Product Attachment and Sustainability:
A Transitional Method to Extend Product Lifespan

by

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ABSTRACT

The consequences of the unconstrained production and manufacturing undertaken during the 20th century by the Western world are numerous and worrisome. Sustainable solutions to these problems involve not only reducing resource and energy usage, but increased product benefits such as lifespan. Product attachment can be used to offset reductions in the more traditional value propositions of a product. The two main definitions of product attachment and the associated research are investigated. Two strong attachment types are identified from the literature and a transitional method for using the two in tandem is proposed. Guidelines for using the method and specific strategies are discussed. The application of design for product attachment strategies is demonstrated with a mobile device design project.

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SOFTWARE USED

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Adobe Photoshop CS5

Adobe Illustrator CS5

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CHAPTER 1

INTRODUCTION

1.1 Problem Statement

The artifacts generated by industrial design have generated a lot of good for the people who designed, manufactured, and used them. Unfortunately, these benefits have been built on the use of resources in an incredibly irresponsible way. The rise of global consciousness in regard to environmental issues has progressed slowly. However, there is now a consensus that the effects of our decisions and progress are having negative repercussions felt on a global scale. These problems, like climate change and related effects, must be addressed or we risk being forced to fundamentally alter how and where we live. Getting the most that we can from the resources we have is a short-term strategy that can help alleviate some pressure while other more permanent measures are developed. Though there has been an emphasis on reducing the resources needed for a product, the benefits of a product also need to be augmented in order to create the most efficient products that we can. This thesis will investigate product attachment as a way to help extend the lifespan of products and proposes a new method in order to help maintain attachment for as long as possible in order to provide more benefits from a product.

1.2 Need For Study

This study is important because of the severity of some of the environmental problems that must be addressed. Product designers have made headway in reducing the

resources used for a product. However, even if the inputs for a product are reduced, this will have little effect if a product is discarded before it has completely exhausted its functional life. Current methods focus heavily on reducing the resources used for each product. However, the considerations for increasing product benefits once the product has left the factory seem to be scattershot and underdeveloped. In order to extend the lifespan of products, product attachment will be investigated as a way to achieve these aims. Product attachment is one strong way to affect this aspect and multiple studies have shown that attachment leads to an extended lifespan. This approach can help make all products more sustainable without even requiring any reduction in resource usage since they will have longer lives.

1.3 Objective of Study

The objective of this thesis is to first demonstrate the linkages between sustainability and product attachment. With this established, product attachment will be examined in order to understand what it is as well as how and why it develops. With this understanding a method can be developed that provides a framework for using product attachment to influence the lifespan of durable products. Guidelines for the framework will be discussed that demonstrate the important goals of the framework. Strategies that build on these guidelines will be identified and generated in order to make the guidelines more actionable for designers. Finally, strategies will be demonstrated through a product design example that shows how design for attachment can be used to create a product with a greater likelihood of attachment and thus a longer product life.

1.4 Assumptions

For this study there is an assumption that product attachment is a construct that exists. One must accept that this construct exists based on behaviors that the definition incorporates and other outcomes that one would expect based on the definition of the construct.

1.5 Scope and Limits

This study is fairly general in scope, in that it is addressed at affecting the lifespan of any durable product. Because of this limitation, the study is limited to an examination of products that have a physical presence. Products that are completely digital have been examined in terms of some of the same product attachment constructs (e.g. Cushing, 2011), however these will not be discussed here. There is also a difference between communal products and those considered possessions or products owned by an individual. Possessions are what will be examined since there is more opportunity to affect the lifespan of them through the construct of product attachment.

1.6 Anticipated Outcomes

The outcomes of this study are that product attachment can be identified as a specific construct with a definition and specific outcomes, including a longer lifespan. Based on the definition, there will be a set of guidelines for how to design for attachment. Using these guidelines, strategies can be theorized or identified that can affect one or multiple guidelines in order to extend the product lifespan. It is supposed that this process will result in a significant increase in the product lifespan in order to demonstrate the

increase in product outputs. With this achieved, products can be designed with the goal of laying a groundwork for product attachment using the identified strategies.

1.7 Definition of Terms

Active Attachment: Attachment based on active, present and future self-expression
     aspects of the user's self.

Attachment: Strong feelings or emotions to another.

Eco-efficiency: The ratio between the produced value and required impacts.

Emotional Product Attachment: Product attachment defined by the emotional importance
     of a product.

Emotional Significance: The degree of the emotional bond experienced with a product.

Obsolescence: A lack of value.

Participatory Design: Involvement of the user in designing a product.

Personalization: Alteration of a product by the user in order to align the product identity
     to the user's self-identity.

Product Attachment: Attachment directed towards a product.

Product Lifespan: The length of time a product is maintained before disposal.

Reflective Attachment: Attachment based on the user's present and past contemplative
     and affiliative aspects.

Self Product Attachment: Product attachment defined by the degree of self-extension.

Self-Concept: A person's assessment of their self as an object of assessment.

Self-Extension: The incorporation of some other object into the self-concept.

Sustainable Development: Satisfying current wants and needs without compromising the

ability to satisfy them in the future.

Value: the amount of worth, utility, or importance.

CHAPTER 2

LITERATURE REVIEW

In this chapter, the link from sustainability back to product attachment will be made. Eco-efficiency is discussed; however, a relatively minority approach to it will be used. Two definitions of product attachment are identified and discussed. It is argued that the construct of product attachment can cover both definitions and then strong types of attachment are identified from the literature.

2.1 Our Common Failures

It is the rare designer who acknowledges the harm that they are bringing upon the planet upon which we all depend. Designer Victor Papanek (2000) is one of the few and began his book *Design for the Real World: Human Ecology and Social Change* by stating bluntly, "There are professions more harmful than industrial design, but only a few of them" (p. ix). In regard to the perception that the products of industrial design have a negative impact on the health and viability of life on earth, Shreve (2006) wrote,

> To hear environmentalists tell it, contained in nearly every consumer product
> being produced today—from plasma screen TVs, DVD players and iPods, to the
> cheap pair of flip-flops and paperback book you bought for your last vacation—is
> a pint-sized ecological disaster that, when combined with all the other pint-sized
> ecological disasters, adds up to the ecological apocalypse.

They have a point. (p. 12)

However, it is not simply a perception that there are far-reaching impacts due to the mass-production of durable goods; the evidence of environmental impacts has become self-evident yet designers seem to be unwilling to acknowledge their role. On this malaise, Shedroff (2009) wrote,

For a variety of reasons, we have accepted the destruction of healthy, vital habitats for ourselves and the natural systems that we rely upon. This has to change. Increasing climate change—indeed, climate crisis—is requiring us to take a systems perspective in order to create healthy, more vital natural capital for which to support human life and activities. Some of these concerns include:

- Habitat destruction and collapse

- Topsoil depletion (which retards our ability to grow food)

- Habitat alteration

- Reduced biodiversity

- Climate change (also known as global warming, global weirding, and climate crisis)

- Ozone depletion

- Fresh water supplies

- Air pollution

- Toxic pollutions (including carcinogens, acid rain, and the by-products of industrial and agricultural chemicals)

- Over-concentration of substances (too much of even good materials, in too high a concentration, or in the wrong places, are just as toxic as harmful materials)

- Resource depletion (such as oil or water)

- Destruction of eco-services (such as the environment's ability to clean air and water, and shade us from harmful ultraviolet rays)

For all of these issues that affect the environment, they all directly affect human health as much as they affect the health of plant, animal, and other life in nature. (p. 13-14)

Of these impacts, climate change might be the most severe. As Burall (1996) stated,

Climate change brought about by increasing emissions of greenhouse gases from such human activities as energy generation and transportation threatens to inundate whole countries as well as forcing vast population migrations as fertile areas dry up; elsewhere, climatic change will take an increasing share of the world's wealth in repairing storm damage, building flood defences and so on. (p. 8)

The list of impacts is startling and the rate at which our needs continue to increase serves only to amplify the importance of finding a way out of this self-created problem. In a 1987 report prepared for the United Nations, the World Commission on Environment and Development [WCED] stated, "Population projections indicate an increase in global population from 4.8 billion in 1985 to 6.1 billion by 2000, and to 8.2 billion by 2025" (1987, p. 101). As the population grows, we have not begun to reduce our consumption to compensate. According to Robins (1993), "Industrialised world reductions in material

throughput, energy use and environmental degradation of over 90% will be required by 2040 to meet the needs of a growing world population fairly within the planet's ecological means" (p. 10). Von Weizäcker, Lovins, and Lovins (1997) point out that, "80 per cent of products are discarded after a single use, and many of the rest are not as durable as they should be" (p. xx). Accordingly, Chapman (2005) states,

> Over 90 per cent of the resources taken out of the ground today become waste within only three months: waste consisting of plastics, metals and other synthetic compounds no longer recognizable to the microbial decomposers that degrade substances back to their basic nutritional building blocks. (p. 8)

Globally we are putting an enormous pressure on our natural resources and earthly biome, giving little regard to the needs of others and the ever-expanding population that will require an ever-increasing amount of energy and resources to maintain current levels of use. Instead of addressing these concerns, collectively we seem to be headed in the wrong direction. According to Parker (1963), "the average citizen of the United States is consuming twice as much in the way of goods as the average citizen consumed in the years just before World War II" (p. 9). The WCED (1987) noted, "As recently as 1950, the world manufactured only one-seventh of the goods it does today, and produced only one-third of the minerals" (p. 206). Even worse, there is an unequal consumption of the current resources. According to Packard (1963), "United States industrial firms are grinding up more than half of the natural resources processed each year on this planet for the benefit of 6 per cent of the planet's people" (p. 6). Between Packard's observations and today, these trends have not abated. Burall (1996) stated,

The Western world has 20 per cent of the world's population but uses 80 per cent of the world's material and energy resources; even if the West stands still and the rest of the world grows only to the point of using half the resources per head used by the West, material and energy use will increase to two and a half times the current levels. (p. 7-8)

The outlook does not appear promising when taken as a whole. The developed Western world consumes a greater share of resources for a smaller share of people, and the rate of consumption has only increased. Meanwhile, the rest of the world desires a similar lifestyle and the populations of both the developed and developing world are increasing. It may be convenient to assign blame for this situation, but that is a tough thing to do. As the WCED (1987) stated, "It is not that there is one set of villains and another of victims" (p. 47). The WCED addressed some of the benefits, stating, "In some parts of the world, particularly since the mid-1950s, growth and development have vastly improved living standards and the quality of life" (p. 31). People seek to maximize their comfort, enjoyment, and happiness. Individually, an impact might be small, but taken as a whole they add up to a massive load that our earthly biological system might not be able to carry anymore.

2.2 Sustainability

In response to the environmental challenges facing the world, the WCED (1987) developed the concept of sustainable development, which "provides a framework for the integration of environment policies and development strategies - the term 'development' being used here in its broadest sense". They formalize the definition by saying,

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"Sustainable development seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future" (p. 40). Though there are some that do not accept sustainability as an ethical goal (e.g. Treanor, 1997, Abstract), this is a minority position. The environmental improvements that began in the 1970s have become more fully realized as time has gone on (Shreve, 2006, p. 15). Environmental awareness has become mainstream and consumers have begun to realize they have what might be considered a direct impact. According to Shreve (2006), 30% of US consumers are demanding products that are better for the environment and there is an economic advantage to pursuing this as this population is a possible $226.8 billion market (p. 21). If the answer to the environmental problems is sustainability, what does this look like?

2.3 Eco-Efficiency

According to Wann (1996), "A major evolutionary principle is getting the best performance with the least amount of effort" (p. 27) One approach to sustainability in this way is termed eco-efficiency. Kuosmanen (2005) stated,

Eco-efficiency means 'doing more with less,' or producing economic output with minimal natural resources and environmental degradation. Although the general idea of eco-efficiency is well established, as yet there is no general consensus about its precise definition or criteria….Usually, eco-efficiency is quantified as the ratio of economic value added to the environment damage index, but numerous variations (and deviations from) this approach have been proposed. (p. 15)

Because eco-efficiency has such a malleable definition it is best to look at the general concept behind it. In this case Yadong, Dingjiang, Bing, and Shanying (2013) stated, "It is measured as the ratio between the (added) value of what has been produced…and the (added) environmental impacts of the product or service" (p. 178). Relying on this basic ratio definition, eco-efficiency for a product can be seen as the ratio of product outputs to product inputs where the product is seen as a system with a discrete boundary. Product outputs are benefits that are created by the product. Product inputs are things that are consumed by the product, including tangible resources and intangible resources (such as air quality or worker health). Outputs are things that would be considered positive, while inputs are things that would be considered negative. Thus, wastewater might be an output of the manufacturing process, but since it is a negative aspect of the product it is classified as an input for the calculations of eco-efficiency. In the same way, a product that consumes CO_2 from the atmosphere would be classified as an output since it is a positive (since at this time we have an excess of CO_2 (Warrick, 2014); if we had CO_2 levels that were too low it could then be seen as a negative and thus an input).

These definitions are intentionally left vague. Product eco-efficiency is useful as a comparative measure and thus the definitions and units of the comparison are unnecessary as long as the units are the same from assessment to assessment. They are also left vague because there is as of yet no quantifiable way to take into account all outputs and all inputs in relation to a product.

How does one quantify the reduction in air quality, impact on the worker health and add that into the amount of energy required to produce and use the product? It is a hopeless task. On the output side, does one measure the lifespan in years? Or is it the

number of working hours? Or perhaps it is the amount of pleasure that a user gains from the use? These are hard to quantify and even harder to sum under one unit.

$$\frac{\text{Outputs}}{\text{Inputs}} \qquad \frac{\text{Outputs}}{\text{Inputs}} \qquad \frac{\text{Outputs}}{\text{Inputs}}$$

(a)   (b)   (c)

Figure 1. Eco-efficiency ratios of outputs to inputs.

We will simply deal with the concept of outputs over inputs. If eco-efficiency is the ratio of outputs to inputs (see Figure 1a) we desire a higher ratio. This can be accomplished in two unique ways. First, we can decrease the inputs (see Figure 1b). Second, we can increase the outputs (see Figure 1c). A combination of the two methods is best and will lead to the greatest increase in eco-efficiency. Thus far, the majority of sustainability efforts have come down on the side of decreasing outputs. DeSimone and Popoff (1997) in their discussion of eco-efficiency stated,

> Practical experience….suggests that there are seven key dimensions that every business should be taking into account when developing products, introducing process changes, or taking other actions with environmental implications. They are:
>
> 1. Reduce the material intensity of goods and services.
>
> 2. Reduce the energy intensity of goods and services.
>
> 3. Reduce toxic dispersion.
>
> 4. Enhance material recyclability.
>
> 5. Maximize sustainable use of renewable resources.

6. Extend product durability.

7. Increase the service intensity of goods and services.

The greater the improvement in each of these dimensions—and the more
dimensions in which improvement occurs—the more ecoefficient a product or
process is. (p. 56-57)

An examination of their key dimensions reveals that the first five of the seven are focused
on input reduction. This makes sense because it is easier to measure and trumpet a
reduction in something perceived as a negative than it is to talk about how much more
value is gotten out of the same input. Reductions are simply easier to measure. Even the
common refrain of 'Reduce, Reuse, Recycle' delivers two strategies to reduce inputs but
only one to increase outputs.

This leaves an opportunity to develop new strategies that can make a product
more eco-efficient and thus sustainable by increasing the product's outputs. The most
common strategy that one finds with this is increased durability. On durability, Shedroff
(2009) stated, "Along with increasing the durability of products by choosing higher-
quality materials, fasteners, and manufacturing processes that last longer, developers can
also identify and eliminate defects and weaknesses that would otherwise prevent a
product from working for a long time" (p. 167). Most of the discussion on durability
focuses on making a product that will continue to function for an extended time.
Chapman (2005) was critical of this approach and stated,

In these somewhat superficial scenarios, durability is distinguished purely by a
product's physical endurance, whether cherished or discarded; engineers therefore
slap each other on the back in triumph as fully functioning hairdryers emerge

from a five-year landfill hiatus. Is this durable design, or simply the designing of durable waste? In addition, product failure is characterized by blown circuits, stress fractures and a host of other technical and physical glitches; in attending solely to physical ageing, designers overlook numerous invaluable metaphysical renderings of durability. (p. 53)

Physical durability ultimately doesn't go far enough considering that according to a survey by Box (1983), "65 per cent of…discarded products were described by their owners as usable at the time of disposal" (p. 45). Other examples abound of this premature disposal. Verbeek and Kockelkoren (1998) cite research by the Dutch Ministry of Environmental Affairs showing that a large proportion of products are discarded while still functional (p. 29). Van Nes found that only 22 percent of products that were replaced were non-functional (as cited in Mugge, Schoormans, & Schifferstein, 2005, p. 38).

Mugge (n.d.) stated that, "Nowadays, people dispose of products although they still function properly, for example, because these products look old-fashioned" (para. 2).

An easy metric to compare measured outputs is the lifespan of a product, from the time it is purchased to the time it is disposed of. If a product's lifespan in increased without an increase in inputs, the product's eco-efficiency ratio increases; the product is more sustainable. If products still have valuable lifespan left when they are being discarded, then something must be going on beyond physical durability. There seems to be a lack of what Chapman (2005) termed, 'emotionally durable design' (p. 18).

2.4 Obsolescence and Value

Standing opposed to the idea of eco-efficiency is the idea of encouraging obsolescence in our durable goods. The rise of mass-production at the end of World War I and the subsequent recession created a particular environment, receptive to the emergence of design as a profession (Heskett, 1985, p. 105). Designers such as Raymond Loewy "combined improved appearance with increased operating efficiency" and helped increase year over year sales of the new products they had a hand in designing (Heskett, 1985, p. 106-107). In order to keep up this manufacturing pace there needed to be a shift from 'forced' purchases to 'unforced' purchases. A forced purchase is one that occurs due to replacement of a product due to product's functional failure; an unforced purchase occurs when a product is replaced due to changes in style or preference (Bayus, 1991, p. 43).

The answer to the product of 'durability' was to encourage obsolescence. Merriam-Webster dictionary defines obsolescence as "the process of becoming obsolete or the condition or being nearly obsolete" ("Obsolescence", n.d.). The concept of planned obsolescence was advocated by London (1932) who proposed a government assigned "lease of life" to products; At the end of their lifespan, products could be turned in for tax credit towards the purchase of new products (p. 6-8). In a 1953 pamphlet, Brooks Stevens (as cited in Heskett, 2003) stated that "The great strides of industrial design are yet to come through Planned Obsolescence," which he defined as the encouragement of the consumer's "desire to own something a little newer, a little better, a little sooner than is necessary" (p. 4). Instead of trying to get the most output from a product, products were designed so that they were replaced before their maximum output has been realized.

In his 1963 book, *The Waste Makers*, Packard criticized the concept of obsolescence and laid out three specific types of obsolescence that has been used to drive replacement of products. They were obsolescence of function, obsolescence of quality, and obsolescence of desirability (p. 46-47). Obsolescence of function occurs when a product's functions have been superseded by a new product's better functions. Obsolescence of quality affects the physical breakdown of a product. Obsolescence of desirability is labeled as the most troubling and is when the owner makes a product psychologically obsolete. There need not be anything wrong with the product save for the fact that it is no longer new, in style, fashionable, etc. Obsolescence of desirability, also termed psychological obsolescence (Packard, 1963, p. 59), is the antithesis of increased output; a product is designed with an artificially shortened lifespan. Obsolescence of any kind reduces the value of a product to the user. An obsolete product no longer has enough value to justify maintaining it.

The value of a possession is not simply the monetary investment to purchase a product. Value is defined as "relative worth, utility, or importance" ("Value", n.d.). Ries (2009) argued, "every product contains both tangible and intangible sources of value" (para. 3). Therefore, when evaluating the value of a possession, various factors have to be considered in order to determine the item's overall value. According to DeBell and Dardis (1979), the decision to replace a product is based off of the interaction between the marginal costs and the marginal benefits of ownership of a product. When a product is first purchased, the marginal benefits from ownership are very high whereas the marginal costs are low. Over time, the marginal benefits of the product will fall whereas the marginal costs will rise (p. 381). This interaction can be seen in Figure 2.
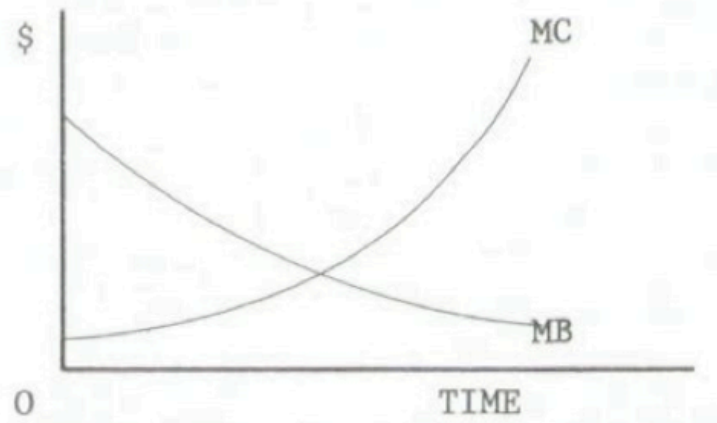
Figure 2. Factors influencing product retention or disposal. MC stands for marginal costs while MB stands for marginal benefits. (DeBell & Dardis, 1979)

When marginal benefits outweigh the marginal costs, a product is not as easily disposed of as when the marginal costs outweigh the marginal benefits. The value of a product can be thought of as the marginal costs subtracted from the marginal benefits thus once the costs outweigh the benefits, the value is negative. A product with negative value is a burden and thus ripe for disposition. Heath and Fennema (1996) suggested that people engage in the spreading of sunk costs across time, known as mental depreciation. They stated:

> Mental depreciation can also lead people to prematurely stop investing in a situation that provides substantial benefits. When they spread a historical fixed cost across uses they may act as though the marginal costs of investment are higher than they actually are because they mentally add a portion of the historical fixed cost to the true marginal cost (p. 96).

