MSc. Strategic
Product Design

TUDelft

THE FUTURE DESIGNS OF OCEAN PLASTIC PRODUCTS

Master thesis
by Francesca Zuurhout

THE FUTURE DESIGNS OF OCEAN PLASTIC PRODUCTS

AUTHOR

Francesca Zuurhout | 4349547

f.zuurhout@student.tudelft.nl

MASTER THESIS

MSc. Strategic Product Design

Faculty of Industrial Design Engineering

Delft University of technology

GRADUATION COMMITTEE

Chair | Dr. Magnier, L.B.M.

Faculty of Industrial Design – Product Innovation Management

Mentor | Prof. dr. Schoormans, J.P.L.

Faculty of Industrial Design – Product Innovation Management

July, 2019

MASTER THESIS

BY FRANCESCA ZUURHOUT

ACKNOWLEDGEMENTS

In front of you is my Master thesis of which I have been working on for the last six months. This thesis is a research project with the aim to discover how to improve the designs of products made from recycled ocean plastics, which will be expressed in recommendations for designers and/or companies who are willing to promote such products. This project enabled me to meet and cooperate with various inspiring people. Therefore I would like to thank those people in advance for supporting me and expanding my knowledge.

First of all I would like to thank my supervisory team, Lise Magnier and Jan Schoormans. Lise, thank you for your trust in letting me explore my own directions in this research domain and your involved feedback. Jan, thank you for broadening my horizons in the domain of customer research by always showing me inspiring new perspectives and sharing your honesty. I enjoyed the collaboration with both of you and to thank you for your supportive and positive way of coaching.

Also, I would like to thank all people who provided extra help and inspiration for my project. In specific I would like to thank Agnes Tan for helping me to make my online study viable and of quality. Thank you for letting me use the TU Delft panel and believing in my project. Also I would want to thank all people who participated in the interviews during my thesis for their time and patience and by providing new relevant insights.

Furthermore, I would like to thank the people which supported and motivated me along the way. I am very grateful for having the support of my friends during this project. In specific I would like to thank Jenny Wu for the encouraging and honest feedback, and Thomas IJzerman for sharing his critical perspectives. Finally I would like to express my gratitude to my family, who believed in me throughout the entire process and gave me the confidence and support to succeed.

EXECUTIVE SUMMARY

Consumers' awareness of environmental issues has increased over the years, resulting in a higher demand of pro-environmental product alternatives. The abundance of ocean plastic waste and the societal pressure for Europe to manage its plastic recycling system creates an opportunity for designing recycled ocean plastic products. Therefore, using ocean plastic for new product development should be encouraged.

In general people have a strong positive attitude towards recycling and ocean plastic products. Cleaning up the oceans is considered a must and giving retrieved ocean plastic new purpose is beneficial. However, people currently still feel somewhat confused in how to behave more pro-environmental due to a lack of ease and lack of knowledge. Also they are not quite able to distinguish recycled products from other (non-recycled) products. In addition, they have reservations towards ocean plastic products which make to direct personal contact and therefore prefer to be made aware of the fact that a product is made from ocean plastic during purchase. Nevertheless people have faith in the future potential of ocean plastics.

People especially like products made from ocean plastic that are easy accessible, produced in large scale, approachable and long lasting. The most suitable product categories to fulfil all these wishes are packaging and furniture. Through examination of the two different product categories it is possible to make more generalised design assumptions for ocean plastic products in order to be adopted by consumers more easily. This is valuable for promoting large scale implementations of ocean plastic products. The products representing these two product categories as used in this research are a bottle of dishwashing liquid and a chair. In order to find out how to design these types of products, information has been gathered regarding the importance of different design elements of ocean plastic products. Highly ranked design elements for ocean plastic products are the shape typicality and the recognisability of an oceanic pattern/texture. Four design alternatives have been created per product in order to test the effects of these design elements. The bottles and chairs were either typically shaped or atypically shaped, and either had an oceanic pattern or did not have an oceanic pattern.

The visual appearance of products can evoke different responses. These responses have been analysed for ocean plastic products. It can generally be concluded that triggering a stronger ocean plastic perception through appearance elements proves to be successful. It is possible to communicate the presence of ocean plastic through design elements effectively. Products with an ocean plastic pattern/texture evoke more oceanic feelings and are found attractive. Since attractiveness is correlated with purchase intention, ocean plastic products with (specific) patterns/textures are likely to be bought more frequent. In addition, typical products evoke a higher purchase intention than atypical products. People currently feel more positive about buying less durable products from ocean plastic which increases the purchase intention for these less durable products. The perceived lifespan of durable products can be positively affected by adding oceanic patterns/textures. Since attractiveness is considered less important for durable products, this increased durability perception could have a positive effect on the purchase intention of such products.

CONTENT

1.

INTRODUCTION OF "OCEAN PLASTICS"

___

This chapter gives a brief introduction of what ocean plastics are and where this resource comes from. Additionally the current ocean plastic market is being examined. This chapter is used to create a certain understanding about ocean plastics, rather than giving in-depth insights.

IN THIS CHAPTER:

1. INTRODUCTION OF "OCEAN PLASTICS"

1.1 WHAT IS OCEAN PLASTIC?

Since the mid-1900s, plastics have become dominant production materials for consumer products (Jambeck et al., 2015). Plastic is light weighted, flexible, versatile, strong and relatively inexpensive compared to other frequently used materials in mass consumption (Le Guern, 2018). Globally the plastic production has continued to rise, replacing materials like glass or metal. This caused that today, an average person living in Western Europe consumes 100 kilograms of plastic per year. One of the main reasons for this plastic consumption overload is due to packaging and single use plastic (Gourmelon, 2015). Lack of recycling and littering currently caused oceans to take in around 8 million metric tons of plastic every year (Jambeck et al., 2015). This is equivalent to over 16 grocery bags filled with plastic for every meter of coastline in the world (Le Guern, 2018). Approximately 5.25 trillion plastic particles (weighing a total of 268,940 tons) are currently floating in the worlds' oceans. This results in having to spend billions of dollars a year in losses in order to resolve this problem. Think of restoring the damage of marine ecosystems, financial losses of fisheries and cleaning on-land environments such as beaches (Gourmelon, 2015).

Of course there are also some social benefits of plastics. For example plastic helps in keeping food products fresh longer (which reduces the total food waste), improving transportation efficiency, and being a contributing part in renewable energy technologies. However the impact of plastic makes consumers question the benefits of plastic. Plastic litter, gyres of plastics in the oceans (floating "plastic garbage patches" due to oceanic currents), toxic additives in plastic products (such as colorants, flame retardants and plasticizers), and micro-pollution (micro plastic particles which can be ingested by marine life) are raising consumer awareness and evoking a demand for more pro-environmental material products (Gourmelon, 2015; Le Guern, 2018).

This could be one of the reasons why recently organisations have started to retrieve plastics from the ocean, such as The Ocean Cleanup. However the possible purposes for this newfound "trash" are still very broad and not yet specified. It is known that the retrieved plastics can (partly) be recycled, and therefore re-enter the production and consumption cycle. This creates products made from recycled "ocean plastic", which can be referred to as ocean plastic products.

1.2. CURRENT (OCEAN PLASTIC) MARKET

Various types of products using ocean plastic are currently on the market. These different types of products can be seen in figure 1. In this figure also the amount of ocean plastic used in the plastic components of the products is given. When looking at these products it is noticeable that most products are either textiles (where the plastic is being processed to a thin wire) or hard plastics. Still the types of products are quite diverse and have very divergent designs.

Figure 2: Pro-environmental products.

When comparing ocean plastic products with "pro-environmental" products, you can observe certain differences (figure 2). Pro-environmental products make most use of warm and pure materials or have dull colouring, whereas ocean plastic products use colder colours and look more like "normal"/not pro-environmental products. One could however argue that ocean plastic products are a sub-category of pro-environmental products. This leads to the question why current ocean plastic products are designed as they are today, and if they should be different.

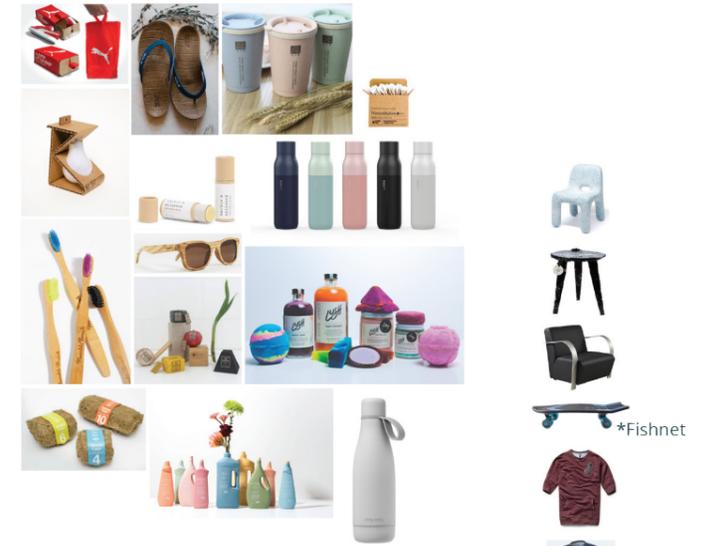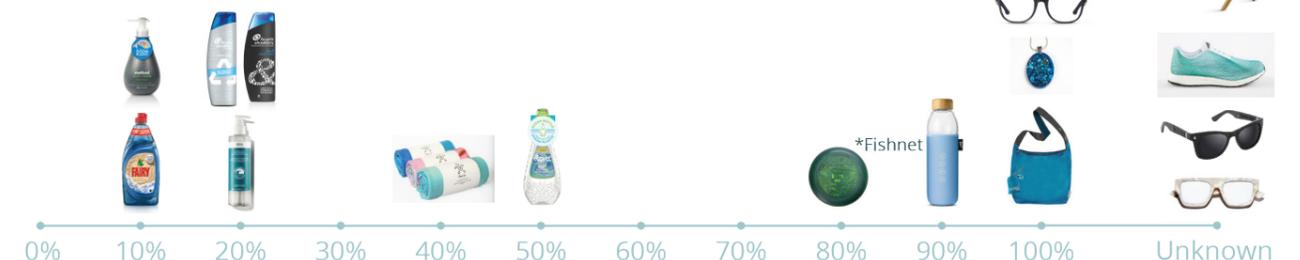**Figure 1:** Current ocean plastic products.

2.
THE
PROJECT

This chapter gives an overview of the projects' context and approach. It explains the objective and relevance of the thesis and elaborates upon the flow of the project.

IN THIS CHAPTER:

2. THE PROJECT

2.1 CONTEXT

Most plastic "trash" which ends up in the ocean is made of virgin (raw) plastics. These virgin plastics products have the advantage that the product appearance can be fully customised according to the wishes of the company and/or consumer. However, when recycling (ocean) plastics, this degree of freedom becomes more restricted. Dependant on the plastic feed-stock, both the material properties and appearance will differ, which will demand much more time, money and effort to customize it as desired (Hopewell et al., 2009). These demanding limitations will play an important role in the selection of the type of products that would be suitable for this material, how the physical appearance of ocean plastic products will look like, and therefore also how people will respond and recognise these types of products.

Recent research has investigated consumers' responses towards products made from recycled ocean plastics (Magnier et al., 2019). Data from this research showed that people are (surprisingly) positive about the possible presence of this material in their daily life products. Moreover, consumers' intention to buy products made from recycled ocean plastics was relatively high. However, this research is focussed on quite specific product categories, leaving out possible other potential product categories. Also it does not take into account responses towards the physical appearance and the communication through design elements of recycled ocean plastic products. In addition, the general awareness about

this type of "new" plastic is still low, making it not yet possible for consumers to fully understand and adopt this innovation. Therefore it is needed to get a better understanding of which specific type of product this recycled ocean plastic would be most suitable, and how to stimulate/promote consumers' adoption of these "new" products through design elements.

