

NOTE TO USERS

This reproduction is the best copy available.

UMI[®]



Sustainable Design: Strategies for Favouring Attachment between Users and Objects

Yi Zhang

A Thesis
in
the Special Individualized Program

Presented in Partial Fulfillment of the Requirements
for the Degree of Master of Arts
(Special Individualized Program Fine Arts)
at
Concordia University
Montreal, Quebec, Canada

November 2008

© Yi Zhang, 2008



Library and Archives
Canada

Bibliothèque et
Archives Canada

Published Heritage
Branch

Direction du
Patrimoine de l'édition

395 Wellington Street
Ottawa ON K1A 0N4
Canada

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file *Votre référence*
ISBN: 978-0-494-63226-0
Our file *Notre référence*
ISBN: 978-0-494-63226-0

NOTICE:

The author has granted a non-exclusive license allowing Library and Archives Canada to reproduce, publish, archive, preserve, conserve, communicate to the public by telecommunication or on the Internet, loan, distribute and sell theses worldwide, for commercial or non-commercial purposes, in microform, paper, electronic and/or any other formats.

The author retains copyright ownership and moral rights in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this thesis.

While these forms may be included in the document page count, their removal does not represent any loss of content from the thesis.

AVIS:

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque et Archives Canada de reproduire, publier, archiver, sauvegarder, conserver, transmettre au public par télécommunication ou par l'Internet, prêter, distribuer et vendre des thèses partout dans le monde, à des fins commerciales ou autres, sur support microforme, papier, électronique et/ou autres formats.

L'auteur conserve la propriété du droit d'auteur et des droits moraux qui protègent cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de cette thèse.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.


Canada

ABSTRACT

Sustainable Design: Strategies for Favouring Attachment between Users and Objects

Yi Zhang

This paper explores the relationships between subjective experiences and objective design parameters. It presents findings from a research project that questions the notion of attachment between users and objects, attempts to understand its emotional origins and seeks to propose design strategies that favour its development. The researcher summarizes the initial outcomes derived from ethnographic interviews conducted among thirty people. This paper suggests that utility, appearance, symbolic meaning and users' experience are four key reasons that sustain the emotional attachment. The study also reveals the importance of sentimental values which users associated with particular products, generated by relationships, memories, and life experiences. Four design strategies are proposed corresponding to each type of attachment. Sustainable design strategies informed by these insights and their implications for design practices are to be explored.

KEYWORDS

Sustainable design strategies, Attachment, Emotion, Experience

TABLE OF CONTENTS

LIST OF FIGURES.....	viii
LIST OF TABLES.....	x
PROLOGUE.....	xi
CHAPTER 1: INTRODUCTION.....	1
1.1 Research Question.....	2
1.2 Delimitation.....	4
1.3 Research Plan.....	8
CHAPTER 2: EXAMINING SUSTAINABLE DESIGN STRATEGIES.....	11
THROUGH LITERATURE REVIEW	
2.1 The Designers' Sector: Bringing Environmentally-Sound Criteria.....	13
into Consideration in the Design Phase	
2.1.1 Design for Disassembly.....	13
2.1.2 Design for Efficiency.....	14
2.1.3 Design for Effectiveness.....	18
2.1.4 Design for Disposal.....	19
2.1.5 Design for Longevity.....	20

2.2 The Enterprise Sector: Minimizing Environmental Impact.....	27
through New Production Processes and New Business Models	
2.3 The Government’s Sector: Setting Up Regulations to Guide Activities.....	30
2.4 The Public Sector: Public Awareness and Ethical Consumerism.....	31
2.5 Ethical Awareness: Key to Achieving Sustainability.....	33
CHAPTER 3: EXPLORING EMOTIONAL ATTACHMENT BETWEEN.....	35
USERS AND OBJECTS	
3.1 Attachment: A Term Derived from the Field of Psychology	36
3.2 Consumption: A Desire to Satisfy Unlimited Needs.....	37
3.3 Objects: An Important Role in Everyday Life.....	38
3.4 Emotions Benefit Long-Term Attachment.....	40
3.5 Design to Sustain and Evolve Emotion.....	41
3.5.1 Narrative: Telling Stories about a Product.....	42
3.5.2 Fiction: Embedding Dreams in a Product.....	43
3.5.3 Experience: Activating Users’ Emotions.....	44
3.5.4 Customization: Building Individual Connection to Objects.....	45
3.5.5 Participatory Design: Involving Users into Design Process.....	46
3.6 Emotion: Dare to Desire.....	47

CHAPTER 4: METHODOLOGY.....	48
4.1 Objective of the Interview.....	48
4.2 Method of the Interview.....	49
4.3 Description of the Interview Guide.....	51
4.4 Profile of the Interviewees.....	54
4.5 Process of the Interview.....	56
CHAPTER 5: RESULTS OF INTERPRETATION OF INTERVIEWS.....	59
5.1 Most Attached Objects.....	59
5.2 Attachment to Tools of Transportation.....	66
5.3 Attachment to IT/Communication Devices.....	69
5.4 Attachment to Entertainment Products.....	73
5.5 Attachment to Domestic Appliances.....	76
5.6 Attachment to Furniture.....	79
5.7 Attachment to Clothing and Related Accessories.....	82
5.8 Attitude toward Old Objects.....	84
5.9 Different Levels of Attachment to the Objects in the Eight Scenarios.....	86
5.10 Insights Gained from the Interviews.....	92

CHAPTER 6: PROPOSAL OF DESIGN STRATEGIES FOR	97
ENHANCING ATTACHMENT	
6.1 Design for Adaptation.....	97
6.2 Design for Expression.....	102
6.3 Design for Individuality.....	107
6.4 Design for Experience.....	111
CHAPTER 7: CONCLUSION.....	115
BIBLIOGRAPHY.....	119
APPENDICES.....	124
Appendix 1: Consent Form to Participate in Research.....	124
Appendix 2: Interview Guide.....	127
Appendix 3: Interview Data.....	131

LIST OF FIGURES

Figure 1. Four responsible parties in achieving sustainability.....	5
Figure 2. Research plan.....	9
Figure 3. Sustainable design strategies and responsible parties.....	12
Figure 4. Ranger wind-up, solar and rechargeable radio	15
- Reducing the use of energy	
Figure 5. Droog rag chair	15
- Reusing old clothes to make a new customized chair	
Figure 6. Blackspots V2 shoes	15
- Recycling old tires for the sole of shoes	
Figure 7. Hockey stick bench.....	15
- Reusing hockey sticks and recyclable plastics to build a bench	
Figure 8. Key phases of Life Cycle Assessment	29
Figure 9. Categorizing most attached objects within four types of attachment.....	61
Figure 10. The order of preference for the proposed objects	89
Figure 11. Braun Pulsonic shaver.....	99
Figure 12. Swiss army knife.....	100
Figure 13. P'kolino Storage Kube Set.....	100

Figure 14. Apple USB mouse.....	101
Figure 15. Lagostina cookware.....	103
Figure 16. YOD toy.....	104
Figure 17. Juicy Salif lemon squeezer.....	105
Figure18. Kettle with bird.....	105
Figure 19. Condiment set.....	105
Figure 20. Hot Bertaa kettle.....	106
Figure 21. Lacoste poster.....	109
Figure 22. Mobile phone covers.....	110
Figure 23. MINI Cooper.....	113
Figure 24. Nintendo Wii.....	114

LIST OF TABLES

Table 1. Profile of interviewees: by gender and age.....	55
Table 2. Profile of interviewees: by profession.....	55
Table 3. The most attached objects and the reasons for the strong attachment.....	59
Table 4. Proposed objects and design strategies.....	87
Table 5. Main reasons for broken or strong attachment for each category of objects...	93
Table 6. Interviewees' attachment to tools of transportation (cars).....	131
Table 7. Interviewees' attachment to tools of transportation (bicycles).....	133
Table 8. Interviewees' attachment to IT and communication devices (cell phones)...	135
Table 9. Interviewees' attachment to IT and communication devices (computers).....	137
Table 10. Interviewees' attachment to entertainment products.....	139
(MP3 and DVD players)	
Table 11. Interviewees' attachment to entertainment products (TV sets).....	141
Table 12. Interviewees' attachment to domestic appliances.....	143
Table 13. Interviewees' attachment to furniture.....	145
Table 14. Interviewees' attachment to clothing and related accessories.....	147
Table 15. Interviewees' attachment to objects placed in the eight scenarios.....	149

PROLOGUE

Twenty years ago in China, junk dealers bought old objects from residents in the city and sold them to people living in the country side. I still remember their catchy tones, like folk songs, when they cried out for objects either too old to be used or too broken to be repaired. Such items could be clothes, shoes, furniture, or small household goods. There were also recycling stores at each residential community for recycling papers, metals or broken appliances, from which most items were sent to manufacturers to be reused as raw materials. However, for financial reasons, people seldom threw anything away. Instead, they tried to repair, reuse and recycle everything. I had a great deal of fun collecting discarded objects for recycling and was proud to be able to help my family—feelings I remember well even today. In developing countries, people practice “sustainable design strategies” even though they do not realize it. Victor Papanek, designer and educator, also observed this phenomenon in developing countries, such as with people in Nigeria using old tires to make water containers and collecting waste as burning fuel (Papanek, 1995). It is a way of living by which people manage to survive and to live better.

As a nation’s economy grows, the basic needs for food, shelter and

survival become less critical for people who live in developed countries. The rise of mass consumption has particularly dramatic effects as people are overwhelmed by the messages that promote dazzling technologies, products and services. Consumerism promises personal satisfaction, but the desire to consume keeps growing. As one of the consequences of over-consumption, tons of products end up in the landfills even though they are still functional. More than simply a waste, these discarded goods have great environmental impact. For example, the disposal of used computers is a burgeoning environmental problem. According to H. Scott Matthews' widely cited study (1997), Americans throw away 10 million used PCs each year. Silicon Valley Toxics Coalition, an environmental advocacy group that monitors the computing and high-tech industries, has reported that more than 700 chemical compounds are used to make one computer work station, and each discarded computer is full of hazardous chemicals (L. John and JR. Allen, 1998). The mobile phone is another challenge. In 1992, fewer than 1 percent of people worldwide had cell phones and only a third of all countries had cellular networks. Just 10 years later, 18 percent of people (1.14 billion) had cell phones. By 2005, consumers have stockpiled some 500 million used cell phones that are likely to end up in landfills where they could leach as many as 142 tons of lead into the

environment (Sheehan, 2004).

Papanek (1995) suggested that there are three primary approaches to this severe environmental crisis: making changes on an individual or family level, leaving the issue to the experts to solve, examining what each of us can contribute from our own specific role in society, which calls on each of us to see what we can do from the perspective of our professions and lives. McDonough and Braungart (2002) argued that the conflict between industry and the environment is not an indictment of commerce but an outgrowth of purely opportunistic, outdated and unintelligent design and that, for designers, trying to be “less bad” is not good enough, considering the objective of sustainable design. The responsibility of a designer is more than offering functional products; it is to design environment-friendly products that promote an environment-friendly life style.

My childhood experience, along with the passion and the willingness to be a responsible industrial designer, motivate me to conduct research on sustainable design, specifically on minimizing the impact of discarded objects. I believe each individual effort is important to change the world.

CHAPTER 1

INTRODUCTION

Sustainable development focuses mainly on economic, environmental and social issues. Among many definitions, the most commonly cited definition of sustainable development comes from the report “Our Common Future,” also known as the Brundtland Report, which defines sustainable development as development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland Commission, 1987). As one of the tools under the umbrella of sustainable development, sustainable design can have profound and direct influence on how the development of products, tools, machines, artifacts, and other devices impacts the environment (Papanek, 1995). As an industrial designer, I am particularly interested in exploring strategies for designing physical objects to comply with the principles of economic, social, and ecological sustainability.

The objectives of this paper are to examine existing sustainable design strategies, to identify different types and levels of attachment between users and objects and its impacts on products’ longevity; and to develop design strategies that

enhance the attachment. This research project attempts to uncover the emotional origins of attachment and proposes design strategies that favour its development.

1.1 Research Question

The current economic model still follows the rule that, the more we produce and sell, the more the economy grows. As a result, tons of products end up in landfills, even though they are still functional, causing severe environmental problems. Research on this behaviour, on retaining products' durability and longevity, and on minimizing the impact of the man-made world on the natural world includes Van Hinte's (2004) suggestion that people discard still-functional objects because of poor quality, boredom, outdated technology or loss of attractiveness. A lecturer at the University of Brighton, Jonathan Chapman (2005) argued that waste is symptomatic of a failed relationship between user and object that leads to disposal. He further suggested that products that can evolve with the users' experience can sustain the attachment between product and user and avoid rapid obsolescence. In discussing how objects attain such longevity, Norman (2004) used three teapots he had kept for long time to illustrate three components of product design: usability, aesthetics and practicality. Because of the meaning

of the objects, the emotional feeling they generate and the memory they invoke, the three teapots are successfully attached to their user and have attained longevity. Esslinger, the founder of Frog Design, suggested that consumers do not just buy a product, but value in the form of entertainment, experience and self-identity. Along with his philosophy of “form following emotion,” Esslinger also argued that people will keep the product longer if it has built in emotional value (Demirbilek and Sener, 2003). A survey conducted during the PRéco project (www.preco.ca, 2003), led by Professor Racine from Concordia University and Professor Lalonde from University of Montreal, found that users refrained from discarding even broken objects to which they were attached. One interviewee told the researchers that he would have his broken food processor repaired instead of buying a new one because he loves a particular size and shape of the vegetable the food processor cut for his salad. Thus, attachment to a satisfying performance preserves this broken object and keeps it from being thrown away. These investigations all show a strong current of thought among researchers that there might be a causal link between lack of attachment and early obsolescence of products and that a high level of attachment is likely one of the factors of product longevity.

Based on these findings, the current research project explores the strategies that favour attachment between users and objects in order to benefit the longevity of products. **The research question is: Considering the objective of sustainable design, what strategies can be sought to favour attachment between users and objects?** The first challenge of the research is to understand the different strategies that have been used to reach sustainability, as well as their strengths, limitations and experimental conditions. In order to gain a deeper understanding of how emotional attachment affects product longevity and how to transfer certain elements into design strategies that reinforce user experiences, the researcher reviews the literature on the notion of attachment, emotion, and the nature of objects. Then, through in-depth interviews, the researcher explores questions such as why and how people attach themselves to objects, what kind of emotions are behind each type of attachment, and what keeps the attachment alive and evolving.

1.2 Delimitation

Sustainable design cannot gain success without support from each of the four main responsible parties: consumers, marketing experts, manufacturers and

the government. These parties are related within a systematic frame in order to achieve sustainability (Figure 1).

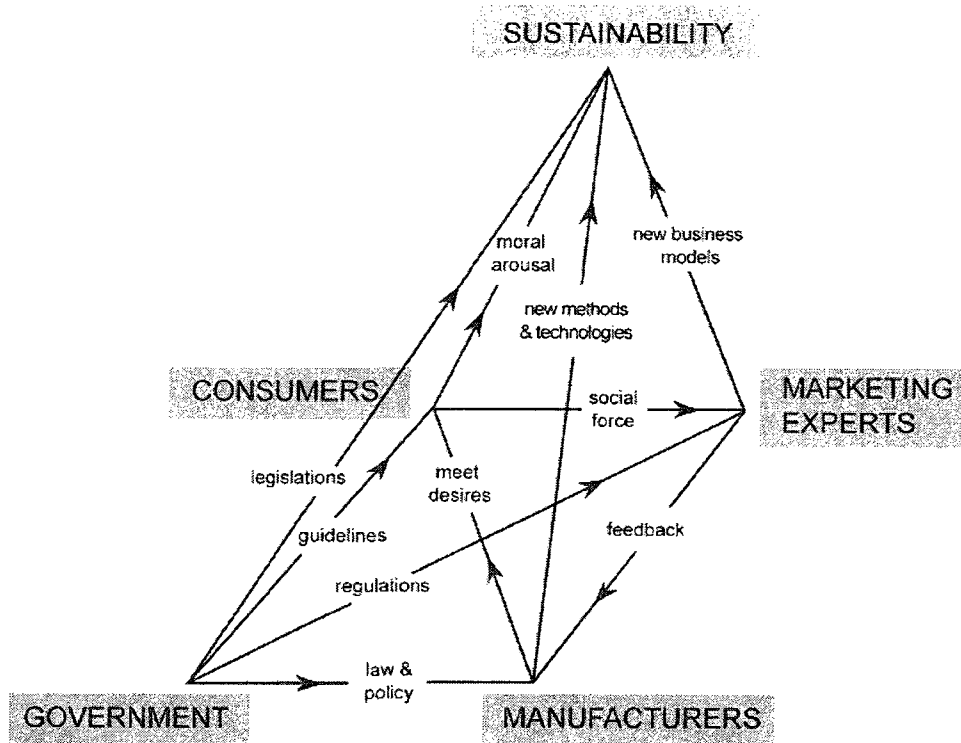


Fig. 1. Four responsible parties in achieving sustainability

Consumers are the social force that pushes the whole system towards an ecological direction. Their ethical concerns not only lead to responsible consumption, but also apply pressure to marketers, manufacturers and the government. Equiterre, founded in 1993, is a large group of organizations developing projects that empower citizens to make environmentally and socially responsible choices. Marketing experts play another key role in the effort towards sustainability. They are the ones who propose new business models and

strategies, such as shifting the focus from selling goods to selling good service, conducting renew-and-exchange programs to reinforce brand loyalty, and so on. Manufacturers, the third key players in the framework, should continuously seek new methods and technologies to minimize environmental impact during the production and transportation phases. Finally, the government is responsible for establishing regulations and passing legislation to protect the environment while growing the economy. In January 1993, Germany's government launched the German Packaging Ordinance¹ program, which requires manufacturers and distributors of products to take back used packaging from consumers for recycling. The Home Appliances Recycling Law (HARL)², enacted in Japan in 2001, requires retailers, manufacturers and consumers to dispose used home electronic appliances properly. On March 1, 2006, China enacted "Measures for Administration of the Pollution Control of Electronic Information Products,"³ a

¹Detailed information of the Packaging Ordinance is available from http://www.bmu.de/english/waste_management/downloads/doc/35132.php, [accessed: July 15, 2008]

² According to HARL, manufacturers and sellers are obligated to take back and recycle used home appliances. Product items subject to the law are TV sets, refrigerators, washing machines and air conditioners. More information is available from <http://www.env.go.jp/en/press/2005/0527a.html>, [accessed: July 15, 2008]

³Detailed information of these measures is available from <http://english.mofcom.gov.cn/aarticle/policyrelease/domesticpolicy/200605/20060502132549.html>, [accessed: July 15, 2008]

law that aims to control and reduce the pollution caused by discarded electronic information products, promote the production and sales of low-pollution electronic information products and protect the environment and human health.

Sustainability, then, is not an isolated issue. Citizens, businesses, municipalities, and the national government all bear a portion of the burden and responsibilities. Press and Cooper (2003) suggested that the drivers for change, including legislation, consumer attitudes and innovations of the eco-entrepreneurs, will shift designers further towards more ecologically friendly design objectives. A study of the strategies of sustainability is necessary for a complete view of the subject, but the focus of the current research is on the strategies applied in design practices from the designer's perspective.

Although many believe that the attachment between users and objects benefits product longevity, some voices question the attachment reinforcement strategy. Van Hinte (2004), organizer of the Eternally Yours Group, doubted whether emotional attachment theory makes much sense, since this relationship is rare and hardly subject to design in practice. Zupan (2005), a master's student at the University of Southern Denmark, suggested that the nature of attachment is reflective and the test of the attachment takes a long time to evaluate.

Chapman (2006) argued that the required conditions for the designer to create the experiences that generate attachment are still unclear. These voices do not deny the link between attachment and products' longevity but highlight that emotional attachment is difficult to translate into design. Therefore, the thesis attempts to explore the attributes of attachment and develop strategies for design that encourage attachment.

1.3 Research Plan

This research project contains three main steps (Figure 2). Following a literature review, interviews are conducted, then, based on the interview data, four design strategies are proposed and developed.

