

CHALMERS



A User Experience Model of Packaging Design

- Guidelines for designing packages to electronic accessories with sustainable considerations

Master of Science Thesis in the Master Degree Program, Industrial Design Engineering

AJJAR POSAY

Master of Science Thesis PPUX05

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ABSTRACT

Packages have been considered as highly relevant for the whole product experiences because they in many cases are the first physical interaction a person has with a product or brand. Mean while packages are used to emphasize the experience, they also contribute to a high amount of waste generation.

The aim of this thesis was to explore factors in packaging design that influence the users experience and further how sustainable factors can be considered when designing packages with regard to a case study. The case study in this work was about packages for electronic accessories, which are accessories that are used for extending or enhancing consumer electronics.

An extensive literature study was conducted, where a framework was developed from different theories. With the case study, different context mapping methods were used. The data from the empirical studies and the theoretical implications, a model on factors influencing user experience in packages was created.

To apply the model for sustainable factors, an iterate ideation process was done. This ideation generated three different design concepts. These concepts were later on evaluated in an experimental study using eye tracking. The outcomes of the evaluation gave directions on how packaging could be designed based on factors for visual attention and aesthetic principles. The directions could further be used as guidance in future work for packaging design development.

Keywords: Sustainable Packaging Design, User Experience in Packaging, Visual Attention, Eye Tracking.

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A handwritten signature in black ink, appearing to read 'Ajjar Posay', written over a thin horizontal line.

Ajjar Posay

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1. INTRODUCTION

More and more brands are understanding the value in how their products are experienced through packaging. This since the packaging can be used as a tool to market brands core values (Kotler & Armstrong, 2001). It is not only the core products that are competing with each other. The packaging has also been considered as central for the product since it stands for the first physical interaction in the store environment (Löfgren et al., 2008).

A common field in the packaging industry is how packages can optimize their environmental impacts since it in many cases leads to economical benefit (Nordin & Selke, 2010). Furthermore, the awareness of sustainability among consumers are increasing for the industry and so does the demands increase on the companies to find new sustainable packaging solutions (PCW, 2010). As many packages traditionally are design for a short life cycle and are to be disposed after purchase. Therefore, potentials are in finding more sustainable solutions since the packaging has great functions up until the purchase is done.

Project Brief

Berge Consulting is a full-service design agency that has carried out different projects in packaging and is working continuously to develop new methods and analyzing tools for this field. Berge has plans to extend their portfolio with cases for upcoming projects.

The objectives with this thesis was to identify factors that may influence the user's experience of the packaging design in a store environment. These factors were further on explored in the design phase through a case study.

Since the work will be used as incitement for packaging design development, a criteria is that it should be a competitive product on the market, i.e the packaging should be appearing among many different companies. In addition, the packaging need to be appeared in a context were the packaging has a communicative role to potential users and that is considered as a bulk product.

Aim

The purpose of this study is to identify how packaging design within electronic accessories can influence the experience for the user in store environment. This is done through theoretical and methodological research, where a case study will be used to identify incentives for sustainable packaging design.

This thesis aim to answer the following research questions:

- *How can packaging design influence the user's experience in the store environment?*
- *How can sustainable factors be considered when designing packages for electronic accessories?*

The Product Category

In order to address the context and the users further when designing a sustainable packaging, a case as a method was applied. Electronic Accessories were chosen as a reference product category. This because it is a considerably generic, not too complicated product and which is predicted to grow, read further in following chapter about the stakeholders and surrounding factors. Figure 1 illustrates what is defined as Electronic Accessories, which are those products that are used to enhance or elongate existing functions on consumer electric or electronic products. These could be such as laptops, phones, cameras or TV's. Electronic accessories include therefore products such as usb-sticks, memory cards, headphones, computer mouse, HDMI cords and similar.

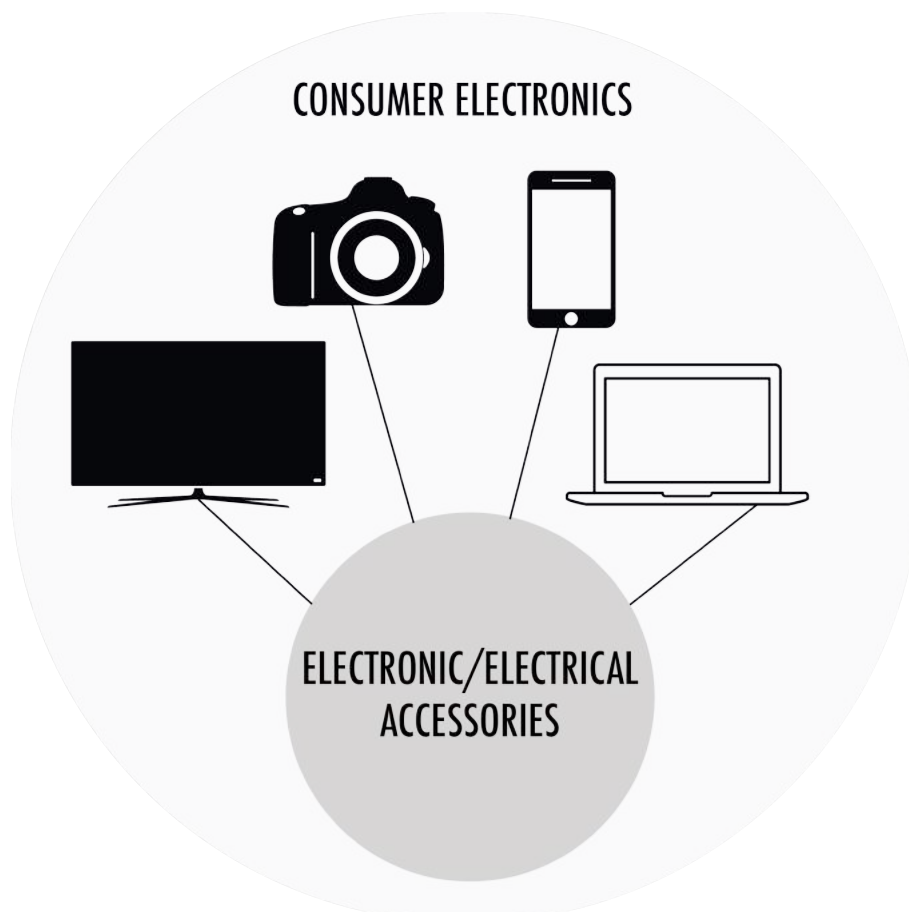


Figure 1. Definition of Case Study 'Electronic/electrical accessories'

Stakeholders

This thesis was carried out in collaboration with Berge Consulting, but there are also other essential stakeholders that influencing the packaging design process. These are illustrated in Figure 1.1 and are: *Government/legislations/policies, Manufacturer, Brand owners, Retailers and the End user.*

Government, legislations and policies

The European Commission is taking the packages waste as a serious issue. This since packaging waste is one of the biggest waste sources for solid waste (Da Cruz et al., 2014). Requirements from the European Commission were initiated in 2009 to limit the packaging waste with the directive 94/62/EC on Packaging and Packaging Waste (EUR-Lex, 2014). See more in section 4.2 Waste Hierarchy.

Manufacturer and Packaging Producer/Suppliers

The production of packaging industry has great interest in new product development, latest innovations and efficient processes. Meanwhile,

Brand owners & Berge Consulting

The interest of being in the lead and creating consumer relations are big for the brand owners. Keeping the costs at low but with high qualities in functionalities is also of importance, where the leading brands are researching in new innovations. The packaging can be used as a tool for brand owners to convey its core values at the same time as they want to create attention at the shelf display from the customer in store (Kotler & Armstrong, 2001).

Working together with the brands, Berge Consulting is a product and service consultant company that is interested in analyzing the topic of packaging design further with new tools and methods. Berge's stake in this project is to gather reference material for future projects. There is also an interest in expanding their project portfolio in packaging design.

Retailers

The retailers facilitate the store environment for the brand owners and the end users, where they can be

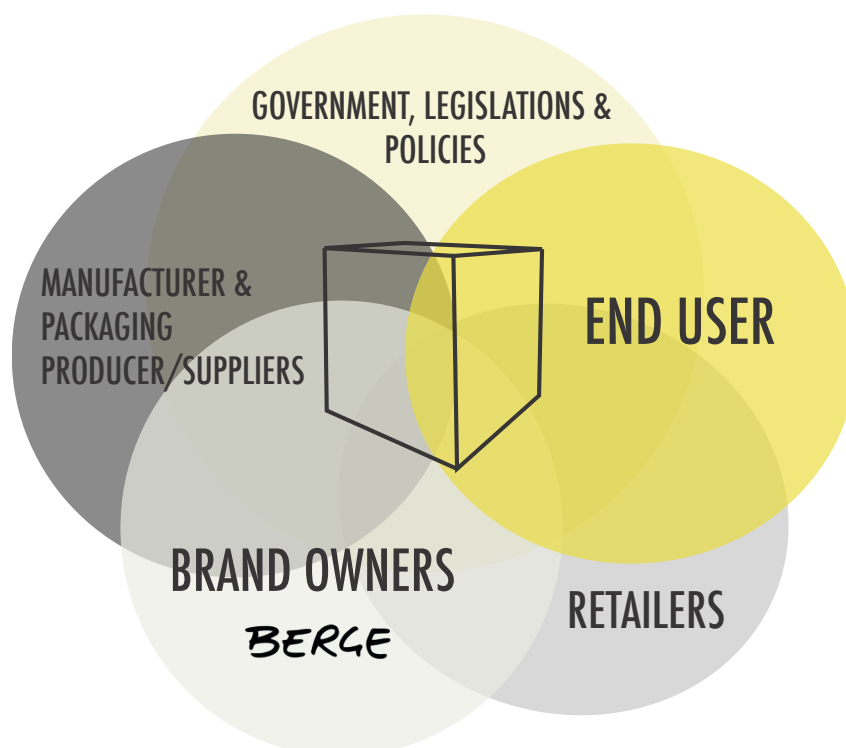


Figure 1.1 The stakeholders involved for packaging design

interested in how the brands are increasing the sales in stores and are dependent on the end users interests. The retailers does also demand and pushes for new technologies. The retailers are working to enhance the shopping experience for their customers.

End Users

The end user is the primary objective for the packages. However, most of the packages are disposed after purchase. According to Elektronikbranschen (2015), the interest in electronics in store has as slightly positive increase. The purchase can be depending on many factors, such as core product, brand or price. The end users get affected by the shopping atmosphere, experience and retail environment (Guy, 1994). According to a trend research by Stora Enzo (2015), more consumers are starting to demand sustainable solutions in general, however some may be unwilling to pay more for sustainable products.

Surrounding Factors

Politics

Awareness among the environment has recently taken large steps, where movements and actions are done. The Climate Change Conference in Paris 2015 was the first time for members of the UN Framework Convention on Climate Change to agreed on a common global climate change target. One of the proposed aim was to keep the global temperature increase at a maximum of 1,5 Celsius (C2ES, 2015).

Another debated concern is the plastics used in consumer products, not only hormone disturbed phthalates but also micro plastics in hygiene products or granulated secondary from bigger plastics. The awareness among citizens in developing countries are increasing, however, even bigger islands of plastics are found in our oceans and micro plastics are changing the environment for living

organisms around oceans. Micro plastics are hard to resolve in nature and are absorbing chemicals which are found in living creatures (GESAMP, 2015).

Although a solution for finding the micro plastics origin has not yet been developed and an increase in social awareness is needed.

Economy

A 50 year global forecast has been done by OECD (2015), which showed a slowed growth in the global economy. Although, according to International Labour Organization the middle class will develop and the poverty will decrease (ILO, 2015). However, the income inequity did in the first decades start to decrease widespread but the consequences of the economic crisis contributed to increase. Also, the global aging population is forecasted to grow, which will have an affect on the labour time span and in turn have an affect on the economic growth (ILO, 2015). Seeing it on in shorter terms the outputs in Sweden are according to OECD (2015) were increasing by around 3% in the year 2015, which will advocate consumption and inflation. Furthermore, has OECD (2015) forecasted that the unemployment will decrease and business investment increase because of increased demands.

Social factors

A prognosis by United Nations Department of Economic and Social Affairs are showing that the birth morality will decrease causing increase in life expectancy (UN, 2013). Also, as mentioned before an increase in an aging population. Further on it will contribute to a new direction for developments and bigger target groups for new product developments, because of increased demands on the market. At the same time, has the interest of new developments shown to increase as well. According to Elektronikbranschen (2015), the interest in electronics in store has as slightly positive increase, from a measurement in Butikscheffsindex (BCI) which is an index based on the employees in some of the biggest electronics stores in Sweden; Audio

Video, Elgiganten, Euronics, Media Markt, NetOnNet and SIBA. 201 store managers all around Sweden answered a web based survey regarding interest based on sales statistics and customer dialogue

Technology

The development in technological innovations are today evolving rapidly, which further improve industrial growth and living standards (World Bank Group, 2016). A forecast illustrated in Figure 2.2, shows the growth in technological devices. The enormous increase in 'Internet of Things' is projected to be a dominant section, in the coming years (Greenough, 2014 in Thinner & Castillo, 2015).

Legislations

Requirements from the European Commission were initiated in 2009 in order to aim for limitations in the packaging waste and promoting the use of waste recovery with the directive 94/62/EC on Packaging and Packaging Waste (EUR-Lex, 2014). The Directive involves all packaging in all materials on the European market, regardless application area.

The directive provide targeted measures in weight and material for recycling or energy recovery. Furthermore, the packages are required to mark the material of use in the packaging to assist classification and identification, as mentioned previously in the stakeholders.

Environment

The environment is another important consideration as consequences for an increasing population. By the year 2050, the world population is estimated to be around 9 billion people and with the amount of carbon-emissions of today the emission needs to be strictly minimized in order to cut down the green house effect. Temperature measurements and analyses done by NASA (2016) revealed that the surface average temperature during 2015 was the highest temperature ever recorded since 1880, which is promoting policy maker to take actions on the environmental issues. As earlier mentioned, some regulations and directions are giving by the European Commission to aim for less wast regarding packages. However, during 2012 each

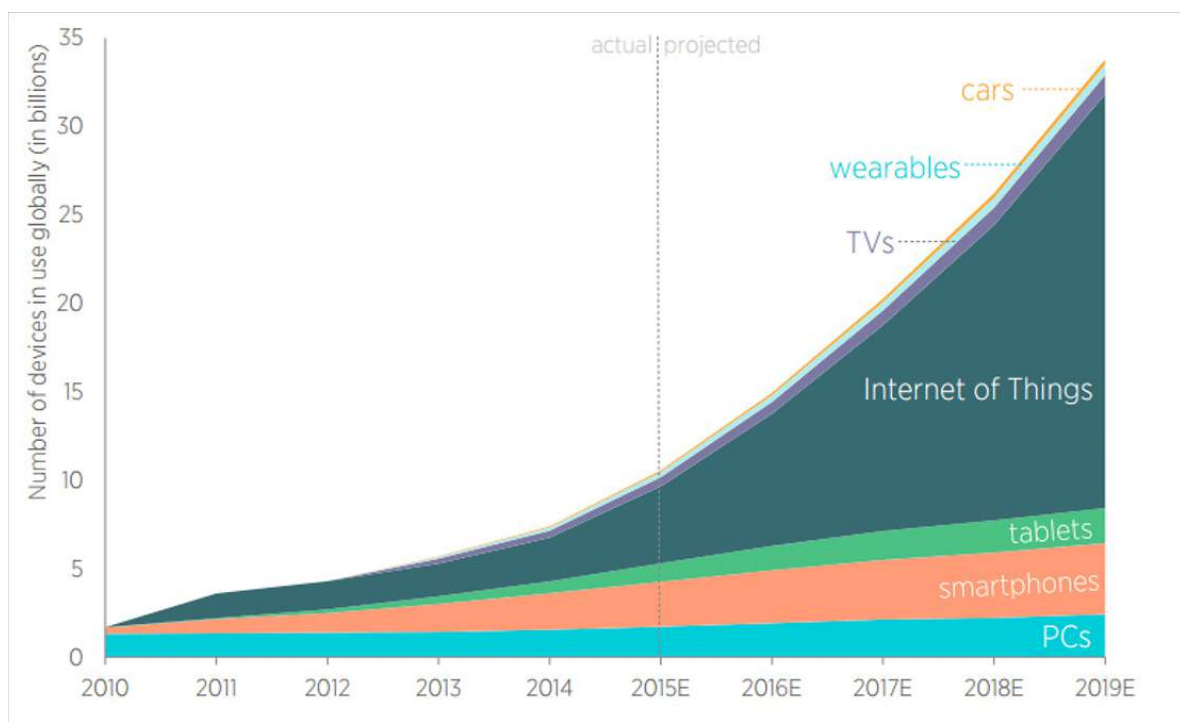


Figure 1.2 The projected growth of technological devices (Greenough in Thierer & Castillo, 2015)

citizen in EU-28 created around 156 kg packaging waste (Eurostat, 2015).

Moreover, a topic that is widely discussed at the moment is the micro plastics and the plastic waste streams polluting the oceans, causing disturbances in the marine ecology. Micro plastics are small fragments of the plastics that are regularly used in products and packages such as PVC, PET, PA, PE, PP and PS (GESAMP, 2015). Recommendations from GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection) are to aim for a decrease use of plastics and controlling the waste of plastics by reduce, reuse and recycle. For further implications on the issue, see Chapter 4. Packaging & Sustainability

Report structure

This report is divided into three major parts; Part I Theoretical framework, Part II: Case: Ideation & Development and Part III: Completion & Discussion, which are illustrated in figure 1. 3. The theoretical framework will address a background research for relevant theories and methodologies to have a fundamental knowledge in for the work in this report. In the second part, a case will be addressed in order to put methods to practice in a context. In the third and last part, conclusions for the work will be drawn and discussed.

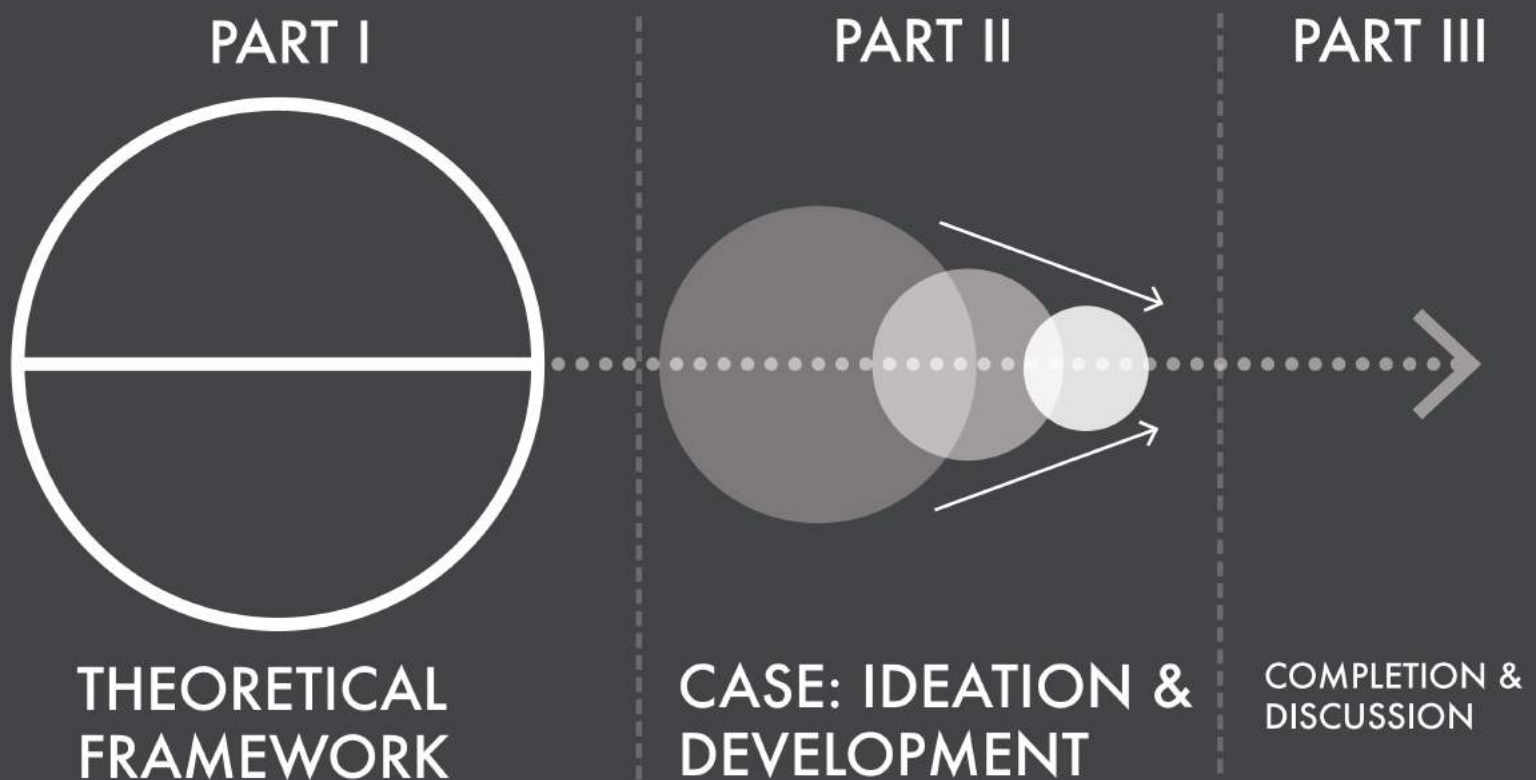


Figure 1.3 The work process and division of three major parts in the report

PART I: THEORETICAL FRAMEWORK

In this part of the report, the theory regarding packages will be addressed. The topics to be researched are: the packaging life cycle, their main functions and the packages' impact on the environment.

2. LIFE CYCLE OF THE PACKAGING

Packaging is mainly used as protection for the core product during the whole life cycle of the packaging. The stages for the life cycle of the packaging is adapted from Verghese et al. (2008). Verghese et al. (2008) mapped 7 stages of the packaging life cycle: *Raw material extraction, Raw material processing, Packaging manufacture, Packaging filled with product, Retail sale, Consumption* and *Disposal*. These were mapped in order to understand the different environmental impacts the packaging has and make them visible.

However, figure 2 is a modification on the packaging life cycle defined by Verghese et al. (2008) where three functional levels are added: *Material Level, Structural Level* and *External Factors*. These were added in order to also understand the functions and the properties on three levels.

At the first stage of the life cycle, the materials are sources where there is a need and specification on the materials properties. For this stage, the packaging has the function of a *shield* on material level, which is the dark circle in figure 2. In the manufacturing, the properties of the structural design are starting to bind surfaces to form a barrier for the core product which could also be seen as a *shell* for a core product. While distributing to the retail store external factors comes to play both at transport but also for storage at the retail store in order to preserve the core products qualities. These are shown in how they are displayed at the shelf in store and packages are therefore becoming a *marketing tool* for the brand. These three defined main functions are further described in the following chapter, *Chapter 3 Packaging & Its Main Functions* in each subchapters. After the purchase, the core product is used and packages are traditionally disposed. The packaging may in the end be reused or recycled for using the materials to make use of the material properties further. The disposed package could also end up in energy recovery or in worst case landfill. The topic of how the packaging and sustainability relates are also to be further addressed in *Chapter 4 Packaging & Sustainability*.

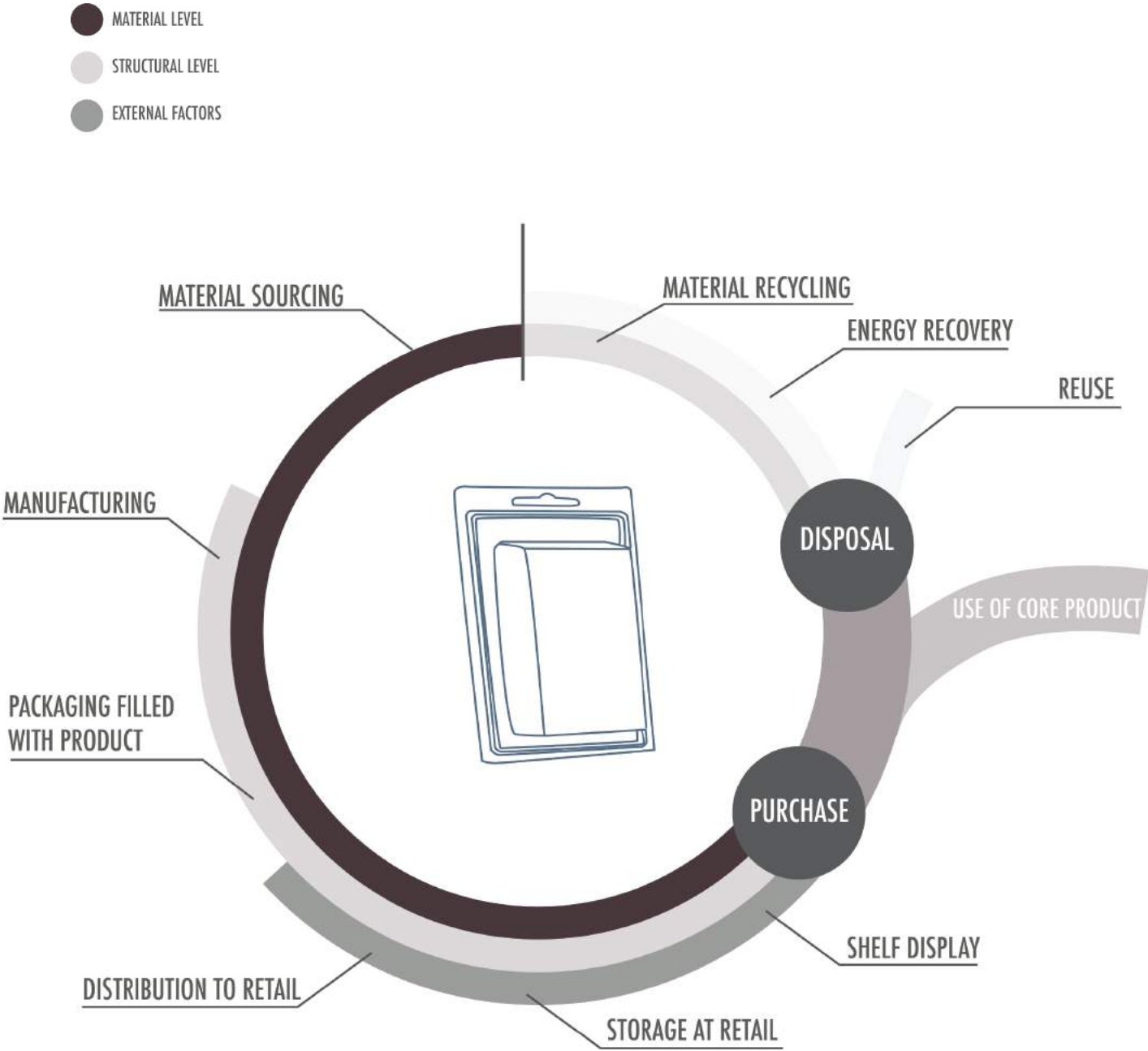


Figure 2 The stages of the packages life cycle adapted from Verghese et al. (2008) with three functional levels for the different colors.

3. PACKAGING & ITS MAIN FUNCTIONS

Packages serve a lot of functions that are needed depending on where in the life cycle of the packaging focus lies and also from which perspective. In this chapter, the different functions will be further acknowledged in order to have fundamentals in packages functionalities and purposes.

The three perspectives that will be addressed are as shown in figure 3.1, the packages function as 'Shield' to protect the core product, as a 'Shell' for the user and as a 'Marketing tool' for the brand.

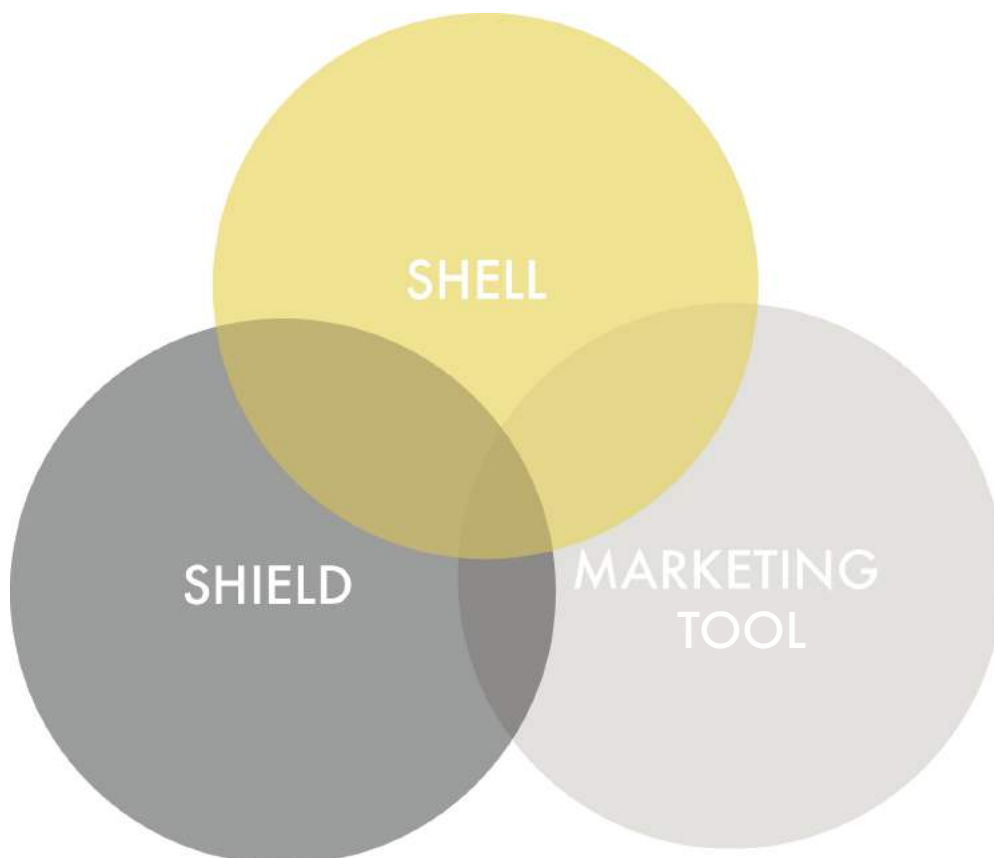


Figure 3.1 The packages main functions

3.1 The packaging - As a Shield

According to Ambrose & Harris (2011) the main purpose for packages is to meet with the practical needs: to "Measure", "Preserve", "Store" and to "Protect". The packaging material is there to protect the core product from any physical damage.

