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Product durability for the experience society

Abstract
We live in a society in which products are too easily disposed of, thereby generating an unnecessary amount of waste. Improving product durability is one of the key issues toward creating a sustainable future. Product durability not only depends on physical durability but just as much on the semantic meaning that the product evokes. Semantic meanings are hard to predict and vary widely amongst individual users. Through various design examples I will introduce a new challenge in durable product design: behavioural obsolescence. In future designs of electronic products, designers not only need to find a balance between the material and non-material counterparts, they need to establish product behaviour, which is meaningful and pleasant to the user in the long run.

Keywords
Sustainability, Durability, Product Semantics, Consumer Electronics, Immateriality and Product Behaviour.

1 Introduction

For too long, design has been hijacked by our consumption driven economic system. When the world economic system came to a standstill during the great depression, market pioneers actively persuaded the world to consume its way out [1]. From that point onwards design became an important tool to stimulate consumption, leading the way to designers such as Raymond Loewy, Harley Earl and Henry Dreyfuss to apply design as a way to boost consumer spending through product aesthetics [2,3].
Even today, design remains a tool to encourage consumer spending and will remain so as long as our economic system is based on thoughtless growth. Exactly this growth is one of the most important problems we have to face in the near future. We currently exploit our natural resources at alarming rates, consuming substances, which took millions of years to form, in a matter of decades. It is inevitable that major changes will have to take place in order to create a sustainable world.
As designers we can contribute in many ways; in this paper I will discuss the design challenges we face to discourage reckless consumerism by improving Product Durability within a future generation of products.

2 Product durability

2.1 Durability as a sustainable issue

Our Western civilisation and the designed world it has brought forward have initiated many problems that threaten our natural environment. For a long time we have been naïve and ignorant (pollution, diminishing the biodiversity or the depletion of natural resources). In recent years it has become more obvious that our natural environment can turn against us (damaged ozone layer, upcoming diseases or the greenhouse effect).

These natural disasters have stressed the urgency to create a sustainable world.
Product designers carry a high responsibility when it comes to sustainable issues, as their creations require material and energy resources. To diminish the environmental burden, designers could reduce the use of resources for new products, introduce renewable resources where possible or create products that last longer. The latter, is more difficult to resolve [4]. Whilst we can eliminate unsustainable materials and change production processes, the durability discourse requires not only a fundamental change in the product's *physicality* but also in the way we *perceive* products.

2.2 Physicality

Most companies are willing to reduce environmental impacts by reducing waste, energy consumption, and material usage, which are all measures that positively reflect their business revenue. However increased product durability implies a prolonged lifetime that is out of tune with universal economic principles of growth. Products that live longer cause a reduction in sales volume and minimise the option for product innovation. In reality, manufacturing products that last longer does not necessarily pose a threat to a healthy economy. Reducing the need for rapid product replacement leads to new services, possibilities to upgrade and above all, it allows products to become prone to aesthetic aging which will ultimately attract loyal customers [5]. Whilst improving the physical quality is a precondition, creating durable products requires more. According to Jonathan Chapman, if we limit ourselves to the physical durability we will simply end up with durable waste [4].

2.3 Perception

Ever since design has become more involved with styling than usefulness and quality, products have become susceptible to styling updates. This brings us to the biggest obstacle toward creating durable products, our drive to purchase new products despite the fact that the products they replace, still work.
Although design has become more related to styling, it cannot solely be held responsible for the lack of product durability. In the 1930's during the modernist period, the role of design was to represent the functional aspects of a product. It soon became clear that such an emphasis on pure functionality would cause a loss of attachment to products [6].
In many ways design offers the possibility to attach oneself to a product. A functionalist design approach may be criticised for not allowing space to create a meaning; yet even functionalist designs, such as Dieter Rams' creations for Braun, may become icons with a very strong meaning to its users [7].
To improve the product's lifetime, it is important that the product represents more than its functionality. Product semantics are an important design discipline that enables further understanding of these complex dynamics.