Therefore, even products that indeed continue to offer value may be discarded because of errors due to mental depreciation. Thus, products are not necessarily kept until their value is completely used up.

Examining the different costs of replacement purchases, Okada (2001) stated:

Consumers making a replacement decision face essentially two types of costs: (1) the purchase price of the new model itself and (2) the mental cost of retiring the old model before they have gotten their full money's worth out of it. (p. 433)

She found that people create a "mental book value" of the product and through use over time this book value is diminished (p. 433). People simply have to mentally lower the value enough to make the replacement purchase justified. In these models, through use over time it becomes easier to dispose of the product. In order to maximize the lifespan of the product it becomes necessary to increase the value: increase the marginal benefits so they outweigh the marginal costs even with fixed costs added in, and increase the mental book value of the product so that it is too high to mentally accept the loss.

Ries (2009) proposed four types of value: practical utility value, perceived value, social value, and identity value. Practical utility value is derived from "tangible benefits that a product enables." Perceived value is based on the perceived quality through associations with brands, design, etc. The other two types of value are based on assisting different aspects of the self-concept with respect to oneself and others (para. 4). The importance of this is that value has different aspects, just like obsolescence has different aspects. Therefore, based on Packard's three types of obsolescence, three types of value can be theorized. First is functional value; a product allows someone to accomplish a task. For many products this is the fundamental benefit; Ries's practical utility value is directly related. Second is quality value. Quality value is related to the condition of the object and thus more directly to the monetary value of a product. Perceived value overlaps with quality value. Finally is psychological value, such as that provided by

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attachment. This value is based on the psychological benefits of the product. These psychological benefits align closely with Ries's concepts of social and identity value.

The 'mental book value' discussed by Okada was focused on the monetary value of the object; however, the true mental value of a product is made up of a combination of different value propositions. For instance, an object worth a lot of money has high quality value. A product that functions well might have high functional value. A product that someone is attached to might have high psychological value. Lack of value in one aspect can be compensated for in other aspects. As products age, their quality value decreases through use and their functional value decreases as other products are introduced that offer marginal increases in benefits. If psychological value is not augmented then the lack of functional and quality value will lead to disposition. Figure 3 shows an example of changing value for a product with a demonstrated lack of influence on the psychological value. The total value is dependent on the maintenance of both functional and quality value. In Figure 3, the point at which the majority of the functional value is lost can be seen at the large drop. This could be from a new model with new features being introduced, or a change in user needs rendering the functional value provided by the product reduced. The loss of functional value is detrimental to the overall value since the majority of the total value was derived from the functional value. This loss of functional value has led to a situation where the product is much closer to disposal.
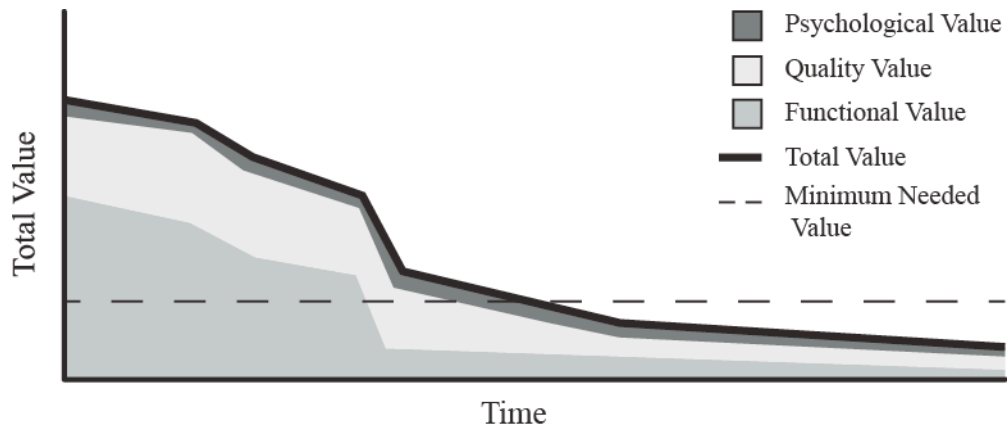
Figure 3. Change in total value over time with nominal psychological value.

The goal of designing for attachment is to increase the psychological value of a product to make up for the decrease in other values over time. If value can be maintained, obsolescence can be avoided and the lifespan can be extended. Figure 4 demonstrates the same product but with the introduction of augmented psychological value. Comparing Figure 4 to Figure 3, one can see that the increase in psychological value maintains the total value above the minimum value level for a longer period of time. By increasing the psychological value of the object, the lifespan of the object can be increased in spite of the decrease in functional value and quality value.
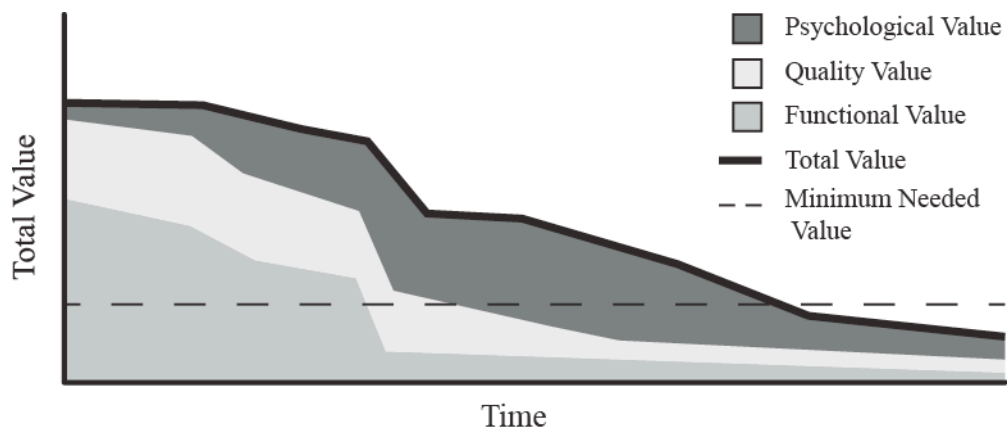
Figure 4. Change in total value over time with increase in psychological value.

2.5 Lifespan

Earlier it was discussed that a longer lifespan leads to a greater output, thus increasing the eco-efficiency ratio and making the product more sustainable. However, it has been shown that not all products should have a longer lifespan. Van Nes introduced the concept of ecological buyback period of products, a calculation method to assess the environmental desirability of lifetime extension. This demonstrated that for products with high energy consumption during the use phase, it might be beneficial for them to be replaced by a product that would end up with a smaller energy-use footprint (as cited in Van Nes & Cramer, 2005, p. 287). However, this is the exception and not the rule. More products will benefit from an increased lifespan.

Van Nes and Cramer (2005) identified five design strategies to help increase product lifespan: "design for reliability and robustness; design for repair and maintenance; design for upgradability; design for product attachment and design for variability" (p. 295). The first two strategies, design for reliability/robustness and design for repair/maintenance, are focused on eliminating quality obsolescence and increasing the physical durability of a product. However, it has been demonstrated that this is not enough since people replace still-functional products. Design for upgradability is aimed at decreasing functional obsolescence. This is a forward thinking strategy that helps extend the functionality of a product, but again function does not solely determine replacement.

Design for attachment and design for variability are both aimed at limiting obsolescence of desirability, but they approach it in different ways. On the topic of design for variability, Van Nes and Cramer (2005) stated

[it] concerns the possibility to offer variation to the user without the need for additional parts. It mainly concerns the physical appearance of the product, but is not restricted to this. This strategy aims at achieving a more enduring interest in the product. (p. 296)

This is almost the opposite of the design for attachment strategy, which is using attachment to a product to help increase the lifespan. In that case, because the product does not change, attachment develops. In the case of variability it is the change itself that causes interest. Design for variability is easily accomplished with digital products. The advent of products with customizable digital interfaces has shown that there are a host of reasons that people personalize a product and a variety of reasons that they give for why it is desirable (Blom & Monk, 2003). Interestingly, Blom and Monk (2003) identified strengthened attachment as one of the reasons people personalize digital interfaces on their products (p. 209). However, variability of a physical product without the need for additional parts is more difficult and Van Nes and Cramer (2005) do not elaborate on how this can be accomplished. Based on findings by Blom and Monk (2003), variability might actually be a strategy by which to stimulate attachment and not a lifespan strategy on its own. In discussing design for attachment, Van Nes and Cramer (2005) state, "It is questionable, and therefore a challenge for designers, whether it is possible to cultivate this product attachment" (p. 296)

However, casual observation shows products that people have not disposed of or replaced in spite of a variety of reasons why this should have occurred already. Things like a favorite t-shirt that is falling apart, or an older technologically dated cell-phone held together with tape are maintained beyond the point where one might expect the

product to be discarded. Attachment is not clearly understood and offers a new and relatively unexplored avenue to increase product life span, increase eco-efficiency and make a product more sustainable.

2.6 Attachment

Merriam-Webster defines attachment as, "strong feelings of affection or loyalty for someone or something," or more precisely, "the state of being personally attached," and "affectionate regard" ("Attachment," n.d.). It is clear that attachment is not a very concretely defined relationship. There appears to be an originator and some target, whether that is a person or an object (or something that falls in between, such as a pet). However, the nature of the attachment relationship seems to be less well-defined. This is the problem when examining attachment; it is a fluid concept that can be interpreted in a variety of ways.

Attachment theory is much better defined. Attachment theory was developed by John Bowlby, a British psychoanalyst (Fraley, 2010, Background section, para. 1), to conceptualize the propensity for interpersonal bonding and explain behavioral aspects of separation in children. According to Bowlby (1979),

> Attachment theory is a way of conceptualizing the propensity of human beings to make strong affectional bonds to particular others and of explaining the many forms of emotional distress and personality disturbance, including anxiety, anger, depression, and emotional detachment, to which unwilling separation and loss give rise. (p. 127)

In attachment theory, attachment is defined as "a bond or tie between an individual and an attachment figure" (Prior & Glaser, 2006, p. 15). Attachment behavior is defined as "any form of behaviour that results in a person attaining or retaining proximity to some other differentiated and preferred individual" (Bowlby, 1979, p. 129), or behaviors associated with the creation and maintenance of attachment. On this subject, Bowlby (1982) said, "Attachment behaviour is regarded as a class of social behaviour of an importance equivalent to that of mating behaviour and parental behaviour. It is held to have a biological function specific to itself" (p. 179). Hence, attachment has a biological source and is hardcoded into people's psyche.

Attachment theory deals with the relationships between individuals. Attachment is observed especially strongly in children, but can be seen throughout a person's lifespan (Bowlby, 1979, p. 129). In children, attachment is seen as being directed from child to a caregiver. The child uses the caregiver as a support for exploration and their self-development (Bowlby, 1982, p. 208). Attachment in children is also a byproduct of a need for "safety, security, and protection" (Prior & Glaser, 2006, p.15). Attachment has been observed as being developed between an infant and a number of different individuals however, the strength of attachment has varied depending on the target (Bowlby, 1982, p. 304). Thus attachment has a strength component; strength of attachment can vary depending on the target. Of note is that attachment behavior is exhibited toward a specific target and is accompanied by an emotional engagement with emotions reflecting the state of the attachment relationship (Bowlby, 1979, p. 130).

Attachment behavior has also been observed being directed toward inanimate objects (Bowlby, 1982, p. 309-313). Hazan and Shaver (1987) found support for

attachment between adults as well, extending the concept beyond children during the developmental stages (p.521). Prior and Glaser (2006) noted that "in adult relationships, people may be mutual and reciprocal attachment figures" (p. 15). This distinction is a key difference between attachment in children and adults; attachment in children is unidirectional. Attachment theory was the first attempt to investigate attachment as a construct, regardless of target and origin. However, attachment can be experienced in regard to many different things.

2.7 Product Attachment

Schultz, Kleine and Kernan (1989) wrote of product attachment, "what attachment is and where it comes from is incompletely understood" (p. 359). Before product attachment had a working definition, Wallendorf and Arnould (1988) presented 'favorite object attachment' as one of four types of attachments that they were able to analyze in their cross-cultural study on 'favorite objects' (p. 537). Schultz et al. (1989) proposed a working definition of product attachment, which stated, "Attachment is a multidimensional property of material object possession, which represents the degree of linkage perceived by an individual between him/her self and a particular object" (p. 360). Alternatively, Schifferstein and Pelgrim defined attachment as "the emotional bond a consumer experiences with a product" (as cited in Schifferstein, Mugge, & Hekkert, 2004, p. 328). These two definitions will be referred to as 'self product attachment' and 'emotional product attachment'. Before discussing the differences between the two attachment definitions, general product attachment and its characteristics will be examined.

Kleine, Kleine, and Allen (1995) stated, "Material possession attachment is a property of the relationship between a specific individual and a specific material possession" (p. 327). Product attachment, or material possession attachment, regards an attachment relationship between an individual and an object. In this case 'object' means, "something material that may be perceived by the senses" ("object," n.d.). This meaning differs from that utilized by Bowlby (1982) and in object relations theory where an object is "that to which a subject relates" and "usually persons, parts of persons, or symbols of one of these" (Daniels, 2007, Central Concepts section, para. 1). It is important to note the use of 'specific' in the definition proposed by Kleine et al. (1995). Attachment is formed with a singular object. Schifferstein and Zwartkruis-Pelgrim (2008) stated, "attachment differs from other consumer behavior constructs, because it focuses on the consumer's relationship with a particular product specimen" (p. 2). Ball and Tasaki (1992) noted the difference between the construct of attachment and "the relationship between a person and a product category," which is termed 'involvement' (p. 159).

Expanding further, Kleine and Baker (2004) stated that product attachment does not concern "product classes or brands" (p. 1). Schifferstein and Zwartkruis-Pelgrim (2008) agreed, stating product attachment does not concern product categories or brands (p. 2). Kleine and Baker (2004) also noted that product attachment is not "general trait materialism," "product category involvement," or simply an "evaluative affect" towards an object (p. 5-6). Nor is product attachment 'posessiveness,' a term for "the component of materialism that is a general attachment to possessions" (Wallendorf & Arnould, 1988, p. 535). Ball and Tasaki (1992) found only a small correlation between materialism and attachment (p. 169). Attachment is also not how desirable a product is. Ball and Tasaki

(1992) found that attachment "is unrelated to social desirability" (p. 168). These other attachment constructs may be related to product attachment and attachment may form with brands or product categories, but they are fundamentally different than product attachment.

Product attachment has been coded under a variety of different terms both to help research subjects identify objects they were attached to, and because product attachment had not been identified by definition as a construct. Csikszentmihalyi and Rochberg-Halton (1981) used the terms "cherished objects" (p. 55) or "special" (p. 56). As they stated, "The word 'special' was used by the interviewer throughout the interview to mean significant, meaningful, highly valued, useful, and so on" (Csikszentmihalyi & Rochberg-Halton, 1982, p. 56). Wallendorf and Arnould (1988) investigated attachment in Americans and Nigerians using the terms "cherished object" (p. 533) and "favorite object" (p. 537) to represent objects to which the respondents had strong attachment. Schultz et al. (1989) echo the last term, referring to "favorite possessions" (p. 360).

It is very important to note and understand that product attachment has an associated strength. The first thing Schultz et al. (1989) noted after introducing their definition of product attachment is that, "Attachment has relative strength" (p. 360). Kleine and Baker (2004) stated "attachment to a possession can be relatively strong or weak. Generally, strong attachment possessions include those regarded as "most difficult to part with and most cherished," "attached to," or "irreplaceable" (p. 3). Ball and Tasaki (1992) make reference to both low and high attachment (p. 159). Schifferstein and Zwartkruis-Pelgrim (2008) acknowledge the idea of strength when they discuss "the degree of attachment" (p. 2). When discussing the relationship between people and

products, Mugge et al. (2005) talked about "a strong relationship with a product" (p. 40). In much of the literature, references are made to persons being 'attached' to a product, but what is meant is that the person exhibits strong attachment to the product. Mugge, Schoormans, and Schifferstein (2008) stated "the definition of product attachment suggests that when experiencing attachment to a product, a strong relationship or tie exists between the individual on the one hand and the object on the other" (p. 426). Alternatively, the case of products that a person does not seem attached to would actually be classified as weak attachment.

The strength of attachment is not static however. Kleine and Baker (2004) stated that "Attachment is dynamic" (p. 5). However, they pointed out that some possessions (e.g. heirlooms) may have less dynamic attachments. In her study on the importance of special possessions, Myer (1985) found that "the possession at first increases in importance and specialness for the individual, then maintains a certain importance for a period, and gradually fades or changes in importance to a greater or lesser degree" (p. 562). Attachment strength was found to vary with length of ownership (Schifferstein et al., 2004) and with ownership stage (Ball & Tasaki, 1992).

Attachment is not formed deliberately by the user, but results from the repeated interaction with the object. Thus, any object can become an object associated with strong attachment. Schultz et al. (1989) stated that, "in general individuals do not deliberately seek to form an attachment to a particular object" (p. 361). However, since attachment is a behavioral system, ready to be activated by a range of specific stimuli, attachment naturally forms (Bowlby, 1985, p. 265). Kleine and Baker (2004) referred to the "personal history" that one has with an attachment possession (p. 3). Myers (1985) stated,

A person's attachment to special possessions is a dynamic process. This process involves, first, the object; second, the individual and her or his situation and history; and finally, the interaction of the two, an individual's investment in a special possession. (p. 562)

Attachment strength does not depend on the type of object either; attachments can form with any object. For instance, Kleine et al. (1995) stated that attachment is not product category specific (p. 330). Kleine and Baker (2004) stated, "Most often attachment possessions are ordinary objects that have special meaning formed through experiences involving the object" (p. 1). Kleine et al. (1995) found that "attachment is not predicted by product class, possession type, or person type; a specific person-object pairing is idiosyncratic to the specific life story episode it narrates" (p. 341). Attachment is not dependent on the object, but on the process of attachment development the user goes through with the object.

Attachment leads to certain product-related outcomes, which are often used as indicators of attachment. Schultz et al. (1989) noted "the degree of attachment is reflected in thoughts, feelings, and behaviors towards a *particular* object. Differences in these thoughts, feelings and behaviors should be evident between strong and weak attachments" (p. 360). Ball and Tasaki (1992) proposed "one would expect different affects and behaviors" towards an object of strong attachment as compared to those expected towards an object of weak attachment (p. 156). According to Mugge et al. (2005), "If a person experiences a strong relationship with a product, (s)he is more likely to take care of the product, repair it when it breaks down and postpone its replacement" (p. 40). Consequently, if a product is lost for one reason or another, the user will

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experience loss (Schifferstein & Zwartkruis-Pelgrim, 2008, p. 1; Ball & Tasaki, 1992, p. 158; Belk, 1988, p. 142; Dittmar, 1992, p. 46).

Bowlby (1979) defined attachment behaviour as "any form of behaviour that results in a person attaining or retaining proximity to" attachment figures (p. 129). Here, Bowlby's definition of attachment behavior will serve as a basis for the idea of attachment markers: thoughts, feelings, and behaviors that are outcomes due to the development of strong attachment and the desire to preserve such strong attachment. These attachment markers vary in strength, reflecting the strength of attachment. In effect, one can search for attachment markers in order to help identify attachment.

In order for attachment to have an impact on the lifespan of a product, the product should be owned by the user. Ball and Tasaki (1992) emphasis that present, future, or past ownership is a part of attachment (p. 158). However, Kleine and Baker (2004) point out that ownership or possession is not necessary for attachment, "only psychological appropriation" (p. 2). Communal objects, such as classroom chairs, can demonstrate this type of psychological possession (Kleine & Baker, 2004, p. 2). It may be true that strong attachment can form with objects that are not owned but psychologically possessed; however the influence that one has over the disposal of a non-possession is less than with a possession, except in certain cases. In order to impact product lifespan, the object must be possessed in such a way that the user determines disposal. This is most likely through physical possession.

Again, product attachment has two different definitions focusing on self-extension and emotional significance. The definition of attachment as emotional bond is based on

self-extension, so that is the logical place to begin an examination of self product attachment.

2.8 Self or Self-Concept

Before one can gain an understanding of product attachment as self-extension, one must first understand the concept of self also referred to as the self-concept. The self is of interest in relation to attachment because according to Belk (1988), "knowingly or unknowingly, intentionally of unintentionally, we regard our possessions as apart of ourselves" (p. 139). Much like the concepts previously discussed, there is no agreement on the precise definition of the self (Rosenberg, 1979, p. 5). The self is an important aspect of each individual and is the psychoanalytical term for what has been referred to variously as "'soul', 'nature', 'breath', 'will', and 'spirit'" (Burns, 1979, p. 3). The self-concept is defined by Burns (1979) as an "operational approach to the perennial philosophic question 'Who am I?'" (p. 2). Rosenberg (1979) defines self-concept as "the totality of the individual's thoughts and feelings having reference to himself as an object" (p. 7). On the importance of the self or self-concept, Burns (1979) stated that,

> Self-concept theorists promote the self concept as the most important and focal object within the experience of each individual because of its primacy, centrality, continuity and ubiquity in all aspects of behaviour, mediating as it does both stimulus and response. (p. 3)

Rosenberg (1979) drew a distinction between two aspects of the self, "the self as subject or agent and the self as object of that person's own knowledge and evaluation" (p. 6).