2.2 APPROACH

2.2.1. AIM OF THE PROJECT

Consumers' awareness about environmental issues has increased over the years, resulting in a higher demand of more pro-environmental alternatives (Gourmelon, 2015; Le Guern, 2018). Reusing waste materials is an example of such pro-environmental alternatives. Primarily, Europe send their plastic waste to China in order to recycle it there However recently China has imposed an import ban on these plastics (NOS, 2018). This could increase the problem of plastic waste abundance in Europe, leaving no options than to find an appropriate solution for plastic waste. According to Bahrudin et al. (2016) consumers perceive something that is made from waste which is retrieved from polluted environments as extra pro-environmental. Ocean plastic is a great example of such waste retrieved from a polluted environment. The combination of this societal pressure to manage our plastic recycling system and the advantage of the extra pro-environmental perception of ocean plastic gives a strategic advantage for designing recycled ocean plastic products. This can be seen as a relevant argument for this thesis, with the aim to develop design guidelines for designers and/or companies who are willing to promote ocean plastics products. By doing this, using ocean plastic for new product development can be encouraged.

2.2.2. SCOPE

Magnier et al. (2019) investigated consumers' perception of products using recycled ocean plastics in their design for different product categories in order to get a better understanding of how to present such products to the consumer and how to encourage consumer acceptance. The

research included three types of goods (textile products, fast moving consumer goods (FMCG) and durables) and categorised four different groups of people (by level of environmental involvement). Data of the research showed that between each different product category, different variables (such as quality expectations, purchase intention and recognisability) seemed to play an important role. However a deeper understanding of how people perceive different product categories is needed in order to find out for which product category people feel ocean plastic would make most sense.

A few other remarkable outcomes of this research were the perceived low risk (in expected quality, functionality and contamination) and the high willingness to pay a premium price for ocean plastic products. This second factor is also strongly correlated with the recognisability of ocean plastic products. Recognisability here refers to the degree a product made from recycled ocean plastic is reflected in the visual appearance of the product (Magnier et al., 2019). As consumers' willingness to buy recycled ocean plastic products is present, it is therefore needed to determine how ocean plastics should be communicated in design in order to promote actual consumer adoption. Therefore a deeper understanding about what influence physical appearance and specific design elements have on the adoption of ocean plastic products is needed.

2.2.3. PROJECT FLOW

By now the project is being defined and a general understanding of ocean plastic is being created (chapter 1 & 2). The following chapters will consist of different phases including; literature research, empirical research and desig. The relationship between different phases and its respective

chapters of the thesis can be seen in figure 3. In this figure, also a brief description of each chapter can be found. Every phase has an important role within the overall project, and will be further explained subsequently.

Peoples' perception of (ocean plastic) products has been researched through a literature study of possible influential consumer interaction variables in relation with ocean plastics. These variables are then being explored during the *qualitative part of the empirical research. Using the insights from this study, stimuli have been designed in order to test ocean plastic product perceptions on a large-scale (*quantitative research). This way the small-scale rich data from the qualitative research is being examined on a large-scale level in order to validate the findings.

* The crucial differences between qualitative and quantitative research are explained in figure 4 (Braun & Clarke, 2013).
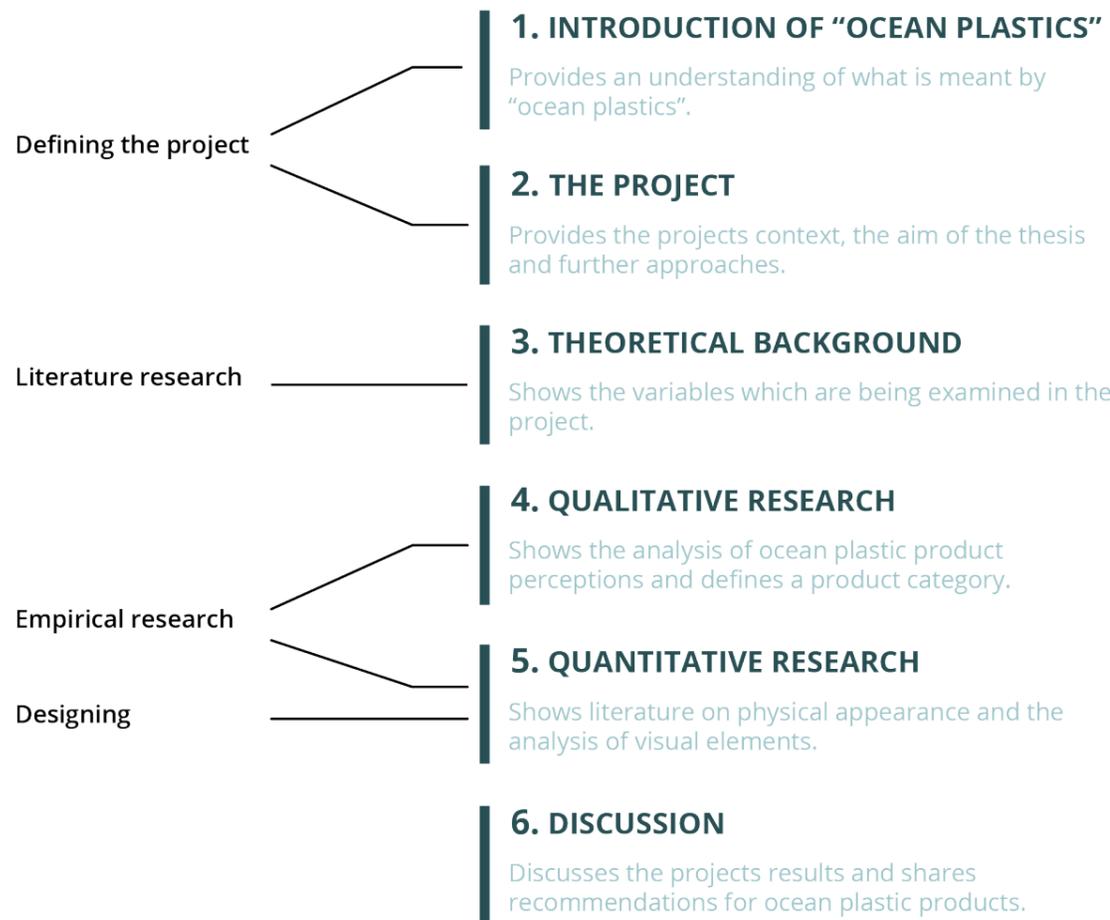
Defining the project

1. INTRODUCTION OF "OCEAN PLASTICS"
Provides an understanding of what is meant by "ocean plastics".

2. THE PROJECT
Provides the projects context, the aim of the thesis and further approaches.

Literature research

3. THEORETICAL BACKGROUND
Shows the variables which are being examined in the project.

Empirical research

4. QUALITATIVE RESEARCH
Shows the analysis of ocean plastic product perceptions and defines a product category.

5. QUANTITATIVE RESEARCH
Shows literature on physical appearance and the analysis of visual elements.

Designing

6. DISCUSSION
Discusses the projects results and shares recommendations for ocean plastic products.

Figure 3: Project flow.

BROAD DIFFERENCES BETWEEN QUALITATIVE AND QUANTITATIVE PARADIGMS

QUALITATIVE

- Words as used data
- Understands and interprets local meaning (data in context)
- 'Narrow' but rich data
- Tends to seek patterns, divergence or differences
- Theory generating & inductive
- Subjective (values personal involvement & partiality)
- Less fixed method
- Time consuming
- Interest in meanings of behaviour or internal cognitions

QUANTITATIVE

- Numbers used as data
- Identifies relationships between variables
- 'Shallow' but broad data
- Tends to seek consensus, norms or general patterns
- Theory testing & deuctive
- Objective (values detachments & impartiality)
- Fixed method
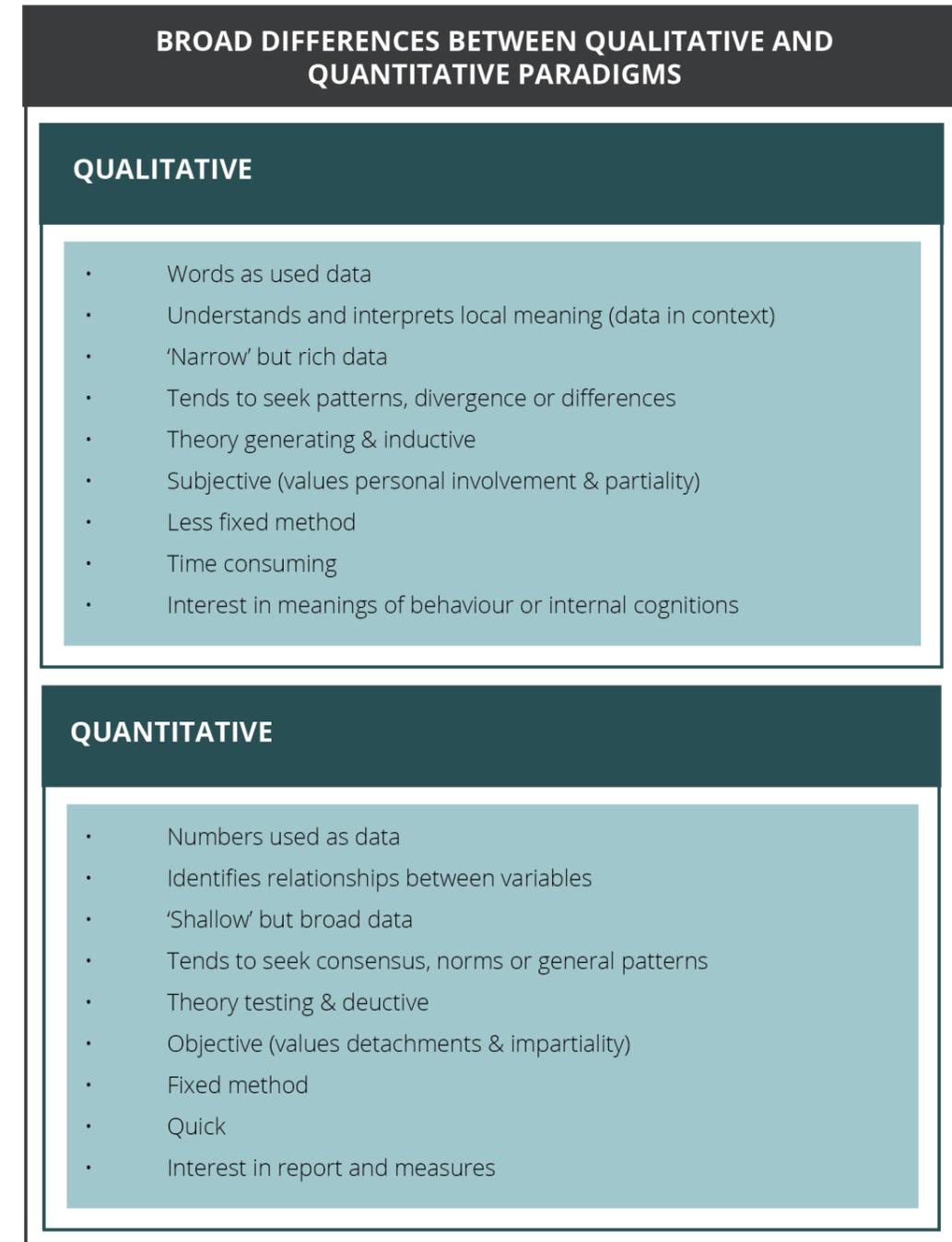- Quick
- Interest in report and measures

Figure 4: Qualitative and quantitative research.

3. THEORETICAL BACKGROUND

This chapter gives an overview of possible aspects which could influence how people perceive ocean plastic (products) and explains which product categories would be suitable to test for possible ocean plastic implementation.

IN THIS CHAPTER:

3. THEORETICAL BACKGROUND

3.1 RECYCLING (OCEAN PLASTIC) PERCEPTIONS

3.1.1 PERCEPTION OF RECYCLING QUALITY

For materials such as plastic, the recycling process considerably reduces the material properties. This is why recycled plastic products can be perceived inferior in quality compared to virgin (raw/non-recycled) plastic products (Hamzaoui-Essoussi & Linton, 2014). This quality perception is also related to the type of recycled good. When comparing textiles, FMCG and durables with each other, people perceive textile products made from recycled ocean plastic as inferior (Magnier et al., 2019). The fact that people may lack knowledge about recycling can contribute to this perception of quality (Guide & Li, 2010). This could go either ways. Despite the lack in knowledge on recycling in general, people may effectively have different quality perceptions depending on the type of products.

