Emotionally Durable Design: Sustaining relationships between users and domestic electronic products

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Abstract

The UK disposes of 1.25 million tonnes of domestic electronic products (DEPs) each year, the majority of which still perform their tasks perfectly, in a utilitarian sense. In an emotive sense, however, these unwanted products bear a metaphysical mode of defect manifest within the relational space occupied by both subject and object. In this way, it is clear that design for durability has important implications beyond its conventional interpretation, in which product longevity is considered solely in terms of an object’s physical endurance – whether cherished or discarded.

This thesis explores the emotional dimension of design for durability to provide a more progressive set of sustainable design propositions; arguing that consumer desires continually evolve and adapt whilst the DEPs deployed to both mediate and satisfy those desires remain relatively frozen in time; this incapacity for mutual evolution renders most DEPs incapable of both establishing and sustaining a relationships with users. The waste this inconsistency generates is considerable, and comes at an increasing cost to manufacturers facing the EU Waste Electrical and Electronic Equipment (WEEE) Directive, but more importantly, the natural world.

This thesis explores 3 converging fields of knowledge: sustainable product design, emotional and user-centred design, and consumer motivation. Although the literature reviewed in this thesis presents selected discourses that articulate the need for longer lasting domestic electronic products, practical working methods, design frameworks and tools that enable the commercial implementation of such artefacts, have yet to be realised. This study argues that the apparently intangible, ethereal nature of considerations pertaining to psychological function cause confusion for the practicing designer tasked with the design and development of greater emotional longevity in DEPs. As a result, the potentially positive impact(s) of academic studies in this area has thus far failed to penetrate the working practices and methodologies of design – arguably, the one place where new models of sustainable design knowledge and understanding are most urgently needed.

The aim of this thesis is to generate new and practical design information that enables product designers to engage more effectively with complex issues of emotional durability through design; presenting a more expansive, holistic approach to design for durability, and more broadly, the lived-experience of sustainability. The three core contributions made by this thesis are thus: (1) the implicit development of a 6-point experiential framework to structure
inquiry and exploration into salient issues of emotional durability through design; (2) the
design and production of 6 experimental DEPs, which exemplify ways of working with the 6-
point experiential framework; (3) the development of an original, and transferable,
methodology for developing case-specific design knowledge to address emotionally durable
design.
## Contents

List of Figures and Tables v  
Acknowledgements vii  
Declaration viii  

### 1 Introduction
1.1 Introduction 1  
1.2 Problem statement 1  
1.3 Hypothesis 5  
1.4 Summary of the literature review 6  
1.5 Research questions 11  
1.6 Methodologies 12  
1.7 Overview of results 16  
1.8 Structure of thesis 18  

### 2 Review of the Literature
2.1 Introduction 20  
2.2 Consumer motivation and the lifespans of DEPs 21  
2.3 Longer lasting DEPs and environmental sustainability 28  
2.4 Object meaning 36  
2.5 Emotional connections between users and DEPs 43  
2.6 Longer lasting products and the creative industry 54  
2.7 The EU Waste Electrical and Electronic Equipment (WEEE) directive 62  
2.8 Implications for research 69  

### 3 Research Context
3.1 Introduction 73  
3.2 Relevance 73  
3.3 Context 76  
3.4 Timeliness 81  


4 Research Questions
4.1 Introduction 85
4.2 Do the creative industries recognise product life extension as a viable approach to sustainable design? 85
4.3 Do users possess DEPs to which they are emotionally attached? 88
4.4 What designable conditions nurture more durable relationships between users and DEPs? 91
4.5 Summary 93

5 Research Methodology
5.1 Introduction 94
5.2 Brief overview of all fieldwork 95
5.3 Fieldwork phase 1 96
5.4 Results from phase 1 102
5.5 Fieldwork phase 2 117
5.6 Results from phase 2 125
5.7 Critical reflection and assessment of work 142
5.8 Summary 144

6 Conclusions
6.1 Introduction 145
6.2 Conclusions 145
6.3 Contributions to knowledge 147
6.4 Future research 152

7 References 154
List of Figures and Tables

List of Figures

- Figure 2.1: Maslow’s Hierarchy of Needs 25
- Figure 2.2: Attachment and detachment profiles 34
- Figure 2.3: 10 categories (and targets) for WEEE 64
- Figure 5.1: The information-gathering stand at 100% Design, from which the survey was conducted 99
- Figure 5.2: Grouping of information in the survey, and question numbers 101
- Figure 5.3: What do you do? 106
- Figure 5.4: Which space do you think is more sustainable? 107
- Figure 5.5: How sustainable would you say your work is? 108
- Figure 5.6: Which strategy do you think is most viable? 109
- Figure 5.7: Which scenario best describes you as a user? 110
- Figure 5.8: What is your most cherished electrical product? 111
- Figure 5.9: Why does it mean so much to you? 113
- Figure 5.10: Can anything be 100% sustainable? 113
- Figure 5.11: Why do you think that is? 115
- Figure 5.12: The Product Life Creative Workshop (Monday 25 September, 2007) 124
- Figure 5.13: Narrative mobile phone (by Ashley Phillips, Richard Morris, Lesley Whitworth and Chris Lefteri) 128
- Figure 5.14: Detachment television set (by James McAdam, Arash Kaynamara and Adeel Khan) 130
- Figure 5.15: Surface vacuum cleaner (by Chris Rose, Ben Wilson, Dr. Natalie Woolf and Akil Chomoko) 132
- Figure 5.16: Attachment digital camera (by Karin Jaschke, Nick Rawcliffe and Jonathan Blaker) 134
- Figure 5.17: Fiction Toaster (by Kathryn Ladd, Kieran Jones and Hannah Scroggs) 136
- Figure 5.18: Consciousness MP3 player (by Bernice Pan, Stefano Santilli and Sarah Owen) 138
- Figure 5.19: Exhibition of 6 experimental prototype objects at 100% Design (2007) 141
- Figure 6.1: A transferable, methodological process for developing case-specific design knowledge to address emotionally durable design 151
List of Tables

- Table 2.1: Ownership of household appliances by UK households (2000) ........................................... 56

- Table 5.1: Results of the survey staged at 100% Design (September 21-24, 2006) .................................. 104

- Table 5.2: Results of the survey staged at 100% Design (September 20-23, 2007) .............................. 140
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Declaration

I declare that the research contained in this thesis, unless otherwise formally indicated within this text, is the original work of the author. The thesis has not been previously submitted to this or any other university for a degree, and does not incorporate any material already submitted for a degree.

Signed:

Date: 22/04/08
1 Introduction

1.1 Introduction
In this first introductory chapter, an outline is presented that provides a comprehensive overview of the key elements of this PhD thesis; this outline uses the following sections to facilitate both comprehension and precision of discussion:

- **Problem statement**: what issues, or problems, does this research address, and why?
- **Hypothesis**: the hypothesis underpinning this thesis will be stated
- **Summary of the literature review**: overview of core literature and its implications
- **Research questions**: the 3 research questions driving this research are introduced
- **Methodologies**: the research methods used are provisionally outlined and justified
- **Overview of results**: an overview of findings and their implications
- **Structure of thesis**: an outline of the remaining chapters in this thesis

The 6 sections of this initial chapter will now be described in greater detail, to provide a global overview of this thesis.

1.2 Problem statement
Since Bernard London (1932) introduced the term 'planned obsolescence',1 made popular by Vance Packard2 in his book *The Waste Makers* (1963)3, interest in the lifespans of manufactured objects has steadily become a ‘crucial constituent of contemporary design discourse’.4 Yet despite the pervasiveness of this insightful notion, thus far, the creative methodologies addressing design for durability have attended almost exclusively to the cosmetic, bodily survival of manufactured objects. In these somewhat superficial scenarios,

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2 Vance Packard was a leading American journalist, social critic and author who questioned the morality of planned obsolescence, to describe the impact of production and consumption. His work explored the use of consumer motivational research by advertisers to manipulate the desires and expectations of consumers.
durability is distinguished merely by a product’s physical endurance – whether cherished or discarded – lab-coated engineers triumphantly exchange high-fives as fully operational hairdryers emerge from a 5-year landfill hiatus. Is this durable product design, or simply the designing of highly durable waste? Though ‘it is not always easy for consumers to identify products designed for long lifespans’, durability is just as much about desire, love and attachment, as it is about fractured polymers, worn gaskets or blown circuitry. In this sense, waste could be seen as nothing more than a symptom of a failed relationship. As a direct consequence, landfills are packed with stratum upon stratum of durable goods that slowly compact and surrender working order beneath a substantial volume of similar scrap. It therefore appears clear that there is little point designing physical durability into consumer goods, if consumers lack the desire to keep them.

The UK alone sends ‘1.25 million tonnes’ of such electronic waste (e-waste) to landfill each year; waste consisting of fully functioning toasters, refrigerators, mobile phones, vacuum cleaners and a whole host of other DEPs that still function perfectly in a utilitarian sense; ‘each year it is estimated that around 5 million operational TVs hit landfill’. Indeed, ‘[m]ost consumer products are not supposed to have a future, apart from being predecessors to the next in line.’ In this way, the consumption and waste of natural resources that has grown to become ubiquitous in the more affluent nations of the world, and the rapidly developing world more generally, could be described as a legacy of modern times, born largely from the inappropriate marriage of excessive material durability with fleeting product lifespans.

A significant economic burden will soon accompany this short-term, inefficient model of production and consumption, resulting from legislative breach of the EU Waste Electrical and Electronic Equipment (WEEE) Directive. This directive addresses concerns about the quantity, and hazardous content, of electrical and electronic waste going into landfill or being incinerated. It will make it necessary to design products with end-of-life criteria in mind.

8 Ibid.
Following full introduction in December 2007, the WEEE Directive is a significant piece of environmental legislation that requires producers of electronic products to take a whole-life responsibility for their products and to meet given targets for the often prohibitively costly take-back and recycling of all products at end-of-life; at which point, it could be argued that the longer life option presents industry with a potentially more economically viable commercial model. Furthermore, the WEEE Directive covers all electrical and electronic equipment with voltages up to 1,000 AC and 1,500 DC and will affect virtually all producers and manufacturers of electrical and electronic equipment, regardless of company size (this will be discussed further in chapter 2).

Although the primary geographic context of this research is the UK, it clearly has broader implications for the European Union\(^{10}\) (EU) as a whole, in particular, those EU member states with advanced production capabilities that currently operate in violation of the EU WEEE Directive. In addition to the legislative demands brought about by the EU WEEE Directive, an ‘increasingly ethically aware market place is [also] encouraging many producers to review their practices’\(^{11}\). In the UK, consumers are ‘shopping with a conscience ... determined to buy brands, products and services that are sustainable, organic or produced under Fair-Trade agreements. Thirty eight percent of male shoppers believe this, along with 49 percent of female shoppers. And in terms of the brands and products they want to buy, 67 percent revealed that they wanted brands and products that were more trustworthy, value driven (50 per cent), authentic (31 per cent), ethical (31 per cent), eco-friendly (29 per cent) and innovative (28 per cent).\(^ {12}\) In addition, the steady increase in ‘end-of-life legislation and product take back policies are engaging all corners of the industry’\(^ {13}\) in re-evaluating the commercial potential for longer lasting DEPs, as a means to deliver evermore sustainable modes of production and consumption. However, amidst this industry-wide push to comply with current and forthcoming environmental legislation, the root causes of the ecological crisis

\(^{10}\) EU member states (at the time of writing) include Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, the Netherlands and the UK.


\(^{12}\) Ibid.

we face are frequently overlooked. Meanwhile, the inefficient consumer machine continues to surge wastefully forth, but now it does so with recycled materials instead of virgin ones – both the commercial and ecological unreality of this model must be questioned.


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23 Cooper, T., 'Durable consumption: reflections on product life cycles and the throwaway society', in Hertwich, E., (Eds), Life-cycle Approaches to Sustainable Consumption (Workshop Proceedings), Austria, November 2002, pp15-27
24 Park, M., Design for Sustainable Consumption, Futureground, Design Research Society, Melbourne, November 2004
(1999) and Csikszentmihalyi & Rochberg-Halton (1981). As a result, there is currently a lack of literature devoted to this focussed, yet fast-growing, area of concern. In addition, the limited amount of research that does occupy this area is further hindered both by its lack of temporal currency, and an apparent unwillingness to develop workable design strategies that facilitate the implementation of commercially viable change.

In terms of its broad conceptual origins, this thesis is located within a far more expansive knowledge domain, comprising significant volumes of a social, cultural, anthropological and philosophical literature, with the collective aim of theorising the deeper origins of the human condition, and the role played by material possessions in constructing human experience. Selected texts from within this vast body of literature are discussed in this thesis, due to their pertinence to the study (see chapter 2), despite their largely philosophical orientation. It is important to note, however, that this thesis makes a measured departure from its philosophical point of origin; emerging from it with a new contemporary agenda to develop an accessible body of knowledge that makes enabling contributions to the practice of design from within the modern-day context of sustainability. Indeed, as everyday life continues to become increasingly experienced through interactions with electronic products, it becomes increasingly essential that our wasteful, inefficient and fleeting engagements with these artefacts be better understood so that appropriate directions for strategic change may be developed. This thesis does not attempt to propose a generalist and sweeping overhaul of global design, production and consumption in all its guises. Rather, this focussed thesis strategically identifies a context within three currently disparate and fragmented fields of knowledge (sustainable design, emotional and user-centred design, and consumer motivation) set against the forthcoming legislative demands of the EU WEEE Directive.

1.3 Hypothesis

Landfill sites across the developed world are overloaded with fully functioning DEPs - toasters that still toast and freezers that still freeze. In many cases, waste of this nature can be seen as nothing more than a symptom of a failed relationship between the subject and the object. The particular hypothesis of this research, therefore, is that consumer desires


continually evolve and adapt whilst the DEPs deployed to both mediate and satisfy those desires remain relatively frozen in time; it is this incapacity for evolution and growth that renders most DEPs incapable of both establishing and sustaining relationships with users. The waste this inconsistency generates is substantial, coming at increasing cost to manufacturers facing the stringent policy-driven demands of the EU WEEE Directive and, perhaps more importantly, the natural world.

1.4 Summary of the literature review

The literature review explores literature, and other primary source material, that is of particular relevance to the study – providing a critical assessment of related work, directly linked to this research. The references detailed within this section are by no means exhaustive, but rather, provide a representative sample from within the literature addressing the key social, economic and environmental issues that are connected to this study (a full review of the literature is provided in chapter 2).

This review is organised within six key sections, enabling deeper analysis of the disparate yet contingent elements of this research; a summary of key literature within each of the 6 themes is listed below:

- Consumer motivation and the lifespans of DEPs: this theme examines key research into the psychosocial factors that fuel the human consumption and waste of material artefacts; examining their influence over the longevity of subject object relationships. Despite the breadth of research into consumer motivation, only a small niche of literature within this well-established field is pertinent to this research. Literature within this ‘niche’ collectively connects the instability of consumer motivation (fuelled by the transient concept of self) with the equally unstable character of our contemporary engagement with manufactured objects; such literature includes Bocock (1993)\(^\text{28}\), van Hinte (1997)\(^\text{29}\), Schultz, Kleine and Kernan (1989)\(^\text{30}\) and Cupchik (1999)\(^\text{31}\).

\(^{28}\) Bocock, R., Consumption, Routledge, London, UK, 1993
\(^{30}\) Schultz, S. E., Kleine, R. E. and Kernan, J. B., 'These are a few of my favourite things: Toward an explication of attachment as a consumer behaviour construct', Advances in Consumer Research, vol 16, 1989, pp359-366
- **Longer lasting DEPs and environmental sustainability**: this second theme in the literature review identifies both the positive and negative impacts of longer lasting products on the natural world. In the case of most DEPs, longer lifespans are environmentally beneficial, as the majority of energy consumed, occurs pre-use during the resource extraction and manufacturing phases. This is particularly true of digital products – such as mobile phones, PDA’s, digital cameras and MP3 players – that require low levels of energy to operate (largely due to their frictionless action, achieved through a lack of moving parts), but actually require relatively high levels of energy to produce. As such, the literature collectively indicates that (with the exception of a small number of products that consume large quantities of energy during the use-phase, such as washing machines and fridge-freezers) design strategies encouraging longer product lifespans are environmentally beneficial; literature that particularly supports this claim include Cooper (1997)32, Packard (1963)33, Manzini (2001)34, Fuad Luke (2006)35, Park (2004)36, Mont (2002)37 and Heiskanen (1996)38.

- **Object meaning**: this theme examines the cognitive processes associated with constructed meaning, and meaningfulness, as signified by objects; key literature includes van Nes (2005)39, Kleine and Kernan (1988)40, Richins (1994)41, de Groot 42

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36 Park, M., *Design for Sustainable Consumption*, *Futureground*, Design Research Society, Melbourne, November 2004


This (and other literature consulted) collectively urges that the more an individual consciously or unconsciously relates to the sensory/aesthetic, cognitive/behavioural, and personal/symbolic qualities of an object, the more profound the resulting meaningfulness of the artefact will be.

**Emotional connections between users and DEPs:** This theme explores attachment, and detachment, behaviours; why users develop attachments to certain products; along with current strategic approaches to object creation that aim to close the perceptual gap between the user and the product. Though a great deal of debate surrounds the need for an increase in subject object attachment, strategies to enable this need are considerably less prolific; key literature in this section include Dunne & Raby (2001), Dunne (1999), Chapman (2005), Purbrick (2003), Belk (1988), Schultz et al (1989), Csikszentmihalyi and Rochberg-Halton (1981), Schultz, Kleine and Kerman (1989), Wallendorf and Arnould (1988), Ball and Tasaki (1992).

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49 Schultz, S. E., Kleine, R. E. and Kernan, J. B., 'These are a few of my favourite things: Toward an explication of attachment as a consumer behaviour construct', *Advances in Consumer Research*, vol 16, 1989, pp359-366
Demirbilek & Sener (2004)\textsuperscript{54} and Dittmar (1992)\textsuperscript{55}. Following the review, it is clear that attachments are not fully programmable; as Forlizzi and Ford (2000) state, ‘designers cannot craft an experience, but only the conditions or levers that might create an intended experience.’\textsuperscript{56} Indeed, marketers play an important role in the construction and manipulation of these experiential levers, as perceived by the end-user. However, within the context of product design, both the nature and scope of these designable conditions are not currently understood. Furthermore, it is also questioned in the literature as to whether attachments are actually beneficial in terms of product life extension. For example, Marchand (2003) explores detachment from possessions as a way to extend the longevity of objects; it was found that through interview, test subjects revealed that ‘by practicing detachment from objects, they are more predisposed to accept an object’s physical ageing.’\textsuperscript{57}

- Longer lasting products and the creative industry: this theme examines research that outlines the economic implications for longer lasting products, and the current commercial perception of product life extension. Due to the recent emergence of this design paradigm, little is known as to the commercial perception of product life extension within an environmental context – literature that directly addresses this is scarce; key literature in this section include Thietart and Vivas (1984)\textsuperscript{58}, Cooper and

\begin{itemize}
\item \textsuperscript{55} Dittmar, H., The Social Psychology of Material Possessions: To Have Is To Be, St. Martin’s press, New York, 1992
\end{itemize}

The EU Waste Electrical and Electronic Equipment (WEEE) Directive: the section examines the WEEE Directive in terms of its legality in legislative terms, its future and also its implications for this research in the context of the design, production, consumption and disposal of DEPs. Key literature in this section includes Cooper (2000)\(^{67}\) and Park (2004)\(^{68}\). The prospect of the WEEE Directive is engaging practically all corners of the design and manufacturing industry in re-evaluating their stance on the lifespans of DEPs. 'The threat of litigation for non-compliance will force many to re-appraise their product portfolios. As a consequence, such legislative instruments might establish frameworks and drivers for a more formalised design response to unsustainable consumption.'\(^{69}\) Today however, products designed for take-back are

\(^{60}\) Cooper, T., Beyond recycling: The longer life option, New Economics Foundation, London, 1994
\(^{64}\) Heiskanen, E. and Jals, M., Dematerialization through services – a review and evaluation of the debate, Ministry of the Environment, Helsinki, 2000
\(^{66}\) Mont, O., Introducing and developing a Product-Service System (PSS) concept in Sweden, IEEE Reports 2001: 6, Lund University, Sweden, 2001
\(^{68}\) Park, M., Design for Sustainable Consumption, Futureground, Design Research Society, Melbourne, November 2004
\(^{69}\) Park, M., Design for Sustainable Consumption, Futureground, Design Research Society, Melbourne, November 2004
still generally geared toward essential, yet costly, end-of-pipe solutions such as product disassembly and the recycling/reuse of component parts.

1.5 Research questions

The investigative foundation for this research is provided by three research questions (RQ); these have been developed in response to inferences drawn from the literature review, and are as follows:

RQ1 Do creative industries recognise product life extension as a viable approach to sustainable design?

RQ2 Do users possess DEPs to which they are emotionally attached?

RQ3 What designable conditions nurture more durable relationships between users and DEPs?

A concise rationale for the three research questions will now follow, to provide initial justification of their selection, motivation and intentions (a full rationale of RQ1, RQ2 and RQ3 can be found in chapter 4, along with reference material to further support their origin). Firstly, in the specific context of DEPs, it is not currently understood whether the creative industries perceive product life extension as a viable approach to sustainable design, despite the fact that ample research described in the review of the literature – including Cooper (2002)70, Stahel (1993)71, Heiskanen and Jals (2000)72 and Mont (2002)73 - illustrates the readiness of consumers to engage with products over greater periods of time, and even pay more for them (see RQ1). Secondly, there is a significant shortfall in current, up-to-date research that clearly denotes both the character and scope of relationships that consumers are already experiencing through engagements with their DEPs, during the use-phase. In contrast, the

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72 Heiskanen, E. and Jals, M., Dematerialization through services – a review and evaluation of the debate, Ministry of the Environment, Helsinki, 2000

73 Mont, O., Functional Thinking: The Role of Functional Sales and Product Service Systems for a Function-Based Society, International Institute for Industrial Environmental Economics (IIIEE), Lund University, Sweden, no 5233, July 2002, p30
review of literature shows that research characterising the relationships established between users and various genres of non electronic objects is relatively well established; these include van Hinte (1997)\textsuperscript{74}, de Groot (1997)\textsuperscript{75} and Schultz et al (1989)\textsuperscript{76}. It is therefore not known whether users possess DEPs to which they are emotionally attached (see RQ2). Finally, the review of the literature shows that numerous studies argue the social, economic and environmental need for the design of artefacts that people want to keep for longer; these include Cooper (2000)\textsuperscript{77}, Park (2004)\textsuperscript{78}, Csikszentmihalyi & Rochberg-Halton (1981)\textsuperscript{79} and Thietart and Vivas (1984)\textsuperscript{80}. Despite this, a niche exists for practice-based design research that enables the creation of a provisional framework for the design of more emotionally durable DEPs (see RQ3).

1.6 Methodologies

Though three research questions underpin this thesis, the methods deployed to examine and explore these questions consist of two interlinked phases of fieldwork. The first, phase 1 (responding to RQ1 and RQ2), consists of a 10-month period of formulation, design, piloting and production of an interactive, information-gathering exhibit at 100% Design\textsuperscript{81}. (Earl’s Court, London, 21-24 September, 2006), through which a significant subject population completed an empirical survey (see figure 5.2); this sample frame was taken from a purposive sample – the creative industry. Following the event, a further 4-month period of data collation.

76 Schultz, S. E., Kleine, R. E. and Kennan, J. B., ‘These are a few of my favourite things: Toward an explication of attachment as a consumer behaviour construct’, \textit{Advances in Consumer Research}, vol 16, 1989, pp359–366
78 Park, M., Design for Sustainable Consumption, Futureground, Design Research Society, Melbourne, November 2004
analysis and interpretation was undertaken, as a means for implications to be drawn from the data set gathered.

Within the context of this thesis, the term *creative industry* is used as a means to encapsulate those engaged in the research, development and practice of design, and includes individuals from the following sectors: product and furniture design, architecture and interiors, graphics design and illustration, exhibition and spatial design, science and engineering, landscape architecture, new media and digital, journalism and media, government & policy, specifier, fashion and textile, arts and crafts, materials, research and education. Indeed, within the creative sector, definition is important, as it is unclear where boundaries lie between disciplines and sectors. As such, the term *creative industry* can be seen as comprising several demographic-specific profiles, which when viewed in their totality, provide a collective, aggregate profile, that is representative of a significantly large sample population.

As the UK's leading trade show for the creative industry, the 100% Design show at Earls Court was identified as an apposite venue for the staging of fieldwork (phase 1) as it provided unprecedented access to the sample population of this study, whilst doing so on neutral territory. Following this identification, a sponsorship arrangement was established with 100% Design; providing financial support to cover stand space but, perhaps more importantly, the academia/industry partnership established also represented a significant endorsement of both the study, and its potential contributions to the creative community that the show serves (see section 5.3 for a full methodological rationale).

Consisting of both qualitative and quantitative questions, this empirical survey represents a product life census of significant scale, with 2154 respondents (including subsequent focus group participants); enabling the capture of essential information from a well-represented creative industry. Although the creative industry is a highly captive audience for such a study, it is argued here that this subjective, personal engagement with the issues under scrutiny, serves as an agent of rigor; facilitating the generation, formulation and capture of a full range of empirical responses, yet within a grounded, controlled, experimental setting.

81 As the UK's leading trade show for the creative industry, the 100% Design show at Earls Court was selected as a venue for phase 1 of the fieldwork as it provided unprecedented access to the greatest concentration of designers, architects and a host of other creative practitioners from academia and industry; 100% Design's location at London's Earl's Court puts it at the heart of the design industry, in one of the world's key creative hubs.
From the 2154 survey responses, 6 essential reasons for attachment were distilled during a 4-month period of interpretation and analysis of the data set gathered; these were narrative, attachment, detachment, fiction, surface and consciousness. These salient, experiential themes are proposed as having a permanent (rather than transitory) value due to their position within the stable and established construct(s) of human psychological function. In addition, the implications of the empirical survey have a clear and direct impact on the results; providing a supportable and original 6-point experiential framework for the development of emotionally durable design, which prior to this research, was not available. This framework was distilled through the methodological process of inductive analysis (described in chapter 5) to provide a foundation for phase 2 of the fieldwork. Furthermore, this framework presents a set of core principles that provide a clear, conceptual structure, for creative enquiry into issues of emotional durability and design. Functioning as a collection, the research was further shaped by the distillation and merging of focus group discussion extracts (captured at fieldwork phase 1) accompanied by insight generated from a full and comprehensive review of the literature (chapter 2).

The second stage of the fieldwork, phase 2 (responding to RQ3) consists of an 8-month period of the formulation, piloting (see chapter 5) and implementation of an interdisciplinary creative workshop event, featuring 20 selected designers, material specialists and behavioural scientists; generating product proposals that qualitatively address the problems and opportunities of product life extension. This event was followed by a 3-month period of the interpretation, development and full-scale prototyping of the workshop findings.

This interdisciplinary event was held at the Creativity Centre at the University of Brighton’s Cockcroft site (25 June, 2007); a purpose-built venue holding up to 40 people, with immediate access to design studios, model-making workshops and extensive multimedia facilities, which rendered this an appropriate venue for such an event. The 20 attendees were organized into 6 quasi-experimental groups; each team developed a proposal and supporting rationale for a DEP, in response to one of the 6 experiential themes captured and distilled from fieldwork phase 1 (see section 6.3.1); providing an original and meaningful link that connects both phases of fieldwork. This was a multiple condition experiment, as it required more than a yes/no answer; rather, it served to both reveal and examine multiple rival hypotheses. Indeed, the core purpose of the workshop was twofold; firstly, the workshop aimed to provide a critical practice-based research environment that would enable the
original formulation and design of 6 experimental DEPs, each of which serve to exemplify ways of working with the 6-point experiential framework resulting from phase 1; secondly, the workshop aimed to develop an original and transferable methodological process, through which future creative teams may develop case-specific design knowledge to address emotionally durable design, within a peer reviewed, experimental setting.

Therefore, in addition to the 6 experimental DEPs (see section 5.6), the creative workshop also generated a body of essential methodological information that, following a period of critique and reflection, was developed into an original, and transferable, methodology for creating case-specific design knowledge to address emotionally durable design (see section 6.3.3), defining the designable conditions that can nurture more durable relationships between users and DEPs (RQ3). Following the interpretation, development and prototyping of the creative workshop findings, a second exhibition was developed to provide a platform for peer review of the workshop’s provisional findings (objects and rationales) at 100% Design (Earl’s Court, London, 20-23 September, 2007). This second exhibition provided a vital platform for the dissemination and critique of the original findings generated through both fieldwork phases, while additionally serving to catalyse critical debate amongst designers and manufacturers surrounding both the problems and opportunities of product life extension; a poll was taken at this event, to gauge the industry’s level of participation in the debate, while also serving to outline their initial perceptions of the 6 artefacts (for results from all fieldwork, see chapter 5).

Though conceptual in nature, the 6 experimental artefacts are of value to industry, as they serve to exemplify and articulate ways of working with, and interpreting, the methodological process developed through this research. Furthermore, the importance of the 6 experimental DEPs is underscored, not by their originality per se, but by the level of critical engagement they established with members of the creative industry, at the point of dissemination. For example, Andrew Wong, a senior designer at the leading international industrial design consultancy Frog Design, engaged strongly with the issues and design methodologies articulated through the 6 DEPs; constructive discussions also took place with representatives from Electrolux and Gillette, regarding the potential of the propositions made by these artefacts, and they may be developed through the development of future workshops, which will employ the original and transferable methodology developed through this study (see section 6.3.3).
1.7 Overview of results

In this section, an overview of the main results interpreted from both phases of the fieldwork will be stated – this is a bird’s-eye view of the information generated in response to the three research questions (RQ1, RQ2 and RQ3) underpinning this thesis (a full and critically reflective presentation of all results and their implications is provided later, in chapter 6).

