Sustainability and Consumption

Design for Longevity and Durability

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ABSTRACT

Global climate change is rapidly increasing. One way to address this problem is a change in consumption and waste management a gradual shift towards circular economy (CE). Consumption rates are accelerating – the way to change this trend is by redefining newness and advertising pre-owned products in the same manner as new products. The symptom of increased consumption is a rapid growth in waste and pollution. When designing future products, it is important to comprehend why some factors and behaviors create a desire to keep a product for longer. In relation to industrial design, the article reviews literature from different scientific disciplines, focusing on the topics of behavioural psychology, novelty and circular economy. Human behaviour is not easily changed, but can be influenced by emotional layering. This is a method used to exploit different emotions towards a product and facilitate attachment and wow factor. Attachment is one of the key factors when designing for longevity and durability.

KEYWORDS: Emotional design, sustainability, consumer behaviour, novelty, attachment, circular economy

1. INTRODUCTION

UN states that climate change is affecting every country on some level, and this is a global challenge. Historically, greenhouse gas emissions are at the highest and are affecting people around the world (United Nation, 2017). Vision and knowledge, together with a change of attitude and behavior is necessary with the goal of working towards a more sustainable future (Kostecki, 1999). Tabloids and social media suggest that being environmental friendly is a trend; some even call it a lifestyle. “Today, people are looking for products that are sustainable and lovable, and it is the job of a designer to create those products” (Ashby & Johnson, 2010, p.2-7). From the perspective of product design a conversion towards sustainability and green thinking primarily requires a shift from “end-of-pipe” technologies (Kostecki, 1999). Circular Economy (CE) is one way of addressing and promoting sustainability and is considered a developing strategy. The strategy is characterized by the circular flow of material (closing the loop). Additionally, the strategy is known to increase the resource productivity and eco-efficiency (Yuan, Bi & Moriguichi 2006). A change in consumer behavior is essential when discussing CE – it will require an extension of a products lifespan, which can be achieved by reuse and repair (European Commission, 2015). The Ellen MacArthur foundation aims to accelerate a transition towards CE across business, government and academia (Ellen MacArthur Foundation, 2017). The charity discusses the importance of a rapid change; “as the global middle class more than

doubles in size to nearly 5 billion by 2030, consumption and material intensity will rise accordingly, driving up input costs and price volatility at a time when access to new resource reserves is becoming more challenging and expensive" (Ellen MacArthur Foundation 2013, p. 6).

This article will further explore and discuss existing literature on human behaviors and consumption; why is it a tendency to crave new products? The increased consumption can be linked to a general craving of novelty and how the brain is programed to seek out newness which triggers a dopamine rush (Bunzeck & Düzel 2006). In terms of longevity, what are the utmost important factors considered by consumers? The author intends to accumulate a broader understanding and the potential of combining knowledge related to consumer behavior and emotional design; what factors are important to consider when designing towards a sustainable future and keeping a product longer?
The motivation behind writing this article is circular economy and a vision to combine the mentality and mindset together with the guidelines from emotional design, and by that figure out the most important factors to keep in mind when designing for longevity, not the throwaway society.

1.1 Methodology

Reviewing literature closely related to the topics of emotional design, behavioural psychology and the human craving for novelty. The research started with a general search before narrowing the scope and search words to a more specific scope. The majority of the literature reviewed for this article consists of contemporary sources with a publication within the past 10 years. The research was conducted in two phases; first getting a better understanding of circular economy and novelty in detail. The second phase focused on emotional design and
consumer behavior and psychology together with sustainability.
The majority of the literature consists of academic papers from the fields of industrial and product design, followed by books written by acknowledge designers, and journals. Google scholar and NTNU´s online library `Oria´ were the primary search engines in all stages of the literary review. When searching for literature, the method was filtering articles for search words and investigating the relation to design. This was done to ensure the relevance to the topic.