Emblem (2012) defined the most common hazards during the packages life cycle and what usually causing them.

Table 1. Hazards, what is causing them and the possible effects (Emblem, 2012)

Hazard	Causes	Possible effects
Shock	Falls from conveyors, pallets, vehicles, possibly due to poor stacking; shunts due to irregular movement along conveyors; drops due to manual handling; impacts in transit due to driving over poor road surfaces	Breakage; deformation
Vibration	Vibration occurs naturally in all types of transport. In road transport the effects are enhanced over the rear axle of the vehicle, and by any imbalance in the load. Irregular road surfaces also increase vibration	Breakage; scuffing; product separation and/or settlement; loosening of screw caps; garments falling from hangers
Compression – static	Stacking in storage, made worse by damp conditions	Breakage; crushing; load collapse
Compression – dynamic	Clamp truck pressure; severe vibration during transport	Breakage, crushing, stack resonance
Puncture	Poor quality pallets, bad handling practices	Breakage; product spoilage; load collapse
Changes in relative humidity	Loads left outside; goods stored in damp warehouses, or where climatic conditions are not controlled; goods shipped via and to different climates	Product spoilage, e.g. corrosion; packaging failure, e.g. damp corrugated board cases
Changes in temperature	As above	Product spoilage; drying out of paper/board materials;
Exposure to light	Retail display	Fading of product and/or pack; product spoilage, e.g. rancidity
Insects, rodents, birds, dust, dirt	Goods stored in warehouses not cleaned or treated for pest control, or where doors/windows are left open or badly fitting	Product spoilage due to poor hygiene; contamination of product and pack
Pilferage and tampering	Goods exposed to uncontrolled personnel access; display on shelf	Loss of products; damaged packs and products; contamination; counterfeit products

Packaging Material

For the packaging to fulfill the main functions, the material has a critical and important role. Based on the statistics on packaging waste in figure 3.2 by EU (2015), the materials used in packages can be identified. The figure shows that the majority of packaging is around 40% paper and board. Also, according to EU Commission, 57 million tonnes of plastics are produced in Europe each year, where 39% of the weight is packaging and wood including other biodegradable materials are around 15%.

Thermoplastics

The most common polymers are thermoplastics such as the ones listed below and identified by the plastic recycling icon: LDPE, LLDPE, HDPE, PP, PVC, PS, EPS and PET. Each polymer has different characteristics and most plastics are used because of the variety and free degree of densities and properties. Most polymers have good tensile strength and have good barriers to heat, chemical and moisture (Wheaton, 2012).

Paper and board material

The section of paper and boards are mainly divided into three categories: paper packaging, folding box board and corrugated board.

Wood packaging material

Wood packaging material is broadly used in international or national trade, which is packaging such as crates, pallets, wood boxes and dunnage, which is used as protection during the transport. Wood packaging is used to ease the distribution since they have standard measurements for warehouse equipment in the same time as it is easy to build with the required sizes. It is also reusable, recyclable and cost effective (GovUK, 2012).

Metals & Glass

Metal and glass are both used as packaging material for mainly food and beverages.

Bio-based and bio-degradable packaging material

Bio-based materials with biopolymers are starting to become highly developed in order to decrease the use of petroleum based polymers. The future potentials in biopolymers are considered as highly positive because of its properties and that it can be biodegradable (Lagaron et al., 2015). Materials such as biologically based LDPE and vegetable starch used as binders are a few examples. See figure 3.2 for even more. Although, the bio-based materials are still to be developed, since the byproducts, cost and improved properties are still to be improved (Lagaron et al., 2015).

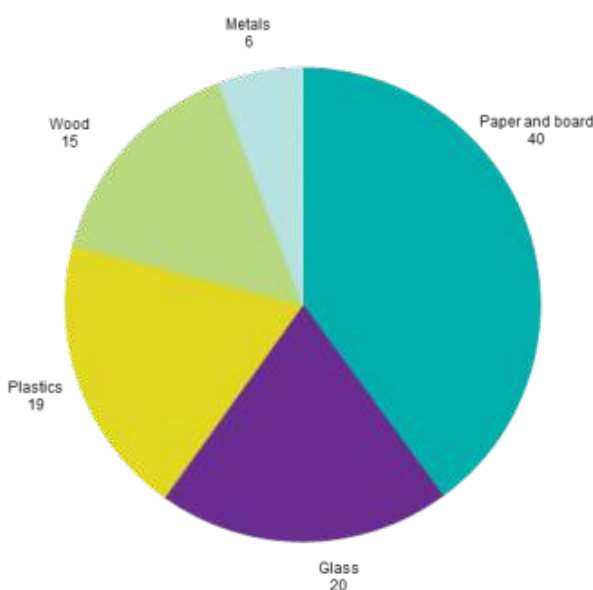


Figure 3.1 Material proportions of packages (EU, 2015)

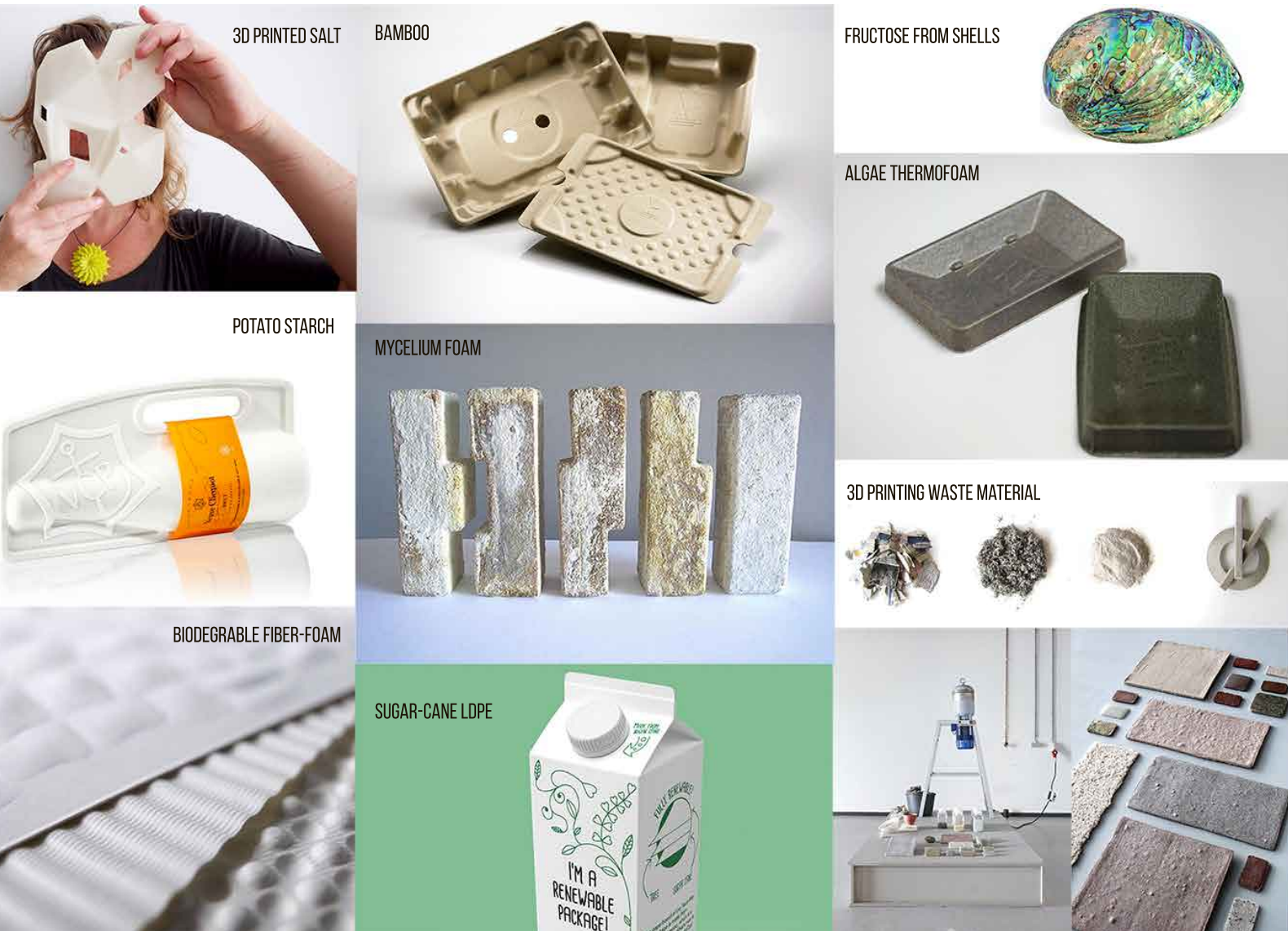


Figure 3.2 Examples of existing bio-based materials and solutions

3.2 The Packaging - As a Shell

In this subchapter the different user experience theories in a packaging design at the store environment are to be addressed further.

Sensorial Inputs & Information Processing

Our senses are our transmitting tools to perceive information about our surroundings and it is debated by many perception theorists that one of the most powerful sense in containing most information is vision (Ludden et al., 2006). How we perceive objects visually and gets exposed by them can be conducted by two characteristic processes; bottom-up, exogenous, or top-down, endogenous, attention (Orquin & Mueller Loose, 2013). Bottom-up processing is when approaching an object based on areas on the stimuli that draw attention based on their properties i.e color, contrast or other gestalt principles such as symmetry. The other perspective to approach an object visually can be top down factors. The perceiver has a task or an intended goal, where she/he searches for the cues to find patterns to build a holistic picture in order to make judgements. The attention can be directed to a

certain location, spatial attention or b to specific features, feature-based attention, depending on the goal (Orquin & Mueller Loose, 2013).

Normans Theory of Emotional Design

Another way of processing information is as Norman's three levels of processing illustrated in figure 3.3. Norman's theory (2004) exists of three levels of processing, Visceral, Behavioral and Reflective. Norman states that all objects are provoking some kind of emotion in order to experience it, however with different amount of generated emotion at the different levels (Norman, 2004). The visceral level concerns immediate and sudden emotional responses that are based on genetical instincts from physical features, as look, feel etc., that triggers emotions. The behavioral level is more related to the emotions generated by usability of the product, where one assess the function and interaction. These emotions are often related to the physical properties such as weight, texture and surface and are at many times subconscious. The reflective level is related to the emotions elicited from the meaning of the product and the observers self-image. The appreciation of an object is dependent in cultural dimensions, i.e what is considered as important or beautiful in the group or culture, based on previous experiences and

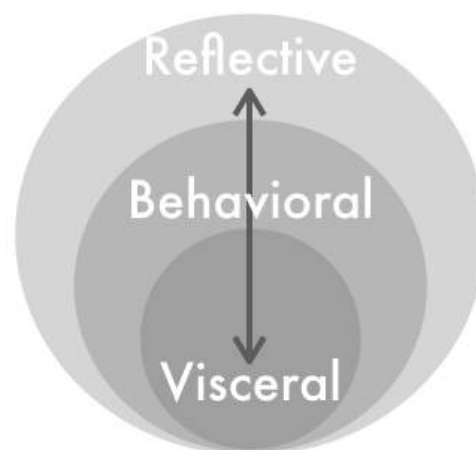


Figure 3.3 Normans three levels of Emotional Design

memories. These emotions are often conscious and could for instance be a product, that could remind one of something from the memory (Norman, 2004).

Visual Attention & Eye movements

The products on the market is well known for meeting high competitions and studies have shown that over 70% of all purchase decisions are made in store right at the point of purchasing (POPAL, 2014). Since there exists a lot of theories on eye movements and decision making, a literature review on 64 studies was conducted by Orquin and Mueller Loose (2013). Earlier studies in decision-making and eye tracking shows that visual attention is connected to the two different information processes mentioned in the previous page, bottom-up and top-down process, see figure 3.4. Bottom-up attention or stimulus-driven attention, is related to four major factors; saliency, surface size, visual clutter and position. Saliency is the way the object is contrasting from its environment, while visual clutter is because the way the eye filter away clutter

(Orquinn & Muller Loose, 2013). Reasonably, the surface size and the position does also affect the visual attention. The top-down attention process, also called Goal-oriented attention, is mainly memory based where factors such as how motivating and relevant the packaging is to ones goals and concerns. Furthermore, factors such as creating interest by novelty but still keeping a balance with recognition.

Many eye-tracker studies have shown that eye movements are a good indication of visual attention, since the durations of fixations have shown to be of different causes. The fixations in the eye movements and information processing has been researched with many eye-tracking studies. Interesting data has been drawn by collect the *Heat maps* and *Gaze plot*, which indicate the sequence and the duration of each fixation at the defined *Areas of Interest*. *Heat maps* are a visualization that has summed up the durations on fixations based on defined areas and the *Gaze plots* are visualization of the sequence and duration by each fixation (Tobii, 2014), see figure 3.5 for examples in both Gaze plot

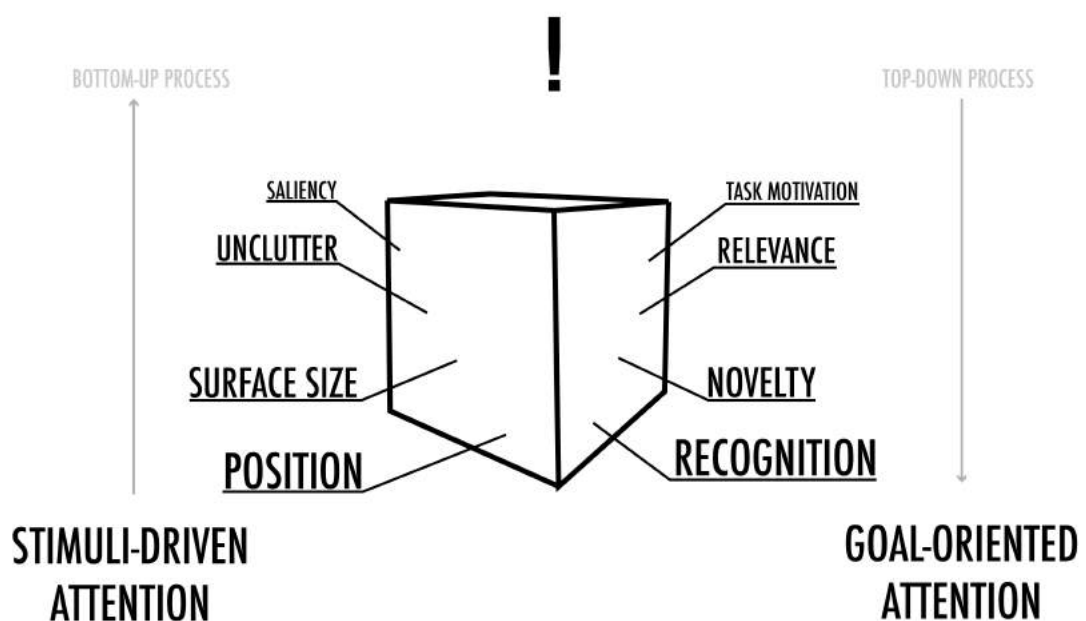


Figure 3.4 Attention based on stimuli and on goals with their factors.



Figure 3.5 An example of a heat map to the left and a gaze plot to the right

and Heat maps from Tobii's User Manual for eye tracker software (2014).

Aesthetic Principles

Aesthetics is one dimension in experiencing objects that contributes to an emotional state (Hekkert, 2006). Hekkert (2006) compiled four features that various theories state what we aesthetically are pleased by in designs from an evolutionary perspective. Figure 3.6 shows the four principles and examples following these principles in packaging designs; 'Maximum effect for minimum means', 'Most advanced yet Accepted', 'Unity in Variety' and 'Optimal match'.

'Most advanced, yet accepted' or *MAYA* is the feature in which a design has a contrast in familiarity and novelty. Humans have from an evolutionary point of view always prioritized safety, but on the other hand are attracted to new unfamiliar objects. The complexity is making the object interesting, but to an extent that it has prototypical features.

One design of the features stated is 'Maximum effect for minimum means'. This feature addresses the matter of when humans see pleasure in getting more for least effort, and when visually perceiving the principle is to understand a bigger context with a small visual cue.

'Unity in variety' is another feature, in which has been debated in early in the history. This means when patterns are to be found, in order to the desire of grouping according to the Gestalt Laws; Symmetry, Similarity, Proximity, Continuation and Closure. These five are the first ones, developed by

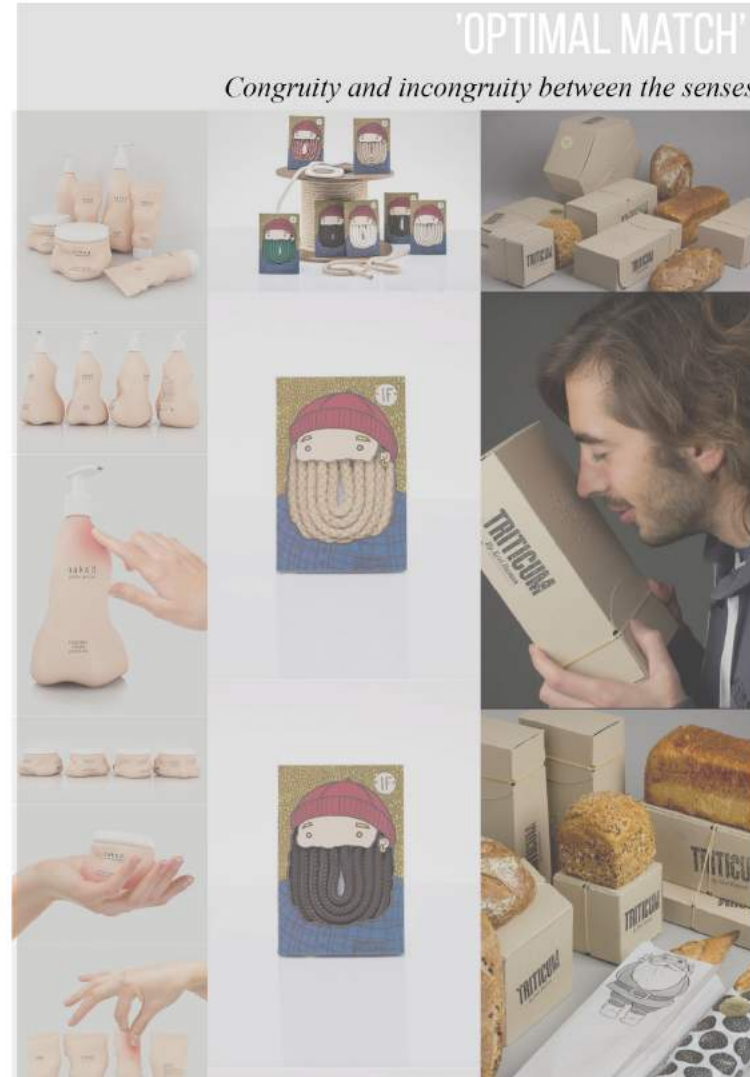
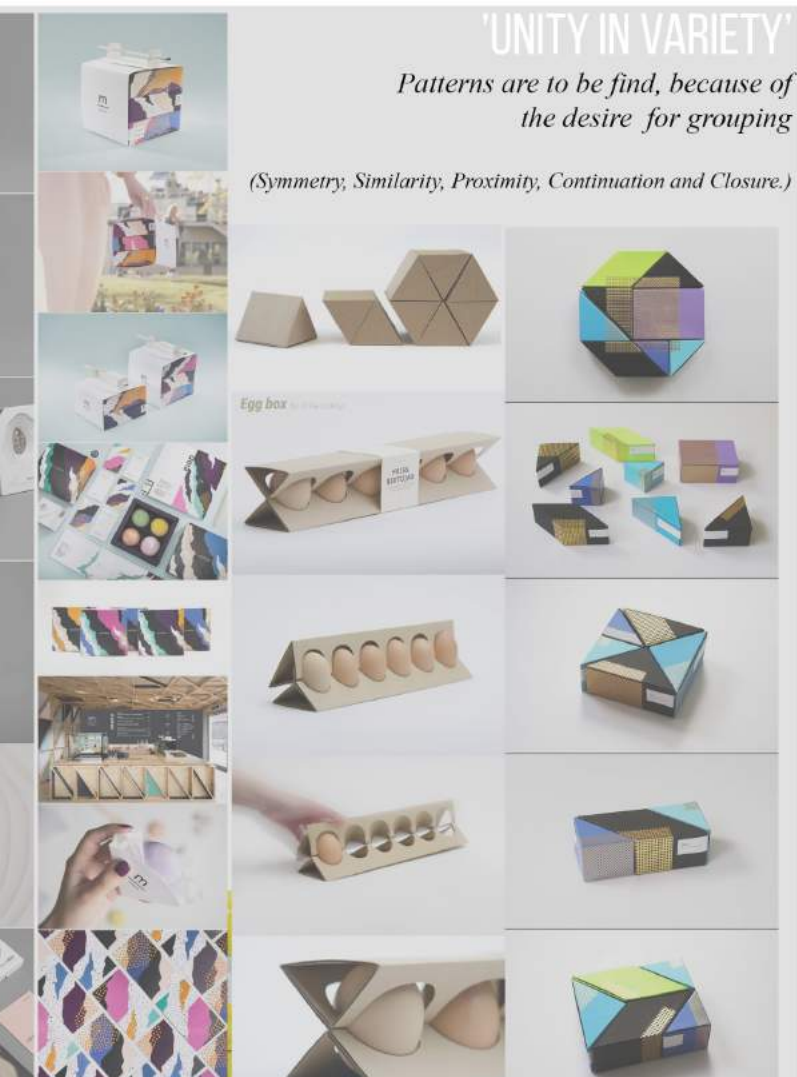
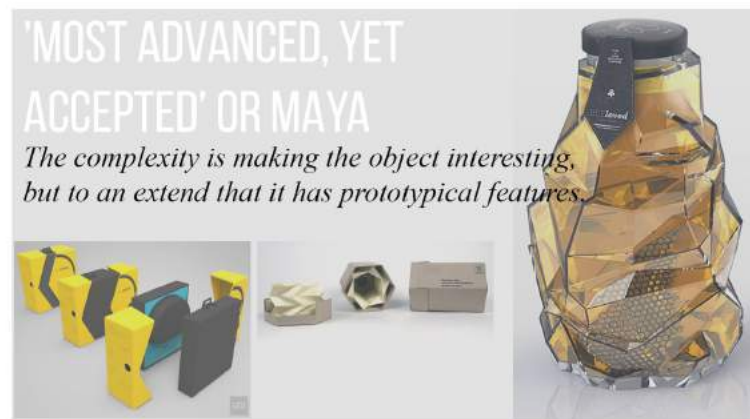


Figure 3.6 Packaging examples of the aesthetic principles

Wertheimer, but has been revised by many other theorists.

An 'Optimal match' relates to the subject of congruity and incongruity as mentioned in previous section 'Visual Attention & Sensorial Design'. The

interdependency of the sensorial inputs should match in order to optimize the experience.

Kano's Model of Attractive Qualities

Design qualities from products has been defined in a model by Kano (2001) and are defined into three different requirements that differs in how well the requirements correspond to the customer's or the user's satisfaction or dissatisfaction. 'Must-be requirements' are the types of requirements that are obvious for the product to fulfill, and should be evident for the customer to not be dissatisfied. These requirements should also be very evident to the user. The requirements that increase the user's satisfaction the more the requirements are fulfilled are defined as 'One-dimensional requirements'. These requirements do however also need to fulfilled as the 'Must-be requirements'. The 'Attractive requirements' are however the types of requirements that the more the requirements are fulfilled the more it would positively surprise the user since it is not

expected (Kano, 2001). These three different types of requirements can be illustrated in a graph, see figure 3.7, with the customer or the users satisfaction on one axis and the amount of requirements unfulfilled/fulfilled on the other axis.

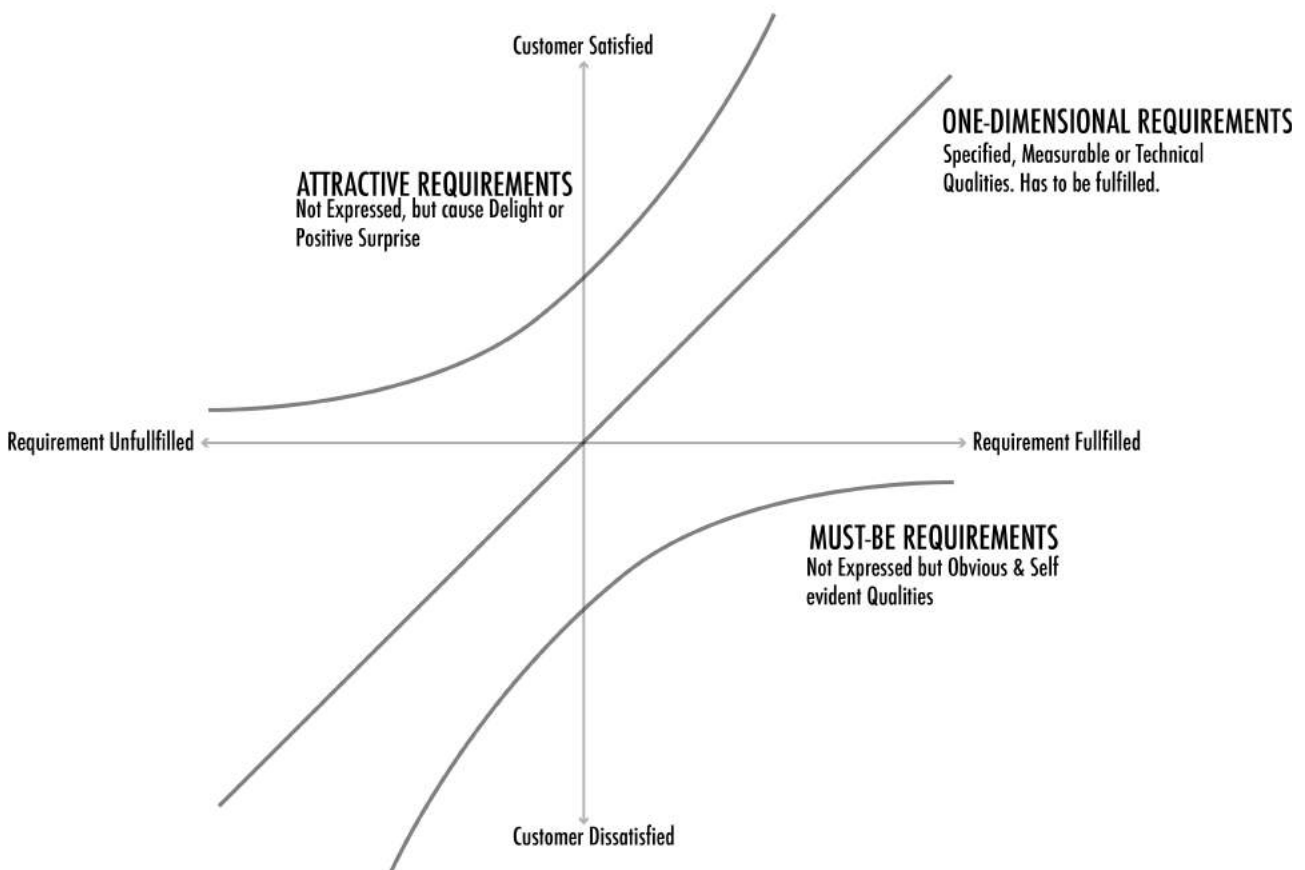


Figure 3.7 Kano's Model of Attractive Qualities

3.3 The Packaging - As a Marketing Tool

In the more recent years, the services of packages has been used as a key tool for marketing brand and to create customer value in order to sell the core product. This chapter will explain further about *Customer Values and the Packaging Services* based on models and studies conducted by Löfgren (2004) and Löfgren et al. (2008).

Customer Value and Packaging Services

Löfgren (2004) view the packaging not only as protection but also as providing a service. Löfgren defined a model, displayed in figure 3.8, that describes the packaging services by two moments of truth where different qualities are expected and effecting the customer's satisfaction. The first moment is at purchase when the decision is to be done where the packaging has the critical marketing role defined as "the silent salesman", which is to express the product and brand values at the first

sight. In the second moment of truth, the package interacts with the customer both physically by open the package and disposed, but also by services it may provide as well. At the two different moments, different expectations, values and concerns will be demanded from the customer. Additionally, when disposing the packaging other qualities are important for the customer satisfaction which in turn leads to a loyalty. Löfgren (2008) also states that the satisfaction from previous moments have an effect on the customer satisfaction also for the latter moment of truth.