Following collation of results from phase 1 of the fieldwork, it can now be noted that both RQ1 and RQ2 have been addressed. Firstly, RQ1 asked ‘do creative industries recognise product life extension as a viable approach to sustainable design?’ Results generated through this particular research question are important, as they serve to test the current state of understanding within industry regarding product life extension, within the broader context of sustainable design. Results from the survey clearly demonstrate that product life extension is recognised as a viable approach to sustainable design, though only 24% of respondents from within this sample frame considered it to be the most effective strategy of the five strategies presented in the survey; coming second only to energy efficient design, with 27% of respondents occupying this profile:

(27%) Energy efficient design
(24%) Design for longer lasting products
(21%) Design for recycling
(20%) Designing with low-impact materials
(8%) Design for disassembly

Secondly, RQ2 asked, ‘do users possess DEPs to which they are emotionally attached?’ Results from both the survey, and subsequent focus group discussions, demonstrate that although 16% of the sample population do possess DEPs to which they are emotionally attached, a larger 84% of respondents perceived value in DEPs for reasons other than attachment, per se. These reasons (in order of frequency) are:

(24%) Narrative: users share a unique personal history with the object; this often relates to when, how and from whom the object was acquired
(23%) Detachment: feel no emotional connection to the object, have low expectations and thus perceive it in a favorable way due to a lack of emotional
demand or expectation (this also suggests that attachment may actually be counterproductive, as it elevates the level of expectation within the user to a point that is often unattainable)

(23%) **Surface**: the object is physically ageing well, and developing a tangible character through time, use and sometimes misuse

(16%) **Attachment**: feel a strong emotional connection to the object, due to the service it provides, the information it contains and the meaning it conveys

(7%) **Fiction**: are delighted or even enchanted by the object as it is not yet fully understood or known by the user; these are often recently purchased objects that are still being explored and discovered by the user

(7%) **Consciousness**: the object is perceived as autonomous and in possession of its own free will; it is quirky, often temperamental and interaction is an acquired skill that can be fully acquired only with practice

Collectively, these 6 experiential themes map a territory of enquiry for emotionally durable design, the results of which provided the foundation for the creative workshop in phase 2. Results from phase 2 begin to address RQ3, which asked ‘what designable conditions nurture more durable relationships between users and DEPs?’ In the practice-oriented culture of Art and Design, research and learning is ‘recognised, articulated, communicated and disseminated commonly through the realised artefact [and in this way], the artefact becomes an essential embodiment of research and learning and is representative of the intellectual and investigative process.’

Through the design and prototyping of six experimental DEPs (in response to the six experiential themes distilled from fieldwork phase 1), a body of practical design information was generated that enables product designers to consider and communicate the emotionally durable potential of DEPs; developing and enabling new commercially viable ways of working in compliance with the EU WEEE Directive.

Following a period of critical reflection and analysis it can be stated that the three key contributions made by this thesis are thus: (1) the implicit development of a 6-point experiential framework to structure inquiry and exploration into salient issues of emotional attachment

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durability through design; (2) the design and production of 6 experimental DEPs that exemplify ways of working with the 6-point experiential framework; (3) the development of an original, and transferable, methodology for developing case-specific design knowledge to address emotionally durable design (a full account of these contributions can be found in chapter 6).

1.8 Structure of thesis

The thesis structure will now be presented, providing an overview of the remaining five chapters:

- **Chapter 2 – Review of the Literature**: Recent literature of particular relevance to the study of product lifespans and the designing of more durable connections between users and products will be discussed; providing a focussed analysis of the more relevant literature addressing the key social, economic and environmental issues that are connected to this study.

- **Chapter 3 – Research Context**: A context for this study will be clearly established – situating it firmly within the knowledge field(s), whilst facilitating deeper levels of enquiry through the identification of key themes and issues that underpin this research.

- **Chapter 4 – Research Questions**: The three research questions (RQs) will be described. A descriptive account of each RQ examines its appropriateness in terms of its degree of originality, and relevance to the study.

- **Chapter 5 – Research Methods**: The qualitative and quantitative methodologies through which the research questions have been addressed are discussed. The appropriateness and relevance of research methods employed will also be explained.

- **Chapter 6 – Conclusions**: The three key contributions made by this thesis are described in full; (1) the implicit development of a 6-point experiential framework to structure inquiry and exploration into salient issues of emotional durability through design; (2) the design and production of 6 experimental DEPs that exemplify ways of working with the 6-point experiential framework; (3) the development of an original, and transferable, methodology for developing case-specific design knowledge to
address emotionally durable design; following this, several opportunities for future research are outlined.
2 Review of the Literature

2.1 Introduction

Literature that is of particular relevance to the study of product lifespans and the designing of more durable connections between users and DEPs will be described – providing a survey and a critical assessment of related work. The references detailed within this section are by no means exhaustive, but rather, provide a focussed analysis of the more relevant literature addressing the key social, economic and environmental issues that are connected to, and underpin, this study. Leading on to the research context that is detailed in chapter 3, this review examines the current state of knowledge; categorising it into six areas of enquiry that enable a deeper analysis of the disparate yet contingent elements of this research. The six key areas are as follows:

- **Consumer motivation and the lifespans of DEPs**: examining research into the psychosocial factors that fuel the consumption and waste of DEPs; examining their influence over the longevity of the use-phase
- **Longer lasting DEPs and environmental sustainability**: identifying both the positive and negative impacts of longer lasting DEPs on the natural world
- **Object meaning**: regarding the cognitive processes that give rise to the origins of meaning, and meaningfulness as perceived in objects; pointing to the central role of meaning, in initiating experiential connections between users and DEPs
- **Emotional connections between users and DEPs**: theories that explore attachment (and detachment) behaviour; why users develop connections to certain DEPs; along with current strategic approaches to object creation that aim to close the perceptual gap between the user and the product
- **Longer lasting products and the creative industry**: the economic implications for longer lasting products, and the current commercial perception of product life extension
- **The EU Waste Electrical and Electronic Equipment (WEEE) Directive**: its legality in legislative terms, its future and also its implications for this research in the context of the design, production, consumption and disposal of DEPs
Implications for research: identification of the key opportunities for research, following a full review of the 6 areas of enquiry within the literature

The implications of the literature review as a whole are stated in section 2.8; in this closing section, conclusions will be drawn that initially identify the context for this study, whilst also outlining the opportunities for research.

2.2 Consumer motivation and the lifespans of DEPs

Despite the breadth of research into consumer motivation that is available today, a niche of literature within this well-established research field – of particular relevance to this project – outlines the deep motivations that shape the transient nature of our contemporary engagement with DEPs.

In *Consumption* (1993), sociologist Robert Bocock tells us that ‘[c]onsumption is founded on a lack – a desire always for something not there. Modern/post-modern consumers, therefore, will never be satisfied. The more they consume, the more they will desire to consume.’ Bocock, whose work examines the contribution of leading writers in the field, including Veblen, Simmel, Marx, Gramsci, Weber, Bourdieu, Lacan and Baudrillard, claims that consumer motivation – or the awakening of human need – is catalysed by a sense of imbalance or lack that steadily cultivates a restless state of being; material consumption is therefore motivated when discrepancies are experienced between actual and a desired modes of existence. DEPs may thus be described as illustrative of an individual’s aspirations and serve to define us existentially. In a paper entitled ‘These are a few of my favourite things: Toward an explication of attachment as a consumer behaviour construct’, Schultz, Kleine and Kernan (1989) describe how ‘possessions are used as symbols of what we are, what we have been, and what we are attempting to become.’ It is proposed here that this self-defining process is an agent of environmental decay; the emotional needs of consumers relentlessly grow and flex, whilst the objects deployed to satisfy those needs remain relatively frozen in time; the mountain of waste this single inconsistency generates is substantial.

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coming at increasing cost to legislation-burdened manufacturers in the EU, and the natural world.

In *Civilization and Its Discontents* (1930)*85*, Freud attributes this common behavioural process to the ego, which enables us to portray — through both the consumption and mediation of objects — an aggregate self-image of coherence, completeness and success. In further support of this construct, Leader and Groves (1995) claim that the ego is an ‘inauthentic agency, functioning to conceal a disturbing lack of unity.’*86 The consumption of DEPs therefore, may be said to assist in the construction of a desired identity through which the self and other may be favourably defined. Similarly, in his paper ‘Emotion and Industrial Design: Reconciling Meanings and Feelings’, Cupchik*87* (1999) claims that ‘[a]t the most superficial level, an object can be seen by the user to resonate with and be symbolic of the self. Thus, perceiving oneself as rich and powerful might lead to conspicuous consumption, such as owning a luxurious car or wearing designer apparel. At a more profound psychodynamic level, having and utilizing an object can compensate for an unconsciously felt inadequacy.’*88 Here, it can be seen how Cupchik’s view serves to further reinforce Bocock’s essential concept of material consumption being motivated primarily by a felt sense of lack.

In *To Have or To Be* (1979), Fromm*89* states that having provides an archaic means of possession by enabling the consumer to ‘incorporate’ the meanings that a given object signifies; consumers are thus drawn to DEPs in possession of that which they subconsciously yearn to become – ‘we find the same connection between incorporation and possession in many forms of cannibalism. For example, by eating another human being, I acquire that person’s power … by eating the heart of a brave man, I acquire his courage; by eating a

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87 Gerald Cupchik has explored the search for meaning as it pertains to social psychology and aesthetics – examining the experience and communication of emotion, with special emphasis on individual and sex differences in nonverbal expressiveness.
89 Erich Fromm was both a practicing psychoanalyst and a committed and insightful social theorist, whose ideas were constructed primarily upon the early works of Karl Marx, to re-emphasize the ideal of personal freedom.
90 Fromm, E., *To Have or To Be*, Abacus, London, UK, 1979, p26
Correspondingly, in *Symbolic Exchange and Death* (1976), Baudrillard points to "a contemporary detachment from reality toward a fabricated, and deeply abstracted culture of signs." Baudrillard describes this process of reality fabrication as *simulation*; rendering the consumption of DEPs like an Apple phone a simulation of design-led style, whilst a Bang & Olufsen TV might provide a more connoisseur-like simulation; according to Baudrillard, consumers are powerfully motivated by a need for the simulation, rather than the physical products themselves.

Koskijoki, in his paper 'My favourite things', describes how Falk (1997) sees the consumption act as a 'transformative and transcendent process of the appropriation and conversion of meaning.' According to Koskijoki, it is this process of appropriation and conversion that designers must address, as it is through this process that connections between users and DEPs are forged. Within the research field, this theory is widely supported, yet due to its complexity, object meaning is still a relatively untouched issue in consumer motivation research. In a paper entitled, 'Measuring the meaning of consumption objects: An empirical investigation', Kleine and Kernan (1988) state that 'only a few consumer researchers have even discussed, much less studied, meaning.' According to Kleine and Kernan, meaning incorporates three essential characteristics: polysemy (one object can carry a number of different meanings), contextual sensitivity (an object’s meaning changes depending on it’s context) and consensus (meaning must be shared by people to make an object discussable).

In 1936, at a conference of the International Psychoanalytical Association in Marienbad, Lacan introduced what he referred to as *the mirror stage*. In the mirror stage (an
important early component in Lacan’s critical reinterpretation of the psychoanalytical work of Freud), infants aged 6-18 months recognize themselves in the mirror as a whole and separate entity instead of the fragmented movements and undefined boundaries between self and other that have constituted their experiential world up to that point; the infant identifies with the image, which serves as a gestalt of the infant’s emerging perceptions of selfhood. Lacan asserts that once experienced, this craving for individuality will remain active until death: ‘[t]he clumsiness witnessed has the effect in man of an organic insufficiency in his natural reality.'

This event is later manifest as an enduring sense of imperfection while constantly needing and looking forward to achieving perfection; as consumers, we thus spend the present creating the future to outdistance the past. In Ecrits (1966), Lacan describes the birth of this need as ‘the transformation that takes place in the subject when he assumes an image.'

Needs may be mapped by polarizing them in two distinct categories consisting of innate (physiological) needs and acquired (psychological) needs. In A Theory of Human Motivation (1894), Maslow categorizes both innate and acquired need within a pyramidal structure consisting of five hierarchical levels:

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version of psychoanalysis, based on the ideas articulated in structuralist linguistics and anthropology. Lacan reinterprets Freud in light of these theories, turning psychoanalysis from an essentially humanist philosophy or theory into a post-structuralist one.

99 Abraham Maslow was a leader in the school of humanistic psychology, best known for his theory of human motivation, which led to a therapeutic technique known as self-actualization. Maslow’s methods were unusual within the context of psychological practices of the time, in that he chose to study exemplary people such as Albert Einstein, Jane Addams, Eleanor Roosevelt, and Frederick Douglass rather than mentally ill or neurotic people, as was the norm.
Known as Maslow's Hierarchy of Human Needs, this theoretical model outlines five key levels of need, consisting of physiological needs, such as water, food and breathable oxygen; safety and security needs, such as shelter, stability and a safe place in which to live; social needs, which may include companionship, tenderness and, perhaps, a sense of belonging; ego needs, which regularly include the need for prestige, status and positive self-esteem; and finally self-actualization needs such as the successful accomplishment of personal goals.

In Maslow's terminology, a need does not become salient until the needs below it are met. According to Thompson (2005), "[w]hen we experience a need, at any level of Maslow's hierarchy, we seek to satisfy that need. This aspect manifests itself as motivation." Alderfer (1972) developed a comparable hierarchy with his Existence, Relatedness, and Growth (ERG) theory, an approach that collapses Maslow's model to incorporate only 3 hierarchical tiers as opposed to 5. Though Alderfer's level-specific categorizations differ from Maslow's, his essential recognition of the hierarchical nature of need is the same. In contrast to both Maslow and Alderfer's universally applicable structures of need, McClellan's (1971) theory of Acquired Needs suggest a more individually constructed framework, that is acquired as a direct result of individual life experiences. For example, according to McClellan, a need for

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100 Thompson, J., 'More than meets the eye. Exploring opportunities for new products, which may aid us emotionally as well as physically', in McDonagh, D., Hekkert, P., van Erp, J., Gyi, D., *Design and Emotion*, Taylor and Francis, London, 2005, pp 332-336
affiliation might come from 'being rewarded for making friends as a child'\textsuperscript{101}. In a naturalistic sense, humans possess underlying needs that are the same, regardless of nation, religion or culture. In \textit{Real Life Economics} (1992), Ekins & Max-Neef identify these as 'subsistence, protection, affection, understanding, participation, creation, recreation, identity and freedom.'\textsuperscript{102} Crucially, 'while these needs stay the same, what changes with time and between individuals is how we go about meeting or satisfying these needs.'\textsuperscript{103}

In the context of Maslow's 5-tier model, it may be said that the satisfaction of physiological needs, and safety and security needs is practically a given (in the developed world). This concentrates remaining human need within the upper three levels. Therefore, consumer motivation is primarily driven by social, ego and self-actualizing needs. Though little study has been carried out to challenge Maslow's theoretical modelling of human needs, a study by Wahba and Bridgewell (1976) entitled, \textit{Maslow reconsidered: A review of research on the need hierarchy theory}, demonstrated its practically universal acceptance. However useful, Maslow's model must not be applied too rigidly, as Virginia Postrel (2004) states in her article \textit{Why buy what you don't need?} 'Human beings do not wait until they have full stomachs and a roof that doesn't leak before they satisfy their aesthetic needs. Given a modicum of stability and sustenance, people have always enriched the look and feel of their lives through personal adornment and decorated objects.'\textsuperscript{104}

In a recent study by Nitta and Shiozaki (2001) for the Nomura Research Institute\textsuperscript{105} (NRI) in Japan entitled, \textit{Changing Consumption Patterns and New Lifestyles in the 21\textsuperscript{st} Century}, Maslow's categorizations of human need are further challenged. They propose that 'seeking shelter, for example, essentially means the inclination to buy brand-name goods with the aim of seeking the approval and support of others. Similarly, pursuing fashion means the desire to stay abreast of what others are doing, while adhering to specific features caters

\textsuperscript{104} Postrel, V., 'Why buy what you don't need?' \textit{Industrial Designers Society of America, Innovation}, Spring 2004, p33
\textsuperscript{105} Nomura Research Institute (NRI) is a leading think-tank and systems integrator in Japan, that considers the possibilities facing society in this era of rapid change where predictions cannot easily be made.
to the pride of demonstrating one’s uniqueness by purchasing goods that are slightly different from those owned by others.\textsuperscript{106} This view from the NRI, suggests that the uptake of DEPs is largely motivated by the need to designate one’s own particular identity – selected DEPs serve to illustrate our values, beliefs and choices as individuals within an unstable and ever evolving societal mass. In \textit{Eternally Yours: Visions on Product Endurance} (1997)\textsuperscript{107}, van Hinte\textsuperscript{108} primes this ideology, stating that consumers acquire and own things to ‘give expression to who they are and to show what group of people they feel they belong to’.\textsuperscript{109} This self-actualizing mode of consumption provides a mirror that reflects brief existential indications, through which we may evaluate our individual existence in relation to our immediate society. Indeed, ‘[i]ntuitively speaking, a solitary entity cannot exist unless one half can relate to the other. This is also implied in René Descartes’ (1644) realization, “I think, therefore I am” (Cogito ergo sum), which articulates the point that that there can be no point unless it is reflected. Bishop George Berkeley (1710) put this in a less solipsistic way when he said, “to be is to be perceived”.\textsuperscript{110} However, the relentless forward thrusting of the self-actualizing consumer also poses a threat to existing DEPs that are no longer representative of the relentlessly evolving self – waste is born.

This part of the review (consumer motivation and the lifespans of DEPs) examines key research into the psychosocial factors that fuel the human consumption and waste of material artefacts, and their influence over the longevity of subject-object relationships. Despite the breadth of research into consumer motivation, it can be noted that only a small niche of literature within this well-established field of enquiry is pertinent to this research. Literature within this context connects the instability of consumer motivation (fuelled by the transient concept of ‘self’) with the equally unstable character of our contemporary

\textsuperscript{106} Nitto, N. and Shiozaki, J., ‘Changing consumption patterns and new lifestyles in the 21st century’, NRI Papers, Japan, no 24, March 2001, p12
\textsuperscript{108} Ed van Hinte is founder of the Eternally Yours Foundation, a leading research group based in The Netherlands, which has been active in the field of product lifetime extension since 1996. It wants to find ways to help products age with dignity, particularly in cases where this is relevant for the environment.
\textsuperscript{109} Ibid., p48
engagement with manufactured objects; such literature includes Bocock (1993)\textsuperscript{111}, van Hinte (1997)\textsuperscript{112}, Schultz, Kleine and Kernan (1989)\textsuperscript{113} and Cupchik (1999)\textsuperscript{114}.

2.3 Longer lasting DEPs and environmental sustainability

In the 1960s, there was growing concern as to the ecological impacts associated with the deliberate shortening of product lifespans by profit-oriented manufacturers attempting to increase the pace of production and consumption. "Throughout the 1960s, many people expressed concern at this trend, but not much happened in response. In 1982 the Organisation for Economic Co-operation and Development\textsuperscript{115} (OECD) produced its report \textit{Product Durability and Product Life Extension}; but again little practical action followed.\textsuperscript{116}"

The term, \textit{planned obsolescence} – sometimes referred to as \textit{built-in obsolescence} – signals the conscious decision to design and produce consumer products that become obsolete within a predetermined timescale. In most instances, planned obsolescence carries a range of economic advantages for producers – first and foremost, by ensuring that consumers repeatedly buy their products, as their old ones are no longer functional or desirable. Bernard London (1932)\textsuperscript{117} first proposed the principle of planned obsolescence. It was not until almost 30-years later in 1963 that pop culture critic Vance Packard published \textit{The Waste Makers} (1963)\textsuperscript{118}, which many mistakenly believe was the first recognition of this phenomenon. The lesser known text by Calkins (1932) entitled, \textit{What Consumer Engineering Really Is}, may provide a text of equal significance in this context. In consumer engineering, Calkins sees

\begin{itemize}
  \item \textsuperscript{111} Bocock, R., \textit{Consumption}, Routledge, London, UK, 1993
  \item \textsuperscript{112} van Hinte, E., \textit{Eternally Yours: Visions on Product Endurance}, 010 Publishers, , Rotterdam, The Netherlands, 1997, p48
  \item \textsuperscript{113} Schultz, S. E., Kleine, R. E. and Kernan, J. B., ‘These are a few of my favourite things: Toward an explication of attachment as a consumer behaviour construct’, \textit{Advances in Consumer Research}, vol 16, 1989, pp359-366
  \item \textsuperscript{114} Cupchik, G. C., ‘Emotion and industrial design: Reconciling meanings and feelings’, \textit{First International Conference on Design and Emotion}, Delft University of Technology, The Netherlands, 1999
  \item \textsuperscript{115} Organisation for Economic Co-operation and Development (OECD) is an international organisation helping governments tackle the economic, social and governance challenges of a globalised economy.
  \item \textsuperscript{117} London, B., \textit{Ending the Depression Through Planned Obsolescence}, Pamphlet, US, 1932
  \item \textsuperscript{118} Packard, V., \textit{The Waste Makers}, Penguin, Middlesex, 1963
\end{itemize}
design as 'a business tool that fashions products to address more closely the changing tastes or needs of the consumer. A broader definition consists of any action that stimulates the consumption of goods ... shaping the goods does not mean a simple colour change, or more attractive package design. Instead, the process involves changing ordinary goods to modern, distinctive ones ... consumer engineering benefits advertisers by supplying them with new product information to reveal in their ads. In turn, the advertisers will be held accountable to these new product claims, thus benefiting the whole of society.' Though informed by the work of both London (1932) and Calkins (1932), Packard's dualistic theories of functional obsolescence and psychological obsolescence assert that the deliberate shortening of product lifespans was unethical, both in its profit-focused manipulating of consumer spending, and its devastating ecological impact through the nurturing of wasteful purchasing behaviours. More recently, Slade (2007) explains in his work, Made to Break: Technology and Obsolescence in America, how disposability was in fact a 'necessary condition for America's rejection of tradition and our acceptance of change and impermanence ... [yet] by choosing to support ever-shorter product lives we may well be shortening the future of our way of life as well, with perilous implications for the very near future.'

Today, dialogue addressing the optimization of the lifespans of DEPs, within an environmental context, is particularly prevalent; researchers including Cooper (1997), Manzini (2001), Fuad Luke (2006), Park (2004), Mont (2002) and Heiskenan

124 Park, M., Design for Sustainable Consumption, Futureground, Design Research Society, Melbourne, November 2004
125 Mont, O., Functional Thinking: The Role of Functional Sales and Product Service Systems for a Function-Based Society, International Institute for Industrial Environmental Economics (IIIEE), Lund University, Sweden, no 5233, July 2002, p30
(1996), have applied increasing emphasis on issues of product longevity over the past 15 years. In this respect it can be seen that product longevity is a well-established theme within research into the environmental effects of material consumption. In the majority of cases put forward by the researchers discussed, it is widely understood that product life extension is environmentally beneficial – primarily, through slowing the pace of material consumption to enable significant reductions in the throughput of resources; in 'Slow consumption for sustainable jobs', Ax (2001) refers to this as 'slow consumption' or slow design. Slow design is extensively referred to in the research of Manzini (2001, 2002), Fuad Luke (2006), Park (2004) and Eno (1996), as a means of reducing the pace of consumption, whilst concurrently enriching the experiential qualities of our engagements with a range of object typologies.

In his paper entitled 'Ideas of wellbeing: Beyond the rebound effect', Manzini (2002) claims that 'because everything moves so fast, and we cannot stop it, we have to create some islands of slowness. Design, in all its history, but especially in more recent years, has been an agent of acceleration. Is it possible to conceive of solutions combining real-time interactions with the possibility of taking time for thinking and contemplation?' In his paper ‘Design for Sustainable Consumption’, Park (2004) expands upon this view, claiming that

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129 Manzini, E., 'Ideas of wellbeing: Beyond the rebound effect', Sustainable Services and Systems: Transitions towards Sustainability, Amsterdam, 2002


131 Park, M., 'Design for Sustainable Consumption', Futureground, Design Research Society, Melbourne, November 2004

132 Eno, B., A Year With Swollen Appendices: The Diary of Brian Eno, Faber & Faber, New York, 1996

133 Ezio Manzini is Professor of Industrial Design at Politecnico di Milano, whose leading research engages with contemporary approaches of strategic design and design for sustainability, with a focus on scenario building and solution development.

134 Manzini, E., 'Ideas of wellbeing: Beyond the rebound effect', Sustainable Services and Systems: Transitions towards Sustainability, Amsterdam, 2002

135 Miles Park is an industrial designer and design researcher in sustainable product design, product lifespans and design for behavioral change, with the aim of furthering understanding of
current consumption operates within a linear production-consumption system that takes resources, makes them into products, then discards or wastes them ... slowing consumption offers a direct response to unsustainable consumption. By slowing the mass flows in the linear production-consumption economy a level of sustainability could be achieved."\textsuperscript{136} The Slow Food movement, founded by Carlo Petrini (1986) in Italy, was the first established part of the broader Slow movement, which has since expanded globally to over 83,000 members in 122 countries, with the aim of implementing a cultural shift that enables a slowing of the pace of modern life. They state that "[t]echnological advances have resulted in labour saving devices for the home. Who would complain about vacuum cleaners, electric stoves, hot water systems, flush toilet, or the bread maker, but have these technologies really given us more time to enjoy life as was their claim? Or have we used this time to become even more busy.\textsuperscript{137} In this way, it can be argued that the unsustainable consumption and waste of natural resources so characteristic of the developed world is a legacy of modern times, born largely from the inappropriate marriage of excessive material durability with fleeting product use careers, or 'career plans'\textsuperscript{138} as van Hinte asserts. Waste of this nature proliferates, and may be seen as nothing more than a symptom of a failed relationship between the user and the product; through focussing solely on waste management strategies such as recyclable waste, biodegradable waste and disassemble-able waste, deeper strategic possibilities are overlooked.

Recycling for example, is not a one-stop solution to sustainable production and consumption; it consumes significant amounts of energy during reclamation, cleaning and reprocessing. In response to this, many are beginning to suspect that recycling might actually liberate consumer conscience and, in so doing, generate even more waste. In 'Consumers, costs and choice', Cooper\textsuperscript{139} (1997) argues that '[e]co-design limits itself to an environmental technological approach and recycling is sometimes even an excuse for more rapid

\textsuperscript{136} Park, M., Design for Sustainable Consumption, Futureground, Design Research Society, Melbourne, November 2004

\textsuperscript{137} Slow Movement cited on http://www.slowmovement.com/, accessed 15 November 2007


\textsuperscript{139} Tim Cooper is a specialist in sustainable consumption and consumer studies; he leads research relating to the environmental impact of consumer products, with a particular focus on product life spans.
discarding.\textsuperscript{140} Even biodegradable waste such as biopolymers, papers, woods and other vegetable-based compounds frequently escape decomposition as overloaded landfills lack the correct mix of water, oxygen and light for the required microbial action to occur. 'In anthropological studies of the Fresh Kills Landfill Site in New York, hotdogs, corncobs and newspapers that were 25 years old were still in recognizable form, and the newspapers were readable.'\textsuperscript{141}

Product life extension however, may be seen as environmentally beneficial as it reduces (and often eliminates) the need for the symptom-focussed waste-management methodologies, whilst simultaneously reducing the need for the resource extraction, manufacturing and distribution of replacement DEPs. Though this basic assumption that longer lifespans have greater environmental appeal, may be generally accurate, Hille (1996) points out that in the case of certain electronic products, there are several exceptions; '[m]ost of the exceptions concern household durables that consume substantial amounts of energy in the use phase when more energy efficient alternatives are available.'\textsuperscript{142} Products that typify this categorization include refrigerators and freezers, as they consume relatively low amounts of energy, yet do so continuously; other examples include vacuum cleaners, washing machines and hairdryers as they use relatively high amounts of energy when actually in use. This argument is also made by Heiskanen (1996), in 'Conditions for Product Life Extension', who describes the optimal replacement scenario for a washing machine; proposing that 'a household that bought a new washing machine in 1973, and exchanged it for a new one in 1983, in 1990 would have consumed less energy than a household that kept the old machine. Thus, total energy use is not reduced until seventeen years into the service life of the first product.'\textsuperscript{143} Though the optimal replacement point will undoubtedly differ depending on the product in question, the key principle is that at some juncture in such a product's life it may be environmentally beneficial to exchange it for a newer, and more energy efficient model. In the case of domestic electronic products such as these, Life Cycle Assessment


\textsuperscript{141} Association of Science – Technology Centers, cited on www.astc.org/exhibitions/rotten/fkl.htm. 11 June, 2002

\textsuperscript{142} Hille, J., 'How we consume energy without ever noticing', \textit{Norges forskingsråd Workshop 23}, No. 24, Oslo, 1996

(LCA) methodologies become particularly helpful in developing case-specific assessments for the optimization of product lifespans, by precisely identifying the point at which product life extension becomes environmentally counterproductive.