James (1950) referred to these two aspects of self as the I and the Me, the I being

the "passing subjective Thought" and the Me being the empirical or objective person (p.

371). Burns (1979) referred to the I and the Me as "discriminated aspects of the same

entity" (p. 6). The self serves as both the objectifier and the objectified during self

examination, a process unique to humans since "man alone has self consciousness"

(Rosenberg, 1979, p. 6-7).

The very recognition of the self is a major developmental event. Mirror self-

recognition has been documented as the assumed first appearance of the developing self

(Greenwald, 1988, p. 30). Rosenberg (1979) pointed out that self-concept is not the same

as Freud's concept of ego (p. 7). However, much like Freud's division of the mind into

the id, ego and superego (Freud, Strachey, & Richards, 1973), the self also has divisions

that come into conflict. Sirgy (1982) stated, "self-concept has been conceptualized as

having more than one component" (p. 288). Rosenberg (1979) distinguished "three broad

regions" of the self: the extant self, the desired self, and the presenting self (p. 9). The

extant self, also referred to as the actual self (Sirgy, 1982, p. 287), is the personal concept

of self. The desired self is an aspirational ideal. The presenting self, also known as the

social self (Sirgy, 1982, p. 287), is the self that is presented to others. Greenwald (1988)

identified four different self-concepts with various origins and roots: the diffuse self, the

public self, the private self, and the collective self (p. 30). The diffuse self, like Freud's

concept of id, is focused on hedonistic pleasure and pain. The public self is focused on

individual social approval. The private self develops as a response to conflict during the

development of the public self, much in the same way that Freud proposed the superego

developed due to conflict between societal expectations and the id (Freud et al., 1973). The collective self is related to various groups or affiliations and more nebulous.

Belk (1988), in addition to acknowledging different aspects of the self, conceived of them as levels of definition with a distinct hierarchy (p. 152). Though he acknowledged a lack of definition on the number of levels, he postulated they could be expressed by the individual, family, community, and group selves (p.152). In general, there appear to be two types of self definitions: temporal self definitions which relate to time, and audience self definitions which relate to the subject of considerations by the self. It is possible that these can coexist, such that a person may have an ideal, actual, and past public selves and ideal, actual, and future group selves. There is, however, one category of self revealed through the literature that relates directly to products: the material self.

2.9 Self-Extension and the Material Self

Belk (1988) in his paper "Possessions and the Extended Self" used the term 'extended self' to refer to the inclusion of objects in the sense of self (p. 139). He saw possessions as helping "adolescents and adults manage their identities" and helping "the old achieve a sense of continuity and preparation for death" (Belk, 1988, p. 139). Belk (1988) suggested that, whereas traditionally one self-extended to objects that were altered or created by oneself, the development of monetary payments in exchange for labor enabled persons another avenue through which to invest oneself into an object, and thus extend the self (p. 144).

The use of possessions to support the self has been discussed before, most notably by William James (1950). When James (1950) defined his four components of the self he included a material self, which consisted of the body, clothing, family, homes, and other property, anything with physical dimension that can be considered as a part of self (p. 292-293). In this definition, family seems a bit odd in that it is the only item that can have its own attachments.

Others drew clearer distinctions between the family and possessions. Prelinger (1959) found that when asked to sort items as self or not-self, possessions were regarded as self whereas 'other people' statistically fell into not-self (p. 18). Thus it seems safe to assume that the material self is inclusive of possessions but not inclusive of family as James had originally postulated. Indeed, Belk (1988) concluded that James's theory that possessions constitute a part of self was supported (p. 140-141).

The material self is an example of the extended self in reference to objects in the physical definition. James's (1979) definition of the material self even echoes the product attachment characteristic of strength; he stated, "the collections thus made become, with different degrees of intimacy, parts of our empirical selves" (p. 293). The material self helps to define and support the other aspects of the self to other people and to the subjective aspect (the I) of one's self.

The process of incorporation of objects into the self-concept involves the transfer of meaning stored psychologically by the object to the user. McCracken (1986) discussed how the movement of meaning took place from the culture at large to consumer goods and finally to individuals (see Figure 5). He proposed that meaning was transferred to goods through advertising and fashion systems, which was then transferred to the

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consumer through possession rituals, exchange rituals, grooming rituals, and in the case of previously owned goods, divestment rituals (p. 72). Cupchik (1999), however, pointed out that meaning is still highly dependent on the individual since "the range of personal meanings can be quite broad" (p. 79).
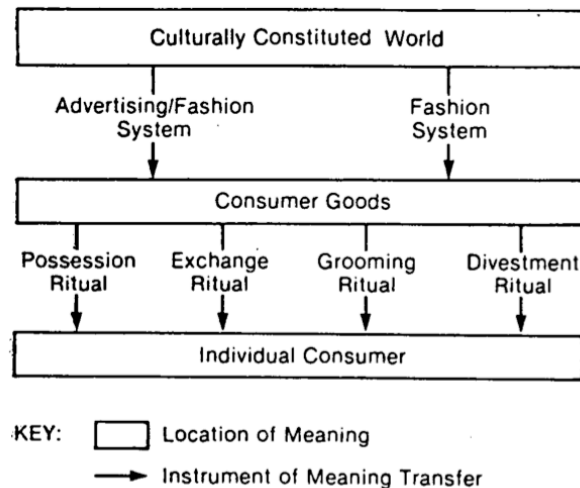
Figure 5. Movement of meaning from culture to product and to consumer. (McCracken, 1986)

Cupchik (1999) also broke meanings down into three different types: sensory/aesthetic, cognitive/behavioral, and personal/symbolic (p. 75). Sensory/aesthetic meanings are the indicators that the other meanings are based on, and have limited impacts outside of being raw processed information. The cognitive/behavioral meaning is the one most often examined by industrial design since it is the "critical bridge between the purpose and structure of industrial design objects and users who must understand and utilize them" (p. 75). Personal/symbolic meanings are related to the self-concept and Cupchik considered them mostly unexplored territory. He stated, "At the most superficial level, an object can be seen by the user to *resonate* with and be *symbolic* of the self" (p. 76). The meanings of objects are a multimodal sum total of the variety of meaning

aspects which vary by object and context (p. 76). The consumer uses ritualized repeated

action to psychologically extend the self to the object by coopting the cultural, yet

personally adapted, object meaning. The transfer of meaning to the consumer is part of

self-extension. This process of self-extension forms the basis for self product attachment.

2.10 Product Attachment as Degree of Self-Extension

The original research on product attachment was heavily based on the concept of

self-extension. Schultz et al. (1989) proposed a working definition of product attachment

as "a multidimensional property of material object possession which represents the

degree of linkage perceived by an individual between him/her self and a particular

object" (p. 359). Mugge et al. (2006) stated, "The experience of attachment to a product

is related to the degree to which this product is used to define and maintain a person's

self" (p. 641). Ball and Tasaki (1992) defined attachment as "the extent to which an

object which is owned, expected to be owned, or previously owned by an individual, is

used by that individual to maintain his or her self-concept" (p. 158). The temporal nature

of this definition will be discussed later. Based on the concept of self-extension, product

attachment results from the incorporation of an object into the extended self. The strength

of the attachment is based on how central an object is to the self-concept. Belk (1988)

stated

> Objects in our possession literally can extend self, as when a tool or weapon
>
> allows us to do things of which we would otherwise be incapable. Possessions can
>
> also symbolically extend self, as when a uniform or trophy allows us to convince

ourselves (and perhaps others) that we can be a different person than we would be without them. (p. 145)

Wallendorf and Arnould (1988) echoed this, stating, "We use objects as markers to denote our characters for others; we also use objects as markers to remind ourselves of who we are. In this sense we derive our self-concept from objects" (p. 531). As the product is used, the ritualized use transfers meaning from the object to the user and in kind the self is extended to include the object. As the object is made a more integral part of the self, attachment to the object grows in strength, resulting in greater attachment markers.

Kleine and Baker (2004) organized the benefits of self-extension into two general themes: self-definition and self-continuity/self change (p. 7-10). Objects can be used both to define the self to ourselves and to others, and objects can be used to both maintain and adapt the self (Kleine & Baker, 2004, p. 7-10). Schultz et al. (1989) noted that

The self is literally changing from situation to situation. Thus, concrete objects help us make those transitions by permitting us to carry past selves into the present, to maintain present selves or to make the transition into the future. (p. 360)

Greenwald (1988) called attention to the importance of self-worth (p. 37). He argued that as the self (or multiple selves) developed, "the search for self-worth is one of the strongest motivating forces in adolescent and adult human behavior" (p. 37). Self-worth is an aspect of self-definition focused inward; thus objects can have an affect on self worth. The maintenance of self-worth is a driver of the attachment process.

Because of the self-extension process, the person becomes attached to the product because without it they would not be able to as easily maintain the self they have constructed or navigate the constant changes in the self-concept. The psychological value of the object has thus been increased. The strength of the attachment in this case is a result of how much the object supports the self, or how integral the object is to the definition and maintenance of the self-concept.

As Ball and Tasaki's definition of attachment suggested (1992, p. 158), attachment can form not only with possessions but also with objects that are expected to be owned, or objects that were previously owned. Kleine et al. (1995) stated, "possessions create a tangible residue of past, present, and possibly anticipated future identity development" (p. 328). This is heavily based in the idea of temporal selves and what Ball and Tasaki (1992) called an "internal rehearsal of the schemata that connect the possession to the self" (p. 158). For instance, forward focused attachment is based in the 'future self' or even 'ideal self' and a rehearsal of what using the product would be like and how it would support the self. If this mental rehearsal leads to positive feelings, the object may begin to be integrated into the self and thus attachment forms (Ball and Tasaki, 1992, p. 167). Kleine et al. (1995) stated, "Material objects are…used in the processes of becoming by *signaling* that a desired identity is developing" (p. 328). Olson (1985) observed that young married couples' attachment objects were used for future-oriented temporal aspects, such as planning and building a vision of their future (p. 389).

Interestingly, Ball and Tasaki (1992) found that for persons aged 15 to 24, the level of attachment fell from the pre-acquisition stage, before purchase, to the early ownership stage, the time period less than the median time an object was owned without

being considered for replacement or disposal (p. 165-167). They reasoned that since attachment to an object yet to be owned is based on self-extension, and younger persons selves are more dynamic and less concrete, they might be more likely to attach and self-extend to objects before discovering that, upon purchase, the objects do not support the self as was imagined and thus attachment falls (Ball and Tasaki, 1992, p. 166). This finding has ramifications since pre-acquisition attachment and subsequent disappointment may have an adverse effect, leading to further detachment. Product marketing relies heavily on the use of pre-acquisition self-extension and attachment to increase sales.

In addition, Kleine, Kleine, and Laverie (2006) found that during the integration of a role-identity into a person's self, possessions are more relevant to the identity than once the identity has been internalized (p. 153). Thus, even if an object supports the self, it may not forever. For the empirical self that exists in the present, possession rituals such as "cleaning, discussing, comparing, reflecting, showing off, and even photographing" serve a secondary function of decommodifying the object for the individual (McCracken, 1986, p. 79) as a part of the self-extension process. McCracken (1986) explained, "Using possession rituals, individuals move cultural meaning out of their goods and into their lives" (p. 79). This self-extension process leads to the development of attachment as the object becomes more important to the self.

For objects owned in the past or objects that represent the past, the focus is on maintaining positive versions of past selves. Olson (1985) interviewed couples married for over 35 years and found that, "Each item the older married couple mentioned had a story surrounding its acquisition. Even smaller articles such as decorations and knick-

knacks, had some story behind them, usually reflecting a common experience" (Olson, 1985, p. 389). Csikszentmihalyi and Rochberg-Halton (1981) stated:

> When a woman attends to a chair in which she has nursed her children long ago, or when a man looks at a trombone he played in college, the past experiences that used to define the selves of these people are again activated and recreated in the present. Thus memories serve to integrate the various patterns around which the self is organized at different points in time. (p. 112)

The dynamic nature of product attachment in the self-attachment definition is related to the changing importance of a product to the self-concept. Schultz et al. (1989) found that evidence of a temporal association (past, present, or future) with an object was more frequent for objects with strong attachment as opposed to objects of weak attachment (p. 363). Thus, objects are held closer when they represent some temporal self.

As a product is used and becomes a part of self, the strength of attachment grows and as a product is removed from the self-concept, attachment diminishes. The interruption of this process can be disturbing for an individual. When an object that a person is attached to is lost or stolen, there is a natural feeling of a loss of self. Belk (1988) stated, "If possessions are viewed as part of self, it follows that an unintentional loss of possessions should be regarded as a loss or lessening of self" (p. 142). He goes on to discuss various situations in which the removal of possessions lead to such a self-loss state, such as imprisonment, enrollment in the military, burglary, theft and natural disasters (p. 142-143). The loss of possessions can be incredibly hard on the possessor. However, Belk (1988) stated, "The trauma that may attend involuntary loss of possessions is not present in voluntary disposition of possessions" (p. 143). Savaş (2004)

found that for some products where the physical existence was lost attachment was constructed towards the experience that the object provided (p. 318).

The dynamic nature of product attachment helps to navigate the static nature of the past. Kleine et al. (1995) stated, "Elements of our past are fixed, and cannot be changed. We may choose to keep certain possessions as artifacts of our life stories or dispose of them" (p. 329). However, not all objects are disposed of in order to remove undesired past selves. In this case, in order to not suffer the same loss of self that occurs when products are physically removed from one's possession, people have a process that helps them remove the object from their self-concept so that upon physical dispossession there is a more manageable or insignificant loss of self. McCracken (1986) termed these processes divestment rituals and they are not used only for removing the self from an object but also to cleanse the selves of others from recently-obtained previously-owned objects, such as houses (p. 80). Lastovicka and Fernandez (2005) identified a ritual they termed "iconic transfer" in which the "positively charged private meaning" is transferred to another object that serves as an icon (p. 817). The icons they identified were means of recording visual or auditory information, such as photos, video tapes, or audio recordings (p. 817). Thus it is the ritual itself of creating the icon that lets the person transfer the meaning from the object to the icon. By creating a new entity, one is creating a replacement vessel of meaning, similar to the process of recalling and replaying memories during reminiscing.

According to McCracken (1986), "goods must be emptied of meaning before being passed along and cleared of meaning when taken on" (p. 80). This process often involves a detachment phase, which allows the user to distance their self from the object.

Kleine et al. (1995) stated "an object of low attachment… indicates the absence of identity relevance or, in some cases, its 'has been/it's not me any longer' quality" (p. 328). Lastovicka and Fernandez (2005) found that people placed items in 'transition places' to both signal the intention to dispose of an object and to test disposition without having to physically dispose of the possession (p. 817). When examining disposition decisions, Jacoby, Berning, and Dietvorst (1977) found that around 13% of the objects surveyed were in storage of some kind (p. 26). These transition places were physically distanced from the central area of the home and thus, "isolating possessions in an out-of-sight transition place incrementally moves those possessions away from the domain of 'me'" (p. 817). By going through the divestment process one is able to leave behind a past self associated with that product.

Schultz et al. (1989) found responses to weak attachment objects often "represented a dislike of present circumstances or old selves that were no longer liked" (p. 364). Kleine et al. (1995) stated, "By dispossessing ourselves of a symbol of a former self, we aid the process of leaving the past behind" (p. 328). Lastovicka and Fernandez (2005) stated, "If extensions of a past-undesired self are disposed, then this facilitates progress toward a more desired future self" (p. 815).

An important thing to note is that, "Attachment is a multi-faceted, relatively complex concept" (Kleine & Baker, 2004, p. 3). Since the self-concept is made up of a variety of defined selves, overall attachment can be a result of self-extension in different aspects. Thus, one might be attached to an object because it extends the social self, whereas another object might support the individual self. Combinations of different facets

and the strength of attachment related to that facet make up the product's resultant attachment.

Due to the variety of differentiable self-concepts (e.g. social self, ideal self, etc), objects can support the self in different ways. Schultz et al. (1989) were a bit more definitive and stated "Attachment is a multidimensional concept" with "three fundamental dimensions: individuation, integration and temporal orientation" (p. 361). They found that the two dimensions of individuation and integration were manifested more frequently, jointly or independently, for products with strong attachments as opposed to those products with weaker attachments (p. 363). They explained, "97.9% of the strong attachment possession protocols evidenced these proposed dimensions," however, "87.2% of the weak attachment possession protocols evidenced neither dimension" (p. 363).

Csikszentmihalyi and Rochberg-Halton (1981) postulated that there were "two main dimensions of meaning, one based on the self-other polarity, the other on action–contemplation" at play in relationships between people and products (p. 113). The self-other polarity aligns with the self-expression /group affiliation dialectic that has been discussed earlier. They found that younger people were more likely to identify objects of high attachment for reasons that related to what they could do with the object, the action dimension. Conversely they found that older people, adults and grandparents, were more attached to objects for their contemplative aspects. This dimension also was found to have a gender component as well with men more likely to be attached to objects for active reasons and women more likely to be attached for contemplative reasons. In all,

Csikszentmihalyi and Rochberg-Halton found that usually the dimension of self aligned with action and the dimension of other aligned with contemplation.

As stated before, strong attachment should manifest itself in attachment markers. In this case, strong self attachment was found to correspond with positive valence (positive emotions), a different set of emotions than those associated with weak self attachment, and protective tendencies (Schultz et al., 1989, p. 362).

Objects received as gifts were also more likely to be associated with strong attachment (Schultz et al., 1989, p. 362). Wallendorf and Arnould (1988) found that a "personal or maker-based reasons" for attachment lead to higher attachment scores than attachments based in object reasons (p. 538). One construct that should be affected by self-extension attachment is emotional significance. Ball and Taski (1992) stated that,

> As attachment and the time of ownership increase, so should the emotional significance of the object. Emotional significance of a possession is the total strength of associations with significant events or people in the person's life, both good and bad. A possession with low attachment will probably (but not always) have little emotional significance, whereas a possession with high attachment may require some time to acquire emotional significance. (p. 159)

The emotional significance of the object is another attachment behavior and one would expect that an object of strong attachment to have a higher emotional significance than an object of low attachment. The construct of emotional significance and link between it and self-extension is the basis for the second definition of attachment.
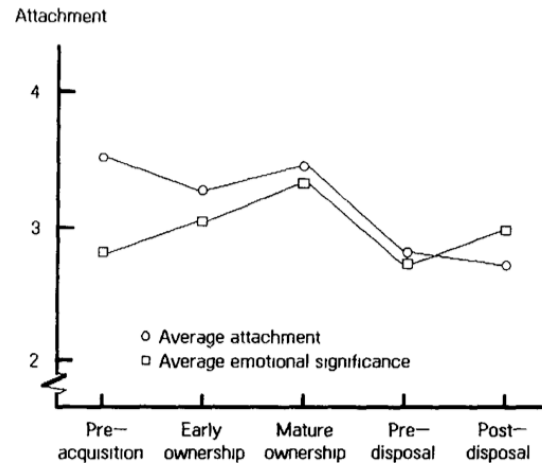
Figure 6. Attachment and emotional significance by ownership stage.
(Ball & Tasaki, 1992)

Ball and Tasaki (1992) investigated self-extension attachment and how it varied

with the ownership stages of different products (see Figure 6). They defined five stages

of ownership based on the median time of ownership for a given object category:

preacquision is the stage before an object is purchased; early ownership is when an object

has been owned less than the median time; mature ownership is the stage when an object

is owned for more than the median time; predisposal is the stage where the user is

considering disposal; and postdisposal is the stage after disposal has occurred (p. 160).

They found that attachment fell from the preacquisition stage to the early ownership

stage, but attributed this to the influence of younger persons aged 15 to 24 (p. 166).

Attachment rises from early ownership to mature ownership but then subsequently

decreases from mature ownership to predisposal and again from predisposal to

postdisposal (p. 166). Thus one can see the structure of one's relationship with a product

and the importance of the product to the self over a product's lifespan. The strength of

attachment rose as the product was integrated into self, but then strength waned as the

object was removed. This change in attachment strength can be seen in Figure 6. One can also see that the emotional significance of the object mirrors the attachment of the object, until disposition at which time the emotional significance increases beyond the level of attachment.

Kleine et al. (2006) found that the importance of possessions to the self-definition actually changed throughout process of internalizing a new 'role-identity'. At the beginning of the self-definition process, the possession is of great importance to the definition of the self and thus more closely held as part of the self-identity since the role-identity has not been fully internalized. During this stage of the process one would expect strong attachment to the object. Over time the role-identity is internalized and made a part of the self and thus the identity relevance of the role-related object is lessened, though this does not preclude the use of objects for self-maintenance. At this point, the object becomes less important to the definition of the new role-identity and thus a less critical part of self, leading to a decrease in the strength of the attachment. Thus, the object is of great importance during the definition phase of self-extension, during the maintenance phase it becomes less important, and finally it becomes least important during pre disposition when the user is considering disposition.