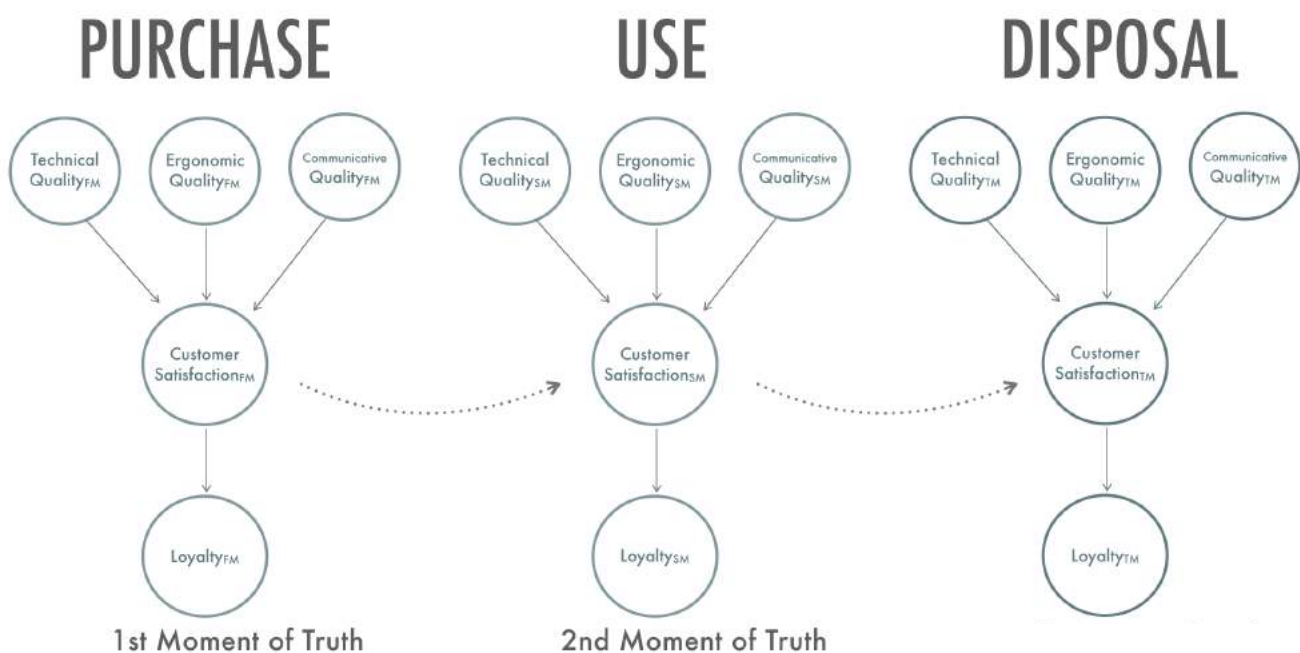


Figure 3.8 1st and 2nd Moment of Truth for a packaging

4. PACKAGING & SUSTAINABILITY

In this chapter, the environmental impacts from packages will be addressed. The definition of sustainability and sustainable packaging is provided, and theories in how to design a sustainable packaging are to be reviewed.

4.1 Sustainability

Sustainability can be defined in various ways. One way to define sustainability is by three pillars: Planet, People and Prosperity, also called the *Triple Bottom Line* (Ashby et al., 2013). According to Ashby et al. (2013), the definition of sustainability is when all three pillars are in balance. These three pillars are highly relevant for products and especially packaging design. This since almost all consumed products are encased by a packaging, making packages as very generic and contributes in most cases to the high generation of waste. According to Da Cruz et al. (2014), packaging waste is one of the biggest waste sources for solid waste.

4.2 Waste hierarchy

In 2008 the European Commission (2016) established a directive of a hierarchy for waste management, called Directive 2008/98/EC, to reduce the environmental impact on waste generated. This is to set goals and put more responsibilities on producers and manufacturer. Illustrated at the top of the mountain in figure 4.1, the highest priority is to reduce or prevent the waste generation by avoiding it in the first place. Secondly, reusing waste by either repairing them or reusing them as something else to make use of the materials that already has been sourced and manufactured. In third place is recycling, which is to recycle the materials in an efficient way. Energy recovery is one of the least favorable ways to manage the waste, since the properties of incinerated materials goes to no use. The least favorable method is to put the waste to landfill, which may have negative impact on the surrounding ecology.

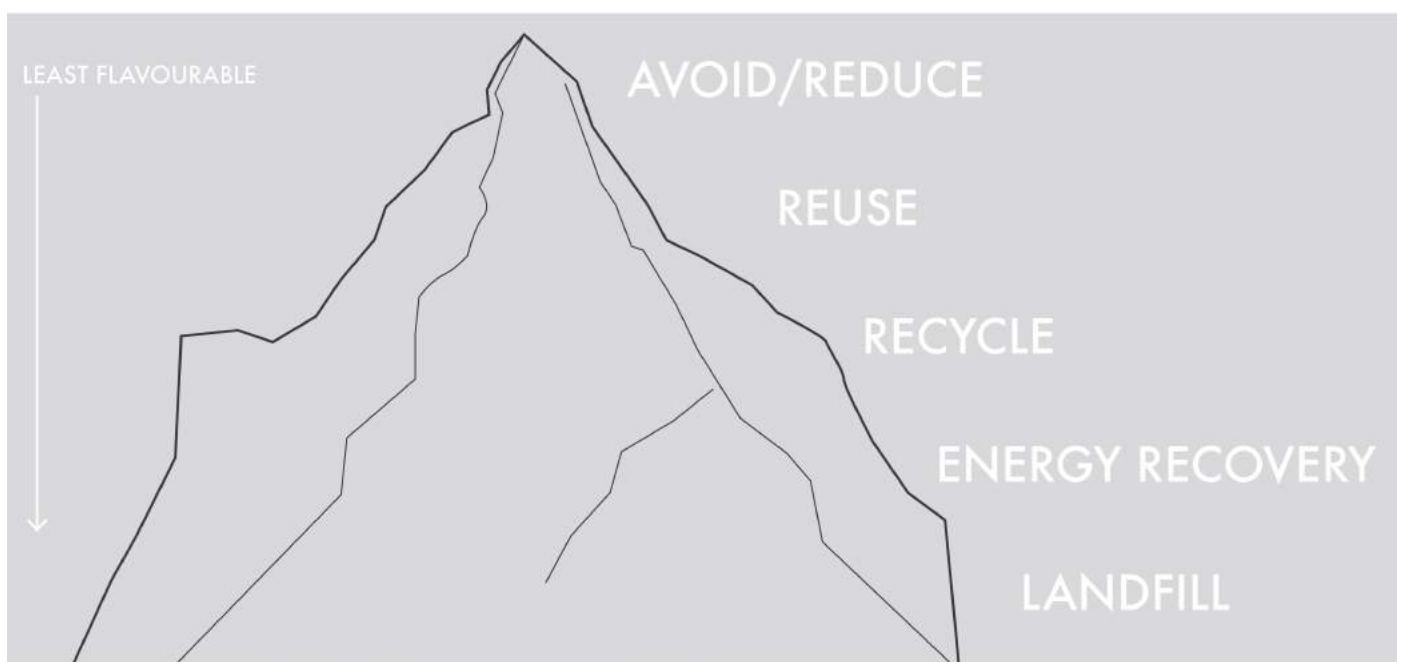
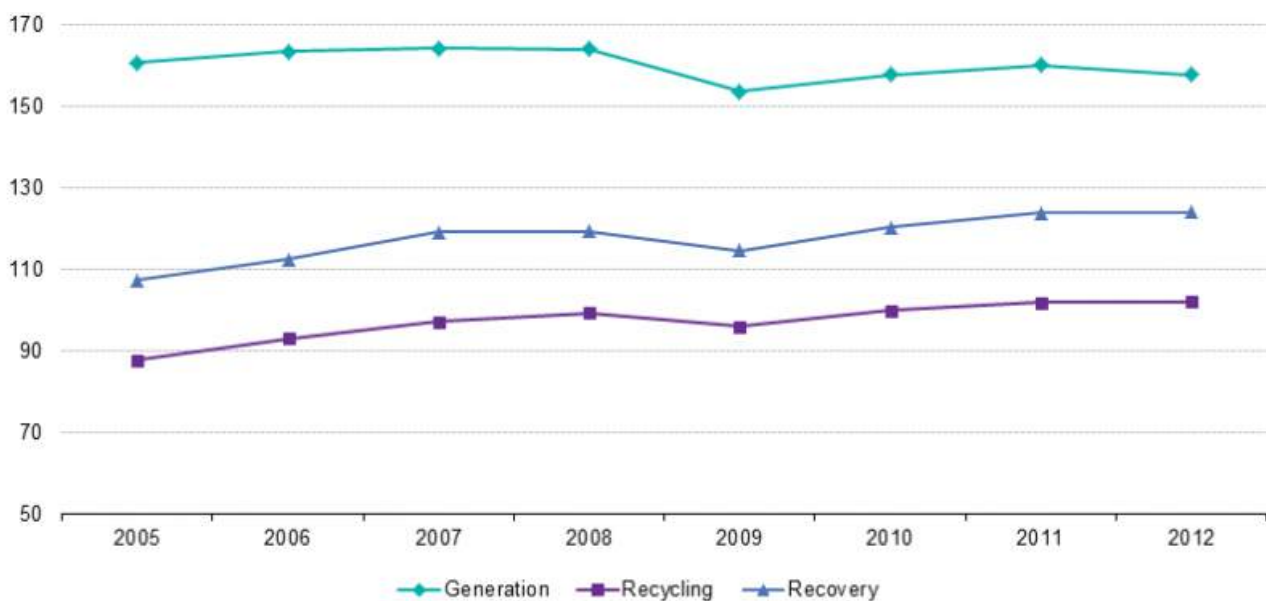


Figure 4.1 The European Commission's Waste Directive 2008/98/EC

Recycling Rates

The European Commission did also establish a packaging waste treatment and directive named 94/62/EC on Packaging and Packaging Waste (EUR-Lex, 2014). The Directive involves all packaging in all materials on the European market, regardless application area. The directive provide targeted measures in weight and material for recycling or energy recovery. Furthermore, the packages are required to mark the material of use in the packaging to assist material identification and sorting. The generated waste and recycling amount in Europe for the past years is shown in figure 4.2. The amount of recovery and recycling has a slow increase in relation to the generated waste, however the generating waste is still high and in 2012 the weight of generated waste was around 156,8 kilograms per citizen in the European Union-28.

In addition, micro plastics are becoming a threat to the marine environment and ecology. A research group from Swedish Environmental Research Institute (2016) had the aim to map the sources to the micro plastics but were found that it was highly difficult since a lot of them are fragments from bigger plastic parts, where plastic waste is one of the contributing categories.



(*) For reasons of comparison, EU-27 data shown also for 2012 although EU-28 is available.

Figure 4.2 Waste, Recovery and Recycling statistics on Packaging (EuroStat, 2012)

4.3 Sustainable Packaging

Seeing the waste stream generated by the amount of packages used, the pressure and responsibility is high for the brands. This in order to obtain sustainability requirements at the same time as compete with other brands and meet the demands of the market. Sustainability is known as complex and multifaceted aspect in product design. According to Verghese et al. (2012) there are four major criteria to consider when designing

sustainable packaging. These criteria are compiled in figure 4.3 and can be used as guidelines when designing sustainable packages.

Zafarmand et al. (2003) studied the aesthetics of unsustainable product design in contrast to sustainable product design. They developed a matrix for seven different aesthetic attributes in relation to different factors contributing to the sustainability of a product (see table 2). This matrix can be used as inspiration or guideline when designing sustainable products.

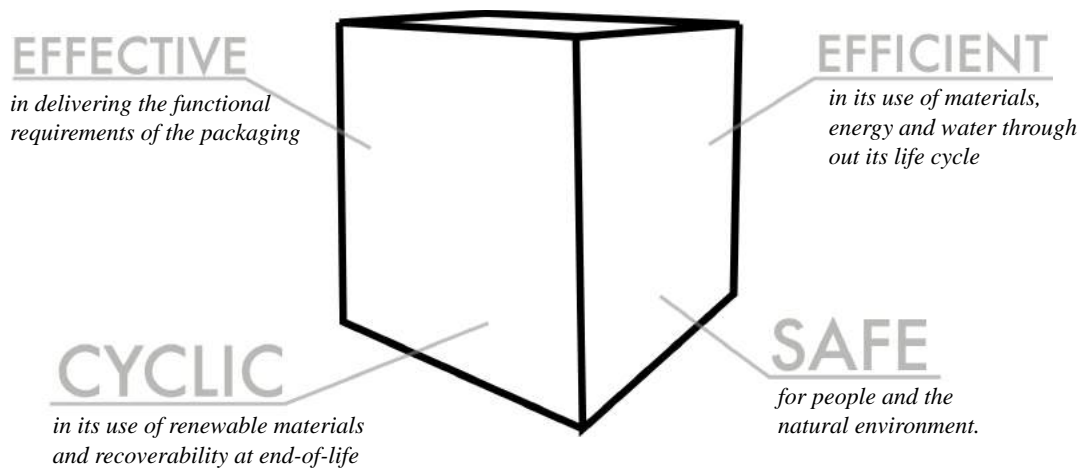


Figure 4.3 The four sustainable packaging criteria defined by Verghese et al. (2012)

Table 2. Aesthetic attributes in relation to aspects of a products sustainability where the black dots are the relations between the attributes and aspects that can be applied in design. Adapted from Zafarman et al. (2003).

<i>Aspects of Products Sustainability</i>	User-Product Relation	User's Environment Awareness	User-Designer Relations	Product Life Extension	Harmony with Environment	Reduced Material/Energy Use	Local Design/Production	Serviceability	Reparability	Renewability	Disassembly	Recyclability
<i>Aesthetic Attributes</i>												
Aesthetic Durability	●			●	○	●		○	●	○		
Aesthetic Upgradability & Modularity	○	○	●	●		○	○	●	●	●	●	●
Simplicity & Minimalism	○	○				●			●	○	●	●
Logicity & Functionality	●	●		●		○			○		○	
Natural Forms & Materials	●	●		○	●		○					●
Local Aesthetic & Cultural Identity	●		●	○	●		●					
Individuality & Diversity	●	○	●	●			○	○				

4.4 Design Strategies for Sustainable Behavior

The concept of designing for sustainable behavior is when a product is designed for the intended user behavior. Lidman & Renström (2011) have compiled and categorized strategies in designing for sustainable behavior, see figure 4.4. They found five different categories: Enlighten, Spur, Steer, Force and Match. The strategies are further divided into two bigger clusters, the red in the figure represent the strategies which the user is affected by the design and the blue is where the product design adapt to the user. The latter is when a product is designed in a way that the product matches and bear down to the users behavior. An example to this can be when monitors are switching to sleep mode after a use. The categories which are to affect the user behavior are further on divided into directing, where the designer has the most control, or moving, when the user is more in control. Enlighten is a strategy used to provide additional information in order to influence the user to a sustainable behavior to raise the awareness. Spur is however more to encourage a behavior by additional motivating

consequences, which can be done by games or competition. In the cluster of directing, Steer is when strategies are addressed to advising the user to a more sustainable behavior and Force is involves the strategies where the user needs to take an active choice for the behavior in which are to be performed.

4.5 Green Washing

The consumer demands for sustainable products are increasing and so does the amount of greener products evolve. According to Terrachoice (2012), the increase in green products was around 73%, where in most of the cases sustainability is considered as eco-friendly. The definition of green washing it that brands are using sustainability as an apparent core value, however these messages from the brands are shown to be superficial and misleading, that do not consider the complex cultural shift. This makes the brands to rather fail than be successfully green, since they stick to the traditional marketing strategies (Rice, 2013).

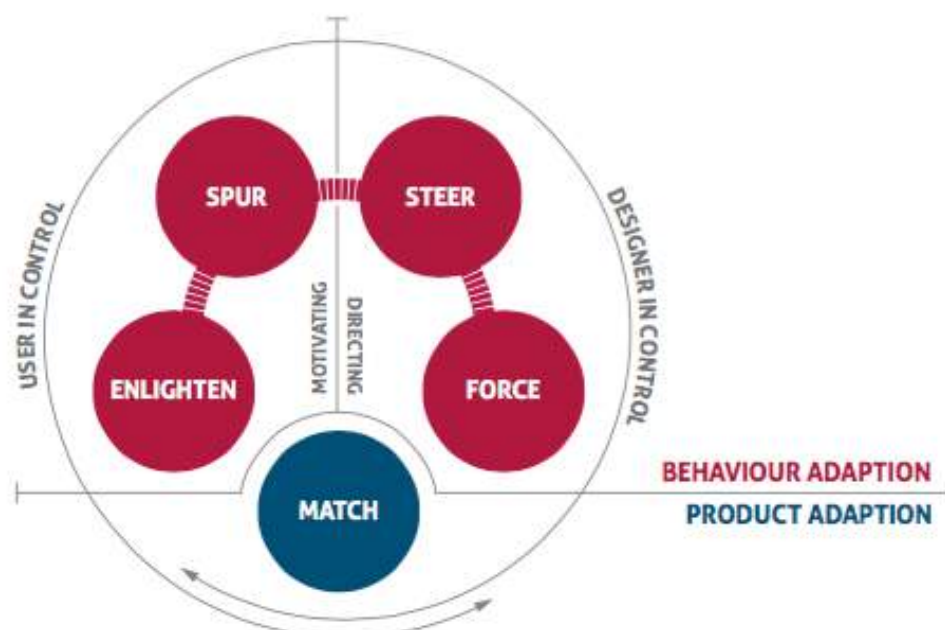


Figure 4.4 Strategies for designing towards a sustainable behavior

CONCLUSION OF PART I

In the previous sections, theories on packaging has been explored. To get deeper knowledge within the packaging user context, some points are still to be further addressed when the roles of packages are integrated in a given context. When packages are designed with regard to their shielding function, an important aspect is to find sustainable solutions that efficiently use materials without compromising properties on the structural level.

Aspects left to explore are how packaging designs could be used to involve the packages to take their environment responsibility, even after the purchase to not only enlighten how sustainable it has been. When focusing on packaging design, it is not only important to consider the quality of the shield, but also how well the design can speak for it self and how well its semantics can contribute to a more sustainable expression. By this, it is necessary to further consider how the users attitudes are on what they considered as attractive in packages in general and also their concerns at the moment of purchase.

PART II. CASE STUDY

In this part of the report, a case will be used as a method to define problems and functions as a basis for a concept development

5. CONTEXT MAPPING

To gain deeper knowledge in what is attractive and desirable for the users, a context mapping was done mainly based on two methods: a web based survey and interview with Repertory Grid Technique.

5.1 Web Based Survey

A web based survey was used to collect information about the general attitudes among users. The survey was filled by 71 persons with different educational backgrounds and ages. The survey was divided into 5 parts (see Appendix A). The first part was general information about the purchased products and the reasons why they were bought. The second part addressed Kano's theory of attractive qualities (2001), where the participants were given different packaging qualities and alternatives to choose what they consider as; a *must*, what is *desirable*, what they feel *neutral to*, what they can live with and what they consider is *okay* and what they *dislike*.

In the third part of the survey, 5 common but different packages were displayed and the participants were to fill in how they would open the packages. The given alternatives were; a utility knife, a pair of scissors, by only using hands, nippers and a comment field if they missed an alternative. The fourth part addressed their recycling behaviors, a question was asked if they used to recycle followed by how they would recycle the 5 types of packages displayed in previous question. The alternatives given were commonly used signs for recycling bins such as; *Hard plastic* (Hårdplast in Swedish), *Soft plastic* (Mjukplast), *Cardboard* (Kartong), *Office paper* (Kontorspapper), *Household waste* (Hushållsavfall), *Combustible waste* (Brännbart) and *Other*. In the fifth, the participants were to write their general opinions about packaging; if they have had any positive and negative experiences, what type it was and why they liked or disliked it. Lastly, a common field appeared if they had anything else

regarding packaging they would like to add. The analysis was made by observing the added proportions and the comments from the questions where the participants could elaborate their experiences.

5.2 Repertory Grid Interviewing Technique

One way for individuals to interpret the surroundings is by analyzing and constructing elements in ways that is unique for each individuals. The Repertory Grid is an interviewing technique used to analyze how individuals are to construct when interacting with objects in order to map key elements in new product development from the customers perspective (Baxter et. al, 2014). The aim with the technique was to find key semantics that users find in packages when first interacting with them and also which constructs are used to describe it.

The repertory grid technique was conducted with 10 interviewees from different disciplines, on an age range of just below 20 to 55. (See interview guide in Appendix B)

The interviews started by introducing 9 products from 3 different categories in 'Electronic Accessories'. The 9 products were to be analyzed in triads, where the first triad was headphones, second was USB-sticks and the third triad was Computer mice. (See products in figure 5.1).

The participants were asked to find similarities between two of the products that differed from the third in each triads until they did not come up with more constructs. After all three triads were asked, the constructs were categorized and grouped into *Objective constructs* and *Subjective constructs*, where the participants were to be asked which *Subjective construct* they found was important when looking

at a packaging. All of the 9 products were then to be rated on a scale from 1-9 based three expressions that was considered of interest; *Sustainable*, *Quality* and *Informative*.

A conjoint analysis was done to find relations between the subjective constructs with the objective constructs.



Figure 5.1 The 9 products in 3 triads used in the RGT. From top left: The first triad Headphones: Product A, B and C, the second triad USB-sticks: labeled as D, E and F, and the third triad Computer Mice; G, H and I.

5.4 Results from Context Mapping

The results from the survey and the RGT are in the following chapter.

5.2.1 Outcomes from Survey

The results from the survey showed the preferable qualities in packages that were considered as attractive and disliked. Figure 5.2 illustrates the answering proportions to respective statements, that was in the second part of the survey. 81% of the participant desired an aesthetically pleasing packaging which was a big majority in relation to 12% being neutral, 5% felt a must, 1% okey and none disliked it. A packaging that is not aesthetically pleasing showed to have two bigger clusters of opinions; 47% felt it to be okey whereas 32% disliked

it. However, considering the majorities on the quality attribute of aesthetics, the combination of the desirable on the functional attributes and okey on the dysfunctional is showed to be an Attractive Quality, in which if appeared is considered as a satisfied surprise and is not missed if not appeared. The results from the property of showing or hiding the content (transparent packaging or non-transparent packaging) was also shown to be an attractive quality. The whole compilation of the survey can be found in Appendix C.

Considering the properties more related to environmental aspects, all of the dysfunctional attributes such as; "Packaging that do not instruct recycling", "Packaging that is made by non-renewable energy" and "Packaging that is made of non-recyclable material" had all a majority of disliking the property and at the same time had the majority in Desirable in the functional attribute.

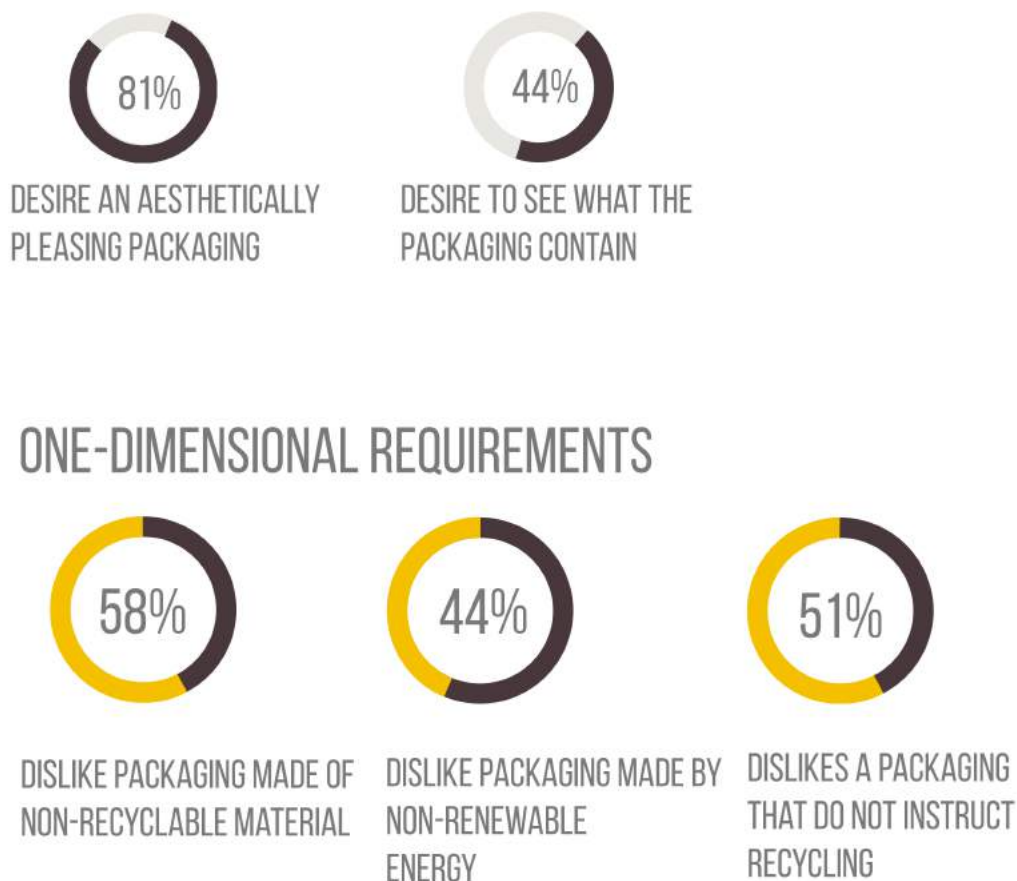


Figure 5.2 Statement proportions of packaging qualities from the survey

This combination is according to Berger et al. (1993) considered as an One-dimensional Quality, meaning that it is a quality that needs to be fulfilled in order to reach satisfaction in the customer. The highest desirability rate was shown in "Packaging made by renewable energy", although, the disliking rate was the lowest among the One-dimensional Qualities and the highest rate of being Okey with the property is a further notice that needs to be considered.

However, the proportions on the answers in "Packaging that is made of recyclable/non-recyclable material" showed to have most people to dislike the dysfunctional attribute and 63% desired a packaging of recyclable material and 23% considered it as a must, whereas 58% disliked a packaging of non-recyclable material, making it the property with highest rates in Desirable/Must among the One-dimensional Qualities.

Different ways to open the packages

The participants were asked to describe how they would open the 5 different packages by the

alternatives; with a utility knife, a pair of scissors, by hand or other. Figure 5.3 illustrates the proportions on the alternatives used when opening packages from the answers in total. The answering rates for heat-sealed packaging showed that the majority of the participants are using scissors when open them. The utility knife does also show to be used even more than using only hands. Considering the packaging where the hands are most frequently used, the paper and plastic boxes showed to be most convenient, though for plastic boxes the amount of people using scissors where more.

Sorting the different types of packages

The participants were asked to fill in how frequently they are used to recycle. The amount of people who recycle seldom was 14% of the participants, whereas the rest use to recycle often (47%) and always (39%). Secondly, the participants were asked to choose which alternative the person would sort the different packages. Based on the outcome, the survey showed that 21% of participants would have recycled the

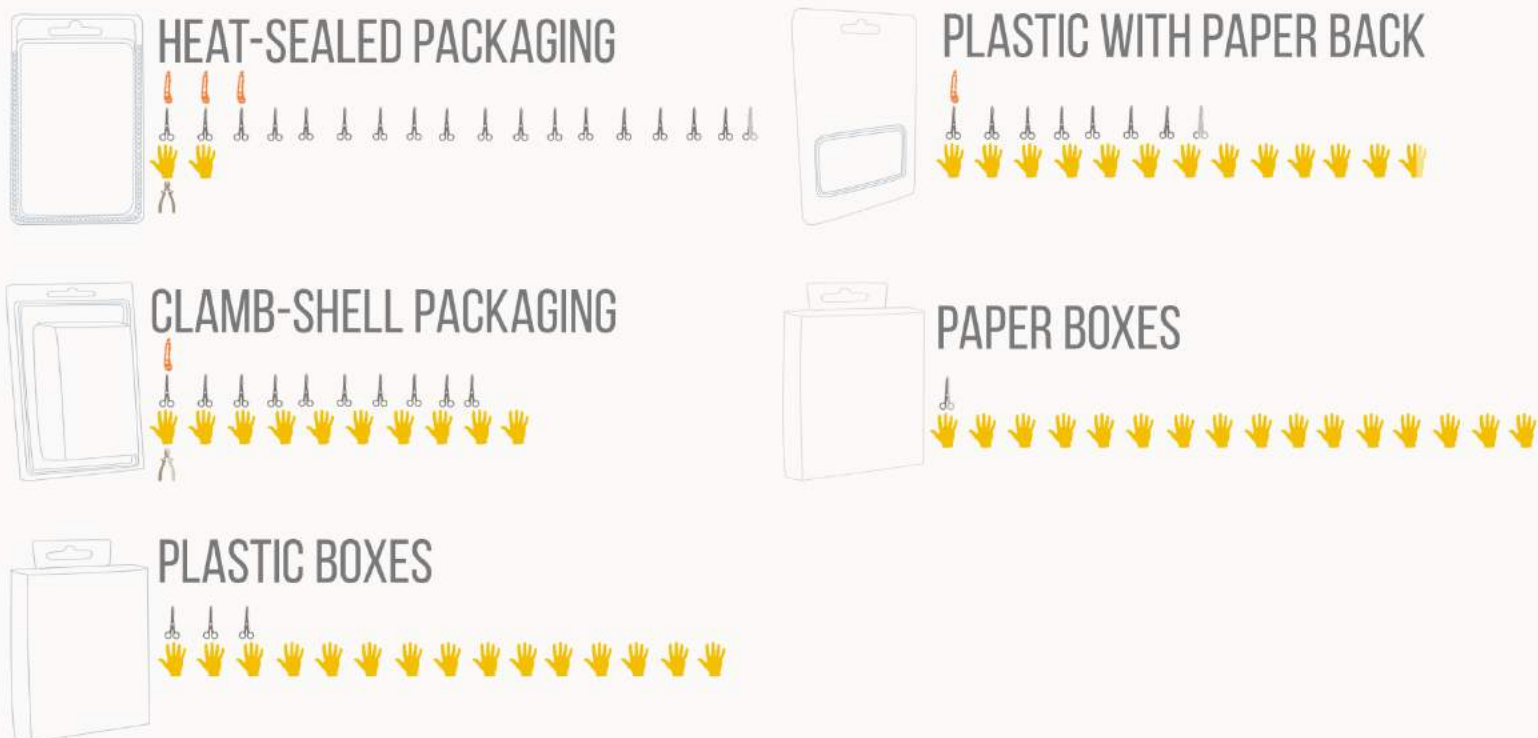


Figure 5.3 Answering division for how to open packages with different characteristics

RECYCLING CONFUSION

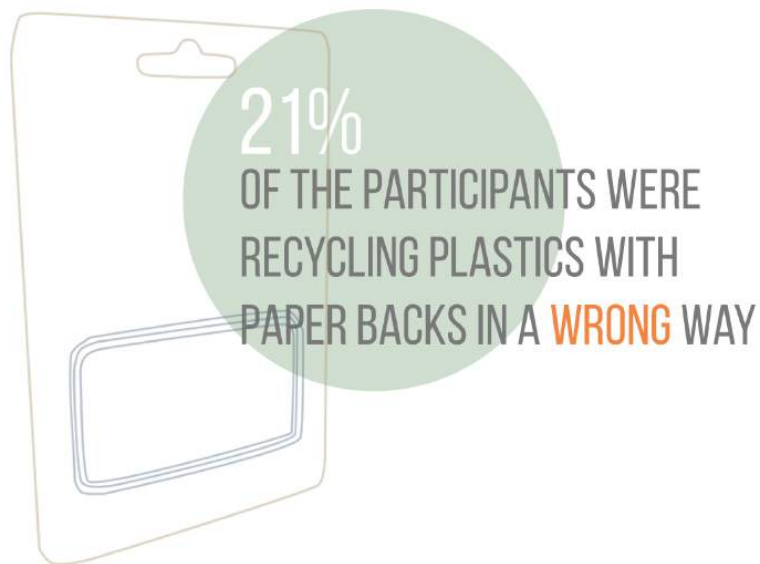


Figure 5.4 The percentage of wrong recycling for paper backs

packaging with plastics and a paper back in a wrong way, also illustrated in figure 5.4, where 13% would have sorted the packaging into household/combustible waste. This was also the packaging having the largest spread on the answers. An interpretation to this may be that the recycling of different packaging with mixed materials may be considered as confusing for the users. However secondly, 16% of the participants recycled the paper box packaging in the least desired way.