Emerging from the global modelling studies and energy audits of the late 1960s and early 1970s, LCA (often referred to as Life Cycle Analysis, Life Cycle Inventory, Cradle to Grave Analysis, Eco-balancing and Material Flow Analysis) has quickly become vital in accurately assessing the burdens placed on the environment by both the manufacture and use of an item, the following of a procedure or the use of a particular manufacturing process. Though numerous LCA methodologies exist today, Lewis and Gertsakis in Design and Environment (2001)\textsuperscript{144}, state there are four key stages to any LCA; these are: definition of the goal and scope, life-cycle inventory analysis, life-cycle impact assessment, and finally, life-cycle interpretation. Despite the enormity of literature addressing LCA methodologies, it is still commonly understood that LCA can be problematic, with many LCAs often reaching contradictory conclusions about similar, or sometimes identical DEPs. In addition, the Global Development Research Centre\textsuperscript{145} (GDRC) (2006) state that, ‘reliable methods for aggregating figures generated by LCA, and using them to compare the life cycle impacts of different products, do not yet exist.’\textsuperscript{146} Furthermore, Robert, Daly, Hawken\textsuperscript{147} & Holmberg in a ‘A compass for sustainable development’ (1997) describe the underlying complexities of seemingly simplistic environmental management tools like LCA, claiming that ‘...such tools may even be hazardous, because they may lead to a false sense of control.’\textsuperscript{148} Despite this, LCA still provides a useful guide that greatly facilitates the assessment of the ecological impact of any given DEP throughout its entire lifetime.

In the case of most DEPs, the vast majority of energy consumed occurs pre-use, during the resource extraction and manufacturing phases; in these instances, the use phase

\begin{footnotesize}
\begin{enumerate}
\item Lewis, H., & Gertsakis, J., Design and Environment, Greenleaf, London, 2001
\item The Global Development Research Center (GDRC) is a virtual organization that carries out initiatives in education, research and practices, in the spheres of environment, urban, community and information.
\item Global Development Research Centre (GDRC), cited on http://www.gdrc.org/uem/lca/life-cycle.html, July 2006
\item Paul Hawken is an environmentalist, entrepreneur, journalist, and author, whose work collectively aims to change the relationship between business and the environment.
\end{enumerate}
\end{footnotesize}
frequently consumes relatively little. This is particularly true of digital, screen-based products – such as mobile phones, PDA's, digital cameras and MP3 players – that require low levels of energy to operate (largely due to their lack of moving parts), but actually require relatively high levels of energy to produce. Furthermore, it is indeed ironic that DEPs occupying this category tend to have particularly fleeting existences due to the emphasis being placed firmly on maintaining currency with the technological state of the art – once a newer model hits the shelves, all value is lost, and replacement behaviours are promptly motivated. The attachment and detachment profile in figure 2.1 describes this process; the blip in the attachment curve just prior to discarding is the result of the user reviewing the life of the DEP, and during this reflective stage, a degree of attachment is restored, however fleeting that may be.

Figure 2.2 Attachment and detachment profiles

Source: Khan, A., McAdam, J. & Kaynamara, A., results from the 'Product Life Creative Workshop', 25 June, 2007 (captured at fieldwork phase 2)

In a paper entitled, 'Functional Thinking: The Role of Functional Sales and Product Service Systems for a Function-Based Society', Mont¹⁴⁹ (2002) points to the origin of this growing

¹⁴⁹ Oksana Mont develops research that explores the environmental and economic potential of
trend, stating that "some products are discarded before they are physically worn out or are technically superseded because their design is out of fashion or inappropriate to changed circumstances." This means that the materials and energies tied-up within such artefacts are wasted through the inability of a product to sustain a durable relationship with its user. de Groot (1997) points out how "[i]nteracting with this technocratic and depersonalized environment fuels a reactionary mind set that hankers after meaningful content, mystery and emotion." Both the range and intensity of experiences delivered by products born of this mindset are incredibly limited, and offer very little to the consumer. "Yet even though industrial design plays a part in the design of extreme pain (e.g. weapons) and pleasure (e.g. sex aids) the range of emotions offered through most electronic products is pathetically narrow." This is a peculiar situation, when one considers that "[t]he discipline of industrial design emerged during the early years of the 20th century to address the, then, new idea of product design for mass production. Industrial design quickly became employed to distinguish one product from another, to create market appeal and to spur consumerism." Yet it may be argued that despite the illusion of choice that surrounds us as a consumer society, "most of the world's population swims in a sea of ready-made similarity ... [this] lack of differentiation leads to boredom, [which] leads to consumption." Indeed, "[i]t may be that industrial design has been part of the corporate leviathan for so long that it is no longer able to flex its creative muscles and, unused, they have atrophied"; product design is in danger of becoming a subordinate packager of contemporary technologies – housing intangible hardware within intelligible synthetic membranes, whose purpose is to enable consumers to easily interact without alteration, or thought.

150 Mont, O., Functional Thinking: The Role of Functional Sales and Product Service Systems for a Function-Based Society, International Institute for Industrial Environmental Economics (IIIEE), Lund University, Sweden, no 5233, July 2002, p30
In this second theme within this review of the literature (longer lasting DEPs and environmental sustainability) both the positive and negative impacts of longer lasting products on the natural world, are identified and discussed. In the case of most DEPs, longer lifespans are environmentally beneficial, as the majority of energy consumed, occurs pre-use during the resource extraction and manufacturing phases. This is particularly true of digital products – such as mobile phones, PDA’s, digital cameras and MP3 players – that require low levels of energy to operate (largely due to their frictionless action, achieved through a lack of moving parts), but actually require relatively high levels of energy to produce. As such, the literature collectively indicates that (with the exception of a small number of products that consume large quantities of energy during the use-phase, such as washing machines and fridge-freezers) design strategies encouraging longer product lifespans are environmentally beneficial; literature that particularly supports this claim include Cooper (1997)\textsuperscript{156}, Packard (1963)\textsuperscript{157}, Manzini (2001)\textsuperscript{158}, Fuad Luke (2006)\textsuperscript{159}, Park (2004)\textsuperscript{160}, Mont (2002)\textsuperscript{161} and Heiskanan (1996)\textsuperscript{162}.

2.4 Object meaning

Since the mainstream establishment of consumerism in the 1940s, numerous theories have been pioneered that attempt to generate coherent understanding of the immaterial factors that influence the uptake and subsequent disposal of manufactured objects. Many of which, attend to the socio-psychological dimensions of the user psyche, such as personality differences, status and desire. Other theories explore more peripheral issues such as spending, saving habits, general product preferences and fashion cycles. ‘As a consequence, only a few consumer researchers have even discussed, much less studied,
meaning. It therefore appears that in research terms, object meaning – and its endurance – is a relatively untouched issue, yet as Walker argues in his book Sustainable By Design (2006), '[a] sustainable solution can be understood as one that possesses enduring value in terms of its meanings and characteristics'; as such, a gap in the knowledge field is immediately exposed.

The concept of meaning is perhaps the most complex of all. As a relational property, meaning is influenced by the consumer's previous experiences, while also being highly context specific. For example, the meaning of a rat in a pet shop differs greatly to that of a rat in a restaurant kitchen. In this respect it is easy to envisage how product meaning can be loosely steered by designers (and perhaps more so by marketing) but never fully directed. However, this idiosyncratic nature that meaning possesses could be the designer's greatest opportunity to create individual, perceivably one-off experiences; within the peculiarity, the randomness and the idiosyncrasies of human emotion, design potential lurks, as it may be argued that emotional responses contribute to the very foundations of individuality. The example of the rat, though obscure, serves to demonstrate that meaning, expectation and memory are all interconnected components of psychological function that collectively serve to craft and form that specific character of any given human experience.

In 'Measuring the meaning of consumption objects: An empirical investigation', research from Kleine and Kernan (1988) reveals that '[o]bject meaning incorporates three essential characteristics: Polysemy refers to the fact that a given object can mean many things – baking soda, for example, can be a refrigerator deodorizer, a dentifrice or an antacid. Contextual sensitivity suggests that the meaning of a turkey on a Thanksgiving Day dinner table probably differs from that of a turkey placed on a dinner table during mid May. And consensus refers to the fact that, even though each person holds idiosyncratic information about an object, some minimal amount of object information (meaning) must be shared by people in order for them to communicate about the object.' This last point – consensus –

164 Stuart Walker is a specialist in product design for sustainability with a focus on the creative activity, or process, of designing as a legitimate research component, in combination with critical reflection and writing.
relates directly to Richin’s (1994) dualistic paradigm of ‘private meanings and public meanings’,167, indicating that some meanings are shared, and others remain exclusive to each individual user, due to their idiosyncratic and highly personal nature. As Purbrick168 (2003) states, '[t]he meaning of objects can appear both fixed and changeable. These two oppositional characteristics are assigned to objects by anthropologists in some of the most influential writings on material culture, works that have shaped the way objects are viewed in art history, cultural studies, design history and sociology.'

To an observer, the things we own and cherish may appear superfluous, ‘banausic, [and] even venal’170 yet we cling to them because they possess personalized meaning, that defines us individually, as separate from society. By allowing the accumulation of these narratives, deep sensations of attachment, empathy and meaning develop within the user. ‘It is this empathy and indeed intimacy, between the subject and the object which activates numinous experiences and expands consciousness.’171

Due to the ambiguous nature of engagement that takes place between people and things, narratives are solely exclusive to each individual user, and frequently give rise to meaningful associations so strong, that the object in question may be considered irreplaceable.

As people, we are driven by a constant search for meaning, and this meaning is frequently experienced through interactions with objects; Ramakers (1999) argues that '[t]he only difference between designer and user is that the designer has made a career of creating meaning[ful experiences].’172 Consumption is a ‘transformative and transcendent process of the appropriation and conversion of meaning.’173 It is this appropriation and conversion that

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168 Louise Purbrick is a cultural historian, whose work examines the role and purpose material culture in everyday life throughout contemporary Britain.
171 Design Transformation Group, Closing the Gap Between Subject and Object, Design Transformation Group, UK, 1997
we as designers need to address, as it is through this process that strong, meaningful connections between people and things are forged. This theory is further supported by Walker (1999) who urges in his paper entitled, 'How the other half lives - product design, sustainability and the human spirit', that 'it is important to consider how things might be if more emphasis were given to that part of us that contemplates purpose and meaning. For the designer this poses important questions about the relevance and nature of products.'

Though partially situated within the social sciences, it is clear that design plays a key role in developing these emergent concepts, which clearly signposts opportunities for collaborative work that spans disciplines. In 'The social psychology of objects', Miller (1995) claims that, '[t]his is an area where social scientists can inform designers, but also where designers with a thorough practical knowledge of what people do with objects, and what objects do to people, can be enormously helpful to social scientists.'

The work of Dewey (1934), Carlson (1997) and Csikszentmihalyi (1993) indicates that 'if we understand the environment in which an experience occurs, and how objects function as emotional levers within that environment, we may be able to discover opportunities to design new products that have an effect on the [resulting] emotional experience.' The Meaning of Things (1981) features a study by Csikszentmihalyi and Rochberg-Halton, who interviewed 315 respondents about their possessions, and concluded that people invest psychic energy in products that as they provide meaningful expressions of themselves; '[p]eople express values and attitudes – their selves – with the kinds of products

175 Miller, H., 'The social psychology of objects', Understanding the Social World Conference, University of Huddersfield, Huddersfield, 1995
177 Carlson, R., Experienced Cognition, Lawrence Erbaum, New Jersey, 1997
180 Mihaly Csikszentmihalyi is a psychologist noted for his work in the study of happiness, creativity, subjective well-being, and fun, but is best known as the architect of the notion of flow and for his years of research and writing on the topic.
they select for their selves, their home and their environment.' In this survey, a categorization of design objects as 'action objects,' or those objects whose use involves some physical handling, interaction or movement, contrasted to 'contemplative objects.'

In a recent study by Jääskö, Mattelmäki, and Ylirisku (2003), entitled 'The Scene of Experience,' it was found that meaning is not always associated with the object itself, but sometimes to the service that the object provides. 'For example products that support self expression and social interaction such as cellular phones, may become meaningful to the owner because of the saved messages or names and contact information of the loved ones.' The ability of products to be customized by the user therefore may be said to elevate its status to something intimate and meaningful – transcending basic mass-produced functionality to become something more unique and self-reflective. In this way, Sweet (1999) urges, '[n]o matter how elegant and functional a design is it will not win a place in our hearts unless it can appeal at a deeper level, to our emotions.' In contrast to this, when discussing this correlation between meaning and function in Mythologies (1973), Barthes states that the two cannot be separated, and that function is just another meaning. This theoretical proposition is particularly pertinent in the case of fashion where function is rarely the key designed value. In the case of fashion – particularly high fashion – function serves as a placebo value that justifies the existence of what is oftentimes a superfluous object. Such mythologies are prolific within today's streamlined world of comfort, where physical needs come in second place to the more resonant pangs of existential malnourishment, fuelled by the continual search for meaning.

Though we have names for each emotion, which enable us to differentiate between them on a semantic level, they do not actually exist in isolation; they are 'compounded

182 Ibid.
183 Jääskö, V., Mattelmäki, T. and Ylirisku, S., 'The Scene of Experience', The Good, The Bad and The Irrelevant (Conference Proceedings), September 3-5, University of Art and Design Helsinki, 2003
184 Sweet, F., Frog: Form Follows Emotion, Thames and Hudson, London, 1999
186 Roland Barthes was a French literary critic, literary and social theorist, philosopher and semiotician.
phenomena involving expressive, behavioural, experiential, and physiological facets.\(^{187}\) In this way it can be seen that emotions are far more complex than they first appear; they are inexplicably intertwined, making their origins practically indistinguishable. In ‘Designing Emotions’, Desmet (2002) reinforces this proposition, claiming that it is not possible to predict how personal associations are made, and how users interpret the meanings signified by products. ‘To be able to create a product that enables the desired emotional effects, designer should [first consider] the concerns of the person, who will use the product.’\(^{188}\)

Though complex in conventional manufacturing scenarios, the research of a more humanistic approach for mass production must be both urged, and enabled.

In a research paper entitled ‘Meaningful product relationships’\(^{189}\), Batterbee and Mattelmaki (2004) describe a survey in which 113 stories and essays are gathered from people in Finland, about possessions with which they have developed a meaningful relationship. Their proposition is that ‘[m]eanings, experiences and meaningful relationships with products are developed over a time span and they are often related to life situations.’\(^{190}\)

From this research, 3 categories of objects were defined, that facilitate the understanding of different kinds of subject object attachment; these categories are; Meaningful Tool (where the activity an objects enables, rather than the object itself, is the thing of meaning); Meaningful Association (a product is significant as it carries cultural and/or individual meaning) and Living Object\(^{191}\) (an emotional bond is created between an individual and a product). Jääskö and Mattelmäki (2003), in their paper ‘Observing and Probing’ describe the complexity of integrating meaningful content into design; stating that ‘[m]ore tacit and hidden aspects such as product meaning or personal motivation have influence in the user experience but are not that easily recognized or communicated to design, or even directly affected by design.’\(^{192}\)


\(^{188}\) Desmet, P. *Designing Emotions* (Doctoral Dissertation), Delft University of Technology, Delft, The Netherlands, 2002


\(^{190}\) Ibid.


It may therefore be asserted that although a designer can certainly elicit within users an emotional response to a given object, the explicit nature of the response is beyond the designer's control; the unique assemblage of past experiences that is particular to each user, their cultural background and life journey determines this. In 'Emotion and Industrial Design: Reconciling Meanings and Feelings' Cupchik (1999) claims that '[p]eople can differentially attend to the sensory qualities of the design object and attach diverse personal meanings onto it because they see it used in various contexts. Their reactive emotions will therefore reflect personal associations and meanings which are projected onto the object.'\textsuperscript{193} This complexity is further elucidated by Belk (1988), who states in his work entitled 'Possessions and the Extended Self', that 'recognising that users consider products as part of themselves is key to understanding the meaning of objects.'\textsuperscript{194} Cupchik's conceptual model of meaning describes its relationship with the lifespans of a range of DEPs. He states that '[p]ersonal/symbolic meanings relate to self-concept and dynamic processes affecting both a person's motivation for engaging with an industrial design object and also how it is seen. These motivations can lead a person to project supplementary meanings onto industrial [design] objects which may not be directly related to their functions or appearances.'\textsuperscript{195} As mentioned earlier, the way in which a user will perceive an object is largely influenced by the accumulative nature of their prior experiences; it follows therefore that '[p]ersonal experiences and meanings complete the image of the object whose appearance and functions are but initial cues as to their broader meaning. The more an individual consciously or unconsciously relates to the sensory/aesthetic, cognitive/behavioural, and personal/symbolic qualities of an object, the more profound will be the attachment.'\textsuperscript{196}

In summary, this third theme (object meaning) examines the cognitive processes associated with constructed meaning, and meaningfulness, as signified by objects; key

\textsuperscript{194} Belk, R.W., Possessions and the Extended Self', Journal of Consumer Research, 15 (September), 1988, pp139-168
\textsuperscript{195} Cupchik, G. C., 'Emotion and Industrial Design: Reconciling Meanings and Feelings', 1st International Conference on Design and Emotion, Delft University of Technology, The Netherlands, 1999
\textsuperscript{196} Ibid.
literature includes van Nes (2005)\(^{197}\), Kleine and Kernan (1988)\(^{198}\), Richins (1994)\(^{199}\), Cupchik (1999)\(^{200}\), de Groot (1997)\(^{201}\) and Batterbee & Matlemaaki (2004)\(^{202}\). This (and other literature consulted) collectively urges that the more an individual consciously or unconsciously relates to the sensory/aesthetic, cognitive/behavioural, and personal/symbolic qualities of an object, the deeper the resulting meaningfulness of the artefact will be.

### 2.5 Emotional connections between users and DEPs

Though a great deal of debate surrounds the need for an increase in subject object connectivity in the context of DEPs, strategies to enable this need are considerably less prolific. Indeed, "[i]t is one thing to design products that elicit certain experiential responses; it is another matter to maintain those experiences that have been generated."\(^{203}\) Influential literature includes Schultz et al (1989)\(^{204}\), Csikszentmihalyi and Rochberg-Halton (1981)\(^{205}\), Schultz, Kleine and Kernan (1989)\(^{206}\), Wallendorf and Arnould (1988)\(^{207}\), Ball and Tasaki

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204 Schultz, S. E., Kleine, R. E. and Kernan, J. B., 'These are a few of my favourite things: Toward an explication of attachment as a consumer behaviour construct', *Advances in Consumer Research*, vol 16, 1989, pp359-366


The results of these studies are conclusive in that they share their relating of attachment behaviours toward the individual's concept of self.

According to the literature, it is currently unclear whether enduring associations between people and things are wholly designable; as van Hinte proposes in *Eternally Yours* (1997), '[f]or personal reasons one can feel emotionally attached even to a turnip or a hubcap.' Each user possesses a unique assemblage of memories, which render objects as vigorous symbols of the self, and carriers of great personal significance. Over 40-years earlier, Benedict in, *Patterns of Culture* (1955), asserted that '[n]o man ever looks at the world with pristine eyes. He sees it edited by a definite set of customs and institutions and ways of thinking.' In addition, very little is known about the psychological processes that define the specific character of our engagement with DEPs; Cupchik (1999) claims the 'emotional processes involved in generating and using industrial design objects have only begun to be explicated. They begin with an initial impression of the object, continue through actual experiences utilizing it, and culminate with degrees of emotional attachment to it.' Similarly, Rhea (1992) sees interaction as an iterative process that users move sequentially through; however, Rhea's model consists of four developmental stages; 'Life Context (refers to the background of people, their thoughts, feelings activities, encompassing beliefs, attitudes and perceptions); Cognitive Presence (distinguishes the product from its competitors); Experience (refers to the period of ownership and use) and Resolution (refers to the experience of disposing of the product and the way people determine their overall experience with the product.)'

In a study entitled 'An Accessible Framework of Emotional Experiences for new Product Conception', DiSalvo, Hanington and Forlizzi (2004) explore the design of products

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geared toward a more prominent model of subject object connectivity. It was found that ‘[i]ssues of emotion, affective response, and inclusive human concerns are exceedingly important in design. As people become more sensitive to dimensions of products that go beyond traditional aspects of usability, the need to understand and create emotional and aesthetic resonance between people and products increases." Similarly, the Design and Emotion Society (2004) believe ‘[t]he concept of experience, where the subject and object meet and merge with one another, is a key issue in designing emotionally meaningful products. This is because experience is a space in which all faculties, especially emotions, are activated. This relates directly to the Freudian (1930) analysis of attachment between people and things, wherein ‘a]t the height of being in love, the boundary between ego and object threatens to melt away." It is commonly accepted that products received as gifts develop strong attachments with users, yet evidence exists to suggest otherwise. In a study exploring the self-reflective nature of possessions entitled ‘How is a possession "me" or "not me"? Characterizing types and an antecedent of material possession attachment’, Kleine, Kleine and Allen (1995) uncovered that ‘many possessions received as gifts invoked only weak attachment ... for a gift to become a high-attachment product it should reflect the receiver’s personal identity." In a paper entitled ‘A perspective on the person-product relationship: attachment and detachment’, Savas (2004) develops this idea, describing how ‘[a]tachment and detachment were explained in terms of appropriateness of the product to the self-definitions of individuals ... product attachment and detachment have significant implications for the consumption

215 The Design and Emotion Society is a world-leading research group that raise issues and facilitates dialogue among practitioners, researchers, and industry, in order to integrate salient themes of emotional experience into the design profession. Established in 1999, the Society responds to a contemporary emergence in the converging areas of consumption, desire, design, sustainability, user experience, branding and identity
218 Kleine, S. S., Kleine, R. E. and Allen, C. T., ‘How is a possession "me" or "not me"? Characterizing types and an antecedent of material possession attachment’, Journal of Consumer Research, 21, 1995, pp327-343
activities, by effecting psychological lifespan of objects.\textsuperscript{219} Purbrick (2003) articulates the gift-giving scenario in her work ‘Wedding presents: marriage gifts and the limits of consumption, Britain, 1945-2000’, stating that ‘[g]ifts are so implicated in the various relationships of everyday life, those of family, neighbourhood, and work that we should not wonder why they elude categorisation. Nor can they be reduced to just the moment of exchange important though that moment may be ... [o]bjects have moments of stasis and moments of transition. Their meanings are known and certain until they are moved and when next at rest [new] meanings settle upon them. For example, wedding presents that make visible and stable the idea of home and family.\textsuperscript{220}

In addition, a study by Schifferstein, Mugge and Hekkert (2004) entitled ‘Designing consumer-product attachment’, found that ‘[m]emories significantly enhance attachment formation ... the extent to which a product evokes memories is positively related to the degree of consumer-product attachment.’\textsuperscript{221} The conclusions of this study state that ‘[i]f a designer wants people to become attached to his/her product, the present study suggests that s/he should facilitate ways to form associations between the product and people, places or events (memories), or s/he should design an object that evokes enjoyment.’\textsuperscript{222}

In direct contrast to the prevailing assumption that attachment is a positive agent in terms of product life extension, Marchand (2003) explores detachment from possessions as a way to extend the longevity of objects in his paper entitled ‘Sustainable Users and the World of Objects Design and Consumerism’. Through interview, test subjects revealed that ‘by practicing detachment from objects, they are more predisposed to accept an object’s physical ageing.’\textsuperscript{223} This indicates that attachments with objects are not necessarily the only way to approach life extension. Marchand’s pioneering survey set out to investigate the multifaceted nature of relationships established between users and their individually created

\begin{itemize}
\item \textsuperscript{222} Ibid.
\end{itemize}
material worlds. However, it targeted a specific sample of subjects who already practiced sustainable living, and had a vested interest in simple lifestyles – a model based on an earlier study developed by Hansen and Schrader (1997). In this respect, the results of this survey are interesting, but they do not represent the broader consumer populous.

In *Eternally Yours* (1997), van Hinte urges that precision and control are oftentimes the precursors of detachment behaviours; the ideology of *fuzzy interactions* with objects runs contrary to the prevailing model of popular design, with its focus on idiot-proof interfaces; in many cases, 'imperfections can be endearing and help to create a bond with the user.'

van Hinte's research also explores design strategies for desirable ageing; 'this leads us straight to the issue of perfection. Numerous car owners polish their vehicle every week. It is the only way in which they can hold up the illusion of newness. Because perfection is vulnerable. A small scratch on a mudguard does more harm to a car than dismantling the engine.' In a paper entitled 'Influencing Product Lifetime Through Product Design', van Nes and Cramer (2005) argue that products must be dynamic and flexible in order to accommodate these instabilities; 'what people basically want is a well functioning and up to date product that meets their altering needs. The dynamic nature of this desire requires a similar approach: the development of dynamic and flexible products.'

DEPs that grow with users are generally more effective in achieving deeper levels of attachment, provided they do not excessively arouse the user; if this happens, ability to coherently interact, deteriorates correspondingly. An influential study by Cupchik entitled, 'Emotion in Aesthetics: Reactive and Reflective Models' (1995), addressing repetition and familiarity in the context of DEPs reveals that 'when particular stimulus properties modulate simple feelings of pleasure or arousal, the basic principles of behaviourism readily apply ... repeated exposure to a stimulus will reduce its potency for eliciting pleasure or arousal.

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226 Ibid., p131


228 Ibid.
through the principle of habituation.\textsuperscript{229} It is worth noting that '[m]oderate arousal can focus attention and enhance performance, while extreme arousal in the form of tension or anxiety can interfere with performance.'\textsuperscript{230} If a DEP excessively arouses the user, their ability to interact coherently with it deteriorates quickly. 'It is therefore essential to avoid the notion of industrial design objects as static in meaning and appreciate that, like paintings and literary works, their meanings evolve over time.'\textsuperscript{231} Furthermore, the particular nature of this stimulus is of great importance: '...novelty in a stimulus can generally increase arousal, while uncertainty (in a detective novel or suspense film) might alleviate a state of boredom or low arousal.'\textsuperscript{232} Additionally, '[m]oderate arousal can focus attention and enhance performance, while extreme arousal in the form of tension or anxiety can interfere with performance.'\textsuperscript{233}

It can be seen that '[e]ngagement is not just something that happens momentarily when we use something. It is also a relationship that has to grow over the years.'\textsuperscript{234} Subject/object relations therefore, are evolutionary, progressive manifestations; in 'Emotion and Industrial Design: Reconciling Meanings and Feelings' Cupchik (1999) states that it is vital we '...appreciate that, like paintings and literary works, their meanings evolve over time.'\textsuperscript{235} This disruptive, unstable nature of experience is described by Brecht (1950); claiming that 'we don’t want comfortable art, we want disruption.'\textsuperscript{236} He saw continually punctuating disruptions as a highly effective means to both generate and sustain engagement between the viewer and the viewed, audience and performer, not unlike the way that MTV uses jolts to

\begin{thebibliography}{99}
\bibitem{231} Ibid.
\bibitem{236} Mander, J., \textit{Four Arguments for the Elimination of Television}, Harvester Press, Brighton, 1980
\end{thebibliography}
hold the audiences attention. A jolt or ‘technical event’\textsuperscript{237} is a sudden change in the direction of information flow. ‘Public television boasts an average of 20 jolts per minute, 40 during commercial breaks, double what they were in 1978.’\textsuperscript{238} At present MTV is said to deliver around one jolt per second. The more jolts we are exposed to, the more likely we are to leave the remote control where it is; according to Lasn (1999), ‘[a] jolt forces your mind to pump for meaning.’\textsuperscript{239}

In a behavioural study entitled ‘Advertising and emotionality’, Holman (1986) identified what he refers to as the \textit{aficionado effect}\textsuperscript{240}; unusually strong attachments to a range of objects observed among collectors, pet owners, gourmets, or technology enthusiasts. In a paper entitled ‘Emotionally rich products: the effect of childhood heroes, comics and cartoon characters’, Demirbilek and Sener (2004) elaborate on Holman’s observation, claiming that ‘[t]his is because consumers emotionally feel attached to these objects. Valued collectible antique products are the ones either produced by a disappeared artist or company, or that were designed in a fashionable way for the period, or again in a specific material related to the historical time. Most of these items have stories of their previous owners embedded into them.’\textsuperscript{241} In \textit{Visual Culture} (1997)\textsuperscript{242}, Walker and Chaplin distinguish 4 kinds of value that can be attributed to an artifact:

1. \textit{Artistic value} – intrinsic excellence, aesthetic quality, significant content
2. \textit{Use value} – practical function irrespective of appearance and aesthetic attributes (this can also include decorative, symbolic, memorial, ideological and political value)
3. \textit{Sentimental value} – private, biographical and emotional life of an individual

\textsuperscript{237} Ibid.
\textsuperscript{238} Lasn, K., \textit{Culture Jam: The Uncooling of America}, Eagle Brook, New York, 1999
\textsuperscript{239} Ibid.
4. **Exchange value** – monetary value is variable because of fluctuations in the market and the economy.

A second influential study by Demirbilek and Sener (2001) entitled ‘A design language for products: Designing for happiness’, reveals that '[t]he attributes of cuteness evoke happiness and the affordance of tendency toward protection, and have been widely used in product design.' This somewhat fundamental idea of protectiveness, is similar to the characteristically forward-thinking Philips Design concept of *cherishability* – a term coined at a design workshop entitled *Visions of the Future* (1996), where '[m]any of the concepts strive to be highly cherishable so that they will be treasured and kept for a long time for their personal symbolic and sentimental value.'

In *The Art of Creating Subjective Reality: An Analysis of Japanese Digital Pets* (2001), Kusahara describes how Bandai’s Tamagotchi attempts to program dependency into a DEP. He claims that '[i]n [the] case of Tamagotchi, the virtual pet displayed no intelligence. Yet kids and even adults felt seriously engaged in and responsible for the life of the little dot-based creature.' This is largely due to the Tamagotchi’s degree of autonomy, or alterity – a term that Hybs in his paper entitled ‘Beyond Interface: A Phenomenological View of Computer Systems Design’ (1996), denotes as ‘...the dimension of an interaction in which the object of one’s intention is perceived in terms of otherness. This particularly elusive concept could be described as the felt sensation of the interaction with an autonomous or intelligent object, animal or individual.’