Though the relation to the self-identity decreased over time, the number and appraisal favorability of the objects both increased. These findings imply that as a person becomes more confident in their self-identity they rely less on possessions to provide support and thus the person's self-extension and attachment may weaken. This can be seen in research by Olson (1985). He found that younger married couples had more artifacts that represented them than older married couples (p. 391). As a married couple

internalizes the marriage role-identity, possessions become less important to the definition of their selves.

If we rely solely on the need support for new self identities, strong attachments may well form but then be gone when the identity has been made a full part of the self. If our goal is to foster strong long-term attachments, self-extension with regard to the present and future self may not be the only source we need to consider.

2.11 Product Attachment as Emotional Bond

The second body of research on product attachment is based on a definition used by Schifferstein and Pelgrim (as cited in Schifferstein et al., 2004, p. 328). Instead of being a measure of self-extension, product attachment is the "emotional bond a consumer experiences with a product" (Schifferstein et al., 2004, p. 328). An "object to which a person experiences attachment triggers one's emotions" (Mugge, Schifferstein, & Schoormans, 2008, p. 325). Chapman (2009) defined attachment as, "a strong emotional connection to the product, due to the service it provides, the information it contains, and the meaning it conveys" (p. 33). Schifferstein and Zwartkruis-Pelgrim (2008) argued that attachment was related to self-extension but was not the same. They stated "when a person feels emotionally attached to a possession, the product may be regarded as part of the self: what is 'mine' becomes 'me'. However, emotional attachment does not seem to be a necessary prerequisite for self-extension" (p. 2). They argued that since self-extension can occur with objects owned for utilitarian purposes, self-extension is therefore not attachment, but it is a related construct (p. 2). Therefore, they defined product attachment as "the strength of the emotional bond a consumer experiences with a

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durable product" (p. 1). However, they do state that "we expect the degree of self-extension to be related both to measures of the strength of emotional attachment…and utilitarian consumer-product relationships" (p. 2).

The idea of emotional bond is very similar to the construct that Ball and Tasaki (1992) discussed as a construct associated with self product attachment; emotional significance (p. 159). They advocated that the two constructs of self-extension and emotional significance were related, but not necessarily completely tied together. In the case of emotional attachment, the construct of emotional bond is a layer on top of self-extension, as opposed to being part of the self-extension process. As such, much of the research is based on determinants of attachment derived from research on attachment as self-extension. Schifferstein and Zwartkruis-Pelgrim (2008) proposed that the determinants of different aspects of the self indeed led to "consumer-product attachment" but that, "the degree of attachment, on the other hand, is dependent on the intensity of the emotional reaction to the product" (p. 3). In effect, aspects of the self determine if attachment will form, but the strength is determined by the emotional reaction. However, there is no mention of the degree of self-extension or an acknowledgment of such.

Previous research showed that the degree of self-extension was related to the degree of attachment markers, such as emotional reaction (Belk, 1988, p. 140). Belk specifically discussed "post-acquisition object bonding" as a contributor to the sense of self. In this case, it seems the strength of the bonding and the strength of the self-extension go hand in hand. In the conception of attachment as put forth by Schifferstein and Zwartkruis-Pelgrim (2008), there is a breaking of this linkage. Instead, they acknowledge that some items to which individuals self-extend also become objects to

which persons have an emotional reaction (p. 3). Based on this it seems that they have simply divided the self-extension objects into high- and low- extension, that is objects which are integral to self and thus have high self attachment and objects which are not integral to self and thus have low self attachment. This would explain the difference in existence of emotional reaction, since that construct, as a marker, should vary with the strength of the self-attachment.

Inherent in the definition of emotional product attachment is the concept of strength, in this case the strength of the emotional bond. Mugge, Schoormans, and Schifferstein (2008) stated, "the definition of product attachment suggests that when an experiencing attachment to a product, a strong relationship or tie exists between the individual on the one hand and the object on the other" (p. 426). They added, "People may experience relatively strong emotional bonds to their most favorite or special possessions, whereas other products are less significant to them" (p. 426). A strong emotional attachment to a product means that the product has great emotional significance to an individual, indicated by a strong emotional bond to the product. In this case, products to which it is described that one is 'attached' are actually products to which one has strong attachment, or a strong emotional bond.

The strength of the emotional attachment develops through the use of the object and is not static. Mugge et al. (2006) stated, "for most possessions that are used daily, the experience of product attachment is dynamic" (p. 642). According to Ko, Ramirez, and Ward (2011), emotional attachment develops "as a result of recurring pleasurable experiences during interactions with a product" (p. 581). The strength of the emotional attachment is a reflection of the strength of the relationship between a product and a

person. As the relationship between the user and the product deepens, the emotional bond deepens as well. Alternatively, "consumers may experience a strong person-product relationship for a only a short time period" (Mugge et al., 2005, p. 41).

Emotional product attachment has attachment markers associated with it, much like those associated with self product attachment. Since emotional product attachment is based on the concept of self-extension, the attachment markers are very similar. According to Schifferstein and Zwartkruis-Pelgrim (2008), "An object to which a person is attached is considered to be special and typically means a lot to that person. Consequently, the person will experience emotional loss if that product is lost" (p. 1). Certain protective behaviors would be expected in order to preserve the object and thus the attachment. According to Mugge et al. (2005),

> If a person feels attached to a product, detaching from and ultimately abandoning the old product seems undesirable because this implies that the product's special meaning is lost. As a result, a stronger person-product relationship is reflected in more protective behaviours and can ultimately postpone product replacement. (p. 41)

Ko et al. (2011) stated, "Emotional distress could result if damage or loss occurs" (p. 581) to an object of strong attachment. People engage in protective behaviors towards objects that have great meaning to them, but also objects that have weaker attachment as well (Mugge et al., 2005, p. 41). The extent or strength of the protective behavior would logically correspond with the strength of the attachment.

Schifferstein and Zwartkruis-Pelgrim (2008) pointed out that in cases of strong attachment, "it is unlikely for the person to dispose of the product" (p. 1). They add,

"People may hang on to products to which they are attached even when these products no longer function properly, suggesting good product utility is not a necessary condition for consumer-product attachment" (p. 2). Not only can emotional attachment lead to protective behaviors to preserve the integrity of the object, it can lead to an increased lifespan regardless of the integrity of the product.

There is a body of research regarding attachment as emotional bond that indicates that the degree of self-extension to a product is related to the strength of emotional attachment with that product. Cupchik (1999) discussed the difference between two types of emotions: active and reactive emotions. He stated, "Active emotions are produced by a *match* between expectations and outcomes with a *match* (i.e. goal realization) yielding positive emotions and a *mismatch* (i.e. frustration or failure) producing negative emotions" (p. 78). In the case of active emotions, they are mainly the result of product use and interaction, being generated by the fulfillment or disappointment of expectations. On the other hand, reactive emotions "reflect personal associations and meanings which are projected onto the object" (p. 79). These are more open for influence by previous personal experiences and thus may be harder to predict. Active emotions are more geared toward product satisfaction whereas reactive emotions are more geared towards product attachment through their interaction with different meaning types. He states, "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" (p. 79). In this case, the various meanings are separated based on various aspects of the self, upon which he placed attachment.

Sirgy (1982) proposed that there were four types of possible assessments with regard to the self and the product, and whether the evaluation of each was positive or negative. The strongest of these was positive self-congruity, which consists of a "comparison between a positive self-image perception and a positive self-image belief" (p. 289). Govers and Mugge (2004) investigated the effect of self-congruence on emotional attachment, focusing on what would be positive self-congruity. They found that, "people become more attached to products with a personality that is similar (high product-personality congruence), than to products with a personality that is dissimilar (low product-personality congruence) to their own personality" (Discussion and Conclusion section, para. 1).

Mugge et al. (2006) identified four possible determinants of product attachment: self-expression, group affiliation, memories, and pleasure, based upon Greenwald's four concepts of the self (p. 641). Their determinants self-expression and group affiliation overlap with the individuation and integration dimensions identified by Schultz et al. (1989). Mugge et al. (2006) found that product attachment was "positively affected by the determinants self-expression, memoires, and pleasure" (p. 645). There was no significant effect for the determinant group affiliation. They found that the determinant memories became more important over time. They concluded, "Usage seems essential to prolong the impact of a product's special meaning and thus for sustaining the consumer-product relationship" (p. 645). They noted that use is especially important for the determinant memories. The limit of this study was that they were examining attachment to only one object, a backpack given to first-year university students.

Schifferstein et al. (2004) found that emotional attachment was affected by both memories and enjoyment, another term for pleasure. They found that after an initial decrease in attachment and memories, both of these rose as the length of ownership increased. Enjoyment fell over time, but did increase in the longest used objects (>20 years). Figure 7 demonstrates this change in attachment over time.
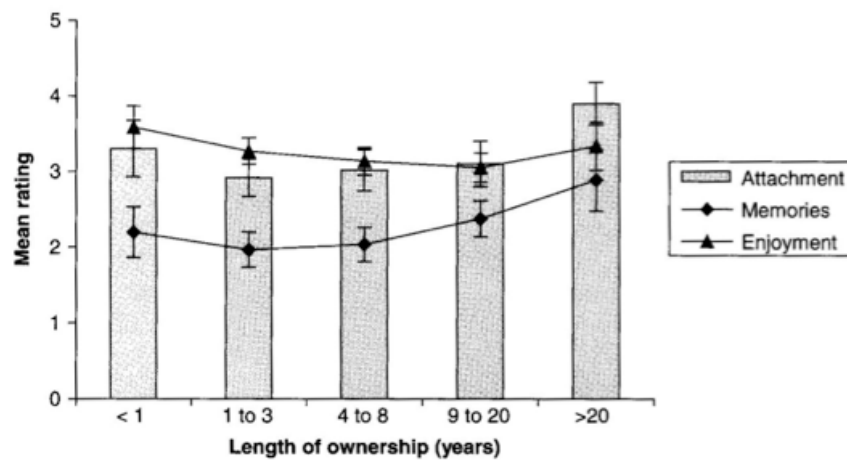
Figure 7. Attachment, memories, and enjoyment as a function of length of ownership. (Schifferstein et al., 2004)

The initial decease in attachment in the more recently acquired objects aligns with that found by Ball and Tasaki, thus there may. This study was limited to a selection of four prescribed objects and thus there is a possibility that people were not very strongly attached to these objects. Measuring attachment by year period also introduces problems in that there is an assumption that all objects have similar average lifespans and can thus be compared.

In regard to enjoyment, Norman (2002) stated, "Attractive products work better" (p. 41). Mugge, Schifferstein, and Schoormans (2008) found this to be true, in that satisfaction was affected by both product utility and product appearance, modified by

'pleasure'. They also found that attachment is affected by both product utility and product appearance (aesthetics) with pleasure or enjoyment as the pathway of the effect. However, Desmet and Hekkert (2002) found that there was "not a one-to-one relationship between the appearance of a product and the emotional responses it elicits" ("Implications" section, para. 2). Mugge et al. (2008) also found that enjoyment and attachment are different constructs that share no linkage; thus one can enjoy a product but not be attached to it. They also confirmed that memories have a direct effect on attachment but enjoyment was unaffected by memories.

Discussing the same conceptual models, Mugge, Schifferstein, and Schoormans (2010) stated, "Consumers only become attached to a product for utilitarian reasons when the product elicits pleasure" (p. 276). However, Savaş (2008) found that for "economically deprived" individuals, attachment developed based on the ability of an object to satisfy a need or provide a utilitarian function.

In spite of these findings, attachment based on utility or aesthetics should not be relied upon. Csikszentmihalyi and Rochberg-Halton (1981) found that when people listed aesthetic objects as strong attachment objects they did not do so for aesthetic reasons, but for connections to others. In fact, aesthetic reasons were an extremely uncommon reason to regard an object as special. Indeed, Turner and Turner (2013) found that aesthetics does not play a role in product attachment. Mugge et al. (2010) found that "consumers experience more attachment to and more satisfaction for a product with above average utility than for an average product" (p. 275). However, since the functional value of an object is highly tied to the object's function, any loss of function will lead directly to a loss in functional value and attachment. Thus, an attachment built on this basis will be

very unstable and dependent on the maintenance of the utility. The goal of designing for product attachment is to be able to supersede the declining functional value with psychological value.

2.12 Product Attachment as a Unified Construct

Having examined two different schools of thought on what product attachment is, it would be helpful to choose which of the definitions, self-extension or emotional bond, was the correct or most useful definition. It is not such a simple task. Regardless of the definition of attachment, the attachment markers are similarly expected and similar to each other. In this case, it is not so much the definition that makes the most difference, but the outcomes. If both definitions lead to similar outcomes, then maybe they are closer than they first appeared.

Research into personalization reflects this connection. The definition of personalization varies based on the context and the author (Treiblmaier, Madlberger, Knotzer, & Pollach, 2004); however, Blom (2000) defined personalization as, "a process that changes the functionality, interface, information content, or distinctiveness of a system to increase its personal relevance to an individual" (p. 313). He added, "Personalization can be system or user-initiated, the former often being described as customization" (p. 313). However, Treiblmaier et al. (2004) reversed these definitions and stated, "Customization is a user-initiated and user-driven process" and "By contrast, personalization is system-initiated, system-driven and requires adaptive components" (p. 2). Here, the term personalization will be used, based on Blom's (2000) definition.

Govers and Mugge (2004) showed that when an object was more representative of self, the emotional bond that developed was stronger. Mugge, Schoormans, and Schifferstein (2009) found that personalization of a product led directly to an increase in the emotional bond and indirectly to an increase in strength through the self-expression construct. Thus, if attachment is the strength of the emotional bond, the amount of self-expression and self-extension has an influence on product attachment. This confirms Ball and Tasaki (1992), who expected that emotional significance was a related construct to self-extension. Schifferstein and Zwartkruis-Pelgrim (2008) found self-extension was almost equally related to irreplaceability, the strength of the symbolic meaning unique to a particular object regardless of other physically identical specimens, as it was to indispensability, the success in fulfilling a utilitarian function (p. 2, p. 5). They found a very strong relationship between emotional bond and irreplaceability, but a much weaker bond with indispensability (p. 5). This would lead the two constructs to appear different. However, they found that there was indeed a strong relationship between self-extension and emotional bond (p. 7).

Since both schools of though on attachment acknowledge similar protective behaviors in regard to attachment objects and there is a strong link between both definitions, it might be most convenient to view attachment as an overarching "umbrella construct." This means that both the constructs of self-extension and emotional bond make up attachment. The literature has shown that they are related constructs, they can affect each other, and there is a link between both and the attachment markers; thus it is a small leap to consider both of them as attachment. Thus, as attachment forms, there is both self-extension and an emotional bond being formed. This also helps to explain the

two types of attachment; since the two components of attachment are not identical, each attachment type may be focused more on one component more than the other.

This approach is not completely unique. Ko et al. (2011) proposed that attachment consisted of an overlap between emotion and commitment. They stated,

> The term 'commitment' in this context is somewhat similar to the 'love' or 'hate' relationship between persons and can be translated to a positive commitment to look after their possession with care to avoid wear and tear, a personal vow to patronize products that are environmentally friendly, or devotion towards treasuring mementoes of the past. (p. 582)

The proposition that attachment is the result of the interaction of multiple constructs is the important takeaway. There is also some overlap between the definition of commitment and self-extension that gives some credence to the model proposed here.

2.13 Two Strong Attachment Types

The attachment determinants, or facets, outlined by Mugge et al. (2006) are the beginning of the analysis on which defining types of attachments should be pursued. Kleine et al. (1995) discovered four different types of attachment: "strong, affiliative, past-oriented attachment", "strong, present-autonomy-oriented attachment", "weak, not-me attachment", and "a 'mixed' (stronger than I like it) attachment" (p. 335). In this case the strong attachment types are the ones of concern, since strong attachment has been linked to attachment markers such as stronger protective measures and longer lifespan. They found that "Most favorite objects captured desirable connections (self-stability) with others (affiliation) or reflected aspects of one's individuality (autonomy)" (p. 335).

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Csikszentmihalyi and Rochberg-Halton (1981) found two similar strong attachments. They identified two overarching categories of objects: action objects and contemplation objects (p. 96). These two types of objects lead to two different types of attachment, active attachment and contemplative attachment. They discovered that active attachment was more focused on the present self-concept and contemplative attachment was more focused on the social or group past oriented self.

They also found that the type of attachment most often mentioned depended on certain factors. They found that men were generally more inclined to be attached to action objects, whereas women were more inclined to be attached to contemplation objects. These attachments help to reinforce the differences "between *instrumental* male roles and *expressive* female roles" (p. 106). They also found that age had an impact on the type of attachment most often mentioned, with younger interviewees more likely to mention active attachment as opposed to older adults who mentioned more contemplative attachments. They found that "Meaning for the young seems to arise from active involvement with objects that define the boundaries of the self; for adults, it tends to follow a more passive involvement with things that expand the boundaries of the self to include relationships with other people" (p. 112). We can see these two types of attachments reflected in the research done by Ball and Tasaki (1992) who purposefully excluded emotional significance and focused on present self-extension and Schifferstein et al. (2004), who focused on attachment and memories. In both of these cases, they found strong attachment developed.

However, there need not be multiple types of attachment at the same time; Kleine et al. (1995) found "affiliative associations can make even a not-me possession more

difficult to dispossess" (p. 341). In this case, the affiliative attachment provided the basis for all the attachment. These two types of attachment, active present/future self-expression attachment and contemplative present/past affiliative attachment, will be the focus for the conceptual model presented here. These two types will be referred to as active attachment and reflective attachment respectively. It is the interaction of these two types of attachment that will provide an overall maintenance of attachment strength.

CHAPTER 3

TRANSITIONAL METHOD, GUIDELINES, AND STRATEGIES

The two attachment types identified from the literature, active and reflective attachment, lead to the formation of a method to increase product lifespan. Active attachment, based on the user's present/future self, self-expression, and active aspects, provides the initial attachment. Reflective attachment, based on the user's past/present self, affiliative associations, memories and contemplative aspects, develops to maintain the overall attachment level. This method has associated guidelines for how to implement it correctly and finally strategies that are needed in order to have a set of specific tools that designers can use to help correctly use the new method. The guidelines proposed here are tailored to the proposed method of designing for maintaining product attachment. However, the proposed strategies are not the only ones that may be used to implement the method guidelines.

3.1 Design For Attachment Foundations

In order to use attachment to affect lifespan, increase eco-efficiency, and improve sustainability, designers need to design objects in such a way that they are encouraging attachments to form. However, this is more difficult than one might think. It has already been demonstrated that attachment has multiple facets. As Page (2014) stated,

"attachment is determined by multiple themes, many of which are circumstantial to consumers' experiences and therefore difficult for designers to control" (p. 265). The best a designer can do is set the stage for attachment to the best of their ability. The designer cannot control attachment formation itself.

One of the demonstrated characteristics of attachment is that the development is not a deliberate process. "Consumers do not actively search for [attachment] at purchase" (Mugge, 2008, p. 117), thus design for attachment is a strategy that should be applied along with other design strategies. While this means that there is more work for the designer to do during the early design phases, this is also beneficial in that design for attachment can become a component of the design process, regardless of product or strategy. However, since attachment is based on individual persons there is still the possibility that attachment will not form with enough strength to affect the lifespan of the product.

One foundational principle in design for attachment is that the product has to be used. Consistently, throughout the design research, the use of the product is what helps contribute to the development of attachment. Use of the product is important for making a variety of attachment determinants effective (Mugge et al., 2006, p. 645). It is no surprise then that people use disposition rituals, which commonly include sequestering the object out of sight, in order to detach from it. A designed object thus has to be successful in other aspects of use and comprehension before attachment can be developed. Again, this means that attachment is another designed aspect that must be considered during the design process. Other aspects of a design such as aesthetics and usability cannot be ignored in pursuit of attachment. Norman (2002) advocated for

aesthetics as a means for making products more effective and thus used when he stated, "Attractive things work better" (p. 41). This could be seen as the 'pleasure' level that Jordan (2000) advocated was the newest area of exploration in design. He assumed that products had achieved usability; however, many people using products would argue that usability is still a growing discipline.

In addition to use, the proximity of the object to the person seems to have an affect on attachment. Turner and Turner (2013) found that people, "are emotionally and aesthetically attached to artefacts which are proximal and close at hand. Absence does not appear to make the heart grow fonder" (p. 412). Thus, to design for attachment, one must design an object that will be used and kept close. The proximal nature helps ensure repeated interactions that could stimulate the strength of attachment more easily.

3.2 Transitional Product Attachment Method

The two strong types of attachments identified through the literature, active attachment and reflective attachment, can be seen to be effective in leading to the desired attachment markers, including an increased lifespan. The two types of attachment have individual problems though that lead them to be unsuitable for usage alone.

With active attachment, the object is depended on to help establish a self. Over the course of self-development there is less dependency on the object and thus the attachment weakens. If it weakens to the point where the psychological value cannot make up for low value in other areas, the product may be disposed of.

Alternatively, the reflective attachment starts very low because there is not history between the object and the user. Over time, as a history develops, reflective attachment

grows and the psychological value increases to help offset losses in other aspects of an object's value. If, however, the reflective attachment grows too slowly, or never grows strong enough, there is a possibility that before the psychological value has increased to the point where it offsets the decrease in value of other areas, the object has been replaced.