Packaging experiences and additional comments

In the last section of the survey, the participants were asked to comment on a positive and a negative packaging experience. The comments were mapped by grouping them into different clusters with common categories. The headings for positive experiences were: *Additional use, Easy to open, Provide information, Brand enhancement, Aesthetically pleasing Total experience* and *Environmental concern*. The headings for negative experiences were: *Unnecessary material, Difficult to open, Requires a tool to open, Difficult to recycle or reuse* and *Afraid of getting cut*. Lastly the headings for added comments were: *Another use, Environmentally friendly, Lifting the core product* and *A good design*. All comments from the survey can be found in Appendix C.

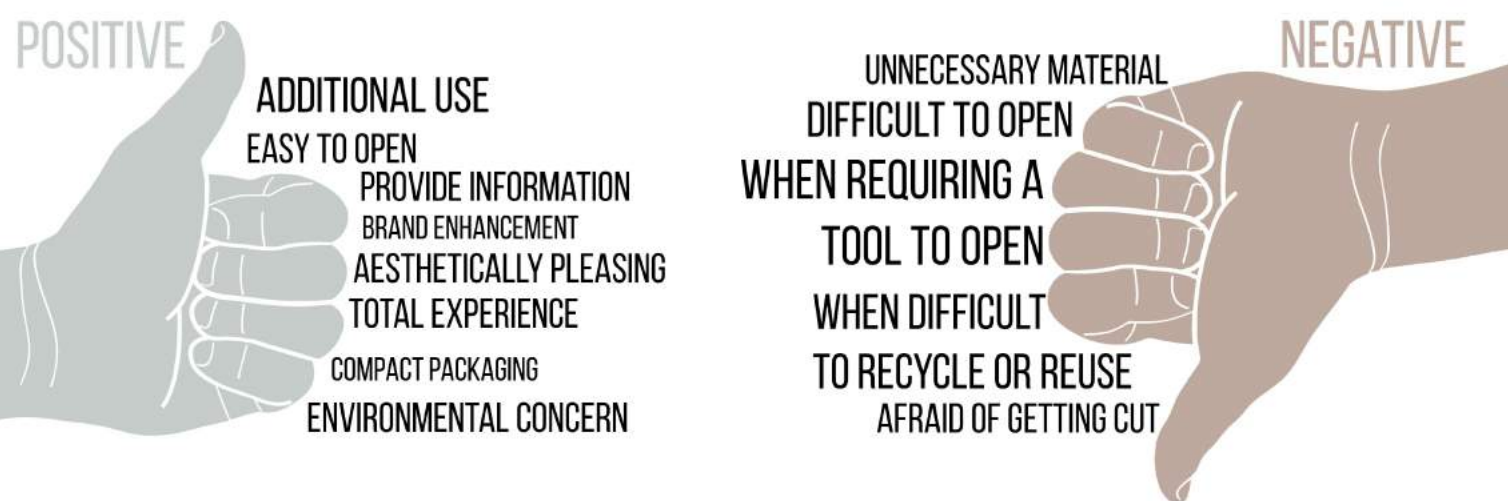


Figure 5.5 Overview of clusters of comments from the survey

5.2.2 Results from Repertory Grid Interviews

Sustainable expression

The products with highest scores on the sustainable expressions were product F and I. Both of the products had paper as the main packaging material. But product F was seen as the most sustainable but had also plastics. A quote from one of the participants that rated F as the most sustainable is: *"The use of material feels very efficient, even if it is plastic"*.

Furthermore, by analyzing the constructs generated by the participants, attributes such as *"clean"*, *"modern"* and other constructs showed to be very related to the graphic profile. Considering the rates that were given in the end of each interview, F did

also got the highest rates in *Quality*, which could also be seen as a related to the expression of *Sustainability*. Quite closely after, product I was scored as the second most Sustainable one. Since I was made entirely of paper board and the construct most mentioned, the material showed to influence a lot to the sustainable approach. This also since G was ranked as the least sustainable and was the physically largest product and contained only plastics with heat-sealed edges.

Informative

Highest scores among all the products were G. 5 of 9 participants generated constructs related to the visibility of the product and its features, whereas 7 of 9 participants commented and wrote constructs related to the infographics being easy to understand and showing only necessary information. These two approaches where also how the participants rated



Figure 5.6 Overview of categories on the subjective constructs and the products A-I from left.

the constructs of being informative, depending on the motives of the participants causing F followed by C as the second and third highest rated ones. F was seen as informative because of the clean and showing only the few information needed in order to understand the products capacity, whereas C was the product showing more features such as mic, aux-cord etc. Furthermore, the three have all distinct colors and contrasts, which can be interpreted as being more clear. This since in opposition, B was seen as the least informative and constructs related to its graphics were in majority. It is seen as very cluttered and messy, since it contain a clear color behind white text and a photography causing low contrast from the background.

Quality

As earlier mentioned, F was rated as the product expressing highest quality, followed by C and I in the respective order. What all three products have in common is that the majority of the packaging have a matte paper finish with distinct colors: F had red against black and white, C has orange against white and grey and I has yellow against black and white. The ones rated as least quality turned out to be E, B & D, where all of them cluttered graphics. E has a vibrant color with a lot of information, B has as also mentioned before a vibrant color, with a lot of text and a photography, and D has also a photography with a lot of information.

The graphs in figure 5.7 shows the 3 triads for the products used in the interview, where each row is one triad with different dimensional combinations. The triads were separated to more easily observe the differences and the characteristics of the packages. The first row shows the headphone category and from left showing a graph on the dimensions: Informative versus Quality, Sustainable versus Informative and Sustainable versus Quality.

Connecting subjective constructs with objective constructs

With both the constructs and the ratings a conjoint analysis could be done to see the relations in what objective constructs that contributed to the different expressions. The grouping of the subjective constructs were combined with each objective constructs of the 9 products and the relations in figure 5.8 could be identified.

It was shown that aesthetically pleasingness was very common for packages made of paper, where also the form and graphics were simple and clean. When it came to the perception of high quality, paper was mostly the main material and clear graphics were also here present, but additionally with black and white colors and a contrasting color. What the test persons experienced as modern were also the paper material but here in combination with clean graphics and the colors of black and white with a contrasting color. Informative was generated by graphics that were clean and clear and also by the form and with the packages made of plastic since it was more adapted to the core product.

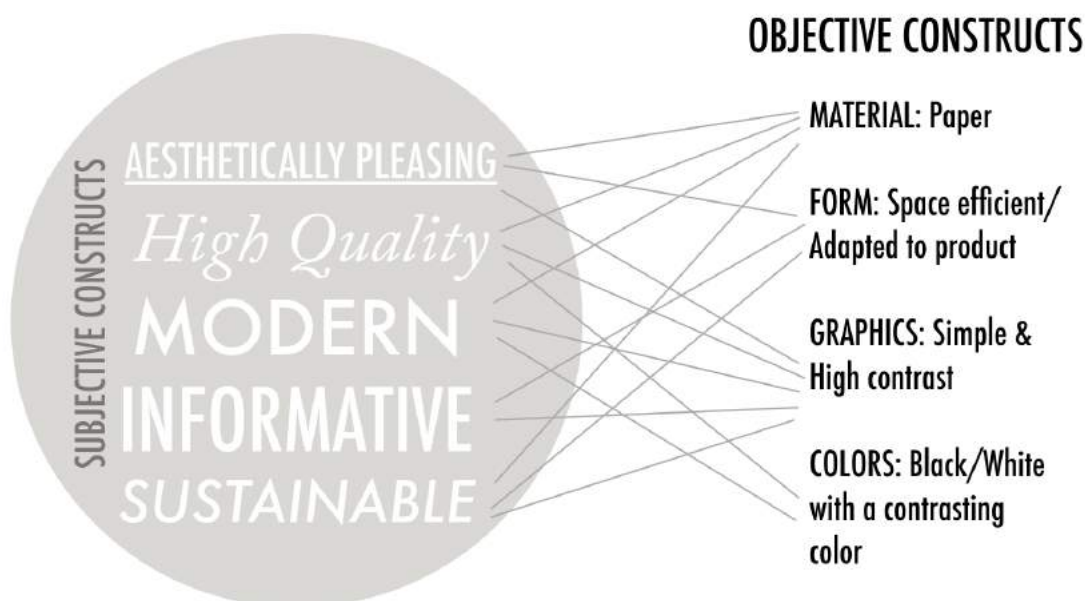


Figure 5.8 Relations identified between technical qualities and semantic expressions

5.3 Conclusion of the Context Mapping

The outcome of the survey showed that the most negative experiences is when opening and disposing the package. Aesthetically pleasing and environmentally friendly packages were appreciated and considered to have positive effect on the users perception of the packaging. The results from the RGT highlight subjective expressions that was considered as relevant to the users, such as: *Aesthetically Pleasing, High Quality, Modern, Informative and Sustainable*. The objective elements in the packages could be mapped as contributing to these subjective expressions. The objective elements were: *Material, Form, Graphics and Colors*.



Figure 5.9 A User Experience Model of Packaging Designs - An Overview of a theoretical combination of Norman' Emotional Design (2004), Orquinn & Muller Loose (2013) and Löfgren (2004) Model of the Packages Moments of truth with empirical data from survey and RGT

A limitation defined here was to continue with only material and form and not on graphics and color, since this may be very brand related.

With theory as a basis, an overview of peoples attitudes and how they are perceiving designs of electronic accessories. Therefore, a model was found in how the different designs could be reflected.

Figure 5.9 illustrates the model in how the packages are perceived and is a combination of theories. At the first moment of truth, designs are processed on the three levels of emotional design by Norman (2004). The attention provoked by these levels can in turn be as Orquinn & Muller Loose (2013) theory of visual attention, stimuli-driven by different factors and goal-driven at the moment of purchase.

Furthermore, the design, reflective, behavioral and visceral, can relate to either the past or the future as being the second moment of truth. For the past, designs can relate to effective transport or production and manufacturing, whereas the future can be more related to the use, reuse or disposal.

These scenarios are further investigated in the upcoming concept development sections.

6. CONTEXT SPECIFICATION

After mapping the context, the context needed to be further specified in order to address the model of

the context. In this chapter, a function analysis, a product category limitation, the user persona and List of requirement will be presented.

6.1 Function Analysis

From packaging theory, a customer journey was made with focus on the packaging functions. The

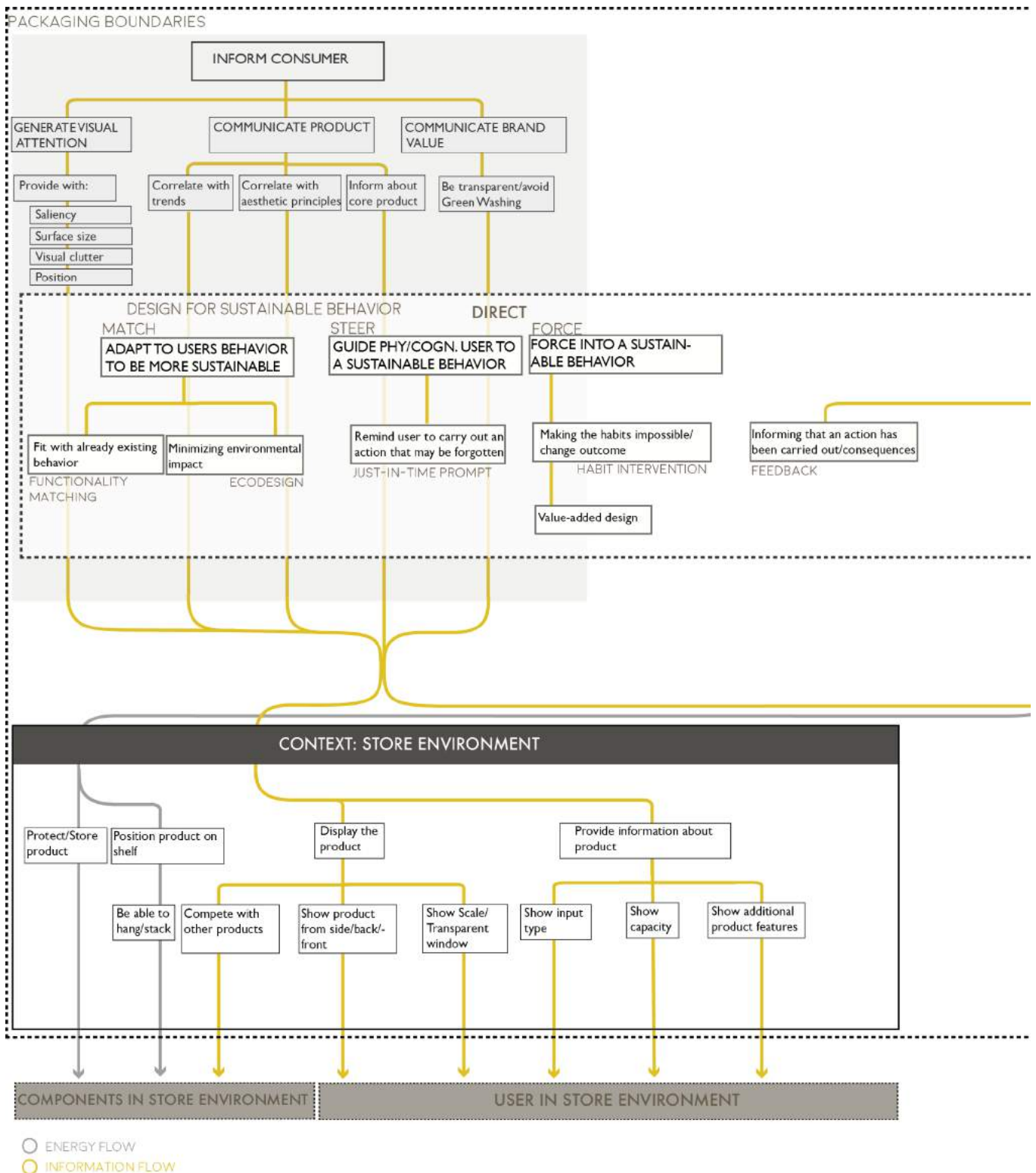
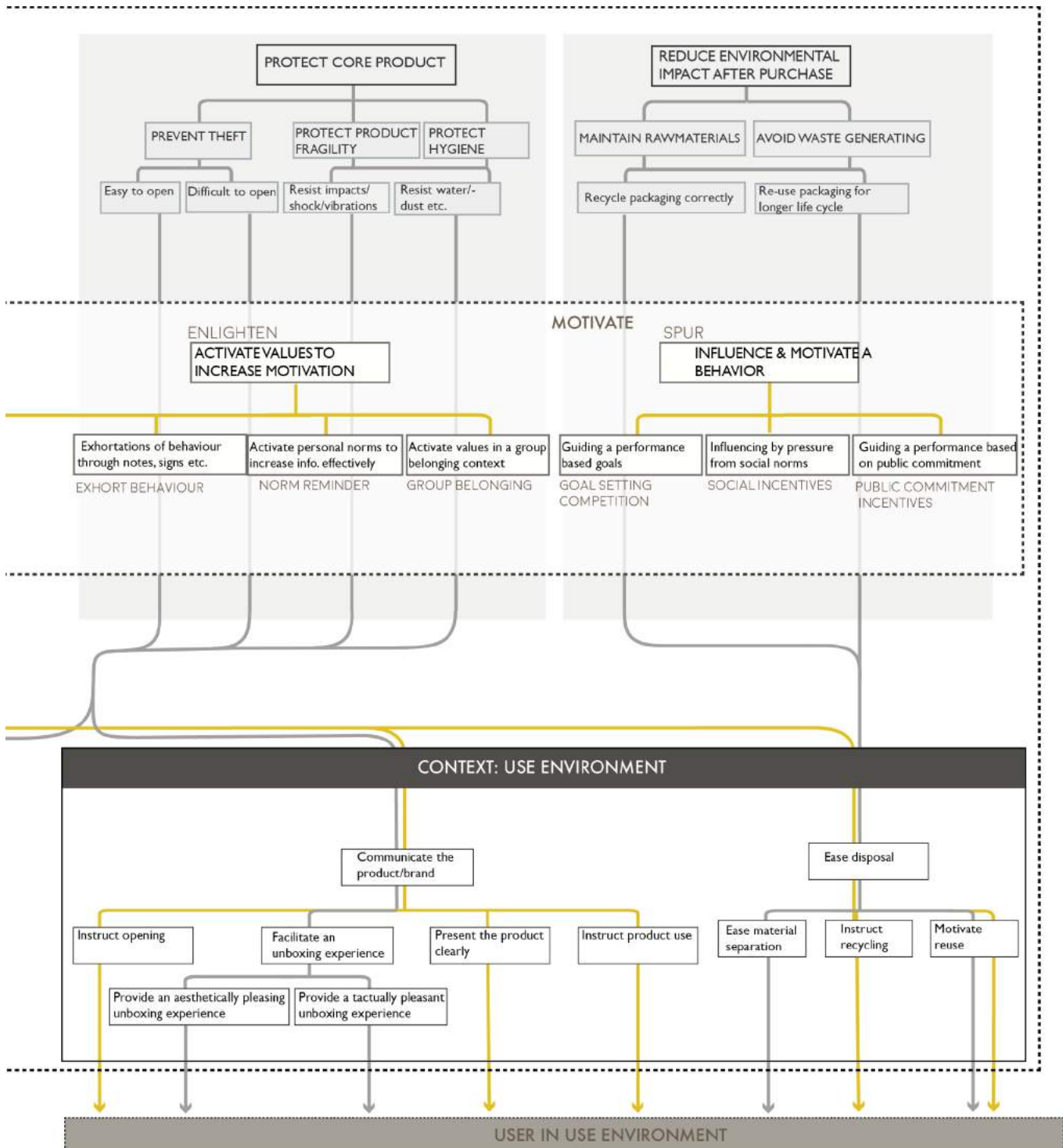


Figure 6.1 Function Analysis

main functions protect and inform, both from a marketing and a user point of view, were defined more in detail in figure 6.1. Additionally, reduce its impact after purchase was defined as one of the main functions. These clusters were divided into sub functions and the interaction with the external factors outside the packaging boundaries are

illustrated with a grey line which is representing physical energy interaction and the yellow line is defined as information flow. The dashed box in the center of the figure illustrates the functions on the strategies of the design for sustainable behavior (Lidman & Renström, 2011).



6.2 Product Category

Limitation: Headphones

A category was further specified as a case for the packages to analyze the typical features for a certain product category. The chosen product category was headphones. Examples were gathered to get an overview of the prototypical features of packages for in-ear headphones (see figure 6.2).

characteristics appeared: Those who actively tried to consider sustainability and those who did not and those with interest in new gadgets and electronics without being truly technology engaged, since most people today are surrounded by small technologies. The identified personas are further described in scenario 1 and scenario 2 for the two personas in figure 6.3.

6.3 User Personas

User personas is a method used to specify and understand the potential user's concerns and needs. Fictional characters are described in who they are, what their previous experiences are in that types of products and what their intentions are in using the products to identify important needs (Karlsson, 2007).

The user personas were derived from both the survey and interviews where two typical



Figure 6.2 Prototypical features for in-ear headphones

Persona 1: M, is 19 and love to have political debates with people and bargain secondhand clothes in drift shops. She is involved in many associations at her school where they discuss how to work more gender equally in school but also environmentally friendly. M likes to socialize with her friends almost all the time, where they communicate through social medias. She likes to have her phone besides her even when she stays in bed for sleeping. Since she is dependent on her phone, she feels very contradictory to her personal believes and staying untrue to the environment. But when she is keeping up with trends and things that comes with it she cannot help but love to buy new accessories for her phone.

Persona 2: S is a social worker in her 50s and loves to cook dinner with her friends and family with a good wine. She consider her life as busy since she has three children that does all kinds of sports and activities. She does not have a true interest in new technical gadgets since she consider them quite complex and only buys them when she needs it. However, she is surrounded by them all the time both at work and home. Sometimes she pauses her daily life by listening to music or podcasts. She tries

to stay environmentally concerned but her recycling rate are not as high as she would like to because it takes a lot of space and it is not always easy to control how the children sort their waste. So to compensate, she instead tries to shop more organic products.



Figure 6.3 User personas with basic facts

6.4 List of Requirements

As a conclusion from the Function Analysis and User persona, a list of requirements was compiled (table

3) to list some of the important aspects to consider for the ideation. The list is divided into four major categories and classified either as goal or demand depending on the preferences for the context.

Table 3. List of Requirements

LIST OF REQUIREMENTS			
Category	DEMAND/ GOAL	Function	Additional comments
Practicability / Technical properties			
	D	All materials in the packaging should be marked	<i>EU Waste Directive</i>
	D	The packaging material should be recyclable	
	G	The packaging should protect the core product with as little empty space as possible	<i>To avoid transport</i>
	G	The majority of the packaging should be made of paper material	<i>Considered as expressing most sustainability according to RGT</i>
	D	The packaging should be able to hang/be stacked	
Safety			
	D	The packaging should protect the core product for high impacts (Measure in Force)	<i>Product Specific</i>
	D	The packaging should protect core product from shock/vibrations (Measure in G)	<i>Product Specific</i>
	D	The packaging should protect the core product against water/dust and vapor	
User behavior			
	D	The packaging should motivate curiosity and gain visual attention	<i>Measured with eyetracker</i>
	G	The packaging should be opened by only using hands	<i>No tools needed</i>
	G	The packaging should provide information about the core product's features	<i>Considered high quality and aesthetically pleasing</i>
	G	The packaging should display the product and its scale in an informative way	
	G	<i>The packaging should instruct opening</i>	
	G	<i>The packaging should facilitate a pleasant unboxing experience (aesthetic and haptic)</i>	
	G	The packaging should instruct product use	
	D	The packaging should be easy to separate the materials for recycling	
	G	The packaging should motivate reuse	
	G	The packaging should instruct recycling in a clear way without confuse the user	
	D	The packaging should follow at least one of the strategies of 'Design for Sustainable Behavior'	
Visual Composition & Expressions			
	D	The packaging should follow one of the packaging trends and correspond to user aesthetic pleasingness	
	D	The packaging should correlate with one of the aesthetic principles	
	D	The semantics of the packaging should follow the intended expressions and correlate with the user persona	
	G	<i>The packaging should have clear infographics</i>	<i>(not relevant)</i>
	G	The packaging should express sustainability: <i>Material choice, Least processed form and Quality</i>	<i>According to outcome from RGT</i>
	D	The packaging should not be referred as 'Green Washing'	<i>Sustainable as an underlying core value and not only for marketing</i>

7. CONCEPT DEVELOPMENT

The concept development was conducted in 3 stages: Ideation, Concept Refinement and Concept Evaluation and is described in the following subchapters (see figure 7).

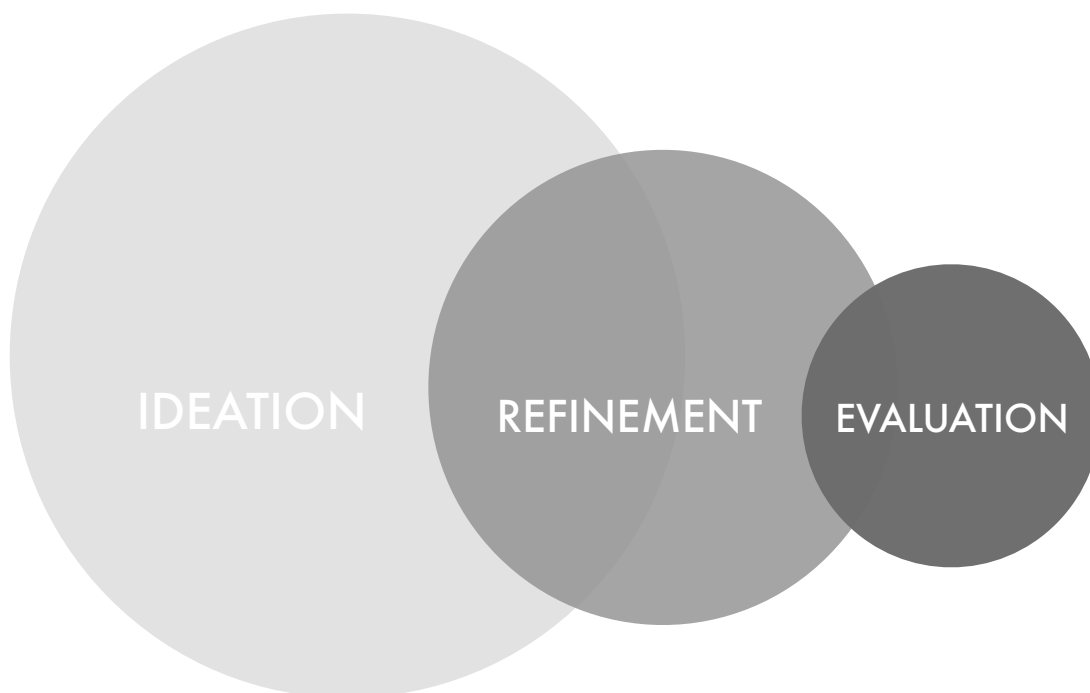


Figure 7. Concept Development Process

7.1 Ideation

The concept ideation was conducted in three brainstorming cycles (figure 7.1). The three brainstorming cycles focused on Norman's emotional design levels: Reflective, Behavioral and Visceral. In the initial brainstorming, the scope was to generate ideas in how to provoke reflections from different stages in the packages life and where it could have a sustainable contribution. In the second cycle, behavioral functions that could contribute to the a more sustainable behavior with the packages were generated. Lastly, the third cycles was to ideate how packages could appear in a visceral manner.

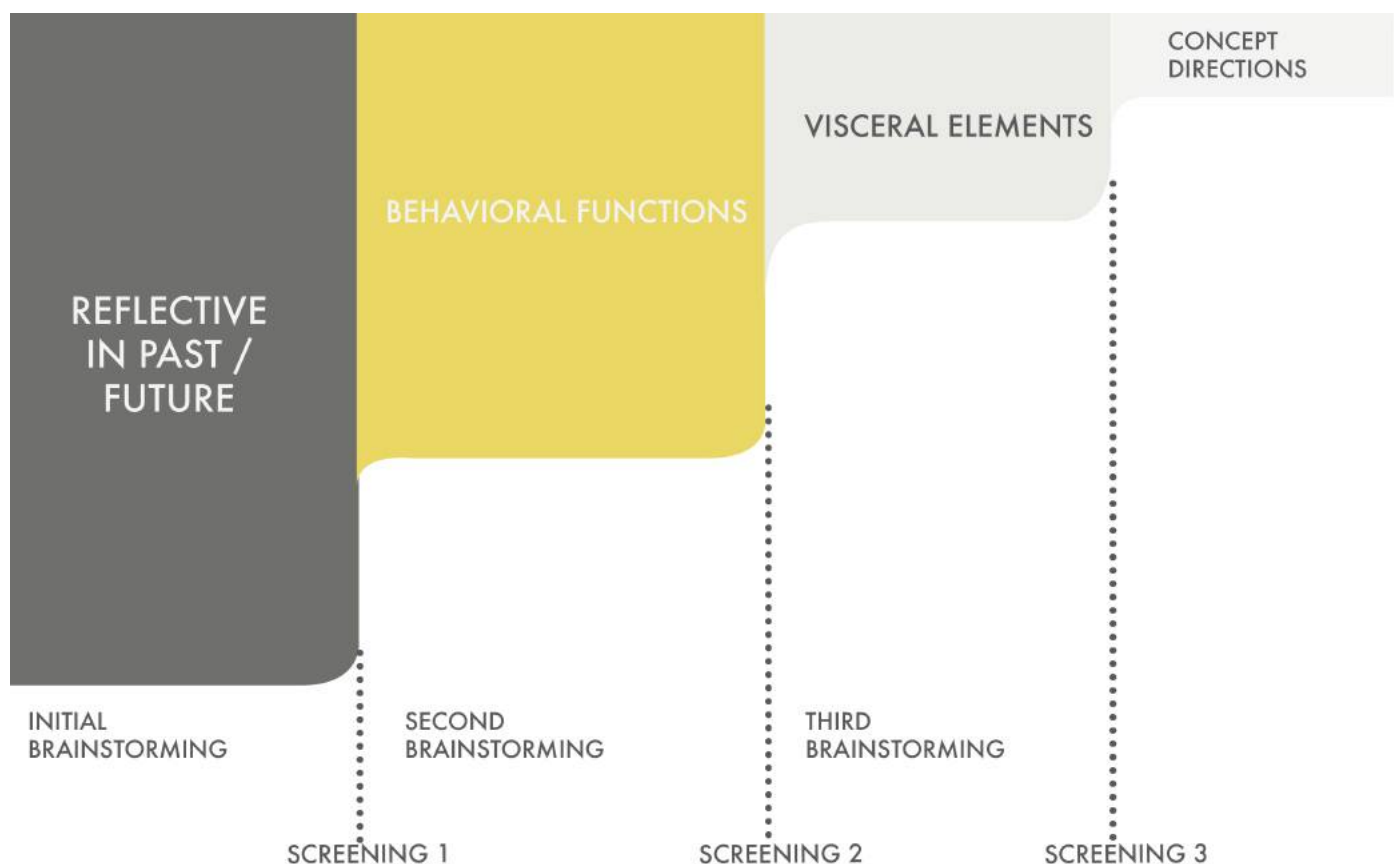


Figure 7.1 Ideation process in three cycles

7.1.1 Initial Concept Ideation & Screening Cycle

Brainstorming

At the first brainstorming cycle, sustainable packaging was broadly sketched. Here the reflections were categorized into how the design contributed to reflections for the past or the future. Packages with a form that would trigger the user to either reflect; 'The package has been sustainably generated' was grouped in the category Past and the ones that would trigger reflections such as 'The package is environmentally responsible' were grouped in the category Future (see figure 7.2).