2. BACKGROUND

2.1 Sustainability

According to Blewitt there are two branches of sustainability; a redistribution of wealth to developing nations, and a focus on maintaining the earth and distributing and consumeing recourses with a focus on future generations (Blewitt, 2015)
Scholars define sustainability different, and the meaning of the word may be defined related to other topics. However, Kostecki is clear on the fundamental idea; "to manage the earth's resources in such a way as to maintain a global carrying capacity which is ecologically sustainable over time, given the continued evolution of technology and maintenance and the enhancement of the ´quality of life´" (Kostecki, 1999, p. 58). Overall, the definitions are grounded within the same foundation – which can implies that sustainability includes an everlasting and recyclable use of materials.

2.2 Circular Economy (CE)

One way of tackling the environmental issues connected to consumption and industrial production is by embracing circular economy (CE). The theory can be traced back to the late 1970s but has attracted increased attention worldwide since then (Geissdoerfer, Savaget, Bocken & Hultink 2016).
In 1976 Stahel and Ready conceptualized a loop economy with main focus on industrial economy (Stahel & Reday 1976). The contemporary understanding of CE has evolved, and has been influenced and incorporated a variety of different philosophies and theories. Cradle-to-cradle, Laws of

ecology, looped and performance economy and regenerative design are some of the methods which share the idea of closed loops (Geissdoerfer, Savaget, Bocken & Hultink 2016).

The overall goal of CE is disputed as to whether it is an economic or a purely environmental strategy, but the majority of scholars argue the economical aspect (Yuan, Bi & Moriguichi 2006). However, CE emphasize the loop-closing strategy found in German and Swedish environmental policy. The abilities of CE are widely recognized to enhance resource productivity, Eco efficiency and thereby achieve and increase sustainable development and production (Yuan, Bi & Moriguichi 2006) and contribute to the EUs action plan, which is production with low carbon, increased resource efficiency and a competitive economy (European Commission, 2015).

Closing the loops is a descriptive term when discussing CE (see figure 1) – when a product reaches the end of life stage, it will be transformed into resources for others. By looping materials back into the industrial ecosystem raw materials and waste can be minimised. A study including seven European countries concluded that each country could have a 70-percent reduction in greenhouse-gas emissions together with a 4 percent growth in workforce just by shifting to CE (Stahel 2016).

A shift will redefine the values of products, materials and recourses – the aim is to maintain it in the economy (loop) for as long as possible (European Commission, 2015). Currently, some products will not be repaired or fixed as a result of the design, no repair information or spare parts. When practicing CE approach, it is crucial to design durable products by considering repair, upgrades and/or remanufacturing. After purchase, the lifetime of the product can be elongated through reuse and repair, which will reduce and perhaps avoid waste (European Commission, 2015).
To start, this will require a change in the design phase and processes which the European commission consider having a greater impact concerning the waste generation throughout the lifespan of a product, sourcing and resource distribution. However, raw materials and renewable materials are still important in addition to innovative industrial processes which will "allow waste or by-products of one industry to become inputs for another" (European Commission, 2015).