These two types of attachment have aspects that make them vulnerable when used independently. Since attachment is additive, the total attachment strength is made up of a combination of the different attachment aspect strengths. If active attachment is not stimulated properly, then there is a possibility that before the strength of reflective attachment is able to carry the total attachment above the minimum necessary attachment level the product will be at risk of disposition (see Figure 8). Conversely, if reflective attachment is not stimulated, then as active attachment fades there is nothing that can maintain the total attachment level above the minimum necessary attachment level (see Figure 9).
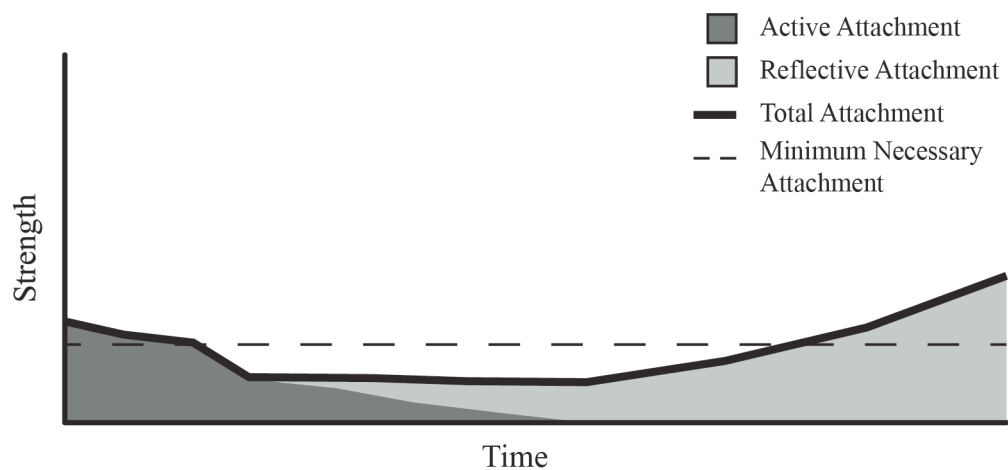
Figure 8. Product attachment strength over time with low active attachment.
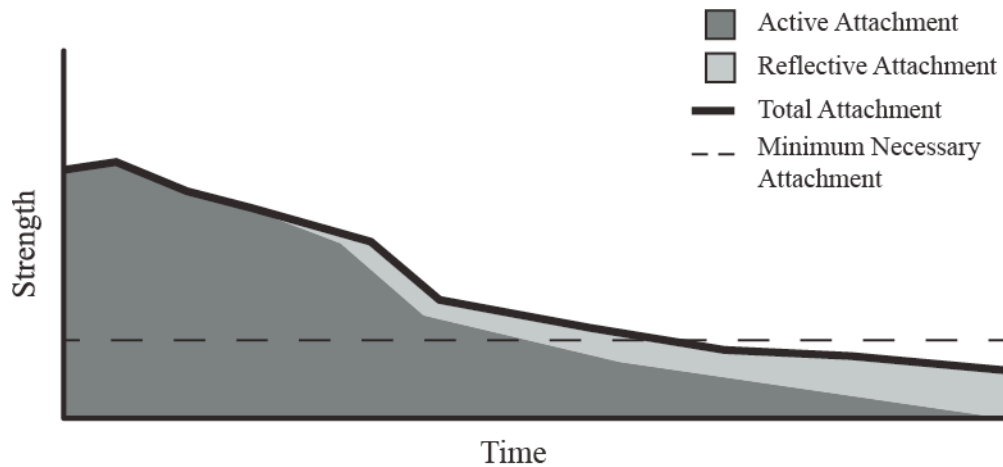
Figure 9. Product attachment strength over time with low reflective attachment.

If the two attachment aspects are used together, however, they provide the foundation for a 'transitional method' to long-term product attachment. Since a multitude of facets of attachment make up the overall attachment level, the two types can be used to make up for flaws in the opposite type. In the transitional method, the initial attachment is drawn from the active attachment type. Based on the research by Ball and Tasaki (1992) and Kleine et al. (2006), this attachment starts high or grows to a high level quickly, but then fades over time. Due to this decline, the effectiveness in maintaining psychological value is compromised. In order to maintain the overall attachment level above the level needed for impactful psychological value, reflective attachment focused on memories must rise in strength to maintain the overall attachment level. The accumulation of reflective attachment strength was demonstrated by Schifferstein et al. (2004) and Mugge et al. (2006). The transition of the total attachment level between the two attachment types is demonstrated in Figure 10. Note the total attachment strength is maintained above the level of minimum necessary attachment.
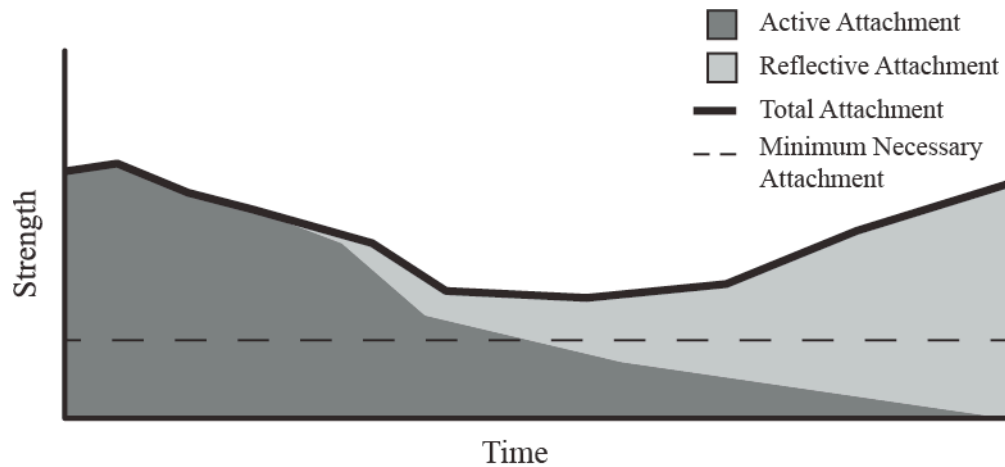
Figure 10. Ideal product attachment transition.

In an ideal case of transitional product attachment the precise facet of attachment changes over the lifetime of the product, but the resultant attachment level is maintained above a threshold, termed the "minimum necessary attachment." Below this level, the attachment strength is too weak to provide enough psychological value and keep the user from disposing of the product or replacing it.

Though this method will allow attachment to extend the product lifetime, there is little hope of maintaining this level of attachment forever, and eliminating product disposition. People utilize disposition rituals so that they can reduce the strength of attachment enough to bring it below the necessary minimum attachment level. Utilizing the transitional method, one would be able to extend the product lifetime by planning for long-term attachment strength-level maintenance, even if eventually the product is disposed of. By maintaining the strength above the minimum necessary level, the product's psychological and thus total value is maintained for a longer period of time.

3.3 Guidelines to the Transitional Product Attachment Method

The transitional product attachment method utilizes the two types of attachment as separate aspects of the total attachment working together to maintain the overall attachment level. This method is not necessarily the best for all products, especially disposable ones that are expected to have a short lifespan. For each attachment type, there is both a strength aspect and a temporal aspect that must be addressed. All four guidelines need to be followed for the method to be most effective. Failure to address all four guidelines will most likely result in less effective attachment stimulation.

3.3.1 Strength of Self/Product Identity Match

The first guideline for the transitional method is to encourage a strong self-identity match with the object. The stronger the self-object match, the closer a person will hold the object to the self-concept, thus making the active attachment stronger. In order for the transitional method to be most effective, the maximum level of active attachment needs to be as strong as possible. As active attachment decreases, there is a greater pool of attachment on which to rely. By starting with stronger active attachment, it is more likely that total attachment strength will be above the minimum necessary attachment level for longer.

3.3.2 Maintenance of Congruent Product Identity

The temporal aspect of active attachment is of equal importance as strength. For this guideline, the goal is to try to extend the length of time that this attachment type is effective. In this case, the object should be a part of self-expression for as long as

possible so that there is more opportunity to develop the reflective attachment type. This can be thought of as the maintenance phase of the active attachment. For this, the meaning of a product needs to be flexible enough so that as a person's self-concept changes the meaning of the object can change as well, even if that does not entail any actual changes in the product itself. Since meaning is constructed by the user, the meaning can change simply because the user perceives that the object meaning is something else.

3.3.3 Formation of Product Narrative

The reflective attachment needs to be developed in similar ways. The first guideline for this is to stimulate the formation of a product narrative. This narrative is made up of experiences with the product and that the product enables, and leads to the quicker formation of a high reflective strength. Since this develops through use, it begins low and grows over time. This type of attachment must be encouraged to form as early as possible. By encouraging this facet to increase, it can more quickly make up for any decrease in the strength of the active attachment type. If this attachment develops too slowly there is a possibility that there is a period where the total overall attachment strength falls below the minimum necessary attachment level because the overall attachment has fallen too low. The earlier this facet of attachment can be encouraged to develop, the better.

3.3.4 Strength of Product Associations

This guideline calls for the strength of the reflective attachment to be as strong as possible. If the strength is not high enough to lead overall attachment to be higher than the minimum necessary attachment level, then as the active attachment strength drops the product is vulnerable to disposition. If the strength of the reflective attachment cannot be generated beyond the minimum necessary attachment level, then the product will most likely be replaced. In this case, the speed of narrative development is useless unless the strength of the narrative associations is strong enough to affect attachment.

3.3.5 Guidelines Overview

The transition method relies on being able to encourage both active and reflective of attachment. If only one type can be generated, the overall attachment and thus some of the protective behaviors are lessened. Failure to encourage active attachment will hamper the development of the reflective attachment because the object may not have been held as close and thus used as much. By not developing this type of attachment, the designer is also counting on the other value propositions of the product to help keep it from disposition until the reflective attachment has been developed to a strength above the minimum necessary attachment level. Since products are disposed of when still functional, this does not appear to be a successful strategy. Failure to develop reflective attachment leaves the active attachment to maintain the attachment level over the product's lifespan. Even if the object meaning was able to shift every time in order to align with the user's changing self-concept, this does not guarantee that the total attachment strength will be maintained at a high enough level.

The guidelines presented are a general framework for working with this method. However, there are many different strategies that one can pursue in order to pursue these guidelines. Some specific identified and developed strategies and their guideline alignment will be discussed.

3.4 Transitional Product Attachment Method Strategies

Using the guidelines as a basis, some specific strategies can be addressed that will enable a designer to use the transitional method and design for product attachment. Strategies are actionable things that might cover multiple guidelines and thus affect either or both of the attachment types. Because attachments can form with any product, strategies cannot cover all aspects that could affect attachment levels in all products. However, the intent is to make them relevant enough that there are some decidedly applicable actions.

First, there are several related strategies that fall under the domain of personalization. Again, we are utilizing Blom's (2000) definition which defined personalization as "a process that changes the functionality, interface, information content, or distinctiveness of a system to increase its personal relevance to an individual" (p. 313). The reason personalization serves as a source for so many strategies is because it helps enable the user to create a product that is more similar to their self-identity which can be an easier process than conducting research on a target market and designing based on the specific market segment.

3.4.1 Post Purchase Personalization

In this strategy, during the design process aspects of the product are designed in such a way that the user, using a prescribed method designed into the product, can personalize the product. An example of this is changing background images on mobile phones or personal computers. Though the user is the one doing the personalization, the product is designed with an explicit methodology to personalize the aspect. This strategy will lead to increased strength in active attachment due to enhanced self-expression. The fact that the personalization can be repeated and modified allows for the maintenance of the active attachment strength over time. Normally this personalization process is designed for easy use by the user; thus there will not be enough investment by the user to stimulate strength in reflective attachment or establish a narrative through the personalization process. A common example of this strategy is the ability to change the desktop wallpaper of laptops (see Figure 11) or change the background of a cell phone.

Figure 11. The author's laptop personalized with a personal photo.

3.4.2 Participatory Design Personalization

This strategy is based on the concept of participatory design, also sometimes called co-design, co-creation, or other terms. With participatory design personalization, the product is personalized before the product is fully complete, as a part of the design and manufacturing process. Manufacturing strategies such as mass customization have made this a much more feasible strategy than is possible with the traditional manufacturing process. The advent of 3D printing could give rise to an even greater interest in this strategy. Many services that enable participatory design personalization are hosted on websites for ease of access.

This strategy falls somewhere between customized standardization and tailored customization, two terms used by Lampel and Mintzberg (1996) to describe customization that occurs starting at the assembly and fabrication level respectively (p. 24). The degree of personalization is not prescribed in this strategy. In general, as customization increases, both cost and manufacturing lead time increase as well (Skjelstad, Hagen, & Alfnes, 2005, p. 1568), so designers must be conscious of managing the level of personalization. When implementing this strategy, designers have to craft a framework that allows users to personalize the product as they see fit, but also encourages them to be successful in the endeavor. Mugge, Schoormans, and de Lange (2007) found that users were only interested in personalizing aspects of products that were highly visible to others. Though it has been found that people are more attached to products that they have invested time and effort in (Mugge et al., 2009), a process that is

overly complicated can result in the user becoming confused and thus not completing the process.

This strategy is effective for both active and reflective attachment because the object meaning has been customized to more closely reflect the person's self-identity and the creation process begins the contemplative process by providing a starting point for memories. Mugge et al. (2009) showed that people became attached both because of the enhanced self-expression, but also because of the personalization process itself (p. 472). If the process were completed with another individual, such as a loved one, this could benefit the reflective attachment even more because links with others help provide an object with strong reflective attachment. Designers have to be careful though, since they are now designing the product as well as designing the experience of product personalization. However, it has been shown that experiences make people happier than products (Van Boven & Gilovich, 2003), so a successful experience may be able to provide much benefit.

One common application of this strategy is through a personalization website interface. However, Nielsen (2009) reported that the success rate of product personalization websites was 66%, well below the average success rate of 83% for other websites (Usability Challenges section, para 1). Users felt "more lost and less in control" on product personalization websites (Usability Challenges section, para 2). Nielsen cited problems with the "discoverability, findability, and comprehension" as the main impediments to success (Usability Challenges section, para 5). He also emphasized the use of setting good defaults, and that personalization "should be reserved for those features that offer substantial user benefits" (The Importance of Good Defaults section).

There is a lot of room for growth though, since only 6% of customers reported using product personalization interfaces to personalize a product (Titlow, 2011, para. 8).

One example is the site hosted by Nervous Systems. It utilizes an online personalization tool called Kinematics (Nervous Systems, n.d.) that allows users to modify a standard design using Nervous Systems' custom interface (see Figure 12). The tool shows adjustments as they are implemented making it easier for the user to modify the design. They have included a 'Random' option as well, which helps those users who are overwhelmed to have a different place to start. The personalization can only occur within limitations that have been built into the system. Once the item is finalized, Nervous System 3D prints the object in nylon.
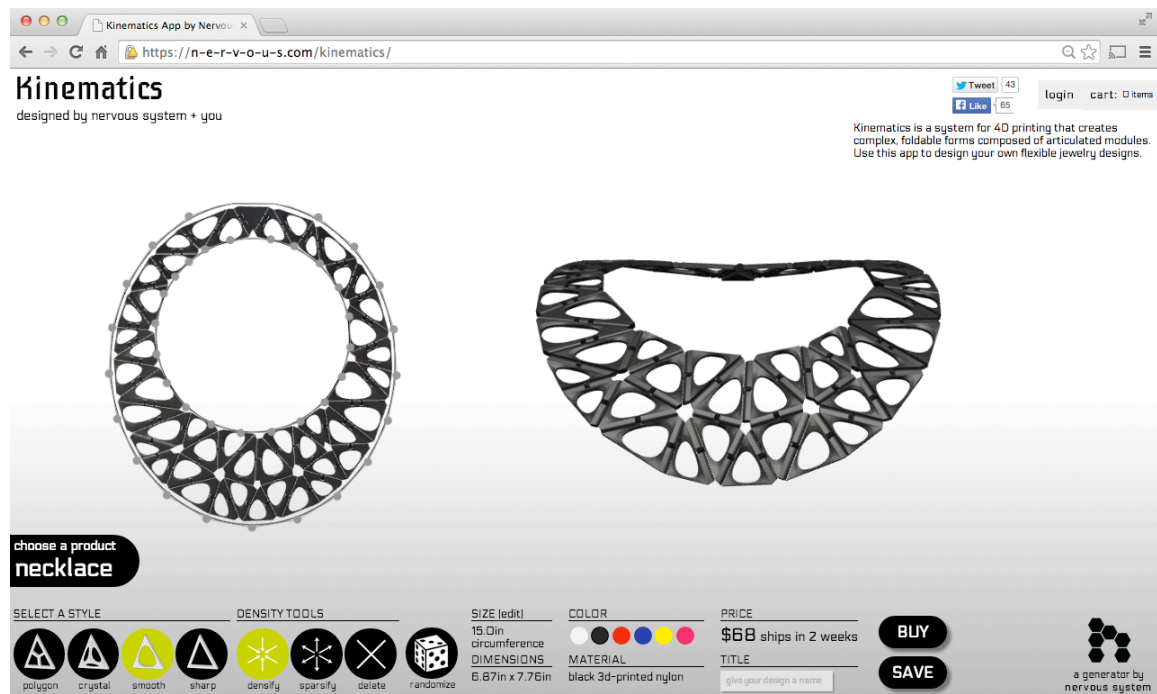
Figure 12. Nervous Systems Kinematics design tool. (Nervous Systems, n.d.)

Motorola has a similar online personalization tool titled My Moto X Design

(Motorola, 2014) that allows one to create a personalized version of the Moto X cell

phone (see Figure 13). With this tool, users can change specific parts of the phone one by

one. The layout of the design tool groups similar colors and materials, making it easier

for the user. Though there is less customization ability than with the Nervous Systems

tool, the simplicity may be a benefit since it means more people will be able to use the

tool successfully. One helpful feature of the Moto Maker is that there is a set of premade

phone 'designs' that can be used as inspiration or modified as needed (see Figure 14). For

web interfaces such as these, special attention should be paid to the interactions and user

interface as with other digital interfaces.
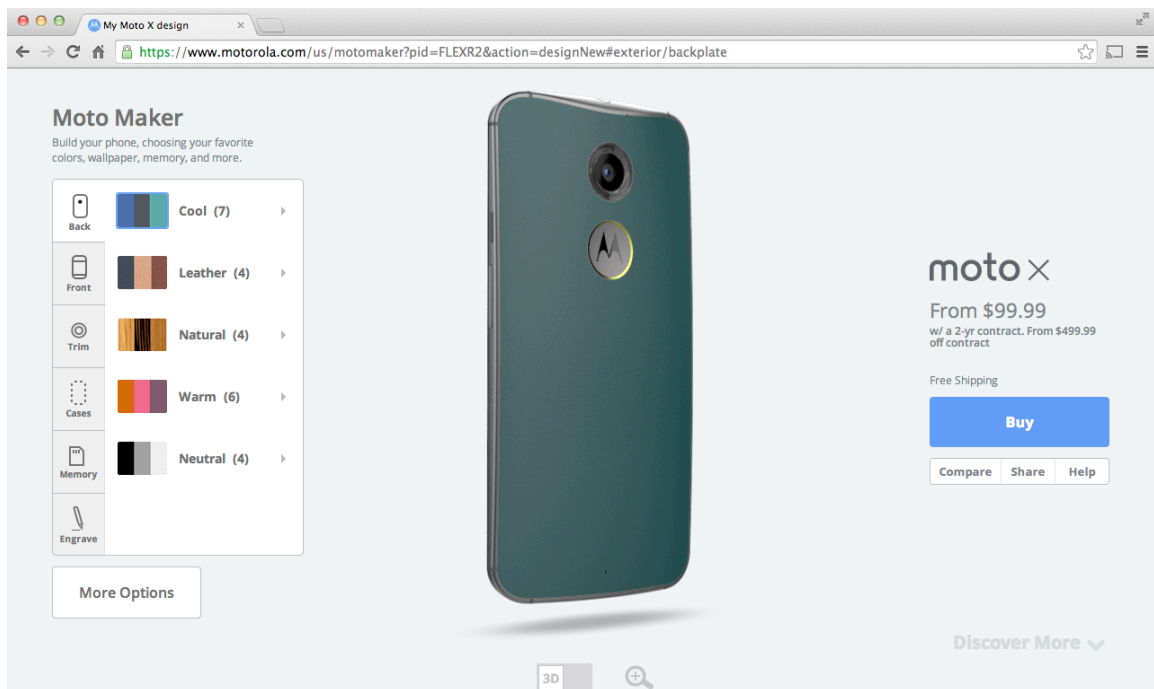
Figure 13. Motorola Moto X design tool. (Motorola, 2014)
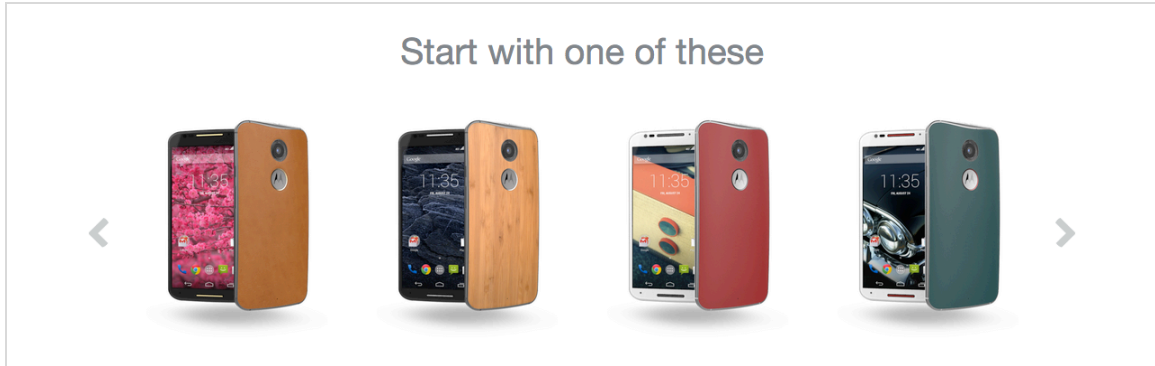
Figure 14. Moto X modifiable presets. (Motorola, 2014)

3.4.3 Creative Personalization

This strategy is what one might first think of when they hear the term personalization. In Creative Personalization, users are encouraged to hack or modify the product beyond that which has been prescribed by the designer. Many people undertake creative personalization of their own volition, and it may be difficult to encourage this behavior in users who are uninterested. If the designer actively enables hacking, then it may be viewed as post purchase personalization; thus there is a fine line to walk when applying this strategy.