The brainstorming started with exploring different packaging designs and ways to open them. These were later on ideated in how they could be more sustainable with different focuses on the chronology; the past or the future. In the past, factors such as effective transports, production and manufacturing were taken into consideration whereas in the future, factors such as disposal, recycle and reuse were considered.

PAST

"This packaging has been sustainably generated"



FUTURE

"This packaging is environmentally responsible"

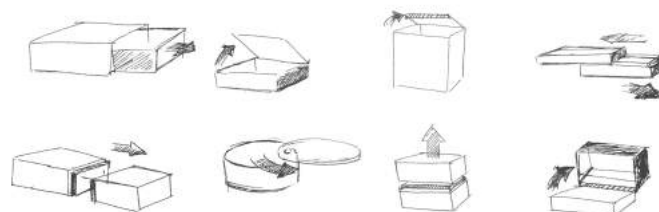


Figure 7.2 First brainstorming sketches

Screening

It appeared rather quickly that a screening was needed in order for the ideation to not get too broad. The first screening was to define in which states the design lacks in control since the aim is to support a solution that is sustainable but lacks at the moment. It was observed that traditionally, the design is in control in the packages past but for the future the user has the prior control. Instead, packages today use incentives to prone the user to take more actions, such as waste symbols or material identifications for material separation., see examples in figure 7.3. Therefore, potential was seen in proceeding with ideations targeting the future.

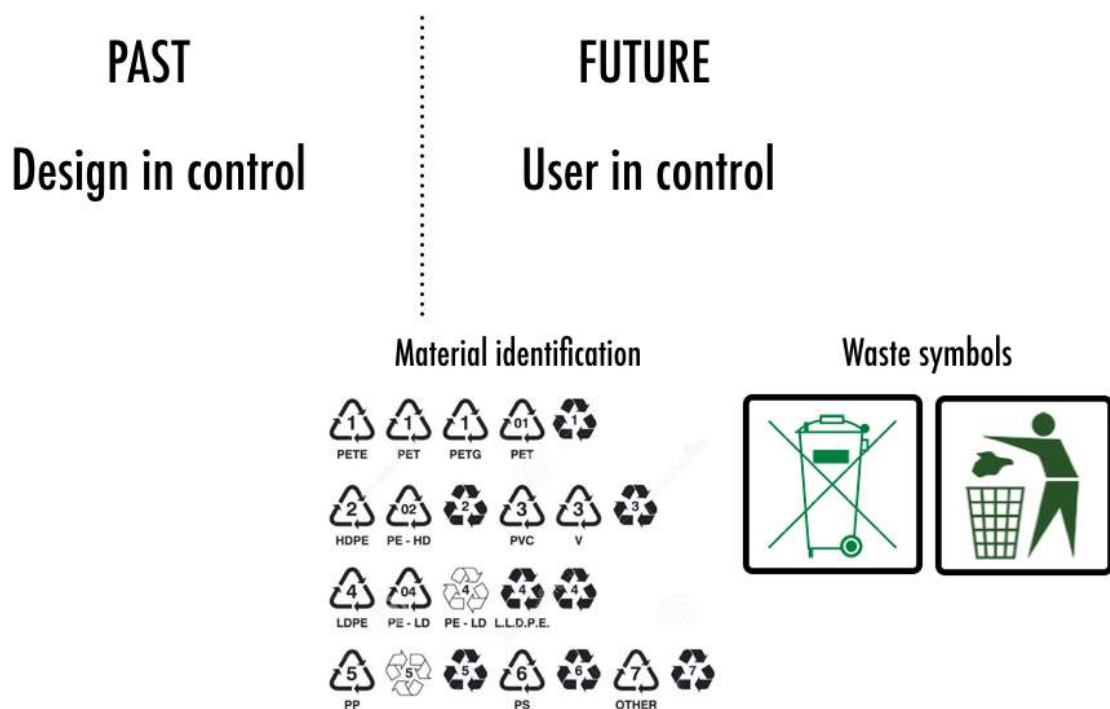


Figure 7.3 Examples of sustainable enlightenment on packages

7.1.2 Second Concept Ideation & Screening Cycle

Brainstorming

In the second cycle, future possible functions to trigger the reflection about the packaging as being environmentally responsible were brainstormed. The actions that were identified were drawn from EU's waste hierarchy for sustainable development (see Chapter 3.4); Dispose, Reuse and Recycle. Elements and were brainstormed in how these actions could be done easier i.e an easy disposal appears when the folding is easy. The different alternatives were inspired by both already existing solutions but also in which functions the package have during the past that can be used even after the purchase, see figure 7.4. The focus in this brainstorming was on the moment after opening, since it is considered as more relevant to the packages sustainable responsibility.



Figure 7.4 Second cycle of brainstorming

Screening

The second screening was used to map the most effective behavioral functions. Since the aim was to involve the user in a more proactive way to the future, a matrix was formed with the behavioral functions as factors and the degree of involvement. The degree of involvement was defined as the framework of 'Design for Sustainable Behavior' by Lidman & Renström (2011) see figure 7.5. Based on the model and the goals, the strategies in which the design is more in control are *Force* and *Steer*.

However, none of the behavioral functions were defined as *force* the second degree on interesting strategy was *spur* since it is defined as involving the design more than *enlighten* but still in the cluster of the user in control. The ones where biggest potential was seen were therefore 'Easy to fold', 'Use the packaging as a shield', 'Use the packaging as a distributor'

	FUNCTIONS	Easy to fold	No need for recycling/Zero waste	Easy to Identify Material for recycling	As a Shield	As Information Carrier	As a Distributor
DEGREE OF INVOLVEMENT		STEER	MATCH	ENLIGHTEN	SPUR	ENLIGHTEN	SPUR

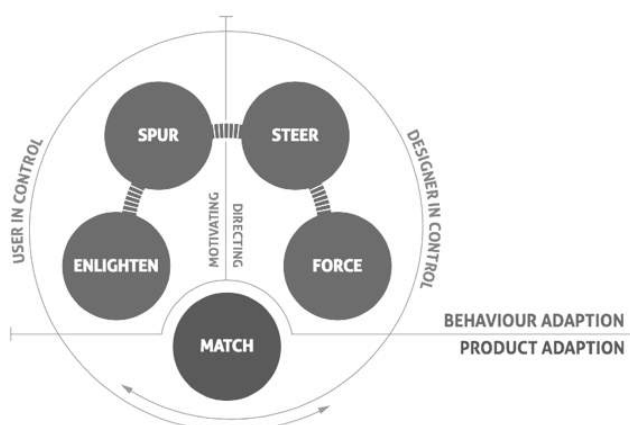


Figure 7.5 Second cycle of screening

Towards the design in control

7.1.3 Third Concept Ideation & Screening Cycle

Brainstorming

In the last ideation cycle, the visceral elements were explored further based on the three behavioral functions. Inspiration to the brainstorming was gathered through random word association generator, ConneXions material library, packaging magazines but also from other fields of design such as product design exhibitions and architecture. Figure 7.6. below shows a summary of elements contributing to the three behavioral and desirable functions.

Screening

The last screening was done by examine the generated visceral elements in how well they are perceived as sustainable. The four sustainable packaging criteria were therefore addressed to screen and map the different elements in how sustainable they would be. In figure 7.7 the three tables are the three behavioral functions with the generated visceral elements in the cells. The four criteria in the definition of sustainable packaging where to; be 'effective' as in do not compromise functionalities, 'safe/honest' as in being sustainable without green washing where green washing is defined as having explicit sustainable cues such as natural material, 'cyclic' as in enlightening an extended life and lastly 'efficient' as in the use of materials.

FUTURE

REFLECTIONS TO TRIGGER

"This packaging is environmentally responsible"

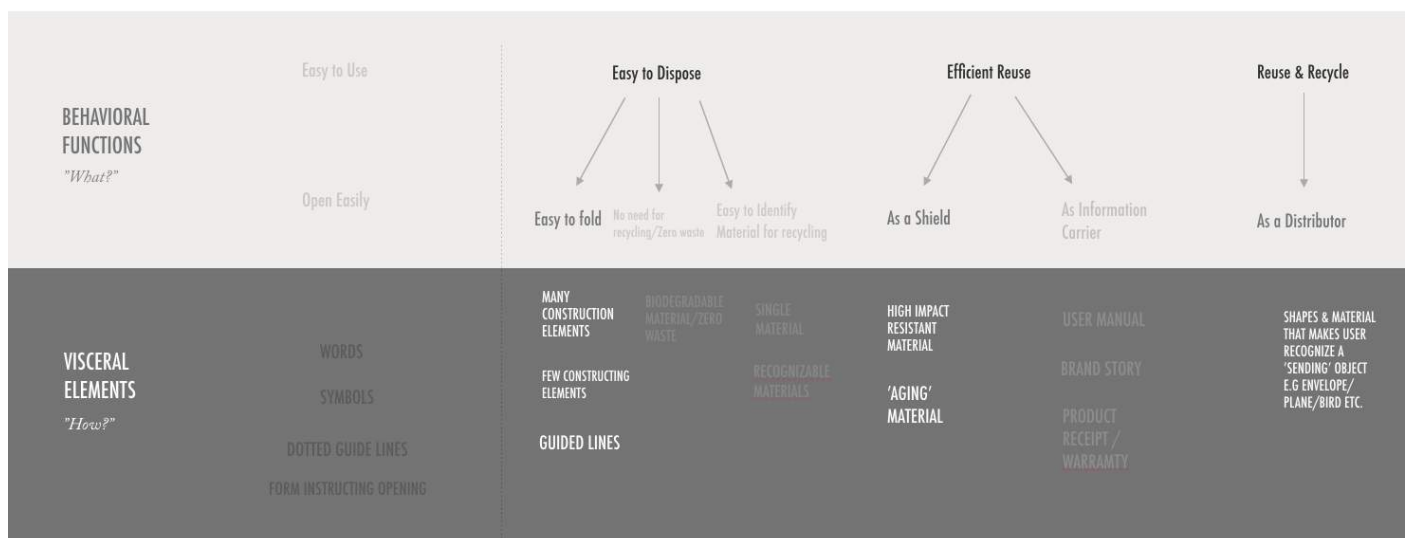
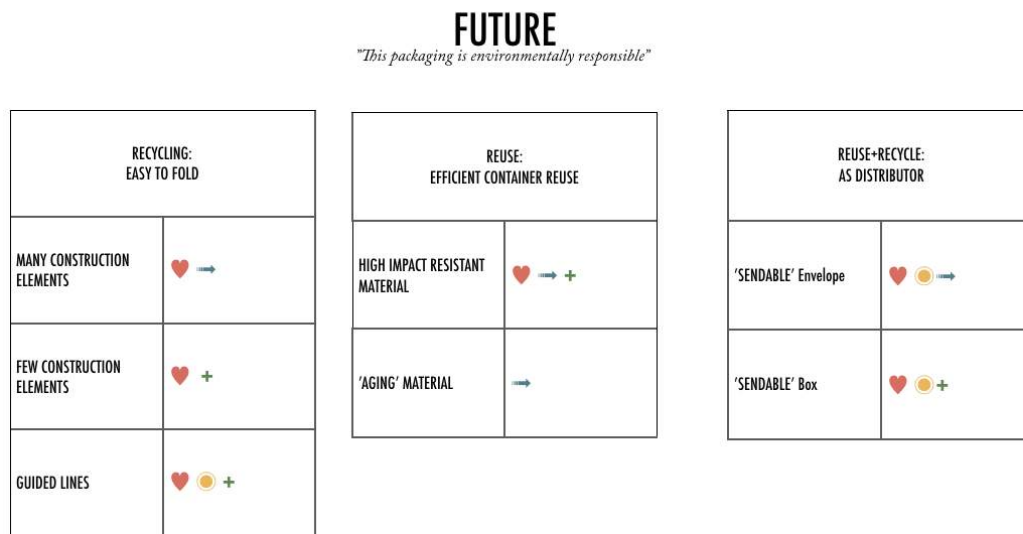


Figure 7.6 Different solutions of visceral elements to the different behavioral functions



WEIGHTENING CRITERIAS:

DEF: SUSTAINABLE PACKAGING

- ➕ EFFECTIVE:
- ❤️ SAFE/HONEST:
- 🟡 CYCLIC:
- EFFICIENT:

DO NOT COMPROMISE THE FUNCTIONALITIES
 SUSTAINABLE WITHOUT GREEN WASHING*
 ENLIGHT AN EXTENDED LIFE
 EFFICIENT USE OF MATERIALS

*Without explicit sustainable cues

Figure 7.7 Visceral elements weighted with criteria for sustainable packaging

The visceral elements that showed to have most potential to work further with was Easy to fold with guided lines. Other functions were to Reuse and Recycle the packaging by using the packaging as a distributor and were the visceral element would be a sendable envelop. This could then be sent back to the manufacturer to guarantee a products qualities and taking responsible for the materials both in the product and the packaging.

7.1.4 Design Direction for Concepts

The three directions for developing concepts further was guided lines for directing an easy folding to steer a recycling behavior and reusing the packaging by using it as distributing the product to guarantee a products qualities, ensuring recycling of the product and the packaging. Since the concepts needed to be tested with physical prototypes within a time frame, the concepts of using guided lines to steer foldings were chosen. This because testing a concept for distributing a product would require a longer period of testing, since knowing the incentives to reuse the packaging again would only be visible when understanding the situations when the core products has been used for a longer time. Also, developing a service system that would make the users to actually reuse the packaging in a way that gives them some sort of added value.

7.2 Concept Refinement

The barriers and difficulties mentioned in the survey regarding recycling was that it took a lot of space at home or that the recycling station was far away. One concept to address this problem could be to integrate functions that makes the package easy to fold, making the visits to the station less frequently. Further ideation and refinement were therefore needed to address the designs in how to use guided lines, which were generated by brainstorming sessions. The outcome were; Clear foldings, Practical Joints and Instructions with text, symbols, shapes, lines, see ideation sketches in figure 7.8.

Additionally to explore the foldings further, a workshop was facilitated and is explained more in coming section.

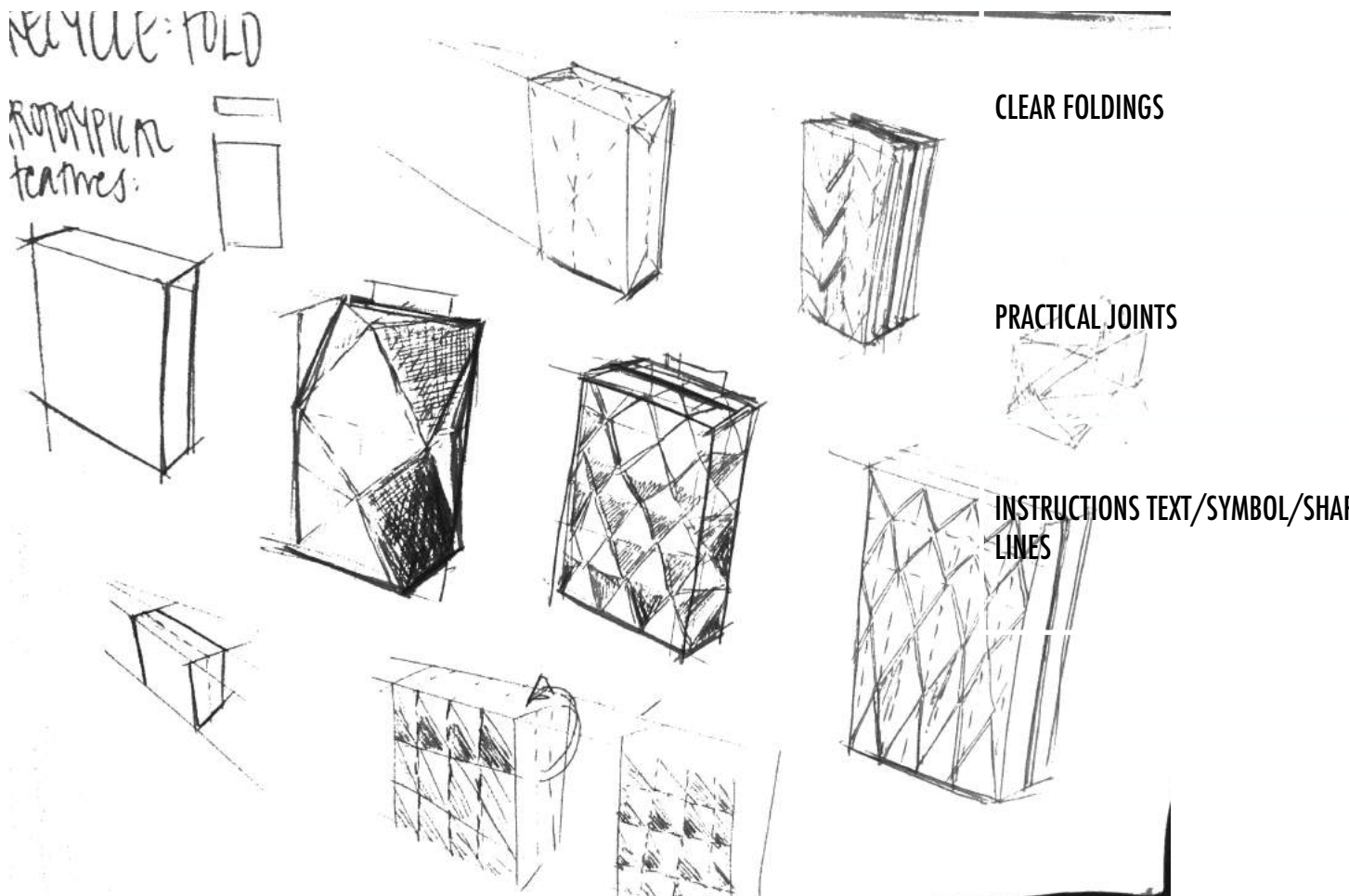


Figure 7.8 Ideation sketches on folding ways

7.2.1 Workshop

Method

A workshop was facilitated in order to generate general thoughts about packages, recycling behaviors and further ideas on how one can fold packages. The participants were a team of two Industrial Designers, two Design Engineers and one Graphical Designer from Berge.

The preparations for the workshop was to create some mock-up models of cardboard paper and a workshop guide that was presented as slides during the workshop (see Appendix E).

The process was divided into four parts. The first part, where they were to brainstorm about different ways of how one can down-size a volume, lasted for no longer than 15 minutes. The different suggestions were to be written down each on small notes. After 15 minutes, the notes were explained and discussed. The suggestions were categorized into realizable and not and then grouped into clusters for no longer than 10 minutes. In the third part, the participants got a few packages each to test out the different ways to fold and to discuss how a box can collapse in an effective way for around 15 minutes. In the last session, discussions on how a box can be designed

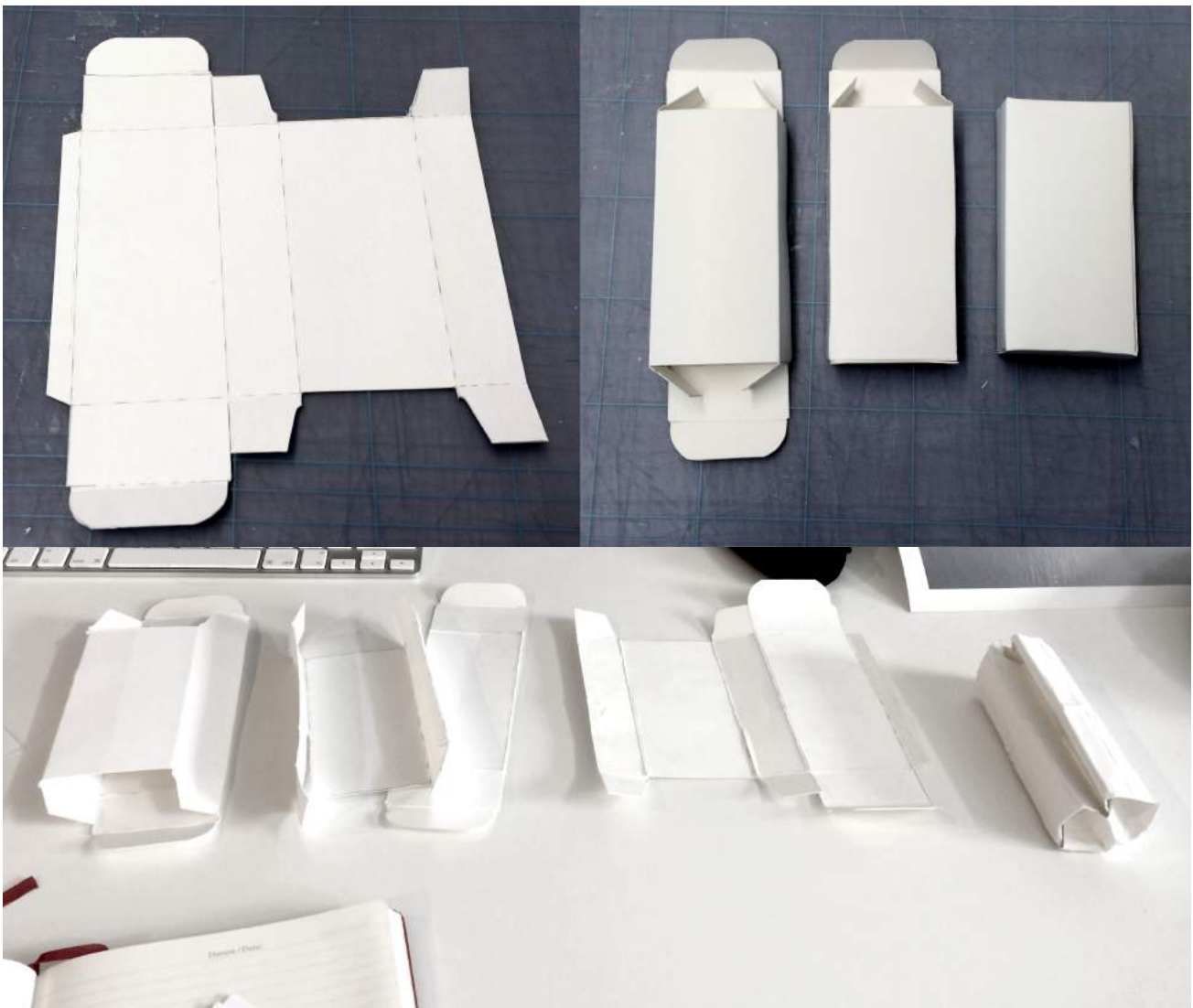


Figure 7.9 Mock-up models for the workshop, above: preparation and below: after the workshop.

to efficiently fold was held during the remaining minutes. Some of the inputs were later on analyzed, see figure 7.9, and the outcomes are to be concluded in the following chapter.

to-side fold and the third typical behavior is to tear or rip the package flat. Existing examples for the three folding behaviors shown in figure 7.11 were used as inspiration for the following chapter.

7.2.2 Concluding Concepts: Typical Folding Behavior

The workshop generated different ways to fold before recycle. These were ideated and further on developed into three bigger categories, as displayed in figure 7.10. The first from the left is a top-down folding, the second, defined in the middle, is a side-

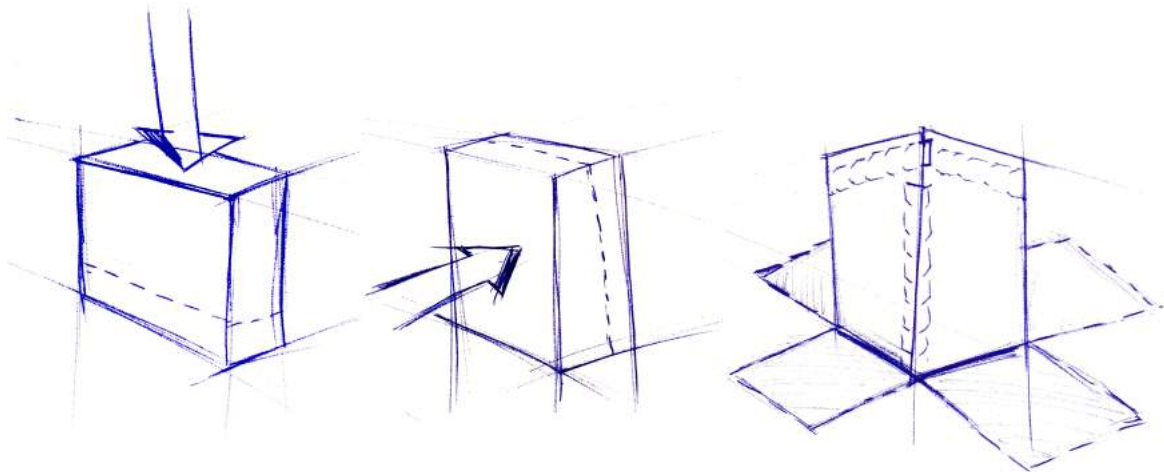


Figure 7.10 The three folding behavior: 1) Top-down, 2) Side-to-side, 3) Tear

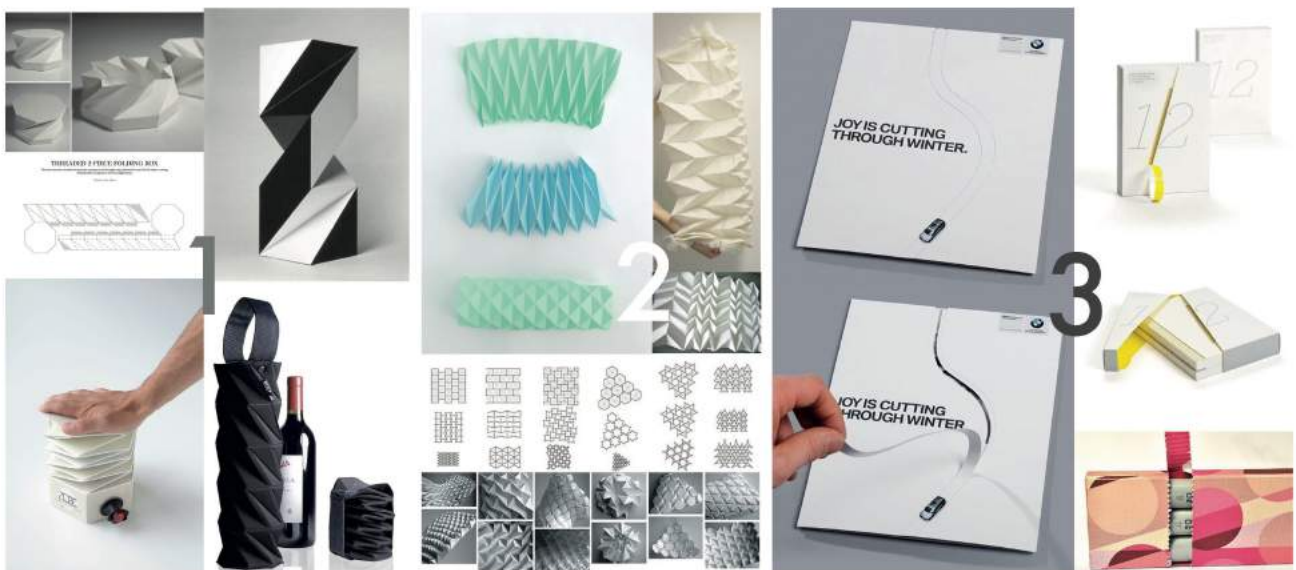


Figure 7.11 Existing solutions on the three folding behavior

7.3 Concept Evaluation with Eye-Tracker

The aim with an experimental test with an eye tracker evaluation was to examine how three different packages correlate with eye movements when hanging on a shelf.

7.3.1 Methods

In order to conduct the experiment, the stimulus and different tools were prepared.

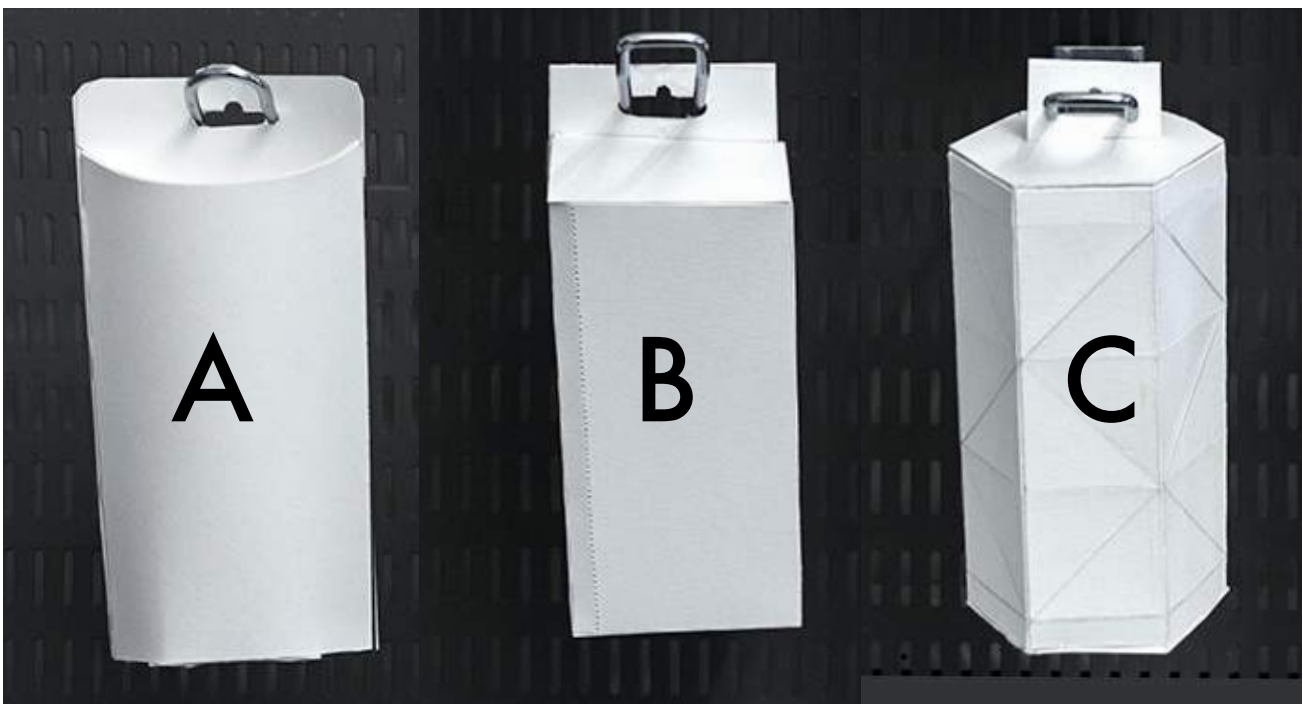
Stimulus

With the three typical folding behavior, aesthetic principles and visual attention factors as fundament, different concepts were generated. These concepts are named Packaging A, B and C, see figure 7.12 for the ideation boards on the aesthetic principles and ideas for the concepts and an overview of the concepts in table 4.