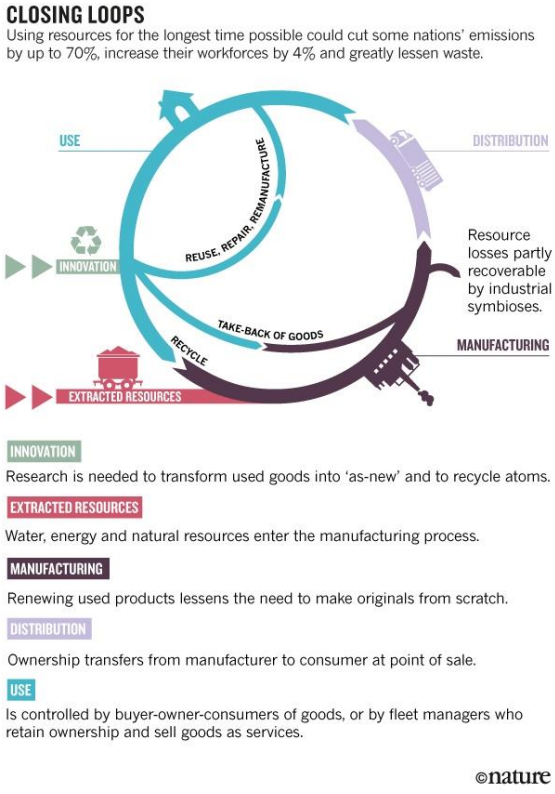

Figure 1: Stahel 2016, p. 436

3. CONSUMPTION

3.1 Global awareness

People are becoming more aware of environmental issues and prefer to buy products that are from a trusted brand and marketed as eco friendly. A global online study performed by nielsen.com shows an increase from 55% in 2014 to 72% in 2015. The younger generations are more willing to spend more money on a product or service if the product is environmentally friendly and from a trusted brand (Nielsen, 2015). This survey is based on participants with online access. The article

"targeting consumers who are willing to pay more for environmental friendly products" conducted a study among environmentally friendly consumers and concluded that 79 percent of the participants are willing to pay up to 40 percent more for the same product if proven to be green (Laroche, Bergeron & Barbaro-Forleo 2001). Both studies suggest a trend and perhaps even a willingness to change.

3.2 Consumer behavior

Research concerning consumer behavior is primarily on the subject of buying behavior. There are several phases concerning the consumption cycle: acquisition, use and disposal (Mugge, Schifferstein & Schoormans 2010). People have a tendency to replace an old product (even if it functions properly) by purchasing a new, depending on the experience and feeling towards the product (Mugge, Schifferstein & Schoormans 2010). Since the 1970s efforts have been made to identify environmentally friendly consumers. There are several factors which have been identified as affecting consumers willingness to spend more money on a green product - "these factors can be classified into five categories: demographics, knowledge, values, attitudes and behavior" (Laroche, Bergeron & Barbaro-Forleo 2001, p. 405).
Consumption may generate validation and enhancement of ones´ self-previsedimage, represent the personal emotion and an indication of social relationships (Laroche, Bergeron & Barbaro-Forleo 2001). Scitovsky discusses the psychological aspect of human behavior – the importance to belong to groups is both a necessity and satisfying. To achieve acceptance within a group, people tend to mimic behaviors of other "members" in order to fulfill their desire for status (Scitovsky, 1992).

Consumption patterns can be referred and linked to materialism; which people associate with image, status values and expressing themselves (Flynn, Goldsmith & Pollitte 2016). Individualism and collectivism are two major factors that impact consumer behavior. Laroche et. al suspects that individualism is not associated with environmental friendliness, but rather suspects that collectiveness trade is more prone to be environmentally friendly and is characterized to "forego individual motivation for that which is good for the group" (Laroche, Bergeron & Barbaro-Forleo 2001, p. 506).
In order to further progress towards a sustainable development a change in consumer behavior is essential. However, such change is proven to be problematic (Cooper & Christer, 2010), as there is no unified theory on social cognition when it comes to economic behaviour (Cruise, van Horen & Mussweiler 2002).

A prolonged life span can be achieved by strengthening the consumer´s attachment of the product. The product is thereby considered to be of a higher value, perhaps be connected to a certain memory, which can create a feeling of nostalgia (Mugge, Schifferstein & Schoormans 2010).
In addition, the consumer must be adequately informed concerning all stages of their prospective purchase – this way they are more qualified to select environmentally friendly products (Cooper & Christer, 2010).

3.3 Craving Newness

Newness and novelty is essential terminology when discussing consumer behavior. "Novelty: the quality of being new, original, or unusual; a new or unfamiliar thing or experience" (Oxford University Press, 2017).