3.1.2 PERCEPTION OF RECYCLED PRODUCTS

Rising consumers' environmental awareness results in an increased demand for pro-environmental products (Hamzaoui-Essoussi & Linton, 2014). This could be why in general consumers have positive evaluations regarding pro-environmental products. Recycled products are also being considered as pro-environmental products by consumers and in general evoke positive feelings (Mobley et al.,

1995). Recycled ocean plastic could however evoke different perceptions compared to these "regular" recycled plastic. According to Magnier et al. (2019) people perceive recycled ocean plastic as having environmental benefits, regardless of the type of product. This could indicate that recycled ocean plastic products could also be considered as pro-environmental products.

Consumers' preference for buying products made from recycled materials in all probability is product specific. Consequently people tend to switch more easily (within a limited price range) from recycled products to new products when the functional risk is high (Hamzaoui Essoussi & Linton, 2010). This indicates that if the functional risk of a product is high, a thought through marketing strategy becomes crucial (such as being a trustworthy brand). Also companies nowadays are "green washing" their products, by for example putting the emphasis on environmental and social attributes of products while actual scientific proof of the "green" claims are unknown or insignificant (Hoek et al., 2013). However, in general consumers have a positive attitude towards buying recycled products. Buying recycled products is also strongly correlated with one's environmental concern (Hamzaoui Essoussi & Linton, 2010), which therefore should also be taken into account then designing recycled ocean plastic products.

3.1.3 PERCEPTION OF VALUE OF RECYCLED OCEAN PLASTIC

Another important element in the scope of this project is how valuable people perceive recycled ocean plastic products. Zeithaml (1988) defined the perceived value as: "consumers' overall assessment of the utility of a product (or service) based on perceptions of what is received and what is given". It needs to be noted that perceived value can be present during different stages of a purchase process. This also takes into account the pre-purchase stage, whereas for instance "satisfaction" does not take this into account (since it is only focussed on purchase and post-purchase) (Sweeney & Soutar, 2001). Since we are still trying to understand the effect of possible products made from recycled ocean plastics during the pre-purchase and purchase stages, discovering one's perceived value of ocean plastic products could be useful.

The dimensions influencing the perceived value of a product/service are: emotional (emotions and/or affection the product generates), social (social utility the product conveys) and functional values. Functional values are being subdivided in price (satisfaction in terms of short term vs. long term investments) and quality (expected product performance) values (Walsh et al., 2014; Sweeney & Soutar, 2001). In general all dimensions contribute in establishing the perceived value, of which emotional and quality are most important value drivers (Sweeney & Soutar, 2001).

3.2 FACTORS INFLUENCING PRO-ENVIRONMENTAL BEHAVIOUR

3.2.1 ENVIRONMENTAL CONCERN

Pro-environmental behaviour in the context of purchase decisions of consumers is being referred to as reducing, reusing and/or recycling (Nameghi & Shadi, 2013). This would mean that buying recycled ocean plastic products can be seen as pro-environmental behaviour. According to Fujii (2006) one's environmental concern, attitude toward frugality (soberness) and the perceived ease of implementation of pro-environmental actions are of big influence when stimulating pro-environmental behaviour. To test these stimuli on different levels, pro-environmental behaviour was being divided in four different categories. These were: reductions in electricity, gas, garbage, and automobile use. The perceived ease of implementation has an effect on all four pro-environmental behaviours, whereas attitude toward frugality affects electricity and gas use, and environmental concern solely effects garbage reduction (Fujii, 2006). Since people become more aware of the amount of plastic waste we produce and are willing to reduce it (Le Guern, 2018), this could mean that environmental concern could also be a dominant drive for peoples recycled (ocean) plastic behaviours. Nevertheless there is no evidence of a linear relationship between environmental concern and pro-environmental behaviour (Pickett-Baker & Ozaki, 2008).

3.2.2 ATTITUDE

Another important factor influencing pro-environmental behaviour is one's attitude. Nameghi & Shadi (2013) state that environmental emotion (peripheral information processing) and environmental cognition (central processing) are positively related to attitude, and therefore contribute to pro-environmental behaviour. Educating people in environmental concern and one's attitude would be effective in promoting overall pro-environmental behaviour (Fujii, 2006).

3.2.3 CONVENIENCE

Peoples' perception or attitude towards recycling could be relevant for recycled products as well. Literature suggests that one's frequency of recycling is more dependent on proximity (distance to for instance trash containers) than on one's environmental concern (Keramitsoglou & Tsagarakis, 2013). This corresponds with Guagnano

(2001) his observation that convenience reduces the effectiveness of altruism (opposite of egoism) as a predictor of pro-environmental behaviour. This implies that practical issues are more decisive than "doing good". So in order to perform pro-environmental behaviour, the perceived ease should be low.

3.2.4 GENDER DIFFERENCE

Both men and women are aware of the social desirability linked to pro-environmental norms. However, women generally have a stronger pro-environmental concern. Moreover, in the research of Félonneau & Becker (2008) women seem to have more strong pro-environmental attitudes. Nevertheless, no significant difference was found for in pro-environmental behaviour was found between the two genders. Important to note is that differences between genders seem culturally dependent.
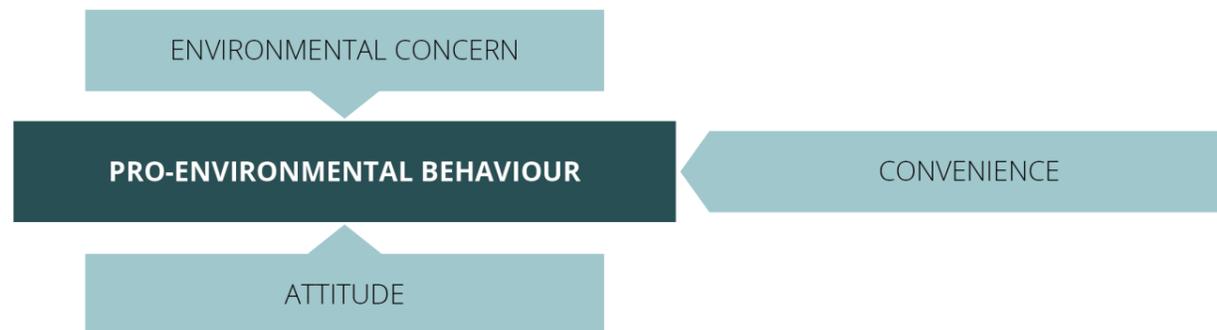
ENVIRONMENTAL CONCERN

PRO-ENVIRONMENTAL BEHAVIOUR ← CONVENIENCE

ATTITUDE

Figure 5: Factors influencing pro-environmental behaviour.

3.3 POSSIBLE WASTE/ SUSTAINABLE MATERIAL PRODUCT CATEGORIES

3.3.1 WASTE MATERIAL PRODUCTS

Waste materials are increasingly becoming a production source for low environmental impact products. Also it is considered aesthetically appealing that unconventional materials which are used in products have a different physical appearance (Bahrudin et al., 2016). This indicates that imperfections within these types of materials are being embraced and the recognisability of such will enforce consumer acceptance. Examples of waste materials used in different product categories are: a bees hive vase (Parsons, 2009); a bacterial cellulose jacket and microbial-induced bricks (Ginsberg, 2014). Yet a remaining question that needs answering is what type of product category people think as most valuable when made from recycled ocean plastic ("waste"). Some first research about the effect of ocean plastic for different product categories has been done by Magnier et al. (2019). These results will be discussed subsequently.

Figure 6: Unconventional material products.

3.3.2 ALREADY ANALYSED OCEAN PLASTIC PRODUCT CATEGORIES

Magnier et al. (2019) elaborated on consumers' perception of products using ocean plastics in their design for three different product categories: textile products, durables and fast moving consumer goods (FMCG). When comparing these types of goods with each other, several differences in perception had been found.

For textile products the quality expectations of the products and purchase intention were low, whereas the general risk was perceived as high. This indicates that there is less trust in this type of good. This could explain the high importance of recognisability and the willingness to pay (WTP) a price premium for these textile products (Magnier et al., 2019); suggesting that people want to be told about the presence of ocean plastics in textile products.

Durable goods were perceived quite differently. The importance of recognisability and WTP a price premium for durables was low, and the purchase intention and quality expectations were relatively high. This could indicate that people expect the presence of ocean plastics in these products to perform fine, and do not bother so much to actively recognise such products compared to "regular" products (Magnier et al., 2019).

The quality expectations, importance of recognisability, purchase intention and WTP a price premium for FMCG were all quite high. The general risk perception of FMCG was low. This could imply that there is sufficient trust and intention for people to buy FMCG (compared to textile and durable goods) when it is recognisable as an ocean plastic product. Perceived safety and environmental benefits were equal for all three investigated product categories (Magnier et al., 2019).

The differences between the three product categories indicate that (risk of) contamination negatively affects purchase intention, and peoples' tendency to avoid direct contact with ocean plastic products. Also there is a high probability for people to only buy products made out of ocean plastics, when not being perceived as contaminated. Contamination here refers to experiencing impurities in an objects its perceived value due to past use (Baxter et al., 2017).

Another general finding was that the more ocean plastic products would be recognisable, the higher the WTP a price premium would be (Magnier et al., 2019). Above finding are only with respect to the three product categories as investigated by Magnier et al. (2019). However there are more product categories which can use "sustainable" materials such as recycled ocean plastic.

3.3.3 SUSTAINABLE MATERIALS IN DIFFERENT PRODUCT CATEGORIES

According to Bahrudin et al. (2016) there are a few different product categories in which sustainable materials are currently important players. These are household objects, packaging, furniture, clothing & accessories building materials and others (See figure 7 on page 27).

Within these categories furniture, household objects, clothing & accessories and packaging had the most developed products (see figure 8), indicating that they make the most products which use unconventional sustainable materials. Also the first three of the categories (furniture, household objects and clothing & accessories) are predominantly made out of recycled plastics (Bahrudin et al., 2016). The fact that reused materials become more common in product design is largely due to the abundance and proximity of the waste resources, creating new opportunities. Interesting is that waste retrieved from polluted environments (of which the ocean
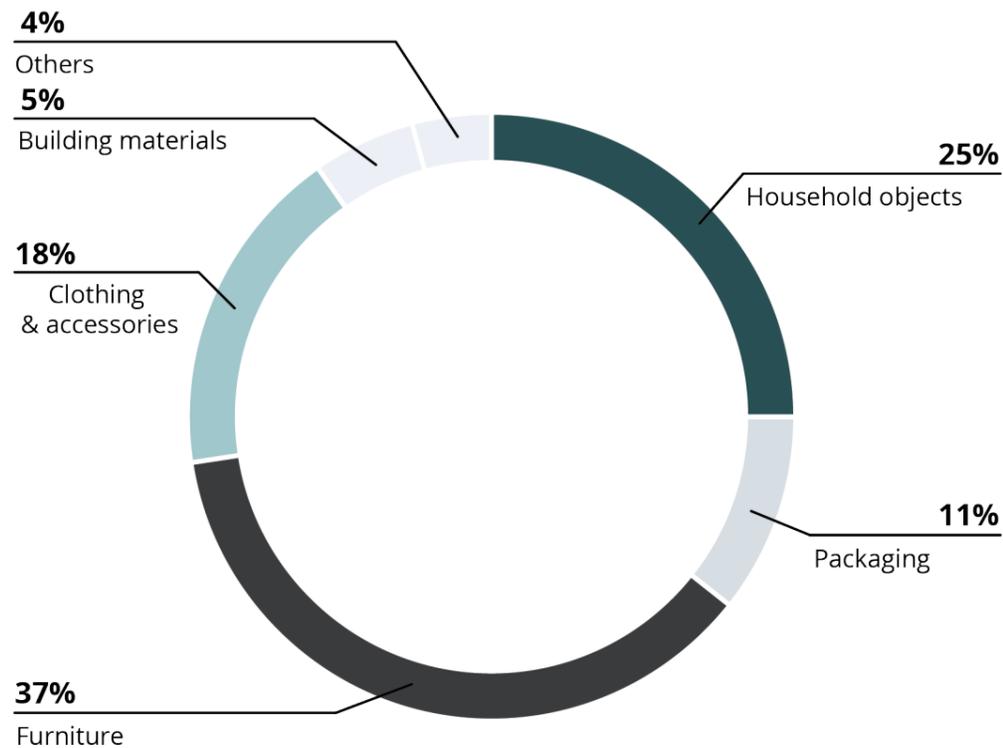
is an excellent example) it is being perceived as extra pro-environmental (Bahrudin et al., 2016). This perceived pro-environmental advantage is often used to market the product, meaning that a recognisable resource, could in fact be useful for gaining customer acceptance.