Creative personalization has similar benefits as participatory design personalization. There will be a benefit to the strength of active attachment since the modification will enable the user to affect the object personality and bring it more in line with the user's self-identity. Many hacks and modifications are permanent, so this might not affect the maintenance of active attachment strength since the expression cannot be adjusted. However, users can always creatively personalize the product again in order to adjust the object identity. Creative personalization will contribute to the creation of reflective attachment since people are attached to objects that they have invested time in.

Also, the modification serves as a reminder of the act and other associations from that time, so the modification can serve as a trigger for recall and reminiscence.

Figure 15 demonstrates the use of creative personalization. The bicycle has been personalized beyond what was intended by the designer/manufacturer and not by using halo products. The personalization process as well as the increased self-expression can lead to increased active and reflective product attachment.

Figure 15. A creatively personalized bicycle. (Mugge et al., 2009)

Figure 16. Creatively personalized notebook covers. Photographed with permission.

Figure 16 is another example of creative personalization. These notebooks belonging to an industrial design faculty member have had the covers personalized with a pen to better reflect the user's self-expression. In this case, the material selection aided in the ability to creatively personalize the product. A paper cover can be drawn on easily whereas another material might make creative personalization in that way more difficult.

3.4.4 Halo Personalization

Halo personalization requires the encouragement of the user to adapt the object meaning through the use of specifically associated objects, most frequently functional accessories to the product, but also through non-functional items such as charms or stick-on graphics. Halo personalization is an effective strategy because it allows the user to personalize the product, but it can also be undone so that the meaning of the object can be modified and thus active attachment may be extended. In this case, it is the other halo products and items being added to the original product that provides the meaning change for the user.

This strategy encourages self/product congruence, but because the halo objects are usually removable the product meaning remains more flexible than with more permanent personalization strategies. This strategy also encourages users to purchase the halo products so there is a monetary benefit as well, especially if the company offers halo products along with the main product.

Cui, Chipcase, and Ichikawa (2007) described the reasons for halo personalization falling into two categories: "Instrumental" which included practical reasons, and "Non-instrumental" which were more subjective and related to the "look of the phone" and how

a user chooses to "promote themselves or their group affiliation" (p. 489). In this case, though the personalization may affect the utility of the product and thus be instrumental, the focus is on non-instrumental reasons for personalization.

Apple has followed the halo strategy with their various iPhone models (Apple, Inc., 2014). The Apple Store website has a full list of cases, screen protectors, armbands, and other accessories that users can purchase to alter the appearance and self-expression of their phone (see Figure 17). Apple even manufactures its own line of cases, so they are not only encouraging halo personalization but they are profiting from the accessory sales as well.
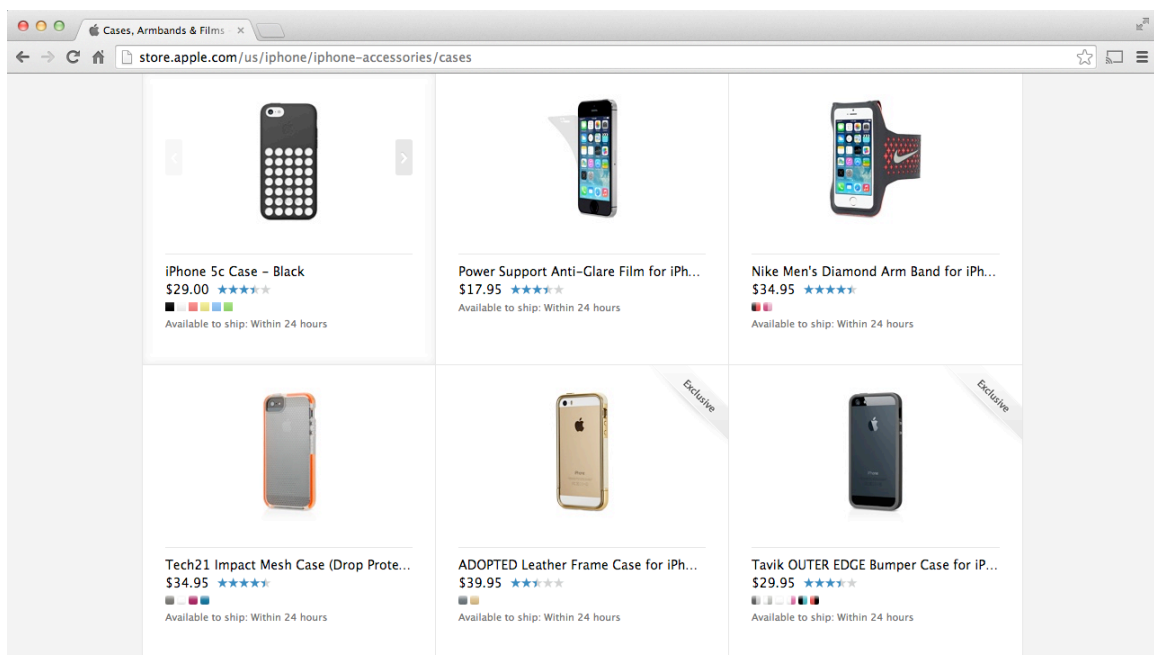
Figure 17. iPhone cases on Apple Store website. (Apple, Inc., 2014)

3.4.5 Cross-Brand Personalization

Brands are incredibly powerful constructs that can be used to help create attachment through strong self-extension and thus active attachment. Cross-brand personalization uses the power of brands to help align a product's self-expression with that of the owner. By associating a product with another brand that has a strong meaning construct for the user, the personality of the product can be altered to more closely align with their self-identity. Closer alignment can lead to stronger active attachment. Additionally, any memories of the brand and its surrounding associations can lead to an increase in reflective attachment strength due to the associations with the brand experience.

This strategy may not maintain active attachment since a person's impression of a brand may change, or the brand may reposition itself away from the user's self-identity. Reflective attachment may also not form if there is no history or association with the brand in question. In some ways, the best cross-branding personalization will also serve as a trigger (see 3.4.10 Triggers) in that it helps form a mental association. This strategy is most often implemented with halo personalization.

Figure 18 demonstrates the cross-branding personalization strategy. The author's water bottle has been personalized with various brand stickers that have emotional associations for the author. This also serves as an example of creative personalization since there has been a modification of the product without the use of halo products. The addition of branded stickers has now associated the water bottle with the brands the stickers represent. In this case, the brands also serve as triggers.

Figure 18. The author's water bottle personalized with brand stickers.

3.4.6 Persona Matching

This strategy, which aligns closely with Lampel and Mintzberg's (1996) manufacturer-oriented definition of segmented standardization, consists of offering a variety of different stylistic options at the point of purchase based on target market-segments. Govers and Mugge (2004) suggested, "designing a product with a pre-determined personality that matches the personality characteristics shared by members of their target group" (Discussion and Conclusion section, para. 2). Ko et al. (2011) proposed an individual's values and ideology could form the basis for attachment. The persona matching strategy is built on these ideas. The application is based on researching the target market for the product and designing a product personality that matches the consumer's personality. This strategy operates on the congruence guideline to increase the strength of active attachment. It would not have any effect on the temporal aspect of active attachment, not would it have a direct impact on the reflective attachment. The

value of research and developing the proper segment persona is very important in this strategy. Poorly developed personas will lead to less than ideal attachment development. This strategy can be thought of as point-of-purchase personalization where the user is selecting the variety of product from a predetermined selection.

3.4.7 Variability

This strategy, proposed by van Nes and Cramer (2005), "concerns the possibility to offer variation to the user without the need for additional parts" (p. 296). This strategy will aid in the user being able to modify the meaning of the object as the person's self-identity changes, allowing the strength of active attachment to be maintained longer. Unfortunately, van Nes and Cramer do not propose a method for how to accomplish such a strategy. Though this strategy is similar to some of the personalization strategies, the fact that it calls specifically for no additional parts sets it apart.

Nokia's Morph Concept demonstrates the use of variability to increase attachment ("Nokia Morph", n.d.). This conceptual design consists of a nanomaterial that enables the device to change shape without the need for mechanical actuation. By adjusting the presentation of the device from a small phone form to a wrist bracelet, the user can change the meaning identity of the device and thus achieve a closer self-expression. There is also opportunity for post-purchase personalization by adjusting the color of the device by taking a photo of a pattern and applying it to the device. The device in two different states is shown in Figure 19.
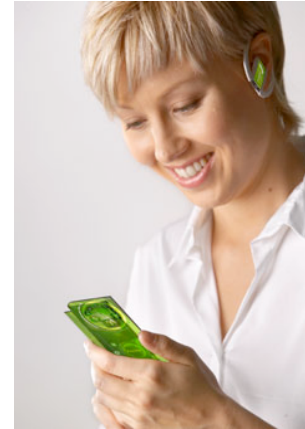
(a)   (b)

Figure 19. Nokia Morph concept in two different states: bracelet (a) and handheld (b).
("Nokia Morph, n.d.)

Though this strategy might not be viable at this time, theoretical materials may be able to accomplish what is needed for this strategy to be applied. If a material's color could be adjusted through a process of user input, this would fall under this strategy. A product with an exterior that could be adjusted by the user would fall under this strategy as well. These are both very theoretical examples, so at this time it might not be the most useful strategy, but with future innovation it may be possible.

3.4.8 Blank Slate/Pure Projected Meaning

This strategy consists of designing an object in such a way that the semantic meaning is not overly defined, which allows the user to mentally project meaning onto the product. Though all object meaning entails some level of projection by the user, in this case the object is purposefully designed so that the only meaning that can be construed is that which is projected. By projecting the meaning onto the object, the user's self-identity will be closer to the generated product meaning. This will enhance the strength of the active attachment due to greater congruence and will enable the meaning

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to be more flexible resulting in ease of maintenance of active attachment. However, this strategy will be detrimental to the object narrative and associations since the object does not have a strong meaning.

3.4.9 Reparability/Upgradability

The strategy of reparability/upgradability, a combination of strategies proposed by van Nes and Cramer (2005) meant to address the need for easy repair and upgrade of a product, allows the user to invest themselves in the product. Williams (2010) stated that engaging the user in the process of upgrade "should increase the emotional connection the user shares with the product" (p. 36). These repairs and upgrades will most likely occur later in the lifespan so one would think that it would not add to the user's active attachment; however, if a user's self-identity is based on being able to repair, upgrade, and understand the inner workings of their objects, this strategy could have an impact on the strength of active attachment. In addition, the repair or upgrade becomes a part of the product narrative and a visible result of the process can act as a trigger for recall of the act of repair and upgrade. This can affect the temporal narrative creation for reflective attachment.

3.4.10 Triggers

Using triggers allows the object to serve as an initiator of reminiscence for a specific memory. This process does two different things. First it recalls memories of an event, place, individual, or any associations that object trigger represents. This replaying of past memories helps to strengthen them, adding to the potential strength of reflective

attachment. Second, by reminiscing, one creates new memories during the act of reminiscence, which adds another point to the object narrative. Mentally rehearsing things that have already occurred help to bring those events forward into the present.

Triggers can be a variety of things, depending on objects. A chipped corner or a worn surface can act as triggers if these physical manifestations are mentally linked to events in the past. Physical triggers utilize what Norman (1998) referred to as "natural mapping", or "taking advantage of physical analogies" (p. 23) If an object has a digital interface, triggers can be things that appear and disappear since the interface can change much more dramatically.

The concept of triggers as something that stimulates action was proposed by Fogg (2009). He described triggers thusly:

> A trigger can take many forms – an alarm that sounds, a text message, an announcement that a sale is ending, a growling stomach, and so on. Whatever the form, successful triggers have three characteristics: First, we notice the trigger. Second, we associate the trigger with a target behavior. Third, the trigger happens when we are both motivated and able to perform the behavior. (Triggers & Timing section, para. 4)

In the case of product attachment, the behavior one is attempting to trigger is the process of reminiscence.

Triggers can be things that stimulate any of the senses. For instance, Mugge, Schoormans, and Schifferstein (2008) proposed using odors to simulate the recollection of memories. If an odor was associated with an experience or time then encountering that odor might trigger the memory of that experience. This same idea can be applied to all of

the senses with haptic touch, visuals, taste, and auditory cues. Obviously for different products, the implementation of some of these sensory triggers will be more difficult; many objects never go into a person's mouth so taste may be a hard sense to use as a trigger. The other difficult aspect is using a product to trigger a specific strong memory with the trigger. The design of the object has to be able to store triggers and stimulate the recall of information in order to provide the trigger at a later time.

Figure 20 shows a fellow industrial design student's guitar with a corner that has been damaged during use. This physical flaw could be a detriment to the object value, however in this case it serves a physical reminder. The trigger serves to activate the mental link between the object and the event. Once triggered, the reminiscence process helps to reinforce the connection and generate another point in the item narrative. The linkage is just as important as the trigger itself. Designers can help set the stage for physical trigger generation, but have limited control over the linkage since that is created by the user.

Figure 20. A student's guitar with a physical trigger. Photographed with permission.

3.4.11 Patina

The use of a patina is similar to the triggers strategy but it is less about specific incidents and more about the overall narrative. McCracken (1988) defined patina as "the small signs of age that accumulate on the surface of object" (p. 32). As an object ages, it collects a patina from use that speaks to the life of the object. This patina can cause reminiscence in the same way that triggers can, but it may be more general and less tied to specific instances.

Turner and Turner (2013) discussed patina and the mental associations that go along with these, which they termed the "metaphorical patina" (p. 411). McCracken (1988) argued that a patina helped to verify the authenticity of a product's narrative. Mugge, Schoormans, and Schifferstein (2008) proposed that objects should "age with dignity" They stated, "Such products are made of materials that form and wear gracefully over time" (p. 436). They suggested that certain materials such as leather or wood were more appropriate for this. No two things will wear the same either, and this variation helps increase the attachment since the object becomes even more unique and scarcity can lead to an object being more important or desired (Del Galdo, 2011). Beyond the natural materials listed, there seems to be opportunity to develop other types of materials that engage in this type of action as well. For instance, a plastic that is designed to change color or texture as it is used and ages might have a similar effect if the wearing process has been designed to be graceful and pleasing.

Figure 21. The author's inherited watch with a patina of scratches.

Figure 21 shows the author's watch that was inherited from his grandfather. The patina of scratches on the item forms a reminder of the history of the watch from its use by his grandfather to the new chapter in the watch's history and added scratches from use by the author. Normally, this cloud of flaws would be seen as a negative, but here they help to connect the watch to a narrative of past people and memories.

3.4.12 Social Facilitators

Objects that are social facilitators help, at some level, in the interactions between people. Reflective attachment relies heavily on memories of persons, places, and events. Therefore, if an object can serve as a pathway for social interactions it will become tied into that interaction. The linking of memories from the interaction with the object can help build reflective attachment strength and encourage the quick formation of this attachment.

Figure 22. Social cups. (Niedderer, 2007)

Niedderer (2007) proposed the term "performative objects" for objects designed

to create mindful interactions between people, such as a set of "Social Cups" (see Figure

22) that had to be connected to at least two other cups in order to stand upright. Niedderer

stated, "people are encouraged to explore their interactions when using the cups" (p. 3).

Such performative objects are just one example of the way that objects can facilitate

interactions with others.

3.4.13 Successful Gifting

Successful gifts, which go on to be favorite objects or objects of high attachment,

reflect a strong self-expression linkage or reflect both the self-expression linkage and a

linkage with the giver (Kleine et al., 1995, p. 340). Gifts that one gives the self tend to be

the former, whereas gifts from others that become strong attachment objects tend to

feature both facets (p. 340). This is interesting because the gift giving helps jumpstart the

formation of reflective attachment due to the presence of the linkage between the giver

and receiver as symbolized by the gift.

However, Kleine et al. found that gifts were not usually among the strong

attachment objects, most likely because "the possession is a poor symbol of the

recipient's identity (not me) and/or of the giver-recipient's relationship (not we)" (p.

340). Therefore, a strategy to combat this would be to provide assistance in the selection

of gifts that closely match the recipient's self and still represent the relationship between

the giver and recipient.

3.4.14 Product Consciousness

Proposed by Chapman (2009), product consciousness is the perception that a

product is indeed an autonomous entity, a product that has quirks and personality (p. 33).

Much like people become attached to others and these attachments are reflected in

objects that represent the relationship, a conscious product can serve as the conscious

object as well as the representational object of attachment. In this case the attachment

relationship may more closely resemble that between people. Because the product has its

own personality, interactions are more varied and must be learned (Chapman, 2009, p.

33). This investment of time may lead to increased reflective attachment because of the

learning process and the building of the relationship. This strategy could be very effective

if used well. Norman (2004) stated, "Designers take note. Humans are predisposed to

anthropomorphize, to project human emotions and beliefs into anything" (p. 138).

Figure 23. LG Aka phones and characters. (Moon, 2014)

Figure 23 shows an example of the product consciousness strategy in use. According to Dolcourt (2014) LG's Aka phones "are a breakthrough in creating an emotional, personality driven connection between people and their phones." The phones come in one of four colors and "each of the four colors already has a name, a personality *and* a backstory" (Moon, 2014). The phone has programmed interactions that reflect the personality of the handset. The front cover only covers part of the screen and rest displays the character's eyes which will help display item status and respond to interactions (Dolcourt, 2014; Moon, 2014).

With more digital interfaces being incorporated into objects, the implementation of product consciousness may become an easier and more attractive option over time. If designers were able to give conscious personalities to non-digital objects, that would open up an even larger range of products that this strategy could be applied to.

3.4.15 Signposts

Products that have signposts of certain aspects of the product lifespan may help stimulate reflective attachment by reminding the user of the shared history with the product. Signposts have an accumulative nature that reflects that history with the object. An example of this is the odometer on a car (see Figure 24). As the odometer increases it provides a numerical index of the history with the car. People celebrate the rollover of the odometer to significant amounts, such as 100,000, since these signify a mature relationship and an achievement in said relationship. With the rise of objects equipped with embedded computer systems, the ability for everyday objects to keep count in this way is increasing.

Figure 24. A car odomenter.

3.5 Strategy Summary

Based on the guidelines, strategies to apply them have been developed. Figure 25 collects the proposed effectiveness of the strategies on the guidelines. This collection of strategies is not an exhaustive list, nor is the effectiveness a rigid metric.

Guidelines

Strategies	Active Attachment		Reflective Attachment	
	Identity Match Strength	Congruence Maintenance	Narrative Construction	Strength of Associations
Post Purchase Personalization	◐	●		○
Participatory Design Personalization	●		◐	○
Creative Personalization	●	○	◐	◐
Halo Personalization	◐	●		
Cross-Brand Personalization	◐	◐	○	◐
Persona Matching	●			
Variability	◐	●		
Blank Slate	◐	●		
Repair/ Upgrade	○		●	◐
Triggers			●	●
Patina			●	●
Social Facilitators			●	
Successful Gifting	●		◐	●
Product Consciousness	◐		◐	●
Signposts			●	◐

Legend: ● Effective ◐ Partially Effective ○ Possibly Effective

Figure 25. Effectiveness of strategies on guidelines

As product attachment becomes more prominent in design research more strategies will be developed or identified that will aid in designing for attachment. The most important thing is to pair strategies that allow the designer to affect the four guidelines for the transitional product attachment method. This may require several strategies that affect only one guideline each, or a few strategies that affect multiple guidelines. The more overlap on each guideline, the more effective the application of the method will be in designing for attachment.

CHAPTER 4

DESIGN APPLICATIONS OF ATTACHMENT STRATEGIES

To show how the previous strategies can affect the guidelines and thus set the stage for product attachment, one must design something utilizing the strategies in order to set the stage for product attachment. This chapter will cover the basics of selection and the effectiveness of strategies for the design of a selected product. The product will not necessarily be an example that will have the highest attachment for all individuals. It is important to remember again that one cannot design attachment; one can only design for attachment. Attachment strength varies based on the person and his or her interpretation of the meaning of objects. Thus what one is really designing is the framework so one can experience attachment. Even when designed for attachment, products will be disposed of and some people will not become strongly enough attached to affect the lifespan of the object. The use of attachment as a strategy to extend lifespan is just one of many methods that designers can pursue in order to facilitate lifespan extension. In fact, there have been generations of products produced without an understanding of this framework. The best designers can do is set the stage for attachment as best they can, with the understanding that attachment formation and strength can affect lifespan and sustainability. As such, this design project is an example intended to demonstrate the strategies as applied to one product. Designers may need to develop their own strategic approaches for other products.