3 Improving durability

3.1 Underlying factors

It is hard to compare products based on sustainable criteria such as energy consumption, material usage, reusability or recyclability. Even for products of the same category it is difficult to judge the environmental impact because most sustainable criteria are complex and may not produce comparable results [8].
Comparisons are much easier when the product lifetime is considered. Products that last a long time are more likely to be judged the best sustainable choice, with the exception of products that consume a substantial amount of energy during usage, such as cars, fridges or light bulbs [5]. The lifetime of these energy hungry products may be challenged when they become less efficient in comparison with new technologies.
In general, extending the product lifetime is an important approach toward reducing the environmental burden. However, if product life is such an important issue, why are products replaced at ever increasing rates? Shedroff and Walker name several factors that influence the end of a product's life. These factors vary from disposability, wear, non-reparability, functional obsolescence, technological obsolescence and aesthetic (psychological) obsolescence [8,9]. Most of these are directly linked to the product's physicality unlike aesthetic obsolescence, which is defined by the way we perceive products. I have used this distinction to classify these factors as either 'physical' or 'perceptive' (table 1). For each factor I have added some common solutions on how to improve the product's durability.

3.2 Aesthetic obsolescence

Aesthetic obsolescence describes the urge to buy newer versions based on style differences, caused by either fashion or wear-and-tear. Products that experience

End of life	Cause	How to improve	
Physicality	Disposability	Legislation, Pricing, Inform Users [9]	
	Wear	Use Durable Materials and Stable Technology [8,9]	
	Non-Reparability	Provide Access, Separate Functional Components, Deliver Components [8,9]	
	Functional Obsolescence	Create Multifunctional Products [8,9]	
	Technological Obsolescence	Provide Upgrades [8]	
Perception	Aesthetic Obsolescence	Hard Qualities:	Simplicity, anti-Fashion, Aesthetic Aging [16]
		Soft Qualities:	Individual Meaning, Stories, Memento's, Tailored and User Inspired Design [5,13,15]

Table 1. Factors that influence the end of a product's life [8,9,10]

aesthetic obsolescence are disposed of for the reason that, the semantic meaning of the product has changed despite the fact that it may be in perfect working order. In terms of product semantics, aesthetic obsolescence is based on both the symbolic functions of the product and the meaning it generates to its user (cultural, social, technological, economic or ecological) [11,12].
According to McDonnagh & Lebbon the product's functions that evoke emotions can be divided into 'hard' and 'soft' product functions [14]. Hard functions include how the product works, how it is constructed and what materials it is made of. Soft functions include intangible qualities such as emotional bonds, personal taste, touch, smell, feel and personality.
I have used the same qualification to make a distinction between ways to reduce these so-called soft and hard qualities of aesthetic obsolescence (see table 1). For each quality there are a number of ways one can eradicate aesthetic obsolescence [5,13,15,16].

3.3 Reducing aesthetic obsolescence through user inspired design

One could reduce aesthetic obsolescence by creating a unique personal meaning, however this does not imply that every product should be tailor-made. Personal meanings generated by one user can inspire other users to obtain a special product relationship. It is about generating a story around the product to strengthen its soft qualities.
In 2002 I conducted a research project, called "Wearable Dreams" to reveal individual relationships between users and their wearable objects [13]. The aim of the project was to develop a method to create new objects based on a unique user-inspired story that would harness personal meaning. In the project I challenged 20 subjects to reveal their personal relationship with one of their favourite wearable items. Each subject was asked to write a story unearthing the special bond they had with their favourite piece of clothing. I used these stories to generate new wearable items not necessarily of the same product type.
One of the outcomes was a Compass Coat that indicates north through electroluminescent embroidered wires (figure 1). Each wire signifies a plant that becomes active when facing north.