Novelty can be a key factor to understanding why the consumption waste is increasing. Early stage of animal studies has suggested that the level of dopamine increase in the context of novelty (Bunzeck & Düzel 2006). The human brain is hardwired to seek out novelty, where it stimulates the dopaminergic midbrain – which releases the reward chemical Dopamine (Bunzeck & Düzel 2006).

Several parts of the brain are capable of simulate the midbrain - most noticeably the hippocampus and the amygdala. Both regions

have functionality linked to the dopaminergic system. Novelty or newness can quickly become old, boring or normal, leaving us to crave new products or experiences – new gadget, change of wardrobe, visiting a new place, a new activity or sport (Bunzeck & Düzel 2006).
Still, the quality of a product is associated with newness. Characteristics such as caring and long-term use are perceived as undesirable, these are important assets in preserving resources for a sustainable future (Stahel, 2016).

4. EMOTIONAL DESIGN

To accomplish a holistic understanding of designing for longevity it is vital to understand all aspect in relation to a consumer. Emotional design adds different aspects and dimensions and contribute to create a more accurate description of the consumer, which help to further understand the behavior.

4.1 Experienced emotion

Design and emotion has been researched a lot for more than a decade. Scholars have discussed and proposed a variety of theories and methodologies with the purpose to investigate the impact on design. The concept of design and emotion are referred to differently, some use emotional design, others emotion design or even emotionalize design. However, the basic definition of the terms lacks a clear and defined understanding. Usually, scholars discuss the emotion of the end user and not the designers and what emotional aspect they are contributing to the product or design process (HO & SIU 2012). From a theoretical point of view the design process should include three main components: designers, design outcome and the users (HO & SIU 2012).
According to Don Norman there are three levels of emotions (Figure 2) when discussing the concept of emotional design: visceral, behavioral and reflective (Norman, 2004). Visceral comes down to biology, the physical preferences where appearance matters such as touch and feel. Behavioral is about the experience the user undergoes when interacting with a product in the manner of function, performance and usability (Norman, 2004) - “if the performance is inadequate, the product fails” (Norman, 2004, p. 37).
The last level of emotion is reflective which is influenced and varies according to culture, experience, education and individual differences (Norman, 2004).

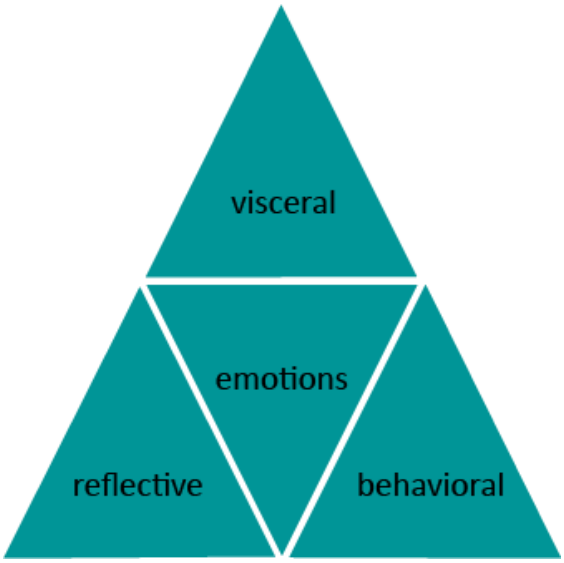

Figure 2: illustrate the three types of emotions defined by Don Norman

4.2 Attachment

The term “attachment” is affiliated with associating stronger feelings towards a product, these can be feelings of connection, affection, love and passion. Additionally, attachment can be described as the emotional bond a consumer experiences with a product. Products are still disposed despite proper function, for instance if a product looks out of date or old fashioned. From the perspective of sustainability in relation to durability and longevity it may be valuable to increase the attachment between the consumer and product - the bond can elongate the consumers interaction with a product and create a desire to keep a product for longer. To stimulate and generate attachment Mugge et al. suggests products with superior utility or appearance (Mugge, Schifferstein & Schoormans 2010).