4.1 Product Category Examination

In order to demonstrate the application of designing for attachment a suitable object must first be selected. One of the foundations of design for attachment is that the object must be used and should be used as often as possible. In this case, mobile devices or more specifically a smartphone could be considered one of the better categories to implement design for attachment. According to the International Telecommunication Union (2014), by the end of 2014 the total number of mobile subscriptions will reach almost 7 billion, a penetration rate of 96% (p. 3). The subscriber rate for the developing world will reach 90%, while the subscriber rate for the developed world actually exceeds 120% (p. 3). In short, there are a large number of mobile devices in use around the globe.

A *2014 Mobile Behavior Report* prepared by Exact Target (2014) found that 85% of Americans surveyed listed mobile devices as a central part of their life and the average amount of time spent on smartphones was 3.3 hours per day (p. 6). Pew Research (2014) found that 90% of American adults now have a cell phone. Smith (2012) reported that 44% of cell phone owners sleep with their phone next to their bed so as not to miss any alerts. In addition, "29% of cell phone owners describe their cell phones as 'something they can't imagine living without'" (Smith, 2012).

The United States also has the shortest replacement cycle for mobile handsets. In 2010 the average handset lifespan in the United States was 21.7 months, having slowly crept up from 18.7 months in 2007 (Entner, 2011, p. 2). However, in a later assessment, Entner (2013) found that by 2012 the lifespan had not continued to improve but had remained steady at 21.7 months. Other countries have replacement cycles measured in years instead of just months. Emmenegger, Frischknecht, Stutz, Guggisberg, Witschi and

Otto (2006) found that increasing the lifespan of a handset from one to four years resulted in a 40% reduction in environmental impact (p. 274). With so many mobile handsets all eventually having to be replaced there is a great opportunity to influence the length of the lifespan, especially in the United States, where the lifespan of mobile devices remains the shortest. Cell phones have become a ubiquitous device, with many people in the developed world owning more than one. Smith (2012) found that 67% of cell phone owners check their phones for alerts even when the phone is not vibrating or ringing. The cell phone has become solidly integrated into people's lives and this provides an excellent opportunity to strengthen attachment, encourage a longer lifespan, and thus make these common devices more sustainable.

In addition, there is evidence that mobile devices may be an excellent source of attachment to begin with. For instance, Meschtscherjakov (2009) stated that, "Since mobile devices are also an expression of our personality and a symbol for our peer group membership they can become an extension of our self" (p. 1). We know that self-extension is one aspect of product attachment, thus the more one self extends the stronger the resultant attachment. Turner and Turner (2013) investigated attachment in regard to digital and non-digital objects. Though they did not define a "digital artifact," their selection of devices accepted as an example of a digital object included mobile phone, laptop, desktop computer, mp3 player, digital camera, games console, and television (p. 409). From this we can infer that a digital object is one with a digital component. Their list of non-digital objects does not include objects with digital interfaces, with the one exception being watches, which may have a digital element depending on the type of watch. Regardless, they found that "there does not appear to be any qualitative difference

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between the attachment people have for digital and non-digital artefacts" (p. 403). Because of this, smartphones should develop attachment much like other objects that do not have digital interfaces. They did note that proximity to the object seemed to have an effect on attachment, with more proximal objects being mentioned more often. As noted previously, objects were moved away from the person in preparation for disposition, thus the proximity would indicate high attachment formation

Taken in whole one can see that a mobile device is an excellent choice for designing for attachment since there are so many, they are replaced so frequently in the United States, there is no difference between attachment just because it has a digital interface, and people use them often and keep them close. In fact, because mobile devices are often used as an expression of self and thus a part of self, attachment should be more likely to form. For all of these reasons, a smartphone handset provides a good platform for the exploration of the design for attachment strategies that have been discussed here.

It is important to note that the application of strategies for a smartphone will be affected by the fact that there is a digital element to the product as well as the physical artifact. Thus, there will be a combination of solutions that encompass the artifact, its interface, and other associated products and experiences. As such, the design is much more of a system design than a simple product design.

4.2 Design For Attachment Strategies Applied To A Smartphone Handset

Designing a smartphone handset to promote attachment first requires the selection of appropriate strategies and the determination of various ways that the strategies can be implemented. One must also consider how different strategies interact since different

strategies can work together and complement each other, or two strategies may interfere with one another if applied at the same time.

It is important to follow the guidelines for the transitional method since that will lead to the greatest maintenance of the attachment level over a longer period of time. By selection of strategy, all guidelines should be pursued so that the application of the transitional method is properly followed. If one of the guidelines is not pursued, the transitional method will not be as effective. As many strategies as needed should be applied, with more strategies providing more opportunities for the development of attachment. For this demonstration, each strategy will be discussed in relation to the design and the reason for application or lack thereof.

4.2.1 Application of Post-Purchase Personalization

Post-purchase personalization is typically found on most mobile devices. Even before the transition to smartphones, so-called feature-phones allowed users to set the wallpaper and change ringtones, though the fidelity of screen and speaker made the rendition poor. Because of this factor, the application of post-purchase personalization will be quite easy for a new mobile device. The ability to personalize the wallpaper, ringtone, icon arrangement, and other parts of the appearance and usability of the operating system will help enable attachment.

Figure 26 shows an interface for setting a personalized wallpaper (see Figure 26a) and ringtone (see Figure 26b) for the smartphone. In both instances, favorite items (photos or songs) are suggested for use in their respective roles. By suggesting these first the user is more likely to apply them and thus for their self-identity to be reflected. A

greater self-identity match should result in stronger active attachment. The use of favorite items such as photos of loved ones can also help the phone to serve as a reminiscence object due to the triggering ability of the personalized aspect. This could lead to some development of the object narrative and reflective strength, though the non-permanent nature of the personalization will leave any reflective attachment aspects vulnerable to decrease if the object personalization is changed.

(a)   (b)
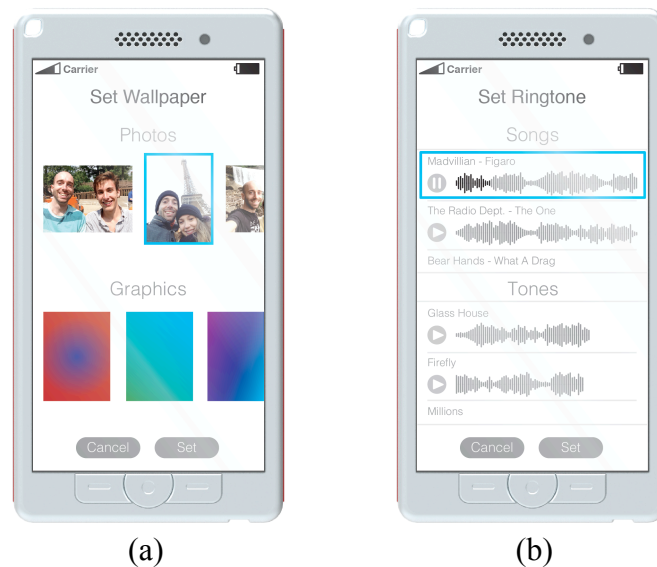
Figure 26. Personalization interface for wallpaper (a) and ringtone (b).

The biggest drawback of the digital post purchase personalization is that the personalization can be changed or undone. Since the photo is not tied to the phone and the wallpaper can be changed, the development of the reflective attachment is not stable and may shift. The focus of this strategy will be focused on active attachment when used with the mobile device.

The use of this strategy does not go beyond the level of post-purchase personalization that one might find with other mobile devices. That is because this

strategy will not lead to high levels of attachment, since the process of personalization requires so little use input. However, because the interface can be adjusted at the user's desire, the maintenance of active attachment will be easy. This trade-off between a low strength and high flexibility helps set a stable foundation for the development of active attachment and some possible development of reflective attachment.

There is no use of post-purchase personalization on the physical artifact itself. This limits the effectiveness of the strategy, but such personalization would be difficult on an object so small. However, the use of a digital interface means that the device can be updated as other types of digital post-purchase personalization are developed. Thus, in the future this strategy may become more effective at affecting attachment.

4.2.2 Application of Participatory Design Personalization

The demonstration smartphone was designed with extensive use of participatory design personalization. Because the investment of time and effort leads to stronger active and reflective attachment, this strategy is a heavily used one. In this case, a web interface is used as a personalization portal through which the user is able to adjust aesthetic features of the product before the product is received. The user is able to adjust the color and material of the frame, picking between metal and plastic. The backplate of the device can be made from a wider selection materials with metal and plastic but also wood and leather. Handset sidegrips can be made from metal, plastic, or wood. The colors of the metal and plastic parts can be selected from a provided pallet and different variations of both wood and leather can be selected. If the user is more advanced, color can be customized to a greater degree. Through the web portal users can also adjust pick out

accessories, though these selections fall under the guise of halo personalization. Figure 27 shows the participatory design personalization web interface being used to select a custom color of patterned metal backplate.
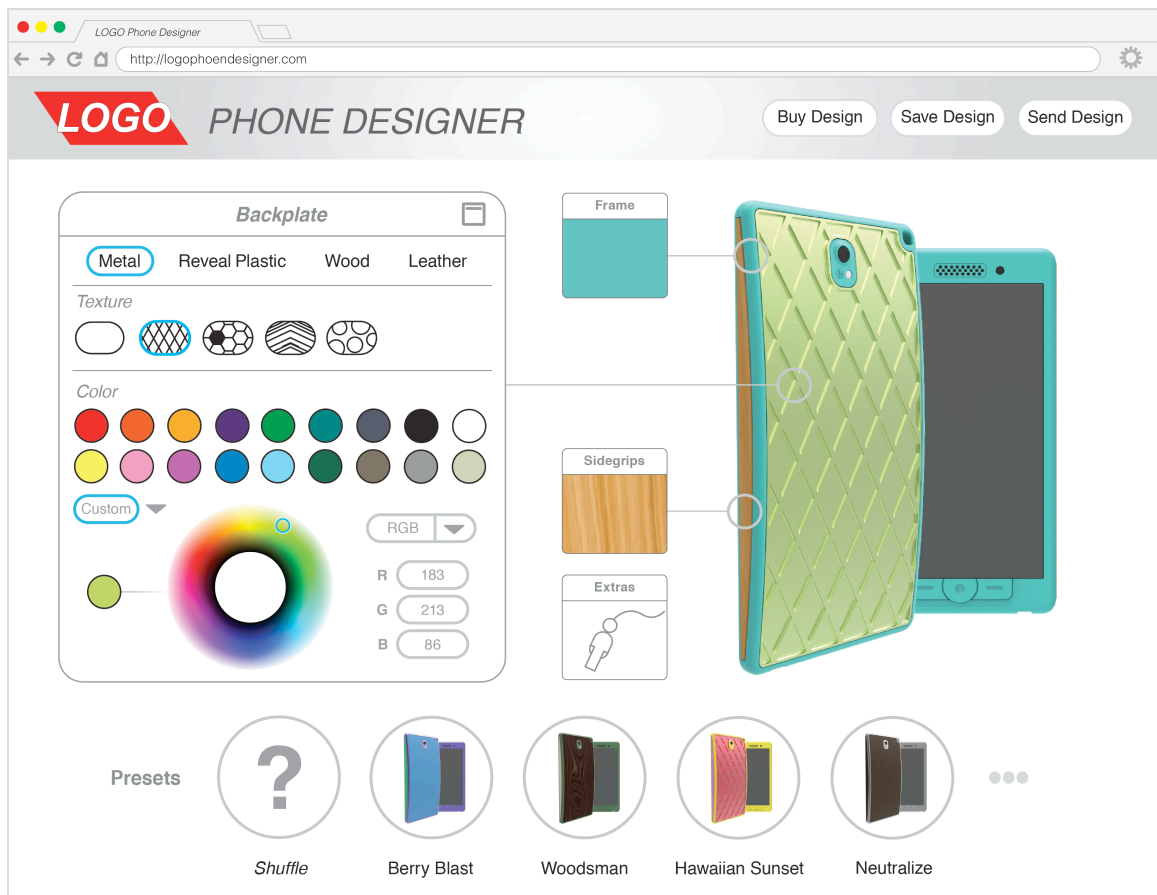
Figure 27. Participatory design personalization web interface.

The ability to select different materials and colors allows for the phone 'personality' to more closely match the user self-expression and thus leading to greater strength in active attachment. Because the personalized elements are not easily adjusted after production, the effect on maintaining active attachment may suffer since the user's self-expression can change. Completing the process will become a moment that can

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affect the reflective attachment development and support reflective attachment strength later on. Thus, the experience of the personalization portal has an influence on the ability to affect reflective attachment, though this will be fairly low.

As stated before, the level of involvement in the participatory design personalization process has to be managed in order for it to be successful. The process should be easy enough that users will invest time into the product, which should be easier to accomplish since mobile devices serve as self-expression symbols, but the process also needs to manage a level of personalization that allows users to fully feel like their personalization is truly personal. This is a delicate balancing act. In this case, having features like pre-made templates that users can select as the starting point for their design and a random generation function makes the process easier for someone with lower skill level or interest level. By having a preselected color palette, users are able to pick colors rather than having to generate them. For users who are more motivated, the ability to customize colors is available. The material variety also enables greater range of options that help improve the personality definition. The number of individual pieces that can be adjusted also changes the complexity of the product output. The more complex the personalization, the more likely that a person will feel that they have invested time to create something truly individual and personalized.

The interface was designed so that a large amount of personalization could be affected with a minimal cognitive load to the user. Selections were grouped and labeled with simpler options more prominent. If the user wishes to personalize on a more complex level, there is an option to engage at that further level. In this case, the development of attachment through the participatory design personalization process has

to be balanced with the completion of the process itself. If user fails to finish the process because it is too complicated, any attachment that would have developed is lost. Users have the ability to save their work by clicking the 'Save Design' button, which sends them a link in their email. Like many things, there is a tradeoff between how much the interface can be focused on personalization options and maintain ease of use for success.

4.2.3 Application of Creative Personalization

This strategy is a tough one to implement because the designer can only set the stage for this type of personalization, but it is the user who enacts it. In the case of the smartphone, there are some material considerations that aid in this strategy. Both wood and leather are materials that naturally lend themselves to creative personalization. Leather can be etched or engraved, while wood can be burned to create interesting effects. Painted metal can be scratched to reveal the metal underneath. A layered plastic was developed for application to this device, which has a lighter or darker core that is revealed if the outer layer is removed. This plastic is branded as Reveal plastic. The user could purposefully abrade the outer layer of the Reveal Plastic to purposefully reveal the inner core in a creative fashion.

Due to these opportunities, as part of the marketing of the phone the company should partner with artists who will use woodcutting and leather engraving techniques to create various artistic versions of the handset. This can demonstrate some of the creative personalization opportunity available with the device. Also, by making the creative personalization of the product a part of the marketing it aligns the phone's product identity closer to that of the maker and artist movement. Though not every user will take

advantage of this, prompting users to consider exploring this avenue can help stimulate attachment through the creative personalization process.

Creative personalization can lead to greater self-expression and thus higher strength of active attachment because the personalization can fit the user's identity more closely. Because it is difficult to undo the described creative personalization, the maintenance of active attachment strength may suffer if the user's self-identity moves away from the personalization identity. The investment of ones self and time can lead to stimulation of reflective attachment as well. The physical effect of the personalization process serves as a trigger for recollection of the personalization event and reflection upon that event.

Again, the implementation of this strategy is through providing an opportunity for creative personalization and then drawing some attention to it through the use of marketing. There is, however, a level of tact needed, because the process of creative personalization goes beyond what is explicitly designed into the product. Thus, the marketing of this aspect of the product should focus on the creative aspect that the artist is bringing to the creation as opposed to the design of the phone that enables this type of personalization. Users may creatively personalize the phone in other unexpected ways, which will aid in attachment. Unfortunately, a designer ultimately has very limited control in affecting these.

4.2.4 Application of Halo Personalization

Halo personalization of mobile devices is very common. Cui et al. (2007) identified cases and straps as varieties of halo personalization used by various cultures

with mobile devices. In this case, designing and marketing a line of cases that the user can select from to personalize the product could encourage attachment through halo personalization. However, the use of cases will actually interfere with other strategies; thus in this instance, cases will not be used.
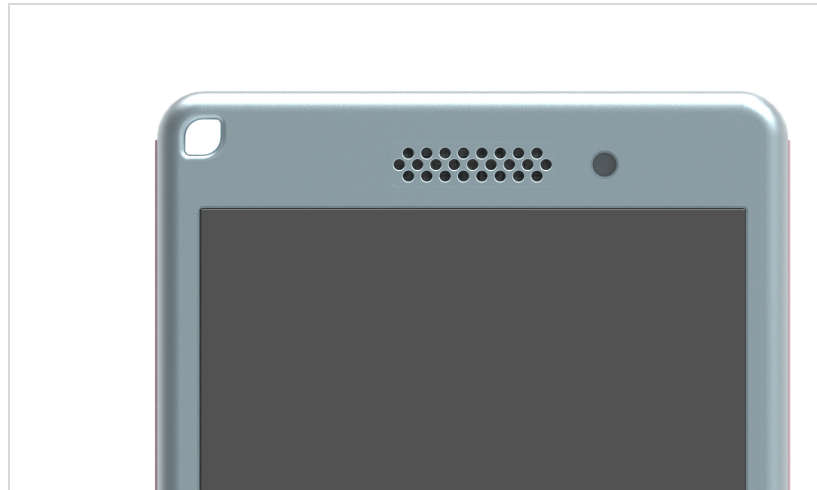

Figure 28. Physical attachment point on handset corner.

A physical attachment point has been made a prominent feature of the phone (see Figure 28) to encourage halo personalization. By providing a line of items that can be physically attached to the phone, halo personalization can be encouraged. These items can range from very simple wrist straps or lanyards, to charms and figures. These charms can be original designs or there can be cross-branded items that help associate the phone's expression with the aspects of that brand (see 3.4.5 Cross-Brand Personalization). For instance, a charm designed to resemble a fictional cultural character may help the phone take on a similar personality in the user's eye.

The addition of the physical attachment point on the mobile device and its prominence make it easy and readily acknowledged that items could be added to the

phone. By offering a selection of halo items available at point of purchase and on the online personalization portal (see Figure 29), halo personalization is encouraged as well. To stimulate their use, a free item could be included with the purchase of the phone. Users may even creatively personalize the handset by utilizing the physical attachment point in other unexpected ways.
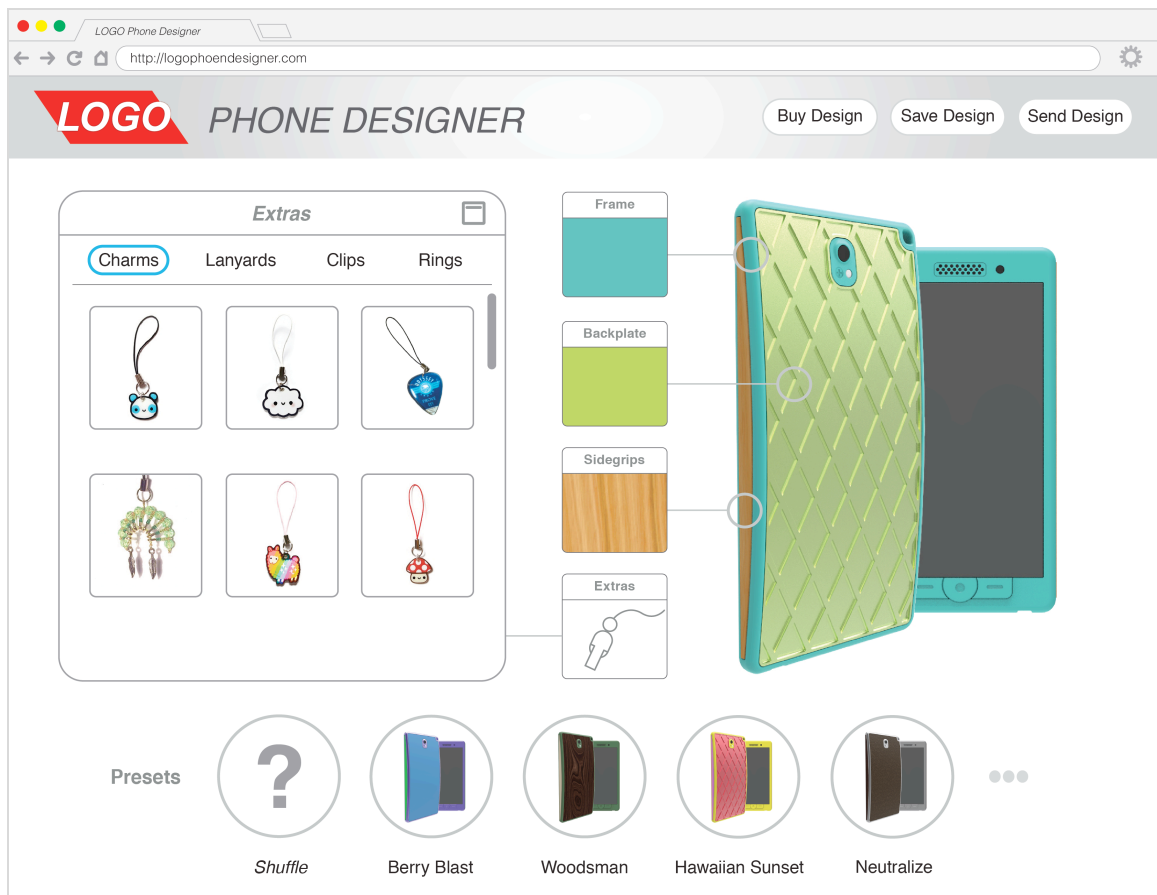

Figure 29. Halo product selection web interface.