In *The Consciousness of Objects - or the Darker Side of Design* (2002) de Groot, ‘[t]he technological object has always been a source of interest and fascination for culture. Soon after the discovery of electricity, the concepts of the robot and Frankenstein were introduced to society by the literary world. Yet the notion of animating the inanimate is not

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245 Machiko Kusahara is a researcher in media art and theory, who has been publishing and curating in the interdisciplinary field connecting art, science, technology, culture, sociology and history.


new and need not depend on circuits and batteries. The ancient Hebrew Golem and a thousand flying carpets indicate that mankind's relationship with the physical has always contained far more than mere aesthetics or use-value.\textsuperscript{248} de Groot elaborates, telling us how interacting within today's technocratic and anonymous assemblage of miniature digital artefacts can leave one cold; DEPs have become excessively subservient, and '[t]he computational and communicative devices that now assist almost every transaction in our daily lives are designed as dull and servile boxes that respond to our commands in a state of neutrality; stress and techno-phobia are the result.'\textsuperscript{249} It may therefore be argued that in an experiential sense, the majority of DEPs are like stories with an incredible opening line, but which just continue repeating it throughout; their narrative capabilities are pathetically limited.

In Design Noir: The Secret Life of Electronic Objects (2001), Dunne and Raby\textsuperscript{250} state that this commercial model represents 'just one approach to product design, one genre if you like, which offers a very limited experience. Like a Hollywood movie the emphasis is on easy pleasure and conformist values.'\textsuperscript{251} Their work describes ways in which '[p]roducts could offer more complex and demanding aesthetic experiences if designers referred to this bizarre world of the 'infra-ordinary', where stories show that truth is indeed stranger than fiction, and prove that our experience of everyday life lived through conventional electronic products is aesthetically impoverished.'\textsuperscript{252}

The Schumacher Society\textsuperscript{253} (1998) claim that quality of life 'is dependent on the number of stories we know about the items we use in our daily life.'\textsuperscript{254} DEPs that evolve slowly over time enable this process, by building up layers of narrative that reflect traces of

\begin{thebibliography}{99}
\bibitem{249} Ibid.
\bibitem{250} Anthony Dunne and Fiona Raby use products and services as a medium to stimulate discussion and debate amongst designers, industry and the public about the social, cultural and ethical implications of emerging technologies.
\bibitem{252} Ibid., p8
\bibitem{253} The Schumacher Society is an educational non-profit organization founded in 1980, whose programs demonstrate that both social and environmental sustainability can be achieved by applying the values of human-scale communities and respect for the natural environment to economic issues.
\end{thebibliography}
the user's invested care and attention. The research of both Walker (1995)\textsuperscript{255}, and McCracken (1989)\textsuperscript{256} into the ageing characteristics (and patination) of material surfaces relate particularly well to these notions – when DEPs are allowed to accumulate the scars of age, exclusive subject object histories are scripted; mapping the particular development of relationships, thus closing the gap between self and other to create a more unified, and co-designed experience. In his paper entitled, 'Durable consumption: reflections on product life cycles and the throwaway society', Cooper (2002) reinforces this idea, asserting that '[t]he way in which products wear, particularly changes in 'product surface' over time, affects their value. For example, many people believe that wood tends to age better than, say, plastic. Aesthetics are important in creating the appeal of products that underpins their longevity.'\textsuperscript{257}

In these instances, 'the 'product' would be a fusion of psychological and external 'realities', the user would become a protagonist and co-producer of narrative experience rather than a passive consumer of a product's meaning. The mental interface between the individual and the product is where the 'experience' lies.'\textsuperscript{258} Users must therefore be designed into narratives as co-producers and not simply inert, passive witnesses. 'The user becomes a protagonist and the designer becomes a co-author of the experience, the product creates dilemmas rather than resolving them,'\textsuperscript{259} as Dunne and Raby assert.

Savas (2004), in 'A perspective on the person-product relationship: attachment and detachment', describes the timeliness of research that explores ways to increase subject object connectivity; stating that '[t]oday, the material world has become much more important than at any time in history. Because, for the first time, the production and consumption activities pose a strong threat on the sustainability of our planet, forcing us to re-evaluate our relationships with products ... one of the reasons underlying today's high

\textsuperscript{257} Cooper, T., 'Durable consumption: reflections on product life cycles and the throwaway society', in Hertwich, E., (Eds), \textit{Life-cycle Approaches to Sustainable Consumption} (Workshop Proceedings), Austria, November 2002, pp15-27

52
consumption levels is the weakening of emotional link between people and products.\textsuperscript{260} Manzini (1997) states that '[t]he time for a new generation of products that can age slowly and in a dignified way, that can become our partners in life and support our memories.'\textsuperscript{261} Finally, in a paper entitled, 'The Building Blocks of Experience', Forlizzi and Ford (2000) clearly state, 'designers cannot craft an experience, but only the conditions or levers that might create an intended experience.'\textsuperscript{262} What those required conditions are however, is still unclear.

In summary, this theme (emotional connections between users and DEPs) explores attachment, and detachment, behaviours; why users develop attachments to certain products; along with current strategic approaches to object creation that aim to close the perceptual gap between the user and the product. Though a great deal of debate surrounds the need for an increase in subject object attachment, strategies to enable this need are considerably less prolific; key literature in this section include Chapman (2005)\textsuperscript{263}, Dunne & Raby (2001)\textsuperscript{264}, Dunne (1999)\textsuperscript{265}, Belk (1988)\textsuperscript{266}, Schultz et al (1989)\textsuperscript{267}, Csikszentmihalyi and Rochberg-Halton (1981)\textsuperscript{268}, Schultz, Kleine and Kernan (1989)\textsuperscript{269}, Wallendorf and Arnould


\textsuperscript{261} Manzini, E., quoted on the Eternally Yours homepage: http://home.wxs.nl/~muis/eternal.htm, April 1997


\textsuperscript{263} Chapman, J., Emotionally Durable Design: Objects, Experiences and Empathy, Earthscan, London, 2005

\textsuperscript{264} Dunne, A. and Raby, F., Design Noir: The Secret Life of Electronic Objects, August/Birkhauser, Switzerland/UK, 2001


\textsuperscript{266} Belk, R. W., Possessions and the Extended Self', Journal of Consumer Research, 15 (September), 1988, pp139-168

\textsuperscript{267} Schultz, S. E., Kleine, R. E. and Kernan, J. B., 'These are a few of my favourite things: Toward an explication of attachment as a consumer behaviour construct', Advances in Consumer Research, vol 16, 1989, pp359-366


(1988)\textsuperscript{270}, Ball and Tasaki (1992)\textsuperscript{271}, Purbrick (2003)\textsuperscript{272}, Demirbilek & Sener (2004)\textsuperscript{273} and Dittmar (1992)\textsuperscript{274}. Following the review, it is now clear that attachments are not fully programmable; as Forlizzi and Ford (2000) state, ‘designers cannot craft an experience, but only the conditions or levers that might create an intended experience.’\textsuperscript{275} The nature and scope of these designable conditions are not currently understood. Furthermore, it is also questioned in the literature as to whether attachments are actually beneficial in terms of product life extension.

\section*{2.6 Longer lasting products and the creative industry}

Little is known as to the commercial perception of product life extension in an environmental context – literature that directly addresses this is scarce. In a paper examining a survey of 1100 businesses across a range of sectors, entitled, 'An Empirical Investigation of Success Strategies for Businesses along the Product Life Cycle', Thietart and Vivas (1984) revealed that '[s]ince the introduction of the concept of product life cycle (PLC) some decades ago a great deal has been written on the subject ... [h]owever, empirical research to date is often limited in scope.'\textsuperscript{276} It is necessary, therefore, to develop research that considers how increased product durability could benefit design.

\begin{itemize}
\item \textsuperscript{274} Dittmar, H., \textit{The Social Psychology of Material Possessions: To Have Is To Be}, St. Martin’s press, New York, 1992
\end{itemize}
Since the Organisation for Economic Co-operation and Development (OECD) published their 1982 report entitled Product durability and product-life extension\textsuperscript{277}, there has been little comprehensive study regarding the industry’s perception on product life extension. In one such paper assessing the commercial potential of increased DEP life cycles entitled, ‘Durable consumption: reflections on product life cycles and the throwaway society’, Cooper (2002) describes ‘the lack of scholarly research relating to the throwaway society or product longevity.’\textsuperscript{278} Indeed, the work of Cooper leads the research field, in particular, his policy review of durability as a waste strategy\textsuperscript{279}. In addition to Cooper’s leading work, Heiskanen (1998) in a paper entitled ‘Conditions for product life extension’ developed research that encourage product life extension within a commercial context\textsuperscript{280}, and Kostecki edited, The Durable Use of Consumer Products (1977); a book addressing the market potential of longer lasting DEPs\textsuperscript{281}, but overall, ‘data on product lifespans has long been regarded as inadequate.’\textsuperscript{282}

In E-SCOPE (Electronics industry – Social Considerations of Product End-of-life project), Cooper and Mayers (2000) conduct a comprehensive quantitative survey of 800 UK households, exploring the consumer perception of the life extension of a range of DEPs. Their study revealed that ‘[a]ppliances were discarded due to technical failure in [only] around two-thirds of cases, but many of these items were not considered irreparable by their owners.’\textsuperscript{283} In this survey 'people were asked to identify the primary deterrent to purchasing longer lasting appliances and fear that they would become out of date was cited by more respondents (30%) than those who cited price (23%). Significantly more men had this

\textsuperscript{277} OECD (Organisation for Economic Co-operation and Development), Product durability and product-life extension, OECD, Paris, 1982
\textsuperscript{278} Cooper, T., 'Durable consumption: reflections on product life cycles and the throwaway society', in Hertwich, E., (Eds), Life-cycle Approaches to Sustainable Consumption (Workshop Proceedings), Austria, November 2002, pp15-27
\textsuperscript{279} Cooper, T., Beyond recycling: The longer life option, New Economics Foundation, London, 1994
\textsuperscript{280} Heiskanen, E., Conditions for product life extension, working paper 23, National Consumer Research Centre, Helsinki, 1998
\textsuperscript{283} Cooper, T. and Mayers, K. Prospects for Household Appliances, Urban Mines, Halifax, 2000
concern than women, who were likely to be deterred by the cost of purchase.\textsuperscript{284} In 2000, the time the E-SCOPE survey was undertaken, the average UK household owned 25 DEPs; this figure was 60\% higher than in 1995, whilst the product stock in 2000 was notably younger than in 1995, suggesting that although popularity in ownership of DEPs is increasing, the lifespans of these DEPs is dropping correspondingly:

Table 2.1 Ownership of household appliances by UK households (2000)

<table>
<thead>
<tr>
<th>PRODUCT CATEGORY</th>
<th>PER 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric cookers</td>
<td>685</td>
</tr>
<tr>
<td>Microwave ovens</td>
<td>897</td>
</tr>
<tr>
<td>Refrigerators and freezers</td>
<td>1475</td>
</tr>
<tr>
<td>Washing machines, dishwashers and tumble dryers</td>
<td>1529</td>
</tr>
<tr>
<td>Vacuum cleaners and carpet cleaners</td>
<td>1332</td>
</tr>
<tr>
<td>Small work or personal care appliances</td>
<td>6277</td>
</tr>
<tr>
<td>Hi-fi and stereo</td>
<td>1599</td>
</tr>
<tr>
<td>Radio and personal radio, stereo and CD</td>
<td>2050</td>
</tr>
<tr>
<td>Televisions</td>
<td>2382</td>
</tr>
<tr>
<td>Video equipment</td>
<td>1448</td>
</tr>
<tr>
<td>Telephones, faxes and answer machines</td>
<td>1890</td>
</tr>
<tr>
<td>Mobile phones and pagers</td>
<td>601</td>
</tr>
<tr>
<td>Computers and peripherals</td>
<td>620</td>
</tr>
<tr>
<td>Toys</td>
<td>929</td>
</tr>
<tr>
<td>Home and garden tools</td>
<td>3388</td>
</tr>
</tbody>
</table>


It is often argued that 'product design's strong ties to the marketplace have left little room for speculation on the cultural function of electronic products.'\textsuperscript{285} Yet, ample evidence exists to indicate that consumers are ready to engage with objects over longer periods of time. Research shows that 75 per cent of UK consumers claim to favour longer lasting products with tangible environmental advantages and would invariably choose these over competitive products. More specifically, '[t]hree-quarters of the people polled in the UK say that they would make a choice of products on a green or ethical basis, and 28 per cent say that they actually have chosen or boycotted a product or company for ethical reasons over the past 12 months ... 86 per cent of British consumers say they have a more positive image of a

\textsuperscript{284} Ibid.
company if they see it doing something to make the world a better place. Survey by Nielsen and at Oxford University (1997) found that two-thirds of consumers say that they would pay more for products with environmental benefits. Though apparently rational acts in themselves, these consumer choices are founded on a deeper, emotional underpinning, which steers and directs human behaviour.

Far greater research emphasis is needed on the use-phase of product lifespans; according to Cooper, 'understanding the subsequent phases of use and disposal is increasingly vital ... [m]easures are needed to promote the design of products with increased durability to encourage owners to take good care of their possessions and to provide greater market incentives for longer-lasting products.' As van Hinte (1997) urges, '[t]he supreme moment of transfer should not be the finale of development processes, but just the first stage. So, besides reckoning with discarding and recycling, product design includes setting up or adapting relevant services: cleaning, repairing, upgrading, transport, spare parts, information desks and, in some cases, even facilities to support shared use. Longer product lifespans provide a route to sustainable consumption whereby reduced materials and energy throughput arising from eco-efficiency is not offset by increased consumption, and the economy remains healthy because products are carefully manufactured and maintained and there is less dependence on rising consumption for economic stability.'

It may be argued that design plays a central role in the creation of longer subject object relationships, and in recent years, this assertion has become increasingly well supported by designers. 'Measures are needed to promote the design of products with increased durability to encourage owners to take good care of their possessions and to

287 The Nielsen Company is a global information, research and media group.
provide greater market incentives for longer-lasting products.\textsuperscript{292} In \textit{Factour Four} (1997), von Weizsacker, Lovins and Lovins argue that 'durability is one of the most obvious strategies for reducing waste and increasing material productivity.'\textsuperscript{293} This proposition is further supported in \textit{Tomorrow's World} (1998); McLaren, Bullock and Yousuf describe durability, alongside reuse and recycling, as 'critical in increasing overall efficiency.'\textsuperscript{294} Despite this, product life extension has attracted relatively little impacting research that informs future directions for designers and manufacturers, that enables the practical implementation of strategies for more emotionally durable design.

In a research paper entitled, 'Choreographing obsolescence - ecodesign: the pleasure/dissatisfaction cycle', Woolley (2003) develops the case for greater understanding of the interrelationship between designers and producers and for analysts and theorists if more informed and affective research models and design methods are to be developed. He urges 'that pleasure-over-time should be extended to parallel and assist in extending the life of products ... to reduce the environmentally destructive effect brought about by the short pleasure/dissatisfaction cycles associated with contemporary, unsustainable patterns of consumption.'\textsuperscript{295}

Many assume that longer lasting products are not compatible with economic growth. In \textit{Natural Capitalism} (1999), Hawken, Lovins and Hunter argue that this is because 'the current model of capitalism is based on a pre-Industrial Revolution worldview dating back almost 200 years, in which the quantity of production equates to the quality of human life.'\textsuperscript{296} In \textit{The Limits to Certainty - Facing Risks in the New Service Economy} (1993), Giarini and Stahel\textsuperscript{297} state that '[s]everal changes in how we think about economics are necessary for understanding a "life after waste" industrialized society. A critical change is to shift to a

\textsuperscript{292} Ibid.
\textsuperscript{297} Walter Stahel is a director of the Product Life institute (Geneva), and works as a consultant in the field of business management and industrial analysis, working mainly in the fields of business strategy and feasibility studies.
service (cycle) economy.' In his paper entitled, 'Beyond Recycling: the longer life option', Cooper (1994) states that '[p]rogress requires a shift from a linear economy to a circular economy in order to reduce demand for virgin material and energy inputs and cut the amount of waste in need of disposal.' In The Ecology of Commerce: How Business can Save the Planet (1993), Hawken claims that '[n]ature is by definition cyclical; there is virtually no waste in the natural world that does not provide food for other living systems. If there were waste, we wouldn't have survived four billion years of evolution, because linear systems use up and exhaust resources ... [through modern production] we have taken an ancient cyclical process and converted it into a linear one' – the combined efforts of marketing and advertising activities throughout the past century have also served to both shape and reinforce this artificial, linear process of consumption and production. Like Hawken, Stahel (1986) in his paper entitled 'The Functional Economy: Cultural and Organizational Change', describes the shift away from lifecycle thinking as the primary cause of our inefficient production and consumption model. 'Current economic systems are the result of linear thinking ... [t]he buyer becomes responsible for the utilization and disposal of goods without knowing what resources are incorporated in the goods' In this way it can be seen that '[i]ndustrial activity involves a linear production-consumption system with inbuilt environmental deterioration at both ends.' However, unlike Hawken, Stahel puts forward the simple proposition that the linear model may still succeed, but only if the product use-phase is extended considerably; he refers to this as the slow-replacement system. However, at present, this system does not consider emotional factors, and chooses to focus on more tangible factors such as rusting, wearing parts and technological obsolescence.

A growing number of researchers, particularly White, Stoughton and Feng (1999), Heiskanen and Jals (2000), Stahel (1986) and Mont (2001), argue that a shift in

corporate activities from selling new products to selling the services provided by products is required. In a Mitchell Prize winning paper entitled The Product Life Factor (1982), Stahel describes how ‘[e]xtending product-life optimizes the total lifespan of goods and reduces depletion of natural resources and consequently waste; it builds on and increases wealth ... the private sector, whether R&D, manufacturing or finance, will find innumerable business opportunities in product-life extension activities – REUSE, REPAIR, RECONDITIONING and RECYCLING.'

The Eternally Yours Foundation (1996) organized three meetings to discuss different aspects of product lifespan, one of which, entitled Sales ’n Service, revealed that a large number of companies are moving away from the established model, in which the consumer represents a black-hole at the end of the production process, towards both fostering and maintaining relationships with their customers. The findings of an Eternally Yours study by Verbeek and Kockelkoren (1997) entitled, ‘Matter Matters’, indicate that ‘in sustaining relations, the material product mainly serves as a conversation piece that keeps on generating turnover for years after its birth.’ In a paper entitled ‘Immaterialization’, Hafkamp (1997) indicates a shift in commercial emphasis; ‘trends in the current economy which point to a “decoupling” of economic activities from its physical metabolism.’ Designers and manufacturers, therefore, should begin to see their responsibilities as spanning the whole period of time that the product is being used, shifting their focus onto maintenance, upgrade and after-sales service, rather than just once at the moment of transaction in the store. This relates to Stahel's (1986) model of a functional economy (also known as a service economy), as it aims to optimize ‘the use (or function) of goods and services and thus the management

304 Heiskanen, E. and Jals, M., Dematerialization through services – a review and evaluation of the debate, Ministry of the Environment, Helsinki, 2000
306 Mont, O., Introducing and developing a Product-Service System (PSS) concept in Sweden, IEEE Reports 2001: 6, Lund University, Sweden, 2001
308 Eternally Yours Foundation is a leading research group based in The Netherlands, which has been active in the field of product lifetime extension since 1996. It wants to find ways to help products age with dignity, particularly in cases where this is relevant for the environment.
of existing wealth (goods, knowledge, and nature). The economic objective of the functional economy is to create the highest possible use value for the longest possible time while consuming as few material resources and energy as possible.\(^{311}\)

'A recent revival of interest in product lifespans has taken place in the context of increasing waste generation and debate prompted by proposed producer responsibility legislation, but data on the age of discarded products and consumer attitudes to product lifespans have been lacking.'\(^{312}\) Cooper (2002) urges 'a need for products to be redesigned, consumer attitudes and behaviour to change, and suppliers to have a greater incentive to maintain products.'\(^{313}\) EU Legislation drives this call for an industry-wide reappraisal of the way we design, produce and consume. Yet as Benyus\(^{314}\) argues in *Biomimicry* (1997), legislative policies generally serve as 'very broad, non-prescriptive policy tools that push the industrial system in the desired direction, without trying to define the end-point, either organizationally or technologically.'\(^{315}\) In addition, Hart (1997) develops this proposition in his paper 'Beyond Greening: Strategies for a Sustainable World', stating that compliance to existing and forthcoming legislation can 'provide producers with an opportunity to turn existing or forthcoming legislation into a competitive advantage.'\(^{316}\) The EU WEEE Directive presents the greatest legislative challenge facing producers of DEPs today.

This fifth theme within the review of the literature, has examined research that outlines the economic implications for longer lasting products, and the current commercial perception of product life extension. It now can be stated, that little is actually known as to the commercial perception of product life extension in an environmental context – literature that


314 Janine Benyus is co-founder of the Biomimicry Guild, an innovation company that uses a deep knowledge of biological adaptations to help designers, engineers, architects, and business leaders address commercial problems in a more sustainable way.


directly addresses this is scarce, though includes Thietart and Vivas (1984)\textsuperscript{317}, Cooper and Mayers (2000)\textsuperscript{318}, Cooper (1994)\textsuperscript{319}, Heiskanen (1998)\textsuperscript{320}, Kostecki (1998)\textsuperscript{321}, White, Stoughton and Feng (1999)\textsuperscript{322}, Heiskanen and Jals (2000)\textsuperscript{323}, Stahel (1986)\textsuperscript{324} and Mont (2001)\textsuperscript{325}. Despite the scarcity of literature, consensus is evident, that product life extension is compatible with commercial growth. However, little practical advice follows for those wishing to implement actual change through design.

2.7 The EU Waste Electrical and Electronic Equipment (WEEE) directive

The EU WEEE Directive calls on EU member states to implement the legal framework to ensure that producers to take responsibility for their electric and electronic products at end of life. Representing the fastest growing waste sector in the EU, WEEE is a significant piece of legislation; all companies that manufacture or produce DEPs are now required to meet the requirements of WEEE by taking a whole-life responsibility for all products bearing their brand. In Britain, the average consumer generates an average of 16 Kg of household WEEE each year;\textsuperscript{326} the UK therefore generates a massive 1.1 million tonnes of household WEEE per year. This is a significant figure indeed when considered that Europe (as a whole) produces only 6.5-million tonnes of domestic WEEE in the same period – indicating that just under 17\% of Europe’s WEEE is created in the UK alone; waste consisting of toasters. 


\textsuperscript{319} Cooper, T., \textit{Beyond recycling: The longer life option}, New Economics Foundation, London, 1994

\textsuperscript{320} Heiskanen, E., Conditions for product life extension, \textit{working paper} 23, National Consumer Research Centre, Helsinki, 1998

\textsuperscript{321} Kostecki, M., (Eds) \textit{The durable use of consumer products}, Kluwer, Dordrecht, 1998


\textsuperscript{323} Heiskanen, E. and Jals, M., \textit{Dematerialization through services – a review and evaluation of the debate}, Ministry of the Environment, Helsinki, 2000


\textsuperscript{325} Mont, O., Introducing and developing a Product-Service System (PSS) concept in Sweden, \textit{IEEE Reports} 2001: 6, Lund University, Sweden, 2001

\textsuperscript{326} Royal Society for the Encouragement of Arts (RSA), cited on http://www.weeeman.org/index.html, 12 April, 2006
refrigerators, mobile phones, vacuum cleaners and a whole host of other DEPs; each year it is estimated that around 5 million TVs find their way into this waste stream. Comparatively, ‘[i]n Canada, over 272,000 tonnes of computers, phones, TVs, stereos, small appliances and other electronic waste go to landfill each year.’\textsuperscript{327} In the UK, ‘69% of Household WEEE arising by weight comes from Large Household Appliances – cookers, washing machines etc. Therefore the predominant weight of WEEE is [made up of] large household appliances. Consumer Equipment (i.e. Hi-Fi) accounts for 13%, 8% Small Household appliances such as vacuum cleaners, 7% IT & telecommunications (mobile phones) and so on.’\textsuperscript{328}

In Consuming Passions: Do we have to shop till we drop, 10 years of consumption in the UK (2004), Ginn reveals that ‘[d]uring the last decade alone, consumption of household goods and services in the UK has risen by 67%, and household energy consumption by 7% ... [c]onsumption is not only growing in magnitude, but the throughput of manufactured goods is speeding up. The pattern of consumption with many types of consumer goods is shortening functional lives as goods are predestined as waste.’\textsuperscript{329} WEEE is arranged using the following 10 categories (all percentages refer to an average weight per appliance):

\begin{itemize}
\item Refrigerators, mobile phones, vacuum cleaners and a whole host of other DEPs.
\item Large Household Appliances: cookers, washing machines.
\item Consumer Equipment (i.e. Hi-Fi).
\item Small Household Appliances: vacuum cleaners.
\item IT & telecommunications (mobile phones).
\end{itemize}


\textsuperscript{329} Ginn, F, \textit{Consuming Passions: Do we have to shop till we drop, 10 years of consumption in the UK}, Global Action Plan, London, 2004.

63
Figure 2.3 10 categories (and targets) for WEEE

Category 1: large household appliances: the rate of recovery shall be increased to a minimum of 80% component, material and substance reuse and recycling shall be increased to a minimum of 75%

Category 2: small household appliance: the rate of recovery shall be increased to a minimum of 70% component, material and substance reuse and recycling shall be increased to a minimum of 50%

Category 3: IT and telecommunications equipment: the rate of recovery shall be increased to a minimum of 75% component, material and substance reuse and recycling shall be increased to a minimum of 65%

Category 4: consumer equipment: the rate of recovery shall be increased to a minimum of 75% component, material and substance reuse and recycling shall be increased to a minimum of 65%

Category 5: lighting equipment: the rate of recovery shall be increased to a minimum of 70% component, material and substance reuse and recycling shall be increased to a minimum of 50%

Category 6: electrical and electronic tools: (with the exception of large-scale stationary industrial tools) the rate of recovery shall be increased to a minimum of 70% component, material and substance reuse and recycling shall be increased to a minimum of 50%

Category 7: toys, leisure and sports equipment: the rate of recovery shall be increased to a minimum of 70% component, material and substance reuse and recycling shall be increased to a minimum of 50%

Category 8: medical devices: (with the exception of all implanted and infected products) the rate of recovery shall be increased to a minimum of 70% component, material and substance reuse and recycling shall be increased to a minimum of 50%

Category 9: monitoring and controlling instruments: the rate of recovery shall be increased to a minimum of 70% component, material and substance reuse and recycling shall be increased to a minimum of 50%

Category 10: automatic dispensers: the rate of recovery shall be increased to a minimum of 80% component, material and substance reuse and recycling shall be increased to a minimum of 75%

The WEEE Directive covers all electrical and electronic equipment with voltages up to 1,000 AC and 1,500 DC and will affect virtually all producers and manufacturers of DEPs, regardless of company size. The directive was developed as a means to address the mounting issue of electrical and electronic waste throughout EU member states. In the UK, around 222 million units of electrical and electronic equipment are put on to the market each year. Electrical and electronic equipment (EEE) has been identified as producing one of the fastest-growing waste streams in the EU. It constitutes 4% of municipal waste today and is increasing by 16% to 28% every five years – three times as fast as the growth of average municipal waste (1 million tonnes EEE per year). The three key objectives of the EU WEEE Directive are; 'to increase reuse, recycling and other forms of recovery, leading to a reduction in the amount of waste going to landfill or incineration; to improve the environmental performance of all operators involved in the life cycle of electrical and electronic equipment; and to set criteria for the collection, treatment, recycling and recovery of WEEE making producers responsible for financing most of these activities - private householders are to be able to return WEEE without charge.'

Alarmingly, a number of surveys have found widespread ignorance among manufacturers and retailers about the impending WEEE directive; 'more than half of global manufacturers of electronic and electrical equipment do not know how to comply with the impending EU recycling initiatives.' At present, '89% of SMEs are unaware of the legislation, 65% are disposing of electronic equipment in a way that does not comply with the directive and 55% know nothing about their company’s environmental obligations and responsibilities.' Although the infrastructure to implement the EU WEEE Directive is currently being established, the UK Government estimates it will cost UK companies 'up to £455 million to comply with the directive; individual companies could incur costs of 1% to 4% of sales.' In addition, it is argued in the majority of available literature, that although legal obligations through product-specific implementation are thought to be some way off, voluntary measures in the meantime will serve to avoid mandatory ones.

332 Ibid.
333 MIREC, Asset Management Survey, 2003
334 The Department of Trade and Industry (DTI), 2007
Interestingly, during the early planning phases of WEEE, it received 'strong criticisms voiced by some industry representatives and the reservations of environmental and consumer organizations.'\textsuperscript{335} Today however, support for WEEE is on the rise, as business begins to better understand the way in which compliance with WEEE reveals new and sustainable routes to profitability. In 2005, the Royal Society for the Encouragement of the Arts (RSA) and Canon Europe developed the WEEE Man. Designed by Paul Bonomini with Giraffe Innovation, this 3.3 tonne sculpture made solely of waste electronic products aims to transform the public regard of waste as out of sight, out of mind by monumentalizing the amount of WEEE created by a single British citizen throughout their life. Standing 7-metres tall, WEEE Man is a robotic figure made entirely of discarded and unwanted electrical and electronic equipment. Along with transforming the public perception of waste and encouraging retailers and to think carefully about waste reduction, the broader objective of the RSA's WEEE Man is to generate support among designers and manufacturers for designs of a longer-lasting and more environmentally sensitive orientation. 'To establish the weight of the WEEE Man a simple calculation was made. The total household WEEE generated annually by the UK population (1 million tonnes) were divided by the UK population (60 million). Average life expectancy for a UK citizen is 77 years. If we take a 21-year-old in 2003 living until 2059, anticipating a WEEE growth rate of around 4% they would produce 3.3 tonnes of WEEE in their lifetime. A person born in 2003 and living until 2080, would generate 8 tonnes of WEEE in their lifetime. This means the WEEE Man would be more than twice the size!'\textsuperscript{336}

The Chartered Institution of Waste Management\textsuperscript{337} (CIWM)(2006) state that in the UK, the 'WEEE directive’s legal implementation deadline of 13\textsuperscript{th} August 2005 was broken; the Government instead implemented the legal infrastructure for WEEE 10-months later in June 2006, which itself was delayed further until December, 2007.'\textsuperscript{338} Prior to full transposition into

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\textsuperscript{336} Royal Society for the Encouragement of Arts (RSA), cited on http://www.weeeman.org/index.html, 12 April, 2006

\textsuperscript{337} Chartered Institution of Waste Management (CIWM) is the leading professional body for waste and resource management with over 7,000 members, mostly in the UK but also in the Irish Republic and 250 members elsewhere in the world.