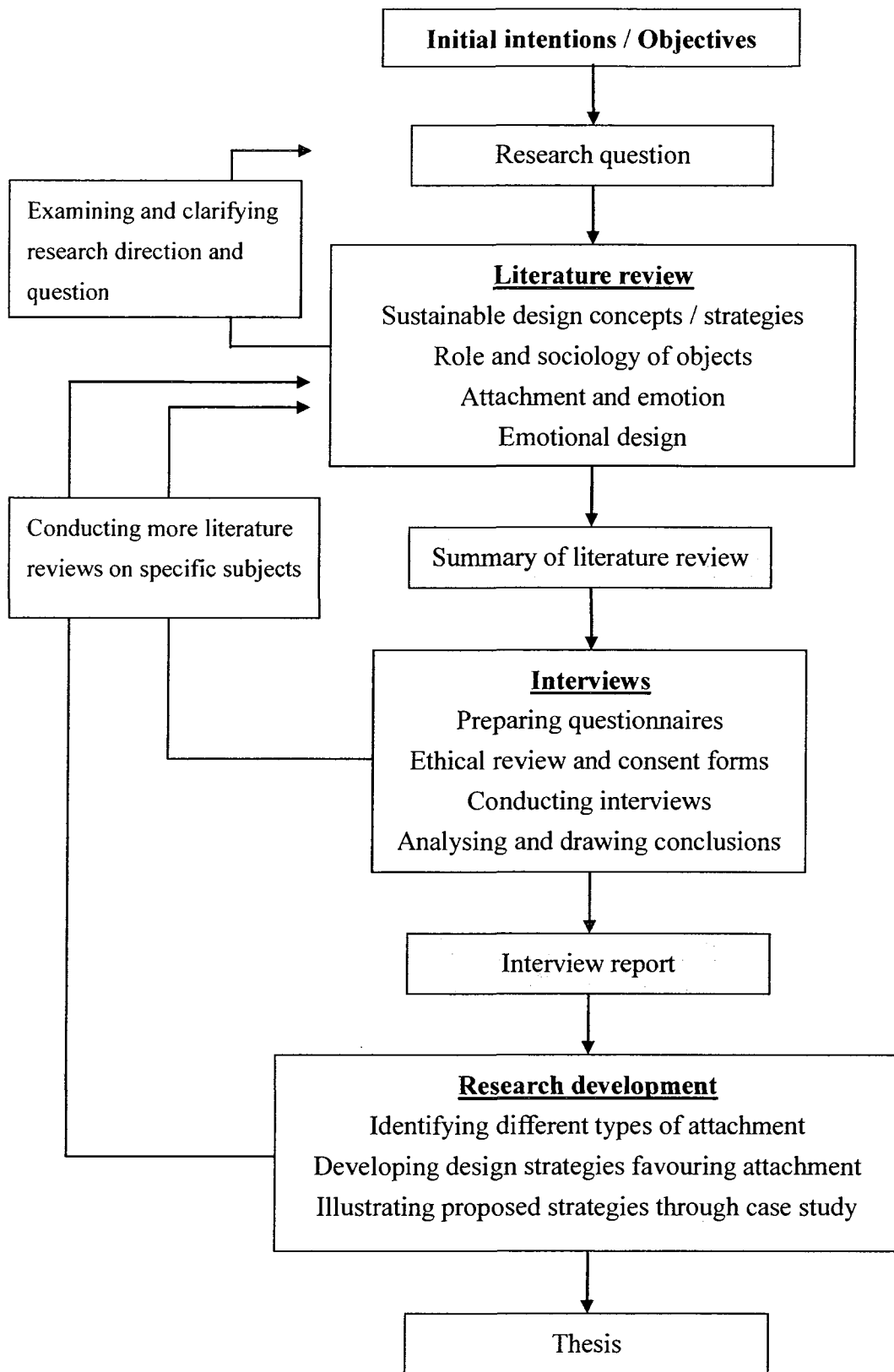


Fig. 2. Research plan

The literature reviews on the subject of sustainable design, attachment and emotion help to build a strong theoretical foundation on the concepts and terms from various perspectives, which have included social, economic, psychological and technological dimensions. Interviews enhance exploration of why and how people feel attached to some objects, and provide data with which to analyse different types and levels of attachment and to explore the attributes of attachment and its underlying emotional characteristics from the perspective of design. Both the literature reviews and the interviews contribute to the development of strategies that, applied in design practices, enhance the attachment between users and objects. The interview method facilitates study of the relationship between subjective experiences and objective paradigms of products from the perspective of everyday life. The interviews follow an iterative cycle of questioning, recording and analysing, resulting in a considerable quantity of written notes and audiotapes. The proposed design strategies are illustrated through a series of case studies. The application of these strategies and related disciplines that designers can learn from are also suggested.

CHAPTER 2

EXAMINING SUSTAINABLE DESIGN STRATEGIES THROUGH LITERATURE REVIEW

A review and comparison of the strategies related to sustainable development are conducted in order to study their applicable conditions, strengths and limitation. These strategies are categorized into four groups according to the subject mainly responsible for applying the strategies: 1) designers, including designers, engineers and researchers; 2) enterprises, including manufacturers and businesses offering the services; 3) government, including the local, national and international government and organizations; 4) the public, mainly referring to the users or the consumers. Figure 3 provides a broad overview of the strategies in each of these categories that have been practiced and discussed in the literature.

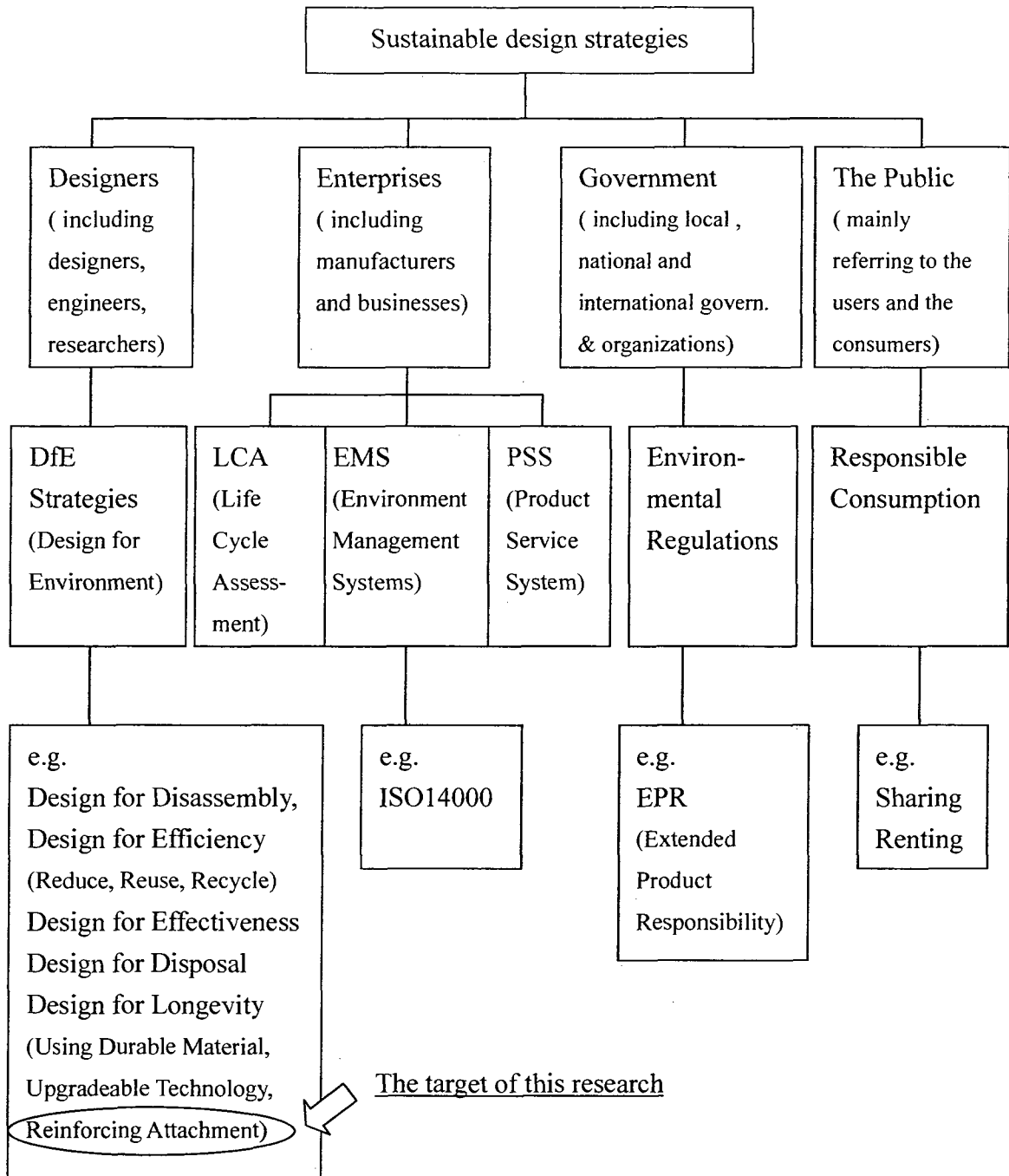


Fig. 3. Sustainable design strategies and responsible parties

2.1 The Designers' Sector: Bringing Environmentally-Sound Criteria into Consideration in the Design Phase

Design for environment (DfE) is the systematic consideration of design issues related to environmental and human health over the life cycle of the product (Fiksel, J., 1993). As an umbrella term, DfE includes the strategies that target each key phase of a product's lifecycle, from material extraction, production, transportation, consuming, to end-life-disposal. This paper focuses particularly on five strategies: design for disassembly, design for efficiency, design for effectiveness, design for disposal, and design for longevity. These strategies are widely practiced and take into account the whole life cycle of products in their designs and production models.

2.1.1 Design for Disassembly

In general terms, the design for disassembly (DfD) strategy is defined as a product design in which high percentages of the product's parts can be reused or recycled (Zhang et al., 1997). DfD uses assembly methods and configurations that allow the components and materials to be separated and recovered economically and efficiently (Billatos and Basaly, 1997). Csikszentmihalyi et al.

(2006) further suggested DfD may be subject to servicing operations (repair, maintenance, diagnostics) and to limit disassembly time and cost.

Although the DfD strategy plays an important role in the design process, it still faces many challenges. First, traditional techniques mix materials in a way that makes them tight, but difficult to separate for recycling, such as many newly designed MP3 players. They were designed as a whole piece which leaves almost no possibility for user to open them when there is a need to replace or repair parts. Second, designers and engineers are unwilling to use mechanical fasteners, regardless they are more secure and reversible. Third, DfD strategy will be only conditionally adopted in recovery and recycling processes if the disassembly cost is much greater than the financial revenues the strategy generates (Gungor and Gupta, 1999).

2.1.2 Design for Efficiency

Design for efficiency usually refers to three principles: reduce, reuse, and recycle. In 1992, the World Business Council for Sustainable Development (WBCSD) first used the term “eco-efficiency,” which is defined as a management strategy of doing more with less. Figures 4-7 illustrate examples of

the many designs that are based on the design for efficiency strategy.

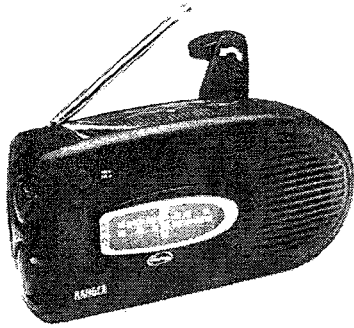


Fig. 4. Ranger Wind-up, Solar & Rechargeable Radio - Reducing the use of energy

Available from:
http://www.bigecocompany.com/product_info.php?products_id=268,
[accessed : July 20, 2008]

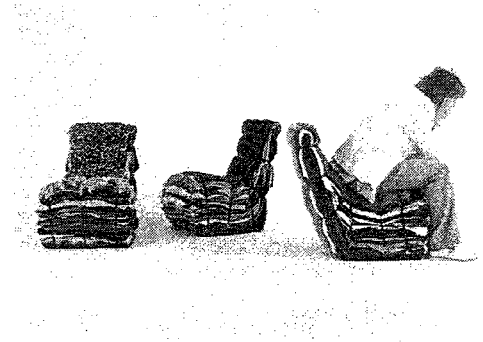


Fig. 5. Droog rag chair - Reusing old clothes to make a new customized chair

Available from:
<http://lovemyearth.blogspot.com/2006/12/recycle-rags-for-your-rump.html>,
[accessed: July 20, 2008]



Fig. 6. Blackspots V2 shoes - Recycling old tires for the sole of shoes

Available from:
http://www.shophumanitaire.com/V2_Boot_Dirty_Wash_p/abbsv2dw.htm,
[accessed: July 20, 2008]

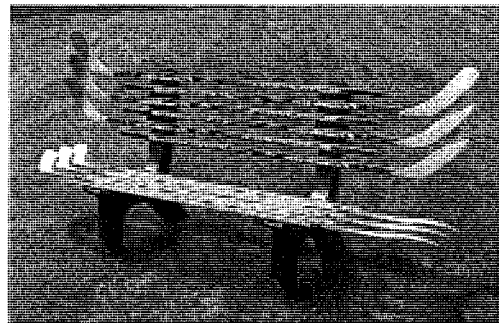


Fig. 7. Hockey stick bench - Reusing hockey sticks and recyclable plastics to build a bench

Available from:
<http://cozywinters.com/shop/sc-hb-highstick.html>, [accessed: July 20, 2008]

According to Environment Canada,⁴ reducing the amount of waste we produce is by far the most effective way to battle the flow of garbage into landfills. Reduction includes designing durable, long-lasting goods; seeking products and packaging that are as free of toxics as possible; and designing products to use less raw materials in production or to be used again after its original use. Reduction actually prevents the generation of waste in the first place, so it is the most preferred method in eco-efficiency. However, McDonough and Braungart (2002) argued that reduction does not halt depletion and destruction, but only slows it down.

Reusing is a secondary alternative when dealing with materials or objects that cannot be reduced. Reusing products whenever possible is even better than recycling because the items do not need to be reprocessed, which consumes energy, before it can be used again. The main approach to the reuse strategy is to employ durable material and easy-to-repair structure and to design a product to be refillable or rechargeable, rather than for one-time use.

Recycling turns materials that would otherwise become waste into valuable

⁴ Environment Canada provides an introduction “the 4Rs”: reduce, reuse, recycle and recover. More information is available from <http://www.ns.ec.gc.ca/udo/hs~reuse.html>, [accessed: July 20, 2008]

resources, generating environmental, financial, and social benefits. Materials like glass, metal, plastics, and paper are collected, separated and sent to facilities where they are processed into new materials or products. One of the challenges of recycling is how to maximize the advantages of the attributes of recyclable materials without degrading the quality of the product, which was described as downcycling by McDonough and Braungart (2002). A research team led by Professor Racine from Concordia University and Professor Lalande from the University of Montreal is conducting a research project called Metacycle (www.metacycle.ca) in an effort to prolong the useful life of a product by transforming it into a new product that has a different function. It is an exploration that beyond recycling.

Under the current industrial and economic model, design for efficiency is still an efficient solution with which to minimize environmental impact, especially with products that have been produced under existing technologies and means. Design for efficiency is an alternative way to prevent the damage that would be caused by discarding these objects into landfills.

2.1.3 Design for Effectiveness

Design for effectiveness is a design strategy proposed and practiced by McDonough and Braungart (2002). The core philosophy of the design for effectiveness strategy is designing a product that can be brought back as an input to nurture the production loop after the product's life is over. Contrary to the built world's cradle-to-grave paradigm, the design for effectiveness strategy creates a cradle-to-cradle paradigm, which means the discarded objects do not become useless waste but are tossed onto the ground to decompose and become food for plants and animals and nutrients for soil. Similarly, industrial products can re-enter the production cycle to supply high-quality raw materials for new products. In this context, design for effectiveness does not mean less waste, there is no waste in nature. McDonough and Braungart believe this is the direction for a new industrial revolution. Their book, *Cradle to Cradle* (2002), presents some examples to illustrate this design strategy: Korean rice husks, first used as packing for stereo components, is then reused as a material for making bricks. Upholstery fabrics can be composed of biological nutrients that can be returned to ecosystems after use.

Although design for effectiveness is a revolutionary design strategy aiming to generate positive environmental impact, McDonough and Braungart admitted that it will not be successful until the whole system is fully implemented. Many products produced under the currently available technologies and production models still cannot adopt this strategy. For example, products that contain hazardous materials such as polyvinyl chloride (PVC) cannot be brought back into the cycle. For these products, it is better to isolate them safely until cost-effective detoxification technologies are developed.

2.1.4 Design for Disposal

If we don't change the current industry technology and system, waste is unavoidable. The aim of disposable design is to minimize the impact of the waste usually generated by human activities. Minimizing the waste and managing the waste are two dimensions.

In the natural system, materials are re-used or recycled as part of a closed loop. Industry is now starting to mimic the natural process through "industrial ecology". In order to be proactive in preventing products from entering the waste-stream, Lewis and Gertsakis (2001) proposed several waste disposal

strategies, including reducing the amount of waste, extending product life, re-using products, re-manufacturing products, recycling materials, designing for minimal consumption and minimizing the impacts of disposal by using material that can degrade rapidly. Although the concept of industrial ecology minimizes the impact of disposal, there is still a long way to go. Therefore, waste management has become another important dimension in the effort to reduce the impact of waste on human health and aesthetics. Waste management is “a sustainable process for reducing the environmental impact of the disposal of all types of materials used by businesses.”⁵ Waste management focuses on efficiently using materials and disposing of rubbish in the least harmful way.

As should be clear, the design for disposal strategy must be integrated with other strategies to minimize the impact of disposal.

2.1.5 Design for Longevity

Design for longevity refers to the development of products that can evolve with the changing desires of the consumer (Van Nes and Cramer, 2006). Simply

⁵ BNET is an online community that provides working professionals with tools, advice, and insight. This definition is available from: <http://dictionary.bnet.com/definition/waste+management.html>, [accessed: July20, 2008]

put, an object can achieve longevity only when it is durable and the consumer is willing to keep it. By designing products to last longer, manufacturers can reduce both resource use and waste generation. Design for longevity is also contrary to the marketing strategy of planned obsolescence, which stimulates repetitive consumption (Slade, 2006). Designing for longevity aims to reduce the amount of discarded objects, especially short-lived e-waste.

In broad terms, design for longevity works to keep products functional, efficient and culturally relevant over a longer period than most consumers' expectation. Lewis and Gertsakis (2001) proposed specific strategies in the design process for extending a product's life cycle, including identifying and eliminating potential weak points in the design, particularly for operational parts; ensuring the product is designed for potential misuse as well for the intended use; designing for easy maintenance and repair; and using classic design or other design means that will encourage consumers to retain products for longer periods. The researcher proposed three additional methods: using durable materials, applying upgradeable technologies, and reinforcing the attachment between user and object.

Using durable materials

Materials can be evaluated against many criteria, including their sources, method of processing, additives, energy efficiency, durability and recyclability (Lewis and Gertsakis, 2001). In 1992, the Tellus Institute conducted a packaging study, in which it compared the environmental impact of different materials and found that durable material does not necessarily mean environmental friendly material. The report concluded that PETE (1), PVC (3), and virgin aluminum should be avoided because each has a very high environmental cost. In addition, even though glass appears to be an excellent packaging material (when compared on a cost-per-ton basis), because glass requires higher volumes for effective packaging, it actually has a higher environmental impact per use than paper and plastic do. They also found that recycling aluminum, unlike using virgin aluminum, has an environmental impact about the same as recycling plastic and paper, although the material that requires the least packaging is preferred.

Although employing durable materials retains products' longevity, Lewis and Gertsakis (2001) suggested an adverse impact, arguing that durable materials may reduce the rate of adoption of environmentally desirable technology

innovations, such as those that increase energy efficiency or reduce emissions. For example, refrigerators used to consume more energy than any other home appliance, but great strides have been made in the last twenty years to make refrigerators more energy efficient. Current models that are Energy Star-qualified use 50 percent less energy than models made before 1993 (US Department of Energy, 2008). However, the durable material used in the old refrigerator, and the appliance's longevity, may cause the consumer to keep the old refrigerator longer, rather than getting a new, energy-certified refrigerator.

Applying upgradeable technologies

Using upgradeable technologies could be a way to solve the problem of rapid obsolescence of electronic products. With this approach, consumers can benefit from new functions without throwing away the old product. This method has already been accepted widely in the field of computer hardware and software, where simply adding one memory bar onto the motherboard can enhance the speed of a computer without getting a new computer. Software, too, can be upgraded by simply clicking some buttons and following a few instructions.

Although some electronic appliances are designed with the potential to be

upgraded and gain a longer lifespan, they are still easily abandoned. According to Slade (2006), this lack of durability is mainly due to psychological and technological obsolescence. Psychological obsolescence explains why many electronic products are discarded, even when they are not technologically outdated. For example, in the United States, cell phones built to last for five years are now retired after only eighteen months of use (Dunne and Raby, 2001). Marketing plays a role here as you can get a new cell phone all but free when you sign a new contract. From the perspective of manufacturers, psychological obsolescence is superior to technological obsolescence because it is considerably cheaper to create and can be produced on demand. Marketing experts also take advantage of psychological obsolescence by continuously sending messages to consumers that newer products meet their needs better. In order to reduce the effects of psychological obsolescence, designers must determine what sustains the pleasure and excitement of using a product and adopt corresponding design strategies.

The second challenge in applying upgradeable technology is compatibility. Can a higher version of software be used in an earlier version of the system? Can PlayStation 3 games be played on the PlayStation 2? Can Nintendo's video

games be played on Sony's video game console? Can the latest HD TV still be able to receive the signal from the old DVD player? Will all series of Apple computers use the same accessories, like wires, adapters and sensors? Currently, compatibility is one of the most troubling problems for consumers who try to upgrade their old electronic appliances to newer models. The strategy of applying upgradeable technology cannot be achieved unless a product is designed with compatibility.

Reinforcing the attachment between users and objects

How to make objects people want to keep because of their lasting value is a challenge, and the notion of attachment to improve the longevity of objects is a somewhat new approach in sustainable design strategies. Inspired by Van Hinte's *Eternally Yours* (2004), which explores time, durability, endurance, and fast and slow design, some designers are looking for strategies to reinforce attachment, instead of technical solutions. Making this strategy viable requires finding out more about why and how emotional attachment plays a role in product longevity.

Press and Cooper (2003) suggested that consumption is far more than a means of fulfilling functional needs and that people today have a greater need for

emotional, sensual and expressive experiences in which goods and services play an essential part. Research conducted for CLM/BBDO's advertising campaign showed that one of the key motivations of consumers between 20 to 35 years of age is the desire for emotional experience (Nixon, 2003). Based on the outcome of the research, Nixon argued that the desire for emotional experiences means that people have the need for feeling their body in new and different, intensive ways, the desire for frequent emotional experiences, and the enjoyment of doing something which is just a little dangerous or forbidden. Although people feel attached to objects for different reasons, a high level of attachment can be achieved only if the product is designed in a way that relates with the user in an emotional experience that has to be evolved over time (Kurtgozu, 2003).

Chapman (2005) suggested using narrative and fiction, to reinforce the attachment between users and objects. According to Chapman, the exponentially increasing needs for fiction, complexity and dialogue result from a daily life that is more and more programmed. Chapman also pointed out that the concept of experience, where the subject and object meet and merge, is a key issue in designing emotionally meaningful products. An ongoing research project called "Metacycle" (www.metacycle), using to principle of participatory design to link

consumers and designers through an interactive framework and a process, thereby defining an alternative model of consumption to achieve product longevity. The consumers who participated in the design process build a strong emotional connection to the objects for the sense of involvement and proud.

The biggest challenge in using the emotional attachment strategy is the uncertainty, subjectivity, and immeasurability of human beings' emotions and behavioural choices. Exploring the link between emotional attachment and product longevity will help develop strategies to enhance attachment. The current study undertakes this exploration as its contribution to the field of product design.

2.2 The Enterprise Sector: Minimizing Environmental Impact through New Production Processes and New Business Models

Under pressure from governmental legislation and consumer interest, enterprises are challenged to reduce the environmental damage caused by production and marketing promotion. Strategies that benefit environmental quality, as well as increasing the profits, are central to this effort. Three strategies, from the perspective of the enterprises are Environmental

Management Systems (EMS), a strategy targeting management; Life Cycle Assessment (LCA), which takes the whole life cycle of a product into account; and Product-Service Systems (PSS), which promotes a new business model.