Halo personalization will have a strong effect on active attachment due to the ability of the halo product to affect the product personality and alignment with a user's self-identity. However, the user may see the halo item as differentiated from the device,

lessening the attachment effect. Maintenance of active attachment is also easier because halo products can be swapped out or removed if the product identity is no longer congruent with a user's self-identity. Halo personalization should not have a strong effect on reflective attachment, except in cases where the halo product acts as a trigger associated with a significant person, event, or memory (see 3.4.10 Triggers). Otherwise, reflective attachment strength would be expected to be low. The halo personalization is also tied in with cross-brand personalization since charms and other halo products can be designed as branded items.

4.2.5 Application of Cross-Brand Personalization

As stated before, cross-brand personalization and halo personalization can be highly related strategies. In this design, the incorporation of branded charms into the online offerings can lead to cross-brand personalization. However, outside of this there is not a significant level of cross-brand personalization used in the design.

4.2.6 Application of Persona Matching

For this application, persona matching is not as applicable because participatory design personalization is used so extensively. The exception is in the selection of presets used for the online personalization interface. Designers can put create presets based on target markets in order to take advantage of persona matching. The advantage of the web interface is that these presets can serve as starting points for subtler personalization by users within a specific persona group.

It is not likely that this strategy would result in a high level of either active or reflective attachment since any preset design can also be personalized through participatory design personalization. However, a large number of designs based on personas can be generated and included in the presets without any production investment. Any design generated through the persona matching strategy will most likely be used as a starting point, making the participatory design process more likely to be successfully navigated.

4.2.7 Application of Variability

The variability strategy is not a viable strategy currently due to the need for smart materials that are able to change shape and color as is needed by the strategy. Because of the horizon of application of this strategy, variability was not considered for this mobile device. As material technology improves and smarter, more reactive materials are developed, this may be become a viable strategy.

4.2.8 Application of Blank Slate/Pure Projected Meaning

For the design of the smartphone, the blank slate strategy tangentially applied. One of the criticisms that is heard occasionally about the design of smartphones is that they are just slabs of glass without any form. This is due to the nature of interaction with most smartphone products. Because of this, there is some aspect of blank slate/pure projected meaning when it comes to all smartphones. However, the strategy is in conflict with the participatory design personalization strategy because in that strategy the user personalizes the product with meaning before the product is produced, thus the product

has semantic meaning due to the variety of materials selected. The design would have to be much more semantically neutral for this strategy to be effective. The design of the demonstration smartphone is purposefully invested with meaning by the user through the participatory design personalization process.

4.2.9 Application of Reparability/Upgradability

In order to utilize reparability/upgradability for the smartphone, it has to be designed in such a way that the device can be repaired and upgraded more easily. Many mobile phones are notoriously difficult to disassemble to fix or tinker with. The design of the mobile device puts a single screw in a very visible location on the camera trim-plate (see Figure 30). When the screw is removed, the backplate can be removed and the rest of the phone components are readily accessible. Thus repairs and upgrades are easier than with other handsets. This will require some rigorous engineering work to get all the phone elements positioned on one printed circuit board in such a way that the internal design will work, but the accessibility will aid in the upgrade and repair process.
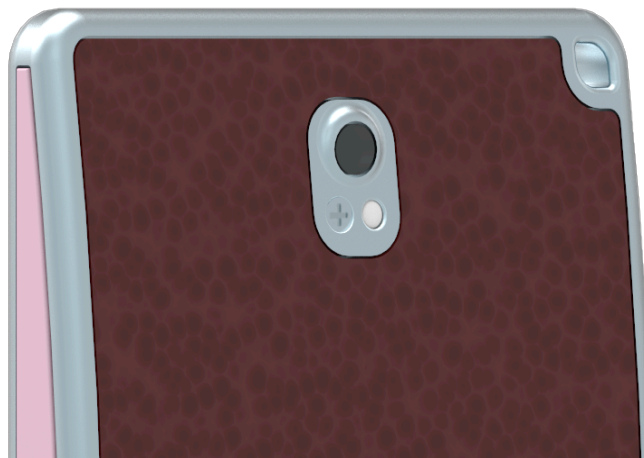

Figure 30. Screw on camera trim-plate.

Again, the investment of time and effort into the repair and upgrade of the phone will create stronger active attachment if the ability to repair and upgrade is a part of the user's self-identity, but the investment will also lead to reflective attachment since the screw and any external changes becomes a visual reminder to the repair process that one has undertaken. There is of course an added benefit in that, by enabling easy repair and upgrade the functional value of the object can be maintained for a longer period as well, giving the user a longer time in which to develop attachment before the overall value begins to fall to disposition levels.

4.2.10 Application of Triggers

Triggers in an object with a digital interface can generally be divided into physical triggers and digital triggers. In fact, the addition of a digital interface to a product helps to open up a wide opportunity for triggers. Alternatively, it can be difficult to design physical triggers into an object. It can be much easier to design the ability for a physical trigger to form on an object.

When developing physical triggers, one can select materials and aesthetics that lead to the formation of triggers. Often times these take the form of what one might think of as a flaw or damage. However, if the damage served as an association for a particular memory that the user would reminisce on, then it serves its purpose as a trigger.

The use of leather, wood, painted metal and Reveal plastic in the smartphone will aid in the development of triggers. Both wood and leather naturally accumulate textural elements and changes that can act as triggers. Paint on metal can be worn away to create a trigger. Reveal plastic, with its colored core, was developed with the express intent of

being able to create triggers. By offering a selection of materials during the participatory

design process that possess the opportunity for the development of triggers, there is a

greater opportunity for the development of reflective attachment. For this to occur, a

trigger on the phone (for example, a distinctive scratch) must be associated by the user

with a target (an event, place, or person) that is favorable and that they would enjoy being

reminded of. The person then has to take in the trigger, whether through touch or

observation, and that process has to cause the recollection to occur. By reminiscing, the

connection between the trigger and the target is strengthened, and the reflective

attachment is stimulated and developed.

When designed with a metal backplate, the smartphone can be personalized with

patterns. Figure 31 demonstrates a handset with a patterned backplate. The pattern can

lend itself to the formation of triggers because the raised area and hard edges are more

likely to attract flaws. The removal of paint from the surface or edge can serve as a

trigger if the damage was associated with a user memory. The Reveal plastic frame is

also likely to accumulate physical triggers due to ability of the plastic core to be revealed.
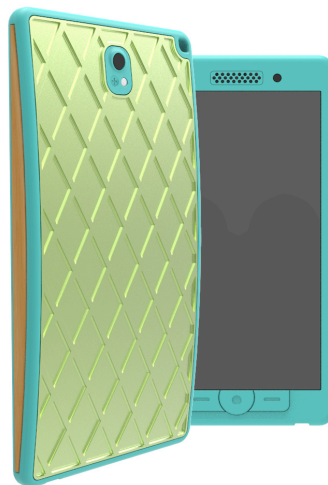

Figure 31. Handset variation with patterned metal backplate and plastic frame.

In addition, halo products can operate on the trigger strategy if they enable the reminiscence due to a mental association by the user.
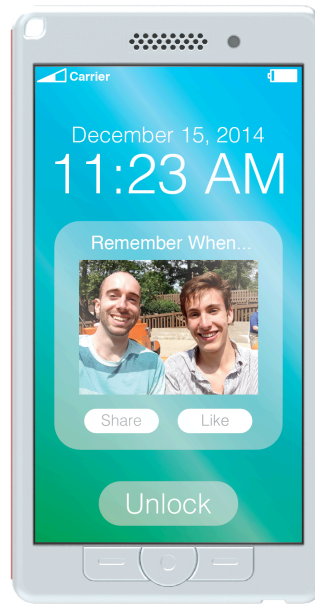

Figure 32. Momento notification.

Because the smartphone uses a digital interface, triggers can also be implemented through the user interface. 'Momentos', or location specific notifications, are an example of digital triggers used with the smartphone. Many modern phones have GPS that enables them to record the location of photographs taken with the internal camera. Over time, photos are transferred, deleted, etc. The photos that remain on a person's camera the longest are thus logically the ones that have a special significance to them. The phone can also note which photos are shared, uploaded, favorite, or otherwise interacted with often. When a person returns to the location where the photo was taken, the phone can send a notification that says, "Remember when…" along with the photo (see Figure 32). This can serve as a trigger designed to activate the memory of a specific event, something that

is tougher to do with physical triggers. This recollection and reminiscence should help

reinforce reflective attachment because it reminds the user of a memory that was enabled

by the phone. The phone will not be the primary target of attachment, but will benefit

from the association with the person, activity, or event in the photograph. The association

of the phone with the reminiscence will lead to increased reflective attachment.

4.2.11 Application of Patina

Figure 33. Demonstration models showing a patina of use versus new.

Patina can be an easier strategy to use than triggers since a patina is a collection of

triggers that serves as a general association with past events or memories rather than

specific instances. It is the volume of wear that creates the literal patina (see Figure 33),

which is connected to the narrative of the object. However, the object must wear well and

still be attractive. For the phone, materials were made available that were recommended,

such as wood and leather, which naturally age with an attractive and evocative patina.

Other materials that do not wear as well, such as metal and plastic, were given treatments

to help aid in the development of a patina. Reveal plastic wears well since it is designed

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to wear and reveal other colors through use. Painted metal was used with the intention that the paint would wear and flake to reveal the raw metal underneath.

The wear pattern for each phone will be different since people hold, use, and store them in different ways (see Figure 34). This uniqueness will help build reflective attachment due to the associated history with the device and the reflection of the shared history. By using materials that change in response to physical interaction, a patina of use is more likely to develop.

Figure 34. A handset model with patina being held during use.

4.2.12 Application of Social Facilitators

A social facilitator is anything that helps create connections between people. A mobile device seems like the perfect opportunity for this since there are many opportunities for communication with a smartphone. The use of the handset to interact with other people can create an association between the device and the people the user

interacts with, leading to the development of reflective attachment. However, this amount of attachment can be achieved by most all smartphones.

Because users personalize the phone to represent them, having a unique-looking phone can serve as a potential for social interaction. A unique handset can serve as a point of conversation between individuals. Thus, personalization needs to be flexible enough for a person to create a unique design that can serve this purpose. By having multiple pieces that can be adjusted and giving users leeway with the color palette, there is more variety and thus a better chance of making a unique design more likely to attract social interactions. If an object often becomes a point of conversation, this can lead to an increase in reflective attachment because of the association with other people.

4.2.13 Application of Successful Gifting

The application of successful gifting in this design works similar to a gift card. A person can purchase the phone as a gift for someone else and the gift receiver is given a web address where they can access the online personalization portal and personalize their phone before it is produced. In this way, the gift receiver will have a phone that is aligned with their self-identity as well as having a phone with a connection to the gift giver since they will remember who gave them the phone. In addition, the giver is able to customize a message that appears on the personalization page, which helps associate the creation with the gift giver (see Figure 35). If the giver desires, they can also design a handset that appears when the gift receiver accesses the web address. A gift that is aligned with a user's self-expression and associated with the gift giver is likely to positively affect both the strength of active and reflective attachment. The object being associated with the gift-

giver will be a large contributor to both developing and maintaining reflective attachment for the handset.
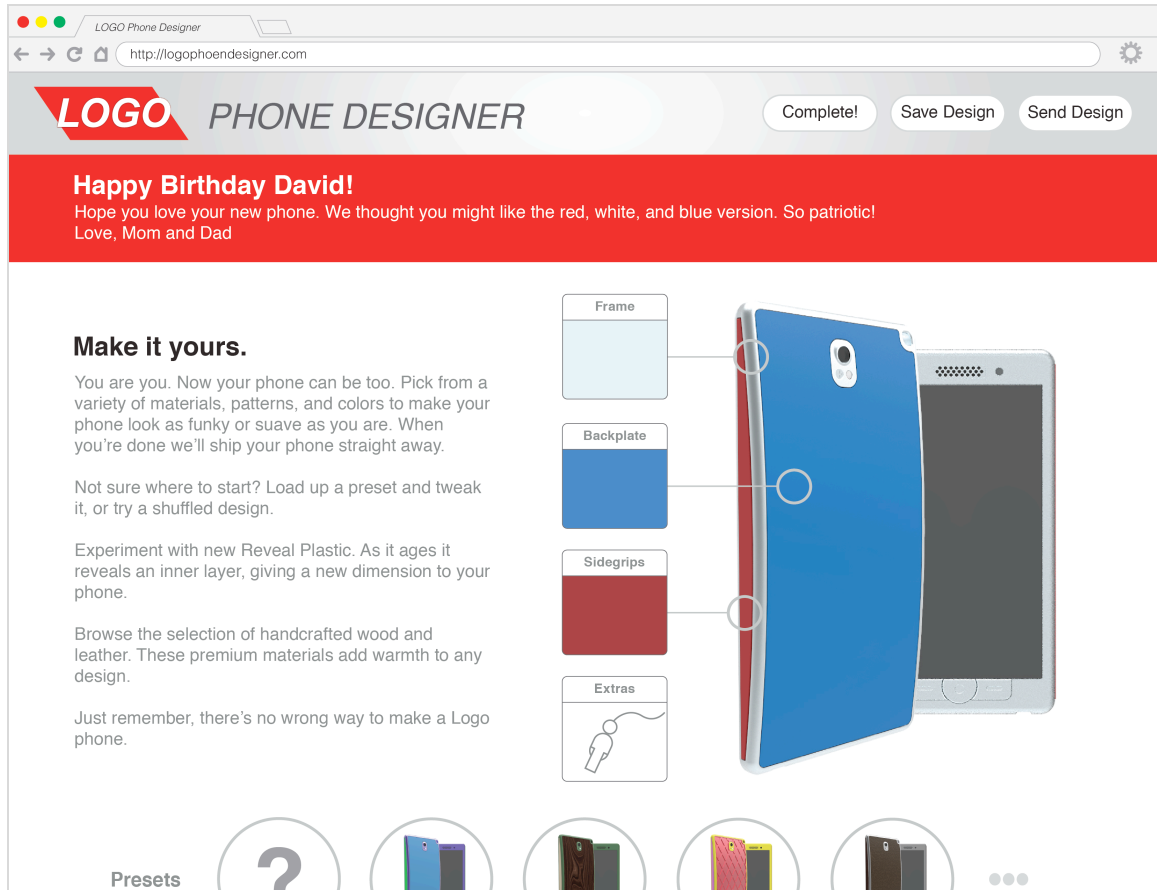
Figure 35. Participatory design personalization web interface with gift message.

4.2.14 Application of Product Consciousness

Product consciousness would be a difficult strategy to implement in a device with this much personalization since the user has determination over the creation of the identity of the object. Because of this, product consciousness would most likely not be a very successful strategy for this device. Most likely a product that comes with a strong

identity is more effective in utilizing this strategy. For this smartphone, the user is providing the identity instead.

4.2.15 Application of Signposts

The use of signposts for a phone should have some effect since a phone is used often and thus can accumulate a large amount of measurable signposts. For this device, the startup date, hours of uptime, number minutes in use, and number of photos taken are recorded and can be displayed to the user (see Figure 36).
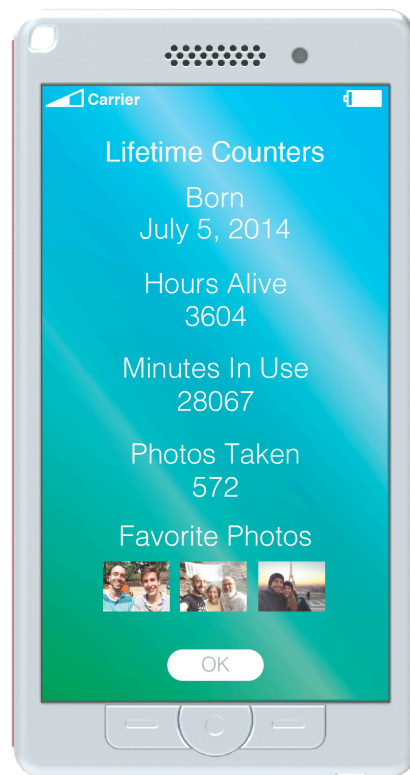

Figure 36. Smartphone counters.

As these numbers grow, users can reflect on the narrative of the phone based on the number of hours the phone has been in use. Since many phones are no longer

powered off, these counters can accumulate quickly. Events such as hitting 1000 hours (around 42 days) or 10000 hours (1.1 years) could become milestone events for the device, much like people celebrate a car's odometer rolling over to 100000 miles. These counters should be linked to the phone's firmware so that it cannot be adjusted or reset during the life of the phone, regardless of software update or reset. These signposts will affect the reflective attachment strength since they are a reminder of the narrative history of the handset.

4.3 Strategy Application Summary

The application of strategies demonstrated here is specific to smartphone mobile devices. They are also not the only ways in which to apply the strategies to this specific product category. Designers will need to work to apply the strategies in the most effective ways, in order to generate the maximum attachment strength. Along with this, the strategies need to be balanced so that there is generation and maintenance of active attachment as well as development and strengthening of reflective attachment. Ensuring that both attachment types are engaged is essential for the application of the transitional method to product attachment. For this device, participatory design personalization drove much of the active attachment and associated strategies. For reflective attachment the focus was heavily on patina and triggers, but also included some interface elements.

CHAPTER 5

SUMMARY AND CONCLUSIONS, LIMITATIONS, AND EXTENSION

5.1 Summary and Conclusions

This study is able to provide a link through research between sustainability and product attachment through the concept of eco-efficiency. This depends on the related concepts of value and obsolescence. The concept of attachment is examined to provide a foundation for an exploration of product attachment. Two schools of product attachment are addressed, with specific characteristics of product attachment development for each type brought together into a more unified definition of product attachment. Using the identification of two strong attachment types that had previously appeared in other research, a transitional approach to designing for product attachment is proposed. This method relies on a strength and temporal component for both types. Thus, guidelines are laid out for increasing strength and maintaining it over time for both active and reflective attachment. Strategies are collected, proposed, and combined in order to provide a list of actionable things to pursue when attempting to implement the transitional approach to design for attachment. The design of a smartphone provides a demonstration for how the actionable strategies could be applied to the product category.

Through this study the research on the concept of product attachment is unified, tied in to sustainability, and broken down to provide an example of the shift from

proposition to action in regard to applying product attachment. The hope is that by demonstrating the use of design for attachment and specifically the transitional method that product attachment can be incorporated into a designer's toolkit for use in making products more sustainable. Though there is an argument that the use of product attachment will lead to decreased sales, Davis found that when people are attached to a specific product they are more loyal to the brand associated with the product (as cited in Mugge et al., 2010, p. 279). Therefore, a company with a long-term focus will find benefit from utilizing product attachment to help stimulate longer product lifespans and users more likely to consider the brand again.

5.2 Identified Limitations

The major limitations with the study of product attachment are the lack of a full understanding of the product attachment construct. As was shown, there are two working definitions of what product attachment actually is. Though these constructs are related, there has until now been no effort to marry the two of them. This lack of concrete definition prevents some more definitive conclusions to be drawn about the nature of product attachment.

Another problem is simply with the construct itself. Product attachment can be very short term, but it can also last for a very long time. When investigating attachment, most of the research is backwards looking and identifies objects of attachment by survey or interview. Some even surveys participants on expected levels of attachment in fictitious individuals. This view of a person's relationship with various objects may affect how people see the objects that they interact and are attached to. Though Mugge et al.

(2006) did conduct a study of attachment to an item over a short period of time, there are limits to the length of time that is practical to study. Thus, there have not been many direct observations of the development of product attachment, only snapshots of attachment levels at a specific time. Because of this, there may be trends in product attachment levels that are being overlooked. A study like this though would be incredibly difficult because there is little to predict which items a person will be most strongly attached to. Also, some attachment lasted for 20 or more years. A study of that length would be incredibly involved, when there is still no clear delineation of the meaning of product attachment yet. Though this is a common weakness in research due to the difficulty of doing longitudinal research, it is still worth noting due to the temporal nature of product attachment.

5.3 Extension

Based on this study, the concept of product attachment has been demonstrated as a viable method for affecting sustainability through an increase in product lifespans. The next step is to begin to break down how this is affected by different product classes. There is also some ambiguity about product attachment and its relation to other constructs such as product satisfaction. Also, though there has been some success in bringing product attachment into the actionable realm for product designers, there is still work to be done to solidify its limitations within the field. Though it is obvious that strong attachment will not form with all products, it is less clear if attachment to a specific product can be affected by designing for attachment. Knowing how effective design for attachment can be for various product categories or types could enable

designers to make better decisions when implementing design for attachment. For instance, Walker (2006) proposed three possibly overlapping categories of objects: "functional", "social/positional", and "inspirational/spiritual" (p. 40). If product attachment can be examined based on such a categorical structure it may make design for attachment a more effective method.

The field of product attachment is not comprehensively researched and thus there is a lot of opportunity for development. Many investigations have not explored product attachment from a design perspective, but that is beginning to change. A general continuation of design research on product attachment will be instrumental in moving our understanding of the construct forward.

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