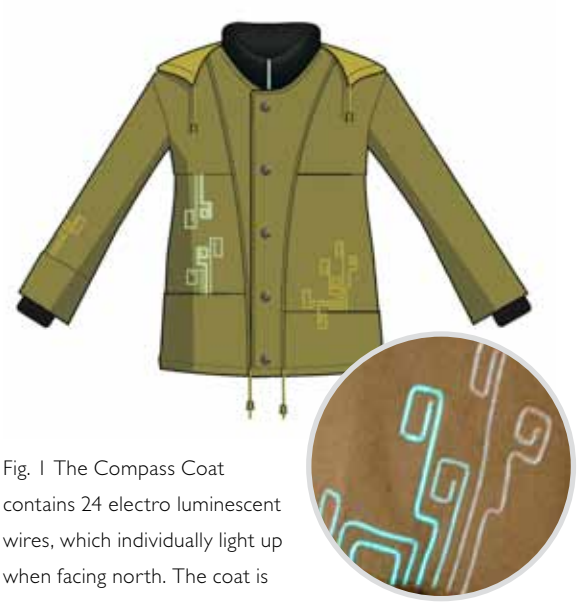

Fig. 1 The Compass Coat contains 24 electro luminescent wires, which individually light up when facing north. The coat is inspired by the moss that grows on the side of a tree which gets most rained upon (major wind direction).

The coat was inspired by a subject's story about using natural elements to find your way home when lost:
"Lost in a new cultivated forest where every tree is planted in regular rows and every tree looks the same.
There is a strong smell of pine. It's getting dark.

Temperature is falling below zero. Dependable Colin knows how to use the side on each trunk on which moss grows to find north..."

The individually inspired approach proved not only beneficial to a single user but also to a larger group of users since it generates a story that facilitates the creation of meaning. It shows that not only hard product qualities, such as shape, usage, construction or materiality create a meaning; also soft qualities such as stories or mementos create a meaning which improves the product's durability [5,14,15].

4 A new challenge

4.1 From durables to consumables

Durable goods are generally defined as products of which the expected lifetime exceeds three years [17]. This definition would mean that mobile phones are consumables since the average life span of a mobile phone is no more than 18 months [18].
The average life span of electronic products is still decreasing, with the newest technologies taking the lead. Research showed that 25% of vacuum cleaners, 60% of stereos and 90% of computers are still in working order when they are disposed of [5]. With the latest technology, life times worsen; most mobile phones, when thrown away, are still in working order [19]. Electronic durables become consumables just like users become consumers.
Instead of improving the life span, fast developing technology has a negative influence on the lifetime of common electric appliances, such as toasters, vacuum cleaners or sewing machines. More electric appliances become electronic appliances through the addition of electronic functions such as timers, programmable settings or status indications. These additional functions make them more vulnerable, difficult to repair and sensitive to changes in technology and style, which negatively influences their lifetime.
A straightforward approach to improve their lifetime would be to reject materiality and strive for immaterial products or services.

4.2 Immateriality

Immateriality has long been seen as a saviour to our material obsession. Many products such as analogue water meters, computer backup drives or books and newspapers have been replaced by an online service or interface. We have to bear in mind that not many products can be transformed into a non-material equivalent and, even if they could, we should be careful not replace the physical product per se but insist on a more meaningful solution.
I have challenged the view of a non-material future in a project called "Message in the Bottle" [21] in which I re-materialised a bygone product, an answer phone, into a new product experience. The answer phone consists of a wooden tray with glass bottles each of which can receive a message, represented by a flickering light inside the bottles, (see figure 2). By using radio frequency technology and electronic tags a new message can only enter an empty bottle; once the user opens a bottle the message will be audible; tilting a bottle will empty its contents. I developed a working prototype in order to share this pleasurable experience, which seemed so different to existing answer phone machines and non-material "voice boxes".

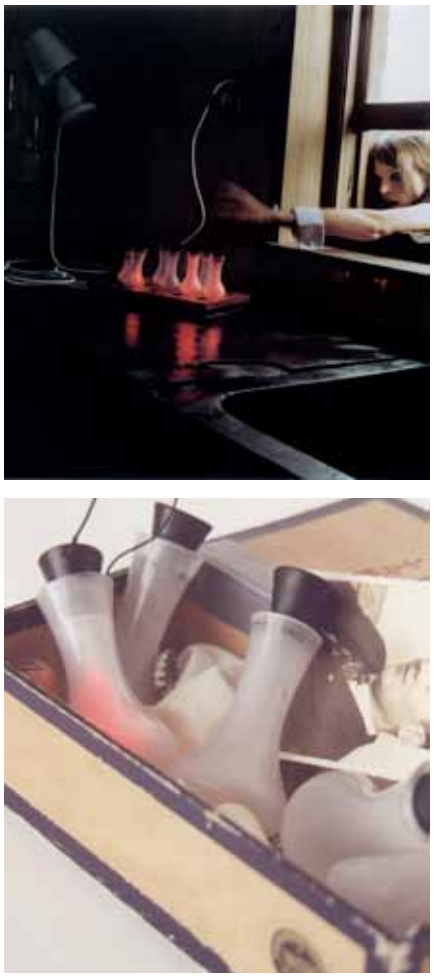

Fig. 2 "Message in the Bottle", an answer phone consisting of glass bottles which capture messages. The product can be experienced through its materiality; users may collect the bottles that contain special messages. In this concept, the non-materiality of voice messages is captured in a tangible object.