\textsuperscript{338} Chartered Institution of Waste Management, cited on www.ciwm.co.uk, 2 September, 2006
national law, the industry response to the WEEE directive is already gathering momentum with producers of DEPs such as Nokia, Bosch Siemens and Canon funding major new initiatives that address the costly take-back and recovery of end of life products. From December 2007, all producers of DEPs aim to have set up recycling systems – either on a collective or individual basis – that provide for the effective recovery of WEEE.

The impacts of the EU WEEE directive on Nokia’s UK market are considerable; handsets are currently replaced on average once every 18-months, [and so] the costs brought by end of life legislation are of particular relevance. Fortunately, their products are sufficiently portable that they may be dropped-off at the nearest high street store. Manufacturers of bulkier DEPs on the other hand, such as washing machines and refrigerators are not so fortunate. As Europe’s leading household appliance manufacturer, Bosch Siemens (2004) forecasted annual costs running to some 60 million euros, just to remain in compliance with the forthcoming legislative demands of the WEEE Directive. According to Uwe Hennack (2006), CEO of Bosch Siemens Homes Appliances Ltd., ‘the challenge is to design products that last longer, are lower cost to recycle, affordable to the consumer, use less waste energy and are produced in an environment that is environmentally friendly.’ It can therefore be stated, that industry is already looking toward the longer life option as a means to generate new and commercially viable business models, in compliance with the EU WEEE Directive.

In anticipation of forthcoming WEEE legislation, a UK-based research network was established in 2004, exploring new ways of extending the lifespans of both electronic and non-electronic consumer products. This 3-year EPSRC-funded project, entitled ‘Network on the Lifespan of Consumer Durables as a Factor in Sustainable Technology’, looked at a broad spectrum of DEPs and sectors to build a collaborative network that would initiate strategic discussion on the key motivational issues that influence sustainability. According to project director Cooper (2005), ‘little research has been carried out in this area, even though increased product durability would help to conserve the Earth’s resources and minimise

Cooper goes on to say that '[s]uccessfully tackling this complex problem will demand a clear understanding of what drives consumer behaviour and how products can be designed to ensure they are considered attractive and useful over a longer period.'

At the commercial forefront of sustainable design debate, the UK Design Council have been watching with interest as the EU WEEE Directive integrates evermore fully with the day to day practices of design. They restate the widely accepted premise that 'one of the reasons for the pile-up in our landfills is that products with short lifecycles are proliferating. Mobile phones, DVD players, TVs and computers all have built-in obsolescence. Manufacturers know that customers will want to upgrade in a few years even if a product is in perfect working order.'

The increasing presence of the EU WEEE Directive is engaging practically all corners of the design and manufacturing industry in re-evaluating their stance on the lifespans of DEPs. 'The threat of litigation for non-compliance will force many to re-appraise their product portfolios. As a consequence, such legislative instruments might establish frameworks and drivers for a more formalised design response to unsustainable consumption.' Today however, DEPs designed for take-back are still generally geared toward economical disassembly and recycling/reuse. Indeed, the greatest challenge for those wishing to operate in full compliance with the EU WEEE Directive will be that of sustainable design methodologies in their current guise. As Lofthouse (2004) states in her essay entitled, *Investigation into the Role of Core Industrial Designers in Ecodesign Projects*, '[eco-design usually functions at an operational level and is unlikely to hold much potential for radical change because it works within the same thinking that caused the problems in the first place.'

Due to the complex infrastructures required to support 'end-of-pipe' solutions to legislation compliance, they present a heavy financial burden to producers, whilst simultaneously failing to address the root causes of the ecological crisis we currently face.

341 Engineering and Physical Sciences Research Council (EPSRC), cited on http://www.epsrc.ac.uk/PressReleases/Networkaimstodisposeof+throwawaysociety.htm, 9 August, 2005
342 Ibid.
This thesis argues that if we are to develop new ways of working in compliance with WEEE legislation, design must break away from the physical model of durability and product longevity, to develop greater understanding of the sustainability of empathy, meaning, desire and other metaphysical factors that influence the duration of product life.

In summary, this sixth and final theme in the review of the literature (the EU Waste Electrical and Electronic Equipment (WEEE) Directive) has discussed the WEEE Directive in terms of its legality in legislative terms, its future and also its implications for this research in the context of the design, production, consumption and disposal of DEPs. Key literature in this section includes Cooper’s paper entitled ‘WEEE, WEEE, WEEE, WEEE, all the way home? An evaluation of proposed electrical and electronic waste legislation’ (2000) and Park’s paper entitled ‘Design for Sustainable Consumption’ (2004). As indicated by this review, it can be stated that the prospect of the WEEE Directive is engaging the design and manufacturing industry in re-evaluating their stance on the lifespans of DEPs. Today, however, products designed for take-back are still generally geared toward essential, yet costly, end-of-pipe solutions such as product disassembly and the recycling/reuse of component parts.

2.8 Implications for research

Following exploration and discussion of the 6 areas of enquiry (described in sections 2.2–2.7), their implications for research may now be identified and outlined.

Literature that deals solely with the DEP are of a notable scarcity; these include Dunne & Raby (2001), Dunne (1999) and Walker (1995, 2006). In contrast, there is a prevalence of key research that explores the particular character of relationships

347 Park, M., Design for Sustainable Consumption, Futureground, Design Research Society, Melbourne, November 2004
established between users and various genres of non-electronic objects; this literature includes the work of Manzini (2001)\textsuperscript{352}, van Hinte (1997)\textsuperscript{353}, Schultz, Kleine & Kernan (1989)\textsuperscript{354}, Cupchik (1999)\textsuperscript{355}, de Groot (1997)\textsuperscript{356}, Packard (1963)\textsuperscript{357}, Fuad Luke (2006)\textsuperscript{358}, Mont (2002)\textsuperscript{359} and Heiskanen (1996)\textsuperscript{360}. Indeed, there is a lack of up-to-date research, which clearly identifies the nature of relationships that users currently have with their DEPs. Several of the studies discussed explore initial purchasing behaviours, the motivation to buy, replacement-motives and examine the user’s willingness to engage in servicing, upgrade and repair when a range of products approach end-of-life. However, none of these surveys explore the particular nature of everyday subject object engagements with DEPs during the actual use-phase – as a result, it is not known whether users possess DEPs to which they are emotionally attached.

Research addressing the industry’s perception of product life extension is scarce – particularly so in the context of DEPs – studies outlining this knowledge-gap are led by Cooper (1994)\textsuperscript{361}, White, Stoughton and Feng (1999)\textsuperscript{362}, Heiskanen and Jals (2000)\textsuperscript{363}, Stahel


\textsuperscript{353} van Hinte, E., Eternally Yours: Visions on Product Endurance, 010 Publishers, , Rotterdam, The Netherlands, 1997


\textsuperscript{357} Packard, V., The Waste Makers, Penguin, Middlesex, 1963


\textsuperscript{359} Mont, O., Functional Thinking: The Role of Functional Sales and Product Service Systems for a Function-Based Society, International Institute for Industrial Environmental Economics (IIIEE), Lund University, Sweden, no 5233, July 2002, p30


\textsuperscript{361} Cooper, T., Beyond recycling: The longer life option, New Economics Foundation, London, 1994

(1986) and Mont (2001). Though ample research indicates that consumers are ready to engage with longer lasting DEPs, and even pay more for them, it is not known how industry regards the prospect of moving toward a more service-oriented commercial model, where people keep things for longer, and further turnover is generated through servicing, upgrade and repair – it is not currently known, whether the creative industries even recognise product life extension as a viable approach to sustainable design?

Studies that argue the social, economic and environmental need for the design of DEPs that people want to keep for longer, are abundant; led by the empirical studies of Cooper (1997, 2002), Csikszentmihalyi & Rouchberg-Halton (1981), van Nes & Cramer (2005) and Park (2004). Yet, beyond their noted significance within academic contexts, the impact of these studies has thus far failed to penetrate the working practices and methodologies of design – arguably, the one place where new models of sustainable design knowledge and understanding are most urgently needed. Indeed, significant (predominately academic) debate surrounds the need for an increase in the emotional longevity a range of objects typologies, though effective practical strategies to enable this need have yet to emerge; literature outlining this knowledge deficit includes Belk (1988).

363 Heiskanen, E. and Jals, M., Dematerialization through services – a review and evaluation of the debate, Ministry of the Environment, Helsinki, 2000
365 Mont, O., Introducing and developing a Product-Service System (PSS) concept in Sweden, IIIEE Reports 2001: 6, Lund University, Sweden, 2001
367 Cooper, T., 'Durable consumption: reflections on product life cycles and the throwaway society', in Hertwich, E., (Eds), Life-cycle Approaches to Sustainable Consumption (Workshop Proceedings), Austria, November 2002, pp15-27
370 Park, M., Design for Sustainable Consumption, Futureground, Design Research Society, Melbourne, November 2004
Wallendorf and Arnould (1988)\textsuperscript{372}, Ball and Tasaki (1992)\textsuperscript{373}, Demirbilek & Sener (2004)\textsuperscript{374} and Dittmar (1992)\textsuperscript{375}. As a result of this emergent scenario, it is not clearly understood what designable conditions nurture more durable relationships between users and DEPs.


\textsuperscript{375} Dittmar, H., The Social Psychology of Material Possessions: To Have Is To Be, St. Martin’s press, New York, 1992
3 Research Context

3.1 Introduction
In this chapter, a context for the thesis will be established; facilitating deeper levels of enquiry through the identification of key themes and issues that underpin this research. The context has been divided into three categories:

- **Relevance**: the social, economic and environmental issues driving this research
- **Context**: situating this thesis within the knowledge fields it occupies
- **Timeliness**: the social, economic and environmental currency of this work

The following sections of this chapter describe the these 3 contextual categories in detail, leading onto chapter 4, where the three research questions underpinning this study will be presented.

3.2 Relevance
The most significant aspect of this thesis is its contribution to ecological sustainability – more specifically, the development of new ways of working that address the inefficient and wasteful character of our contemporary engagement with DEPs. In *Sustainable by Design* (2006) leading sustainable design theorist Walker argues that ‘[t]he relationship between product design and sustainability has been the subject of extensive debate in recent years, and is clearly complex and multifaceted ... [t]here also has been considerable discussion about the design of longer-lasting products ... [and] these approaches make important contributions to sustainability.’\(^{376}\) Indeed, we lead a wasteful and resource hungry existence, taking out a great deal more from the Earth than we put back. In *Natural Capitalism* (1999) Hawken et al, argue that resources – as we like to label matter that we have a use for – are being transformed at a speed ‘far beyond the natural self-renewing rate of the biosphere ... as a consequence, reserves of useful matter are running low.’\(^{377}\) In broad anthropocentric terms, ‘[t]he human race was fortunate enough to inherit a 3.8 billion-year old reserve of natural


capital ... [a]t present rates of consumption it is predicted as unlikely that there will be much of it left by the end of this century.\(^\text{375}\)

In the past fifty years alone the human race has 'stripped the world of a fourth of its topsoil and a third of its forest cover ... [i]n total one third of all the planet's resources have been consumed within the past four decades.\(^\text{379}\) Additionally, passive consumer attitudes to the ecological crisis we face are enforced further by the misguided preconception that comfort must be sacrificed in order to make positive change, and 'the changes in living that would be required are so drastic that people prefer the future catastrophe to the sacrifice they would have to make now.'\(^\text{380}\) After all, 'not everyone feels the call to create water-pumps or utility vehicles for local people in Africa, to design wheelchairs and other useful devices or to conceive environmentally-friendly products on the basis of detailed lifecycle analyses.'\(^\text{381}\)

Warped notions of ascetic lifestyles abounding with non-enjoyment invade the consumer psyche, rendering the prospect of a greener existence an undesirable alternative and thus the inefficient consumer machine continues to thrust wastefully forth; feel good after measures such as recycling are deployed, baring grave similarity to 'someone who quits smoking on his deathbed.'\(^\text{382}\)

This research is further motivated by an emergent trend within the creative industries, wherein design practice is leading to a 'slumbering dissatisfaction with our material world. Many people loathe our throw-away society in which lack of quality is taken for granted. The result is an enormous waste and needless destruction of value.'\(^\text{383}\) Even today, in the era of environmental awareness, ethical consumption and sustainable design, a sense of instability continues to encircle the design, production and consumption of electronic products. Perhaps due to the normalcy of innovation, an expendable and sacrificial persona renders most DEPs transient and replaceable orphans of circumstance. In response to this, commercially viable strategies for DEPs must be developed, that slowly penetrate the user psyche over longer and more rewarding periods of time – 'new and alternative genres of

\(^{378}\) Ibid., p2


\(^{380}\) Fromm, E., \textit{To Have Or To Be}, Abacus, London, 1979, p11


\(^{382}\) Palahniuk, C., \textit{Fight Club}, Henry Holt & Company Inc., USA, 1999

\(^{383}\) \textit{Eternally Yours}, cited on http://www.eternally-yours.nl/, 5 May, 2006
objects that reduce the consumption and waste of resources by increasing the resilience of relationships established between consumers and their DEPs.

In an age of looming ecological crisis, mounting legislation and limited sustainable design progress, new approaches to sustainable design are needed. The urgency of this need, is reinforced by The Stern Review (2006), stating that ‘[i]f no action is taken to reduce emissions, the concentration of greenhouse gases in the atmosphere could reach double its pre-industrial level as early as 2035, virtually committing us to a global average temperature rise of over 2°C. In the longer term, there would be more than a 50% chance that the temperature rise would exceed 5°C. This rise would be very dangerous indeed; it is equivalent to the change in average temperatures from the last ice age to today. Such a radical change in the physical geography of the world must lead to major changes in the human geography – where people live and how they live their lives.' In 2007, the environmental audit for the United Nations (UN), involving 1400 scientists, concluded that ‘the speed at which mankind has used resources over the past 20 years has put humanity’s very survival at risk.’ Following the publication of their findings, the UN Environment Programme made an urgent call for action, stating that ‘the point of no return is fast approaching.’ A comparative survey by Global Environmental Output, also in 2007, shows that ‘[t]he world’s population has grown by 34% to 6.7 billion in 20 years ... 73,000km² of forest is lost across the world each year – 3.5 times the size of Wales ... [p]opulations of freshwater fish have declined by 50 per cent in 20 years ... [and] more than half all cities [throughout the world] exceed WHO pollution guidelines.’

It is imperative therefore, that the methodologies through which we address sustainable design, and more specifically design for durability are questioned, to enable the development of new strategic working methods, which address the unprecedented

386 United Nations Environment Programme, 2007
387 The United Nations Environment Programme (UNEP) is the voice for the environment in the United Nations system. It is an advocate, educator, catalyst and facilitator, promoting the responsible use of the planet’s natural assets for sustainable development.
389 Global Environmental Output, 2007
ecological crisis we currently face. Yet, amidst the industry-wide movement to achieve compliance with environmental legislation such as the EU WEEE Directive, the root causes of the ecological crisis we face are all too frequently overlooked. By neglecting to better understand the motivational drivers underpinning the consumption and waste of DEPs, design resigns itself to an end-of-pipe problem-solving agency, rather than the central pioneer of positive social, economic and environmental change that it potentially could be.

3.3 Context

Although the primary geographic context of this research is the UK, it has broader implications for the European Union (EU), in particular, those EU member states with advanced production capabilities that operate outside of the remit of the EU WEEE Directive (at the time of writing, EU member states include Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, the Netherlands and the UK). Although large components of this thesis, both process and product, are transferable to non-EU member states, the focus that this geo-political definition enables, serves to provide a real context for progress in terms of pioneering new, viable ways of working.

Following full transposition into UK law in December, 2007, the WEEE Directive will pose unprecedented restrictions on producers by enforcing them to take a whole-life responsibility for the electronic products they sell, at the end of their lives. At present, products designed for take-back are generally geared toward a greater ease of disassembly and recycling; this is not only prohibitively costly, but also logistically complex. This thesis argues that in order to develop effective new ways of working in compliance with the WEEE Directive, we must look beyond this essential, yet symptom-focussed model of sustainable design (take-back, disassembly and recycling), to develop greater practical understand of the metaphysical (a ‘branch of philosophy dealing with first principles of things, including such concepts as being, substance, space, time, identity etc.’390) factors that influence the success or failure of a given DEPs lifespan; informing the design of DEPs that consumers want to keep for longer, as an economically viable and legislation compliant means of reducing waste from electrical and electronic equipment (WEEE).

It is also important to note that, in terms of its broad philosophical origins, this study may be connected to a potentially larger body of knowledge than is initially defined within this thesis. This broader, and somewhat pervasive context comprises a significant quantity of well-established theories of a social and cultural orientation. Conventionally, this tends to urge a leaning toward the theoretical study of humanistic paradigms that explore the cultural dimensions of product life extension, or, to examine the social implications of migrating the established linear model of consumerism toward a more cyclical, service-oriented process for example. However, this thesis makes a deliberate and informed departure from this convention (evidenced in chapter 2, where a full review of the literature can be found); emerging from it, with an aim to engender a more commercially focussed body of knowledge, that makes practical contributions to the development and practice of design itself.

This is a deliberately focused investigation that strategically avoids certain zones of enquiry, to aid both the precision and contemporary relevance of this investigation. This research is focused on sustainable design, though it includes two other influential fields of knowledge – emotional & user-centred design and consumer motivation. This interdisciplinarity is important, as it facilitates the development of original research findings through the integration of disparate and isolated bodies of knowledge. Each of the three knowledge fields will be described in more detail.

Firstly, sustainable design is concerned with the creation of objects that comply with the fundamental precepts of economic, social, and environmental sustainability – as such, the ecological implications of design decisions present one of the prime facets of contemporary discourse within the creative industries today. According to the UK Design council, '[t]he sustainability challenge is a design issue. Eighty percent of a product, service, or system's environmental impact is determined at the design stage.'[^designCouncil2002] In addition, new and enlightened consumer awareness (coupled with rising levels of environmental legislation) urge design to question the ecological integrity of its activities. However, with the exception of influential texts from a handful of researchers – namely, van Der Ryn and Cowans' *Ecological Design* (1997)[^vanderRyn1997], McDonough and Braungarts' *Cradle to Cradle* (2002)[^McDonough2002], Papanek's *Green Design*[^DesignCouncil2002],[^vanderRyn1997][^McDonough2002]
Imperative (1995)\textsuperscript{394}, Chapman & Gants’ Designers, Visionaries and Other Stories (2007)\textsuperscript{395}, Manzini and Jegous’ Sustainable Everyday (2003)\textsuperscript{396} and Walker’s Sustainable by Design (2006)\textsuperscript{397} – sustainable design methodologies have a tendency to adopt a symptom-focused persona; addressing the after-effects rather than the causes of the inefficient model of design, production and consumption we face today. This is particularly evident when one looks outside of academia and design research circles, where practicing designers do not always have the time to engage in theoretical debates about the future of design – instead they require workable, time-efficient strategies that can be put into practice, today; this lack of accessible, ready information forces designers into a minority position, of limited power and influence.

In response, sustainable design practice has a tendency toward end of pipe methodologies such as recycling, disassembly and biodegradability. ‘If the so-called green design approach (better known in the United States as “design for the environment”) has a limitation, it is that it intervenes at the “end-of-pipe.” It modifies individual products or services, but does not transform the industrial process as a whole.’\textsuperscript{398} For example, ‘increased recycling does not reduce the flow of material and energy through the economy but it does reduce resource depletion and waste volumes.’\textsuperscript{399} In overlooking deeper strategic possibilities, sustainable design overlooks potentially deeper and more effective strategies. This research looks beyond recycling, biodegradability and design for disassembly, to explore the deeper motivational origins of our wasteful engagement with DEPs; developing credible new strategic opportunities, that build upon current perceptions of environmentally responsible design, to signpost directions for positive change. Furthermore, a secondary purpose of this research looks beyond a specific product genre (DEPs), to propose more global design reappraisal.

\textsuperscript{397} Walker, S., Sustainable By Design: Explorations in Theory and Practice, Earthscan, 2006
\textsuperscript{398} Thackara, J., In the Bubble: Designing in a Complex World, MIT Press, Cambridge, MA, 2005, p18
Secondly, emotional & user-centred design (sometimes referred to as experience-driven design or interaction design) is an emergent, human-centred paradigm that puts users at the forefront of design considerations. Emotion (referred to in this thesis as a sub-category of psychological function) plays a critical role in the user’s ability to comprehend and perceive the world, and how he/she encounters the specific character of new objects and experiences that shape it. Through integrating salient themes of user response into the design process, emotional & user-centred design can be seen as a specialist, inclusive approach to object creation that considers the ‘visceral, behavioural and reflective’\textsuperscript{400} dimensions of objects in order to engender meaningfully resonant user experiences; designing richer and more sophisticated layers of experiential content into a given product, so that it ‘invites you for a dance’\textsuperscript{401}. In this way, it can be seen that ‘products are not merely functional, but provide important signals in human relationships.’\textsuperscript{402} Indeed, ‘[t]he design of experiences isn’t any newer than the recognition of experiences.’\textsuperscript{403} Furthermore, though everything generates an emotional response of some manner, emotional & user-centred design practitioners endeavour to manipulate and control the nature of experience. In the majority of cases, this control is deployed as a facilitator of marketing, PR and commercial proliferation, through the slow penetration and manipulation/corruption of the user psyche, toward the wasteful cycles of desire and disappointment that have become so characteristic of consumerism today; perhaps due to its apparently intangible character, opportunities to utilize this as an agent of ecological sustainability within the creative industries have thus far been largely overlooked; as a result, disciplinary collaborations between emotional & user-centred design and sustainable design are currently scarce, choosing instead to occupy the discipline-specific territory to which it has become accustomed. This thesis argues that such cross-disciplinary synergies would be mutually beneficial in developing capabilities to design new genres of DEPs that support deeper user engagements, whilst also proposing the emergence of new, sustainable modes of subject object relations, whose potential implications transcend the primary focus of this study.

\textsuperscript{400} Norman, D., \textit{Emotional Design: Why We Love (or Hate) Everyday Things}, Basic Books, New York, 2004, p7


Third and finally, consumer motivation is a subcategory of marketing theory that fuses key elements of sociology, anthropology, psychology and economics. It is primarily concerned with the demographic, psychographic and behavioural characteristics of individual consumers, and through this, aims to better manipulate and work with the everyday needs and wants of people. As a broad field of knowledge, consumer motivation represents the interests of behavioural scientists from psychology, marketing, advertising, communication and other related areas that explore human motivation. As a purposive behaviour, motivation can be thought of as an activated state 'wherein decisions are planned and implemented, and goal-directed behaviours activated' - in this case, the consumption (and subsequent discarding) of material goods. Analysis of the consumption act is complex as it has ambiguous qualities - 'it relieves anxiety, because what one has cannot be taken away; but it also requires one to consume ever more, because previous consumption soon loses its satisfactory character.'

Theory indicates that the need to consume tends to occur when a perceived discrepancy exists between an actual and a desired state of being. Despite the broad range of conflicting and contradictory theories that abound, the principle endeavour of consumer motivation (as a field of knowledge) is to develop understanding of the manifest - known to the person - and latent - unknown to the person - motivational drivers that make people do the things they do, buy the things they buy and discard the things they discard. To date, knowledge emerging from this field has almost exclusively served to bolster economic sustainability. Yet, '[i]t is [surely] a shallow philosophy that would make human welfare synonymous with the indiscriminate production and consumption of material goods.' Until recently, environmental and social sustainability have scarcely featured within the interests of this commercially oriented field - as such, the efficacy of conventional capitalism must be questioned; more lucrative models exist than the blind nurturing of endless sequences of desire and destruction.

Material consumption is driven by complex motivations and is about far more than just the acquisition of newer, shinier things. It is an endless personal journey toward the ideal...

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405 Fromm, E., *To Have or To Be*, Abacus, London, UK, 1979, p27

or desired self that, by its very nature, becomes a process of incremental destruction. Furthermore, the process of material consumption operates on a variety of experiential layers from the rational and the tangible, to the profound and the numinous. Without an adequate understanding of the motivational, human factorial and behavioural drivers that characterise the human condition, sustainable design corners itself within a limited, short sighted and technological approach, in which opportunities for real progress are overlooked. In this way, it may be said that designers poorly understand the complex behavioural issues that both drive and influence patterns of material consumption, which themselves, are fundamental to effective engagement with a sustainable design agenda.

3.4 Timeliness

Environmental concern is anything but a contemporary malaise. Research shows a recorded awareness of our impact on the biosphere dating back to the 13th century; German theologian Meister Eckhart frequently conceptualized Earth as a ‘fragile resource affected by human endeavour’\textsuperscript{407}. Six hundred years later at the dawn of the materially decadent Arts and Crafts period in Britain (1850-1915), early connections between emergent cultures of superfluous materialism and environmental decay were first acknowledged – clearly, the strong moral position on industrial production (and its impact on the workforce and our way of life) were characteristics of this period, and in this way can be seen as contributing factors in the awakening of a broader ecological consciousness at the turn of the 19\textsuperscript{th} century. In \textit{Contrasts} (1836), British architect, designer and theorist Augustus Welby Northmore Pugin, describes the way in which the ‘clean environment of well-designed buildings and the joy of making, seen in the medieval societies, were opposed by the harsh realities of the Victorian [smoke-filled, industrialised] era\textsuperscript{408}; this sentiment was shared later by Marx, Engels, Ruskin and others. The extravagant modes of consumption enabled by the enhanced pace of post-industrial revolution manufacturing were steadily corrupting the biosphere, causing concern for many. Catalyzed further by the late 1960s ‘awakening of ecological consciousness\textsuperscript{409}.\n
\textsuperscript{408} Pugin, A. W. N., \textit{Contrasts}, Self-published, UK, 1836
fuelled by seminal work from Packard, namely, *The Hidden Persuaders* (1957)\(^{410}\) and *The Waste Makers* (1963)\(^{411}\), sustainability has now become a well-established social, cultural and economic issue, and one that is forecast to grow in both importance and levels of participation over the decades to come.

It is argued here, that given these developments the creative industries are in a state of flux; an attitudinal migration toward more sustainable models of design, production and consumption is currently emerging, causing industry to update its practices to meet the escalating demands of an ‘increasingly ethically aware market place’\(^{412}\) in the UK, coupled with the forthcoming policy-driven demands brought about by the EU WEEE Directive. However, ‘whilst most EU member states have enforced the EU WEEE Directive, in December 2005 the Energy Minister, Malcolm Wicks, announced that the implementation of the EU WEEE Directive in the UK would be delayed further. A review will be followed by a full consultation exercise (Spring, 2006) before the Government proceeds to transpose the main provisions of the Directive into UK law. It is now estimated that the legislation will come into force in the UK in December, 2007.’\(^{413}\) Once enforced, the EU WEEE Directive reinforces the commercial argument for product life extension, as waste generated by the current model of production and consumption will be rendered an economically detrimental practice, in breach of environmental law. It can therefore be seen that ‘in terms of sustainability, the efficacy of conventional capitalism must be questioned’\(^{414}\).

At present, products designed for take-back are generally geared toward economical disassembly, recycling, reuse and/or incineration, rather than prolonged lifespans. Technical procurement methodologies such as these may make it possible to design DEPs ‘that are [a little] friendlier to the environment, but leaves a fundamental problem unaddressed: the short lifetime of our products ... [i]t is not enough to make less polluting products, however important that may be, when they are replaced at high speed because people throw them

\(^{412}\) ES Magazine, Associated Newspapers Ltd, ‘Put your money where your mouth is’, *Evening Standard/ES Magazine*, UK, September 2000
\(^{413}\) WEEE man website, December 2006
In enabling consumers to keep DEPs for longer, their electronic products are transformed into ‘conversation pieces’ linking consumers to producers, though an ongoing dialogue of service, upgrade and repair. If appropriately managed, it is proposed that fostering and maintaining such relationships with customers, presents a significant part of the solution to these issues; enabling business to continue generating revenue without the need for further costly manufacturing, resource extraction, energy consumption, atmospheric pollution and waste.

Amidst the consumer society of today, empathy is sought not so much from each other, but through fleeting embraces with designed products, of which DEPs feature heavily. This ‘shift, away from immateriality and anonymous experience, towards reflexive encounters, is seemingly only the crest of a larger cultural wave which is rapidly imparting greater understanding into the way we perceive, condition and create the world in which we live.’

This has fostered a mind shift within the development of both object and human centred relationships – driving a steady societal shift away from deep communal mutuality towards a fast culture of individualism and superfluous materialism; migrating away from a culture of human-human engagements, toward a fast culture of human-product engagements. It is argued here, that this sociocultural phenomenon is contributing to the wasteful and unsatisfactory character of material consumption today.