Furthermore, the paper "Emotional Design; Application of a Research-Based Design Approach" discusses the importance of wow factor and defines it as an emotional experience, consisting of a combination of fascination, desire and pleasant surprise. To create a wow factor emotional layering is used – combining and appealing to multiple layers of emotions. Desmet et al discuss the layering of pleasant surprise, fascination and desire (Desmet, Porcelijn & van Dijk 2007). Implementing the new dimensions of emotions may encourage and strengthen the emotional bond a consumer experiences towards a product (figure 3) (Mugge, Schifferstein & Schoormans 2010).

Moreover, the method encourages desirable products and may result in products with superior appearance in combination with unique utility (Desmet, Porcelijn & van Dijk 2007).

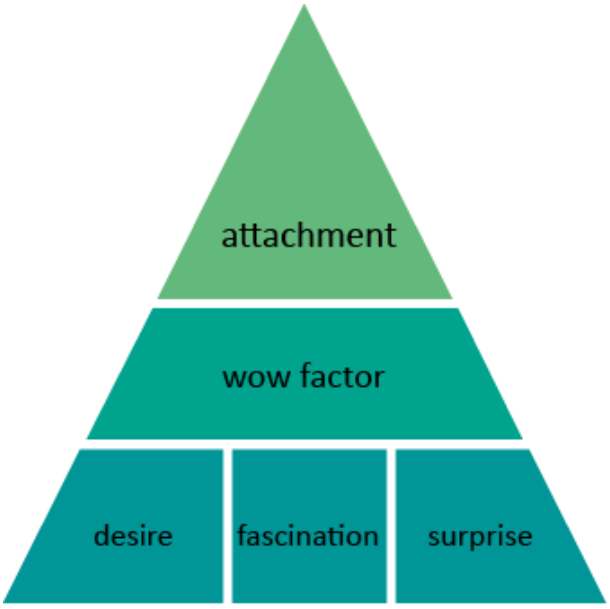

Figure 3: illustrate important elements which facilitate attachment

5. DISCUSSION

This literature review aims to inform the readers about human behaviour, consumption and the tendency to crave new products. In addition, create a broader understanding of emotional design and CE. In terms of longevity, it is vital to identify the most important factors to consider when designing for durable and sustainable products. A considerable portion of reviewed literature repeats similar concepts and references and lack novelty. This creates a recurrence of similar conclusions and arguments mostly founded within the same research. Literature in relation to behavioural studies could benefit for further application of newer methods, one suggestion can be to apply practise theory.

5.1 Circular Economy

CE is a strategy in constant development and the interest has increased around the world. The strategy has evolved by combining philosophies from different methods and theories concerning waste management, environmentally friendly philosophies and closed loops systems. From a sustainable perspective, this strategy is complying and aiming to reduce contamination, waste and redistribute recourses. In relation to the topic and aim of the article, CE is a strategy that will exploit resources in a more feasible way by recycling the material back into the industrial chain and promoting sustainable production. Additionally, a change from linear to circular production will shape and redefine the design stages. CE requires the products to be reparable, easily disassembled for recycling purposes, also the products should mainly be produced from recyclable materials.
However, the concept of designing for longevity is somewhat contradicting human biology. Knowing and understanding the craving for newness - it is vital to include emotional design and strongly consider consumer behavior when designing new products for CE and longevity. The insight has the potential to strengthen the emotional bond and nudge a consumer in the direction of keeping a product longer.