Fig. 3 The Birdbox alarm clock; the product consist of a simple box and a mobile phone application.

Fig. 4 As soon as the alarm sounds a video of real birds will appear in the opening. Whilst the product remains simple its interface can be complex yet easy to change or upgrade. The product shows a reduced materiality without compromising the pleasure and experience of a real alarm clock.

End of life	Cause	How to improve	
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Performance	**Behavioural Obsolescence**	**Soft Qualities:**	**Surprise, Mood, Support and Upgradability**

Table 2. Completed overview of Factors that influence the end of a product's life

We need some kind of materiality to relate ourselves to our world. This project aims to demonstrate that simply removing the object itself does not necessarily eliminate the annoyance caused by the object but may actually introduce a less pleasant and meaningful relationship [20,21,22].

4.3 New product relationships

Designers should not feel obliged to replace physical objects with non-material equivalents. Instead they could strive to create more meaningful objects by establishing a balance between the material and non-material counterparts.

Recently new opportunities have appeared with the development of mobile phone applications such as i-Apps. Although many mobile phone applications are developed as an additional function for the phone, the first applications have emerged that derive their true meaning in relationship to an external product.

One of these products is the Birdbox, an alarm clock developed by Luckybite [23]. The actual product is no more than a cardboard box, matching the display of an analogue clock that can be downloaded on an i-Phone (fig 3). When the alarm sounds, whistling birds appear instead of the face of the clock (fig 4).

The Birdbox shows that products can potentially exist in both a material and non-material form. For the Birdbox, the material part is kept simple, light and easy to recycle. By separating the electronic component (which I refer to as the "non-material" part), products can remain simple and functional, which has a positive influence on their durability. The electronic component can be upgraded or replaced when necessary whilst the material part of the product can be reused, sustainable or subject to graceful aging.

4.4 Behavioural obsolescence

It's clear that the meaning of electronic products in the near future is not necessarily attached to their material content. More products will contain technologies that allow them to have a mind of their own, turning the semantic meaning away from the material to the behavioural content.

Product behaviour could manifest itself as a routine, which might be a pleasant reliable relationship but may just as well be a weary experience that challenges the product's durability. I would like to highlight this future challenge by introducing the term *behavioural obsolescence* (see table 2). Behavioural obsolescence manifests itself through the performance or the behavioural qualities we experience when using the product.

To overcome Behavioural Obsolescence designers should develop intelligent electronic products with 'behaviours' that can be supportive, witty

or even moody. When a product always behaves in an expected way it may induce boredom in its relationship with the user.

5 Conclusion

The lack of product durability is an important but difficult problem to tackle. Products with a longer lifetime are easily more sustainable than attempts to adjust the material and energy intake during production. Unfortunately, most products still show a lifetime much shorter than their materiality allows, in particular electronic devices. It is hard to increase the product's durability since it requires improvements on various product levels which involve different players. Firstly, on the physical level, any product has a limited lifetime due to its material components. Products are subject to wear and tear but might just as well be surpassed by a new technology or the impossibility of upgrading or repairing the product. Improving the physical durability involves convincing companies that products that last longer can fit with a healthy business plan.

Secondly, every product carries a specific meaning that is generated by the user. Products are sensitive to aesthetic obsolescence when the user is not able to establish a meaningful relationship. There are many ways to improve designs either through a product's hard or soft qualities.

A new, third improvement is necessary to increase the product durability. As products in general become more intelligent they show a certain 'behaviour', which shapes the relationship to the product's user. To overcome monotonous 'relationships' intelligent electronic products need to be fluid and easy to upgrade. This new challenge can be related to as behavioural obsolescence.

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