Environmental Management Systems (EMS) is a management structure in which an organization assesses and controls the environmental impact of its activities, products or services.⁶ To develop an EMS, an organization has to assess its environmental impacts, set targets to reduce these impacts and plan how to achieve the targets. EMS can be modeled by the ISO14000 series of standards. Recently, it has become more than pertinent for designers to have knowledge of EMS and to be able to refer to relevant national and international norms.

Life Cycle Assessment (LCA) was first defined as an objective process to evaluate the environmental burdens associated with a product or activity by identifying and quantifying energy and materials used and wastes released to the environment, and to evaluate and implement opportunities to affect environmental improvements (Fava et al., 1991). The value of LCA lies in its ability to map a product's environmental impacts across its whole life cycle.

⁶ Defined by Standards Council of Canada , available from:
http://www.scc.ca/en/help/glossary/acronymdetails_51.shtml, [accessed:July20,2005]

Lewis and Gertsakis (2001) summarized a product's life cycle as passing through several stages: extraction and processing of raw materials, manufacture of the product, use or operation of the product, and end-of-life options, with a critical distribution or transport phase occurring between all the stages (Figure 8).

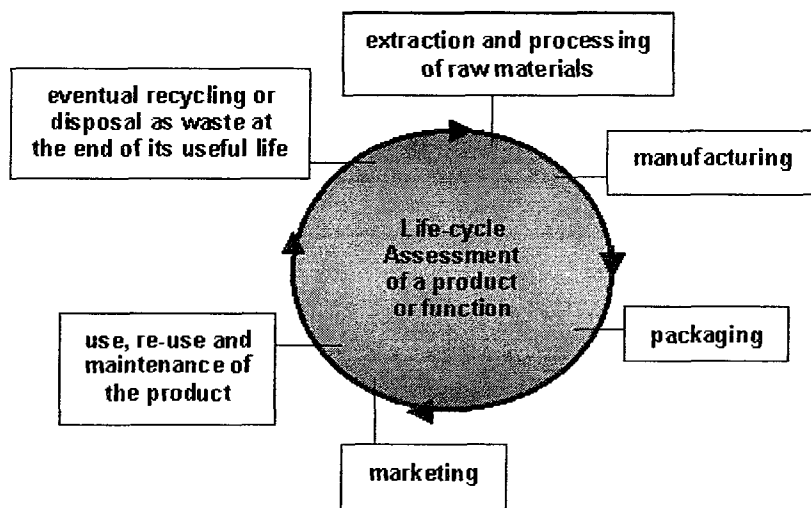


Fig.8. Key phases of Life Cycle Assessment

Available from: <http://www.agrifood-forum.net/practices/lca.asp>, [accessed: July20, 2008]

Product-Service System (PSS) is a new concept with which businesses can improve their sustainability performance. It is an innovation strategy which shifts the business focus from designing and selling physical products only, to selling a system of products and services which are jointly capable of fulfilling specific client demands (Manzini and Vezzoli, 2001). For example, a company offers a washing machine that, instead of being just a single product that washes

clothes, includes a full cleaning service consisting of maintenance, service quality, and end-of-life remanufacturing or recycling. Under this model, the new relationship between the consumer and the company is more interactive, which is extended beyond the traditional marketing model's simple sales of the product.

2.3 The Government's Sector: Setting Up Regulations to Guide Activities

Many countries, including Canada, have implemented policies and programs to prevent pollution and minimize environmental impacts. In the face of the many environmental challenges, and in the interests of supporting sustainable development objectives, these policies and programs are evaluated, developed and implemented by both the government and businesses. One of the key approaches to doing this is Extended Producer Responsibility (EPR).

EPR is an environmental policy approach in which a producer's physical and/or financial responsibility for a product is extended to the post-consumer stage of a product's life cycle, rather than to municipalities and taxpayers⁷. A number of different policy tools, including deposit-refund schemes, product

⁷ EPP is defined by Organization for Economic Co-operation and Development (OECD) Available from: http://www.oecd.org/document/19/0,3343,en_2649_201185_35158227_1_1_1_1.00.html, [accessed: July 20, 2008]

disposal charges, voluntary agreements and covenants, and end-of-life product take-back requirements, are used or are under consideration by the government to implement EPR (Lewis and Gertsakis 2001).

Japan is taking the lead in promoting and implementing EPR. In Japan, EPR is compatible with the shared-responsibility principle where citizens, businesses, municipalities, and the national government each bear a portion of the burden and have clearly defined responsibilities (Ogushi and Kandlikar, 2007). For example, under the Home Appliance Recycling Law (HARL), retailers collect end-of-life products, consumers pay the expenses mandated for recycling and transportation, and producers recycle the collected products. In 2002, the European Union adopted the Waste Electrical and Electronic Equipment Directive (WEEE Directive), which targets 81 products in 10 sectors and covers both businesses and consumers.

2.4 The Public Sector: Public Awareness and Ethical Consumerism

No matter how environmentally friendly a product is, in terms of material selection, energy consumption, production and transportation, the product is truly sustainable only when users purchase, use and recycle it in a

responsible manner. Raising the public awareness of environmental crisis and responsible consumption is as important as designing a sustainable product.

Anne Marchand (2006), a Ph.D. candidate in Sustainable Design at University of Calgary, suggested that the meaning of objects involves both aesthetic value and moral worth (goodness). Since an increasing number of consumers are aware of the environmental crisis and the responsibility of each individual, sustainable consuming has become a way to express their beliefs. Whiteley (1999) contended that the trend of ethical buying confirms that the public is willing to express its ethical and political beliefs by consuming responsibly, if the market provides that choice. From the perspective of ethics, the role of designers is not simply designing “sustainable products,” but envisioning products, processes, and services that encourage responsible consuming behaviours.

Sharing and renting are two emerging environment sound practices among consumers. Instead of owning a product, consumers share it amongst a group of users or simply rent a product without fully purchasing it. One of the best known cases is the PUBs (Public-use Bicycles) program. According to DeMaio’s report (2001), 50 cities throughout the world participate in PUBs programs. The PUBs

circulated throughout the city as riders picked them up in one place, rode them, and dropped them off in another place, and provided cheap and clean transportation.

McDonough and Braungart (2002) suggested that products containing valuable technical nutrients, such as cars, carpeting, computers and refrigerators, could be reconceived as services. An example is when people take public transportation on weekdays for work or study and rent a car on weekends for errands and leisure activities. Renting of services is more common for companies than for individuals. Some companies rent plants for their offices, along with a service for taking care of them, and others rent carpet and cleaning services. Convenience attracts users to switch from the traditional model of ownership to a new model of renting a product, function or services.

2.5 Ethical Awareness: Key to Achieving Sustainability

Researchers, enterprises, the government and the public all seek sound environmental strategies, but public ethical awareness is the essential force needed to solve the crisis. Responsible-consumption movements, a direct answer to the current problem of waste and over-consumption, still rely largely on

personal ethical awareness. As Mahatma Gandhi said, “Earth provides enough to satisfy every man’s need, but not every man’s greed.” A high moral ground will be the ultimate way for mankind to overcome greed for fame and wealth and live in harmony with nature. Therefore, sustainable design strategies must consider nature, human beings and the man-made world as a whole system in which each party nurtures and benefits the others. Bousbaci and Findeli (2005) suggested that current design trends have shifted from aesthetics-oriented and logic-oriented inquiries to ethics-oriented inquiries. One of Laozi’s preaching on the subject of harmony, given about 2500 years ago, says: “Bearing and nurturing, creating but not owning, giving without demanding, this is harmony.”⁸

⁸ The GNL Tao De Ching. Copyright (C) 1992, 1993, 1994, 1995 Peter A. Merel. This document attempts to draw the texts of several popular English translations of Lao Tse into a consistent and accessible context. It is based on the translations of Robert G. Henricks, Lin Yutang, D.C. Lau, Ch'u Ta-Kao, Gia-Fu Feng & Jane English, Richard Wilhelm and Aleister Crowley. Available from: <http://www.chinapage.com/gnl.html#10>, [accessed: July 20, 2008]

CHAPTER 3

EXPLORING EMOTIONAL ATTACHMENT

BETWEEN USERS AND OBJECTS

Responsible consumers, advanced technologies and improved production methods have not prevented a veritable sea of products from being discarded. Chapman (2005) suggested that these products are thrown away, even though they still function well, because of broken attachment between consumer and object. Most products within the current design model are static, with non-evolutionary characteristics or even without characteristics. While users are eager to adapt to continually changing situations, the products are frozen in time. The broken attachment to objects that have lost their meaning because of the gap between a static product and an evolving user leads to dumping one product after another. With consumption an individualistic process motivated by complex emotional drivers, sustainable design must be explored from the perspective of emotion, a psychological dimension, along with the notion of attachment and the ability to transfer certain elements of attachment to the relationship between users and objects.

3.1 Attachment: A Term Derived from the Field of Psychology

Attachment is a psychological term defined as “an affectional tie that one person or animal forms between him/herself and another specific one...a tie that binds them together in space and endures over time” (Ainsworth, Bell and Stayton, 1974).

According to John Bowlby (1958, 2005), a British developmental psychologist in the psychoanalytic tradition notable for his pioneering work in attachment theory, the core of the term “affectional bond” is the attraction one individual has for another. In 1989, the American developmental psychologist Mary Ainsworth (1989) established six criteria for affectionate bonds between individuals and a sixth criteria for attachment bonds, which are being persistent, involving a particular person, involving a emotionally significant relationship, maintaining proximity with the affectionately bonded person, separation anxiety, and seeking security and comfort in the relationship.

The research on attachment in the field of psychology mainly focuses on the affectionate bond between individuals, such as children and parents, romantic partners, or an individual and the public. However, there are also arguments for an affectionate tie between a pet and its owner and a person and his/her

collections, even daily objects, which is the focus of design for attachment.

3.2 Consumption: A Desire to Satisfy Unlimited Needs

Consumption is an individualistic process motivated by complex emotional drivers. Consumption, as Bocoock (1993) described, is founded on a desire always for something that is not there so that, the more that is consumed, the more that is desired to be consumed. Human needs evolve so that, when lower-level needs are met, higher-level needs emerge, resulting in an infinite sequence of desire. Because consumption is a meaning-seeking process, it is an addiction of sorts in which the consumer needs more and more of it to get the same satisfaction (Van Hinte, 2004).

Chapman (2006) argued that consumption is how people experience the unknown, a way to relieve anxieties and the need to express the self. He described consumption as an individualistic process motivated by complex emotional drivers. When we consume an object, we are actually consuming its meaning, including its aesthetic, ethical, and cultural meanings, as well as the satisfaction gained from the quality, performance and manipulation of the object. Press and Cooper (2003) suggested that, far more than the satisfaction of

functional requirements, people today have a greater need for emotional, sensual and expressive experiences in which goods and services play an essential part.

3.3 Objects: An Important Role in Everyday Life

Objects occupy significant physical and symbolic space in our daily lives, but what do they mean to their users? Design studies can benefit by expanding their discourse to include a more socially and culturally rooted understanding of objects. Boradkar (2006) suggested that “objects” include artifacts, products, devices, gadgets, goods, and commodities and defined the term “things” as physical entities that are fashioned by human and /or mechanical labor with material and immaterial dimensions, and with symbolic and utilitarian value, that signify art as well as technology, that possess multiple and fluid meanings and that are at once ordinary and extraordinary. In this regard, objects have two traits: their physical substance and their symbolic meaning.

From the perspective of semiotics and product semantics, Baudrillard, a French cultural theorist and philosopher, overlaid Karl Marx’ view of commodity systems and addressed three values of objects: use-value (utility), exchange-value (tradability) and symbol-sign value. As Baudrillard remarked, “An object

is not an object of consumption unless it is released from its psychic determinations as symbol; from its functional determinations as instrument; from its commercial determinations as product; and is liberated as a sign to be recaptured by the formal logic of fashion, i.e., by the logic of differentiation” (Baudrillard, 1981).

Arjun Chaudhuri (2006) categorized objects into two groups, hedonic objects and utilitarian objects, based on consumers’ perceptions of the objects. Hedonic goods provide enjoyment, pleasure and fun, while utilitarian goods provide functional practicality. Therefore, consumers have two attitudes towards objects: a utilitarian attitude and an affective attitude. He further suggested that objects represent the consumer’s needs, personality, lifestyle, and all the other facets that make up the individual. Current design researchers have emphasized the emotions behind objects. Aren Kurtgozu (2003) suggested that the cognitive and emotional borders between subject and object are increasingly blurred in recent designs.

These studies all explore the attributes of objects that are important to users. Therefore, from the perspective of design, a product could include three aspects: its physical features, such as look, feel and sound; its performance, such as

function, coherence and usability; and its message, such as cultural content and meaning (Norman, 2004). Although people feel attached to objects for different reasons, emotions can always be found behind these reasons. Therefore, studying the concept of emotion, focusing especially on emotional attachment, is imperative to the research.

3.4 Emotions Benefit Long-Term Attachment

Among contemporary theories of emotion, many psychologists adopt the ABC model, which defines emotions in terms of three fundamental attributes: physiological arousal (e.g., heart rate changes), behavioural expression (e.g., facial expressions), and conscious experience, the subjective feeling of an emotion (Buck 1985, 1988, 1999). Emotions are also categorized as primary, those we feel first (e.g. joy, pleasure) and secondary emotions, those that are attached to objects, events, and situations through learning, which require additional input, based largely on memory (Plutchik 1980). Primary and secondary emotions influence behaviour. Chaudhuri (2006) argued that knowledge by acquaintance (emotion), known as subjective experience, is immediate and direct, while knowledge by description (reason), resulting from

the interpretation of sensory data and involving judgments about phenomena, is rational and indirect. Rational beliefs are amenable to change, while feelings are more resistant, so emotions are fast, memorable and permanent. Thus, the nature of emotion is that emotions can be a key element of developing a long-term attachment.

Norman (2004) used his teapot collections to suggest that there are three levels of emotion: the visceral level, the behavioural level and the reflective level. According to his theory, the visceral level is pre-conscious, involving appearance; the behavioural level is about experience with a product, based on function and performance; and the reflective level is conscious, where the highest level of feelings, emotions and cognition reside. Among these three levels, the visceral and behavioural levels are about the present, while the reflective level is about long-term relationships and the satisfaction produced by owning, displaying and using a product. In this context, long-term attachments can be built on emotions underlying objects.

3.5 Design to Sustain and Evolve Emotion

In the First International Conference on Design and Emotion (1999),

Cupchik spoke about experience, meaning and emotion in terms of attachment. He suggested that personal experiences and emotional meanings complete the image of the object: “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.”(Cupchik, 1999) Press and Cooper (2003) further suggested that increasingly design is about meeting “soft” needs, including lifestyle, fashion, changing tastes, and cultural relevance. Since then, various means have been explored to sustain and evolve emotion. These new design strategies are more human-oriented in that they boost users’ experiences, either physically, emotionally, intellectually, or culturally.

3.5.1 Narrative: Telling Stories about a Product

Low-tech narrative experience is one of the means of emotional design; the story behind an object could be the reason a person keeps it for a long time. The attachment is largely built on emotions, which are generated through meaningful memories. People have experiences of a well preserved family album; an old, broken toy from childhood; an object that represents a precious relationship, and so on. In the context of narratives, each individual creates his/her own stories

about objects. This narrative evolves slowly and amorphously through use, so that the story can be kept alive. Emotional design, then, is a process of encoding a product with symbolic meaning towards a preferred reading of the product. However, when consumers use a product, they decode its symbolism in different ways based on different subcultures. Chapman (2005) suggested that, when we use an object, we unfold its layers of narrative. Chapman used jeans as an example to demonstrate that, when narrative experiences can be communicated, the objects that communicate them adopt even greater significance; they share intimate narratives with the user and further within the user's social group. These evolutionary characteristics keep them from becoming obsolete. Since consuming a product is an evolving, creative process, these emotional readings can be retold or re-interpreted. The essential task for designers is to understand how people give meaning to the objects they use, and how they unfold or re-interpret the narratives with them.

3.5.2 Fiction: Embedding Dreams in a Product

Fiction is another means of emotional design. Chapman (2005) suggested that, as everyday life becomes more and more programmed, the need for fiction,

complexity and dialogue increases exponentially. People love fiction because it draws them out of reality and provides them a chance to imagine, so products with rich fictions have the potential for longevity. He uses the MINI-Cooper as an example to suggest that the fiction the product embeds allows users to associate their dreams with the product. People who give names to their objects provides another example of fiction's having a direct link to the attachment between users and objects.

3.5.3 Experience: Activating Users' Emotions

Chapman (2005) suggested that the concept of experience, where the subject and object meet and merge with each other, is a key issue in designing emotionally meaningful products because experience is a space in which all faculties, especially emotions, are activated. According to marketing specialist Darrel Rhea (1992), a design might influence and benefit customers physically, emotionally, intellectually and culturally. Customers' every experience with a product reveals opportunities to use design in innovative ways. The challenge to which Rhea refers is not only to satisfy users' expectations, but to go beyond them to provide unexpected benefits designed within the objects and which the

users can use to explore or create new meanings and relationships with the objects. Thus, designers must explore the dynamic nature of those user experiences, including how they change over time, interact with each other, and create demand for new and different experiences.

3.5.4 Customization: Building Individual Connection to Objects

Customized design, another way to build emotional attachment, is used to the greatest extent in the furniture and automobile industries, where the emotional bond is built on a sense of differentiation and satisfaction. The customized design strategy allows consumers to acquire goods and services that meet their own specific needs, an approach widely used in the furniture and automobile industry. Kaplan and Haenlein (2006) defined mass customization as a strategy that creates value by some form of company-customer interaction at the fabrication/assembly stage of the operation to create customized products. The customized object thereby becomes an image ready to be coded as a representation of the self, a way for people to distinguish themselves from others and their surrounding environment. In this context, customization proactively manages product variety in the environment of rapidly evolving markets and

products, many niche markets, and individually customized products, which have been considered more than a merely functional thing (Anderson, 2004). The emotional bond is built on a sense of differentiation and satisfaction.

3.5.5 Participatory Design: Involving Users into Design Process

Participatory design, which is the direct inclusion of users within a development team, also works to build a close relationship between the creator and the created object by providing the participants the pride of achievement and involvement. Participatory design allows users to make the decisions and empowers users with the tools that the experts use. It is the proactive involvement, such that they actively help in setting design goals and planning prototypes (Carroll, 2006). The field of participatory design grew out of work beginning in the early 1970s in Norway, when computer professionals worked with members of the Iron and Metalworkers Union to enable the workers to have more influence on the design and introduction of computer systems into the workplace (Kuhn and Winograd, 1996). From then on, many design researchers have begun exploring this method within the design context to involve end users in the design process.

3.6 Emotion: Dare to Desire

Although emotion generally remains something of a mystery to most human beings, we see its influences every day. Consumption, as a key source of meaning and identity, has become far more than a means of fulfilling functional needs: it is a way to define ourselves in terms of lifestyle, values, and membership, and to express our feelings. Nixon (2003) argued that people today have a greater need for emotional, sensual and expressive experiences in which the goods and services they consume play an essential part. Since the first conference on Design and Emotion was held in 1999 at the Delft University of Technology, emotional design has become an emergent trend which requires new strategies to be explored along with the objectives of sustainable design.

Users have become more proactive in the creative process of identifying new meanings, new uses and experimental requirements through their relationships with material things. Therefore, designers and design researchers need to work on encoding objects and services not only with functions and interpretation, but with narratives, fictions and experiences by learning how people use these objects, how they give meanings to things, and how they gain emotional experiences from designed artifacts.

CHAPTER 4

METHODOLOGY

4.1 Objective of the Interview

To gain deeper and more comprehensive understanding of the attachment between users and objects, it is essential to study people's point of view and own experience of their material world. Qualitative research is one of the widely adopted approaches to gain insight into people's attitudes, behaviours, value systems, concerns, motivations, aspirations, culture or lifestyles. Hence, it is a field of inquiry to study everyday experience of smaller but focused samples rather than large random samples. Qualitative research typically relies on four methods for gathering information: participation in the setting, direct observation, in-depth interviews, and analysis of documents and materials (Marshall, Catherine & Rossman, Gretchen, 1998). Considering the needs and limited length of time of the project, the researcher chooses the method of in-depth interview to conduct the research.

The interviews in this study are intended to assist in understanding how consumers engage with the material world emotionally. Participants are

encouraged to share personal experiences of their relationships with daily objects, especially the level of attachment towards different categories of objects in various scenarios. Design strategies are developed according to the initial findings of the interviews. The interviews are audio-recorded and approved by the Ethics Review Committee.

4.2 Method of the Interview

The interview is one of the qualitative methods to address the perspectives of human subjects. The ability to organize an efficient interview is one of the criteria of a qualified design researcher. In-depth interview employs both descriptive and structural questions. Descriptive questions are broad and general, which allow people to describe their experiences, their daily activities, and objects and people in their lives to provide the interviewer with a general idea of how individuals see his/her world. Structural questions are used to explore responses to descriptive questions and to understand how the interviewee organizes knowledge. The two types of questions were employed alternately during the interviews.

The interviews are generally semi-structured, with the interviewer

preparing an interview guide in advance. The interviewees are asked to sign a consent form (Appendix 1) at the beginning of the interview, and the conversation would not be recorded until the consent forms were signed. The interviewer begin by explaining the reason for the interview, the process and the types of questions that would be asked. Both the researcher and the interviewees have a list of key questions to guide the conversation, but the contents are subject to changed according to the interpretation given by the interviewees. The interviewees are allowed to speak without time limit on the topic of each question addressed.