Within the creative industries, it may be argued that perceptions are opening up, and broadening – ‘[t]he transition from “green” to “eco-“ to “sustainable” in the design field represents a steady broadening of scope in theory and practice, and to a certain extent, an increasingly critical perspective on ecology and design ... [h]ere, use of terms seems to indicate an attempt to wrestle with the complexities and implications of an ecological approach to design – going beyond the rather simplistic notions of design and the environment in the previous decade.’ In this way, it can be seen that ‘environmental

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417 de Groot, C., Closing the Gap Between Subject and Object, Design Transformation Group, UK, 1997, p20
consciousness is rapidly becoming a fundamental product design focus – sustainability provides us with the greatest opportunity to radically rethink the way in which we engage with DEPs today, while the EU WEEE Directive provides the economic incentive that we need to get started. As mentioned earlier, new ways of working are needed that break away from the physical model of durability; developing greater understand of the sustainability of empathy, attachment, meaning, desire and other metaphysical factors that influence the degree to which products are kept, serviced, maintained and upgraded and repaired over a period of rewarding and fulfilling years, rather than simply cast aside as scrap following a short-lived and deeply disappointing handful of weeks.

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4 Research Questions

4.1 Introduction
Following the establishment of the context for this research in the previous chapter, the three research questions (RQs) underpinning this study (outlined in chapter 1) will be described in full. These questions provide the investigative, experimental foundation of this thesis, and are as follows:

RQ1 Do creative industries recognise product life extension as a viable approach to sustainable design?
RQ2 Do users possess DEPs to which they are emotionally attached?
RQ3 What designable conditions nurture more durable relationships between users and DEPs?

A descriptive account of each individual RQ will now follow (sections 4.2, 4.3 and 4.4), examining their overall appropriateness in terms of their degree of originality, and overall relevance to the knowledge fields this thesis occupies. The interrelationship between the three RQs will also be discussed, at the end of this chapter (section 4.5). The research methodologies through which these questions are investigated will not be described until later, in chapter 5.

4.2 Do creative industries recognise product life extension as a viable approach to sustainable design? (RQ1)
Though the origins of this thesis are rooted in the discipline of product design, it is helpful to expand the disciplinary scope of the research; generating new findings through the merging of often unhelpfully segregated disciplines. For example, an architect’s perception of product life extension will presumably differ from that of a fashion designer, crafts person, furniture designer, or indeed a product designer. One would also assume that similarities in perception might also occur, “that transcend the normal disciplinary boundaries.”420 Valuable insight will be generated through the analogies and anomalies such an interdisciplinary discussion

uncovers, as '[n]o theory ever agrees with all the facts in its domain.'\textsuperscript{421} Therefore, RQ1 targets the broader creative industry (of which product design is a central part), to facilitate this cross-disciplinary mode of knowledge gathering and generation.

The creative industry that RQ1 identifies is an aggregate of interlocking, sectors and consists of designers, specifiers, manufacturers, researchers, marketers and educators working within the disciples of architecture, interiors & landscape, product & furniture design, exhibition & spatial design, fashion & textiles, arts & crafts and graphic design, illustration & new media. In economic terms, 'the creative industries make significant contributions to growth.'\textsuperscript{422} Their recent prominence may be assigned to the analogous 'rise of cultural industries, the significance of knowledge to all aspects of economic production, distribution and consumption.'\textsuperscript{423} Socially the creative industries play a prevalent role, in bridging the conceptual gap between the consumer and the producer while in an environmental context, they are, arguably, in the strongest position of all to redirect the interlinked processes of design, production and consumption toward economically viable positive change; situated in the eye of the storm of a collaborative process, designers are ideally positioned to embody these concepts within the design of DEPs. As Bruce Mau asserts in \textit{Massive Change} (2004), '[d]esign has a ubiquitous presence, one that guides our everyday actions, shaping our consciousness, reconfiguring our spaces, modifying our lives. With such a dynamic force at our disposal, we must acknowledge the power and the opportunity it presents.'\textsuperscript{424}

Until recently, designers and manufacturers of DEPs have only superficially attended to issues of sustainability, often treating it as a cynical marketing strategy, a passing trend or a whimsical mutation of design proper. However, due to a recent and significant rise in take-back legislation in the EU, industry is being forced to engage more fully with issues of sustainability. Leading global brands such as Nokia, Bosch Siemens, Sony, Philips, Dell, Hotpoint, Canon and Electrolux are funding major new initiatives that 'take responsibility for

\textsuperscript{421} Feyerabend, P., \textit{Against Method}, Verso, London, 1993


\textsuperscript{423} Castells, M., 'Materials for an Exploratory Theory of the Network Society', \textit{British Journal of Sociology}, vol 51, no 1, 2000, pp5-24

what happens to the products they sell at the end of their lives.” In this way, all producers of electronic products must aim to set up recycling systems (either on a collective or individual basis) that provide for the effective recovery of e-waste (or WEEE) to ensure that electronic products and their components never touch landfill. As discussed in chapter 2, the financial implications of this shift in commercial emphasis are significant, and have an equally significant impact on the everyday practices of design. However, beyond waste management methodologies, few are addressing product life extension as a means to reduce waste, further consumption and consequently, reduce the financial outlay associated with electronic waste today.

Designers are certainly aware that product lifespans and commercial success are intrinsically linked. Yet following a comprehensive review of the literature, it would appear that product life extension is seldom given the same degree of importance as other specialist, though possibly less effective, approaches to sustainable design such as design for recycling, the specification of low-impact materials or design for disassembly for example. In many cases, product life extension is not considered at all; it is not currently understood why this is, though one hypothesis would be that insufficient knowledge motivates a migration toward simpler, less sophisticated approaches to environmentally responsible object creation; these approaches tend to be compatible with the similarly linear corporate frameworks of business and economics, and thus readily implemented. Another hypothesis is that ‘the majority incorrectly assume that longer lasting products are economically detrimental as they slow down consumption.’ This outdated idea could be seen as a hangover from the Industrial Revolution, in which it was wrongfully assumed that ‘growth in total output (GDP) maximizes human wellbeing’, fuelled further by the shaping of US policy following the Wall Street crash in the 1930s. Indeed, we have now had 30-years of talking about alternatives to the prevailing linear model of production and consumption, and things are now, just beginning to change.

As described earlier in chapter 2, due to a lack of research addressing the industry’s perception of product life extension (particularly so in the context of DEPs) it is not known whether product life extension is recognised as a commercially viable and effective sustainable design strategy. Though ample research described in the review of the literature – including Cooper (2002)\textsuperscript{428}, Stahel (1993)\textsuperscript{429}, Heiskanen and Jals (2000)\textsuperscript{430} and Mont (2002)\textsuperscript{431} – illustrates the readiness of consumers to engage with products over greater periods of time, and even pay more for them, it is not known how industry regards the prospect of moving toward a more service-oriented commercial model, where people keep DEPs for longer periods of time, and further turnover is generated through servicing, upgrade and repair. As a specialist approach to sustainable design, it is still not understood how product life extension is collectively perceived. A clear and informed understanding of the industry’s perception of product life extension is vital. Only through this understanding, can new and effective strategies be developed that designers will accept, support and ultimately implement.

4.3 Do users possess DEPs to which they are emotionally attached? (RQ2)

As everyday life ‘grows increasingly electronically mediated’\textsuperscript{432}, it becomes both timely and of growing importance to examine the nature of engagement that we currently encounter with the plethora of DEPs that now surround us; in addition, the focus of this study is on electrical and electronic goods, as these are especially problematic in terms of their environmental consequence, due to the escalating rate of consumption and subsequent volume of waste generated in this sector. Following a full review of the literature, it is clear that attachments with DEPs are not currently understood. Several surveys explore initial purchasing behaviours, the motivation to buy, replacement-motives and examine the user’s willingness to

\textsuperscript{428} Cooper, T., ‘Durable consumption: reflections on product life cycles and the throwaway society’, in Hertwich, E., (Eds), Life-cycle Approaches to Sustainable Consumption (Workshop Proceedings), Austria, November 2002, pp15-27


\textsuperscript{430} Heiskanen, E. and Jals, M., Dematerialization through services – a review and evaluation of the debate, Ministry of the Environment, Helsinki, 2000

\textsuperscript{431} Mont, O., Functional Thinking: The Role of Functional Sales and Product Service Systems for a Function-Based Society, International Institute for Industrial Environmental Economics (IIIEE), Lund University, Sweden, no 5233, July 2002, p30

\textsuperscript{432} Dunne, A. and Raby, F., Design Noir: The Secret Life of Electronic Objects, August/Birkhauser, Switzerland/UK, 2001, p42
engage in servicing, upgrade and repair when products approach end-of-life; these include Nitta and Shiozaki (2001), Cooper (2002), van Nes & Cramer (2005), Batterbee & Matlampaaki (2004) and Stahel (1982). Despite this, up-to-date research that identifies the nature of relationships that users currently have, during the use phase, with their DEPs is unavailable, and as a result, it is not known whether users possess DEPs to which they are emotionally attached.

In contrast, it appears that attachments with non-electronic products are a well-documented and somewhat commonplace phenomenon; these include van Hinte (1997), de Groot (1997) and Schultz et al (1989). Subject object relationships in non-electronic product genres are relatively widespread, and a profundity of literature exists, which unanimously claims that users readily develop attachments with their material possessions. Yet as mentioned, the case studies identified in the available literature primarily occupy non-electronic product genres. Examples of these objects might include photographs of loved ones, a teddy bear from childhood, a penknife handed down from one’s father, a seashell from a special holiday or perhaps a pair of shoes that have taken you to unforgettable places – all of which are not elements of the everyday cycle of production and consumption. Artefacts of this nature embody values far beyond their monetary worth, and hold a special place in the hearts and minds of users; in this sense it can be seen that ‘the emotional side of

433 Nomura Research Institute (NRI) is a leading think-tank and systems integrator in Japan, that considers the possibilities facing society in this era of rapid change where predictions cannot easily be made.


89
design [which occupies the territory of psychological function] may be more critical to a product's success than its practical [utilitarian] elements.\textsuperscript{441} Research indicates that attachment behaviour has a direct influence on the longevity of such objects, and regularly motivates users to hold onto them, even after they befall disuse or have been replaced. Durable and long-lasting attachments to non-electronic objects are everyday occurrences, and provide valuable indications that a more sustainable mode of contemporary engagement with DEPs is potentially achievable. Furthermore, it may be argued that several theoretical constructs developed through research into non-electronic objects are of a transferable nature. In addition to the pervasive typology of knobs, buttons and dials, the complexity of interface, is in many cases the primary dividing line between electronic and non-electronic object genres.

RQ2 targets the user in order to measure the current state of engagement with DEPs. Too often, investigations of this nature are conducted without user-consultation, and are performed in a top-down manner that wrongly assumes the hierarchical superiority of the designer and marketer. Through engaging the user directly, original insight will be generated that greatly informs the development of future design proposals – "relocating the electronic product beyond a culture of relentless innovation for its own sake."\textsuperscript{442} In this way, RQ2 aims to find out what people think, rather than what experts think people think. It is hypothesised that RQ2 will stimulate polarised responses that are both positive and negative in character; uncovering in some cases stories of great attachment, meaning and intimacy with a particular DEP, and in other cases the story will be more bleak, depicting a less-charismatic account of dull periods of use, characterised by non-attachment and a pervasive sense of disappointment and banality. Both poles of response are considered to be of value to this research, as they serve to illustrate the ‘omnipresent character’\textsuperscript{443} of relationships that users are currently experiencing, or not experiencing as the case may well be?

If we are to develop DEPs that users wish to keep for greater periods of time, it is essential that we first acquire explicit understanding of the nature of relationships that users

\textsuperscript{441} Norman, D., \textit{Emotional Design: Why We Love (or Hate) Everyday Things}, Basic Books, New York, 2004, p34


are currently experiencing through engagements with existing DEPs. RQ2 enables this understanding, through posing an original and pertinent question, at a time when it is greatly needed.

4.4 What designable conditions nurture durable relationships between users and DEPs? (RQ3)

Following a full review of the literature, it can be stated that numerous studies argue the social, economic and environmental need for the design of DEPs that people want to keep for longer; these include Cooper (2000)444, Park (2004)445, Csikszentmihalyi & Rochberg-Halton (1981)446 and Thietart and Vivas (1984)447. Despite this, design researchers have yet to effectively apply the results of this research to the process of designing and creating such objects. This has contributed to the current state of knowledge, in which, it is consensually agreed that designers operating within the rigid constraints of industry should be looking to extend the life of DEPs, but it is not known how this can be approached through design. RQ3 aims to redress this balance by occupying the gap that currently separates theoretical research, and contemporary design practice, in this particular context.

Following a comprehensive review of the literature, it can be seen that there is a lack of accessible, useable information for creative practitioners operating within an industrial context. Most designers are unfamiliar with the vernacular of academic research, and find this language to be both non-inclusive and of an impenetrable character. The corollary of this is that the academic community continues in becoming evermore conversant within the knowledge field, whilst the broader (non-academic) creative community continues relatively unchanged. It is therefore of great importance that practice-oriented research is developed that engages the creative community more effectively, so that they may begin to integrate the findings from academic research into everyday design practice; enabling a rethink of the

445 Park, M., Design for Sustainable Consumption, Futureground, Design Research Society, Melbourne, November 2004
'status of product design, urging a move away from the constraints of the marketplace in favour of more critically, socially and aesthetically engaged practice.'\textsuperscript{448} Furthermore, this knowledge-gap greatly diminishes the likelihood of design redirecting itself toward the creation of DEPs capable of supporting durable and lasting relationships with users, as the information that academics are generating in this area is not being picked-up and worked with. In this respect, the impact(s) made by such product life research is compromised, as it fails to reach the wider design populous that are required in order to implement its proposition. In this way it may be asserted that academic researchers – with their tendencies toward normative assessments of what should, and ought to be – describe what designers must do, without describing how to do it; ‘it is all signposts and no destination.’\textsuperscript{449} This situation is symptomatic of the hands-off, and non-practice-based orientation of the majority of product life research that has been undertaken to date. In response to this, RQ3 aims to build upon and develop theoretical research to explore more applied, and practical ways of working, which can be more fully integrated to design practice, with the aim of establishing design frameworks and working methods that identify and articulate the designable conditions required to nurture more durable relationships between users and DEPs, in an accessible and participation-widening way.

Beyond issues of accessibility, it is not currently known how to approach design for emotionally durable DEPs. As discussed earlier (chapter 2), the designer is unable to fully direct the explicit character of relationships that users develop with artefacts. This is because the nature of subject object interaction is both unstable and deeply idiosyncratic – each user brings a unique assemblage of perceptions and judgements to the process of interaction. Though responses to given products are designable, the specific character of that response is believed to be largely beyond the capabilities of design, due to the social, cultural and individual idiosyncrasies of each individual user. However, it is clear that design can increase the likelihood of a relationship developing between the subject and the object, and direct, or guide it to some extent. The intention of RQ3 therefore, is to creatively explore, define and communicate through objects the ways in which this may be achieved through design.


Today, a significant conceptual gap exists between text-based academic research, with its roots in grounded theory, and workable design strategies that realize these theories through the creation of artefacts. These artefacts become the inclusive bridge, connecting the design community with their respective communities within academic research; translating research into a language that both parties can engage with and share. In this way, RQ3 enables both the development and communication of theoretical research through the production of conceptual objects that propose new ways of working. Through this, creative strategies can be clearly presented that will inform creative practitioners as to the designable conditions that nurture more durable relationships between users and DEPs.

4.5 Summary

Each individual RQ may be described thematically, to provide three distinct areas of enquiry. These areas of enquiry are developed in response the specific user-groups that have been targeted by this research – the creative industry (RQ1), the user (RQ2) and the individual designer (RQ3). In fragmenting the research questions in this way, greater depth and precision of results can be achieved, essentially, by asking the right questions to the right people in the right way.

Beyond the three identified themes, the research questions may also be polarized within the twin typologies of observational questions (RQ1 and RQ2) and experimental questions (RQ3). In polarizing the research questions in this way, the motivation behind their selection becomes more evident, while their interrelation with one another becomes equally apparent; defining an emergent knowledge space that is of greater sophisticated than the linear mode previously discussed. RQ1 and RQ2 are observational questions in that they aim to establish an understanding of the current situation, without intervention or manipulation of the results. In generalist terms, these observational questions seek to uncover why things are the way they are, as things currently stand. It was hypothesized that insight resulting from this first line of observational enquiry (RQ1 and RQ2) would provide an evidential foundation upon which an effective response to RQ3 may be subsequently constructed (the creation of experimental object proposals in response to what was learnt through RQ1 and RQ2). Indeed, in contrast to the observational standpoint of RQ1 and RQ2, RQ3 is a more experimental question that aims to engineer new situations, from which original knowledge may be generated, that both informs and enables positive change.
5 Research Methodology

5.1 Introduction

This chapter will discuss the qualitative and quantitative methodologies through which the research questions (described in chapter 4) have been addressed. Distinctions are frequently drawn between qualitative and quantitative modes of investigation\textsuperscript{450}, yet in recent years it has been argued that both methods work effectively together. For example, based on analysis of the history of science, Kuhn asserts in his paper entitled 'The Function of Measurement in Modern Physical Science' that 'large amounts of qualitative work have usually been prerequisite to fruitful quantification in the physical sciences.'\textsuperscript{451} Furthermore, in their paper entitled 'Competing paradigms in qualitative research', Guba and Lincoln (1998) argue that '...both qualitative and quantitative methods may be used appropriately with any research paradigm.'\textsuperscript{452}

The three separate research questions (RQ1, RQ2 and RQ3) are addressed through two interlinked fieldwork components, or phases; these will be described both in isolation, and in the form of a comprehensive body of fieldwork. This way, the fieldwork can also be experienced holistically, as an aggregate package of investigative evidence. Along with this discussion, the appropriateness and relevance of research methods deployed will also be explained, as a means to justify the particular orientation of this research. This discussion will be broken down into the following six sections, to facilitate a more detailed examination of the processes and procedures employed, whilst enabling a precise and critical analysis of the emergent properties generated by this research:

- Brief overview of all fieldwork: this short section describes why two phases are adopted for three research questions, and comprehensively sets the scene for the discussions to follow throughout this chapter

\textsuperscript{450} Tashakkori, A., Teddlie, C. & Teddlle, C., Mixed Methodology: Combining Qualitative and Quantitative Approaches, Social Science, USA, 1998

\textsuperscript{451} Kuhn, T. S., 'The Function of Measurement in Modern Physical Science', Isis, 52, 1961, pp161-193


94
Fieldwork phase 1: describing the design, development and implementation of phase 1 of the fieldwork, along with a detailed account of the research methodologies through which this comprehensive body of work is formulated.

Results from phase 1: data gathered from this aspect of the fieldwork is collated and interpreted into a useable form, from which insight may be drawn that responds to both RQ1 and RQ2.

Fieldwork phase 2: this section describes the design, development, piloting and implementation of the creative workshop element of the fieldwork, and features a detailed account of the research methodologies through which this second phase of fieldwork was formulated.

Results from phase 2: all results from the second phase of fieldwork will be discussed in this section, and collated into a useable form so as to form the basis of a response to RQ3.

Critical reflection and assessment of work: assessment of precision, thoroughness and originality will be made in this section; particularly, as set against the argument constructed in the review of the literature.

Following these discussions, a brief summary (section 5.9) will enable the review of key points that emerged within this chapter; from this, early conclusions will be drawn that inform the final chapter in this thesis – Conclusions.

5.2 Brief overview of all fieldwork

Though three research questions underpin this thesis, the methods employed to examine and explore these questions fall into two interlinked phases of fieldwork. Phase 1 (responding to RQ1 and RQ2) consists of a 10-month period of formulation, design, piloting and production of an interactive, information-gathering exhibit at 100% Design (Earl's Court, London, 21-24 September, 2006), through which a significant subject population were asked to complete an empirical survey (see figure 5.2); this sample frame was taken from a purposive sample – the creative industry. Following the event, a 4-month period of data collection was undertaken.

453 As the UK's leading trade show for the creative industry, the 100% Design show at Earl's Court was selected as a venue for phase 1 of the fieldwork as it provided unprecedented access to the greatest concentration of designers, architects and a host of other creative practitioners from academia and industry.
collation, analysis and interpretation was undertaken, as a means for implications to be
drawn from the data set gathered.

Phase 2 (responding to RQ3) consists of an 8-month period of the formulation,
piloting and implementation of an interdisciplinary creative workshop event (University of
Brighton, 25 June, 2007), featuring systematically selected interdisciplinary designers,
materials specialists and behavioural scientists, generating product proposals that
qualitatively address the problems and opportunities of product life extension. This event was
followed by a 3-month period of the interpretation, development and full-scale prototyping of
the workshop findings. In both phase 1 and 2 of this research, the dependent variable is the
lifespan of the object (result) and the independent variable is the cause (or range of possible
causes) of this; a degree of correlation between these variables will be sought, throughout all
stages of the fieldwork.

Despite distinctiveness as two independent bodies of fieldwork activity, both are
interlinked – results from the phase 1 inform phase 2, which itself, provides a means for
creative and conceptual interpretation of these results through realized artefacts and the
development of transferable methodological design models. The literature shows that this
connection signifies a rare yet meaningful transaction between data gathering to object
creation, situating the research within original territory. To give a clear account of the
methodologies involved, a more descriptive analysis of phase 1 and 2 of the fieldwork will
now follow.

5.3 Fieldwork phase 1
As mentioned earlier, this first phase of the fieldwork consisted of a 10-month period of
formulation, design, piloting and production of an interactive, information-gathering exhibit
and survey, developed with collaboration and support from 100% Design (central event of the
London Design Festival), Nick Gant (BoBo Design), Earthscan Publishers (the world's leading
publisher of books on sustainability) the School of Architecture and Design (University of
Brighton) and the Knowledge Exchange. The culminating point of fieldwork phase 1, was an
interactive, information-gathering stand at 100% Design (Earl’s Court, London, 21–24
September, 2006); providing a custom designed context from which to mount an effective
product life survey, with a significant subject population of 2154 members of the creative
industry (for a full profile of respondents, see figure 5.3). Following the event, a further 4-
months of data collation, analysis and interpretation was undertaken, as a means for implications to be drawn from the data set gathered.

As the UK’s leading trade show for the creative industry, the 100% Design show at Earls Court was identified as an ideal venue for the staging of fieldwork (phase 1) as it provided unprecedented access to the sample population of this study, whilst doing so on neutral territory. Following this identification, a sponsorship arrangement was pursued, negotiated and established with 100% Design; providing financial support to cover stand space, but perhaps more importantly, this academia/industry partnership also represented a significant endorsement of the study, and its potential contributions to the creative community that the show serves. It was therefore essential that this first phase of fieldwork was carried out at 100% Design, or this invaluable access to such a large primary sample population, and endorsement would not have been possible. Furthermore, it is important to note that although the creative industry are a highly captive audience for such a study, it is argued here that this subjective, personal engagement with the issues under scrutiny, facilitates the generation, formulation and capture of a full range of empirical responses, yet within a grounded, controlled, experimental setting.

The custom design and production of the interactive stand space (undertaken during phase 1) created a means to achieve optimal control over the context in which the survey was delivered, and a consequent consistency in the results that it yielded. In this way, the exhibit provided an enabling platform from which an effective and grounded product life census, of significant scale, was able to be carried out (see section 5.4 for the results of this census), wherein a purposive sample of 2154 respondents (including subsequent focus groups) completed an empirical survey that generated original information in direct response to both RQ1 and RQ2.

Indeed, the information-gathering exhibit was designed to provide a tailor-made 'context for the capture and harvesting of vital information'. Individuals occupying this sample are also users themselves, and in this respect, are apposite respondents for the posing of both consumer-focused questions, and industry-focused, questions. Moreover, it is hypothesised that this specialist sample population come with a sharpened, more developed comprehension (and articulation) of the immaterial, intangible qualities of their material possessions, and that this would lead to professionally and objectively informed, yet subjectively articulated responses to the questions posed.

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During the design, development and piloting of this first phase of fieldwork, it was discovered that it is unhelpful to engage subjects in these debates across boardroom tables or via email, as might normally be the case. Through staging an exhibition in this way, and on neutral territory, respondents were found to be more open to discussion, and as such, the results generated are of greater value; in this way, it can be seen that the spirit of the event was a significant factor in the success of this particular survey. It was also observed during the piloting of this research that for debate of this nature to initiate, a point of view must first be put forward, providing respondents with something to respond to; debate is stimulated when people are given something to agree or disagree with. In Interpreting Information Systems in Organizations (1993), Walsham argues that interpretive methods of research such as those deployed in this first phase of the fieldwork are 'aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context.' In reaction to this premise, the stand was specifically designed to engage respondents in such a proactive and context-specific way; consisting of two physical structures (these also served as polling booths in which surveys were completed) that deliver through their juxtaposition two polarized perceptions of product longevity and sustainability (see figure 5.1). One was a biodegradable (short lifespan) space made from interlocking sheets of structural cardboard, constructed without glues or fastenings. The other space was a recyclable (long lifespan) geodesic dome with a monocoque structure fabricated from interlocking die-cut polymer sheet, 0.5mm in thickness. Both spaces deployed a mono-material construction methodology so as to reemphasize their fundamental difference as being their lifespans.

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455 Walsham, G., Interpreting Information Systems in Organizations, Wiley, Chichester, 1993
The aim of the survey (conceived, developed and piloted during the early stages of phase 1) was to directly engage participants in debate, as means to establish an initial understanding of the creative industry's collective perception of product life extension (RQ1), and to find out whether (as users) they possess DEPs to which they are emotionally attached (RQ2). Once on the exhibition stand, selected individual subjects were invited to complete the survey, which generated essential data that (following interpretation) would enable RQ1 and RQ2 to be addressed. Though the sample population for the survey consisted of 2154 individual subjects, it was anticipated that data saturation point would be achieved at between 1000-1500 respondents having taken part in the survey; following this, data is likely to become repetitive, though some degree of reinforcement will come from this repetition.

As mentioned earlier, the survey consisted of both qualitative and qualitative questions; the research design of this survey focuses on the responses of a large subject population and determines their collective responses to both RQ1 and RQ2. Once complete, each of the
2154 surveys was attached to the stand’s exoskeleton, to create a skin that grew over the course of the 4-day event. This skin became part of the exhibit – a gallery of thought that collectively mediated an expansive range of perceptions relating to product life extension and the environment today, whilst also serving to catalyse further critical debate and discussion regarding perceptions of product life extension and sustainability through their imposing presence on the stand.

The 11 survey questions featured within this research design address a single issue per item, avoid bias, offer clear alternatives and are carefully posed in order to take into account the tendency toward social desirability. Collectively, they explore what people think, and in this sense, adopt a phenomenological approach, as they focus on the lived experience of individuals. The questions featured in the survey (see fig 5.2) are split into the following 3 streams of enquiry:

A. **Respondent**: (Survey questions i, ii and 1) This information is useful in profiling the results of the survey into particular industry-specific groupings only (further information pertaining to respondents’ gender, age and income was not sought due to their lack of relevance to the investigation)

B. **RQ1**: (Survey questions 2, 3, 4 and 5) These questions determine whether the creative industry collectively recognises product life extension as a viable approach to sustainable design

C. **RQ2**: (Survey questions 6, 7, 8 and 9) Establishing whether users possess DEPs to which they are emotionally attached, why they think that is and to what degree this might relate to sustainability
Figure 5.2 Grouping of information in the survey, and question numbers

100% Sustainable? survey

Name:
Email:

What do you do?
- Product & Furniture Design
- Architecture & Interiors
- Graphics Design & Illustration
- Exhibition & Spatial Design
- Science & Engineering
- Student
- Landscape Architecture
- New Media & Digital
- Journalism & Media
- Government & Policy
- Specifier
- Fashion & Textile
- Arts & Crafts
- Materials
- Research
- Teacher

Which space do you think is more sustainable?
- DarkSpace
- BrightSpace

How sustainable would you say your work is?
[ ] 0 [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ] 6 [ ] 7 [ ] 8 [ ] 9 [ ] 10

Which strategy do you think is most viable?
- Design for recycling
- Design for disassembly
- Energy efficient design
- Design for longer lasting products
- Designing with low-impact materials

Which scenario best describes you as a user?
- Exchange a toaster after 2 years for a more energy efficient model
- Replace a toaster after 6 years when it breaks
- Periodically repair and service a toaster so it runs indefinitely

What is your most cherished electrical product?

Why does it mean so much to you?

Can anything be 100% Sustainable?
- Yes
- No

Why do you think that is?

Source: Author
Prior to print production, the survey was piloted with 30 individuals from across the primary sample population – the results of this pilot analysis demonstrated three anomalies. Firstly, that the language adopted in the survey needed simplifying, so that non-specialist respondents also understood what was meant. Many who took part in the pilot analysis misinterpreted terms like 'product life extension' and 'product longevity' – the tone and use of technical language was thus reduced in response to these observations, to make the survey more inclusive and accessible. Secondly, the pilot analysis revealed that the survey asked too much of the respondents in terms of time, and personal information – given the context in which the survey would be conducted (trade show), issues of time were of particular importance. In response, gender, age range, company size and income-related questions were omitted from the survey due to their relative lack of importance to the investigation (contact details and industry-specific profile information were kept, as this was considered valuable in profiling data). Furthermore, multiple-choice style questions (and tick-box responses) were introduced where possible to further reduce the respondents’ workload. Third and finally, the pilot analysis revealed that the survey was too complex. Indeed, discussed in isolation, product life extension can be an abstract and beguiling subject, particularly for the non-specialist. For this reason, the survey is firmly situated within the context of sustainable design; the subject of product life extension emerges from this commonly understood context, to ensure that respondents are introduced to issues of product longevity gradually, and from a commonly understood context. Furthermore, the questions in the survey – where possible – ask respondents to consider their own experience as a means to answer the question effectively. To further facilitate the generation of these results, an informal and non-specific language was adopted for all questions in the survey to create a relaxed and conversational feel.