3.3.4 RESEARCH QUESTIONS

Based on the previous chapters you could say that currently society is shifting towards a more pro-environmental future where ocean plastics could become a dominant player, however the awareness and implementation of ocean plastic products is still quite low. Hence the main research question and corresponding sub-research questions of this project are as follows:

Main research question thesis:

"How to design ocean plastic products in order to create consumer enhancement?"

Sub-research questions thesis:

(1)

"Which type of product category is suitable for ocean plastics?"

(2)

"To what extend should ocean plastic be reflected in the visual appearance of a product?"

Figure 8: Unconventional material products distribution.

*HOUSEHOLD OBJECTS	PACKAGING
E.g. plate, mug, bowl, pot, clock, toothbrush, vase, basket, mat, toys, hoover.	*E.g.* bottle, plastic bag, void fill packaging, fruit-carrier bag, razor packaging.
*FURNITURE	*CLOTHING & ACCESSORIES
E.g. stool, chair, bench, lighting, side table, table, outdoor seating.	*E.g.* dress, shoes, textile, necklace, sneaker, bag, sunglass.
BUILDING MATERIALS	OTHERS
E.g. acoustic panel, bricks, tiles, flooring.	*E.g.* musical instrument, car interior finish, surfboard, 3D printer filament.

Figure 7: Pro-environmental product categories (* Indicates that it is predominantly made out of recycled plastics).

THEORETICAL BACKGROUND

RECYCLING (OCEAN PLASTIC) PERCEPTIONS AND PRO-ENVIRONMENTAL BEHAVIOUR

The fact that plastic is being recycled can influence one's quality perception. However this quality perception can differ depending on the type of product(s) since people may lack knowledge about different material processing types. Despite all perceptions, people perceive ocean plastic products as pro-environmental, which often evoke positive feelings. In order to explore how consumers value ocean plastic products, different dimensions should be examined. This includes the positive evoked feelings and quality, but also social utility and price.

The factors which are influencing pro-environmental behaviour could have a big impact regarding ocean plastic behaviours since they are being perceived as the same. These influencing factors are ones environmental concern, one's general attitude towards ocean plastic and recycling convenience. Although women tend to have a stronger pro-environmental attitude, no difference in behaviour is found between genders. Hence both genders need to be taken into account.

In order to understand ocean plastic perceptions and possible behaviours regarding to ocean plastic products, all these previously discussed factors influencing these aspects need to be explored. By performing a qualitative study, rich information about these perceptions and behaviours can be obtained which are needed to answer the research question.

DIFFERENT PRODUCT CATEGORIES

Waste materials are increasingly becoming more common in product design. Hereby physical appearance plays an important role in recognisability and adaptation of the products. For the product categories tested by Magnier et al. (2019) it became clear that recognisability and contamination of ocean plastic play an important role for behavioural intentions. In order to get a broader view of which possible (additional) effects ocean plastic would have on products, the product categories explained by Bahrudin et al. (2016) will be retained for further research. This will give a better understanding of the effects of ocean plastics for different types of products and how to design ocean plastic products in order to create consumer enhancement.

4. QUALITATIVE RESEARCH

This chapter clarifies the qualitative research of the recycled ocean plastic product study. Qualitative research is needed to obtain rich data about ocean plastic (products) perceptions. These rich perceptions will determine the further design dimensions of the project. This chapter elaborates upon the set-up of the study (in the form of interviews) as well as the analysis and results of it.

IN THIS CHAPTER:

4. QUALITATIVE RESEARCH

4.1 THE ESSENCE OF QUALITATIVE RESEARCH

Qualitative data is used to interpret and understand meanings of behaviour in a certain context. It is narrow but rich data which can uncover new patterns, differences, etc. Qualitative research can, based on the interpreted facts and phenomena found, be used to generate new theories. The research method is rather subjective, meaning that the interpretations of such research reflect on personal experiences of the researcher. However this is not seen as a bias (Braun & Clarke, 2013). It is generally agreed there is to be more than one way to interpret the data, meaning there is no single "right" answer. The analysis tells "one" story of what could have been told about the data. However of course there are different ways to manage the data and to validate it (Braun & Clarke, 2013). This interpreting and understanding of meanings and behaviours are of big importance when wanting to promote novel products, since less is known about peoples' responses within these domains. Therefore conducting a qualitative research is a crucial step in understanding peoples' ocean plastic products enhancement.

4.1.1 EXPERIMENTAL QUALITATIVE RESEARCH

This research is an experimental qualitative research since perspectives, experiences and practices are being expressed in the data. The focus lies on accepting and prioritizing the participants'

own interpretations and perspectives. This type of analysis provides rich and contextualised descriptions of meanings (Braun & Clarke, 2013).

4.1.2 VALIDITY

Validity refers to how researches can confirm that their findings are corresponding to participants' experiences, which can be seen as the overall quality and trustworthiness of the study. Qualitative research should meet certain criteria in order to assess validity, specifically: credibility, transferability, dependability and conformability (Guba, 1981). This includes: whether the findings make sense, if generalization is possible, the stability of the data over time, and whether the findings can be confirmed by others (Ravitch & Mittenfeller, 2015). This should be taken into account when concluding the analysis.

4.1.3 THEMATIC ANALYSIS

There are several analyses which can be used to analyse a qualitative study. The type of analysis used in this research is a thematic analysis. This analysis involves in "discovering, interpreting and reporting patterns and clusters of meaning within the data" (Spencer et al, 2014). It identifies topics that are integrated in themes in order to address the research question. Some people even argue that the thematic analysis is not an approach on its own but actually a method which can be integrated in multiple other theories/analysis (Spencer et al, 2014).

4.2 INTERVIEW VARIABLES

Based on the literature discussed in chapter 3, some variables in the domain of recycled ocean plastic s are important to understand in order to define guidelines for designing ocean plastic products. These variables will be clarified in the following paragraphs.

4.2.1 PERCEPTION AND ATTITUDE

An important element which would be interesting to explore is consumers' perception of recycled ocean plastics. Exploring consumers' perceptions would be of high value since this influences the required design strategy for ocean plastic enhancement. In order to expose this, it is needed to understand how people perceive recycling in general and recycled ocean plastics compared to "regular"/"on-land" recycled plastics. When looking at these perceptions of recycling, practical issues could play an important role (Keramitsoglou & Tsagarakis, 2013). Interesting then would be to find out if this is still the case, when considering that people have become more pro-environmental supportive over recent years.

Another important element regarding ocean plastic perceptions could be to uncover emotional, social and functional values for both recycling and ocean plastics. This can be done by asking people how they perceive the quality, the price, the social aspects regarding recycling and/or ocean plastics and what their affective responses are. By doing so, the relation between ocean plastics and recycling in general can be understood.

To see if there is a relation between environmental concern and pro-environmental behaviour, it is needed to know why people perform or do not perform certain behaviours regarding recycling. Therefore it is needed to discover peoples' attitude towards pro-environmental behaviour and the willingness to be educated about aspects influencing pro-environmental behaviour.

4.2.2 RECOGNISABILITY

Imperfections in physical appearance and recognisability in general are of big influence when successfully marketing recycled or new material products (Hamzaoui Essoussi & Linton, 2010). Therefore it is interesting to find out if people already have some kind of common perception for the physical recognisability of recycled ocean plastic products.

4.2.3 PRODUCT CATEGORIES

Trying to understand how and why (quality) perceptions differ per product category can be useful for choosing an appropriate product category to design for. In addition people's knowledge regarding recycling can be tested. This can be done by referring to the perceived quality perceptions of people for ocean plastic products (Guide & Li, 2010).

The three types of goods analysed by Magnier et al. (2019) (textile products, FMCG and durables), can in fact be placed in the product categories explained by Bahrudin et al. (2016). This more generic division of product categories could be more useful when finding an appropriate product category for recycled ocean plastic, simply because there are more and more diverse options to analyse.

4.3 INTERVIEW GUIDE

The objective of this study is to find out peoples' pro-environmental/recycling perceptions, how they perceive recycled ocean plastic (products), and to find an appropriate product category to design for. Hereby underlying values and behavioural intentions can be uncovered.

Therefore the main research question for this qualitative research is as follows:

"How do people perceive ocean plastics and what type of product category would be most valuable to design for?"

The sub-research questions for the qualitative research are:

(1)

"What is peoples' general attitude towards recycling plastics?"

(2)

"How do people perceive recycled ocean plastics?"

(3)

"Which product category do people find most interesting for the presence of ocean plastics?"

(4)

"What are peoples' first reactions regarding the recognisability of ocean plastics?"

The interviews taken are semi-structured, which has as advantage that the researcher is free to build a conversation around the interview guide. Therefore participant's experiences can emerge more naturally. The questions prepared in the interview guide were

all aimed at eliciting certain kinds of responses. In figure 9 you find the six types of questions which are most used in an interview guide eliciting these kind of responses (Patton, 2002) (*Background questions are not included in the interview guide but will be asked informally just before the interview itself to get acquainted with each other (interviewer and respondent). Examples of such asked questions are: How old are you? Are you married? What have you studied? What do you do for a living? Etc.). In figure 10 an example is given of the implementation of the types of questions in one of the subtopics of the interview guide (subtopic 1). For the full (and final) interview guide see appendix 2.

In general, questions in the interview guide were: open-ended, neutral (free of judgements), clear and singular (highlighting only one aspect) where possible. When a question is not found clear by the respondent, they are free to ask for clarification (Patton, 2002).

4.3.1.PROBES

Asking follow up questions (probes) can enrich the level of response. This can easily be done using 4 different types of probes (Patton, 2002), which are listed below.

1. Detail-oriented probes
   (who, where, when, what, how)
2. Elaboration probes
   (uh-huh, can you elaborate on that)
3. Clarifications probes
   (what do you mean with that)
4. Contrast probes
   (how does A compare to B)

Figure 9: Types of questions interview guide.

Figure 10: Example sub-topic from interview colour coded.

The types of probes are all used during the interviews. Some of them were already prepared in the interview guide. These probes are indicated in figure 10 with round bullets before the questions. All predefined probes can be found in the complete interview guide in appendix 2. Other examples of non-fixed probes which arose during the interviews can be found in the transcriptions (see appendix 3).

4.3.2 PRODUCTS IN THE EXPERIMENT

In order to determine products to design for, images were added to the interviews to get an understanding of preferences between product categories. The goal of the experiment in the interview was to find out if people have a preference for a certain product category. Directly asking this question to them would be overwhelming, therefore predefined products are chosen. The chosen products represent a specific product category. The interviewees however were not told about these different product categories. Using pictures of products serve to make the participants more at ease in order to make them think about possible implementations of ocean plastics. The products are used to find arguments for supporting, or not supporting specific ocean plastic implementations. Also by first offering predefined products it should become easier for the interviewees to discuss or come up with possible other applications for ocean plastics. The product categories used were based on the categories from Bahrudin et al. (2016). The representing products are chosen based on the findings of Bahrudin et al. (2016) and Magnier et al. (2019). The selected group of products consists of the items shown in figure 11. Subsequently the chosen products representing a product category are being explained.

HOUSEHOLD OBJECTS

E.g. plate, mug, bowl, pot, clock, **toothbrush**, vase, basket, mat, toys, **hoover**.

PACKAGING

E.g. **bottle**, plastic bag, void fill packaging, fruit-carrier bag, razor packaging.

FURNITURE

E.g. stool, **chair**, bench, **light-ing**, side table, **table**, outdoor seating.

CLOTHING & ACCESSORIES

E.g. dress, shoes, textile, neck-lace, **sneaker**, bag, **sunglass**.

BUILDING MATERIALS

E.g. **acoustic panel**, bricks, tiles, **flooring**.

OTHERS

E.g. musical instrument, car interior finish, surfboard, 3D printer filament.