Specific skills are useful in ensuring an active conversation. First, a conversation starting with a casual topic helps create a comfortable and friendly atmosphere so that the interviewees find it easier to engage in the dialogue. Starting with an open-ended question encourages participants to open up about their experiences. Second, most interviewees come from backgrounds other than design, so it is important to select proper vocabularies for better communication, instead of using industry terms and jargon (Appendix 2). Using examples to represent a group of objects is a good strategy for making it easier for the interviewees to understand the questions and to share their thoughts. For example,

instead of asking the participants to talk about their attachment to IT/communication objects, they are asked to share their using experiences about computers and mobile phones. Third, in order to address specific areas of interest and opportunity, improvised questions are employed tending to create more interactivity in the interview.

4.3 Description of the Interview Guide

The interview contains three parts. The first part asks the interviewee to describe one object to which he or she is most attached. The researcher uses this open-ended question to start a conversation and serve as a warm-up exercise which enables the interviewees to get familiar with the concept of attachment and the topic of the interview. Throughout the conversation, the researcher aims to find out the reasons for the strong attachment that led to the participant's willingness to keep the object over time.

The second part of the interview is a group of questions about the relationship between the interviewee and his or her daily objects. In order to grasp the complexity of the relationships that people experience with their daily belongings, the researcher divides the type of objects that people use into six

categories: tools of transportation, IT/communication devices, entertainment products, domestic appliances, furniture, clothing and related accessories. The interviewees are asked about the frequency with which they replace the products, the reasons for the replacement, how they deal with the old objects, their feeling of discarding objects and under what circumstances they are willing to keep the objects longer. They are also invited to share experiences of using these products. In this part, the strict inclusion, means-ends and rationale questions are used the most. Strict-inclusion questions help gather information on the categories participants used to organize information (e.g., types of problems the interviewees experienced while using kitchen appliances). Means-end questions lead to information on behaviours (e.g., how the interviewee dealt with old or broken objects). Rationale questions lead to information on causes of the behaviour (e.g., incentives for the interviewees' feeling attached to specific objects, reasons for the interviewees' replacing a functional object).⁹ These questions assist in drawing conclusions about what causes a rupture attachment and strong attachment, as well as about different levels of attachment in regards

⁹ These interview strategies are discussed in detail in an online article, "*Asking the right questions in the right way*," by Carol Westby , Angela Burda and Zarin Mehta, available from: <http://www.asha.org/about/publications/leader-online/archives/2003/q2/f030429b.htm>, [accessed: Aug 08, 2008]

to each category of objects.

In the last part of the interview, the researcher places eight objects in various scenarios and asks interviewees to choose them in order, according to their preference. The eight objects are 1) a chair constructed by the user with recycled materials; 2) an iPod received as a birthday gift from the user's partner, who uploaded many of his/her favorite songs; 3) a multifunctional and upgradeable PDA working efficiently and well protected in a leather case; 4) a brand-name pair of shoes the user loved for its design and comfort; 5) an old family watch the user received from his/her grandfather; 6) a bicycle the user rode to many places during previous trips the user had taken; 7) a hockey stick the user used in an important match in childhood and which had been signed by a famous player; and 8) a designer kettle the user bought at a design exhibition and enjoyed using. Each scenario includes several strategies that are suggested might help achieve sustainability, such as participatory design, emotional design, aesthetic design, design for perceived value, and design for efficiency. Through this exercise, the goal is to examine which strategies would influence users' behaviour and how they would affect product longevity. An attempt is also made to find out what value the objects contain that could promote their longevity.

The information obtained during the interviews has a significant impact on developing design strategies for strengthening attachment.

4.4 Profile of the Interviewees

The interviews are carried out through in-depth conversations, each lasting approximately one hour. A select group of 30 people is invited to participate in the interviews. They are chosen with respect to a balance in gender, age, profession and background. Financial independence is one of the qualifications in selecting the participants, although their financial situation varies, and the participants are the decision-makers in consuming an object (Table 1, 2).

Each age group of interviewees has unique characteristics. Interviewees under 25 years old are college students who live with their families, bear less financial pressure and are more involved in decision-making about personal objects than family objects. Interviewees between 25 to 35 years old are either single or young couples. Most of them live independently and are starting to build a family. Their desire to consume is high, but the consuming power is limited because of their financial situations. Interviewees between 35 to 45 years old are either single or part of a couple with young kids or without kids. Most

have accumulated a certain amount of monetary autonomy. Both their willingness to consume and their power to consume are strong, although family concerns have taken priority over personal interests. Interviewees who are 45 years old or older are mostly couples with grown children. They have established better living environments and stable financial situations. Studying each group brings valuable insights in exploring the attachment between users and objects.

Table 1. Profile of interviewees: by gender and age

	Under 25 years old	26-35 years old	36-45 years old	46-55 years old	Over 55 years old
Female	1	5	5	2	2
Male	1	6	4	2	2

Table 2. Profile of interviewees: by profession

Student	Educator	Designer	Administrator	IT Developer
6	2	2	3	3
Scientific Researcher	Health Specialist	Marketing Expert	Business / Sales Person	Financial Analyst
2	3	3	3	3

There are certain limitations in the interviews. First is the numbers of interviews. The second limitation is the variety of geographic distribution.

Although these interviewees are from different cultural backgrounds and professions, they all live in Montreal, a large metropolitan city in North America. Their living environment, social influences, financial situations and consumer objects that are available in the market are similar, so the outcome derived from these interviews should be restricted in the context of North America.

4.5 Process of the Interview

The process of the interview is a repetitive cycle of questioning, recording and analysing, resulting in a considerable quantity of written notes and audio records. Conducting the interviews takes the following steps:

- 1) Make initial contact with potential participants.
- 2) Schedule an interview and determine the location.
- 3) Prepare the interview log and audio recorder.
- 4) Meet in person with interviewee.
- 5) Participant signs two Consent Forms, and each party keeps one copy. The

Consent Form includes:

- Statement of research goals

- Contact information for the interviewer and the principal supervisor
 - Written notification of the rights of the participants
 - Checklist for the participant to indicate the degree of confidentiality
 - Signature of the participant
- 6) Conduct the interview and record the conversation.
 - 7) Interview ends.
 - 8) Review of the recorded interview and writing of the interview journal.
 - 9) Documentation of the digital file and of the interview log.

The interviews are conducted in three formats: 45 minutes, one hour, and open length. To accommodate participants' schedules, participants select an interview length when consenting to the interview, and they could discontinue their participation at any time during the research. The interview location is selected by the participants according to their preference and convenience. The interviews respect social, cultural, political differences and diversity in language, gender, religion, society, culture, political position, and economic status.

The interviews are conducted through a six-phase process:

Phase 1: Identify and invite participants who are suitable for the interviews.

Phase 2: Form interview guide and test the interview guide among people other than the thirty interviewees, acquire approval of the interview from the ethical review committee.

Phase 3: Prepare printed materials and recording facilities.

Phase 4: Conduct interviews and write interview notes.

Phase 5: Analyse the interviews and draw conclusions.

Phase 6: Document the interviews and communicate the outcomes.

Since the interviews provide only a general overview of society, certain limitations must be kept in mind when analysing them. First, it is possible that there will be no consensus on why people feel attached to certain objects in certain scenarios, because emotion is subjective, unique and uncertain. Second, the interviews are conducted in a western society, where the economic, social and cultural environment are different from that of people living in other societies, so the interviewees may represent only a small part of the global consumer population. However, the stories providing individual experiences are still valuable to the research topic. The researcher is willing to contribute this experiment of developing a reliable research design and methodology on a subjective subject to the development of the design discipline.

CHAPTER 5

RESULTS OF INTERPRETATION OF INTERVIEWS

5.1 Most Attached Objects

At the beginning of each conversation, the interviewees are asked to describe one object to which they are most attached. This question helps to create an open ambiance in which the participants could start a conversation. This method has been proved a good strategy.

Table 3. The most attached objects and the reasons for the strong attachment

Interviewee	Most attached objects	Reasons for strong attachment
No.1	A toy from childhood	Birthday gift / memory of childhood
No.2	A toy from childhood	Sense of security (habit)
No.3	An designer's armchair	Aesthetics / gift
No.4	A toy from childhood	Gift / sense of security (habit)
No.5	A wall clock	Aesthetics / utility
No.6	Diaries and letters	Memory of past life
No.7	Photo albums	Memory of past life / relationship
No.8	A book	Appreciation of content
No.9	A mobile phone	Functionality (Utility and practicality)
No.10	A pair of jeans	Aesthetics (evolving beauty)

No.11	A book	Appreciation of content/ stress releasing
No.12	A Tomahawk axe	Performance and function / memory
No.13	A Senegalese mask	Gift/ aesthetics
No.14	A book	Appreciation of content / stress releasing / cultural roots
No.15	Letters from Parent	Memory of past life / relationship
No.16	Photo albums	Memory of past life / relationship
No.17	Diaries	Memory of past life
No.18	Photo albums	Memory of past life / relationship
No.19	CDs	Appreciation of content
No.20	A set of dishes	Aesthetics / utility
No.21	An electronic guitar	Memory of past life / relationship
No.22	None	Not attached to any object
No.23	A blanket from a friend	Gift / friendship
No.24	PDA	Functionality (utility and practicality)
No.25	A computer hard disk	Functionality (utility and practicality)
No.26	None	Not attached to any object
No.27	A watch	Gift / utility
No.28	Stones	Aesthetics / memory of travelling
No.29	A coat	Functionality (utility and practicality) / self-esteem
No.30	A bicycle	Functionality / memory

With the exception of two interviewees who claim not to be attached to anything, the majority of interviewees declare strong attachment to a specific object for various reasons. From an analysis of these reasons, the researcher proposes four types of attachment emerged (Figure 9):

- Attachment to objects that perform well
- Attachment to objects that satisfy a sense of aesthetics
- Attachment to objects that reinforce self-esteem or public image
- Attachment to objects associated with experiences

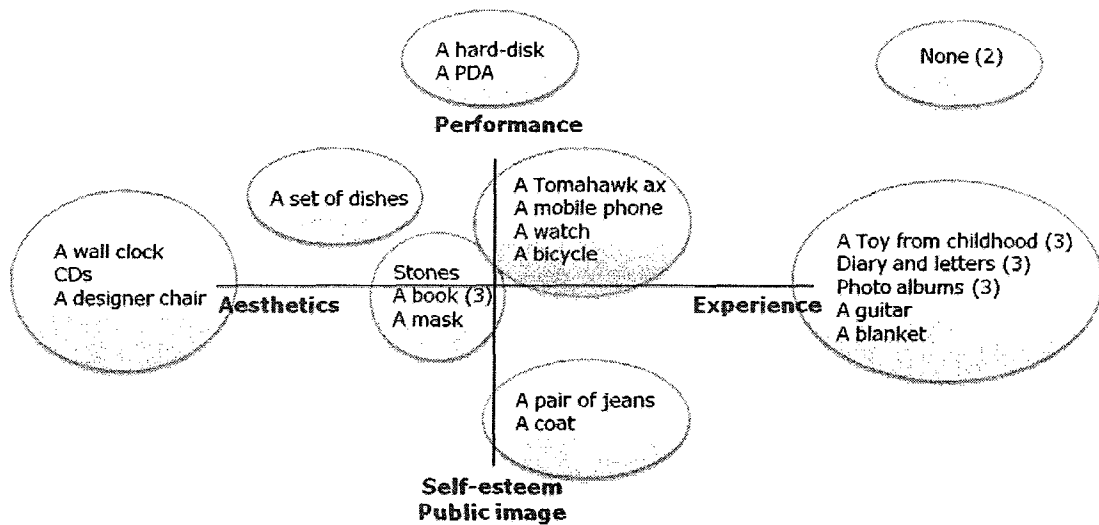


Fig. 9. Categorizing most attached objects within four types of attachment

1) Attachment to objects that perform well

This type of attachment is built on users' satisfaction with the level of

functionality, utility and performance. These objects are considered reliable, trustworthy, comfortable and practical, so a strong bond is built.

“I have a nail cutter that I have used for many years. It is not a beautiful one, but performs so well for me. Each time I travel, I always make sure I have brought it with me. If I need to take an airplane, I will make sure I leave it in the suitcase but not my purse so it won’t be taken in accordance flight safety policies.”

“For some products, such as kitchen tools, I don’t mind what they look like. As long as they work well, I will keep and use them for long time. But they have to work well in my way, even if it may not be the way the products are designed for or suggested.”

2) Attachment to objects that satisfy the sense of aesthetics

This type of attachment is built on users’ appreciation of the aesthetic quality of objects in terms of appearance, sensation, uniqueness, intelligence or artistic content. Users gain long-term enjoyment and pleasure from the aesthetic perception of objects, which can be either classical or evolve over time.

“I bought this wall clock in 1999... The wall clock is decorated with glass

frames filled with dry grains, shells and flowers. Even now, I still think it is really beautiful... I don't think it will ever be outdated."

"An object that I have kept a very long time is an armchair... The reason I love it so much is because of the design."

"I have a pair of jeans that I've worn for 15 years. When I first bought them, they were nice for the reason of looking shiny and brand-new; then, after five years, they were cool because they were so worn, and after ten years until now, they are still cool because they have holes."

3) Attachment to objects that reinforce self-esteem or public image

This type of attachment is built on the self-esteem or public image that objects reflect. Confidence, pride and belonging are the emotional characteristics underlying this type of attachment.

"I have a bicycle which I have used for 5 years. I customized most parts with better components myself. It is definitely worth keeping... Another thing is it can make me look cool. So even though there are new ones on the market, I think I will still keep this one."

“The object I have kept the longest is my coat. I keep it because I am very comfortable with it, even if it looks outdated. I feel it is me... I am happier to put on something I feel good in, instead of putting on something people think looks good on me.”

“People see you through the objects you use. I bought this tablet PC three years ago. It makes me look professional when I communicate with people from other disciplines. When I talk to people and pull out my tablet PC, people take me much more seriously.”

4) Attachment to objects associated with experiences

This type of attachment is built on users' experiences, which are mostly associated with memories, relationships, life style and experience of use. All but ten interviewees (66.7%) affirm that the objects to which they are most attached are those which they associate with experiences. They consider these objects as part of their lives.

“There's a sentimental value with the bike...When I was little, I didn't have friends, so I went biking. Therefore, I really like my bike and go

many places with it... My bicycle even has a name; I call it 'Serpent.'”

“The object I have kept the longest time is my watch, [which I've had] for around twenty years. I like it because it was a gift from my husband, and it is still working well.”

“First, I will say the kettle. It reminds me of the lifestyle that I am looking forward to. For me, it represents a peaceful tea time, a relaxing moment and a good mood. If one day I am rich but don't know how to enjoy the simple life, I will not feel happy. For me, the kettle is an attitude towards life and that's important to me.”

The first interview question, then, lead to utility, aesthetics, symbolic meaning and past experience as four keys to reinforcing attachment. Among them, past experiences have the strongest and most durable effect on users' attachment. This outcome supports the hypothesis made during the review of literature on attachment, emotion and attributes of things.

After the open question about which objects people are attached to, more direct questions related to different categories of daily objects follow. Dividing

these daily objects into different categories allow the questions to be targeted specifically towards each group of objects in terms of their function, performance, user experience, cost, and other elements.

5.2 Attachment to Tools of Transportation

In this category, car and bicycle are chosen as two study cases. All but nine interviewees (70%) have cars, and the rest use public transportation or other means of transportation. Fourteen interviewees have or use to have second-hand cars. Among the 21 people who have cars, 6 are leasing cars or use to lease cars for reasons of security, finance or self-image, but do not consider it a strategy for minimizing the environmental impact. Although people spend thousands of dollars to buy a car, the expense does not mean that they have strong attachment towards their cars. Among the 21 people who have cars, 13 interviewees consider a car simply a product to consume that can last for four to five years. However, in reality, a car is often replaced every two to four years, more often than users' expectations. The cost and difficulty of maintenance (60%), the end of a lease (26.7%), moving (33.3%), and security (26.7%) are four main reasons for a broken attachment. One positive aspect of these old cars is that most of them are

sold or traded, so the environmental impact caused by cars is largely from the emission of CO₂, not the car itself.

Compared to cars, bicycles are more commonly owned by interviewees. Among the 30 interviewees, 26 currently have bicycles or use to have bicycles. Unlike people in countries such as China or Europe, where bicycles are one of the main means of transportation, the interviewees use bicycles for exercising and leisure activities. Twelve interviewees appreciate biking as a healthy outdoor activity and lifestyle, which brings them the feeling of freedom, relaxation, and connection to the nature and community. Another five interviewees appreciate the bicycle for its practicality and as an economic mode of mobility. They are able to go anywhere easily on campus, in the city, or even traveling in bicycle. Moreover, three interviewees link their bicycles to self-image, because the bicycles make them feel good and look “cool.” Two interviewees describe their bicycles as part of their lives and memories, but seven participants, who don’t like riding bicycles, only use them occasionally. According to the interviews, people have high expectations of their bicycles. Among the 25 participants who ride bicycles, all but one expect to use a bicycle as long as possible. Compared to cars, bicycles also have longer life span in reality. The reasons participants

replaced bicycles includes moving to another place (47.6%), theft (33.3%), broken parts (23.8%), age (28.6%), and lack of need (14.3%). Interviewees discard bicycles for two main reasons: that replacement for a newer model is inexpensive and that it was not cost-effective to repair the old ones.

Although cars and bicycles are both transportation tools, users are more attached to bicycles mainly because of their easiness to master and maintain, the ability to customize, cost savings, sentimental meanings they carry, and the rich experience they offer. The majority of interviewees have stronger feelings about bicycles than cars. However, two interviewees admit a strong emotional attachment to their first cars, as they still remember the excitement of owning and driving them; however, this emotional attachment doesn't prevent the user from discarding the car when it is no longer functional. On the other hand, two interviewees report that they still keep their old bicycles even though they don't ride them anymore, because of the special meaning the bicycles have: one of them was received as an anniversary gift and the other one, once a high-end bicycle, was given to the user by a close relative.

From the perspective of design, being able to maintain an object easily and providing rich life experience are two keys that benefit the longevity of this

category of objects. From the perspective of marketing, knowing how to relieve users from the burden of maintenance and to stimulate their experience can help improve the longevity of the objects.

5.3 Attachment to IT / Communication Devices

In this category, the mobile phone and the computer are chosen as the two targeting objects to study because these two objects are possibly the most widely used IT/communication objects and the environmental impact of discarded mobile phones and computers is significant.

The interviews show that the majority of interviewees have mobile phones; among the 30 participants, only two have never had a mobile phone. Interviewees have an average of three mobile phones over their lifetimes. Although development of mobile phones is very fast, 19 of the participants claim that they use only the basic function: making phone calls. The remaining 9 interviewees who have phones report using functions such as exchanging text messages, web surfing and taking pictures. Among them, only 4 interviewees are interested in using additional features the mobile phone offers. All those who use these additional features are under 30 years old and replace their mobile phones

every few months. The look of a mobile phone has a much stronger influence on them, since they consider a mobile phone as both a tool and, at a certain level, an accessory. The main reasons given for replacing a mobile phone are to change an outdated model (40.7%), to change the service provider (22.2%), influence from others (11.1%), to replace a broken phone (25.9%), and to replace a lost phone (14.8%).

The attachment to mobile phones is mostly built on functionality. Although 40.7% of the interviewees report getting a new mobile phone because the old one is outdated, and claim that they won't buy a new one simply for the style, unless there is a "revolutionary" improvement. As long as the phone meets their needs, they don't mind keeping it. However, the manufactures still attempt to attract more users by providing dazzling new functions and technologies, even though many participants say they have never tried them and are not interested in them. The extra features, then, do not seem to enhance the attachment between users and their mobile phones; although extra features are meant to be exciting and appealing as gadgets, in the end, they are not that useful. Such marketing strategies do not encourage sustainability but have a goal of speeding up obsolescence.

Like mobile phones, computers are used by almost everyone in daily life. All interviewees have either desktop or laptop computers at home. In general, participants report that, while laptops are more convenient to carry around, they lack the flexibility to upgrade or change parts and desktops are more powerful in terms of performance. Almost no interviewees have tried to upgrade their laptops, choosing instead to replace them every three to five years and sending their old laptops back to stores, trading them in or simply giving them to others. While, five interviewees say they upgrade their desktops about every six months in order to keep high performance, the majority of the interviewees (20 out of the 25 who have desktops) report that they do not upgrade their desktops that often. Fear of the computer system's complexity and the fact that their needs are already satisfied prevent users from upgrading old desktops. The fast pace of technology development and rapid drop in prices make old computers neither worth selling nor worth giving away, so many of them end up in landfills. Compared to mobile phones, the interviewees show a higher attachment to computers for the multi-functions they provide. The cost of replacement is likely another reason that people keep computers longer than mobile phones.

Although most interviewees say they do not have a strong attachment to

these IT/communication objects because of their foreseeable obsolescence, some users still develop an emotional attachment with these objects. One interviewee who works as a software developer sees the computer as a pet that can be “trained” and personalized to perform the way she prefers. Her computer is not a high-end one, but she customized the interface to fit her use habits and installed two systems that she could easily shift between. Although she has a new laptop for working, she still loves to use her old desktop at home since the new one is still “in training.” For her, the computer provides not only efficient functionality, but also a great user experience.

IT / communication devices help the user to do many things that are part of everyday life — listening to music, watching movies, exchanging messages, surfing on the internet, checking calendars, playing games and so on. Some interviewees even claim they could not live without these objects. But their attachment is to the function of the objects, not to the object itself. From the perspective of design, the ability to personalize and upgrade could enhance attachment and extend the object’s life span. From the marketing perspective, after-sales services, such help for upgrades, repair, or customization at an affordable price, are essential.

5.4 Attachment to Entertainment Products

Four objects are chosen for this category: an MP3 player, a television, a DVD player and a game console. The interviews reveal that 16 interviewees—slightly more than half— have never owned an MP3 player and, among those who do own one, only 6 use it often or more often than they did when they first purchased it. Most of the interviewees enjoy trying it as a new device, but the fun does not last long when they figure out they have to keep downloading music and recharging the battery to maintain performance. Five participants also report that they use other devices—mobile phones, car radios or computers—to accommodate the same function. Four interviewees dislike the sound quality of the MP3 players, preferring live music, a stereo system or CDs. One interviewee says that he would not spend money on a downgraded object, especially for image and sound, which require a good quality to appreciate. Twelve interviewees feel that running the MP3 player is too “time-consuming.” Thus, the conversations show that the attachment between users and MP3 players is very weak.