Packaging A is a so called "pillow box" that has the characteristics of a curved surface in front and the ability to be flattened from the front to the back. The aesthetics of the packaging were to address one of the aesthetic principles defined by Hekkert (2006) 'Maximum Effect for Minimum Means', in that sense that it sustainably-wise is a simple shape with less material in comparison to the other two. The stimuli-driven attribute of this packaging is the

surface size is bigger than the other packages and the goal-oriented attribute to visual attention is that the amount of material is less making it address *Relevance*.

As for Packaging B, the general form is a "traditional box" but with indented dots that could be used to guide a tearing movement when opening. The aesthetic principle this packaging addresses is 'Unity



Concepts Factors	A	B	C
STIMULI-DRIVEN ATTENTION	Surface Size	Position	Saliency
GOAL-ORIENTED ATTENTION	Relevance	Recognition	Novelty
AESTHETIC PRINCIPLE	Maximum effect for maximum means	Unity in variety	Most advanced yet accepted
FOLDING BEHAVIOR	Side-to-side	Tear	Top-down

Figure 7.13 The three concepts to test

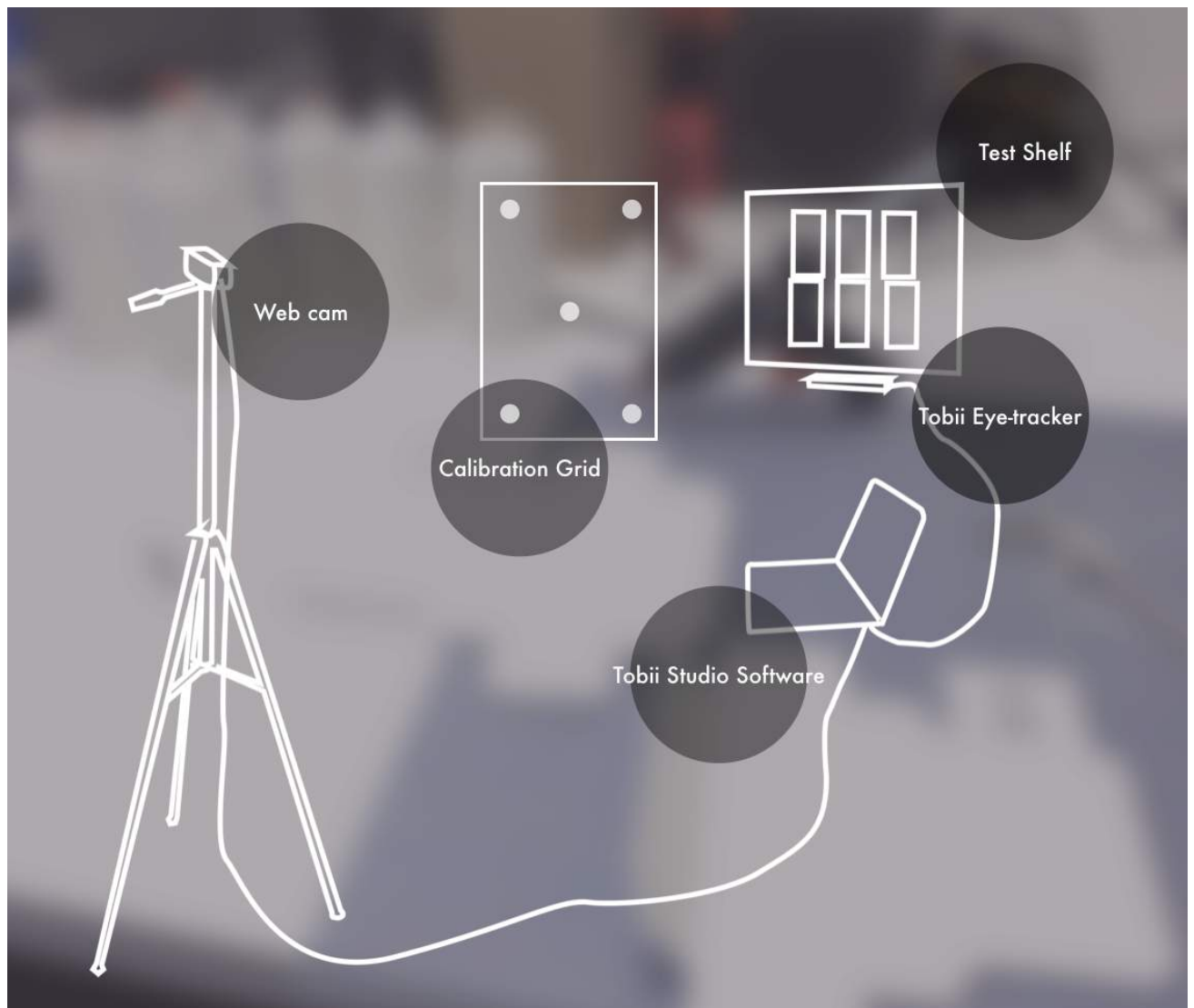


Figure 7.14 Test setup: A web camera, Calibration grid, Test shelf, Eye tracker and Tobii Studio Software

in Variety, where the indented line differs from a typical box, resulting the variety yet belongs to a category of traditional boxes. The stimuli-driven attribute for Packaging B is that it will be placed in the most relevant *position* for the users to look, which is at eye level and at the center of the shelf. The goal-oriented attribute in this packaging is as mentioned, that its characteristics is easily *recognized* since it is a typical box.

The third concept to test is Packaging C, which is a hexagonal box with many folding lines and edges that could be used to guide a top to down folding.

This packaging design address the aesthetic principle of 'Most Advanced Yet Accepted', since its form is not as the prototypical feature for headphones. The hexagonal form contributes to the stimuli-driven attribute that the packaging has which is a *Salient* surface in at the front. The goal-oriented attribute that the packaging is to address is the *Novelty* in the form for headphone packages. See figure 7.13 for the physical concepts made of cardboard paper.

Tools

The tools used were; a PC, Tobii Eyetracker X2-30 Tobii Studio Software, a recording webcam with a tripod, a calibration grid and an additional audio recorder, see the setup in figure 7.14.

The PC was used to gather the data and to control the experiment through Tobii Studio Software, the eye tracker and a webcam. The installation of the eye tracker required important parameters in order for the eye tracker to collect the eye movements, such as eye tracker distance from the active area, the angle of the eye tracker and the measurement on the active area. Furthermore, the webcam were put on a tripod and placed behind the participants to map the eye movement connected to the eye tracker based on a reference grid, named the "Calibration Grid", see figure 7.14.

The important eye tracker metrics for this study were: the time of the first fixation on the different packages, the amount of times the participant fixates on the different packages and the total fixation duration on the different packages. These are calculated by identified Areas of Interest (AOI), see figure 7.14. Other interesting elements were the sensorial incongruity in how the packages differed between only looking at the packages on the shelf and holding, where incongruence in-between may affect the aesthetic evaluation on the product Hekkert (2006) in Ludden et al. (2006).

Participants

The participants were 8 persons of different educational backgrounds and ages. These participants were chosen based on what they stated was the most valuable for them in packages in order to get a variety of participants. The alternatives were derived from the previous context mapping and the distribution were 3 participants that valued Aesthetically Pleasantness, 3 participants that valued Easy Recycling and 2 participants valued

Informative about core product as the most important aspects in packaging design.

Process

The experiment started with three general questions about age, occupation and what the participant value the most in packages. Secondly, the participants position and eye movements were configured with the eye tracker with an eye calibration, where the eye movements thereafter were recorded. The participants were told to imagine to be in a store, searching for a new pair of headphones and were asked to try to talk out loud about their thoughts. The participants were then exposed to the 3 different packages, where they hung on a shelf with 2 examples each (See figure 7.13 for the distribution of the packages). They were then asked to tell general opinions about the packages and to rank the packages visual expressions on *aesthetically pleasing*, perceived quality, *modernity* and *easiness to recycle*, similar to the Repertory Grid Technique in Chapter 4.2, however with only one triad. Furthermore, they were to choose an order in which package they wanted to take a closer look at and feel on. The packages were presented in the order that was desired and the participants got to interact haptically with the packages. The participants were also asked here to rank the packages again based on *aesthetically pleasing*, perceived quality, *modernity* and *easiness to recycle*.

Limitations

The major limitation to this test was that the study could not be conducted in the right environment, since the tools were the biggest drawback. The stimuli were also blank, making only the form appearing which is also a further limitation since many are steered by brands and graphics. These limitations were drawn to have a more focused and structured experiment, in order to get most out of the eye tracker test only based on the forms.

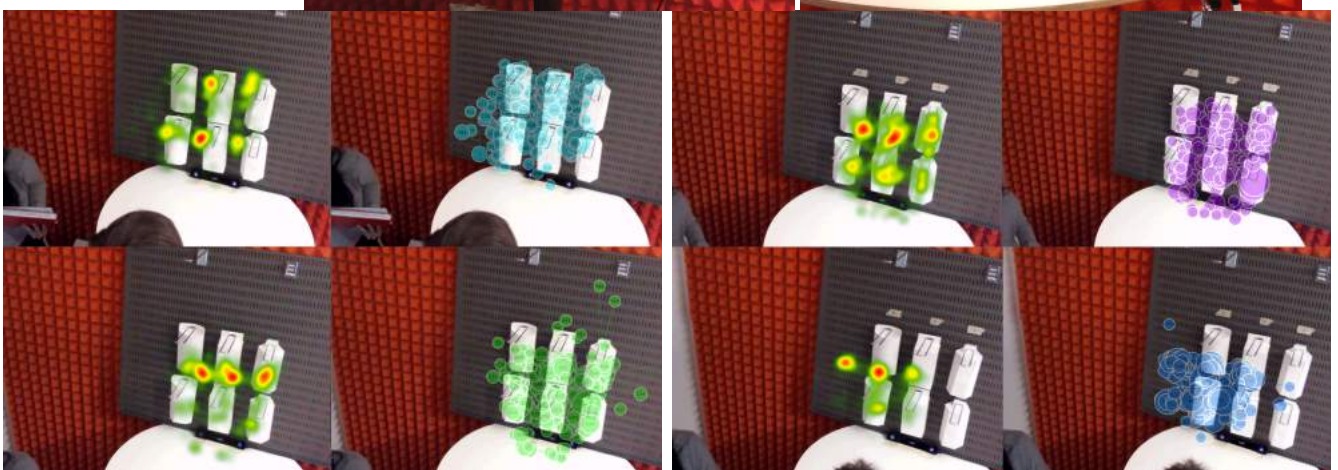
7.3.2 Test Results & Analysis

The results from the test gave indications on how the form expressions correlated with the eye movements of the participants.

Outcome from Eye Measurements

The general data from the eye tracker is analyzed through heat maps and gaze plots, see figure 7.15. The area and colors of the heat maps indicate the total amount of fixations in general, where it variegates from green to yellow to red, whereas the gaze plots shows the numerical sequences and

fixation duration with the sizes on the colored dots. Each color in the gaze plots represents each participant. Shown in the heat maps, Packaging B in the middle was in general the packaging with most fixations.



7.15 Examples of Heat maps and Gazeplots from the test

The time it took for the participants for the first fixations and for how long the duration of that first fixation was on the three different packages are shown in figure 7.16. Packaging B showed to be the packaging to the quickest fixation, meaning the packaging that was first visible and fixated on, which also was the packaging with longest duration on the first fixation. Packaging A was the one in turn to be fixated at and lastly Packaging C, which also has the shortest first fixation duration. By looking at the stimuli-driven characteristics of the packages, position was the most relevant for the first fixation time and duration. The stimuli-driven characteristic that was least was type of saliency.

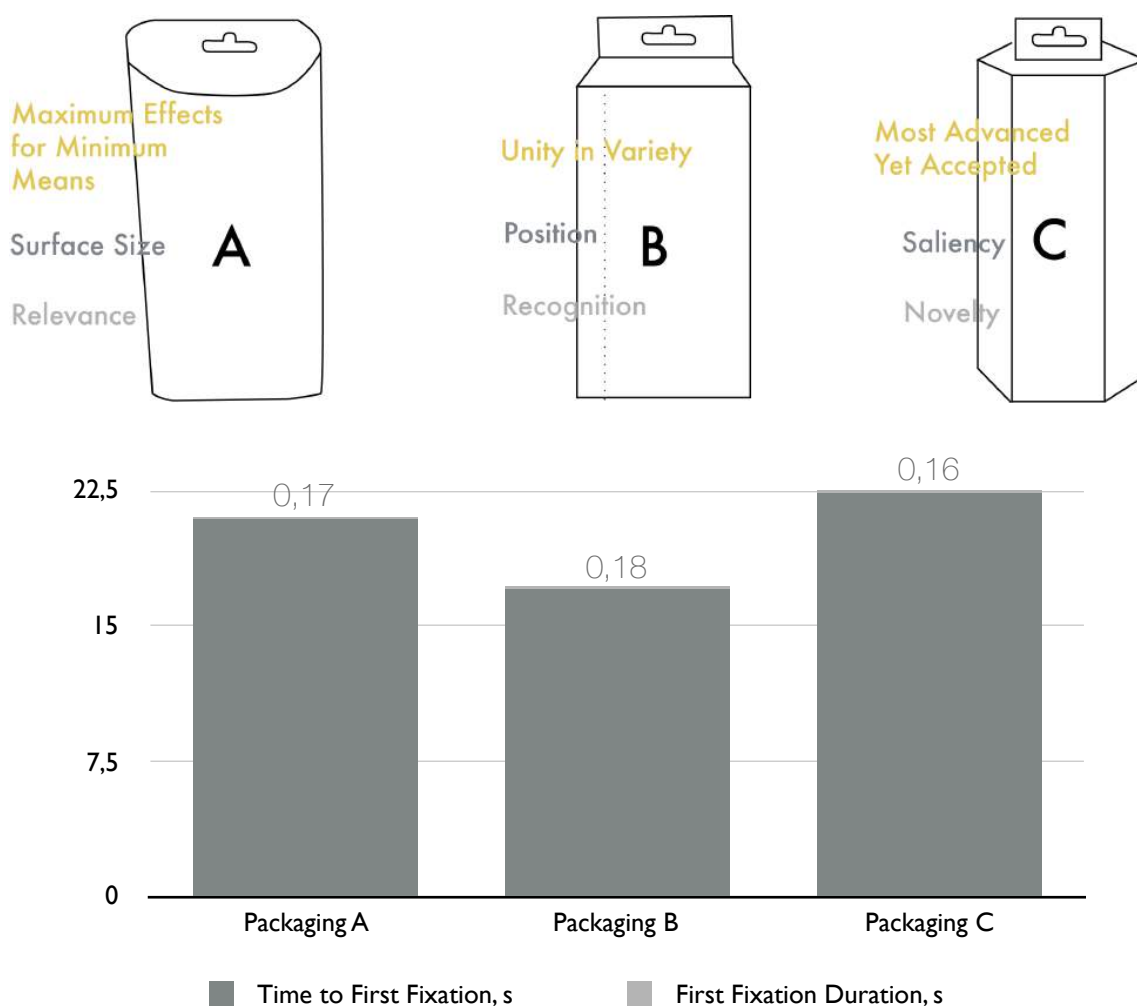


Figure 7.16 Compilation of the mean time and duration for the first fixation

In figure 7.17 below, the total mean fixation duration and the mean count of fixations for each packaging are shown. Illustrated in the figure, the mean count from all the participants fixations was distinctly highest on the AOI for Packaging B with the characteristics of *Recognition*. Furthermore, Packaging B was also the packaging with the most fixation count, but not in such significant difference as the total fixation duration. The packaging with the least and shortest fixations was Packaging A and the 'Relevance, whereas Packaging C maintained the middle position for both metrics. A contributing factor to consider may be the stimuli-driven factors which was for A. Surface Size, B. Position and C. Saliency.

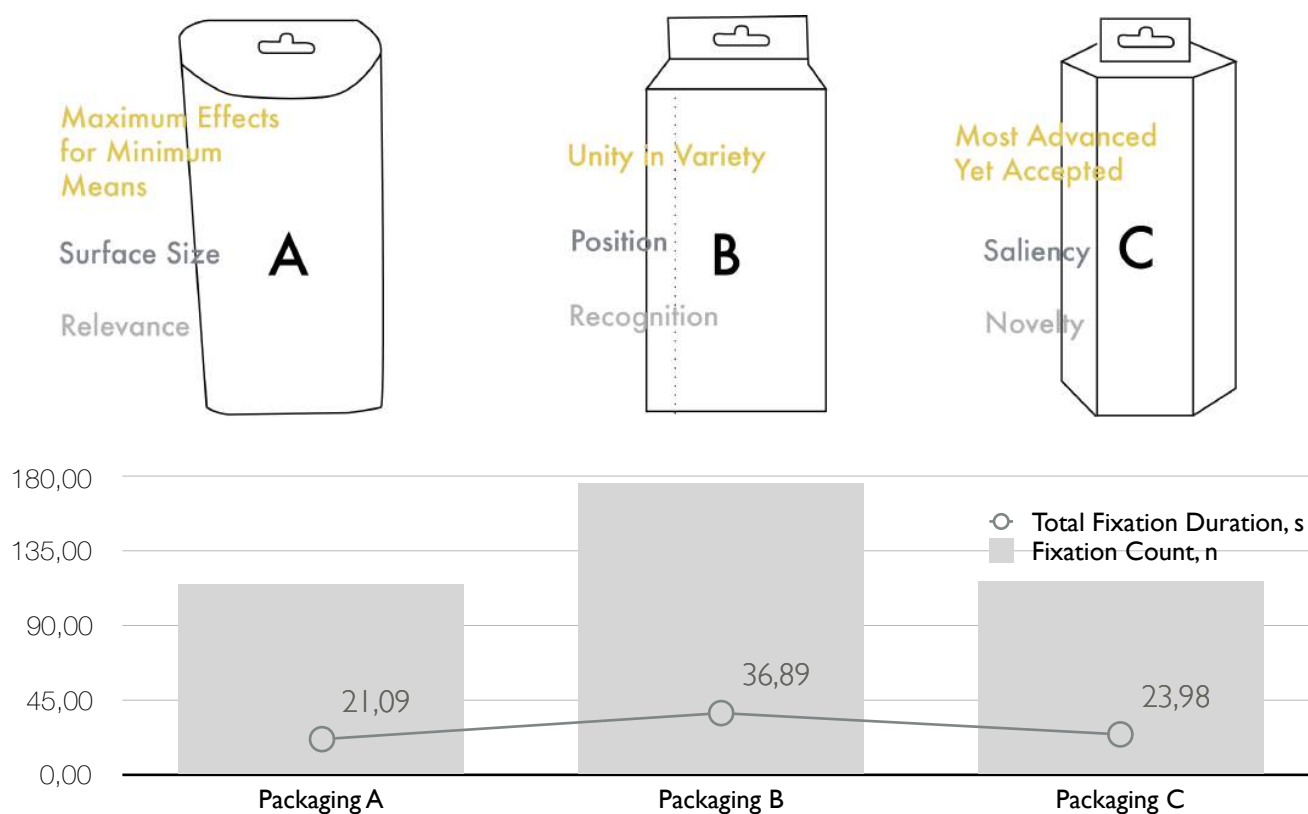


Figure 7.17 Compilation of the mean amount of fixations and the mean on the total fixation duration

Outcome from Semantic Evaluation in RGT

The ratings given by the participants were collected and the mean rankings were derived for each of the semantic aspects that were ranked in RGT, see figure 7.18 for the results. The two different tones (light and dark) are representing each packages for the different interaction scenarios, where the light tones are when the packages were only displayed on the shelf and the test persons were only using vision (V). The darker tones are representing when the test persons also got to touch the packages haptically and using vision (V+H).

Considering the total mean, Packaging A, light and dark grey, was the packaging with the overall highest mean ranking of all the three concepts when the packages were displayed on the shelf. Packaging B, light and darker yellow, was the only package where

the rankings were higher before touching the product and when only using vision. In contrast, the mean rankings increased for Packaging A and C even more after the participants felt the products. Packaging C, in light and darker brown, was the packaging with the overall lowest rankings when displayed on the shelf but had the bigger increased difference in the semantic rankings after touching the packaging

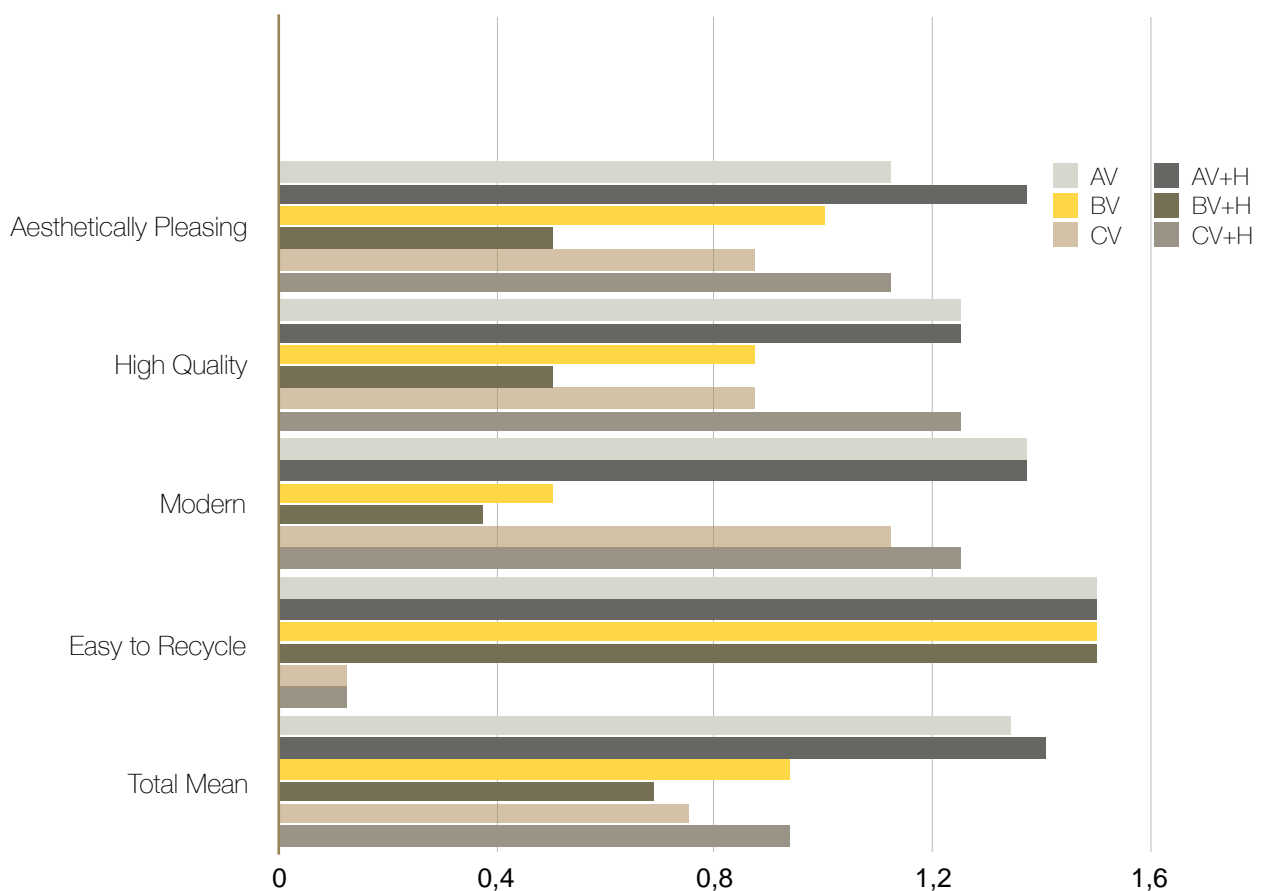


Figure 7.18 The mean on the rankings converted to values on semantic expression when displayed on shelf (V) and when the packages also were examined with touch (V+H)

However, looking at how the individual semantic attributes correlates with the characteristics of the packages., shown in figure 7.19, the aesthetically pleasingness showed to increase for the aesthetic principles 'Maximum Effect for Minimum Means' and 'Most Advanced Yet Accepted', whereas it decreased for the principle 'Unity in Variety'. The expression of high quality did not change at all for the aesthetic principle 'Maximum Effect for Minimum Means', whereas for Packaging B and 'Unity in Variety' the quality was perceived as much lower when it was touched and Packaging C and 'Most Advanced Yet Accepted' increased in perceived quality. Analyzing the values for the expression of Modernity the highest values were for 'Maximum Effects for Minimum Means' where one quotation from a test person was "The round and curves feels modern for packages", however 3 of 8 ranked Packaging C as the most modern where one test persons comment was "It look more difficult to make, which makes it look more modern". On the expression of 'Easy to recycle', the ranking for Packaging A and B was equally high, where 4 of 8 ranked Packaging A as the easiest one since all of them mentioned that it is probably just to flatten it, while 4 of 8 ranked Packaging B as the easiest since it is just a simple box. This was also the only semantic feature that was not changed from with only vision and when with added haptics.

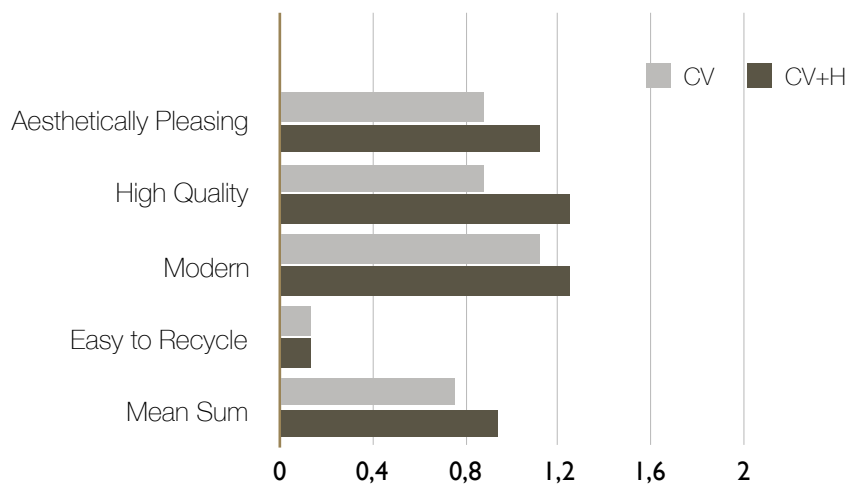
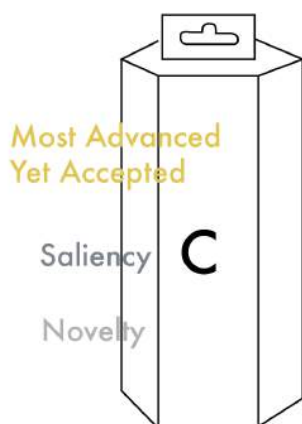
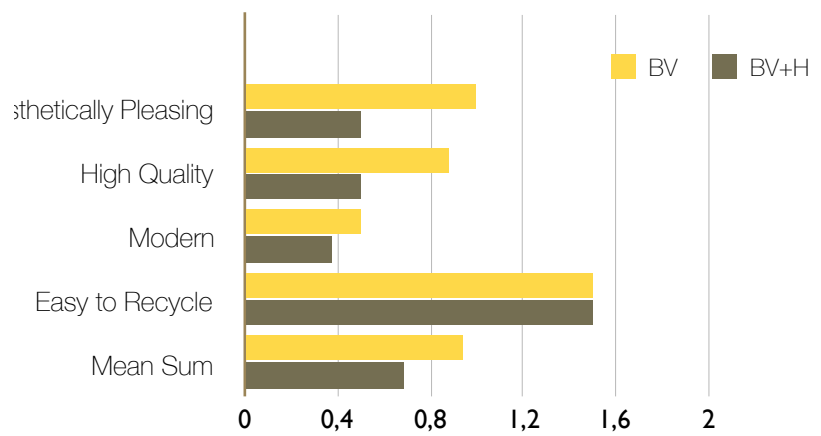
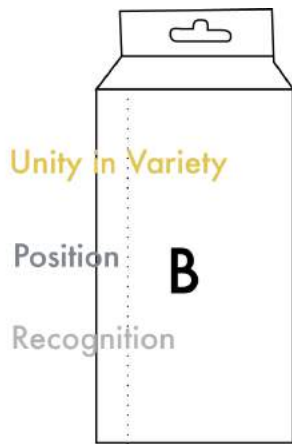
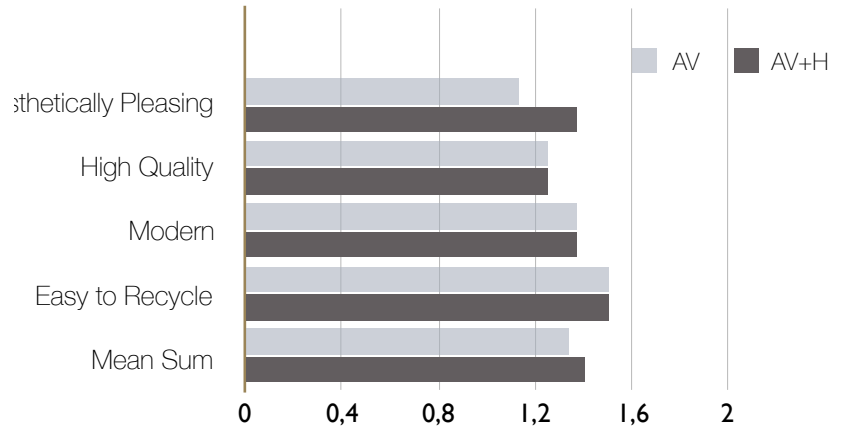
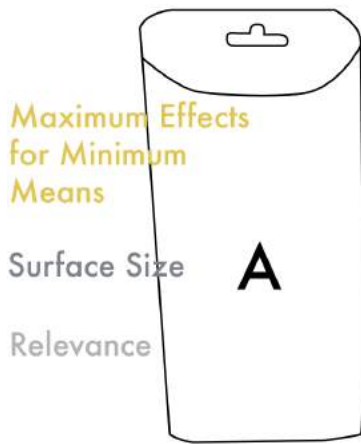


Figure 7.19 The mean values on semantic expression for each packaging concepts

In figure 7.20, the differences in the semantic rankings were calculated to analyze the incongruity between the sensorial inputs. The differences shown in the figure are derived from the mean ranking scores in total for the three packages when they first were displayed on a shelf (V), where the participants were only to use their vision to reflect upon the packages semantic expressions. These rankings were then subtracted by the rankings from when they were haptically (V+H). The results show that the mean rates for Packaging A and C generated positive differentiation after the participants got to touch the packages, where the incongruity for Packaging C was the highest. However, Packaging B showed to have a negative difference and also the packaging with highest incongruity overall.