Figure 12: Pro-environmental product categories with selections.
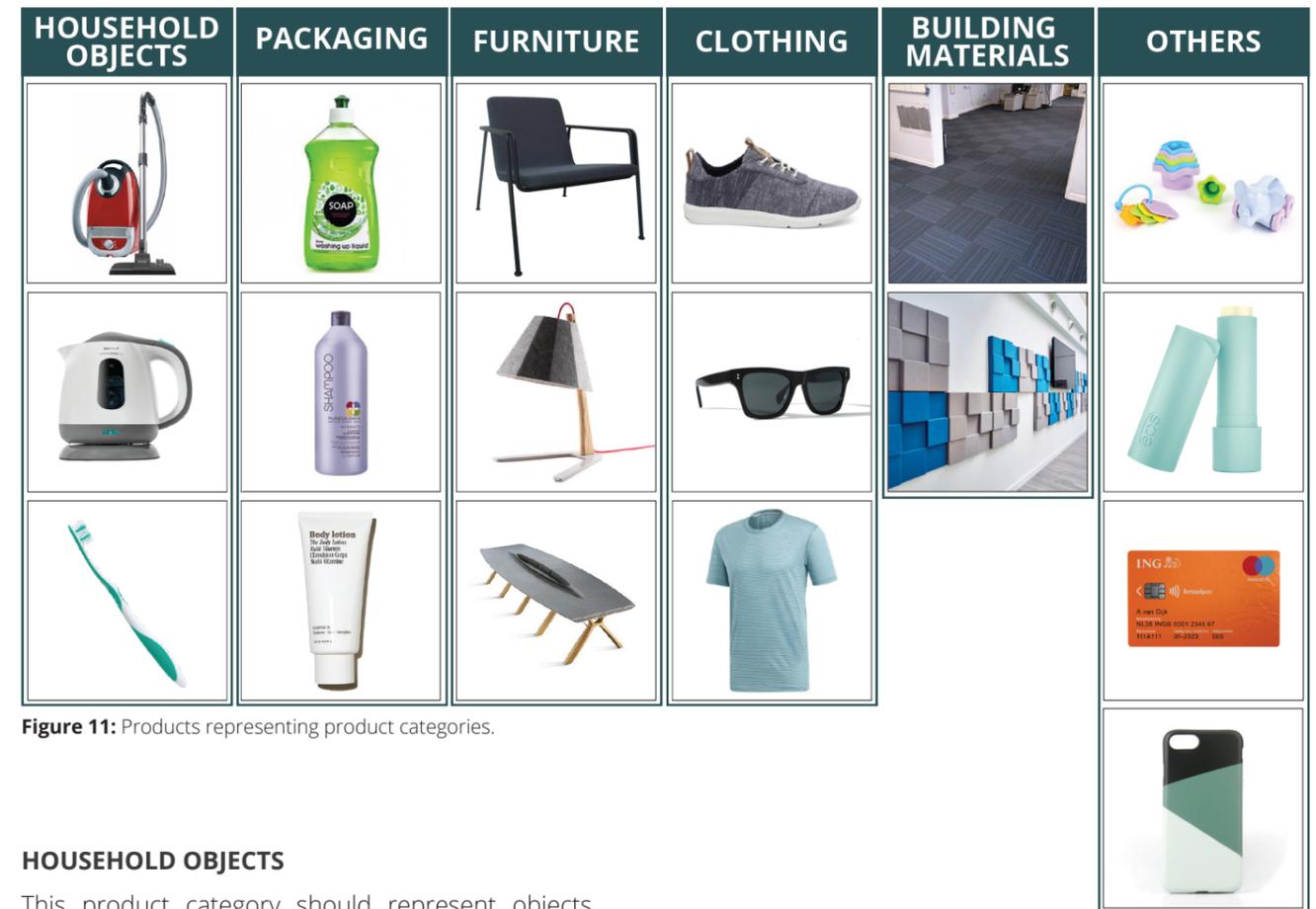
Figure 11: Products representing product categories.

HOUSEHOLD OBJECTS

This product category should represent objects which are frequently used in peoples' households. The chosen products for this category are: a vacuum cleaner, a water kettle and a toothbrush. The vacuum cleaner and the toothbrush were already proposed in the product category of Bahrudin et al (2016) (see figure 12). Also Magnier et al. (2019) used a vacuum cleaner as a variable, which could therefore be interesting to validate. The toothbrush was picked in order to test the contamination perception of people in an extreme scenario (since people make direct oral contact with toothbrushes). In order to test the perception of hygiene the kettle was chosen. Most people know that boiling water can work antibacterial since germs are killed by the temperature of the water. However people might have another perception of this when they feel that ocean plastic is contaminated, and is therefore a useful product to include in this test.

PACKAGING

This product category should represent objects which are commonly used and known for being made out of plastic. The chosen products for this category are: a bottle of dishwashing liquid, a bottle of shampoo and a body lotion packaging. These products are specifically focussing on contamination perceptions. All products contain substances which make different types of direct personal contact. The dishwashing liquid should in fact make no direct contact with people since this is being washed of during the cleaning process. However some soap remnants could of course remain on the dishes which might cause a different contact perception. The shampoo makes direct contact with the skin, but is being washed of immediately as well. The body lotion is being absorbed by the skin and

is therefore making even more direct personal contact. The dishwashing liquid and the body lotion are also tested by Magnier et al. (2019) and are therefore also interesting to validate. (Herby the most direct contact option was hand cream instead of the now used body lotion; however these could be interpreted as the same kind of product)

FURNITURE

This product category should represent frequently used furniture which most people come in contact with daily. The chosen products for this category are: a chair, a lamp and a table. All these three types of products are based on the products from Bahrudin et al (2016). The chair and the table are chosen to test the perception of long time use and contact. The lamp is chosen to test the perception of radiation. A lamp often becomes very warm when in use, which could cause a different harmfulness perception compared to a chair or a table.

CLOTHING

This product category should represent clothing and clothing accessories which are frequently worn by people. The chosen products for this category are: sneakers, sunglasses and a t-shirt. The sunglasses are chosen to test the perception of more occasional usage. However sunglasses are often worn with good weather which could heat the frame of the glasses. Also it makes direct contact with the face. Therefore this is an interesting product to test short time but intense usage. The sneakers and the t-shirt are more long time usage products, whereas the t-shirt makes direct contact with the skin and the sneakers make less direct contact. However the sneakers most probably are used more frequently than t-shirts since people have fewer shoes than clothes. Magnier et al. (2019) tested a sweater and running shoes, which are comparable with

the products within this test. This again could be interesting to validate.

BUILDING MATERIALS

This product category should represent building materials which can easily be found in crowded buildings. The chosen products for this category are: an acoustic panel and flooring. Hereby both the acoustic panel and the flooring could have an effect of the air quality of the space since they often come with big quantities. For the acoustic panel no direct contact is assumed, whereas the flooring could make more direct contact (for instance people walking on the floor on bare feet or sitting on it).

OTHERS

This product category should represent object which are often entwined in peoples' daily lives but who not belong in one of the other categories. The chosen products for this category are: baby toys, lip balm, a debit card and a phone case. The baby toys and the lip balm are chosen to test the oral contamination perception of people in different scenarios. Namely for one's self or for others (babies). Interesting here is the difference in age and participation. The debit card and the phone case make less direct contact but are frequently used by almost everyone. Hereby the phone however could evoke a certain perception of radiation and makes direct contact with the skin, whereas the debit card does not.

4.3.3 PROCEDURE OF THE EXPERIMENT

At a certain point during the interviews the participants were asked to reflect on the different types of products. Hereby they were asked to cluster the products on whether they would like (yes), would not like (no) or were not sure (not sure) if they would like to have the specific product to be

made from ocean plastic. Cards with the three types of cluster names (yes, not sure, no) were placed in front of them and the product pictures were given to them. The 18 different products were shuffled by forehand to evade that the products could already consecutively be in the predefined product categories. The process of this sorting is illustrated in figure 13.

4.3.4 EXTRA TEST VARIABLE

Since ocean plastic products could contain a different amount of recycled ocean plastic of the total amount of plastic of the component(s) (see also figure 1 in chapter 1.2), an exploratory question was added at the end of the interview. People were asked what they found the minimal, normal and maximal amount of recycled ocean plastic a product should contain in order to be sold as an ocean

plastic product. They were asked to pinn these three different conditions on a scale ranging from 0 to 100%. An example of such is given in figure 14. This test was added to find out a level of "product fairness" regarding the amount of ocean plastic in the product.

4.3.5. PILOT STUDY

In order to test the flow of the interview guide, a pilot study has been done. According to the pilot some questions where either skipped, added, shuffled or rephrased. If needed, question where modified to be even more open-ended, clear and neutral. In general it was needed to really focus on how people "feel" about certain things. This will help in getting more valuable insights. Especially since the topic of the interview is generally quite unknown by people. The pilot interview with the comments/adjustments can be found in appendix 4.
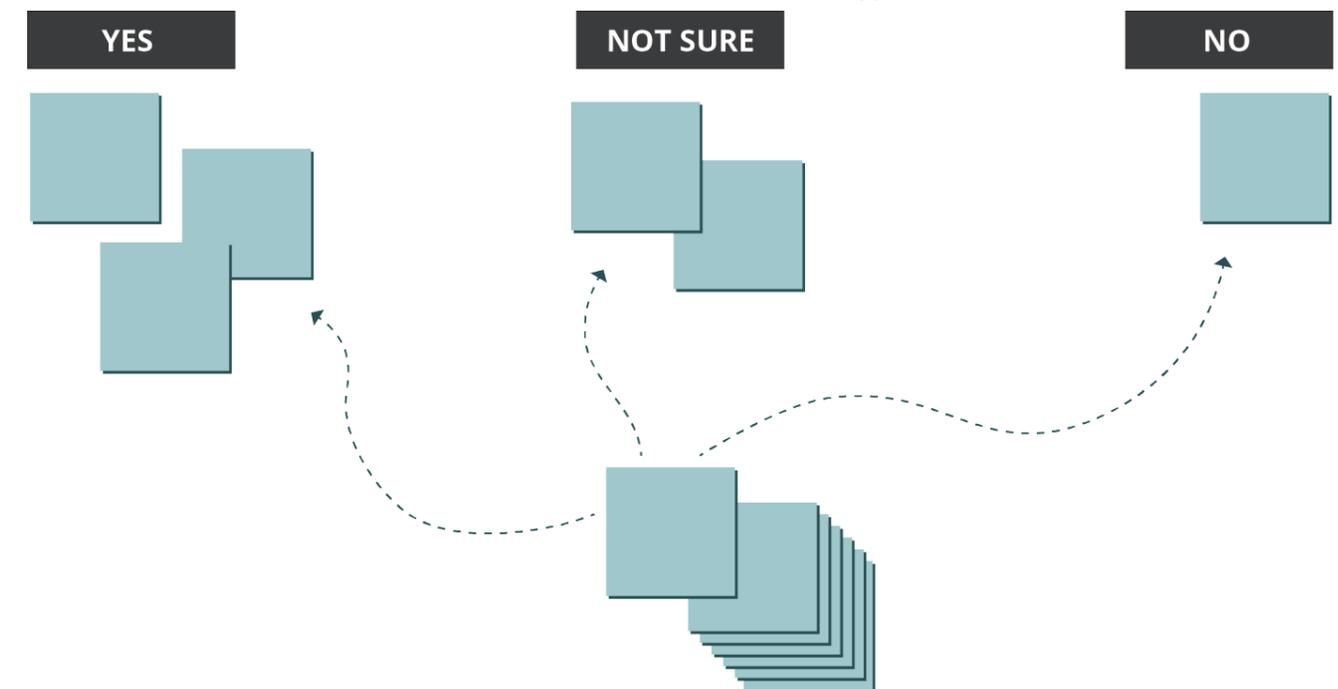

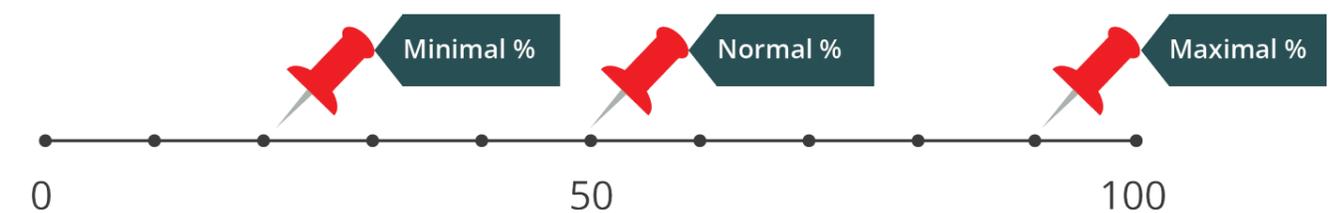**Figure 13:** Sorting process product pictures.

Figure 14: Pinning percentage of ocean plastic.