Television, as a traditional entertainment product, once played an important role in family life, and new technologies have led to larger and higher-resolution

sets. However, the interviewees indicate that the importance of a television in daily life is fading. Among the 27 interviewees who have a television at home, only 11 claim they watch TV programs often, and the other 16 don't spend much time in front of the TV. The function of a TV set is also changing; three interviewees bought a new TV set simply for playing games and another 6 bought it for family members, mainly parents or children. One interviewee reports watching TV programs for better social communication with colleagues. Similar to MP3 players, televisions face challenges from other products. Computers and play stations have unseated TVs in many of the interviewees' homes, as do individual "smart" devices, such as iPods and iPhones. People still need a television to play Nintendo Wii, but there is no doubt which—the TV or the Wii—would be saved from a house fire. Still, while televisions have lost some of their luster in the internet age, the majority of interviewees consider it necessary to have one in the living room because a television is like a piece of furniture in a home environment, no matter whether it is used often or not. The newly developed high-definition TV has also brought back its charm. Somehow, the TV is still considered more than mere technology; it is meant to be art as well, live and in cinematic stereo.

DVD players are beginning to disappear; although 14 interviewees still keep a DVD player at home, 12 claim they don't use it often. As a disappearing technology, the DVD player is one of the easiest electronic appliances to discard. The interviewees show almost no attachment to it.

Game consoles are age and gender-oriented objects. Five of the 30 interviewees have game consoles, and all are male and under 30 years old. Most of them have updated their game consoles from PlayStation 2 to a newer generation, such as PSP, PS3 or Xbox 360, but none has Nintendo Wii since they consider it to be less than professional or challenging. They see performance as one of the most important criteria and reported that, if their budget permitted, they would buy newer game consoles with better images, sound effects and new games. Most of the five interviewees who have old game consoles gave them to friends or family members. Compatibility is another important driver for giving away their old products because many new games cannot be played on old game consoles. This kind of planned obsolescence breaks the attachment between users and objects.

It is difficult to build stronger and longer attachment between entertainment appliances and users because of the rapid development of new technologies and

performance and manufacturers' strategy of planned obsolescence. From the perspective of design, new experiences are more attractive than new appearance, and future compatibility with a new generation of components needs to be considered. From the perspective of marketing, the strategy has to be changed from a focus on selling individual products to function and services.

5.5 Attachment to Domestic Appliances

Domestic appliances include a large inventory of objects, ranging from kitchen electronic products and cookware to cleaning devices. The interviewees have varying criteria for choosing and purchasing domestic appliances; half of the interviewees put performance at the top of the list, and 10 consider functionality to be the most important criterion. Although functionality and performance are two different concepts, the interviews indicate that most participants consider them as two sides of a single coin. Seven interviewees rate appearance in second place, and two consider cost the top priority, explaining that a high percentage of current domestic appliances have identical quality, so cost is considered the differentiating criterion. Political, ethical and ecological criteria also emerge as important factors, showing that consumers have begun to

be more aware of the environmental impact of each product. For example, one interviewee has bought energy-certified kitchen appliances, and another interviewee carefully chooses products with fewer plastic parts that are produced by environmentally sound manufacturers.

Although domestic appliances are used with high frequency, users still expect them to last forever, whether they are large appliances, such as refrigerators and stoves, or small, like microwaves, toasters and vacuums. “As long as it works, I will not change it,” is heard frequently during the interviews. Among the 30 participants, 20 people (66.7%) say they would replace the old products only when they are broken. Five (16.7%) say they replace old products when they move, and five (16.7%) say they have discarded functional appliances because of unsatisfactory performance. Only 3 people (10%) report buying new domestic appliances simply because they enjoy exploring new products. Nearly three-quarters of the interviewees say that domestic appliances are very important to their daily lives, but many people don’t really notice these objects, so there is an ambiguous attachment between users and this category of objects. One interviewee says he doesn’t care about these domestic appliances, but when they are broken or not functional, he becomes extremely angry. Two

interviewees suggest that most appliances do not perform in keeping with the manufacturers' promise, which breaks any potential for attachment. Users must adapt to these appliances in order to use the functions and, when the user is not willing to adapt any longer, the objects will be abandoned. Three interviewees further emphasize the point that the appliances have to be able to work in the way that the users expect and prefer.

Although the participants seem to be attached to the performance and function these appliances provide, rather than to the objects themselves, some users still generate a strong emotional attachment to their domestic appliances. One interviewee shares his story of having had two espresso coffee machines. One of them, a gift from his father-in-law, required the user to do all the steps manually in order to prepare a good-tasting coffee. As a result, making good coffee brought fun and a sense of achievement and satisfaction, and a strong attachment was built. However, this attachment didn't last when the machine reached its end-life and could no longer be repaired. When he bought a new coffee machine, no matter how hard he tried, he could not make coffee as good as he could when using the old coffee machine, so he decided to sell it. While preparing the information for selling online, he found some forums that

discussed this model of machine, which helped him to re-explore and finally figure out the proper way to use the machine so he became satisfied with its performance and enjoyed using it. This story shows that an attachment can be built while users adapt to or explore the objects in order to get maximum performance. Several other interviewees also describe a willingness to adapt themselves to a new product and explore it, so the process of user adaptation could actually be a strategy to build sustainable attachment to objects.

Users have strong attachment to their domestic appliances as long as they function well; 14 interviewees (46.7%) say they have a strong attachment to this category of objects, 11 (36.7%) have an average or above average attachment, and only 5 (16.7%) claim feel no attachment at all. Overall, the level of attachment relies heavily on the object's functionality and performance, so, from the perspective of design, the object should be designed to be adaptable and reliable and with the potential to be explored, in order to enhance attachment.

5.6 Attachment to Furniture

Unlike other objects, furniture is not usually replaced often. Among the 30 interviewees, 24 expect to use their furniture for their whole lives. Appearance

(53.3%) and the quality (56.7%) are the two major criteria for choosing furniture. While 16 interviewees bought their furniture new at IKEA, second-hand stores, retail stores, friends, family members, and even the internet are reported as alternative sources of acquiring furniture. Interviewees shop at IKEA for its affordable prices, modern and stylish design, ease of assembly and disassembly when moving, and ease of re-sale. However, among those who bought furniture at IKEA, 6 people are disappointed after using the IKEA furniture for a period of time, because the quality is not adequate for long-term use. From a traditional point of view, furniture are objects that represent stability and value at home and that create a cozy home environment. Once the users begin to enjoy the ambiance, feel comfortable and get familiar with this environment, they will seldom change their furniture. Eleven participants don't feel bored, even when they have used the same furniture for long time. The other 19 interviewees simply do some small modifications to give the environment a new look, such as changing textiles, buying some small decorative objects, repainting, or changing the position of the furniture in a room. These innovative ways of creating something new out of something old can enhance the attachment between users and their furniture.

Furniture has a longer life span than electronic appliances. First, the

development and changes in the furniture industry are slow and seldom revolutionary, so users don't feel their furniture is outdated, even if they use the same furniture for years. Second, furniture creates a secure, comfortable and familiar environment for users, which is far more important than physical function. One interviewee says if she throws away or replaces a piece of furniture at home, she will feel strongly that something is missing and that the furniture that surrounds her no longer creates a warm and safe living space. Another interviewee talks about her experience of selling old furniture to others, describing it as feeling like abandoning a child.

The strong attachment between users and furniture is built on the sense of security and comfort that the environment provides. In this context, a piece of furniture is far more than a functional object, but something that satisfies a psychological need. In most cases, interviewees discard their furniture only when it is broken or when they have to move to another place. Thus, adopting design for disassembly strategy in the design process would accommodate moving from space to space and would provide easier ways to repair broken parts.

5.7 Attachment to Clothing and Related Accessories

Clothing and related accessories are the category of items that people replace the most often in their daily lives. Fast-changing fashion trends have strong influences on consumers. In the interviews, women are more passionate about shopping for clothing and related accessories than men are. Among 15 female interviewees, 14 claim that they have more clothes than they need or wear. One of the female interviewees even admits that she is addicted to buying clothes; it has become a therapy for her when she is not in a good mood or when she feels tired. Most male interviewees report that they do not shop for clothes and related accessories often but are satisfied with what they have. Among all the participants, motivations for purchasing clothing include following trends (10%), creating self-esteem (66.7%), meeting physical needs (23.3%), being influenced by other people (10%), and habit (16.7%). People deal with old clothes by keeping them at home (50%) or by donating them to charity (66.7%). Only three interviewees throw away old clothes because it is more convenient to do so (10%). Half of the participants are happy to give away their old clothes, knowing that someone else could use them. While 8 people (26.7%) report having no feelings about their clothes, 7 feel a bit sad about discarding them; however, they

also report that the negative emotion usually dissipates quickly because of lack of strong attachment.

In general, people have less attachment to clothes and related accessories; even though this is a category of objects that are physically closest to users. Some interviewees do have certain degrees of emotional attachment towards one or two specific items of clothing that are associated with past experiences; one female interviewee still keeps a skirt that she wore as a child, and another keeps one souvenir of clothing from each stage of her. Another reason that people keep old clothes and related accessories is because they evolve with time and continues to satisfy a user's taste. This retro appreciation for objects can reinforce attachment over the years. One male interviewee has kept a pair of jeans for almost 15 years because the jeans has evolved with the trend and still satisfied his sense of beauty. Some clothes may not evolve with changing trends but users tend to keep and appreciate a classical style. These interviewees have a clear idea of their own style and preference, believing that the classics will not fade but will add more charm over time.

The interviews also suggest that some clothes have been kept for a long time because they have reinforced users' self-esteem. One interviewee says,

“When I put on my old coat, I feel it is me and very comfortable.” In this context, clothing represents the person who wears them because it reflects the person’s personality and style. Ethical consumption is the key to reducing the environmental impact of this category of objects. From the perspective of design, customization can satisfy an individual’s taste and needs and create a personal connection.

5.8 Attitude toward Old Objects

Besides attachment to different categories of objects, the 30 interviewees are also asked about their attitudes toward and actions related to old objects. Most interviewees try to give away old objects before throwing them away, and the emotions that bond users with their old objects fade soon after they acquire a replacement. Because the practical function is the primary factor of a sustainable relationship between users and objects, once the objects no longer provides utility, the attachment is easily broken. However, a few interviewees feel a little sad when discarding old objects; one interviewee describes the feeling as being like abandoning a family member or breaking up a relationship: “One minute, you are still using the object and it is satisfying your needs; but the next it is

kicked out and not functioning any longer.” She feels that people don’t give any credit to the old object, which has accompanied and served the master for long time. In addition, none of the interviewees has strong attachment to electronic appliances, old or not. They are attracted by these products but not attached to them.

One interviewee shares a unique experience: She suggests that building a relationship with an object is like making a friend and that, the longer the object is used, the better the user gets to know it and, the better the user knows it, the longer he or she will keep the object. The relationship between users and objects is always evolving, and she gets more satisfaction from using an object, even after a long period of time. The habitual of the everyday is important.

When there are scratches on their objects, 28 out of 30 interviewees do not mind, as long as the scratches are neither too disturbing visually nor affecting the function. In terms of the link between scratches and attachment, one interviewee gives an interesting interpretation to his feelings of scratches on his iPod: he says that the scratches generate both more attachment and less attachment. When there are scratches on his iPod, he feels much more relaxed about using on any occasion, since it is not new and shiny anymore; he uses it more often and

casually, which in turn generates more attachment. But if the iPod is still new and has no surface defects, he appreciates the product more in terms of the aesthetics. In this context, the scratches cause less attachment.

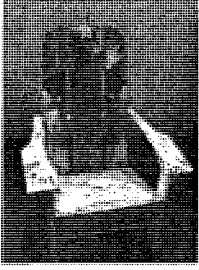
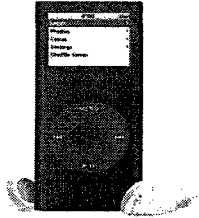
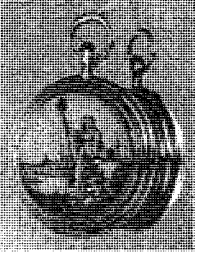
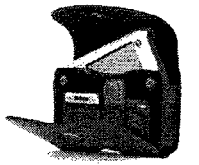
Long-term attachment could eventually lead to lack of interest, since curiosity and searching for freshness are part of our nature. However, only seven interviewees admit that they are easily bored when using old objects, and the rest do not share this feeling. Some interviewees compromise by continuing to use the old objects out of long-term habit; some do not care as they don't like to be bound by any object; and some are concerned only with functionality since, as long as the object work, they don't have a problem using it—the objects become invisible to them. This presents an interesting challenge to designers: how to design a product with rich experiences and evolve the experiences to reinforce the connection?



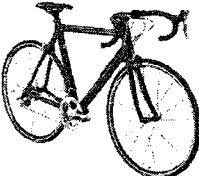

5.9 Different Levels of Attachment to the Objects in the Eight Scenarios

In the last section of the interview, subjects are shown images of eight objects, along with short scenarios for each one. The design strategies are not revealed directly to the participants, but through the eight scenarios (Table 4).

The participants are asked to rank them in order according to their preferences or the importance each of these objects has for them.

Table 4. Proposed objects and design strategies

Proposed objects in eight scenarios			Represented strategies
Picture	Category	Description	
	Furniture	Chair - Self-made object made with recycled materials	Participatory design Responsible consumption
	Entertainment products	iPod - Birthday gift from a spouse	Emotional design (relationship/ gift); Aesthetic design
	Clothes and accessories	Watch - Family heirloom	Emotional design (family bond); Aesthetic design; Design for perceived value
	IT/Communication devices	PDA - Digital device with leather case	Multifunction; Upgradeability; Aesthetic design

	Clothing and related accessories	Shoes - Comfortable brand-named article	Brand loyalty; Ergonomic design
	Domestic appliances	Kettle - Alessi-designed piece, bought at a design exhibition	Aesthetic design; Design for experience (souvenir)
	Tools of transportation	Bicycle - Long-term travel partner	Design for experience; Design for disassembly; Emotional design (memory)
	Entertainment products	Hockey stick - Souvenir of a winning match, signed by a player	Design for perceived value (collection); Emotional design (memory/ pride)

The 30 interviewees rank the eight objects and score them from low score of 1 to high score of 8. The first object chosen is considered as the most important object to the interviewees and is scored 8. The second object chosen is scored 7, and so on. Then the thirty scores for each object are calculated, as

shown in Figure 10. (See Appendix 3, Table 15, for detailed calculation.)

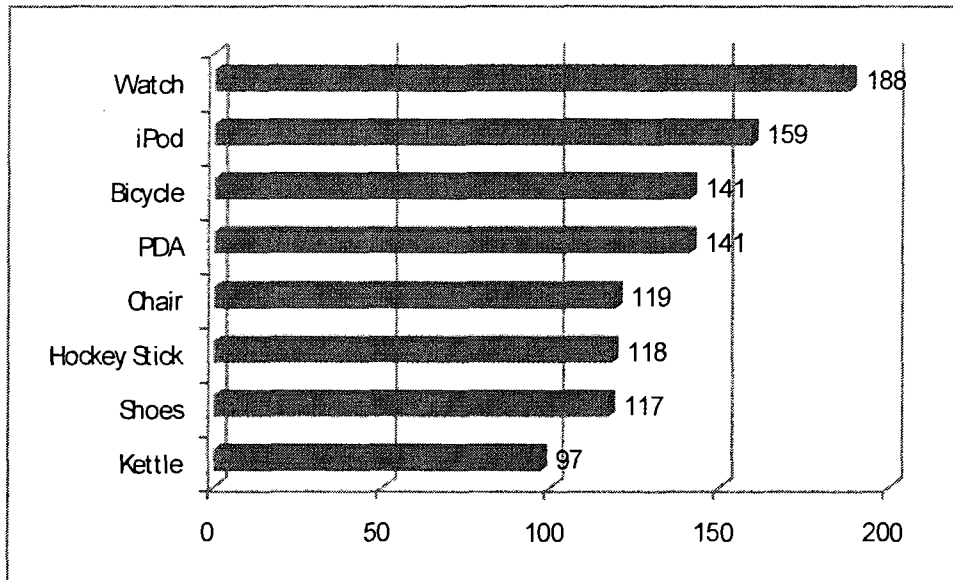


Fig. 10. The order of preference for the proposed objects

The object receiving the highest score is the watch inherited from a relative. Most interviewees consider the family bond an important factor since the affection and the story the object carries are considered irreplaceable. However, the object's size, function and value also impact the longevity of the family objects. For example, some interviewees claim they would keep an old family watch but not an old piece of furniture because of storage constraints. Functional objects are also more likely to be kept than non-functional ones, and the value of the inherited object is also taken into account.

The object receiving the second-highest score is the iPod given by a partner

as a birthday gift. The interviewees appreciate the love and care this object represents and that it is also high-tech, trendy and useful. In this context, whether it is perceived as unique piece, a needed object or something the receiver really appreciates all impact the longevity of the object.

In third place is the PDA, which score high for its efficient functionality. Some interviewees use the device for saving personal data, searching for information, and for communicating to the outside world and feel strongly that life would be inconvenient without a PDA. The cost of a PDA is also considered by many interviewees. (For those interviewees who don't have a PDA, computers are placed in this scenario and the same results are obtained.)

The bicycle that had been ridden for a long time and to many places occupies fourth place. The interviewees who rank the bicycle higher do so mostly because of ease of use and maintenance. Although the feelings of riding a bicycle and memories of many places positively influence the longevity of the bicycle, the affordable price of replacing to a new one is the primary reason of a mid-level score.

Following the bicycle in fifth place is the home-made chair. Few interviewees value this object because they feel they could just make another one

if needed; what they enjoy the most is the process, not the end result. Some interviewees also consider the finish and aesthetic quality of the object, which, in many cases, seems rough compared to commercial objects.

The sixth object that the interviewees choose is the hockey stick. Although it is a trophy from a winning match, the participants prefer to leave the sense of pride and success in the past. The interviewees' attitude towards a famous star's signature varies greatly; some don't care about it at all, and others value it highly.

The shoes and the kettle occupy the last two places. People appreciate the comfort of the shoes, but the ease of getting a new pair makes the shoes less important, as is also the case with the kettle. Many interviewees judge the importance of these two objects by asking themselves, "If I don't have it, would it matter?" When the answer is negative, the importance of the object to the user is low, as is attachment. Although both the shoes and the kettle are well designed, brand-name objects, participants seldom consider that to be a critical element, unless it is related to quality.

The score of each object reflects the overall view of the objects in the eight scenarios, but there are some exceptions at the individual level. One interviewee links the kettle to a casual lifestyle about which he dreams, so he ranks it at the

highest place. One interviewee sees the shoes as mental therapy; when she puts on a pair of comfortable shoes, she feels confident, happy and relaxed. Another interviewee scores the bicycle the highest of the eight objects, considering it a faithful friend from childhood experiences. Each interviewee brings different perspectives to the meaning of objects.

The rankings of the eight objects show that relationships, including family and friends, meant the most to users. The function of objects, reflected in practicality, utility and performance, is the most important reason affecting product longevity. Following these two factors is cost, relating to the monetary value of objects and the cost of replacement or repair. The research findings suggest that design strategies which are able to reinforce emotion, function, aesthetics and value could enhance attachment and that, among these design strategies, emotional design has the most influence on product longevity.

5.10 Insights Gained from the Interviews

Although the interview sampling is limited by the number of respondents and by geographic location, the quality of in-depth conversations still leads to useful insights (Table 5).

Table 5. Main reasons for broken or strong attachment for each category of objects

Category	Representative objects	Main reasons for broken attachment	Main reasons for strong attachment
Tools of transportation	Car, Bicycle	Cost of maintenance “Maintaining the parts to maintain safety costs too much”	Utility (efficiency) Driving/ riding experience Lifestyle (freedom)
IT / Communication devices	Mobile phone, Computer	Psychological and technological obsolescence (depreciation) “New models are better/ faster than old ones.”	Utility (information) Public image
Entertainment products	Television, DVD player, MP3 player, Game Console	Technological obsolescence (depreciation) “The old technology is outdated.”	Users’ experience
Domestic appliances	Kitchen appliances,	Cost of repair and replacement “Repairing usually costs more than replacing.”	Utility (function) Users’ experience

Furniture	In general	Moving “Too big and heavy to transport.”	Monetary value (cost) Aesthetics Emotional experience (needs for a stable environment, sense of security and comfort)
Clothing and related accessories	In general	Psychological obsolescence “Outdated and not stylish anymore.”	Aesthetics (fashion and style) Self-esteem and public image

First, the kind of attachment that users develop with each category of objects varies. However, in most cases, whether the object is functional or not is the primary condition for willingness to keep an object. Once the object does not work anymore, the attachment will be easily broken. This result may be caused by the fact that the interviews took place in North America, where the goods and supply is abundant and purchasing power is strong.

Second, sentimental meaning attached to experience is the most influential factor in building a strong attachment to an object. A bicycle is associated with the feeling of freedom; a childhood doll provides a sense of security; books

relieve stress; a blanket is a reminder of a precious friendship; and a kettle represents a leisure lifestyle. Those objects with rich sentimental values are most likely to have longevity.

Third, the phenomenon of detachment is made apparent when some interviewees claim that they are not attached to any object, leading to the conjecture that people are more attached to needs and less to physical objects. The MP3 player is a good example: Many interviewees appreciate the music and sound, but not the MP3 player itself. A similar philosophy holds many other digital products, such as mobile phones, DVD players, and computers. Eric Chan, a well known New York-based industrial designer, suggested that “as designers, we have to think about how users enjoy the experience of whatever it is that they are doing, not the object. The object should become transparent” (Press, 1995). Chan saw that designing for experience is as important as designing an attractive form. At a certain level, consumers’ needs have shifted from owning physical goods to enjoying a service, function and performance.

Overall, the first part of the interview suggests that people appreciate objects associated with emotional experiences, which creates a strong attachment. The second part of the interview suggests four types of attachment and different

levels of attachment to different category of objects, as well as the phenomenon of detachment. The third part of the interview suggests that utility, appearance, symbolic value and users' experiences are four key reasons that sustain the emotional attachment between users and objects. Among them, users' experience, especially sentimental meaning, has the strongest influence on attachment. The interviews also reveal that the sentimental value associated with particular products is generated by relationships, memories, and life experiences.