5.4 Results from phase 1

In this section, quantitative and qualitative data gathered from the survey (following a period of collation, analysis and interpretation) is presented, and its implications are discussed. In a paper entitled 'A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems' Klein and Myers (1999) provide guidelines for this mode of data

analysis. The results from this begin to suggest ways to which RQ1 and RQ2 may be responded to, while also providing a summary of the results yielded by the research thus far, enabling initial conclusions to be drawn. In table 5.1 (below), respondents’ answers to questions 1-9 of the survey have been collated to give a comprehensive overview of all results from this first phase of the fieldwork. The table is a preferable format for the nominal display of predominately quantitative data as it presents information within an ‘accessible matrix’\(^{457}\), whereas a graph provides a representation of data by spatial relation within a diagram (bar graphs have been used later to represent the data as the independent variables are predominately categorical). Questions in the survey use a nominal scale (with the exception of Question 3, which uses a Likert scale), in which characteristics are organized within categories which are mutually exclusive, but which also lack any intrinsic order in terms of perceived priority of importance. It is essential to note that details pertaining to individual respondents’ names and contact emails (questions i and ii on the printed survey) have been omitted from the results below, for reasons of privacy:

\(^{457}\) Oppenheim, A. N., Questionnaire Design, Interviewing and Attitude Measurement, Continuum International Publishing Group – Academi, USA, 2000
Table 5.1 Results of the survey staged at 100% Design (September 21-24, 2006)

<table>
<thead>
<tr>
<th>SURVEY QUESTION</th>
<th>RESPONSE RANGE</th>
<th>RATE</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What do you do?</td>
<td>Product and Furniture Design</td>
<td>609</td>
<td>(27%)</td>
</tr>
<tr>
<td></td>
<td>Architecture and Interiors</td>
<td>453</td>
<td>(21%)</td>
</tr>
<tr>
<td></td>
<td>Graphics Design and Illustration</td>
<td>144</td>
<td>(6%)</td>
</tr>
<tr>
<td></td>
<td>Exhibition and Spatial Design</td>
<td>63</td>
<td>(3%)</td>
</tr>
<tr>
<td></td>
<td>Science and Engineering</td>
<td>36</td>
<td>(2%)</td>
</tr>
<tr>
<td></td>
<td>Student</td>
<td>312</td>
<td>(14.5%)</td>
</tr>
<tr>
<td></td>
<td>Landscape Architecture</td>
<td>3</td>
<td>(0.5%)</td>
</tr>
<tr>
<td></td>
<td>New Media and Digital</td>
<td>30</td>
<td>(1%)</td>
</tr>
<tr>
<td></td>
<td>Journalism and Media</td>
<td>108</td>
<td>(5%)</td>
</tr>
<tr>
<td></td>
<td>Government &amp; Policy</td>
<td>21</td>
<td>(1%)</td>
</tr>
<tr>
<td></td>
<td>Specifier</td>
<td>9</td>
<td>(0.5%)</td>
</tr>
<tr>
<td></td>
<td>Fashion and Textile</td>
<td>99</td>
<td>(5%)</td>
</tr>
<tr>
<td></td>
<td>Arts and Crafts</td>
<td>78</td>
<td>(5%)</td>
</tr>
<tr>
<td></td>
<td>Materials</td>
<td>30</td>
<td>1.5%</td>
</tr>
<tr>
<td></td>
<td>Research</td>
<td>63</td>
<td>(3%)</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>30</td>
<td>(1%)</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>66</td>
<td>(3%)</td>
</tr>
<tr>
<td>2. Which space do you think is</td>
<td>DarkSpace</td>
<td>852</td>
<td>(41%)</td>
</tr>
<tr>
<td>more sustainable?</td>
<td>BrightSpace</td>
<td>302</td>
<td>(14%)</td>
</tr>
<tr>
<td>3. How sustainable would you</td>
<td>0</td>
<td>83</td>
<td>(4%)</td>
</tr>
<tr>
<td>say your work is?</td>
<td>1</td>
<td>42</td>
<td>(1%)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>109</td>
<td>(5%)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>185</td>
<td>(8%)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>209</td>
<td>(9%)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>306</td>
<td>(14%)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>374</td>
<td>(17%)</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>311</td>
<td>(14%)</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>294</td>
<td>(13%)</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>95</td>
<td>(4%)</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>146</td>
<td>(7%)</td>
</tr>
<tr>
<td>4. Which strategy do you think</td>
<td>Design for recycling</td>
<td>444</td>
<td>(21%)</td>
</tr>
<tr>
<td>is more viable?</td>
<td>Design for disassembly</td>
<td>157</td>
<td>(8%)</td>
</tr>
<tr>
<td></td>
<td>Designing with low-impact</td>
<td>409</td>
<td>(20%)</td>
</tr>
<tr>
<td></td>
<td>materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design for longer lasting</td>
<td>502</td>
<td>(24%)</td>
</tr>
<tr>
<td></td>
<td>products</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Energy efficient design</td>
<td>574</td>
<td>(27%)</td>
</tr>
<tr>
<td>5. Which scenario best describes</td>
<td>Exchange a toaster after 2 years</td>
<td>234</td>
<td>(12%)</td>
</tr>
<tr>
<td>you as a user?</td>
<td>for a more energy efficient</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>model</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Replace a toaster after 6 years</td>
<td>1341</td>
<td>(62%)</td>
</tr>
<tr>
<td></td>
<td>when it breaks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Periodically repair and service</td>
<td>525</td>
<td>(26%)</td>
</tr>
<tr>
<td></td>
<td>a toaster so it runs indefinitely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. What is your most cherished</td>
<td>Laptop</td>
<td>474</td>
<td>(22%)</td>
</tr>
<tr>
<td>electrical product?</td>
<td>iPod/MP3 Player</td>
<td>324</td>
<td>(16%)</td>
</tr>
<tr>
<td></td>
<td>Mobile phone</td>
<td>147</td>
<td>(7%)</td>
</tr>
<tr>
<td></td>
<td>TV</td>
<td>120</td>
<td>(6%)</td>
</tr>
<tr>
<td></td>
<td>Lighting</td>
<td>120</td>
<td>(6%)</td>
</tr>
<tr>
<td></td>
<td>Kettle</td>
<td>72</td>
<td>(3%)</td>
</tr>
</tbody>
</table>

456 The Likert Scale used here, takes '0' as a minimal point, denoting respondents' work as completely unsustainable, and '10' as an optimal point, in which respondents view their work as completely, 100% sustainable; points '1-9' explore the territory between these two poles.
Though the results yielded by this tabular presentation of the data may appear somewhat sterile, they provide an evidential and grounded foundation upon which the second phase of the fieldwork may be situated. In ‘The Function of Dogma in Scientific Research’, Kuhn (1963) states that ‘[w]hen measurement departs from theory, it is likely to yield mere numbers, and their very neutrality makes them particularly sterile as a source of remedial suggestions. But numbers register the departure from theory with an authority and finesse that no qualitative technique can duplicate, and that departure is often enough to start a search.’

An interpretive analysis of the collated data featured in table 5.1 (above), and its implications for this research, will now follow. Through this discussion, themes, patterns and anomalies in the results will be identified. In addition, the discussion will begin to situate this empirical data within the context of the two research questions; begin to demonstrate the effectiveness of these results in addressing RQ1 and RQ2:

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459 The 6 thematic responses featured here, have been distilled through inductive analysis from the 2154 results yielded by the survey, to provide a more comprehensive interpretation and presentation of the data

- **Question 1**: In the context of this thesis, the term 'creative industry' comprises several demographic-specific profiles (listed below), which when viewed in their totality, provide a collective, aggregate profile, that is representative of a significantly large sample population; this first question on the survey aimed to gather demographic data that would facilitate the profiling of results, while also serving to ensure that the desired subject population had taken part in the survey. Results show that the overall subject populous was effectively engaged, with the clear majority of respondents coming from the fields of Product and Furniture Design (609 respondents – 27%) and Architecture and Interiors (453 respondents – 21%).

- **Figure 5.3 What do you do?**

![Bar chart showing number of respondents in various fields.](image)
- **Question 2**: this question explored attitudes to sustainable design in the specific context of product longevity. 852 respondents (41%) voted for DarkSpace (cuboidal cardboard structure) as being the most environmentally beneficial, whereas a proportionally greater 1302 respondents (59%) voted for BrightSpace (geodesic polymer dome). Although views were clearly divided, a nominal interpretation of this data indicates that the majority of respondents perceive biodegradable, short-lived products to be less environmentally favorable to longer lasting, more ecologically resilient ones; this indicates that product longevity is perceived as a viable means of achieving sustainability through design.

**Figure 5.4** Which space do you think is more sustainable?
- **Question 3**: asked respondents to make an assessment of how sustainable they thought their work was. Here, the research design is based on that of a Likert scale⁴⁶¹, as it enables respondents to rate their work in terms of its degree of sustainability on an interval scale of 0–10. Responses covered the full range of variables, though the highest percentage of respondents (374 – 17%) graded their practice at only 6 out of 10 on the sustainability scale created by this survey. Furthermore, only 146 respondents (7%) within the sample frame perceived their work as fully achieving sustainability. A practical implication of this finding is to assert that 93% of the creative industry considers its work to be largely unsustainable.

![Figure 5.5 How sustainable would you say your work is?](image)

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⁴⁶¹ Likert, R. ‘A Technique for the Measurement of Attitudes’ in Archives of Psychology 140, 55, 1932
Question 4: this question aimed to find out the creative industry's collective perception of product life extension as a viable approach to sustainable design. Though the results were varied, the majority of respondents (574 – 27%) claimed that 'energy efficient design' was the most viable approach. Of the 5 possible choices, 'design for longer lasting products' was the 2nd most common choice (502 – 24%). This further supports the assertion that product life extension is recognized as a viable approach to sustainable design, favoring it to what were previously assumed to be more dominant strategies such as 'design for recycling' (444 – 21%), 'designing with low-impact materials' (409 – 20%) and 'design for disassembly' (157 – 8%).

Figure 5.6 Which strategy do you think is most viable?
- **Question 5:** gauged respondents' attitudes toward the lifespan of a typical DEP. The variables used here may be described as discreet; quantitative variables vary in amount, whereas categorical variable differ in kind; a discreet variable is one that 'falls into a number of distinct bins'\(^{462}\). Again, results were spread across the three possible variables, but the majority of respondents (1341 - 62%) claimed that they would 'replace a toaster after 6 years when it breaks'. Surprisingly, only 525 respondents (26%) within the sample frame claimed they would 'periodically repair and service a toaster so it runs indefinitely'. This indicates that in practice, the service, upgrade and repair of DEPs may be a less favorable to consumers than is commonly assumed by product life researchers today.

**Figure 5.7** Which scenario best describes you as a user?

![Bar chart](image)

---

- **Question 6**: aims to establish firstly, whether users possess DEPs to which they are emotionally attached, and secondly, what those individual DEPs are. The ten typologies of DEPs that featured most frequently throughout the results have been listed below. Collectively, these 10 typologies represent only 1419 (66%) of the total 2154 responses to this particular survey question. This is, predictably, due to the diverse and at times obscure range of product types that featured within many of the responses, demonstrating the random, idiosyncratic character of attachment behaviors within this context. Therefore, the most common occurrence of a cherished category of DEP was a laptop (474 – 22%). Interestingly, a number of commonly owned DEPs (such as washing machines, refrigerators and irons) did not feature in any of the 2154 results. This might suggest that users are more attracted to DEPs that provide desirable services and experiences such as music (MP3/iPod – 16%), communication (mobile phone – 7%), entertainment (TV – 6%) or making hot beverages for example (kettle – 3%).

**Figure 5.8** What is your most cherished electrical product?
- **Question 7**: this qualitative question expands upon question 6, asking respondents (through both the survey, and subsequent focus group discussions) to rationalize ‘why’ they value and cherish that particular DEP. From the full range of responses received, 6 recurring experiential themes were identified within them, and have been distilled below (results have been listed in order of frequency):

  (24%) **Narrative**: users share a unique personal history with the object; this often relates to when, how and from whom the object was acquired

  (23%) **Detachment**: feel no emotional connection to the object, have low expectations and thus perceive it in a favorable way due to a lack of emotional demand or expectation (this also suggests that attachment may actually be counterproductive, as it elevates the level of expectation within the user to a point that is often unattainable).

  (23%) **Surface**: the object is physically ageing well, and developing a tangible character through time, use and sometimes misuse

  (16%) **Attachment**: feel a strong emotional connection to the object, due to the service it provides, the information it contains and the meaning it conveys

  (7%) **Fiction**: are delighted or even enchanted by the object as it is not yet fully understood or know by the user; these are often recently purchased objects that are still being explored and discovered by the user

  (7%) **Consciousness**: the object is perceived as autonomous and in possession of its own free will; it is quirky, often temperamental and interaction is an acquired skill that can be fully acquired only with practice

As can be seen above, of the 6 distilled experiential themes, narrative was the most common reason given by 526 respondents (24%). It is interesting to note, that of the 526 respondents occupying this profile, 341 received their DEP as a gift. Furthermore, although 364 (16%) of the sample population do possess DEPs to which they are emotionally attached, a far greater proportion of the sample frame (84%) perceived value in DEPs for reasons other than emotional attachment per se.
Figure 5.9 Why does it mean so much to you?

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consciousness</td>
<td>200</td>
</tr>
<tr>
<td>Fiction</td>
<td>400</td>
</tr>
<tr>
<td>Attachment</td>
<td>600</td>
</tr>
<tr>
<td>Surface</td>
<td>300</td>
</tr>
<tr>
<td>Detachment</td>
<td>100</td>
</tr>
<tr>
<td>Narrative</td>
<td>500</td>
</tr>
</tbody>
</table>

Question 8: measured the respondents' expectation of sustainable design within the context of product life extension. In response to the question, 'can anything be 100% sustainable?' 1142 respondents (53%) answered 'yes', with a marginally lesser 1012 respondents (47%) answering 'no'. This clearly illustrates that (based on current levels of understanding) the creative industry is divided in their belief that complete sustainability is, or is not, an attainable ideology.

Figure 5.10 Can anything be 100% sustainable?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>1000</td>
</tr>
<tr>
<td>Yes</td>
<td>500</td>
</tr>
</tbody>
</table>
- **Question 9:** calls for a more qualitative response to question 8; respondents were asked why they feel that it is, or is not, possible for anything to be 100% sustainable? Responses were considerably varied in both the positive and negative profiles. Of the 1142 positive (yes) responses, in which respondents felt that it was possible for a given DEP to be 100% sustainable, the following 3 recurring themes were identified, and have been distilled as follows:

  (46%) **Metaphysical:** 522 respondents (the majority of positive responses) described particular user-experiences as being 100% sustainable, rather than objects themselves; these experiences commonly included love, friendship and joy

  (29%) **Cyclic:** 328 respondents felt that when materials and energies can be renewed within closed-loop systems, objects become 100% sustainable; issues of recycling and biodegradability feature heavily in these responses

  (26%) **Longevity:** 292 respondents considered product lifespan as being central to an object achieving sustainability (the longer it lasts, the lower the impact); responses within this profile frequently referred to antiques, family heirlooms, and other enduring artefacts as positive examples

Of the 1012 negative (no) responses, in which respondents felt that it was not possible for a given DEP to be 100% sustainable, the following 5 recurring themes were identified, and have been distilled as follows:

  (28%) **Psyche:** 281 respondents assigned human nature as a permanent obstacle to any object achieving 100% sustainability; a large number of responses within this profile alluded to the human desire for newness as the greatest barrier to achieving absolute sustainability through design

  (28%) **Obsolescence:** 288 respondents in the negative profile assigned constant advancements in technology as the reason that nothing can be 100% sustainable; 93 individuals within this profile also referred specifically to fashion-obsolescence, as a limiting factor for sustainable design

  (21%) **Waste:** 217 respondents within this profile claimed that everything creates waste of some sort (during resource extraction, production, shipping, use and disposal) and therefore cannot be 100% sustainable
Excess: 143 respondents outlined the issue of scale; individual products may achieve sustainability, but when produced, shipped and used in large quantities, sustainability was believed to become less likely.

Energy: 83 respondents believed that energy consumption (during production and use) renders all products incapable of achieving 100% sustainability.

These results (both positive and negative) are helpful as they collectively signal an acknowledgement of the limitations of sustainable design, while also illustrating the subject population’s apparent proficiency in formatively evaluating the ecological integrity of products. Furthermore, the terms themselves begin to construct a vocabulary for clearer articulation of immaterial phenomenon, within the context of this study. It is also important to note that in both positive and negative profiles, strong references to the lifespan of objects were made. This further supports the argument that the creative industry does recognize issues of product longevity as being related to sustainable design.

**Figure 5.11 Why do you think that is?**

The results pertaining to both research questions (RQ1 and RQ2) were found to be conclusive, and also generated further information that superseded the original 2 research questions they aimed to address – developing broader contextual knowledge that identifies the problems and opportunities of product life extension. Firstly, RQ1 asked ‘do creative industries recognise product life extension as a viable approach to sustainable design?’ Results from the survey clearly demonstrate that product life extension is recognized as a
viable approach to sustainable design, though only 24% of respondents consider it to be the most effective strategy of the five strategies that were presented; coming second only to energy efficient design (27%).

Secondly, RQ2 asked, ‘do users possess DEPs to which they are emotionally attached?’ Results from the survey indicate that although 16% of the sample population do possess DEPs to which they are emotionally attached, a larger 84% of respondents perceived value in DEPs for reasons other than attachment per se. This data is significant in its challenging of the starting hypothesis of the research, which presupposed emotional attachment as the prime factor in product life extension consideration. It can now be seen, following interpretation of the data set, that a total of 6 thematic factors define the context (see figure 5.9). Furthermore, the fieldwork undertaken in phase 1 gathered original data indicating what these DEPs are, and from this, a shortlist of the most commonly cherished DEPs was formulated. In addition, 6 reasons as to why users cherished their specified DEP (beyond emotional attachment) were gathered through both the survey, and subsequent focus group discussions; these were narrative, attachment, detachment, fiction, surface and consciousness. These 6 experiential themes were established through a process of inductive analysis, which as Patton asserts in *Qualitative Evaluation and Research Methods* (1992), ‘studies details of the data to discover categories and dimensions.’ The implications of the empirical survey have a clear and direct impact on the results; providing an evidenced, grounded and original 6-point experiential framework for the development of emotionally durable design, which prior to this research, was not available; these 6 salient, experiential themes are proposed as having a permanent (rather than transitory) value due to their situatedness within the stable and established construct(s) of human psychological function. Collectively, they serve to define a zone of enquiry for emotionally durable design, which was carried forward to provide the foundation for the creative workshop in phase 2 of the fieldwork. This 6-point experiential framework presents a set of core principles that provide a clear, conceptual structure, for creative enquiry into issues of emotional durability and product design. Functioning as an aggregate-package, the structure, flow and feel of this text was further shaped by the distillation and merging of focus group discussion extracts (captured at fieldwork phase 1) accompanied by insight generated following a full and comprehensive review of the literature (chapter 2).

5.5 Fieldwork phase 2

Phase 2 (responding to RQ3) consists of an 8-month period of the formulation, piloting and implementation of an interdisciplinary creative workshop event (University of Brighton, 25 June, 2007). This event was followed by a 3-month period of the interpretation, development and full-scale prototyping of the workshop findings, leading to a subsequent exhibition of experimental prototype DEPs (100% Design, Earl’s Court, 20-23 September, 2007). Phase 2 of the fieldwork was developed with support from the School of Environment and Technology, and the School of Architecture and Design (University of Brighton), 100% Design and Nick Gant (BoBo Design). The workshop event featured a focussed sample of 20 attendees from both academia and industry; systematically selected interdisciplinary designers, materials specialists and behavioural scientists, generating product proposals that qualitatively address the problems and opportunities of product life extension. Workshop participants came from the sectors of Design (8), Behavioural Sciences (6) and Materials (6); a full profile of all participants can be found below:

- Nick Rawcliffe: a product and furniture designer whose work explores the experiential role of functional, everyday objects; he has an MA Industrial Design from the Royal College of Art, London
- Adeel Khan: ex Head of Business Change Management for Virgin Atlantic Airways and management consultant specialising in operational strategy and behavioural change; he has an MBA Tanaka Business School, Imperial College, London
- Dr Bernice Pan: developer of customizable clothing, based on her doctoral and industry research on mass customization for the fashion and textiles supply chain processes; she completed her postdoctoral research at the School of Engineering Design at Brunel University, London
- Ben Wilson: product and industrial designer who consults to some of the worlds leading consumer brands including Sony, Levi’s, Audi and Nike
- Karin Jachke: an architectural theorist with a specialist interest in the implementation of sustainability, through design; she has worked in the department of design and architectural theory at Bauhaus-University Weimar and undertaken study at Technische Universität Berlin, the Bartlett School London and Princeton University
- **Arash Kaynamara**: an industrial designer whose collaborative, research-driven practice spans both academic and industrial contexts; he has an MA Industrial Design from the Royal College of Art, London

- **Richard Morris**: a product designer with experience of managing large projects; his work engages with issues of innovation and the exploitation of innovation through entrepreneurial activity

- **Akil Chomoko**: strategic business developer with 12 years of experience in the emergent technology, product development and digital media sectors; he has an MBA Tanaka Business School, Imperial College, London

- **Kieren Jones**: a designer/maker with a participatory and inclusive approach to object creation that engages the user in the process of creation; he was awarded the British Council prize (2005) for the most talented UK designers

- **Kathryn Ladd**: a sustainable design specialist, whose work bridges both theoretical and practical domains; she is co-founder of product design company, Gecko, and more recently of design consultancy Factotum; her doctoral research explores the creation of a contemporary range of crafted objects with artisans in West Africa

- **Dr Natalie Woolf**: a design researcher exploring physical responsiveness using digital technologies; she completed her PhD at the Royal College of Art, London

- **Chris Rose**: an interdisciplinary, cultural theorist, whose work connects contemporary cognitive research and practices in art, design and the sciences, to generate and develop new understandings of material culture

- **James McAdam**: a designer whose work includes industrial, product and furniture design; he has an MA Design Products from the Royal College of Art, London

- **Chris Lefteri**: is an author, designer, educator and an internationally recognized authority on materials and their application in design

- **Dr Lesley Whitworth**: a design historian whose work engages with socioeconomic issues of consumption and Industrial Design; she is a Visiting Fellow at the Business History Unit at the London School of Economics

- **Ashley Phillips**: a sustainable design theorist, whose practice based research, engages with issues of inclusivity and user experience through interaction; he has a
specialist understanding of how people perceive and interact with their environments and the objects within those environments

- Hannah Scroggs: a three-dimensional design student whose practice explores material longevity, patination and the ageing process through a range of objects

- Jonathan Blaker: a post doctoral researcher in the Polymers and Composites Engineering (PaCE) Group in the Department of Chemical Engineering, Imperial College London, investigating renewable green nano-composite materials

- Sarah Owen: a three-dimensional design student whose practice looks object multiples and collections as a means to generate meaning

- Stefano Santilli: a furniture designer and director of Studio 22a; his practice integrates contemporary issues of sustainability through the finalized artifact; his postgraduate research explored emotional attachments with products

The core purpose of the workshop was twofold; firstly, the workshop aimed to provide a critical practice-based research environment, which would enable the original formulation and design of 6 experimental DEPs, each of which serve to exemplify ways of working with the 6-point experiential framework resulting from fieldwork phase 1; secondly, the workshop aimed to develop an original and transferable methodological process, through which future creative teams may develop case-specific design knowledge to address emotionally durable design, within a peer reviewed, experimental setting. Though the defining boundaries separating non-experiments, true experiments and quasi-experiments are at best blurred, this form of experimental research is clearly quasi-experimental as during the creative workshop, 'the experimenter lacks a certain degree of control over the subject'. Furthermore, this is a multiple condition experiment as it requires more than a yes/no answer; rather, it serves to both reveal and examine multiple rival hypothesise.

The methodological process of the creative workshop was piloted twice. At both pilots, the six experiential themes identified in phase 1 of the fieldwork were used, in to create a non-variable constant running throughout. Furthermore, both pilot workshops were carried out with subjects from across the primary sample population, though the timings, group sizes

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and modes of delivery were adjusted in each pilot in order to both test and establish optimum conditions for the final creative workshop.

At pilot 1 (University of Brighton, 22 February, 2007), there were 24 participants (6 groups of 4) and the session lasted four hours. The pilot was less successful than anticipated, as the session was too short to yield any useful, developed results, and though the group dynamics were reasonably successful in terms of number, each creative team lacked the diversity sought in this experiment, due to corresponding lack of disciplinary diversity in the profiles of each group member. It also became apparent through this first pilot that an excessively detailed and lengthy introduction (delivered at the opening of the workshop) served to close down the breadth of discussion, while also consuming the time and energy of participants.

At pilot 2 (University of Brighton, 27 March, 2007), there were 18 participants (6 groups of 3), and the session lasted for 6 hours. The duration of the workshop was more suitable than in pilot 1 and a greater depth of results were enabled because of this; a further 2 hours however, would have allowed for a feedback session at the end of the workshop, which would have been helpful in consolidating results, and enabling a formative assessment/review of findings. In addition, the quality of pilot 2 was further aided by a much shorter introduction to the workshop, which served to conserve the energy and time of participants, while also leaving the debate sufficiently open for each team to engage with more fully, and with a greater sense of ownership over the issues. In this second pilot, group dynamics were less successful however, with only 3 members in each team; despite this, a greater disciplinary mix in each group compensated somewhat.

In response to both pilots, it was concluded that the optimal conditions for the creative workshop were 6 groups of 4, with a duration of 8 hours (1 whole day). Furthermore, following the completion of both pilots, it was evident that object creation would have enabled the realisation, analysis and peer review of both the methodological process, and the workshop participants' interpretation of it. Therefore, the final creative workshop event (University of Brighton, 25 June, 2007) consisted of the following six stages:

1. **Context:** attendees were given a general introduction to the workshop, its origins, intensions and motivations; this presentation summarized the research and outlined the results of the information-gathering exhibition (fieldwork phase 1). To facilitate comprehension, each of the 6 experiential themes structuring the workshop were
described at the opening; piloting showed that without sufficient introduction, these experiential themes were easily misinterpreted by workshop attendees, compromising the validity of results generated. This introductory talk was followed by a question and answer session, in which issues of complexity were raised and addressed.

2. **Group**: the workshop attendees were then organized into 6 experimental groups; each group consisted of members from each of the 3-attendee profiles (listed above). Here, "[q]ualitative samples tend[ed] to be purposive, rather than random" to ensure that each group features an equal balance of individuals from academia and industry, which enabled a greater pluralism and diversity of discussion, along with a greater degree of experimental control.

3. **Experiential Theme**: each group was allocated one of the six experiential themes, and documented discussion of this theme in relation to DEPs was undertaken; the purpose of this sessions was to encourage each group to generate a shared context, whilst also enabling each group to explore, discuss and debate their particular experiential theme in isolation. Where possible, the particular specialism of each workshop participant was matched appropriately with the allocated experiential theme, to optimize the scope and validity of results.

4. **Design**: one of six DEPs were randomly selected by each group; these DEPs were a toaster, digital camera, mobile phone, MP3 player, television set and vacuum cleaner; these DEPs were selected due to their prominence in the WEEE directive’s strategic framework for waste reduction (see figure 2.2: 10 categories (and targets) for WEEE). Each team then proceeded to create object proposals for their selected DEP that addressed the needs and opportunities identified within their allocated experiential theme. During this stage of the workshop, all design, production and visual communication of each team’s proposals was carried out in preparation for the final stage of the workshop.

5. **Share**: finally, each group gave a 15-minute presentation detailing their given experiential theme, the DEP they randomly selected and the final design proposal they developed; this was accompanied by a written rationale of the design, outlining the designable conditions that nurture more durable relationships between users and DEPs (see section 5.6 for these results). This session was recorded, to facilitate the

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accurate writing-up and review of results, whilst also providing opportunities for dissemination.

6. **Collate and disseminate:** Following the creative workshop, a 2-month period of prototyping was undertaken, to develop each of the 6 proposals into a physical experimental prototype, to be exhibited at 100% Design (Earl’s Court, London, September 20-23, 2007); this exhibition was situated at the heart of one of the creative industry’s leading shows, and provided an invaluable opportunity for critical reflection and discussion of the projects findings, coupled with a further opportunity to record the industry’s response to each of the 6 DEPs through a poll (see section 5.6 for the results of this survey).

The workshop event was held at the Creativity Centre at the University of Brighton’s Cockroft site; a purpose-built venue holding up to 40 people, with immediate access to design studios, model-making workshops and extensive multimedia facilities, which rendered this an ideal venue for such an event. To achieve optimal control, the workshop environment was deliberately similar to that of the design studio environment, and in this sense is naturalistic, as the environment aimed at not influencing the results. In this naturalistic paradigm, it is assumed that there are multiple interpretations of reality and that the goal is to understand how individuals construct their own reality within their own social and professional context. Indeed, paradigms such as this do tend to be group specific, and in this way, define a paradigm as ‘the entire constellation of beliefs, values and techniques’ shared by a given community. Within both phase 1 and 2 of fieldwork, the dependent variable is the lifespan of the object (result) and the independent variable is the cause (or range of possible causes, or antecedent factors) of this; a degree of correlation between these variables will be sought, throughout all stages of the fieldwork.

Though the venue came free of charge, funding for phase 2 was still required; this was secured through the planning, pursuit and securing of a CETLC award (Centre for Excellence in Teaching and Learning through Creativity), of £5000. This enabled 8 professional designers to attend the workshop, while also covering the cost of catering (for all 20 attendees), travel and accommodation (where necessary) and also of the materials used...

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during the workshop; the cost of developing and prototyping the 6 object proposals that came out of the workshop was also covered by this funding.