4.4 SAMPLING

4.4.1 GENERAL INFORMATION PARTICIPANTS

The respondents were obtained via snowball sampling focussing on people from different households. They were interviewed individually in calm and/or familiar environments to make them feel more comfortable in giving personal opinions/answers (Miles et al, 2013). In general the sample was well balanced. The genders of the participants were equally divided and they were aged between 22 and 90 years old (with an average age of 42). The participants could be grouped in six different types of households namely: couple family with no children, couple family with young children, couple family with young adult children, one parent family, single person household, and group household. The demographical information of the participants can be found in figure 15.

4.4.2 SATURATION

The total amount of obtained interviews is 12. This number is established due to the saturation during the interviews. This means that the amount of interviews is dependent of the saturation of the data. In here saturation is referred to as follows:

"Saturation means that no additional data are being found whereby the sociologist can develop properties of the category. As he sees similar instances over and over again, the researcher becomes empirically confident that a category is saturated." (Glaser & Strauss, 1967)

Accordingly, an example of such saturation is illustrated as a saturation curve which can be found in figure 16.
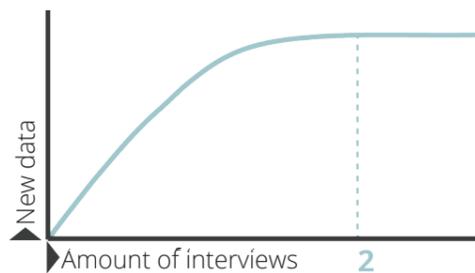

Figure 16: Saturation curve interviews.

SAMPLE INFORMATION

GENDER		
Male	50%
Female	50%
Total participants	12

AGE	
Average age in years	42

HOUSEHOLD TYPE	
Couple family with no children	16,7%
Couple family with young children	25,0%
Couple family with young adult children	16,7%
One parent family	8,3%
Single person household	16,7%
Group household	16,7%

Figure 15: Information participants.

4.5 THEMATIC ANALYSIS OF THE INTERVIEWS

A thematic analysis is a method to identify, analyse and report certain patterns (themes) within the data. It describes the data in rich detail and makes you able to interpret various aspects of the topic which is being researched (Braun & Clark, 2006). During this analysis an inductive approach was used, thus an inductive thematic analysis (Braun & Clark, 2006). This means that the themes which evolved are strongly linked to the data since no pre-existing coding frame was used (Patton, 1990). This can also be recalled as a bottom up approach. Regarding the identifying of the themes, a semantic approach was used. Hereby the themes express the meanings of the data and form a description or interpretation of the patterns in order to theorise the meanings and implications of the research topic (Patton, 1990). These findings are often brought into relation with previous literature (paragraph 4.9.2).

The five sequential phases of a thematic analysis (similar to phases of other qualitative research) are explained in paragraph 4.5.1 till 4.5.5. Important to note is that the analysis is iterative opposed to a linear process, which means that the analysis is being processed over time and iterations are crucial then interpreting the data (Braun & Clark, 2006).

4.5.1 DATA FAMILIARISATION

In general it is advised to repeatedly read though the data in an active way before coding the data. Possible meanings or patterns could then already be shaped throughout the reading process (Patton, 1990). Since I personally took all interviews, I was already familiar with the data and which patterns evoked in general and respondent specifically. When all interviews were obtained, the data needed to be transcribed into written texts (see appendix 3). This of course also is an excellent way to familiarise yourself with the data (Riessman, 1993) and develop interpretive skills which are needed to analyse the data (Lapadat & Lindsay, 1999). During the transcribing, possible meanings were being noted and a potential first set of codes was being developed.

4.5.2 INITIAL & FOCUSSED CODING

Codes identify a meaning of the data which is interesting for the analysis (Braun & Clark, 2006). Codes can either be applied on short segments or larger segments of the data (e.g. line by line coding or paragraph coding). In this analysis both line by line coding and paragraph coding are used. Regarding the line by line coding a little of the relevant surrounding data was implemented in the codes in order to keep the corresponding context to the codes (Bryman, 2001). Segments can also be linked to multiple codes, meaning that the data refers to multiple topics at the same time. These are called co-occurrences. Co-occurrences will be further explained in chapter 4.8.

When coding the first three interviews, as many potential patterns as possible were coded. After the three initial interviews, the codes were analysed in order to create a good basis for the codes which could be used to analyse the subsequent interviews. These sets of codes are called focussed codes. Focussed coding searches for the most frequent or significant codes. It categorises coded data based on thematic similarity (Saldaña, 2015). Similar codes are then merged into one code covering all of the initial codes. The codes were brought back from approximately 150 initial codes to approximately 120 focussed codes. Since it is an iterative process the final amount of codes used in all interviews was 118.

4.5.3 THEMES

A theme captures something important about the data related to the research question(s). It presents a "patterned" response or meaning which occurs in the data set (Braun & Clark, 2006). The themes are being emerged by the grouping of different codes. This is done by analysing the codes and/or relation between codes and form overarching themes between them. The thematic process will eventually lead into main themes and sub-themes (themes within themes). The initial thematic map can be found in appendix 5.

4.5.4 REVIEWING THE THEMES

When refining the themes it is important to see if themes cohere meaningfully and whether there are distinct differences between the themes (Braun & Clark, 2006). During this phase some codes were either removed or added from/to themes. Also a new sub-theme has been emerged from an already existing theme (Intrinsic motivators > seeking for change). These changes can be seen in the final thematic map (figure 17) showed on page 44 and 45. A summarised version can be seen in figure 18 (page 46) which is only showing the themes and not all the codes corresponding to the themes, The thematic map and how to interpret figure 17 will be further explained in chapter 4.6.

4.5.5 DEFINING AND NAMING THEMES

During the reviewing of the themes some themes have been renamed. Figure 17 and 18 show the final names of the themes. The first set of names can be found in the initial thematic map in appendix 5. It is important that the naming of the theme captures the essence of the story each theme tells, and should be able to be explained in just a few sentences. These small stories should then fit into the bigger overall story of the research. Chapter 4.6 will further explain these "stories" of the analysis.

4.6 THEMATIC MAP

The interview guide consisted of four different topics which where: one's general recycling perception, ocean plastic perceptions, ocean plastic product perceptions and product appearance impressions of ocean plastics. Within these topics, several themes where found.

As shown in the legend, all different elements of the map are colour-coded. The groundedness of the codes corresponding to themes and sub-themes are listed accordingly in terms of size. The higher it is on the list, and the bigger the font size is, the more grounded the code is. The groundedness of a code is displayed by a number. This number behind the groundedness corresponds to the amount a code occurs in the total analysis. The density (relations between codes) is not shown in the figure.

4.6.1 STORIES OF THE THEMES

As explained in 4.5.5 it is important that the name of the theme captures the essence of the story each theme tells. This story should be able to be explained in just a few sentences. These stories corresponding to the themes will be explained next.

POSITIVE ACTS

People see recycling as a part of pro-environmental actions which in their eyes is something good. They feel positive about the possible implications of recycling and pro-environmental gestures and are willing to behave even more green (compared to what they already do).

NEGATIVE FEEDBACK

People feel they get less feedback about recycling in terms of how to do it and whether it is useful. They hear different things and don't know what to believe causing the general awareness and attitude towards the recycling system to be low.

INTRINSIC MOTIVATORS

People have personal beliefs which all result in wanting to "do well" for the environment. They experience subtle nudges which motivate them to act more pro-environmental and make them feel positive about this.

SEEKING FOR CHANGE

People feel a critical new mind-set is needed in which "change" will be of most importance. They are willing to support the pro-environmental gestures they see happening around them but feel more action(s) should be taken in order to achieve the gestures.

EXTRINSIC INFLUENCERS

People need help in better understanding the situation and want external parties to be proactively thinking/doing this along with them. They feel dependent of these external parties and therefore want a green push and confirmation by them.

POSITIVE THOUGHTS

People have positive thoughts about ocean plastics and would be willing to buy products made from it. They feel that cleaning the ocean and using this obtained material is a useful pro-environmental act which creates an added value for this rich material resource.
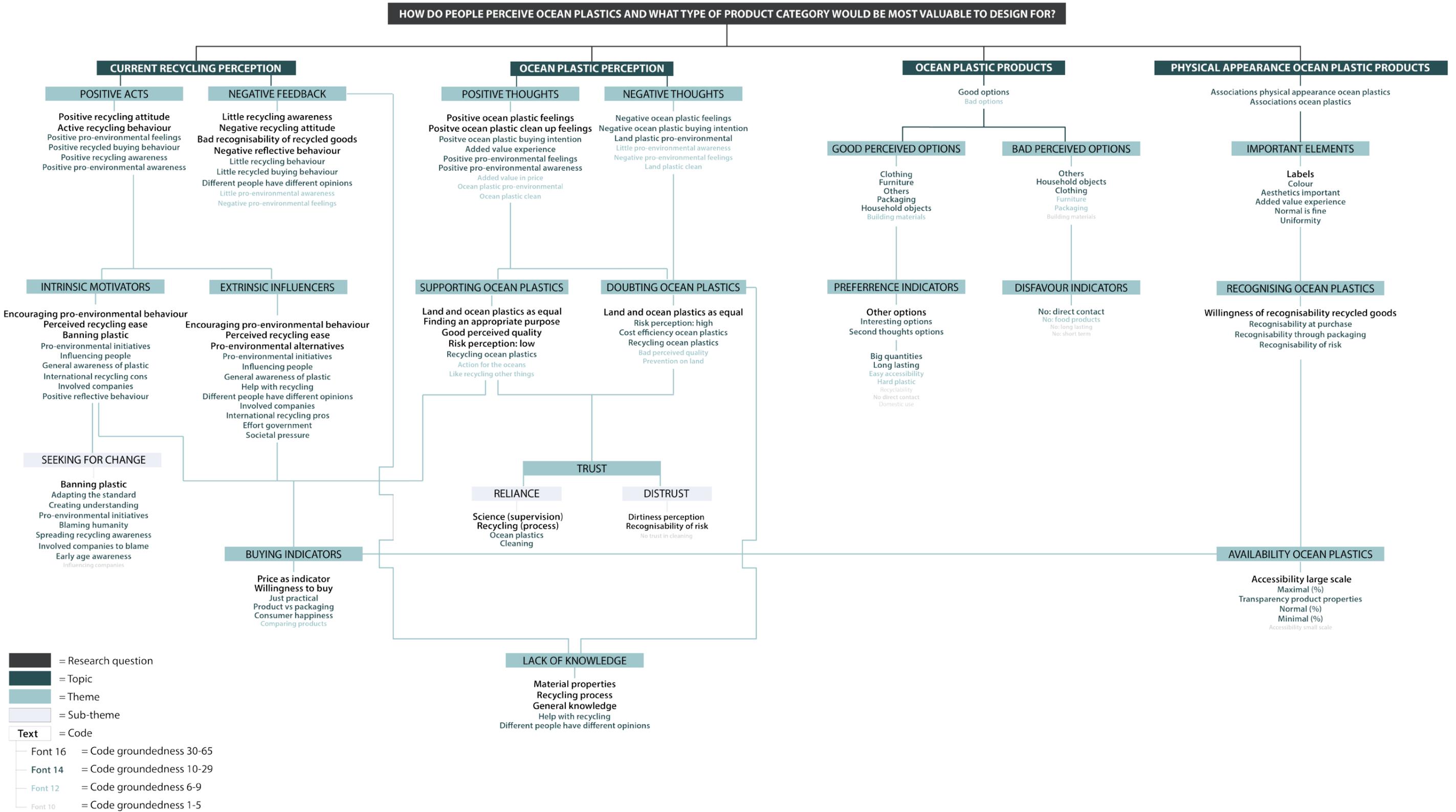
HOW DO PEOPLE PERCEIVE OCEAN PLASTICS AND WHAT TYPE OF PRODUCT CATEGORY WOULD BE MOST VALUABLE TO DESIGN FOR?