CHAPTER 6

PROPOSAL OF DESIGN STRATEGIES

FOR ENHANCING ATTACHMENT

The interviews provide beneficial insights into the concepts of attachment. Analysing the types of attachment and the underlying emotional reasons have led to four design strategies, each of which corresponds to one type of attachment. These strategies are illustrated through case studies.

6.1 Design for Adaptation

Design for adaptation is a strategy whereby objects are designed to be adaptable to different contexts, such as user's needs, habits, ergonomic requirements, use environment, and the nature of the task, in order to reinforce users' satisfaction over time. This strategy corresponds to the type of attachment that is built on quality performance. The long-term assurance and trust generated from the flexibility and reliability of objects could enhance attachment.

Like the term attachment, adaptation is also widely used to describe one of the phenomena of being human: a person's immediate response to stimulation is

a sensory adaptation, which then gives way to neural adaptation (Martinez-Conde, Macknik and Hubel, 2004). Simply put, to adapt is to change over time in responding to a constant stimulus.

Some existing strategies can achieve the goal of adaptation. Design for disassembly enables the parts of objects to be disassembled, replaced and modified; modular design provides users multi-functionality with high flexibility. Ergonomic design includes objects, systems and environment for human use by maximizing efficiency and quality. User Interface (UI) Design optimizes the utility of a product, considers the psychology and physiology of users, and makes the process of using the product effective, efficient and satisfying.

In addition to exploring design strategies, development of new materials can assist in design for adaptation. In the field of smart materials, shape-memory materials are being explored as they can change shape, density, position, natural frequency, and other mechanical characteristics in response to temperature or electromagnetic fields (Rogers, 1995). A deep fryer utilizes thermal sensitivity by lowering the basket into the oil at the correct temperature (Falcioni, 1992). The Ni-Ti underwire bras, designed with a shape-memory alloy, have been extremely successful in Japan because of their comfort and durability (Stoeckel

and Yu).

Braun is a German brand that is known for high performance standards in the field of electronic appliances. The latest Braun Pulsonic shaver (Figure 11) is a good example of design for adaptation as it combines shaving performance, ergonomic handling, aesthetic appeal and high. The Braun Pulsonic shaver was designed with a flexing head, which automatically navigates larger contours of the face through an adaptation angle, while the touch-sensitive foils individually adapt to the slightest change in skin surface. Braun also offers a complete range of replacement parts for prolonging the lives of its products. Both high quality and flexibility prevent this product from being discarded rapidly.

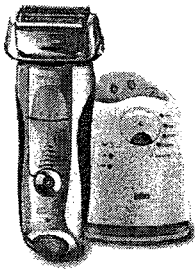


Fig. 11. Braun Pulsonic shaver

Available from: <http://www.braun.com/na/pulsonic/pulsonic.html>,
[accessed: July 20, 2008]

The Swiss Army knife is another success story (Figure 12). It has a blade and numerous other tools, such as a screwdriver, a can opener, a wire stripper, tweezers, scissors, and a bottle-opener. These attachments are stored compactly inside the handle of the knife. The Swiss Army knife gained its success from its

versatility, precision, dependability, multi-functionality and quality. Users build a strong attachment to it for these features and associate it object to the spirit underlying the brand.

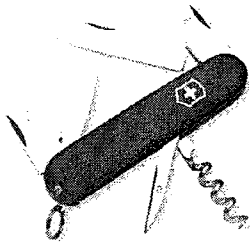
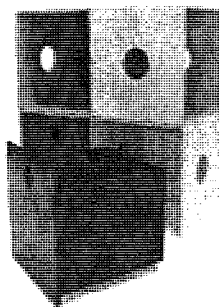


Fig. 12. Swiss army knife

Available from:

<http://www.swissarmy.com/MultiTools/Pages/Product.aspx?category=sportsandleisure&product=53131&>, [accessed: July 20, 2008]

The P'kolino Storage Kube Set adopts modular design method to design objects that users can configure according to their needs (Figure 13). The set of kids' furniture is multi-functional and can be used as shelves, bins and chalkboards with colors designed to complement the users' home décor. The high flexibility enhances the bond with its users.



Kube Set



additional accessories shown

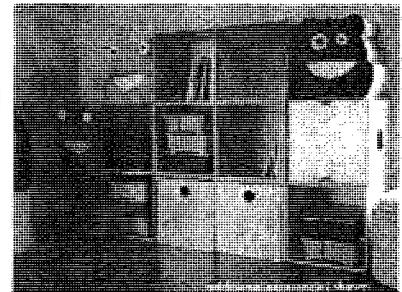


Fig.13. P'kolino Storage Kube Set

Available from:

http://www.pkolino.com/index.php?main_page=product_info&products_id=47, [accessed: July 20, 2008]

The above cases are examples of how to apply design for adaptation strategy in design practice, there are also some objects are abandoned after a short period of use because they are designed to be adaptable. Apple's "Hockey Puck" USB mouse is such a product (Figure 14).



Fig. 14. Apple USB mouse

Available from:

http://www.aarongersfieldnewyork.com/wiki/wiki.php?wiki=Image:Apple_iMac_USB_mouse.jpg, [accessed: July 20, 2008]

Apple USB mouse was a revolutionary design in terms of using the USB standard as its method of connectivity, but as a hand-held product, it is literally painful to use for extended periods because of the failed ergonomic and interface design. It has a single button that is difficult to find without looking directly at it. The round form and small size of the mouse make it difficult to fit in most users' hands, so the overall users' experience is negative.

Adaptation is a two-way process: an object should be able to adapt to users' needs, and vice versa. Users must keep an open mind about adapting to objects and be willing to explore all the features of the object, as well as new ways to

use it. An interviewee describes this relationship as a friendship that requires both sides to spend time to “get to know” each other. Some interviewees also mention that they have no problem adapting to the objects they use, which sometimes means they have to change their habits of use. For them, the fun of exploring something new and learning how to take maximum advantage of the designed functionality are part of the experience.

The design for adaptation strategy is suggested for tool design, footwear design, furniture design, and design of other objects that are closely related to the human body.

6.2 Design for Expression

Design for expression is a strategy for designing objects that satisfies users’ sense of aesthetics through various communication means to create long-term enjoyment through appreciation of aesthetics. According to Beaker (1997), a product lasts 10–15 years is not just about ecological or quality issues, but also of aesthetics. Expression is a primary means of conveying social information among humans, a way to exchange ideas and emotions. While human beings express their ideas and emotions by using language, facial expression and body

posture, objects communicate through their “look” (appearance), “sense” (material and texture) or “intelligence” (content).

Lagostina, an Italian manufacturer of premium stainless-steel cookware, is renowned for its design. Influenced deeply by architecture, philosophy and historical style, it combines the beauty of pure lines with high-quality material and finishing. The design of its striking handles and lid loops were inspired by the sculpted contours of Italy’s most famous architects. The finest stainless steel delivers a level of performance and elegance. The aesthetics of this object, symmetry, relief and texture, is well expressed and communicated through its design vocabulary (Figure 15).

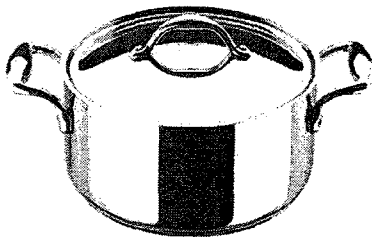


Fig.15. Lagostina cookware

Available from:

<http://www.lagostinaworld.com/collections/accademia/accademia-cookware-set.htm>,

[accessed: July 20, 2008]

Besides the appearance, the well-expressed intelligence behind the objects is another factor that gains appreciation from the users. The Amos Toys' 20-cmYOD (Figure 16) is an example that achieved high popularity among

consumers during an investigation conducted among some of Canada's most fashion-forward retailers (Cazzin and Wong, 2008)

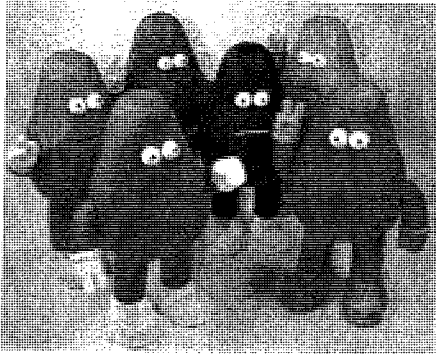


Fig.16. YOD toy

Available from:

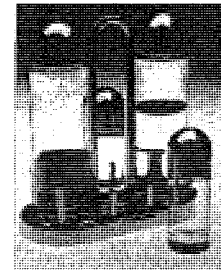
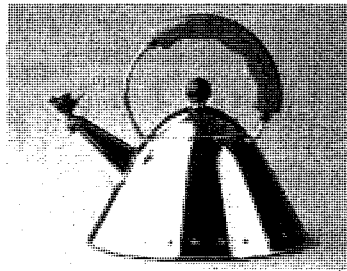
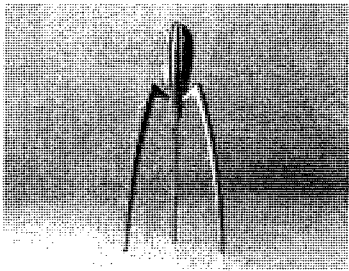
<http://www.hypebeast.com/2007/09/amos-toys-yod>,

[accessed: July 20, 2008]

Contrary to its visual simplicity, the figure has a complex aesthetic concern: The YOD derives its shape based on an ancient mathematical formula filtered through the minds of modern-day philosophers. It is the convergence of academic and design theory. The limited numbers of the toy is another reason for the success of this toy. Available in six different colors, each color of the YOD is limited to 200 pieces per color, and a special white-and-black limited edition, with different hand gestures, is limited to 140 pieces. The restriction of availability and exclusivity attracts collectors, so a strong attachment is built on the uniqueness of this vinyl figurine.

Alessi, known for its iconic Italian design, is devoted to the production of household goods. Alessi is successful not only in delivering the sense of

aesthetics through their products but also communicating creativity, imagination and humor. Rita Clifton, chairman of Interbrand UK in London, observed that "They combine functional design with aesthetically pleasing lives, often making people smile in the process." Alessi's best-known collections include Philippe Starck's arachno-inspired Juicy Salif lemon squeezer, Michael Graves' Kettle with Bird, and Ettore Sottsass' domed oil and vinegar cruets. The outstanding quality of aesthetics assures the longevity of these products (Figure17- 19).



From left to right:

Fig. 17. Juicy Salif lemon squeezer

Available from: <http://images.businessweek.com/ss/06/07/alessi/source/4.htm>, [accessed: July 20, 2008]

Fig. 18. Kettle with bird

Available from: <http://images.businessweek.com/ss/06/07/alessi/source/3.htm>, [accessed: July 20, 2008]

Fig. 19. Condiment set

Available from: <http://www.theglasswarestore.com/Alessi-5070-AAS1013.html#additional>, [accessed: July 20, 2008]

However, not every product was designed to be able to communicate well and clearly to the users. The Bertaa kettle, designed by Philippe Starck for Alessi, represents a failed example, from the perspective of semiotic design (Figure 20). The cone-shaped shaft pierces the body of the kettle, serving as both its handle and its spout, but the mechanism is complex and unreliable and users found it difficult to use. As Alessi CEO Alberto Alessi said, "You shouldn't need an instruction manual to operate a kettle." The unclear design vocabulary caused the product to be pulled from production in 1997.

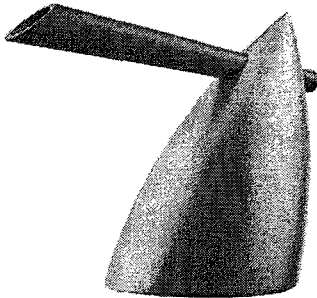


Fig. 20. Hot Bertaa kettle

Available from: <http://mydeco.com/product/alessi-miniature-hot-bertaa-kettle/036556352a955af1cf8b02b70c0729467e6ca394/>,
[accessed: July 20, 2008]

There are other ways to express various aspects of the aesthetics. For example, people may love a book because of the wisdom within the lines, the texture of the paper or respect for the author. In this context, the graphic layout design of the book, the content and illustrations, and the printing material are all important elements when adopting the design-for-expression strategy.

These cases suggest the importance of studying material culture, design

vocabulary and semiotic design as imperative in exploring the design-for-expression strategy. Learning from classical designs and other disciplines can also enrich the design. The design for expression strategy is especially applicable to furniture, media objects (such as books), domestic appliances, and objects that provide decorative function.

6.3 Design for Individuality

Planned obsolescence is a widely adopted marketing and production strategy, especially in the category of electronic products, even though it causes such rapid depreciation that users have less attachment towards them. Design for individuality is a strategy in which objects are designed to reveal who they are, what they do, and to what kind of social group they belong. Design for individuality corresponds to the type of attachment that is built on self-esteem and public image. Design for individuality is a strategy to counter planned obsolescence by promoting individual goals, desires and choice.

Mass production provides consumers abundant products at an affordable price; however, the similarity of all these objects reduces surprise and eliminates uniqueness, resulting in less attachment. Customization is a design method

geared specifically to reflecting the individual's goals, desires and choices. Once the bastion of planned obsolescence, the automobile industry has widely adopted this approach, as has the furniture industry. Local designers and producers also provide a bright future for customized design. As a process of encoding a product with symbolic meaning, symbolic design could prolong a product's lifespan because of the importance of its cultural (including religious) meaning to the individual. Strategies to create brand loyalty can also help to build a bond between users and objects at certain levels.

Lacoste's success is largely a result of the public image it represents. A French apparel company founded by René Lacoste, a famous tennis player, and his business partner Andre Gillier in 1933, Lacoste sells high-end clothing, most notably tennis shirts, and related products, such as footwear, perfume, leather goods, watches and eyewear. In 1952 the shirts were exported to the United States and advertised as "the status symbol of the competent sportsman," influencing the clothing choices of the upper-class. The Lacoste brand reached its height of popularity in the US during the late 1970s as an icon of "preppy" culture. In 2000, the company hired an avant-garde French designer Christophe Lemaire, who created a more modern and upscale look to reinvigorate the brand.

Being extremely popular among youth, Lacoste has become identified with fashion and class. Having a Lacoste product represents the owner's taste, class and the group he/she belongs to. Therefore, it is no surprise that a Lacoste shirt can retain its position in users' wardrobes for long time (Figure 21).



Fig. 21. Lacoste poster
Available from:
<http://www.lacoste.com/usa/main.html>,
[accessed: July 20, 2008]

iPod is another typical example of design for individuality. It is not just a MP3 player, but also seen as a fashion accessory. The song collection can be personalized to represent their cultural interests and orientation. The interface was also designed easily to understand and operate, furthermore, by using the iTunes song rating system, users can quickly create a playlist with only highly rated songs according to their preference. Therefore, upon owning an iPod, the user also becomes part of a club of iPod owners, who take on some of the qualities that the brand purports, such as sophistication, aesthetic appreciation, and wealth.

Mobile phones are recognized as one of the most easily discarded products because of the rapid development of new models. Young consumers, who are fashion followers and easily bored by old designs, change their mobile phones often. For them, mobile phones are not only communication tools, but also accessories which reflect and represent themselves. A customized mobile phone cover responds to this need and reduces the number of discarded phones. These covers have a protective function, but also allow personalization. They are easily repainted with various themes in accord with users' preferences, and the vivid reflection of individual character prolongs the life span of old mobile phones (Figure 22).

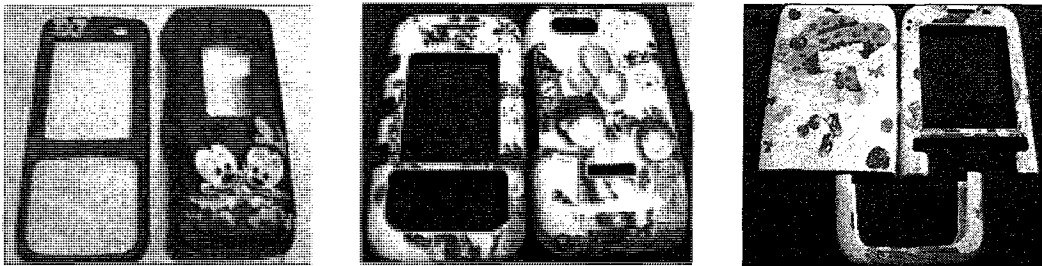


Fig.22. Mobile phone covers

Available from: <http://tech.163.com/mobile/07/1025/16/3RLN7GU200111VG0.html>,
[accessed: July 20, 2008]

The design for individuality strategy is particularly applicable to electronic products, clothing and related accessories. Adding personal character to these

products to strengthen individual connection may prevent them from rapid obsolescence caused by outdated style or technologies.

6.4 Design for Experience

Campbell (2001) suggested, “What people seek is not the meaning of life, but the experience of being alive.” As consumption is a natural way of experiencing unknown things, design for experience is a strategy for designing objects that evoke fun, excitement, success and other positive emotions. It corresponds to the attachment built on users’ experiences that are associated with memory, affection, relationship, life style and use. Chapman (2005) observed that experience can be evolving, using jeans as an example. He suggested that jeans have an evolutionary characteristic that can be communicated and shared over time, such as the western spirit, narratives of the pioneers who first wore them, and history passing through time. This attribute ensures the attachment to jeans over time.

Participatory design could strengthen the bond between users and objects through proactive involvement. Emotional design invokes users’ memory and affection to gain strong attachment. Low-tech narratives and fictions are also

suggested to use to enhance users' experience, triggering dreams and imagination to busy and repetitive daily lives (Chapman, 2005).

Not simply satisfied by functionality, current users have much higher expectations for the user experience, which they associate with the qualification of objects. Enterprises are aware of the trend and have emphasized the users' experience through their slogans. Jeep states, "Have fun out there"; BMW offers "sheer driving pleasure"; Honda creates "the power of dreams"; Nissan invokes "a driving experience that is created for the ultimate benefit of you, the driver"; and Mercedes-Benz believes every model should be evocative, provocative, and emotional, and create driving excitement.

The MINI Cooper is an example of a product that provides a new driving experience, fulfilling the dream of freedom and full of imagination. Drivers are amazed not only by its dramatic appearance, but also by its agility. For people who live in a crowded city, the MINI Cooper offers fun and excitement in a daily repetitive life. The film *The Italian Job* (2003) further pictures the MINI Cooper as a dreaming car which ran through traffic, swayed down stairs, weaved through subway tunnels and raced down sidewalks. Drivers experience the pleasure of "crazy, unexpected and unbelievable" adventures through the fictions embedded

in it. As Britain's best-selling car, the Classic MINI car remains a cultural icon around the world and still enjoys its popularity. The MINI Cooper's success demonstrates that the product that provides richer, lengthier and more exciting user experiences could benefit a longer-lasting consumption (Figure 23).

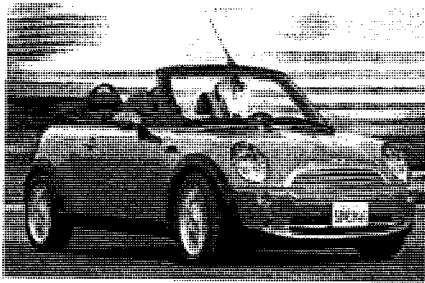


Fig. 23. MINI Cooper

Available from: <http://www.mini.ca>, [accessed: July 20, 2008]

The Wii is another good example of experience design. Wii is Nintendo's seventh-generation video game console. A distinguishing feature of the Wii console is its wireless controller, the Wii remote, which can detect motion and rotation in three dimensions. This experience-oriented product totally change the image of a video game console. Unlike the traditional hand held controller, which focuses on scenarios, quality of image and speed but ignores the human experience, the Wii remote controller provides a natural, intuitive and realistic feel. A total body experience is not just pushing buttons, the player can use the Wii remote controller to mimic the actions of swinging a racket, bat or club, rolling a ball down an alley, or bringing up a left uppercut. The philosophy of

Wii is fun and experience, and its great success demonstrates the design strategy of generating an emotional bond between users and objects that can be from evolving experiences (Figure 24).

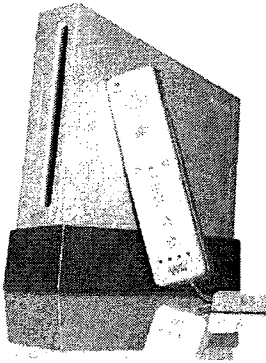


Fig. 24. Nintendo Wii

Available from: <http://en.wikipedia.org/wiki/Wii>, [accessed: July 20, 2008]

The design for experience strategy is applicable to transportation tools and entertainment products where users are encouraged to explore products and to get fun and excitement out of unfolding them. This kind of evolving experience could benefit product longevity.

CHAPTER 7

CONCLUSION

Recent research studies (Chapman 2005, Norman 2004, Van Hinte 2004) underscore the causal link between attachment and product longevity. By undertaking an ethnographic interview process, this research has investigated how one can establish such a causal link. Analysis of the interviews suggests that utility, appearance, symbolic meaning and users' experience are four key elements that sustain the emotional attachment between users and objects. Among them, users' experience seems to have the strongest and most durable effect on attachment. The study also reveals the importance of sentimental value generated by relationships, memories, and life experiences. Four design strategies are proposed — design for adaptation, design for expression, design for individuality and design for experience — each of which corresponds to one type of attachment.

Even though this research has contributed to a better understanding of the psychological dimensions of our attachment to our material environment, it has certain limitations and challenges. First, the notion of attachment is a very

complex concept about which many factors are still unknown or uncertain. As a new strategy, attachment might work only for certain products in certain scenarios, rather than being an absolute solution. The environmental issue should be discussed in a systemic context, putting economic, social systems, the physical and natural environment all into consideration.

Second, the consumer world we live in tends to reduce the long-term relationship we have with objects. The phenomenon of detachment increases when there is lack of repair infrastructure or the cost of repair is higher than the cost of replacement. Detachment might also be a result of human beings' unlimited desire and perceived needs, which is exploited by market strategies that promote the idea that "the next one is always better." From the perspective of the cost of material and energy in producing each object, detachment causes waste to the environment. However, in certain cases, the detachment caused by continuous technical evolution is to the benefit of the environment. For example, Hydro-Québec is now promoting the replacement of old refrigerators because the new ones use less energy. Therefore, attachment to one's old fridges could be a problem for this campaign. Encouraging detachment and finding ways to give these old refrigerators a second life is the better alternative.

