ALL	3. When/If carrying out research on people, do you follow rigorous methods?	
	MTHD	4. If you follow rigorous methods, please mention them and briefly describe them	
	MTHD	5. What are the main drivers for your company to choose to follow rigorous user-research methods?	
	INTU	6. Please describe the main reasons why your company prefers not to use rigorous methods for user research	
	MTHD INTU DSGN	7. How do you implement your understanding of people into the physical design of objects? Please show and describe some examples if possible	
	ALL	8. Please define what 'emotions' means to you (afterwards, offer my working definition for clarity)	
	ALL	9. What role does the understanding of people's emotions play in your company?	
	MTHD EMOT	10. Amongst the methods/approaches you use, which ones relate specifically to emotion and for what specific purposes?	
	ALL	11. Please describe and show examples (if possible) of projects that address people's emotions (follow up with questions about the specific projects)	
	ALL	12. What are the main barriers, if any, for your company to address people's emotions in the design process?	
	ALL	13. Do you follow any methods to measure emotional responses of users to your products? Please describe them	
	MTHD DSGN EMOT	14. How do you translate raw data from research on emotion into the design of products?	
	INTU DSGN EMOT	15. When designing with users' emotion in mind, do you search for inspiration elsewhere (poetry, art, cinema, personal experience...)? Please mention examples	
	INTU DSGN EMOT	16. How does your personal experience of everyday life influence the way you address emotion in the design process? Please mention examples	
	SRPR	17. Have you attempted to surprise people with your designs? Please mention examples	
	SRPR	18. When you attempt to surprise people, what approaches do you follow?	
	SRPR	19. What characteristics or features of your designs would you describe as "surprising"? Please explain why	

Appendix 3.2.1. Example of an answered questionnaire from the DLF exhibition

Domestic Futurists
Design Led Futures
School of Design

Thank you for visiting this exhibition and participating with this questionnaire. You are not required to fill it up in order to attend the exhibition. However, your participation will help us assess the reaction of the public to some of the concepts exhibited. You'll need to answer some questions and it should take about 10 minutes to complete.

This part is to be filled up BEFORE starting your visit

Step 1. Describe and/or draw how you picture yourself performing the activities below in the year 2017. Include what kind of technologies and products you think you might be able to use.

Keeping Food Fresh **Cooking**

Washing and Drying Clothes **Washing Yourself**

Step 2. Do you share the concerns below?
Please circle the number of your choice. Example:

In ten years, I would like to go to the moon

I agree 1 2 3 4 5 6 7 I disagree

I'm concerned about how much water I use in the shower

I agree 1 2 3 4 5 6 7 I disagree

I'm concerned about how much energy my fridge uses

I agree 1 2 3 4 5 6 7 I disagree

I'm concerned about how much energy driers use

I agree 1 2 3 4 5 6 7 I disagree

I'm concerned about how much water and energy washing machines use

I agree 1 2 3 4 5 6 7 I disagree

I'm concerned about the safety of gas stoves

I agree 1 2 3 4 5 6 7 I disagree

If you want us to send you this card or the results of the study, please write down your details in the box below. Your details will remain confidential.

☐ send me this card
postal address:

☒ send me a summary of the results of this research
email: [REDACTED]

This part is to be filled up DURING your visit

Step 3. Find the following projects, read about them, and answer these questions. Circle the number of your choice.

'In comparison to my current lifestyle, this concept is:' Not so different 1 2 3 4 5 6 7 Radically different
	'For me, this concept elicits emotions that are..' Pleasant 1 2 3 4 5 6 7 Unpleasant Surprising 1 2 3 4 5 6 7 Unsurprising
	'This product would help me save water and energy' I agree 1 2 3 4 5 6 7 I disagree
	'I would be willing to use this product' Definitely Yes 1 2 3 4 5 6 7 No way
	'I am familiar with some aspects of this concept' I agree 1 2 3 4 5 6 7 I disagree

'In comparison to my current lifestyle, this concept is:' Not so different 1 2 3 4 5 6 7 Radically different
	'For me, this concept elicits emotions that are..' Pleasant 1 2 3 4 5 6 7 Unpleasant Surprising 1 2 3 4 5 6 7 Unsurprising
	'This product would help me save energy' I agree 1 2 3 4 5 6 7 I disagree
	'I would be willing to use this product' Definitely Yes 1 2 3 4 5 6 7 No way
	'I am familiar with some aspects of this concept' I agree 1 2 3 4 5 6 7 I disagree

'In comparison to my current lifestyle, this concept is:' Not so different 1 2 3 4 5 6 7 Radically different
	'For me, this concept elicits emotions that are..' Pleasant 1 2 3 4 5 6 7 Unpleasant Surprising 1 2 3 4 5 6 7 Unsurprising
	'This product would help me save water and energy' I agree 1 2 3 4 5 6 7 I disagree
	'I would be willing to use this product' Definitely Yes 1 2 3 4 5 6 7 No way
	'I am familiar with some aspects of this concept' I agree 1 2 3 4 5 6 7 I disagree

Please turn over

Appendix 4.1.1. Set of cards with strategies for eliciting surprise

(please refer to attached sleeve with cards)

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