CURRENT RECYCLING PERCEPTION

POSITIVE ACTS

Positive recycling attitude
Active recycling behaviour
Positive pro-environmental feelings
Positive recycled buying behaviour
Positive recycling awareness
Positive pro-environmental awareness

NEGATIVE FEEDBACK

Little recycling awareness
Negative recycling attitude
Bad recognisability of recycled goods
Negative reflective behaviour
Little recycling behaviour
Little recycled buying behaviour
Different people have different opinions
Little pro-environmental awareness
Negative pro-environmental feelings

INTRINSIC MOTIVATORS

Encouraging pro-environmental behaviour
Perceived recycling ease
Banning plastic
Pro-environmental initiatives
Influencing people
General awareness of plastic
International recycling cons
Involved companies
Positive reflective behaviour

EXTRINSIC INFLUENCERS

Encouraging pro-environmental behaviour
Perceived recycling ease
Pro-environmental alternatives
Pro-environmental initiatives
Influencing people
General awareness of plastic
Help with recycling
Different people have different opinions
Involved companies
International recycling pros
Effort government
Societal pressure

SEEKING FOR CHANGE

Banning plastic
Adapting the standard
Creating understanding
Pro-environmental initiatives
Blaming humanity
Spreading recycling awareness
Involved companies to blame
Early age awareness
Influencing companies

OCEAN PLASTIC PERCEPTION

POSITIVE THOUGHTS

Positive ocean plastic feelings
Positve ocean plastic clean up feelings
Positve ocean plastic buying intention
Added value experience
Positive pro-environmental feelings
Positive pro-environmental awareness
Added value in price
Ocean plastic pro-environmental
Ocean plastic clean

NEGATIVE THOUGHTS

Negative ocean plastic feelings
Negative ocean plastic buying intention
Land plastic pro-environmental
Little pro-environmental awareness
Negative pro-environmental feelings
Land plastic clean

SUPPORTING OCEAN PLASTICS

Land and ocean plastics as equal
Finding an appropriate purpose
Good perceived quality
Risk perception: low
Recycling ocean plastics
Action for the oceans
Like recycling other things

DOUBTING OCEAN PLASTICS

Land and ocean plastics as equal
Risk perception: high
Cost efficiency ocean plastics
Recycling ocean plastics
Bad perceived quality
Prevention on land

TRUST

RELIANCE

Science (supervision)
Recycling (process)
Ocean plastics
Cleaning

DISTRUST

Dirtiness perception
Recognisability of risk
No trust in cleaning

BUYING INDICATORS

Price as indicator
Willingness to buy
Just practical
Product vs packaging
Consumer happiness
Comparing products

LACK OF KNOWLEDGE

Material properties
Recycling process
General knowledge
Help with recycling
Different people have different opinions

OCEAN PLASTIC PRODUCTS

Good options
Bad options

GOOD PERCEIVED OPTIONS

Clothing
Furniture
Others
Packaging
Household objects
Building materials

BAD PERCEIVED OPTIONS

Others
Household objects
Clothing
Furniture
Packaging
Building materials

PREFERRENCE INDICATORS

Other options
Interesting options
Second thoughts options

Big quantities
Long lasting
Easy accessibility
Hard plastic
Recyclability
No direct contact
Domestic use

DISFAVOUR INDICATORS

No: direct contact
No: food products
No: long lasting
No: short term

PHYSICAL APPEARANCE OCEAN PLASTIC PRODUCTS

Associations physical appearance ocean plastics
Associations ocean plastics

IMPORTANT ELEMENTS

Labels
Colour
Aesthetics important
Added value experience
Normal is fine
Uniformity

RECOGNISING OCEAN PLASTICS

Willingness of recognisability recycled goods
Recognisability at purchase
Recognisability through packaging
Recognisability of risk

AVAILABILITY OCEAN PLASTICS

Accessibility large scale
Maximal (%)
Transparency product properties
Normal (%)
Minimal (%)
Accessibility small scale

Legend:

■ = Research question
■ = Topic
■ = Theme
□ = Sub-theme
[Text] = Code

— Font 16 = Code groundedness 30-65
Font 14 = Code groundedness 10-29
Font 12 = Code groundedness 6-9
Font 10 = Code groundedness 1-5

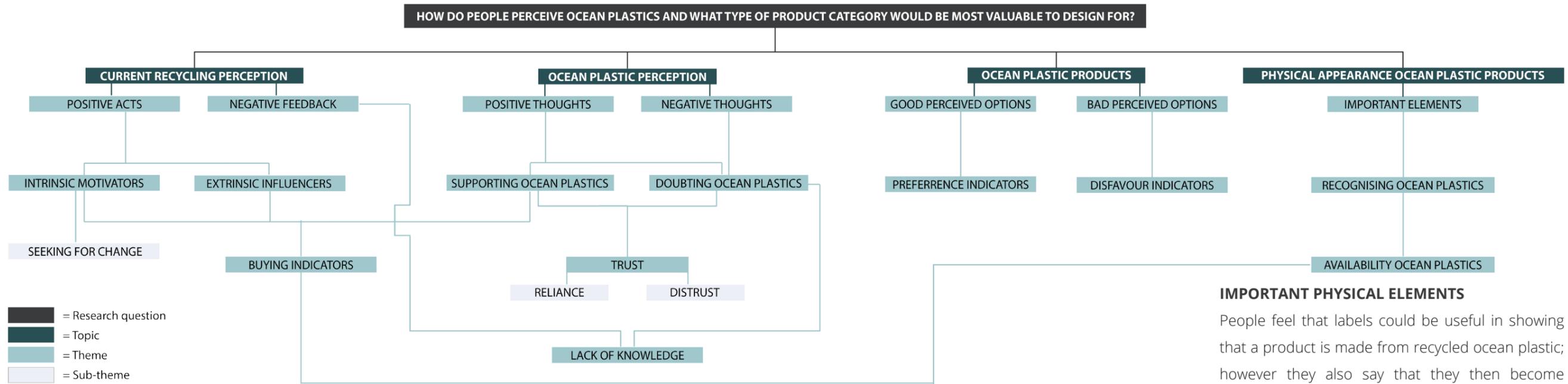**Figure 17:** Thematic map with all codes.

Figure 18: Thematic map without all codes, small.

NEGATIVE THOUGHTS

People have negative thoughts about ocean plastics since they believe the problem of the plastic pollution is caused by on-land actions. Therefore solving the land plastic problem can be seen as more pro-environmental and is most probably a more controlled and thus cleaner process.

SUPPORTING OCEAN PLASTICS

People believe that when there is a good fit between the material (ocean plastic) and the product(s) made from it, all property aspects will be fine (such as quality and safety). This, way using recycled ocean plastic products could become more common.

DOUBTING OCEAN PLASTICS

People have doubts about whether ocean plastic is as useful as it might seem. Recycling on-land plastic should have the same pro-environmental benefits (cleaning the earth), while the process of recycling ocean plastic could even be more risk full than on-land plastic. Companies could just use the perceived "good deed" of cleaning the oceans as a way to gain more money.

TRUST > RELIANCE

People feel that they are able to trust the future of recycled ocean plastics, since they believe it can properly be cleaned and the process of recycling will be of no harm. Also there will be scientific supervision just like any other process regarding consumer consumption in the world, making it all trustworthy.

TRUST > DISTRUST

People feel that the toxic cannot be removed during the cleaning process of recycling ocean plastics. When ocean plastic products do appear on the market, they want to be made aware of the fact that it is made from this material so they can make their purchase decisions based on that.

LACK OF KNOWLEDGE

People lack knowledge about the recycling process, the material properties of recycled ocean plastic, or plastics in general. They hear different thing by different sources and are therefore confused which forces them to make decisions based on their own assumptions.

GOOD PERCEIVED OPTIONS

For certain product categories people have no problems of it being from recycled ocean plastics. In chapter 4.8 you will find more information about these product categories.

BAD PERCEIVED OPTIONS

For certain product categories people "do" have problems of it being from recycled ocean plastics. In chapter 4.8 you will find more information about these product categories.

PREFERENCE INDICATORS

There are several aspects which people find interesting for recycled ocean plastic products. Most discussed is that people long for products of big quantities and lasting.

DISFAVOUR INDICATORS

People tend to avoid recycled ocean plastic products which could get (micro) particles inside the body.

IMPORTANT PHYSICAL ELEMENTS

People feel that labels could be useful in showing that a product is made from recycled ocean plastic; however they also say that they then become overloaded with logo's/indicative information. In general they just want something to be aesthetically pleasing and have different perceptions of how colour/transparency would influence this.

RECOGNISING OCEAN PLASTICS

People want recycled goods to be recognisable so they can base their decision on it. This should be immediately noticeable during the purchase process itself.

BUYING INDICATORS

People express a high willingness to buy pro-environmental and recycled ocean plastic products. However they predominantly let this decision be based on practical elements such as price, urge or sense of the used material (e.g. no plastic is needed for a shoebox).

AVAILABILITY OCEAN PLASTICS

People feel that ocean plastic products should be taken to large scale production. The amount (%) of recycled ocean plastic that these products should contain is not fixed since using it on large scale (with even just small amounts) could already have a positive impact.

4.7 MOST OCCURRING CODES

The analysis shows that there is a big variation in how often different codes occur. This means that some topics are being discussed more and by multiple respondents than others. Interpreting the most occurring codes can help in understanding the overall storyline of the analysis. The five most occurring codes are the following: Positive recycling attitude (G65, P12), Positive ocean plastic feelings (G57, P12), Encouraging pro-environmental behaviour (G55, P12), Price as purchase indicator (G46, P12), and Positive ocean plastic clean up feelings (G37, P12). Hereby G indicates the groundedness of a code and P the amount of interviewees which mentioned it (Groundedness #amount of occurrences, Participants #amount of interviewees). These five previously mentioned topics were discussed by all 12 participants, which indicates the relevance of the topics.

When interpreting these most grounded/occurring codes you could say that in general people have a strong positive attitude towards retrieving plastic waste from the oceans, recycling in general, and recycled ocean plastic products. This could be explained by the fact that they encourage pro-environmental behaviour.

Also noticeable is that price plays an important role in this matter. People mention that price would be a decisive factor when buying ocean plastic products. However it is difficult to state something concrete about this indicator since people tend to make somehow unspecified statements about this like:

"If the price difference is acceptable I think I would go for recycled sooner"
– Interviewee 12

From the data it can be concluded that the price of ocean plastic products should approximately be in the same price range as the "normal" alternatives from the same product category.

In appendix 6 the codebook of the most occurring codes can be found. This codebook gives an explanation of the previously discussed five most grounded codes, but also a few other interesting and grounded codes. Per code, a quote is added to give the code more context.

4.7.1 SELECTED INTERESTING CODE

Another interesting frequent occurring code is the following: Land and ocean plastics as equal (G52, P10). People do not have a strong preference for one or the other. They feel that if the plastic is recycled, it contributes in creating a sustainable future.