Third, this research adopts interviews as the research method to increase understanding of users' viewpoints, needs and preferences about the material world. However, as a novice interviewer, the researcher has to learn how to avoid being overwhelmed and distracted by unimportant details in the interview, since the conversation is restricted to one hour. In addition, the questioning skills and the ability to assess the situation accurately need to be improved in order to organize a more efficient interview to gain information. Finally, while an attempt is made to create a diverse pool of interviewees in terms of age, gender, and profession, the outcomes might represent the viewpoints of only a certain group of people because of the limitations in the sample selection.

Other than exploring attachment in a broad scope which covers objects from large transportation tools to small electronic appliances, conducting research on specific object might be able to deepen specialized knowledge foundation. This approach would focus on one object and facilitate analysis of the factors that influence its longevity, the circumstances under which the attachment reinforcement strategies are applicable, and the exploration of which strategies enhance attachment. "Research through designing," a relatively recent academic research approach, could also be adopted in the research. Designing a series of

mobile phones with sustainable design strategies and testing the result with users could illustrate what strategies work efficiently in avoiding rapid psychological and technological obsolescence.

The future research on this subject is aiming to answer questions, such as how does the attachment change along with changing circumstances? Is it possible to measure long-term emotional attachment and, if so, how? How much impact does attachment have on the product longevity compared to other influencing factors, such as marketing strategies, consumer ethical choices, etc? To continue this research, the researcher is going to design objects following the proposed four design strategies and test how consumers react to them. The researcher is also interested in exploring a new life style in which users can get excitement and satisfaction out of “invisible things”—as opposed to material goods—such as functionality, experience, and service, in order to minimize the cost of resources.

BIBLIOGRAPHY

Ainsworth, M.D.S., *Attachment beyond infancy*, American Psychologist, 44, 709-716, 1989.

Ainsworth, Bell, & Stayton, *Infant-mother attachment*, in M.P.M. Richards (Ed.) *Integratin of a child into a social world*, Cambridge, England: Cambridge University Press, 1974 Butterworth-Heinemann, 2006.

Anderson, David M., *Build-to-Order & Mass Customization, the Ultimate Supply Chain and Lean Manufacturing Strategy for Low-Cost On-Demand Production without Forecasts or Inventory*, CIM Press, 2004.

Baudrillard, J., *For a Critique of the Political Economy of the Sign*, St-Louie, MO: Telos Press, 1981.

Beaker, H.P., *Interview, by Charter, M.*, the Journal of Sustainable Product Design, P44, April 1997.

Billatos, S. B. and Basaly, N. A., *Green Technology and Design for the Environment*, 1st edition, Washington, DC: Taylor & Francis, 1997.

Bocock, R., *Consumption*, Routledge, London, 1993.

Boradkar P., *Theorizing things: status, problems and benefits of the critical interpretation of objects*, The Design Journal, Volume 9, Issue 2, 2006.

Bousbaci, R. and Findeli, A., *More acting and less making*, Design Philosophy Papers 4, 2005.

Bowlby, J., *The Nature of the Childs Tie to his Mother*, International Journal of Psychoanalysis 39: 350-373, 1958.

Bowlby, J., *The Making and Breaking of Affectional Bonds*, Routledge Classics, 2005.

Brundtland Commission, *Our common future (Brundtland report)*, Oxford University Press, 1987.

Buck, R., *Prime theory, an integrated view of motivation and emotion*, *Psychological Review*, 92(3), 384-413, 1985.

Buck, R., *Human motivation and emotion*, NY, Hohn Wiley, 1988.

Buck, R., *The biological affects: A typology*, *Psychological Review*, 106, 301-336, 1999.

Campbell, J., *The Power of Myth*, Episode 2, Chapter 4, PBS television series, Mystic Fire Video, 2001.

Carroll, John M., *Dimensions of Participation in Simon's Design*, *Design Issues: Volume 22, Number 2, Spring 2006*.

Chapman, J., *Emotionally Durable Design: Objects, Experiences and Empathy*, London; Sterling, VA: Earthscan, 2005.

Chapman, J., *Sustaining Relationships between People and Things*, Design & Emotion Society Conference in Gothenburg, Sweden, 26th-29th September, 2006.

Chaudhuri, A., *Emotion and Reason in Consumer Behavior*, Fairfield University, Amsterdam; Boston: Elsevier, 2006.

Csikszentmihalyi, Giudice, F., La Rosa, G. and Risitano, A., *Product Design for the Environment: A Life Cycle Approach*, Taylor & Francis, Boca Raton, FL, 2006.

Cupchik G.C., *Emotion and Industrial Design: Reconciling Meanings and Feelings*, First International Conference on Design and Emotion, Delft University of Technology, Delft, 1999.

DeMaio, P. J., *Smart Bikes: Public Transportation for the 21st Century*, July 2001.

Demirbilek, O. & Sener, B., *Product design, semantics and emotional response*, *Ergonomics*, 46, 1346-1360, 2003.

Dunne, A. and Raby, F., *Design Noir: The Secret Life of Electronic Objects*, Basel, Boston, Berlin: Birkhauser, 2001.

Falcioni, J. G., *Shape Memory Alloys, Mechanical Engineering*, Apr. 1992.

Fava, J. et al., *A technical framework for life-cycle assessment*, SETAC Society of Environmental Toxicology and Chemistry, Pensacola, FL, 1991.

Fiksel J., *Design for the Environment: An integrated systems approach*, International Symposium on Electronics and the Environment, Virginia, IEEE, 1993.

Gungor, A. and Gupta, S.M., *Issues in environmentally conscious manufacturing and product recovery: A survey*, Computers and Industrial Engineering, 36, 811-853, 1999.

H. Scott Matthews, et al., *Disposition and End-of-Life Options for Personal Computers*, Green Design Initiative Technical Report #97-10, July 1997.

Kaplan, A.M. and Haenlein, M. *Toward a parsimonious definition of traditional and electronic mass customization*, Journal of Product Innovation Management, 23(2), 168-182, 2006.

Kuhn S. and Winograd, T., *Participatory Design*, from book *Bringing Design to Software*, Winograd, T.,(ed), Addison-Wesley, 1996

Kurtgozu, A., *From Function to Emotion: A Critical Essay on the History of Design Arguments*, the Design Journal, Volume 6, Issue 2, 2003.

L., John and JR., Allen, *Activists warn of new perils emerging in the digital age*, National Catholic Reporter, May 1, 1998.

Lewis, H., Gertsakis, J., Grant, T., Morelli, N., and Sweatman, A. *Design and Environment: A Global Guide to Designing Greener Goods*, Greenleaf Pubns, 2001.

Manzini, E. and Vezzoli, C., *Product-service Systems: Using an Existing Concept as a New Approach to Sustainability*, UNEP and CIR.IS, 2001.

Marchand, A., Walker, S., and De Coninck, P., *The Role of Beauty for Sustainability: A Discussion on Responsible Consumption, Attitudes and Product Design*, Management of Natural Resources, Sustainable Development and Ecological Hazards, WIT Press, Southampton, UK, pp. 371-380, 2006.

Marshall, Catherine & Rossman, Gretchen B., *Designing Qualitative Research*, Thousand Oaks, CA: Sage, 1998.

Martinez-Conde, S. et al., *The Role of Fixational Eye, Movements in Visual Perception*, NEUROSCIENCE, Vol. 5, March 2004.

McDonough, W. & Braungart, M., *Cradle to Cradle: Remaking the Way We Make Things*, North Point Press, a Division of Farrar, Straus and Giroux, New York, 2002.

Nixon, S., *Advertising Cultures: Gender, Commerce, Creativity*, Sage publications Ltd., 2003.

Norman, Donald A. *Emotional Design: Why We Love (or Hate) Everyday Things*, Basic Books, New York, 2004.

Ogushi, Y. and Kandlikar, M., *Assessing Extended Producer Responsibility Laws in Japan*, Environmental Science and Technology, Vol. 41, Iss. 13, 2007.

Papanek, V., *The Green Imperative: Ecology and Ethics in Design and Architecture*, New York: Thames and Hudson, 1995.

Plutchik, R., *A general psychoevolutionary theory of emotion*, In R. Plutchik & H. Kellerman (Eds.), *Emotion: Theory, research, and experience: Vol. 1. Theories of emotion* (pp. 3-33), New York: Academic, 1980.

Press, M., *Buddy, can you spare a paradigm?* Co-design Journal, 1 (3), 1995.

Press, M. and Cooper, R., *The Design Experience: the Role of Design and Designers in the Twenty-first Century*, Ashgate Publishing Company, 2003.

Rhea, D., *A new perspective on design: focusing on consumer experience*, Design

Management Journal, Fall 1992.

Rogers, C., *Intelligent Materials*, *Scientific American*, September 1995.

Sheehan, M. O'Meara, *Good stuff? – Cell Phones*, Worldwatch Institute, 2004.

Slade, G., *Made to break: Technology and obsolescence in America*, Harvard University Press, 2006.

Stoeckel, D. and Yu W.K., *Superelastic Nickel- Titanium Wires*, available from Raychem Corporation, Menlo Park, CA.

Tellus Institute, *Tellus Packaging Study*, Boston: Tellus Institute of Resource and Environmental Strategies, 1992.

US Department of Energy, *Refrigerators & Freezers*, 2008, available from http://www.energystar.gov/index.cfm?c=refrig.pr_refrigerators, [accessed: July 20, 2008]

Van Hinte, E., *Eternally Yours, Time in Design*, 010 publishers, Rotterdam, 2004.

Van Nes, N. and Cramer, J., *Product lifetime optimization: a challenging strategy towards more sustainable consumption patterns*, *Journal of Cleaner Production*, Volume 14, Issues 15-16, Pages 1307-1318, 2006.

Whiteley, N., *Utility, design principles and the ethical tradition*, In Ashfield, J., ed., *Utility Reassessed: The Role of Ethics in the Practice of Design*, Manchester: Manchester University Press, 1999.

Zhang, H.C. et al., *Environmentally conscious design and manufacturing: a state of the art survey*, *Journal of Manufacturing System*, 16(5), 352-371, 1997.

Zupan, K., *Using Natural Phenomena to Create Product Attachment between Human and Machine*, Master's project-thesis, University of Southern Denmark, Sonderborg, 2005.

Appendix 1: Consent Form to Participate in Research

Participants will be given two copies of the consent form – one to keep, and one to sign and return to the researcher.

Name: _____

Date: _____

CONSENT TO PARTICIPATE IN:

Design Research of Sustainable design: attachment between user and object.

This is to state that I agree to participate in a program of research being conducted by Yi Zhang, Master student, of the Special Individualized Programs of Concordia University.

Address: 8-6161 Sherbrooke W., Montreal, Quebec, H4B 1L9

Email address: yi.helen.zhang@gmail.com

A. PURPOSE

The purpose of this research, titled **Sustainable design: strategies for favouring attachment between users and objects**, is to explore the strategies that favour attachment between consumer and product, in hence to extend product longevity. Van Hinte (2004) indicates that discarding functional products is possibly due to the lack of quality, out of sheer boredom, outdated technology or simply loss of attraction. Jonathan Chapman (2005) argues that waste is symptomatic of failed user/object relationships. Many researches show that there is a strong current of thought among researchers that there is a causal link between lack of attachment and early obsolescence of products. In another word, a high level of attachment could be one of the factors that favour product longevity. My research question is: Considering the objective of sustainable design, what strategies can be sought to favour attachment between users and objects?

B. PROCEDURES

Participants in this survey will be asked to answer questions about the subjects of personal experience about the relationship between material objects and the participant itself. It will be clearly indicated in any published materials resulting from this research. Responses to the questions will be recorded with a portable audio recorder operated by

the principal researcher. Participants may choose to give brief or lengthy answers to any of these questions. The number of questions a participant may be asked will be varied to match the planned interview length. Participants will not be paid.

C. RISKS AND BENEFITS

This research is intended to constitute low potential risk to research participants.

The benefits of participation include:

- Contributing to the sustainable design research that is intended to extend the longevity of products, in hence to benefit the environment.

D. CONDITIONS OF PARTICIPATION

Please understand that the data from this study may be published. Participants may choose the degree of confidentiality that they are comfortable with from the list below. Confidentiality will be maintained for the duration of the research. You may change your indicated preference of degree of participation at any time during or after the interview, and prior to publication. Following publication, electronic or tangible media transcripts will be surrendered, or destroyed, at the request of the participant.

Do you consent to having your participation recorded by the interviewer using an audio recorder? Yes No

Would you prefer an interview length of: forty-five minutes, one hour or as long as is necessary?

45 minutes 1 hour as is necessary

Please check the box next to the degree of confidentiality that you are comfortable with:

A) You are willing to be directly quoted by name and title in any published materials.
The context of quotes or attributions included in materials intended for publication will be verified with, and approved by, the original contributor before publication. Quotes or attributions in the Concordia University thesis will not be confirmed with the original sources unless the thesis is accepted for publication in whole or in part.

- B) Be directly quoted with title attributed, but name withheld in published materials.
- C) Be directly quoted with name and title withheld in published materials.
- D) Not be directly quoted, but name and title (and status as participant) may be published.
- E) Not be quoted, and name and title may not be published.
- F) You are willing to give permission at a later time to be directly quoted by name and title in any published materials, if and when you see the results first.

I understand that I have chosen my participation in this study to be either CONFIDENTIAL (i.e., the researcher will know, but will not disclose my identity), or NON-CONFIDENTIAL to a degree that I am comfortable with (i.e., my identity will be revealed in study results):

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

NAME (please print)

SIGNATURE

Martin Racine, Associate Professor, Design and computation arts, Concordia University, is my Principal Supervisor.

Professor Racine may be reached at 514-848-2424 Ext: 4656

If at any time you have questions about your rights as a research participant, please contact Adela Reid, Research Ethics and Compliance Officer, Concordia University, at (514) 848-2424 x7481 or by email at areid@alcor.concordia.ca.

Appendix 2: Interview Guide

This interview serves to a research project in the field of Sustainable Design. This research project is conducted by Yi Zhang, a SIP Master student of Concordia University. The interview information is only used in research and academic purpose.

Part one: Profile

Name:

Gender: Male Female

Age: under 25 years old 25-35 years old 35-45 years old
 45-55 years old over 55 years old

Profession:

How many times have you moved in the past ten years?

How many jobs have your changed in the past ten years?

Are the material objects important to you? And how important are they to you?

Not important _____ very important

1 2 3 4 5 6 7 8 9 10

Part two: Personal experience

Please describe one object that you have kept for a long time.

1. What is the object?
2. Why do you keep it for a long time?

Do you have car? Is it your first car? How many cars have you had before? How long did you have each car? What were the reasons you change your car? Do you intent to keep a car for long time? Or do you consider it as a consuming product that you will replace in several years? Do you enjoy the experience of driving a car? How did you deal with your old cars? Do you mind if there is scratch on the surface, even it does not disturb the performance? What was your feeling when you replaced the old one, sad, happy or no feeling?

Do you have bicycle? Is it your first bicycle? How many bicycles have you had before?

What were the reasons you replace the old bicycle to a new one? Do you intend to keep a bicycle for long time? Or do you consider it as a consuming product that you will replace in several years? Do you enjoy the experience of riding a bicycle? Do you use it as a transportation means or leisure activity equipment? How did you deal with your old bicycles? What was your feeling when you replaced the old one, sad, happy or no feeling?

Do you have cell phone? Is it your first cell phone? Do you use all its provided functions? Do these extra functions attract you? For example, text message, MP3, camera or video... What were the reasons you buy a new cell phone? Are you going to change your current model to a newer model, if there is new technology or cool design sold in market? How did you deal with your old cell phones? (Keep at home, sell, throw away, give to somebody else, or give to second hand store...) Do you mind if there is scratch on the surface, even it does not disturb the performance? What was your feeling when you replaced the old one, sad, happy or no feeling? Do you think it is necessary in your daily life?

Do you have computer/laptop? Is it your first computer/laptop? What are the main functions do you use? What were the reasons you buy a new computer/laptop? Are you going to change your current model to a newer model, if there is new technology or cool design sold in market? How did you deal with your old computers/laptops? How often do you upgrade your computer/laptop? Do you mind if there is scratch on the surface, even it does not disturb the performance? What was your feeling when you replaced the old one, sad, happy or no feeling? If the computer/laptop can be updated with the latest feature and maintain a good performance, will you pay less to upgrade it or pay more to buy a new one?

Do you have MP3? If it is not your first MP3, how many did you have before? And why did you replace the old ones? Do you use it often? Will you replace the old one if the new MP3 can offer larger space for storing more songs and music? If your cell phone has MP3 function, do you still like to use a MP3 to listen to music?

Where do you buy your furniture? Do you intend to invest money to buy good quality and durable furniture, which can be used for long time? What kind of style do you prefer, modern or classical? Do you like to move the layout of your furniture at home to create a new look with the environment? Do you replace your furniture often? Why?

Do you have a TV? How long have you had used this TV? Do you intend to buy a new

one? What are the reasons if you want to buy a new TV or keep the old one? Do you spend a lot of time in front of TV? Do you think it is necessary in your daily life?

Do you like to invest money in buying good quality kitchen appliances and tools, such as rice cooker, pot, toaster, microwave, coffee machine...? How often do you replace the old ones to newer ones? Will you be attracted by the new technologies, new functions or new forms introduced in market? Do you enjoy the experience of using the kitchen appliances or tools?

Do you buy clothing and accessories often? How often? Do you usually buy expensive ones or less expensive ones? What kind of style do you prefer, sportive, dress, casual or depending on the situation? Do you like to buy accessories to fit with different clothing, such as necklaces, glasses, watches, hats... Do you have a lot of clothes or accessories? How did you deal with the old clothes? What was your feeling when you have to give up your old clothes?

What kind of gifts do you usually receive? Do you keep these gifts even you don't use them anymore, or broken, or not function anymore?

What kind of objects do you love to update often? Do you like to keep the old objects at home? Why? Do you like to make any object by yourself? Are you easily to feel bored when you use an object for a long time? How do you get rid of the boredom of using a same object for a long time? Compared to the function, performance, appearance, cost and using experience, what are the most important factor do you think? What is your general attitude and habit towards daily objects?

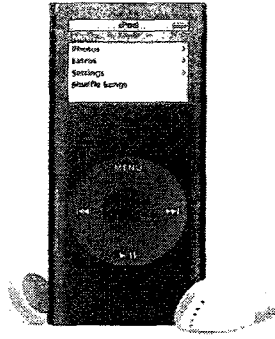
Part three: Game of choice

Please imagine if you are under an emergent situation, you are only able to take one object with you, which one you will choose? What is your second choice? The third? The forth...? Please mark 1-8 to the following items. (1 stands for the first choice, and 8 is the last choice.)

(Please read the description of following images)



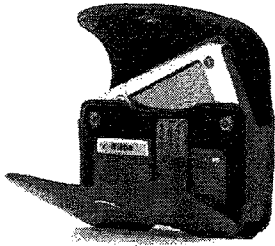
You spent hours and hours on this chair. It was made by recycling materials. You painted and made it by yourself.



This is a birthday gift your partner gave you. He has set it up and downloaded many your favorite songs for you.



It was a family heritage, your grandpa's old watch. He gave to your father when he passed away. Your father also used it and now it is yours.

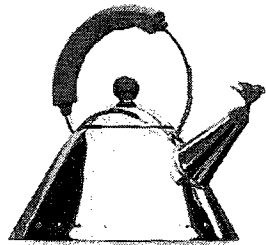


This upgradeable PDA seems have multi-function you need, phone, internet, notepad, map, and game... You also like the texture of its leather pack.

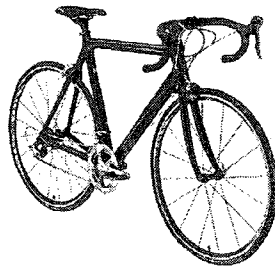
Please place these objects in order according to your preference



This is your favorite shoes. It is very comfortable. You are a royal fan of the famous brand and its design.



This is an Alessi® kettle you bought on an exhibition. You always enjoy using it.



You have traveled many places by riding this bicycle. It is like one of your long-term friends.



This is a hockey stick you used to win the first place in an important match. And your favorite player Guy Lafleur signed his name on it.