5.2 Redefining newness

When discussing novelty and the way the brain reacts and even crave the dopamine rush is quite clear and homonymous. Scholars agree -

the aspect of novelty is relevant and important during a change towards a CE mindset.
Today consumers associate quality with newness. One example could be fast fashion, which is one segment of the fashion industry. Fast fashion companies exploit an increase of consumers who desires to wear current fashion at a lower cost. The companies are characterized by large inventory with a purpose to sell quick at the lowest possible price. The targeted users are purchasing the product with an expectation and a mentality, which comply with disposal quality. Compared to other segments of the industry fast fashion companies offer new products every two to four weeks, where traditional segments offer new products every three to four months. The business model is created for rapid and high quantity consumption designed to never keep up with the new offerings (Lambert 2014). In order to pursue the CE mindset, a change in human behavior is in order – one way may be redefining newness and facilitate repair and second-hand purchases. Still, products are designed in a way which exclude repair as an option. Providing adequate information about how to repair, where to recycle and how it is made has proved to impact the choice of an environmentally aware consumer.

Newness is everywhere. Advertisement for pre-owned items are often less attractive compared to new items. If pre-owned items were assimilated with the same standard of advertisement and presenting the items as if they were new, it is likely to contribute and boost sales. Additionally, advertisement has a great influence on a consumer, and can potentially impact a redefinition of newness. One aspect can be terminology, perhaps benefit from phrases and words that are not associated with less fortunate, handed or passed down – instead emphasize on positive wordings related to “new for you”, or “good as new”. When advertising pre-owned items and products it is important to consider the emotional bond between the consumer and object, aiming for the wow factor.

5.3 Emotional design and human behavior

On one side, there is “individualism” and on the other side is “collectivism”. Collectivism is considered to be the trait or personality that is more adaptive to change. From consumer behavior Mugge et al. state that a behavioral change is considered to be problematic which get support from emotional design and the desired need for newness.
When encouraging a shift to CE, the targeted group should consist of people with the collectivism trait. In addition, “reflective” from emotional design is an important aspect to consider in combination with social validation where people tend to mimic behavior of others within a group. This combination has potential to change and inspire other in the group – long term it can potentially facilitate change in a greater section of society and keep on growing. For instance, creating a change of behavior in one person may facilitate change in their social network due to the psychological aspect of belonging and validation. Theoretically, the behavioral change will then proceed to spread in the social network of other members of the group.

5.4 Attachment

Attachment has been described as the emotional bond between a product and person. The term comprehends connection, affection, love and passion – these are all feeling one can experience towards a product. Attachment is proven to elongate the consumers interaction with a product and create a desire to keep a product for longer. The product attachment can be affected and related to self-expression (reflective), memories and perceived pleasure or surprise element (wow-factor). Attachment is not a constant state and depends on elements from the behavioral category from emotional design. Appealing to the emotional bond may trigger attachment, which can be connected to nostalgia and is considered to be a key element when designing for longevity.

5.5 Future research

By challenging the existing literature, it can potentially enrich the understanding of longevity and all the aspect that entails.
One objective regarding future discussion and research can be to create a broader understanding of different consumers - perhaps appeal to the different motivations behind a "green consumption". Furthermore, it is important to understand the relations between sharing, attachment, materialism and study why some consumers feel repulsed by the thought of buying used or secondhand product - Is it possible to compensate with another factor to reduce or eliminate the feeling? Regarding the feeling of being repulsed, it is important to further understand the root and extent of the issue. When looking into this matter, it can be beneficial to apply new methods, such as behavioral study together with practice theory as a foundation for future studies and research. This has not been covered in this article.

6. CONCLUSION

This literature review´s main focus was to discover and identify the most important factors when designing durable and sustainable products. The reviewed literature creates a foundation of different scientific discipline in order to understand different aspects of human behaviour.
When designing for longevity the literature review revealed that easy access of information and attachment is the key factor.
Information allows the consumer to get a better understanding of the product, its environmental impact and if it is easy to repair. With a sustainable aim CE is essential, and the closed loop strategy needs to be included in the design stages. Consider all phases within a products lifecycle, design for easy repairs and provide information regarding recycling and how and where a product can be repaired. Additionally, superior appearance in combination with unique utility creates a wow factor, which facilitates the element of surprise. Emotional layering is one method, which is used in relation to longevity – appealing to multiple emotions connected to consumption. The methods enable desirable products and facilitate attachment.

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