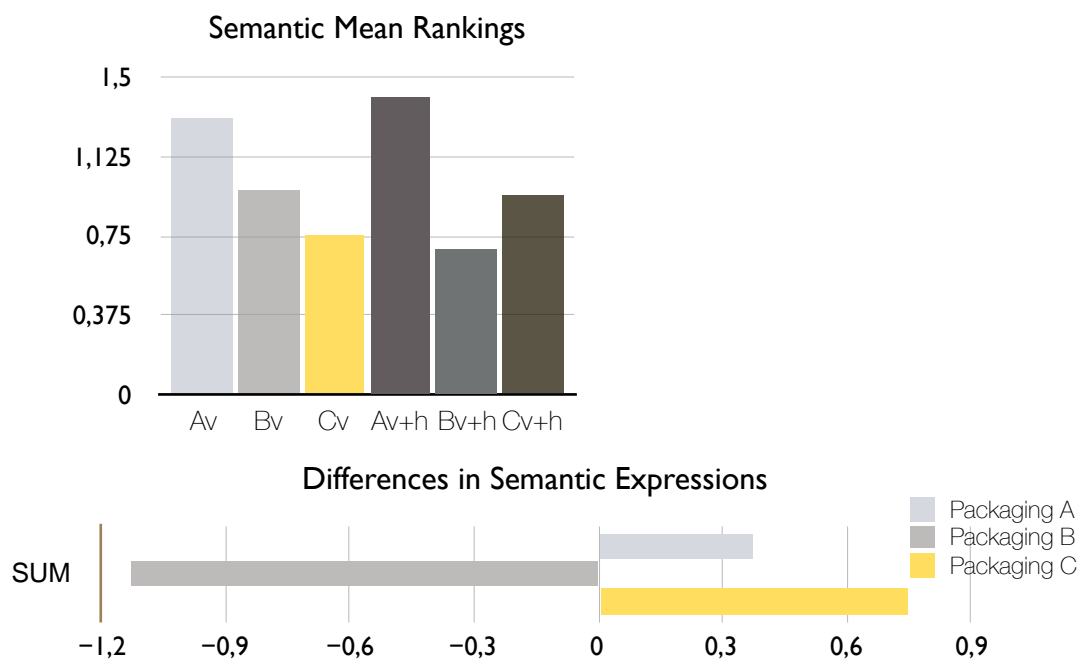


Figure 7.20 The differences in semantic expression before and after the packages were touched

Correlation with Interest and Willingness to buy

After the participants were asked to rate the semantics when only observing the packages on the wall, they were asked to also rank the packages in which order they were interested in look closer and feel on. Also, after they had rank the semantics both visually and haptically, they were asked to tell which package to buy the most. The mean ranks were calculated and are illustrated in figure 7.21 below.

The mean ranking in interest for Packaging A and Packaging C turned out to be equally high, whereas the ranking for Packaging B was very much lower. Analyzing the willingness to buy, the highest ranked was Packaging A. Remarkably though was that the ranking for Packaging B was much higher for

willingness to pay, than the ranking for interest, whereas the willingness for Packaging C decreased a lot making it the least desirable packaging to buy.

Furthermore, in the end the participants were questioned if the chosen package to buy would be reused. The most common answer was that it will probably not be because of the hole for hanging the packaging on the shelf, contributes a lot to the perception of the packaging being temporary.

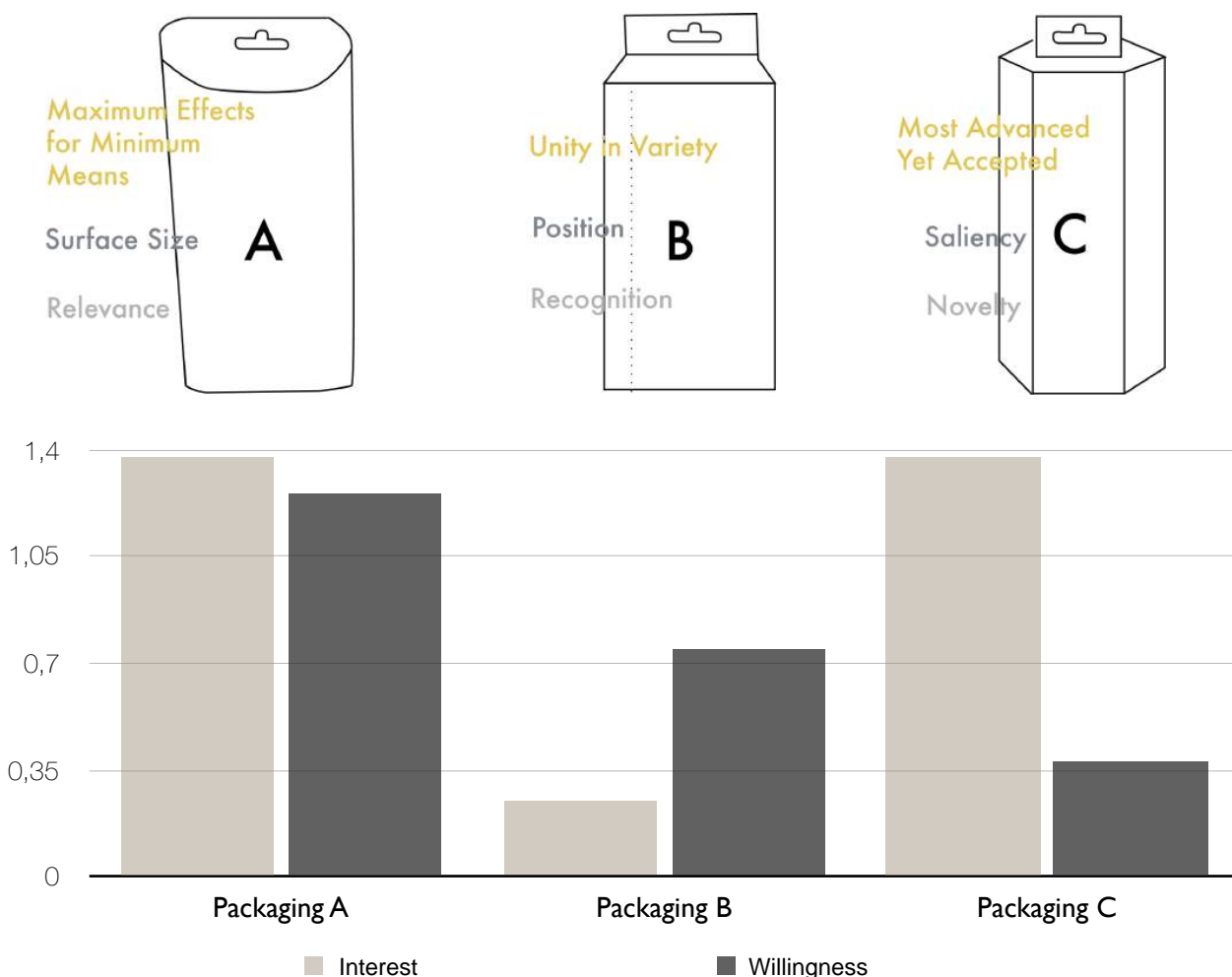


Figure 7.21 The mean values for interest and willingness to buy

7.4 Design Directions

The outcomes of the results can be provided with guides for concepts in order to increase in visual attention and positive experience. The advised aspects to work with in packaging designs are shown in the expression board in figure 7.22 and are explained in the following paragraphs:

Aesthetic principle: Maximum Effect for Minimum Means

The aesthetic principle of 'Maximum Effect for Minimum Means' did show to be most positively experienced semantic-wise. This could be to design packaging with less material and with minimalistic shapes, trying to strive for a simple way to communicate the form and may also be more sustainable.

Create interest: Relevance & Novelty

Two goal-driven factors for visual attention showed to create equally as much interest and were Relevance and Novelty. This is however also a combination of the aesthetics; Relevance-Maximum Effect for Minimum Means and Novelty-Most Advanced Yet Accepted. By using forms that are relevant for the

Induce eye fixations: Position & Recognition

A noticeable factor for visual attention showed to be the Position, where the eye height and in the center was the position of interest within this context. Although, in other cases packages may be positioned strategically by the retailer which is out of the packages control. The packaging can however be designed in a way that it could induce the eye fixations by guiding the fixations on the packages regardless its position. Recognition was the goal-oriented factor showed to contribute to increased eye fixations. This may be that the participants used the recognizable form as a reference point, both caused by position and recognition.

Recyclability: Relevance & Recognition

The clarity in Relevance and the routine in Recognition showed to be the factors for most efficient recycling. Relevance such as a form that would steer the user in a simple matter and making the folding intuitive. In the same and easy matter, recognition in forms that are used to recycle i.e. boxes, which does also contribute to the perception of the packaging being easier to recycle.



Figure 7.22 Advised Expression Board

PART III. COMPLETION & DISCUSSION

In this last part of the report, the work and process will be discussed and concluded with some final suggestions for future developments.

8. DISCUSSION

In this chapter, the work in this report will be discussed whether the aims was met, if the theory and how the methodology has been used. The chapter is therefore divided into sections, where the research questions are first to be answered;

How is packaging design influence the user's experience at the first moment of interaction?

The model, A User Experience model of packaging design, is a way to compile the factors in a design that influence the users experiences at the store environment (See figure 5.9). The model was created based on theoretical implications and empirical data from context mapping methods. This model could consequentially be applied as guidance or directions

for similar case for developing sustainable packaging designs.

How can sustainable factors be considered when designing packages for electronic accessories?

Sustainable factors were involved to packaging design ideation based on Norman's three levels of affective and emotional design. By introducing how the packaging design could trigger reflections to the past or the future, the behavioral and the visceral elements could thereafter be more concrete.



Figure 5.9 A User Experience Model of Packaging Designs - An Overview of a theoretical combination of Norman' Emotional Design (2004), Orquinn & Muller Loose (2013) and Löfgren (2004) Model of the Packages Moments of truth with empirical data from survey and RGT

Theoretical Framework

Since the project scope was broad, it was difficult in the beginning to define areas to start the first phase, where a lot of time was put on a background research. The literature studied were however very helpful to find paths and guidance in the work. Since a lot of studies has been made on eye movements and visual attention, few did actually address the importance of semantics in the studies, which this thesis has addressed. However, further is needed to acknowledge the fields of semantic influences further. A critical point though is as addressed in the introduction, the packaging and retail industry is dynamic and changing, therefore it is highly relevant for extensive user-semantic researches to be done frequently.

The definition of sustainable packaging by Verges et al. (2012) has been applied as a basis for the criteria at the ideation phase. In this work, packages that are designed for the 'Future' i.e easier to recycle was shown to be the most sustainable action, as sustainable packaging was defined. An important note for this selection was to involve the user more to not take the risk of being green washed, which was considered important.

Methodology

The case study

Using a case as a method has for this matter been of great use. Since the product category was chosen as a generic product, similar methods could be applied to related products. However since the reference category Headphones was decided and generated during the process, the amount of time that was put on other electronic accessories could perhaps have been saved if it was defined at earlier stage.

Furthermore, knowing afterwards that only form and material was chosen to be considered in this case, electronic accessories may not be optimal since purchases are at many cases steered by brand and/or graphics.

Context Mapping

During the context mapping, a web based survey and interview were conducted to gain insights from the users, which were formed into criteria for the concept development. Aspects to consider when gathering data from users, are the validity in self-assessing ones sustainable behavior. This was one reason why the survey was constructed to test the participants knowledges to instead find out where confusions can occur.

Ideation & Concept Refinement

The ideation process showed to be very iterative and lasted longer than expected. This was prioritized mainly to get all the pieces together and form a holistic picture of the important factors and finding a structure of context, which was the model shown in figure 5.9, whereas the concept refinement were additionally lasted shorter. Therefore, a workshop was facilitated in order to boost the concept development and refine the concepts further. The workshop was held to in an effective way to get insight into folding and recycling behavior, which was how the three different holding behavior were identified. Although, having a more extended user research in recycling and folding behavior may have been found, but because of limitations in time, three foldings were sufficient enough to ideate concepts from. Regarding the concepts that was used as stimuli for the experimental study with the eye tracker, important to mention is that the aesthetic principles and the combination with the visual attention factors used were randomly picked as examples on how the test could be carried out.

Methods for evaluation

Limitations in the test was as mentioned in the beginning of this section to the environment. The validity in the user's mindset may have differed since the test was conducted in a lab environment because of limitations in the tools. This made it however done more structurally to find underlying factors to the visual attention. A similar test may be done in

the real retail environment, but the other factors in the environment may be needed to consider such as store interior, background noise, other customers etc.

Another limitation to this test was that the stimulus were only tested with form and material. This was in order to make the test more structural and to isolate different features such as aesthetic principles, stimuli-driven factors and goal-oriented factors to the shapes and material. However, this is obviously not how the reality looks since graphics and colors were also considered as having central roles for the packages from the objective constructs in the context mapping (from Chapter 5.2.2 Outcomes from RGT). This was nevertheless decided in order to make the test more structural and controlled, since involving even more factors may make it difficult to understand the underlying factors. Although, a similar test with also graphics and colors may be interesting for further research in the field to get further knowledge of how it reflects upon reality.

Outcomes of evaluation

The outcome of the eye movements showed that the visual attention and eye movement differed a lot in relation to the different factors. As one of the defined factors for stimuli-driven attention '*Position*' and goal-oriented factor '*Recognition*' defined by Orquinn & Muller Loose (2013) showed to have large effect on the first fixation, the amount of fixations and how long the fixations were. However, comparing different aesthetic principles by Hekkert (2006), '*Maximum Effect for Minimum Means*' showed to have a large and positive impact on the packages semantics which in turn contributed to a high willingness to buy. '*Most Advanced Yet Accepted*' did moreover create a lot of interest in observe closer but with low willingness to buy.

The aim was to explore how different forms that are eased for recycle are interacted for the first moment. However, it could be discussed that the recycling ways were not significantly appearing in the designs

of the three packages enough. Packaging A, '*Relevance*', and B, '*Recognition*', were the ones that were considered as easy to recycle, whereas almost all participants did not know how to fold Packaging C for recycling, since it was addressing the goal-oriented feature '*Novelty*'. A suggestion is have a longer ideation process in how to integrate easiness to recycle it in the design and making it more apparent and easy to recycle. This can be done with more explorative workshops and observations in the most common ways to recycle or fold packages, to more deeply understand more goal-driven factors such as '*Relevance*'.

The interest and the visual attention in the stimuli-driven factor *Position* did to some extent not correlate with the measured fixations.

Validity

It was debated whether the test would be conducted based on a physical model versus a digital model, where the validity was of highest prior. In order to make any conclusions, the stimulus were chosen to be as close to reality as possible and in that sense physical models were chosen. Additionally for the eye tracker to position the eye fixations, an external web camera was needed.

Furthermore, since the web camera needed to be positioned a distance above and to the right of the participants because of the lack of space in the test room making the recordings in an angled perspective view, the Areas of Interest were estimated to the relation of the camera angle. In order to get even correct and specific values, a bigger location may be needed to position the camera right in front of the shelf, where the Areas of Interest could equally large. Based on the additional factors that was influencing the accuracy on the eye tracker, a question that can be debated may be whether if digital may be more valid than physical based on the conditions and limitations in this test.

Another factor that was not taken into account was to analyze the outcome with a basis of what the

participants value the most in packages, which was a question ask at the beginning of each test. This was not considered because of the self-assessment they had to assume, since the participants were not in the real context for what they were to assess. However, suggestions can be to try to find new evaluation ways where these values can be defined in another way than direct self-assessment. The outcomes could then be interesting to compare in order to more structurally understand the personas.

Overall findings

Generally, the eye tracker measurements among other objective measurements can be of valuable use in earlier product development to elevate the semantics for the user's experience (Köhler et al. 2014). However, to implement such in packaging design development, another interesting aspect is the product costs and brand, which has not been considered in this work. This since the aim was to mainly focus on the users experience and semantics. Making business cases could be of interest for further evaluation for concepts. Transport and Material could be calculated in an LCA together to evaluate the sustainability in a more concrete way.

9. CONCLUSION & FURTHER RECOMMENDATIONS

A theoretical framework with an applied case study were addressed on the topic of sustainable packaging design. Based on the outcome of this study, directions to packaging designs can be given, where aesthetic principles has been addressed with aspects of stimuli- and goal-oriented factors for visual attention. In an evaluative test, both stimuli-driven and goal-oriented factors showed to influence eye fixations and semantics. Position and recognition showed to have a large impact on fixations to the visual attention, however not critical enough since the semantics weighted heavier for aesthetics for making purchase decisions. Maximum Effect for Minimum Means showed to have the most positive influence on the aesthetics packaging design. Relevance and Novelty in the design did create high interest and considering the perception of easy recycling Relevance and Recognition showed to be the most effective recycling. Further recommendation to this work would be to address some of the following topics.

Explore the folding behavior further

Making more extensive research in recycling habits in the use environment and further ways to fold could be recommended. This to designing guided folding lines even more intuitive and adapted to the users.

Explore how concepts hold with brands or graphics

A limitation to this research was to understand factors in packaging designs for forms and material, a further research would be to explore these concepts with additional graphics and brands as another case. This could be done to understand the importance of for instance colors, images or

graphics on a design and how it adds to the users perception.

Study subjective experiences with objective measurement in a similar way, i.e RGT combined with LCA

Lastly, a suggestion on further work is to combine subjective and objective measurements in a similar way as this work, but with a even more objective tool to measure sustainability such as Life Cycle Assessment. This in turn would make the outcomes to be even more effective for the development in sustainable product design.

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APPENDIX A: SURVEY

Page 1:

Survey: Packaging for smaller electronic accessories

Hil

This is a survey for my thesis at Industrial Design Engineering, Chalmers, and is about packaging designs for smaller electronic accessories.

This survey is aimed to you who have purchased some of the following items for personal use during the last 3-5 years:

- USB-Stick
- Headphones (in- or Over-ear)
- Memory card (SD-card, Micro-SD or similar)
- Computer mouse

Thank you in advance!
/Ajjar Posay

[Fortsätt »](#)

16 % ifyllt

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Page 2:

Survey: Packaging for smaller electronic accessories

***Obligatorisk**

General Information

Age: *

- <20
- 20-39
- 40-59
- 60-79
- >79

Which item/items have you purchased the last 3-5 years? *

- USB-stick
- Headphones (in-ear)
- Headphones (over-ear)
- Memory card (SD-card, Micro-SD or similar)
- Computer mouse

How do you purchase these kind of items? *

- In store
- Internet shop
- Second hand
- Övrigt:

Why?

[« Bakåt](#) [Fortsätt »](#)

33 % ifyllt

Tillhandhålls av Google Forms

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APPENDIX A: SURVEY

Page 3:

Survey: Packaging for smaller electronic accessories

*Obligatorisk.

What do you think of following properties in packages to smaller electronic accessories?

A packaging that shows what it contain (transparent) *

- It is a must
- It is desirable
- I'm neutral to it
- It is okey
- I dislike it

A packaging that hide what it contain *

- It is a must
- It is desirable
- I'm neutral to it
- It is okey
- I dislike it

A packaging that is aesthetically pleasing *

- It is a must
- It is desirable
- I'm neutral to it
- It is okey
- I dislike it

A packaging that is not aesthetically pleasing *

- It is a must
- It is desirable
- I'm neutral to it
- It is okey
- I dislike it

A packaging that instruct recycling *

- It is a must
- It is desirable
- I'm neutral to it
- It is okey
- I dislike it

A packaging that do not instruct recycling *

- It is a must
- It is desirable
- I'm neutral to it
- It is okey
- I dislike it

A packaging that is made by renewable energy *

- It is a must
- It is desirable
- I'm neutral to it
- It is okey
- I dislike it

A packaging that is made by non-renewable energy *


- It is a must
- It is desirable
- I'm neutral to it
- It is okey
- I dislike it


A packaging that is made of recyclable material *

- It is a must
- It is desirable
- I'm neutral to it
- It is okey
- I dislike it

A packaging that is made of non-recyclable material *

- It is a must
- It is desirable
- I'm neutral to it
- It is okey
- I dislike it

 50 % ifyllt

Tillhandhålls av  Google Forms

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APPENDIX A: SURVEY

Page 4:

Survey: Packaging for smaller electronic accessories

*Obligatorisk

How would you open the following packaging?
If you miss an alternative, please comment it in 'Övrigt'/'Övrigt'

Packaging type 1: Heat-sealed edges



How would you open similar packaging? *

- Alternative A
- Alternative B
- Alternative C
- Alternative D
- Övrigt:

Packaging type 2: Single-folded



How would you open similar packaging? *

- Alternative A
- Alternative B
- Alternative C
- Alternative D
- Övrigt:

Packaging type 3: Plastic box



How would you open similar packaging? *

- Alternative A
- Alternative B
- Alternative C
- Alternative D
- Övrigt:

Packaging type 4: Mixed materials



How would you open similar packaging? *

- Alternative A
- Alternative B
- Alternative C
- Alternative D
- Övrigt:

Packaging type 5: Paper box



How would you open similar packaging? *

- Alternative A
- Alternative B
- Alternative C
- Alternative D
- Övrigt:

« Bakåt Fortsätt »

66 % ifyllt

APPENDIX A: SURVEY

Page 5:

Survey: Packaging for smaller electronic accessories

*Obligatorisk

Recycling

Do you use to recycle?

- Never
- Seldom
- Often
- Always

How would you sort the packages?

1.  2.  3.  4.  5. 

A.  **Hårdplast**
Hård plast, till exempel CD/DVD

B.  **Mjukplast**
Blåsor, plast, till exempel matplåt

C.  **Kartong**
Papper, papp och kartong, till exempel kartonger

D.  **Kontorspapper**

E.  **Hushållsavfall**

F.  **Brännbart**
Hushållsavfall, till exempel papper, kartonger, plast

Packaging type 1 *

- A. Hårdplast = Hard Plastic
- B. Mjukplast = Soft Plastic
- C. Kartong = Cardboard
- D. Kontorspapper = Office Paper
- E. Hushållsavfall = Household Waste
- F. Brännbart = Combustible Waste
- Övrigt:

Packaging type 2 *

- A. Hårdplast = Hard Plastic
- B. Mjukplast = Soft Plastic
- C. Kartong = Cardboard
- D. Kontorspapper = Office Paper
- E. Hushållsavfall = Household Waste
- F. Brännbart = Combustible Waste
- Övrigt:

Packaging type 3 *

- A. Hårdplast = Hard Plastic
- B. Mjukplast = Soft Plastic
- C. Kartong = Cardboard
- D. Kontorspapper = Office Paper
- E. Hushållsavfall = Household Waste
- F. Brännbart = Combustible Waste
- Övrigt:

Packaging type 4 *

- A. Hårdplast = Hard Plastic
- B. Mjukplast = Soft Plastic
- C. Kartong = Cardboard
- D. Kontorspapper = Office Paper
- E. Hushållsavfall = Household Waste
- F. Brännbart = Combustible Waste
- Övrigt:

Packaging type 5 *

- A. Hårdplast = Hard Plastic
- B. Mjukplast = Soft Plastic
- C. Kartong = Cardboard
- D. Kontorspapper = Office Paper
- E. Hushållsavfall = Household Waste
- F. Brännbart = Combustible Waste
- Övrigt:

1.  2.  3.  4.  5. 

A.  **Hårdplast**
Hård plast, till exempel CD/DVD

B.  **Mjukplast**
Blåsor, plast, till exempel matplåt

C.  **Kartong**
Papper, papp och kartong, till exempel kartonger

D.  **Kontorspapper**

E.  **Hushållsavfall**

F.  **Brännbart**
Hushållsavfall, till exempel papper, kartonger, plast

« Bakåt

Fortsätt »

83 % ifyllt

Tillhandahålls av
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APPENDIX A: SURVEY

Page 6:

Survey: Packaging for smaller electronic accessories

General opinions about packaging

Do you have any positive experiences regarding packaging in general?
What type was it and why did you like it? Please comment below:


Do you have any negative experiences regarding packaging in general?
What type was it and why didn't you like it? Please comment below:

Is there anything else regarding packaging you would like to add?
If yes, please comment below:

« Bakåt Skicka

100 %: Du är klar.

Skicka aldrig lösenord med Google Formulär

Tillhandahålls av Formuläret skapades inuti Berge .
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APPENDIX B: Repertory Grid Guide for Interviews

Repertory Grid:

Participant No. ____

Name: _____

Age: <20 20-39 40-59 >60

Occupation: _____

Process:

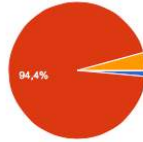
- Show all products and triads
- Ask to write what is similar/differ on notes- in all triads (ABC-DEF-GHI)
- Ask the person to rate all elements to the interesting constructs

	Constructs	Counter Poles	Additional		Constructs	Counter Poles	Additional
	Technical properties				Technical properties		
ABC			Informative about product Less amount of material	DEF			Informative about product Less amount of material
ABC			Easy to recycle Efficient	DEF			Easy to recycle Efficient
ABC				DEF			
	Aesthetics//Visual Appearance//Expression				Aesthetics//Visual Appearance//Expression		
ABC			Modern Sustainable Lifting the core product	DEF			Modern Sustainable Lifting the core product
ABC			Aesthetically pleasing	DEF			Aesthetically pleasing
ABC				DEF			
	Ergonomic aspects				Ergonomic aspects		
ABC			Easy/safe to open Informative to recycling	DEF			Easy/safe to open Informative to recycling
ABC				DEF			
ABC				DEF			
	Added value//Emotions reflected				Added value//Emotions reflected		
ABC			Pride Confident Calm	DEF			Pride Confident Calm
ABC			Positive	DEF			Positive
ABC				DEF			

APPENDIX C: Compilation of Answers from Survey

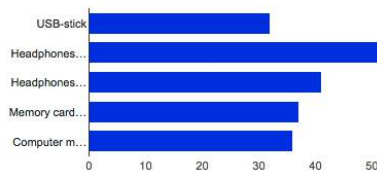
General Information

Age:



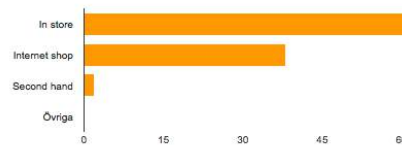
<20	1	1.4 %
20-39	67	94.4 %
40-59	3	4.2 %
60-79	0	0 %
>79	0	0 %

Which item/items have you purchased the last 3-5 years?



USB-stick	32	45.1 %
Headphones (in-ear)	58	81.7 %
Headphones (over-ear)	41	57.7 %
Memory card (SD-card, Micro-SD or similar)	37	52.1 %
Computer mouse	36	50.7 %

How do you purchase these kind of items?



In store	62	87.3 %
Internet shop	38	53.5 %
Second hand	2	2.8 %
Övriga	0	0 %

Why?

Needed them for private and professional use	needed them	Convenient	Moore's law and capitalism -- https://sv.m.wikipedia.org/wiki/Moore's_lag
Needed headphones, and prefer to test and try the products.	Headphones to listen to music, mouse because I bought a new computer and a memory card for my camera as well as for my phone	Needed them mostly for work.	convenience :)
Needed new stuff.	It's easier	Like to try the product before buying it.	It is easier
Want it direct	De fyller ett klar behov	Listen to music	Previous headphones broke, and needed new replacements with a certain functionality right away (didn't want to wait for shipment via mailorder)
Jag såg dom och tänkte att jag behövde dom.	Jag vill ha nytt och det ska vara smidigt	Better quality music on the go	I like to touch and feel before purchasing
Jag vill känna och klämma :)	No good market for secondhand	convenience/impulse	It's the fastest
It is the most convenient option, and also I didn't want to wait to have it delivered	needed new hardware	Can ask for help if I haven't decided on beforehand. Can also visually inspect if the product looks or feels good, see details better.	My in-ear headphone cables always got tangled and the headphone stopped working after some time. So I bought an over-ear with flat cables that cannot tangle
Forgot mine at home	because I don't have to wait for them to arrive	I needed them	Often cheaper online
I needed the things immediately and didn't want to wait for them to get shipped.	Needed new ones	Like to have good technical gadgets in working condition at all time	Because I want to be sure that I'm buying the right sd-card or usb stick. Also because the sound from the headphones determines if I buy them or not.
because I get the cheapest price	I needed the things immediately and didn't want to wait for them to get shipped.	I bought them spontaneously when I saw them	Eeeh, stuff?
Easier	Needed them for private and professional use	I need them	I needed new things
Why I bought them or why I bought them through that channel. I needed them and I bought them in a store because it was quickest.			

APPENDIX C: Compilation of Answers from Survey

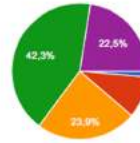
What do you think of following properties in packages to smaller electronic accessories?