Appendix 3: Interview Data

Table 6: Interviewees' attachment to tools of transportation (cars)

Interviewees	Age group	Cars owned	Total cars owned / used to owned	Owner's expected car life expectancy	Years of use	Reasons to replace previous cars	Cars leased
No.1	<25ys old	N	0	-	-	-	N
No.2		N	0	-	-	-	N
No.3	25-35 years old	Y	1	life long	still keep	-	N
No.4		N	0	-	-	-	N
No.5		Y	1	life long	still keep	-	N
No.6		Y	1	life long	still keep	-	N
No.7		Y	3	4 years	4 years	moving	N
No.8		Y	1	several years	still keep	-	N
No.9		Y	2	several years	3 to 4 years	moving / old	N
No.10		N	0	-	-	-	N
No.11		Y	2	life long	10 years	not worthy to repair	Y
No.12		N	0	-	-	-	N
No.13		Y	3	life long	2 to 3 years	end of lease	Y
No.14	35-45 years old	N	0	-	-	-	N
No.15		Y	4	several years	2 to 3 years	security/ not worthy to repair	N
No.16		Y	3	several years	4 to 5 years	moving / security	N
No.17		N	0	-	-	-	N
No.18		Y	2	5 to 6 years	2 years	broken	N
No.19		Y	3	several years	2 years	moving / old	N
No.20		Y	4	4 years	3 years	not worthy to repair / end of lease	Y
No.21		Y	6	several years	3 to 4 years	broken	Y
No.22		Y	2	life long	1 year	Broken	N

No.23	45-55 years old	Y	1	several years	still keep	-	N
No.24		Y	1	life long	several years	moving	N
No.25		Y	2	2 to 3 years	1.5 years	broken	N
No.26		N	0	-	-	-	N
No.27	>55 years old	Y	5	4 years	4 years	security / end of lease	Y
No.28		Y	2	life long	still keep	-	N
No.29		Y	> 6	4 years	4 years	security / end of lease	Y
No.30		N	0	-	-	-	N
Summary		21 owning cars	1.8/pp	8 expect using for life long 13 expect using for several years	2- 4 years 6 still keep	4 end of lease 9 broken or not worthy to repair 5 moving 4 security	6 leasing cars

Table 7: Interviewees' attachment to tools of transportation (bicycles)

Interviewees	Age group	Bicycles owned	Total bicycles owned/ used to owned	Owner's expected bicycle life expectancy	Years of use	Reasons to replace previous bicycles	Reasons of like / dislike bicycles
No.1	<25 ys old	N	-	-	-	-	
No.2		Y	1	life long	several years	still keep	don't like
No.3	25-35 years old	Y	1	life long	several years	move	practicality
No.4		Y	1	life long	3 years	still keep	lifestyle
No.5		Y	3	life long	3 years	stolen/ old/ no need	don't like
No.6		Y	2	life long	several years	broken/move	part of life
No.7		Y	6	life long	several years	move/ broken	lifestyle
No.8		Y	1	life long	several years	still keep	don't like
No.9		Y	2	life long	several years	stolen/move	lifestyle
No.10		Y	4 to 5	life long	several years	stolen/old	practicality
No.11		N	-	-	-	-	
No.12		Y	1	>20ys	several years	still keep	self-esteem / lifestyle / practicality
No.13		Y	4	life long	several years	updated	self-esteem/ lifestyle
No.14	35-45 years old	Y	>1	life long	several years	stolen/ old	practicality
No.15		Y	2	-	-	move	don't like
No.16		Y	> 1	-	several years	broken	lifestyle
No.17		Y	6 to 7	several years	2 to 3 years	broken/ old	lifestyle
No.18		Y	5 to 6	-	several years	still keep/old / stolen	lifestyle
No.19		Y	3	-	several years	move	lifestyle
No.20		N	2 to 3	life long	several years	move	
No.21		N	-	-	-	-	
No.22		Y	1	life long	several years	move	don't like

No.23	45-55 years old	Y	1	life long	several years	still keep	lifestyle
No.24		Y	3 to 4	-	several years	stolen/ old/ broken	self-esteem/ lifestyle
No.25		Y	2	life long	several years	stolen	lifestyle
No.26		Y	>1	-	-	move	practicality
No.27	over 55 years old	N	0	-	-	-	
No.28		Y	1	life long	long time	no need	don't like
No.29		Y	1	life long	several years	no need	don't like
No.30		Y	1	life long	long time	no need	
Summary		26 owning bicycles	10 owning 1 bicycle 16 owning more than 1 bicycle	19 life long 1 several years	19 several years 2 long time 3 using 2-3 years	5 still keep 10 moving 7 stolen 3 no needs 5 broken 6 old	12 lifestyle 5 practicality 3 self-esteem 7 don't like 1 memory

Table 8: Interviewees' attachment to IT and communication devices (cell phones)

Interviewees	Age group	Cell phones owned	Total cells owned / used to owned	Functions used	Years of use	Reasons to replace previous cells
No.1	<25 ys old	Y	4	some	3 months to 1 year	old/ broken/ influenced by others
No.2		Y	5	some	1 to 2 years	old model /lost /broken
No.3	25-35 years old	Y	2	basic	-	working purpose
No.4		Y	3	basic	-	working purpose
No.5		Y	3	basic	4 years	old model
No.6		Y	2	basic	1 years	changing service provider
No.7		Y	> 1	some	-	broken/changing service
No.8		Y	2	basic	1 years	working purpose
No.9		Y	3	basic	5 to 6years	old model
No.10		Y	3	some	-	lost /broken
No.11		Y	4 to 5	some	1 to 2years	old model
No.12		Y	1	basic	4 years	working purpose
No.13		N	-	-	-	-
No.14	35-45 years old	Y	5	basic	2 years	lost/old model
No.15		Y	2	some	3 to 4years	old model
No.16		Y	5	basic	1 to 2years	changing service provider
No.17		Y	6	some	-	influenced by others
No.18		N	-	-	-	-
No.19		Y	> 1	some	-	old model
No.20		Y	> 10	basic	1 years	old model/broken
No.21		Y	1	basic	-	cost of service
No.22		Y	3	basic	-	giving to friend
No.23		45-55 years old	Y	2	basic	-
No.24	Y		> 3	basic	-	lost/old/influenced by others
No.25	Y		> 1	some	-	changing service provider
No.26	Y		4	basic	2 to 3years	changing service provider/lost

No.27	over 55 years old	Y	1	basic	still use	-
No.28		Y	2	basic	still use	-
No.29		Y	3	basic	-	broken
No.30		Y	4	basic	several years	broken/changing service
Summary		28 owning /used to own 2 never owning	3/person	9 some 19basic	4 one year or less 4 two years 8 more than two years	11 old model 7 broken 4 lost 6 changing service provider 3 influenced by others 3 working purpose 1 giving to friend 1 cost of service

Table 9: Interviewees' attachment to IT and communication devices (computers)

Interviewees	Age group	Desktops owned	Total desktops owned / used to owned	Frequency of upgrading	Years of use	Reasons to replace previous desktops	Laptops owned	Total laptops owned / used to owned	Years of use	Reasons to replace previous laptops
No.1	<25 ys old	Y	1	rare	several years	-	N	-	-	-
No.2		Y	3	rare	several years	old model	N	-	-	-
No.3	25-35 years old	Y	1	rare	5 years	old model	N	-	-	-
No.4		N	-	-	-	-	Y	2	-	Large/heavy
No.5		Y	1	rare	4 to 5 years	-	Y	1	5	-
No.6		Y	2	rare	several years	problem	Y	1	3	-
No.7		Y	1	rare	5 years	-	Y	1	-	-
No.8		N	-	-	-	-	Y	2	2-3	move
No.9		Y	4 - 5	often	upgrade per 3-4 months	performance	Y	2	5	good deal
No.10		Y	1	rare	-	-	Y	1	3	-
No.11		Y	1	often	upgrade per 3-6 months	performance	N	-	-	-
No.12		N	-	-	-	-	Y	2	6	Performance
No.13		Y	3	rare	3 yeas	performance	Y	1	3	-
No.14	35-45 years old	Y	2	rare	several years	performance	N	-	-	-
No.15		Y	3	rare	3 years	performance	N	-	-	-
No.16		Y	4	rare	several years	performance	N	-	-	-
No.17		Y	6	often	upgrade per 6months	performance	N	-	-	-
No.18		Y	> 1	often	upgrade per 6months	performance	N	-	-	-
No.19		Y	> 1	rare	3 years	performance	N	-	-	-
No.20		Y	3	rare	several years	performance	N	-	-	-

No.21		Y	2	rare	several years	new needs	Y	2	4	performance
No.22		Y	3	rare	several years	performance	Y	1	-	-
No.23	45-55 years old	Y	1	rare	several years	performance	Y	1	4	-
No.24		N	-	-	-	-	Y	2	-	Performance
No.25		Y	1	rare	several years	move	N	-	-	-
No.26		Y	1	often	upgrade per 6m-1year	performance	N	-	-	-
No.27	over 55 years old	Y	2	rare	10 years	old model	N	-	-	-
No.28		Y	3	rare	>10 years	old model	N	-	-	-
No.29		Y	2	rare	10 years	old model	N	-	-	-
No.30		N	-	-	-	-	Y	-	4	-
Summary		25 owning desktops	9 owning 1 desktop 16 owning 2 or more desktops	5 often; 21 rare	Several years or more	5 old model; 1 new needs 13 Performance; 1 move	14 owning laptops	7 owning one laptop 7 owning two laptops	Average 3-5 years	1 price 3performance 1 model 1 move

Table 10: Interviewees' attachment to entertainment products (MP3 and DVD players)

Interviewees	Age group	MP3 owned	Total MP3 owned/ used to owned	Frequency of using	Reasons of like / dislike it	Reasons to replace previous MP3	DVD owned	Frequency of using
No.1	<25 ys old	Y	2	very	design/music	function	Y	often
No.2		Y	2 to 3	rare	other replacement	design	Y	rare
No.3	25-35 years old	N	-	-	-		N	
No.4		Y	2	very	efficiency / music	broken	N	
No.5		N	-	-	-		Y	rare
No.6		N	-	-	-		Y	rare
No.7		Y	3	often	music	design	Y	rare
No.8		Y	1	rare	trouble to download / quality		Y	rare
No.9		Y	2	rare	no time/ quality	function	Y	rare
No.10		Y	1	very	music		N	
No.11		N	-	-	other replacement		Y	rare
No.12		N	-	-	trouble to download / quality		N	
No.13		N	-	-	quality		N	
No.14	35-45 years old	N	-	-	no time		Y	rare
No.15		N	-	-	no time/other replacement		Y	for kids
No.16		N	-	-	no time		N	
No.17		Y	1	rare	no time		N	
No.18		N	-	-	no time/quality		N	
No.19		Y	1	rare	no time		Y	rare
No.20		Y	1	rare	quality/other replacement		Y	rare
No.21		N	-	-	other replacement		N	
No.22		Y	2	rare	no time		N	

No.23	45-55 years old	N	-	-	no time	giving to son	N	rare
No.24		Y	2	rare	no time		N	
No.25		N	-	-	no time		N	
No.26		Y	1	often	music		Y	
No.27	over 55 years old	N	-	-	don't know what it is		N	rare
No.28		N	-	-	no time/ don't like it		Y	
No.29		N	-	-	don't know what it is		N	
No.30		Y	1	often	good for killing time / design		N	
Summary		14 owning MP3 player	7 owning 1 MP3 7 owning 2 or 3 MP3	6 use often 8 rare	5 other replacement 12 no time 2 trouble to use 2 don't know the object 4 low quality	2 design 1 broken 1 giving away 2 function	14 owning DVD player	2 often 12 rare

Table 11: Interviewees' attachment to entertainment products (TV sets)

Interviewees	Age group	TV owned	Total TVs owned / used to owned	Frequency of using	Using purpose	Reasons to replace previous TV
No.1	<25 ys old	Y	2	everyday	watching programs	bigger screen
No.2		Y	1	not often	only for games	still keep
No.3	25-35 years old	Y	1	not often	social communication	still keep
No.4		Y	1	often	watching programs	still keep
No.5		Y	1	often	watching programs	still keep
No.6		Y	2	not often	for family members	bigger screen
No.7		Y	2	not often	watching programs	good price / new model
No.8		Y	1	not often	only for games	still keep
No.9		Y	1	not often	watching programs	still keep
No.10		N	-	-	-	-
No.11		Y	2	everyday	for other family members	still keep/new model
No.12		N	-	-	-	-
No.13	Y	1	not often	only for games	still keep	
No.14	35-45 years old	Y	1	not often	watching programs	still keep
No.15		Y	3	often	for family members	bigger screen
No.16		Y	2 to 3	often	watching programs	fit the environment
No.17		Y	2 to 3	not often	watching programs	new model
No.18		Y	1	not often	watching programs	still keep
No.19		Y	1	not often	for family members	new model
No.20		Y	1	often	for family members	fit the environment
No.21		Y	1	not often	watching programs	still keep

No.22		Y	1	not often	watching programs	fit the environment
No.23	45-55 years old	Y	1	not often	for family members	still keep
No.24		Y	1	often	watching programs	still keep
No.25		N	-	-	-	-
No.26		Y	1	often	watching programs	still keep
No.27	over 55 years old	Y	2	often	watching programs	new model / good price
No.28		Y	4	not often	for family members	broken / still keep
No.29		Y	2	not often	watching programs	new model / good price
No.30		Y	1	often	watching programs	still keep
Summary		27 owning TV sets	17 owning one TV set 10 owning more than 1 TV set	11 often 16 not often	3 for playing games 6 for other family members 1 for social communication 17 watching programs	3 for fitting to new environment 3 for good price 8 for new models or technologies 16 still keep the old ones

Table 12: Interviewees' attachment to domestic appliances

Interviewees	Age group	Frequency of replacement	Criteria	Reasons to replace previous appliances	Experiences	Levels of attachment
No.1	<25 ys old	rare	don't care	broken	do not care	no
No.2		rare	functionality	broken	no feeling	no
No.3	25-35 years old	rare	energy-certified / appearance	move to another country	-	strong
No.4		rare	functionality/ high-end	move to another country	Important / picky	strong
No.5		rare	function / appearance	move to a house	-	average
No.6		rare	functionality	not satisfied	important / disappointed	strong
No.7		several months	quality (even expensive)	performance	enjoy	strong
No.8		rare	color/ function	broken	Basic needs	no
No.9		rare	performance/cost	broken/explore new products	like explore high-tech	average
No.10		rare	Performance / working in my way	don't work well	aware of them	strong
No.11		rare	don't care	broken	no feeling	no
No.12		rare	political/ economic /esthetic/service	broken	enjoy	strong
No.13	rare	quality/price	move/ broken / unrepairable	fine	average	
No.14	35-45 years old	rare	appearance	broken	like new one	> average
No.15		rare	quality	broken/explore new objects	important	> average
No.16		rare	easy to understand / manipulate	performance	important	> average
No.17		rare	quality/new techs-functions	performance	enjoy	strong

No.18		rare	quality (not the high-tech)	broken	important	strong
No.19		rare	performance	broken	enjoy	> average
No.20		rare	quality (even expensive)	broken	enjoy	strong
No.21		rare	functionality	broken	enjoy	above average
No.22		rare	functionality /price	broken	hard to tell	no
No.23	45-55 years old	rare	functionality	broken	important	average
No.24		rare	quality/performance	move	Fine /enjoy	strong
No.25		every 4-6 ys	quality	broken/ explore new products	enjoy	strong
No.26		rare	functionality	move	enjoy	average
No.27	over 55 years old	rare	quality	unrepairable	important	strong
No.28		rare	quality /easy to use /efficient	broken/ unrepairable	important	strong
No.29		rare	performance / appearance	broken/ unrepairable	important and picky	average
No.30		rare	appearance /performance	unrepairable	enjoy	strong
Summary		1 every several months 29 rare 1 every 4-6 ys	15 performance 2 cost 10 functionality 7 appearance 2 don't care 3 other concerns	20 broken (4 unrepairable) 5 move 5 not satisfied with the performance 3 explore new products	12 important and enjoy 8 important 3 no feeling 3 fine/ok 1 hard to tell the feeling 1 important but always disappointed	5 above average 14 strong 6 average 5 no attachment

Table 13: Interviewees' attachment to furniture

Interviewees	Age group	Where to buy	Reasons for buying furniture there	Owner's expected furniture life expectancy	Reasons to replace previous furniture	How to get rid of the boredom
No.1	<25 ys old	retailer stores	price	2-3 ys	changing style	change layout
No.2		rent from Janitor	convenient	several years	move	no feeling
No.3	25-35 years old	IKEA	design/ price	life long	moving	small decorations
No.4		friends /IKEA /retailer stores	design	life long	moving	small decorations
No.5		IKEA	cheap/ design	several years	save space	change textile
No.6		department & retailer stores/ IKEA	aesthetics/ quality	life long	moving	not bored
No.7		designer stores	aesthetics/ quality	life long	moving	replace small objects
No.8		IKEA	easy to shopping / more choices	2-3 years	changing style	painting
No.9		family / IKEA	quality/design/ service	life long	moving	no feeling
No.10		2nd hand stores / retailer stores	price/ old but still cool	several years	changing style	make a new combination
No.11		IKEA	cheap/easy to resell	life long	broken	no feeling
No.12		2nd hand stores / IKEA / friends	price/material	life long	if broken	using them in different ways
No.13	IKEA	design/price	life long	if broken	not bored	
No.14	35-45 years old	IKEA / retailer stores	more choices /price	life long	moving	small decorations
No.15		retailer stores	quality	life long	if broken	small decorations
No.16		IKEA/ furniture stores	convenient /quality	life long	broken/ old/ moving	change layout

No.17		IKEA	design/quality	life long	if broken	not bored
No.18		IKEA(now), retailer stores	design/quality	life long	moving	Change textile/ small objects
No.19		department & retailer stores	design/quality	life long	moving	not bored
No.20		retailer stores	quality	life long	moving	not bored
No.21		family / department stores	price	life long	if broken	make a new look /change layout
No.22		retailer stores	quality	life long	if broken	no feeling
No.23	45-55 years old	IKEA	easy to move/change	life long	if it is broken	change small objects
No.24		friends/ IKEA/ retailer stores	quality	life long	if broken	change layout
No.25		retailer stores	quality	life long	if broken	change layout
No.26		IKEA/ retailer stores	style/quality	several years	moving	not bored
No.27	over 55 years old	department & retailer stores/ IKEA	quality	life long	if broken / new need	change the painting/texti le
No.28		furniture retailer store	style/quality	life long	if broken	change layout / decoration
No.29		department & retailer stores/ IKEA	quality/style	life long	if broken	not bored
No.30		family/ retailer stores	quality/design	life long	moving	small modifications
Summary		16 IKEA 18retailer stores 5 department stores 6 family/ friends 2 second hand stores 1 rent from Janitor	16 appearance /design /style 17 quality 9 price 2 more choices 2 convenience 3 other reasons (easy to move /resell / shopping)	6 several years 24 life long	4 changing style 12 moving 14 if broken 2 new needs	11 not feeling boredom 13 change / decorations / textile / painting 6change layout 2 new context /combination

Table 14: Interviewees' attachment to clothing and related accessories

Interviewees	Age group	How much clothes owning	Frequency of replacement	Reasons to replace clothes	Criteria	How to deal with old clothes	Feeling of giving away old objects	
No.1	<25 ys old	a lot	every 3-4 months	new style	personal preference	keep	sad	
No.2	<25 ys old	>average	no pattern	trend	Trend / quality	throw away	no feeling	
No.3	25-35 years old	not a lot	not often	feel good	quality/ classic style	keep	no feeling	
No.4		a lot	very often	therapy to relax	personal preference	keep/ donate	sad	
No.5		a lot	every week more for kids	influenced by others	self-image/ stylish	give away	happy	
No.6		average	not often	look and feel good	classical style	donate	sad	
No.7		a lot	every month	for various situations	quality	give away	happy	
No.8		average	not often	for various categories	quality /style	donate	happy	
No.9		average	once a year	need	quality /style /cost	donate	no feeling	
No.10		>average	no pattern	feel good	stylish	donate	happy	
No.11		a lot	often	stay in trend	stylish	wear at home	no feeling	
No.12		average	every year	look and feel good	quality / personalized	keep	a little sad	
No.13		not a lot	not often	need	quality	keep	no feeling	
No.14		35-45 years old	a lot	not often	look and feel good	quality / good on me	keep	happy
No.15			average	every 3-4 months	look and feel good	quality	donate	happy
No.16	a lot		each sale season	feel good	quality	give to relatives	happy	
No.17	a lot		every 2 months	habit	stylish	keep	happy	

No.18		a lot	every 3-4 weeks	habit	quality / finishing	donate / give away	happy
No.19		average	several months	need	cost	donate/ throw away	happy
No.20		>average	every 6 months	habit	brand/ quality	donate	happy
No.21		average	not often	personal style	personal preference	keep	a little sad
No.22		not a lot	not often	need	feel comfortable	keep	no feeling
No.23	45-55 years old	a lot	no pattern	habit	personal preference	keep/ donate	happy
No.24		a lot	often (before) / not often (now)	influenced by others	brand/ feel comfortable	keep	no feeling
No.25		not a lot	every 2-3 years	need	personal preference	donate	a little sad
No.26		not a lot	not often	need	fit me	throw away	no feeling
No.27	over 55 years old	average	not often	influenced by others	classical style	donate	happy
No.28		average	not often	look and feel good	classical style	keep/ donate	happy
No.29		not a lot	not often	need	feel comfortable	keep/ donate/	happy
No.30		not a lot	not often	aesthetic/ functions	feel comfortable	keep/ donate	
Summary		11 a lot 3 above average 9 average 7 not a lot	8 often (within every 3 months) 4 average (every 4-6 months) 15 not often 3 no pattern	3 follow style / trend 10 self-image 3 influenced by others 7 need 4 habit 1 therapy	12 quality 7 trend 4 comfort 10 self-image 2 cost 4 classical beauty	15 keep 5 give away 15 donate 3 throw away	15 happy 7 sad 8 no feeling

Table 15: Interviewees' attachment to objects placed in the eight scenarios

Interviewees	Age group	Chair	iPod	Watch	PDA	Shoes	Kettle	Bicycle	Hockey stick
No.1	<25ys old	5	6	3	7	8	2	1	4
No.2		3	6	2	8	5	1	4	7
No.3	25-35 years old	5	8	3	4	6	7	2	1
No.4		4	8	5	1	3	2	7	6
No.5		7	6	8	2	5	4	3	1
No.6		6	5	8	3	2	1	7	4
No.7		3	7	6	8	5	1	2	4
No.8		7	4	8	3	5	2	6	1
No.9		5	1	8	2	4	3	6	7
No.10		4	3	8	6	2	1	7	5
No.11		5	2	8	7	3	1	4	6
No.12		3	2	8	5	7	4	6	1
No.13		6	3	7	2	4	5	8	1
No.14	35-45 years old	1	4	8	7	3	2	6	5
No.15		4	5	8	7	2	1	6	3
No.16		4	7	5	8	1	2	6	3
No.17		5	6	8	4	3	1	2	7
No.18		4	8	7	1	2	6	5	3
No.19		2	5	7	6	4	1	3	8
No.20		3	7	8	6	1	5	4	2
No.21		1	6	5	4	8	3	7	2
No.22		8	7	5	6	4	3	2	1
No.23		45-55 ys old	1	4	6	3	5	2	7
No.24	6		2	4	8	1	3	5	7
No.25	2		6	8	1	7	5	3	4
No.26	4		5	3	2	7	8	6	1
No.27	over 55 ys old	2	8	7	4	6	3	5	1
No.28		4	8	6	7	1	3	2	5
No.29		4	6	8	3	1	7	2	5
No.30		1	4	3	6	2	8	7	5
Total		119	159	188	141	117	97	141	118