The 6 experiential themes which provided the conceptual foundation for the creative workshop (narrative, attachment, detachment, fiction, surface and consciousness) were distilled from the survey (fieldwork phase 1), and so provide a meaningful link that connects both phases of fieldwork. However, prior to the event itself, it was not known what design outcomes would be developed in response to these themes. This deliberately speculative approach to the research generated essential qualitative data for addressing RQ3. As Miles and Huberman in *Qualitative Data Analysis* (1985) assert, "the strength of qualitative data is that it is rich and holistic with strong potential for revealing complexity nested in a real context."67 Indeed, design is not a precise science, and due to the deliberately serendipitous character of fieldwork phase 2, the event aimed to capture and reinvigorate the culture of critique that in previous years has empowered design with the qualities of change. In their paper entitled 'Qualitative Research Methods for Evaluating Computer Information Systems', Kaplan and Maxwell (1994) state that such research 'does not [aim to] predefine dependent and independent variables, but focuses on the full complexity of human sense making as the situation emerges.'468

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As an essential part of the design and development of the creative workshop event, it was piloted a total of two times – the second pilot responding to the findings of the first, to enable an optimal model to be achieved; both pilot workshops were carried out with individuals from across the primary sample population. The six experiential themes identified in phase 1 of the fieldwork were also used in all three pilots to create a non-variable constant running throughout. In contrast, the timings and group sizes were adjusted in each pilot in order to establish optimum conditions for the final creative workshop. In response to both pilots, it was concluded that the optimal conditions for the creative workshop were 6 groups of 3, with an overall duration of one extended day (rather than two shorter days, as was previously assumed).

The creative workshop and the subsequent dissemination, critique and peer review of its findings at 100% Design (Earl's Court, London, September 20-23, 2007) enabled the design and production of 6 experimental DEPs, which exemplify ways of working with the 6 experiential themes through which to address emotionally durable design (identified at phase 1), whilst also enabling the post-rational modelling and origination of a transferable, methodological process for developing case-specific design knowledge to address emotionally durable design (see figure 6.1). Though conceptual in nature, the 6 experimental artefacts are of value to industry, as they serve to exemplify and articulate ways of working with, and interpreting, the methodological process developed through this research. Furthermore, the importance of the 6 experimental DEPs is underscored, not by their originality per se, but by the level of critical engagement they established with members of the creative industry, at the point of dissemination. One selected example of such a discussion that took place at the show was Andrew Wong; a senior designer at the leading international industrial design consultancy, Frog Design, who engaged strongly with the issues and design methodologies articulated through the 6 DEPs; constructive discussions also took place with representatives from Electrolux and Gillette, regarding the potential of the propositions made by these artefacts, and they may be developed through the development of future workshops, which deploy the original and transferable methodological process developed through this study (see section 6.3.3).

5.6 Results from phase 2
In this section, qualitative data generated during the second phase of the fieldwork (following a 3-month period of the interpretation, development and full-scale prototyping) will be
collated and presented. In the interest of precision, this discussion will be 'situated within the specific context of the research question it aims to answer' \(^{469}\) - what designable conditions nurture more durable relationships between users and DEPs? (RQ3). From this discussion initial conclusions will be drawn, whilst a more detailed critique will take place in chapter 6.

Divided into 6 parts (one for each experimental group), the following section presents each of the 6 experiential themes explored at the workshop event, images of each of the 6 object proposals developed in response to those experiential themes, and finally, a descriptive rationale supporting each individual proposal; the complete (collated) results from the creative workshop are as follows:

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\(^{469}\) Wolcott, H. F., *The Art of Fieldwork*, Walnut Creek, CA: AltaMira Press, 1995
**Narrative:** Users share a unique personal history with the object; this often relates to when, how and from whom the object was acquired.

**Mobile phone:** The product takes all the functions of a mobile phone but focuses on sound, image and evolving form to capture and create an intense, personally-charged record of the random moments of your daily life. Manufactured from recycled materials specified by the user, the product reacts slowly, over a prolonged period of time, conforming gradually through use to the shape of your pocket. The phone is an intimate companion, and places the emphasis of the mobile phone business back onto the object. On recording, you can capture up to one-minute of sound taken from a phone call, or of moving image. At any moment it could be given as a gift to the subject of your life. Information cannot be downloaded and will be randomly deleted, as capacity is used-up.
Figure 5.13 Narrative mobile phone (by Ashley Phillips, Richard Morris, Dr Lesley Whitworth and Chris Lefteri)
**Detachment**: Feel no emotional connection to the object, have low expectations and thus perceive it in a favourable way due to a lack of emotional demand or expectation (this also suggests that attachment may actually be counterproductive, as it elevates the level of expectation within the user to a point that is often unattainable).

**Television set**: The rationale for this television starts as a journey from the TV having pride of place in the house, to relegation to the spare room to the object’s eventual scrapping. So what’s next? In our view, there are 3 desirable outcomes for the old TV: re-use, return to manufacturer or component disassembly; this product celebrates the first approach – re-use. Here, the TV is converted into a new product by the purchase of add-ons, used with the TV as a source of light and sound play; this could include a light etch-a-sketch, light stickers and light alphabets for example.
Figure 5.14 Detachment television set (by James McAdam, Arash Kaynamara and Adeel Khan)
Surface: The object is physically ageing well, and developing a tangible character through time, use and sometimes misuse.

Vacuum cleaner: This vacuum cleaner uses three key principles; modular tech components, textiles and folded-steel. Modular functionality tells the user which bits are OK, and which bits require attention. These parts may be replaced and/or upgraded as desired, and are easily installed by the user. The mobile luggage typology enables the product to be carried close to the body or being picked up, dragged etc. Furthermore, the design problem is the dirty smell – textile/leather can affect the odour aspect. There could be a by-product of the effort of vacuuming – such as the laying of an egg; the product of work (in the context of cleaning) is a good idea to give tangible result at the back end - aiming at a visual vocabulary of material recycling.
Figure 5.15 Surface vacuum cleaner (by Chris Rose, Ben Wilson, Dr Natalie Woolf and Akil Chomoko)
Attachment: Feel a strong emotional connection to the object, due to the service it provides, the information it contains and the meaning it conveys.

Digital camera: ‘Attachment’ is connected with perception(s) of quality, both in terms of performance and longevity. Attachment is also connected to long-term experiential engagement with the material substance of the object. This concept aims to prolongue the overall emotional and material lifespan of the object without sacrificing performance. The main problem is the pace of technology, leading to perceived or real depletion of the object’s quality. This modular system facilitates the user to keep pace with technological change – upgrading the parts, which would otherwise encourage detachment, and eventually, the purchase of a whole new object. The object has a backbone part, which is resistant to technological change – defining the object, and providing the basis for material continuity and sustained attachment. Emotional attachment with an evolving object is achieved where quality-over-time is maintained for longer, through both the renewal and upgrade of user-interface/function and components, in this order.
Figure 5.16 Attachment digital camera (by Karin Jaschke, Nick Rawcliffe and Jonathan Blaker)
**Fiction:** Are delighted or even enchanted by the object as it is not yet fully understood or known by the user; these are often recently purchased objects that are still being explored and discovered by the user.

**Toaster:** This is a ceramic induction-heater toaster, which appears to operate in a magical way. There are no visible controls, no mechanical elements; in fact, there are no visible technologies at all. It is a contemporary take on an old-fashioned toast rack. The user places the bread in one of the slots, to activate the heater within. Importantly, the user has to remove the toast when they ‘judge’ it to be ready. The toaster is placed on the table at meal times, and has a removable charger, which is attached via a magnetic link, adding to the sense of playfulness. Sleek, creamy-white and minimal, with the feel of an industrial component, this fictional toaster is designed to accompany any aesthetic, and sustain curiosity over time.
Figure 5.17 Fiction Toaster (by Kathryn Ladd, Kieran Jones and Hannah Scroggs)
Consciousness: The object is perceived as autonomous and in possession of its own free will; it is quirky, often temperamental and interaction is an acquired skill that can be fully acquired only with practice.

MP3 Player: This soft, amorphous, shape-shifting product responds to extremes – simulating the acknowledgement of positive moods by glowing and purring, as well as appearing to react to low moments with encouraging signals – but ultimately, temporarily stiffening or shutting-down through abuse or neglect. The music on the MP3 Player can be selected in response to mood changes, as a tool to regulate the emotional condition of the user. The accumulation of personal memory within a seemingly conscious product in this way enables the user to develop an attachment – as an owner develops with their responsive companion.
Figure 5.18 Consciousness MP3 player (by Dr Bernice Pan, Stefano Santilli and Sarah Owen)
Boland states in ‘Phenomenology: A Preferred Approach to Research in Information Systems’ (1985), that ‘[t]he philosophical base of interpretive research is hermeneutics and phenomenology.’ This form of determinism assumes that events are caused by identifiable antecedent factors. In this way, fieldwork phase 2 may be described as a hermeneutic approach to knowledge creation as it attempts to discover the deeper motives behind why people (users) behave the way they do in response to particular objects and designed experiences. RQ3 asked, ‘what designable conditions nurture more durable relationships between users and DEPs?’ The creative workshop provided an effective means to begin addressing this question, as it not only enabled the generation of design responses (as detailed in the 6 descriptive texts, above), but also explored and tested these principles through the realised artefact – an accessible language, which engaged the sample population more fully than the written word alone. In addition to the 3-month period of development, interpretation and prototyping that followed the workshop (discussed earlier), the creative workshop also generated a body of essential methodological information that, following a period of critique and reflection, was developed into an original, and transferable, methodological process for creating case-specific design knowledge to address emotionally durable design (see section 6.3.3), defining the designable conditions nurture more durable relationships between users and DEPs (RQ3).

Results of this research were disseminated as a central feature of the 100% Design show (Earl's Court, London, 20-23 September, 2007) to 37,000 members of the creative industry, along with representatives from over 700 related press and media organisations; exhibiting the 6 experimental DEPs within the neutral context of the 100% Design trade show enabled focused, open and critical discussions with targeted individuals and key industry representatives that would otherwise not have been possible. Beyond dissemination of findings, this exhibit also provided an opportunity for critical reflection, analysis and peer review of findings, it also provided an enabling platform from which to carry-out a poll, assessing the industry’s collective perception of the 6 experimental prototypes, and their perceived relative efficacy in the context of product life extension. Respondents were asked


471 One selected example of such a discussion that took place at the show was Andrew Wong; a senior designer at the leading international industrial design consultancy, Frog Design, who engaged strongly with the issues and design methodologies articulated through the 6 DEPs; constructive discussions also took place with representatives from Electrolux and Gillette
to place a sticker next to the experimental prototype that they felt was 'most likely to nurture more durable relationships with their users'; this method offered the most appropriate mode of product evaluation within this particular context, whilst also facilitating the measure of response (i.e. how many people engaged directly with the exhibits). Following the poll, stickers were counted, and data was compiled in response. The poll was also provided an essential means through which to engage participants in the spirit of enquiry and evaluation – in being provoked to make a definitive choice, respondents actively interrogate, examine and critique the 6 DEPs, enable a deeper engagement with the debate, rather than simply observing the artefacts as passive, inert bystanders. The poll engaged a total of 1141 respondents, the results of which (in order of frequency) are as follows:

Table 5.2 Results of the survey staged at 100% Design (September 20-23, 2007)

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>VOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment digital camera</td>
<td>330</td>
</tr>
<tr>
<td>Fiction toaster</td>
<td>285</td>
</tr>
<tr>
<td>Consciousness MP3 player</td>
<td>219</td>
</tr>
<tr>
<td>Narrative mobile phone</td>
<td>171</td>
</tr>
<tr>
<td>Surface vacuum cleaner</td>
<td>77</td>
</tr>
<tr>
<td>Detachment television set</td>
<td>59</td>
</tr>
</tbody>
</table>

The interaction between theory and practice that took place in 'phase 2' of the fieldwork proved invaluable as it generated a depth of insight and understanding within participants that would have been otherwise inaccessible, outside of this context; dealing with theoretical, and practice-based content in this fully-integrated way led to a more holistic mode of engagement with the workshop.
Figure 5.19 Exhibition of 6 experimental prototype objects at 100% Design (2007)

Source: Author
5.7 Critical reflection and assessment of work

Throughout the previous sections of this chapter, the research design, and methodologies employed throughout fieldwork phases 1 and 2, have been both described and rationalised. In the following section, the approaches taken will be reflected upon, in order to enable an initial assessment of the research in terms of its effectiveness, originality. This retrospective evaluation will be achieved through the aligning of phase 1 and 2 of the fieldwork, against the arguments constructed in the review of the literature (chapter 2), which itself, will be aligned to the original hypothesis that sets out the initial aim of this research.

This initial aim was to question why users dispose of products that still work? The underlying hypothesis (as detailed in chapter 1) was that consumer desires continually evolve whilst material possessions remain relatively frozen in time; it is this incapacity for mutual evolution that renders most products incapable of sustaining durable, emphatic relationships with users. The quantity of waste this single inconsistency generates is substantial, coming at increasing cost to legislation-burdened manufacturers and the natural world. In this sense, it can be seen that more enduring connections between users and DEPs are crucial for both manufacturers and consumers in an age of increasing environmental legislation and wasteful consumption. This hypothesis was reached through deductive reasoning, and is a directional hypothesis as it makes a specific prediction about the nature and direction of the relationship between the independent and dependent variables.

In response to this hypothesis, research was undertaken to afford this thesis with a defined research context, coupled with a review of the literature to date. In the review of the literature (chapter 2) it was revealed that three notable gaps in understanding were evident within the knowledge field that this research occupies (as identified in chapter 3). Firstly, it was observed that in the case of DEPs, insufficient research addressed the industry’s perception of product life extension. Though ample research clearly indicated that consumers are ready to engage with longer lasting products, it was not understood how individuals operating within the defined territory of the creative industry regard product life extension. Secondly, there was insufficient evidence to indicate whether users possess DEPs to which they are emotionally attached. It is widely assumed that they do, but on what scale, and for what reasons it was unclear. This scarcity of research was particularly evident within the context of DEPs, yet as more of our everyday life becomes electronically mediated, it would appear that this growing context is where research is needed most. Finally, it was noted that although the social, economic and environmental need for the design of longer lasting
products is well documented within the literature, opportunities for practice-based research exist, that (through their existence) define a provisional framework for the design and production of emotionally durable DEPs. It was considered that if these gaps in knowledge were to be explored, important information could be generated that (following interpretation) could have positive implications for the current situation. In response to this, three research questions were formulated (see chapter 4) that target each of the three identified areas of need within the field. The three research questions were:

RQ1 Do creative industries recognise product life extension as a viable approach to sustainable design?

RQ2 Do users possess DEPs to which they are emotionally attached?

RQ3 What designable conditions nurture more durable relationships between users and DEPs?

Although each of these questions could have been addressed in a number of ways, the research design for all fieldwork (phases 1 and 2) aimed to be appropriate to the subject population that was targeted. Furthermore, though three research questions underpin this thesis, the fieldwork designed to explore and address these questions consists of just two parts, or phases. Splitting the fieldwork into two distinct phases proved to be a successful strategy, based on the strength and value of results produced by each phase. This is because the research design enabled the research questions to be explored with a sufficient degree of depth and focus, while also enabling two very different, yet theoretically linked, streams of investigative inquiry to be carried out.

In terms of the limitations of this study it may be stated that, though deliberately broad and inclusive, the definition of domestic electronic products (DEPs) can be restrictive. This is due to its grouping together of multiple product categories, namely, electrical products (kettles, toaster, refrigerators, washing machines etc.) and electronic products (laptops, MP3 players, mobile phones, digital cameras etc.). The implications of this for future research are described later in section 6.4, where a case for further delineation between electrical and electronic products is made, to enable greater distinction between these categories of products. Similarly, it may be argued that the title of this study, ‘Emotionally Durable Design: Sustaining relationships between users and domestic electronic products’ is of a restrictive character due, in part, to the use of the term domestic electronic products, but also due to its
accessible and inclusive sense. Indeed, the title has value due to its direct communication of the broad theoretical context of this study, yet through this, it may be argued that the precision and depth of this study may therefore be overlooked.

5.8 Summary
In this penultimate chapter, the processes and procedures through which the three research questions (developed in chapter 4) were addressed, have been detailed and rationalized. It is important to note that this chapter did not feature any of the inevitable blind alleys, or dead ends that were encountered during the research; rather, this chapter focuses purely on research activity that was conducive to addressing RQ1, RQ2 and RQ3. A collective overview of all fieldwork was given (section 5.2) that rationalized the splitting of fieldwork into two distinct phases, as aligned against the three research questions. Following this, a detailed account of the design and implementation of research methodologies for both phase 1 and 2 of the fieldwork was given (section 5.3 and 5.5). This provided a comprehensive overview not only of the methods used, but also of the rationale behind their selection. The results from both phases of the fieldwork were then collated and interpreted (section 5.4 and 5.6). In this way, it can be seen that construct validity has been achieved, which, according to Cook and Campbell in their paper entitled 'The design and conduct of quasi-experiments and true experiments in field settings' (1976), occurs when 'the results support the theory behind the research.' A detailed account of the realizations that emerged from this (section 5.7) includes a critical reflection and assessment of the work, a restating of the hypothesis, and from this, a demonstration of precision, thoroughness and originality. Much of the discussion within this chapter is set against the argument constructed in the review of the literature (chapter 2). Following completion of this section of the thesis it is evident that the results generated by the fieldwork (phase 1 and 2) have been effective in exploring and responding to RQ1, RQ2 and RQ3. From these results, initial conclusions were drawn (section 5.4 and 5.6) that provide a basis for the final chapter of this thesis (chapter 6) where these conclusions, and their specific contributions to knowledge will be stated more fully.

472 Cook, T. D. & Campbell, T. D., 'The design and conduct of quasi-experiments and true experiments in field settings'. In M. D. Dunette (Ed.), Handbook of organizational psychology, Rand McNally, Chicago, 1976, pp223-326
6 Conclusions

6.1 Introduction

This chapter has been divided into three sections to enable greater precision in the discussion:

- **Conclusions**: a concise statement regarding the inferences made by this research
- **Contributions to knowledge**: the new and original knowledge generated by this work
- **Future research**: a description of future research opportunities

6.2 Conclusions

Commercial interest in the lifespans of manufactured objects can be traced back to Bernard London’s introduced of the term ‘planned obsolescence’\(^\text{473}\), in 1932. Almost 80 years later, the fieldwork driving this thesis has shown that, today, the design of longer lasting products is widely recognized as a viable approach to sustainable design. Yet despite the pervasive nature of this recognition, practical design tools and methodologies that enable designers to effectively address these issues, have yet to be developed. Indeed, though the historical discourse is familiar, a tangible and accessible vocabulary is lacking within the specific context product life extension and the DEP. This thesis argues that this lack has contributed to a current state of inertia within both academic and industrial domains, in which an absence of accessible, practical methodological information has served to freeze progress. This research engages directly with this; generating new practical design information that enables designers to more effectively engage with complex issues of emotional durability through design.

This thesis examines the knowledge fields of sustainable design, emotional and user-centred design, and consumer behaviour and is set against the policy-driven demands of the EU WEEE Directive. Following collation and interpretation of all fieldwork within these contexts, conclusions may be stated in response to the findings outlined in the previous chapters; these conclusions are stated in relation to the three research questions (RQ1, RQ2 and RQ3) that drove their investigation.

Firstly, it may be concluded that product life extension is widely recognized within the creative industry as a viable approach to sustainable design (RQ1), though undoubtedly, disagreement and debate surrounds the means through which this may be approached. Prior to this research, it was not known how the designers regarded the commercial viability of longer lasting products and it was clear, following a comprehensive review of the literature, that this gap in knowledge was obstructing the development of new creative strategies to enable the design of longer lasting, emotionally durable DEPs. This obstruction was particularly problematic in the emerging context of the EU WEEE Directive, where viable strategies to enable enhanced product longevity, if supported, could provide an economically viable means of compliance. As a result of the new information generated through this research, it can now be proposed with greater confidence that considering an alternative commercial model, in which users keep DEPs for longer periods of time, is a potentially viable option; enabling further turnover to be generated through the servicing, upgrade and repair of products, whilst avoiding fines and other litigation for operating in violation of the EU WEEE Directive.

Secondly, it may be concluded that users do possess DEPs to which they are emotionally attached (RQ2). As everyday life continues to grow evermore electronically mediated, it becomes increasingly essential that greater understanding be generated as to the particular experiential character of users' relationships with their DEPs. Following this research it may be concluded that (within the sample frame) value was perceived in DEPs due to the presence of one of the following six experiential themes; narrative (24%), surface (23%), detachment (23%), attachment (16%), fiction (7%) and consciousness (7%). It is argued here, that these results have a high external validity as their implications span beyond the context of the original sample frame. Indeed, these results were generated in response to a survey (followed by subsequent focus group discussions) that explored and examined fundamental user/product scenarios, and as a result, the specific identifiable emotional characteristics that emerged through this study have relevance and meaning beyond the immediate sample population. Following a critical period of interpretation, these experiential themes (described in chapter 5) were developed further, to form a 6-point experiential framework (see section 6.3.1), enabling a more structured mode of inquiry and exploration into salient issues of emotional durability and design.
Third and finally, conclusions may be drawn from this research that serve to define the designable conditions that nurture durable relationships between users and DEPs (RQ3). Following a comprehensive review of the literature, a demonstrable lack of accessible, useable information for creative practitioners became evident, while beyond issues of accessibility it was also not fully understood how to approach the design and development of emotionally durable DEPs. Through this research, six experimental DEPs were developed that manifest six distinctive ways of working (see section 6.3.2). Individually, each of the six experimental DEPs exemplifies one particular thematic approach to emotionally durable design. Collectively, the six experimental DEPs further support the definition of a territory of enquiry for emotionally durable design. In addition, an original and transferable methodological process for developing case-specific design knowledge to address emotionally durable design was formed in response to insight generated through phase 2 of this research (see section 6.3.3); this transferable methodological process was generated through reflective analysis of the creative workshop, both in terms of its process, and product, and may be described as an emergent property, generated by this research.

6.3 Contributions to knowledge
The aim of this thesis is to generate practical design information that enables product designers to consider the emotionally durable potential of DEPs, presenting a more expansive, holistic understanding of design for durability – both in terms of the paradigm, and that of the language used to articulate it – and more broadly, the lived-experience of sustainability. The three key contributions made by this thesis are thus; (1) the implicit development of a 6-point experiential framework to structure inquiry and exploration into salient issues of emotional durability through design; (2) the design and production of 6 experimental DEPs, which exemplify ways of working with the 6-point experiential framework; (3) the development of an original, and transferable, methodology for developing case-specific design knowledge to address emotionally durable design. A descriptive account of these contributions will now follow.
6.3.1 The evidenced identification of a 6-point experiential framework to structure inquiry and exploration into salient issues of emotional durability through design

This experiential framework disassembles the findings of this research into six divergent streams of enquiry; providing designers with distinct conceptual pathways through which to initiate engagement with issues of emotional durability. These pathways are essential to the practitioner, enabling them to begin framing and articulating specific points of intervention; enabling a more structured, focussed model of exploration into issues emotional durability and design. Furthermore, as a collection of terms, an original territory of enquiry is delineated and defined. The 6-point experiential framework (and supporting annotations) is as follows:

- **Narrative**: users share a unique personal history with the object; this often relates to when, how and from whom the object was acquired
- **Detachment**: feel no emotional connection to the object, have low expectations and thus perceive it in a favorable way due to a lack of emotional demand or expectation (this also suggests that attachment may actually be counterproductive, as it elevates the level of expectation within the user to a point that is often unattainable)
- **Surface**: the object is physically ageing well, and developing a tangible character through time, use and sometimes misuse
- **Attachment**: feel a strong emotional connection to the object, due to the service it provides, the information it contains and the meaning it conveys

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474 On Tuesday 5 February 2008, the 6-point experiential framework was presented as evidence at The House of Lords and examined by The Science and Technology Committee as a part of their ‘Enquiry into Waste Reduction’. The evidence was presented within the context of providing product designers with distinct conceptual pathways through which to initiate engagement with emotionally durable design, and the EU WEEE Directive. Chaired by Lord O’Neill of Clackmannan, the session aimed at examining ways in which products and production processes can be made more sustainable and therefore produce less waste. Following the session, this evidence (featuring the 6-point experiential framework, and supporting annotations) will be appended to The House of Lords Science and Technology Committee’s Report, which will be published in the summer of 2008; this report is described by the House as being instrumental in advising, steering and directing the development, formulation and implementation of future British governmental policy, within the dual contexts of product design and sustainability. A full transcript of this session, along with the supporting documentation (featuring the 6-point experiential framework), can be found on The House of Lords web site at: http://www.parliament.uk/parliamentary_committees/lords_s_t_select.cfm
- Fiction: are delighted or even enchanted by the object as it is not yet fully understood or know by the user; these are often recently purchased objects that are still being explored and discovered by the user
- Consciousness: the object is perceived as autonomous and in possession of its own free will; it is quirky, often temperamental and interaction is an acquired skill that can be fully acquired only with practice

This 6-point experiential framework presents a set of core principles that provide a clear, conceptual structure, for creative enquiry into issues of emotional durability and product design. Functioning as an aggregate-package, the structure, flow and feel of this text was further shaped by the distillation and merging of focus group discussion extracts (captured at fieldwork phase 1) accompanied by insight generated following a full and comprehensive review of the literature (chapter 2).

6.3.2 The design and production of 6 experimental DEPs, which exemplify ways of working with the 6-point experiential framework

Both individually, and as a collection, the 6 co-designed DEPs embody new and original ways of working with the 6 experiential themes (described in section 6.3.1); testing these principles through the accessible, inclusive language of objects, as a means to engage the sample population more fully than with the written word alone. The review of the literature reveals there is a lack of accessible, useable information for creative practitioners today, which greatly diminishes the likelihood of design being redirected toward the creation of more emotionally durable DEPs.

This process of conversion (theory to practice), gives rise to the emergence of new, iterative understandings of the theory from which the practice originated. This cyclical transaction between words (6-point experiential framework) to objects (6 experimental DEPs), underscores the significance of this contribution. In this sense, the 6 experimental DEPs are enabling items; providing case-study illustrations that both individually, and collectively, articulate the designable conditions that nurture more durable relationships between users and DEPs.
6.3.3 The development of an original, and transferable, methodological process for developing case-specific design knowledge to address emotionally durable design

Founded upon the 6-point experiential framework (described in section 6.3.1), and further shaped by the creative workshop findings, this transferable methodological process exists as a cyclical model of theoretical enquiry manifest through object formation, originating from a common theoretical source. The significance of this model is underscored by its potential for transference and the development of case-specific proposals for emotionally durable DEPs within a range of market sectors. As illustrated in figure 6.1 (below), the process exists as a series of 6 experientially distinct filters, or lenses, through which product proposals may be examined and developed by any given creative team; following this process, object creation takes place, which allows for the critical reflection and discussion of the findings (both amongst the workshop participants, and externally through a peer review process); from this, insight is generated, which is fed back into the cycle a second time to enable refinement and advancement of concept, with the ultimate aim of informing and directing design activity.

Rather than disseminating the information generated through this research for more formal cognition in a didactic, rote manner, the contributions made by this thesis empower organisations to take these issues on themselves, and initiate duplicate workshops in response to the framework(s) laid out in this thesis.

Figure 6.1 A transferable, methodological process for developing case-specific design knowledge to address emotionally durable design (Overleaf)
6.8 Future research

Due to the international orientation of much of the design and production of DEPs, it is proposed that a comparative study be undertaken, situated outside the immediate geographic context of this thesis – the UK. Furthermore, if that study were to be situation within a region of rapid socio-economic development, such as India, China or Brazil for example, it could be hypothesized that an alternative vocabulary of attachment phenomena would be identified, while different DEPs may be found as being the focus of attachment behaviors. It is also probable that the designers within those geographic contexts may have a different perception of product life extension than their UK (and in many cases, EU) counterparts? Future research of this orientation would not only enable opportunities for the cross-referencing of data between two culturally, and geographically, different sample populations in a way that would yield results (beneficial to both) through the development of a more expansive dataset, but would also look to develop sustainable design strategies within an identified area of growing ecological concern (developing nations).

Though deliberately broad and inclusive, the definition of domestic electronic products (DEPs) used in this study has limitations, due to its grouping together of multiple product categories – namely, electrical products (kettles, toaster, refrigerators, washing machines etc.) and electronic products (laptops, MP3 players, mobile phones, digital cameras etc.). Therefore, in future studies, further delineation should be made between electrical and electronic products. Indeed, a second opportunity for future research would be to isolate the study to electronic (as opposed to electrical) products only; this classification would enable further detailed study to be undertaken, which examines specific user relationships with objects capable of storing and containing personal information (in a virtual sense). As with this study, it would be appropriate to then bridge theory with practice, by defining an accessible design framework for the development of such products.

A third avenue for future study would be to develop an alternative structure for the creative workshop element of phase 2; combining the 6 experiential themes within a single design-based exercise, in which a single product is designed in an integrated way, with considerations made to all 6 themes, simultaneously. This would be distinctive from the exercise presented within this thesis, in which a single product was designed using a single experiential theme, in isolation. Furthermore, a future design-based exercise could be conducted individually (rather than with small groups, as in this study) as a means to
deliberately avoid the natural tendency of any group toward the streamlining of ideas to achieve consensual agreement, as this can serve to compromise the originality of results generated. Finally, a future design-based event could be conducted over a longer timescale (rather than a single day) to enable participants to engage with a greater depth and scope of inquiry.

Fourth and finally, the feedback gathered at the dissemination point for this research (100% Design, 20-23 September, 2007), indicates that several opportunities now exist for future research with key industrial organizations – including Frog Design, Electrolux and Gillette – that applies the original methodological process generated through this thesis, to develop case-specific design knowledge addressing emotionally durable design, within specific DEP sectors; moving toward the practical implementation of the new and original knowledge generated by this research. In addition, the methodological process defined through this research could be placed within alternative contexts; within a purely academic context for example, it would provide theoretical architecture to better examine the problems and opportunities of product life extension.
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