A packaging that shows what it contain (transparent)



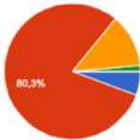
It is a must	7	9.9 %
It is desirable	32	45.1 %
I'm neutral to it	18	25.4 %
It is okey	10	14.1 %
I dislike it	4	5.6 %

A packaging that hide what it contain



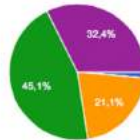
It is a must	1	1.4 %
It is desirable	7	9.9 %
I'm neutral to it	17	23.9 %
It is okey	30	42.3 %
I dislike it	16	22.5 %

A packaging that is aesthetically pleasing



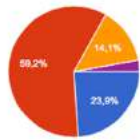
It is a must	4	5.6 %
It is desirable	57	80.3 %
I'm neutral to it	9	12.7 %
It is okey	1	1.4 %
I dislike it	0	0 %

A packaging that is not aesthetically pleasing



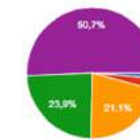
It is a must	1	1.4 %
It is desirable	0	0 %
I'm neutral to it	15	21.1 %
It is okey	32	45.1 %
I dislike it	23	32.4 %

A packaging that instruct recycling



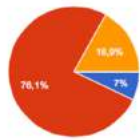
It is a must	17	23.9 %
It is desirable	42	59.2 %
I'm neutral to it	10	14.1 %
It is okey	0	0 %
I dislike it	2	2.8 %

A packaging that do not instruct recycling



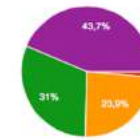
It is a must	1	1.4 %
It is desirable	2	2.8 %
I'm neutral to it	15	21.1 %
It is okey	17	23.9 %
I dislike it	36	50.7 %

A packaging that is made by renewable energy



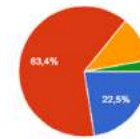
It is a must	5	7 %
It is desirable	54	76.1 %
I'm neutral to it	12	16.9 %
It is okey	0	0 %
I dislike it	0	0 %

A packaging that is made by non-renewable energy



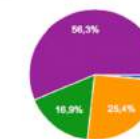
It is a must	0	0 %
It is desirable	1	1.4 %
I'm neutral to it	17	23.9 %
It is okey	22	31 %
I dislike it	31	43.7 %

A packaging that is made of recyclable material



It is a must	16	22.5 %
It is desirable	45	63.4 %
I'm neutral to it	8	11.3 %
It is okey	2	2.8 %
I dislike it	0	0 %

A packaging that is made of non-recyclable material

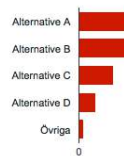


It is a must	1	1.4 %
It is desirable	0	0 %
I'm neutral to it	18	25.4 %
It is okey	12	16.9 %
I dislike it	40	56.3 %

Open:

Packaging type 1: Heat-sealed edges

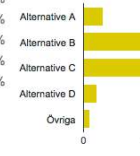
How would you open similar packaging?



Alternative A	13	18.3 %
Alternative B	69	97.2 %
Alternative C	8	11.3 %
Alternative D	4	5.6 %
Övriga	1	1.4 %

Packaging type 2: Single-folded

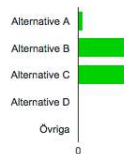
How would you open similar packaging?



Alternative A	3	4.2 %
Alternative B	37	52.1 %
Alternative C	43	60.6 %
Alternative D	2	2.8 %
Övriga	1	1.4 %

Packaging type 3: Plastic box

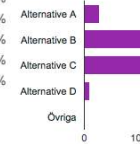
How would you open similar packaging?



Alternative A	1	1.4 %
Alternative B	11	15.5 %
Alternative C	66	93 %
Alternative D	0	0 %
Övriga	0	0 %

Packaging type 4: Mixed materials

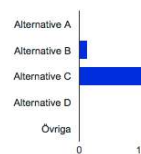
How would you open similar packaging?



Alternative A	3	4.2 %
Alternative B	31	43.7 %
Alternative C	55	77.5 %
Alternative D	1	1.4 %
Övriga	0	0 %

Packaging type 5: Paper box

How would you open similar packaging?

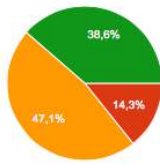


Alternative A	0	0 %
Alternative B	2	2.8 %
Alternative C	70	98.6 %
Alternative D	0	0 %
Övriga	0	0 %

APPENDIX C: Compilation of Answers from Survey

Recycling

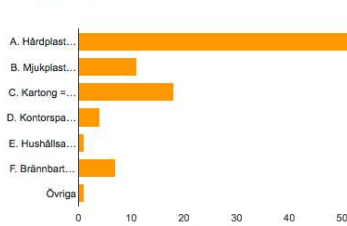
Do you use to recycle?



Never	0	0 %
Seldom	10	14.3 %
Often	33	47.1 %
Always	27	38.6 %

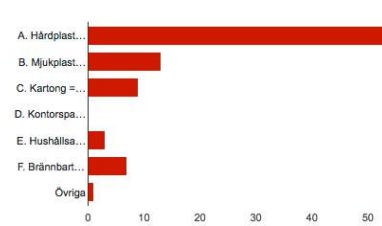
How would you sort the packages?

Packaging type 1



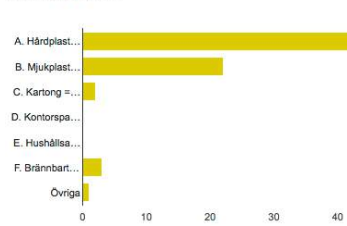
A. Hårdplast = Hard Plastic	56	78.9 %
B. Mjukplast = Soft Plastic	11	15.5 %
C. Kartong = Cardboard	18	25.4 %
D. Kontorspapper = Office Paper	4	5.6 %
E. Hushållsavfall = Household Waste	1	1.4 %
F. Brännbart = Combustible Waste	7	9.9 %
Övriga	1	1.4 %

Packaging type 2



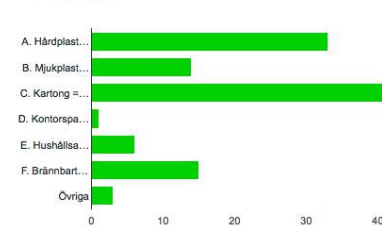
A. Hårdplast = Hard Plastic	56	78.9 %
B. Mjukplast = Soft Plastic	11	15.5 %
C. Kartong = Cardboard	18	25.4 %
D. Kontorspapper = Office Paper	4	5.6 %
E. Hushållsavfall = Household Waste	1	1.4 %
F. Brännbart = Combustible Waste	7	9.9 %
Övriga	1	1.4 %

Packaging type 3



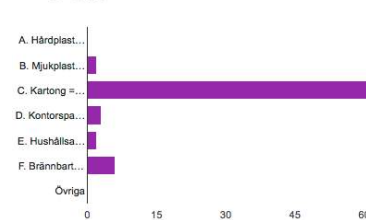
A. Hårdplast = Hard Plastic	46	64.8 %
B. Mjukplast = Soft Plastic	22	31 %
C. Kartong = Cardboard	2	2.8 %
D. Kontorspapper = Office Paper	0	0 %
E. Hushållsavfall = Household Waste	0	0 %
F. Brännbart = Combustible Waste	3	4.2 %
Övriga	1	1.4 %

Packaging type 4



A. Hårdplast = Hard Plastic	3	4.2 %
B. Mjukplast = Soft Plastic	15	21.4 %
C. Kartong = Cardboard	40	57.1 %
D. Kontorspapper = Office Paper	1	1.4 %
E. Hushållsavfall = Household Waste	8	11.4 %
F. Brännbart = Combustible Waste	15	21.4 %
Övriga	1	1.4 %

Packaging type 5



A. Hårdplast = Hard Plastic	0	0 %
B. Mjukplast = Soft Plastic	2	2.8 %
C. Kartong = Cardboard	64	90.1 %
D. Kontorspapper = Office Paper	3	4.2 %
E. Hushållsavfall = Household Waste	2	2.8 %
F. Brännbart = Combustible Waste	6	8.5 %
Övriga	0	0 %



APPENDIX C: Compilation of Answers from Survey

General Opinions regarding Packaging

Positive experiences:

Earphones, apple and urban ears has aesthetically nice packages	I like the way Apple have their things in boxes in which the things are placed just perfectly in.	Generally I like packaging that contribute and enhance the story of the brand, Apple, Rapha (rapha.cc), smart packaging where you can try the product or at least feel the quality.	Yes. When the packaging is pleasant I like more to spend money in it.
i like products that dont need any packaging at all, do we really need packaging?	Apple packaging in general, extremely well curated experience	The way that some headphones show specific features of the product (shape ov earbuds, type of cord/connector, buttons for functionality etc) while hiding other parts that are not necessary to see are hidden.	I like compact packaging, feels more thought through and exclusive
single folded packages are ususally preferable, since they ususally are more easy to open.	mymuesli refill container	Yes. Mionix Caster mouse packaging is very attrative,simplistic and displays the product very well when opened for example. Jays earbuds are also very nice packaging, sometimes a little to good. Why not combine the packaging with carrying hard shell case like some do. (xbox elite controller) all you need in one place.	A-jays package. Nonrektangular shape. Every component is placed in a nice layout inside. Apple (iphone, mac etc) sleek and compact design with no extra material
packages that are easy to open so that you only need to use your hands.	Easy to open, but also to close again after opening	Most Apple products have well designed packaging and material choices, but on the other hand they don't usually work well for display purposes since they are usually not transparent. I like packaging that slide out to reveal the content, even though i checked that I didn't like hidden products before	I like them when they add something to the product, e.g. if they are very beautiful or functional (can be used after you have consumed the product for example).
Yes, zoundindustries urbanears headphones. Great packaging	Headphones. They had a colorful package which took my attention and made me buy them	Packaging that can be opened using only hands is great, also my last pair of headphones came in a cardboard box which looked really good and a bit exclusive, didn't matter that I couldn't see the product.	I prefer when it is made from just one material. Easier to dispose of. And when you don't need a pair of scissors to break in to it.
Yes, when the packaging is made of cardboard and is easy to open.	Like the iphone package design, simple and easy to open.	Compact cardboard packaging is the best. I like for example the boxes in which an iPhone is delivered (not 100% sure this is cardboard though), you can use the box after to put small things in it (like random stuff on your desk).	Packaging for premium products, iPhones etc, are usually esthetically pleasing. Which is nice.
Less stuff better	Cleveland opening not needing tools or dis toying the package	The packaging should always be made of one material for easier recycling. If that's not possible, it has to be very easy and visible to separate for example the plastic and the metal parts	Packaging from some specific brands is nice: it is visually pleasing and not hard to open. Sometimes so nice that you want to keep the box.
I love paper boxes where the lid is so tightly fitted that it barely slides off. Like the iPhone's.	Not that I can recall	I like packages that are easy to fold (like picture nr 5 on previous page). They occupy less space in my home during the time interval from opening of package until I recycle it	.easy to open and only one material is best
I like it when the packaging feels expensive/luxurious and stylish/modern.	Not really	Groceries are always easy to look at and see how you should recycle. Sometimes I get confused with a package that doesn't say and I can't know if there are any hazardous material in it! Electronic stuff, Apple for example, has really neat packaging with minimalistic look and it is no unnecessary material or large pieces of plastics and/or styrofoam.	Yes, cardboard boxes made mostly by recycled materials with Eco-friendly ink. Feels like it won't waste to much energy, nor polute any excessive amounts.

APPENDIX C: Compilation of Answers from Survey

	<p>I really enjoy the experience of opening packaging of apple product.. And removing the plastic protection film that's on screens and shiny plastic.</p>	<p>Packaging that allows me to keep carrying the product in it in the future = (not bigger than necessary, easy to open, and resealable) Packaging that looks nice and shows the parts I would like to see, for example (in ear - happy plugs) it makes me feel happy and more excited that I am buying that specific product, + I can see the colors. when there is a good separation in the packaging for instance for warranties and instructions and product respectively. This allows me to keep track of those things by keeping the packaging. Therefore it is nice when it is resealable and not to big as well.</p>	<p>It's great when you can use it for something else after purchase, so that it does not just end up in the bin. Or for example, when dish washing tablet packaging just disappears when becoming wet.</p>
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Negative experiences.

<p>heatseal plastic that is nearly impossible to open. package with alot of unnesserary items and space, like thick manual or execss of support mamterial.</p>	<p>I hate these plastic packages with a heat weald, they are impossible to open without cutting off at least two of your fingers,</p>	<p>of course heat sealed plastic packaging is hard to open. Its good that you can see some products if they dont have a demo product but that is always the best. I hate to big packaging, when then mix materials and even morse when then make it hard to separate them.</p>	<p>Yeah, most packaging that is vacuum sealed. Horrific experience</p>
<p>I dislike it when it's hard to get into to the packaging and then it looks cheap.</p>	<p>It is horrible when it is impossible to open the packaging. You end up hurting yourself in the process. Plus once it is opened it is broken and cannot be used for storage of the item later on.</p>	<p>Yes, when it's made of hard plastic and I need scissors to open the packaging. Worst case scenario is when you buy scissors and you need scissors to open the packaging, which you obviously don't have since you just bought scissors.</p>	<p>hard plastic that you cut yourself on and if the different materials isn't separable</p>
<p>I think it is very often packaging is a negative part of a product since it is hard to open.</p>	<p>I hate the packaging with only hard plastic - it is hard to open, you can cut you're hands on it, and I have the impression that plastic is less environmentally friendly than cardboard even if you can recycle it.</p>	<p>Well, when I get a product and it is wrapped into many different types of waste then I feel it is bad and unnecessary. It makes me a bit sad. And sometimes it is even dangerous to recycle everything because you don't want to cut your finger on sharp metal/plastics or whatever it could be.</p>	<p>I don't like any package that you need to open with the help of a tool, for example scissors.</p>
<p>I don't like packages like the kingston one in the previous page, the one made from hard plastic covered with cardboard. I find them hard to open and hard to peel apart for recycling.</p>	<p>I really dislike the heat sealed version of package! I do not understand it at all. How do you do if you want to return the product after ripping that package? Demands to much effort to open as well, tools too.</p>	<p>Packages that are not possible to open only with my hands, I get angry and scream. It is also irritating if there are to many instruction manuals/ documents inside the package, it kind of ruins my first moment with the product</p>	<p>The heatsealed ones which are very common are really difficult to open, do not like them.</p>

APPENDIX C: Compilation of Answers from Survey

Those heat-sealed packages are the worst. If choosing between two similar products where one is heat-sealed, I will almost always choose the other. They really are the worst.	Blister packs, without tools, is a pain	Hard plastics, alternative A from before. So much harder to open than necessary, especially if I want to open them right away. Packaging that are small but still can be opened in both sides, why? It makes them bad do re-use when I have no problem taking it out from only one side. Packaging that is big and then have multiple cables inside but no good way to store the cables once the product is taken out of the package since it is then bigger than necessary.	Alot of material
Plastic packaging with Heat sealed edges tend to cut your hands	Yes, shrink-wrapped packaging of cheeses in supermarkets cos its really difficult to open. And using a scissor kinda damages the cheese	Heat-sealed sucks big time, also folded hard plastic. It's not only difficult to open, but also has sharp edges (after using scissors to open) and will not collapse in the recycling bin. All packaging where you need a "proper" tools to get into (i.e. not just any sharp object) .	i hate plastic packages where u have to use scissors or a knife in order to open them.
The ones with sealed edges are really bad, I guess they are good for robustness but not for opening.	Sealed (melted together) plastic packages are useless because they are too difficult to open.	I hate packaging that requires tools to open, and packaging where the cardboard and plastic is merged and inseparable without taring the packaging since it's hard to recycle, you feel bad if you have to throw them in the same bin.	I hate the "type 1" (that you had in the pictures) packages, they are SO hard to open. Buuu!
Big plastic packages not fitted for the item at all	Hate the hard plastic packaging, hard to open and just annoying when you need tools to open it.	Any kind of product which is in a package like A in the previous examples. They are utterly horrible to unpack! I don't know what your're doing for your thesis exactly, but I hope that you can help humanity get rid of them! :)	Not negative, but I was neutral regarding a product I bought. It didn't have a see-through package. I wouldn't have bought it unless I needed it.
Heat sealed edges are a nightmare! Those kind of packages always hurt my hands	Att jag skurit mig på tandborstförpackning en.. Och att det ofta är onödigt svåra att få upp på ett smidigt sätt.	I have a love/hate relationship to heat sealed packages. In one way the complete enclosure makes the product seem extra new and fresh, like an egg. But I often get frustrated by how damn hard they are to open and how easy it is to hurt yourself in the process.	Packaging made of plastic in general, sealed and hard to open. Gives the product a cheap expression.
Not being able to open without tools	the hard plastic heat sealed packages are difficult to open.	Gluing different materials together makes it more difficult to recycle. Pringles is a great example of bad packaging.	A bad packaging inspires a bad product. It takes away professionallity.
Heat sealed everything...	Any heat-sealed packaging is always a pain.	Some are impossible to open!! And very often things are packaged way too much than nessecary.	heatsealed edges are difficult to open
Yes! I hate those plastic packages that you can't open with only your hands, the heat sealed ones(?).		Since I always recycle it's annoying when the packaging is a mixed material. In some cases it's fine, if its easy to seperate. But otherways it's quite frustrating.	Yes, especially with "Heat-sealed edges-packaging"

Added comments:

APPENDIX C: Compilation of Answers from Survey

<p>hate blister packaging because its impossible to open without a scissor. also, i think all packaging should be recyclable, maybe even made in a way that it has a second use</p>	<p>Use easier packing, like paperi always throw them away as they take up unnecessary space.</p>	<p>For electronic accessories that you carry with you overtime, I would prefer to have packaging that is suitable for transport. For example if I have a mouse, it would be great to have a packaging that you can have the mouse in to protect it from wear and tear in your bag. Something else then just the box that it comes in (that is usually not suited for using after purchase). Similar to a case for glasses, a case for your mouse.</p>	<p>Plastic stickers (usually circular) for sealing plastic boxes/ cartons are ok, since they can be cut open with a key or any sharp object, and still be quite safe for retail (shoplifting prevention).</p>
<p>Att jag inte bryr mig så mycket om hur förpackningen ser ut och att produkten syns, utan snarare att innehållet framgår på ett tydligt sätt.</p>	<p>Easy to open, functional and enviormen tally sustainabl e.</p>	<p>I like smart paper/kartong packages which you easily can open and make flat when you've taken out the product so I easily can put it in my recycle-bin. Then it doesn't get full so fast so I don't have to walk to the recycle station and empty it at the time.</p>	<p>I like the ones that is composed with only one type of material. Neat and easy to recycle.</p>
<p>Better and more relevant information, a more relevant packaging eperience, e.g. Material and color feel on the box, size and proportions of product etc</p>	<p>Simple, clean easy to open. // Be clever ;)</p>	<p>I think it is nice if the packaging is sustainable but for me as a customer it is not a top concern. If it should be recycled it should be easy to do for the user. In my case the recycling station is far away from my apartment. I usually only separate the green waste from the rest.</p>	<p>I'm a fan of the mushroom material for packaging electronic devices! Can be found at Material Connexion</p>
<p>Choice of material and amount of packaging should feel appropriate to the content. The experience of opening is key, everything else is secondary (if it's not extremely inappropriate to content).</p>	<p>Use renewable materials as much as possible! Please :)</p>	<p>Also hate the transport package then send the product in, often standardized and way to big. plastic sticker seald packaging can be irritating. You want to be able to open everything with your hans or at least with as few steps as possible.</p>	<p>What brings my attention to a product is the colors. That's the first thing I see when I come in a store and what makes me remember a product</p>
<p>Bio-degradable packing I find awesome, if all the garbage that people throw in nature would be bio it would have been gone and clean by now :)</p>	<p>It's really nice with good packaging design =)</p>	<p>Regardless of type of packaging material or type, I find that I associate a smaller package as more environmentally friendly than an equivalent product with a bigger package (in my mind, resource-inefficient). Even if the material used in the bigger packaging in total is less carbon-intense than the smaller package (for example if the packaging material is different). That is why a carbon-footprint calculation would be nice. (Though I may be in the minority).</p>	<p>Try to choose sustainable packaging, look at the full life cycle of the material, how it is produced etc.</p>
<p>They should be made from renewable or recycled materials. Perhaps even include a recycling fee somehow</p>	<p>I like non-glossy boxes the most</p>	<p>The product itself is my main deciding factor for purchase. Packaging is secondary marketing fluff. First priority for packaging: protection in transit. Old newspaper is fine, in the right context. The ability to try, touch and test the product itself is far more important.</p>	<p>It has to be good designed</p>

APPENDIX D: Compilation of Answers from RGT

Constructs:

Dysfunctions	A	B	C	D	E	F	G	H	I
Non-informative:									
No clarity in functions/features	II	I		IIII	IIII I	I		II	IIII III
Not clear display of product or brand	IIII	IIII	IIII		I			IIII	IIII IIII
Expression of low quality/cheap/unmodern	II	IIII	I	I	II	I	IIII	II	I
Too much information/effort	IIII	II	I	IIII III	IIII IIII	I		II	I
Not sustainable/too much material/space	IIII	II	IIII	IIII	IIII	I	IIII I	IIII	
Difficult to open/do not instruct how to open	IIII	IIII			IIII		IIII		
In general: Unattractive/Negative expression		II		IIII	IIII	I	IIII	I	
Overall sum:	17	17	8	20	29	5	17	14	19

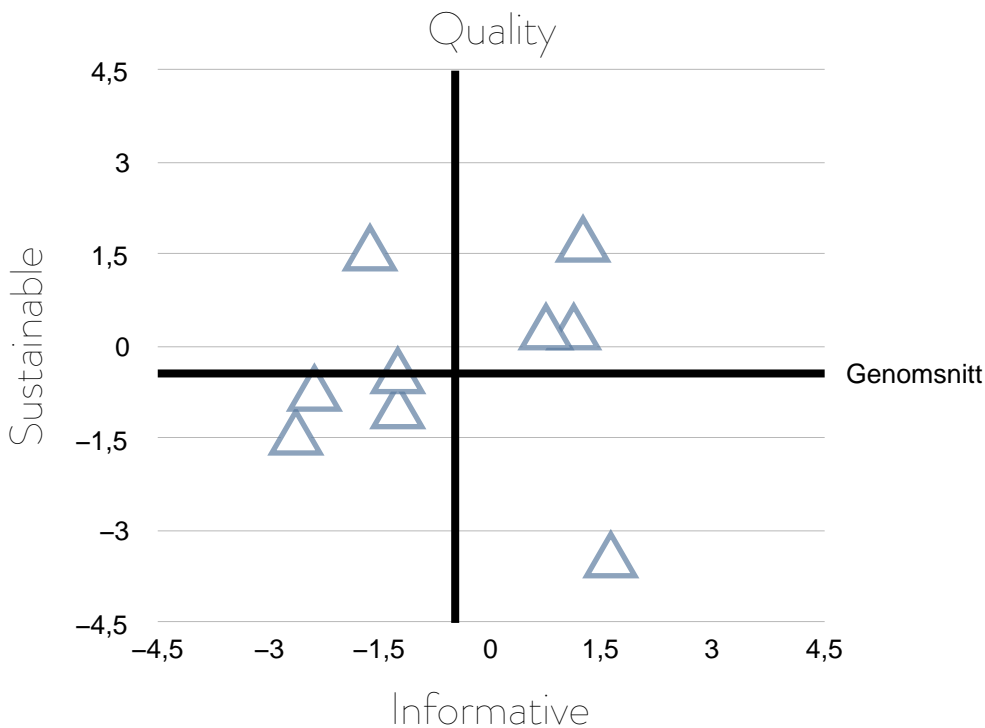
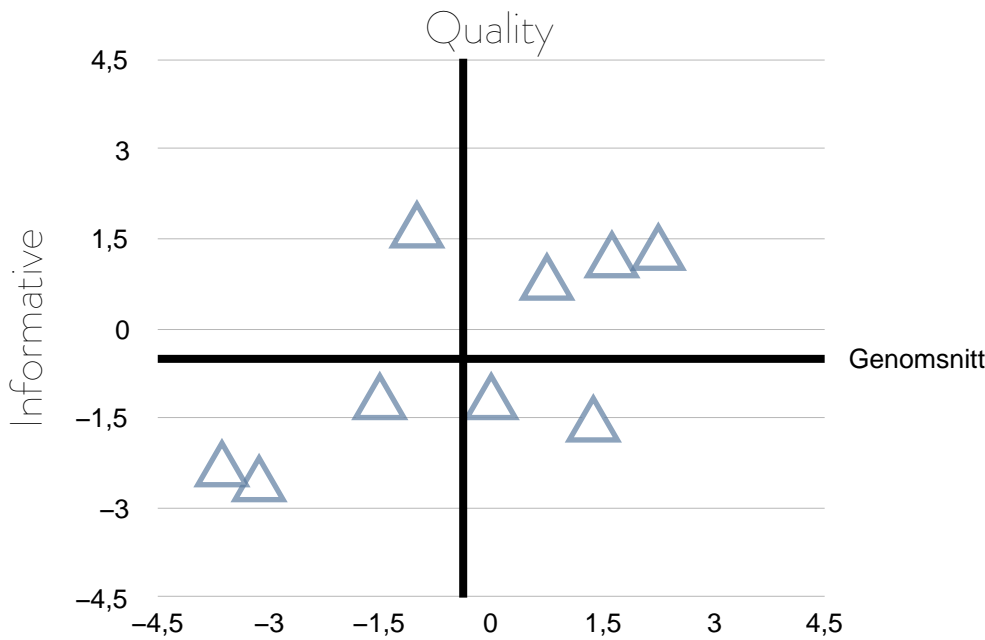
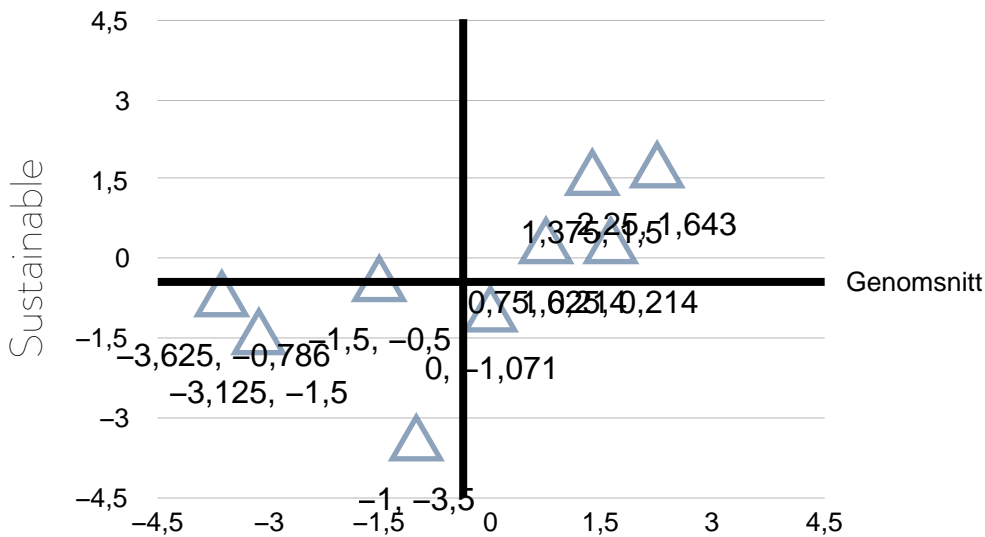
Functions	A	B	C	D	E	F	G	H	I
Informative:									
Clarity in functions/features	I	I	IIII	IIII	II	IIII II	IIII IIII	IIII I	IIII
Clear display of product or brand	IIII	IIII	IIII	I		II	IIII IIII I	IIII IIII	II
Expression of higher quality/modern	II		IIII	I		IIII	I	II	IIII
Discreet/minimalistic	I	I	I			IIII II			I
More sustainable/Material effective	II	IIII I	II	I	II	I		I	IIII
Easy to open/instruct how to open			IIII	IIII		IIII		IIII	IIII
In general: Attractive/Positive expression	II	II	II	I	I	IIII		IIII	IIII
Overall sum:	12	15	23	12	5	27	22	24	23

APPENDIX D: Compilation of Answers from RGT

Ratings

Mean rates	A	B	C	D	E	F	G	H	I
Quality/ Exclusive/	36	61	23	48	65	18	44	30	25
Mean	4,5	7,625	2,875	6	8,125	2,25	5,5	3,75	3,125
Quality/ Exclusive/	0	-3,125	1,625	-1,5	-3,625	2,25	-1	0,75	1,375
Informative/ Clear	46	57	27	46	55	26	23	30	49
Mean	5,75	7,125	3,375	5,75	6,875	3,25	2,875	3,75	6,125
Informative/ Clear	-1,25	-2,625	1,125	-1,25	-2,375	1,25	1,625	0,75	-1,625
Sustainable	39	42	30	35	37	20	56	30	21
Mean	5,5714	6	4,2857	5	5,2857	2,8571	8	4,2857	3
Sustainable	-1,07	-1,5	0,214	-0,5	-0,78	1,642	-3,5	0,214	1,5
Price	99	99	199	99	149	69	199	129	99

APPENDIX D: Compilation of Answers from RGT



WORKSHOP

Måndag 18 April

PROCESS:

DEL 1: Brainstorma

DEL 2: Sortera & Gruppera

DEL 3: Testa på boxarna

DEL 4: Diskutera

APPENDIX E: Workshop Slides 18 April

DEL 1: Brainstorma

(max 15 min)

'PÅ VILKA SÄTT KAN MAN MINSKA PÅ EN VOLYM?'

Tänk gärna på andra saker än en förpackning;
påsar? kläder?

T. ex. vika, skrynkla ihop etc...

DEL 2: Sortera

(max 10 min)

SORTERA, DISKUTERA & GRUPPERA LAPPARNA

APPENDIX E: Workshop Slides 18 April

DEL 3: Testa

(max 15 min)

'HUR KAN DE GÖRAS MED PAPP-BOXAR PÅ
ETT EFFEKTIVT SÄTT?'
DISKUTERA & TESTA!

DEL 4: Diskutera

(Resterande tid)

'HUR SKULLE EN BOX KUNNA SE UT
FÖR ATT UNDERLÄTTA EGENSKAPEN?'

Diskutera ihop och kom gärna med förslag med skisser!