4.8 CO-OCCURRING CODES

Segments of text can also be linked to multiple codes. Therefore sometimes data refers to multiple meanings at the same time. These overlaps in data are called co-occurrences. In figure 19 an example of a co-occurrence is being explained. Hereby a fragment of one of the interviewees is analysed. In the figure you see that the same text fragment refers to different codes. The text fragment shown is a response of one of the participant's attitude towards recycling ocean plastics. In general the paragraph is about trust in the recycling process (code 1). The first sentence is also linked to the knowledge lack of recycling (code 2). The last part of the paragraph refers to both the dirtiness perception (code 3) and risk perception (code 4). Figure 20 shows these same co-occurrences in a more theoretical way. Here you can more easily see the overlaps (co-occurrences) between the different coded fragments. You can observe that code 1 co-occurs with code 2, code 3 and code 4. Also you see that code 3 and code 4 co-occur since they cover the same piece of text fragment. This means that in this small paragraph a total of four co-occurrences can be found.
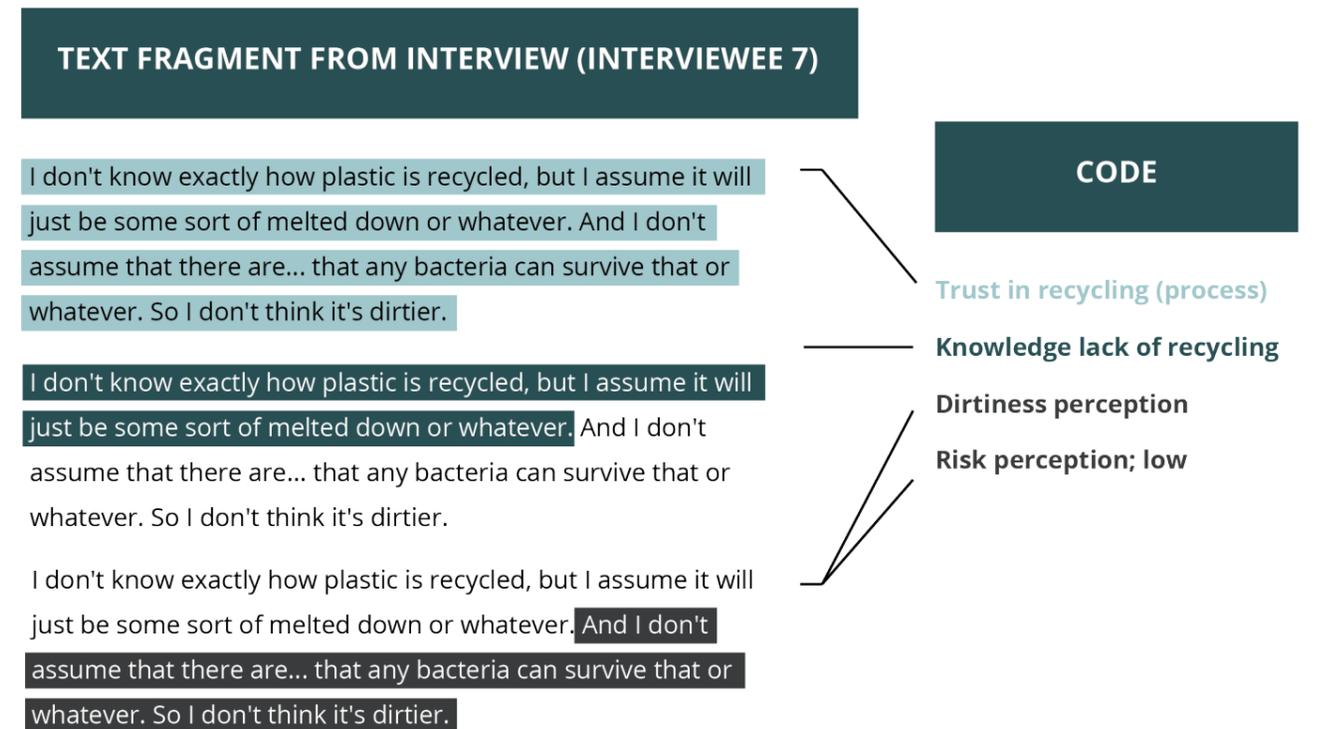

TEXT FRAGMENT FROM INTERVIEW (INTERVIEWEE 7)

CODE

I don't know exactly how plastic is recycled, but I assume it will just be some sort of melted down or whatever. And I don't assume that there are... that any bacteria can survive that or whatever. So I don't think it's dirtier.

Trust in recycling (process)

I don't know exactly how plastic is recycled, but I assume it will just be some sort of melted down or whatever. And I don't assume that there are... that any bacteria can survive that or whatever. So I don't think it's dirtier.

Knowledge lack of recycling

Dirtiness perception

Risk perception; low

I don't know exactly how plastic is recycled, but I assume it will just be some sort of melted down or whatever. And I don't assume that there are... that any bacteria can survive that or whatever. So I don't think it's dirtier.

Figure 19: Explanation of a co-occurrence from an interview.

Text fragment

(Code 1)
Trust in recycling (process)

(Code 2)
Knowledge lack of recycling

(Code 3)
Dirtiness perception
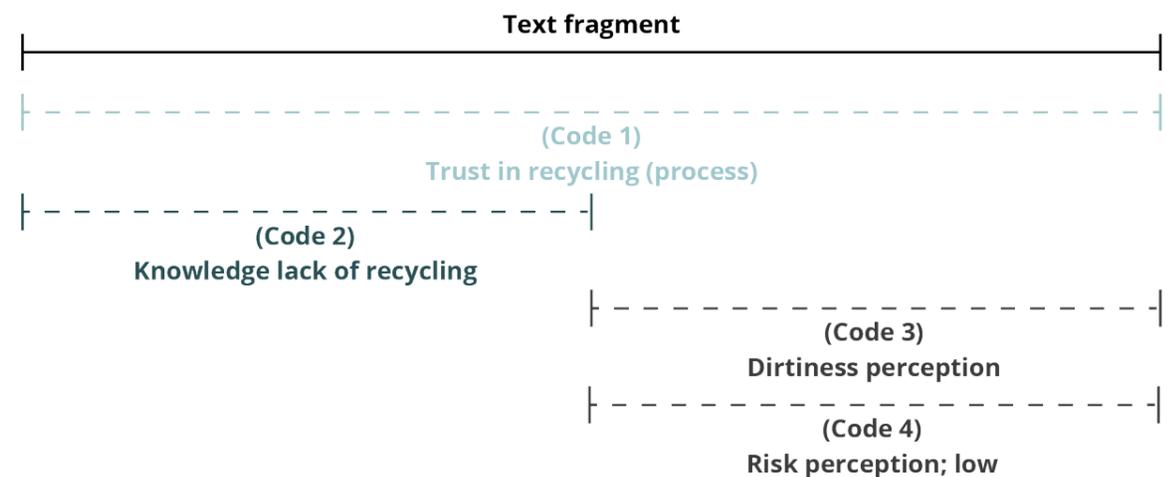
(Code 4)
Risk perception; low

Figure 20: More theoretical explanation of co-occurrence.

Co-occurrences can be useful in explaining/ interpreting relations between different codes. Based on all codes from the data set, a co-occurrence analysis has been done. Hereby the amount of co-occurring codes (how often does this co-occurrence occurs) in combination with the amount of interviews in which the co-occurrences occurred (in how many interviews did they occur) was of most importance. The amount of quotes the co-occurrence contains and by how many interviewees it occurred defined the strength/relevance of the co-occurrence. An explanation of the most important co-occurrences of this analysis can be found in appendix 7. In paragraph 4.8.1 the relations between the strongest co-occurrences will be explained.

C-COEFFICIENT

When running a co-occurrence analysis, a c-coefficient is displayed. The c-coefficient should vary between 0 and 1. Meaning that when the c-coefficient is 0, the two codes do not co-occur and when 1, the two codes co-occur wherever they are used. Interpreting the c-coefficient is only meaningful with a sizable data set and not for this study with "only" 12 respondents. That is why the c-coefficient is only used as an indicator to interpret relations between codes, and is not used to make determinative conclusions (Atlas.ti, 2014).

4.8.1 RELATIONS CO-OCCURRENCES

When looking better at all different co-occurrences and why they are occurring, a few clusters seem to appear. These clusters are: contamination, information, certainty and future orientation. This is shown in figure 21. These clusters are formed during analysing several aspects of the co-occurrences. These aspects are: Understanding the codes, interpreting the relation between the two codes

(co-occurrence) and understanding the relation between the co-occurrences and thus the meaning of the cluster (e.g. contamination). This process will be explained by showing all three steps for the "contamination" cluster in order to understand the clustering process. For the other three clusters (information, certainty and future orientation) only the last step (meaning of the cluster) will be explained.

CONTAMINATION – Codes

When looking at the cluster "contamination", you see that it contains two co-occurrences. These are [Bad options: others] x [No: direct contact] and [Blaming humanity] x [Positive ocean plastic clean up feelings]. In order to explain these co-occurrences it is first needed to understand the separate codes. These are explained below.

Code: [Bad options: others]
Description: Reservations in terms of hygiene and perceived risk (baby toys & lip balm).

Code: [No: direct contact]
Description: Disapproval based on possible contamination through mouth and skin.

Code: [Blaming humanity]
Description: Feeling sorry for this situation that got out of hand caused by mankind.

Code: [Positive ocean plastic clean up feelings]
Description: Positive feelings about getting plastic out of the ocean.

CONTAMINATION – Co-occurrence

Interpreting these individual codes in relation with one another gives the following explanation of the co-occurrences:
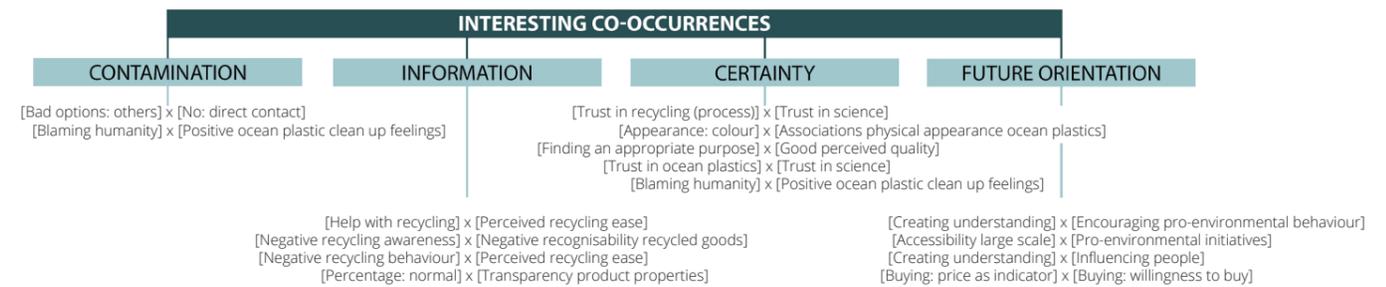

Figure 21: Co-occurrences clustered by codes.

Co-occurrence: [Bad options: others] x [No: direct contact]
Explanation: People have their reservations when it comes to products which make direct contact with the mouth which can lead to micro-plastics going inside one's body.

Co-occurrence: [Blaming humanity] x [Positive ocean plastic clean up feelings]
Explanation: People feel sorry for what mankind has done with the misuse of plastics and therefore have positive feeling about cleaning up the oceans.

CONTAMINATION – Cluster

The combination of the co-occurrences explains a certain incident. In this case it explains a perception of contamination. This perception can be explained as follows:

People have their reservations when it comes to recycled ocean plastic products which make direct contact with the mouth since they feel it could be contaminated. Since still less is known about these recycled ocean plastics, people feel micro-plastics could come inside one's body and harm their health. Therefore they want to avoid recycled ocean plastic products which make direct oral contact.

However on the other hand people feel sorry for how the oceans are being contaminated with plastic mankind waste and therefore have positive feeling about cleaning everything up. In this situation it would be a nice incident that the retrieved ocean plastic can be reused. Contamination in this cluster then refers to both the negative feelings of the contamination of the oceans as the contamination risk of ocean plastic products.

INFORMATION – Cluster

People want to be eased at any time in any way. , and hence require specific information. The intentions to "do good" are there but they still need help in how and where to do this since they feel confused or inconvenience in performing these actions. This currently leads to negative pro-environmental behaviours.

This lack of ease/information is also being reflected in how people recognise recycled alternatives and how this is being communicated to them. People today are not able to distinguish recycled products from other (non-recycled) products and feel this should be openly communicated to them so they can make a conscious purchase choice and do not feel betrayed.

CERTAINTY – Cluster

People are having trust in that the recycling process will be safe and of quality since they have trust in science. This indicates that the developed products will definitely meet certain applicable standards. Because of this people are confident about the future of ocean plastics in general aswell and feel that producing such products will support the further cleaning of the ocean.

Besides the process, people feel that when ocean plastics are being used for "the right" products, these will certainly be of good quality. In terms of the physical appearance people feel that everything is possible alike virgin plastics, otherwise another product category which would be more suitable will be found. A diverging appearance is therefore a designer's choice and not established by limitations of the material.

FUTURE ORIENTATION – Cluster

People need to be explained or shown "why" they should behave pro-environmental in order to create understanding of the situation as a whole. This understanding can be created via products, such as recycled ocean plastic products.

Due to a positive willingness to buy recycled ocean plastic products (as well as general pro-environmental products), a need for accessibility is being sparked in the consumer market. People want to spread positive pro-environmental intentions and feelings in society and want pro-environmental options being offered to them easily.

Lastly the price obstructs the ease of actually buying recycled ocean plastic goods. In order to ease this decision making process ocean plastic products should have a reasonable price compared to other alternatives from the same product category.

ALL CO-OCCURRENCES

In essence these co-occurrences can be explained by using different key words per cluster. These keywords are based on the definitions of the clusters which are explained in this chapter. This simplification is shown in figure 22.

In this figure a new element is also added, namely a discrepancy. The information cluster is based on feelings of which actual knowledge about the mechanical properties of plastic or the process of recycling lack. Despite this desire for more information people feel certain about ocean plastics. Interpreting this, you can say that people currently are not aware of all aspects regarding recycling (ocean plastics), yet they feel confident about it. This could have very positive influence of possible future ocean plastic products.
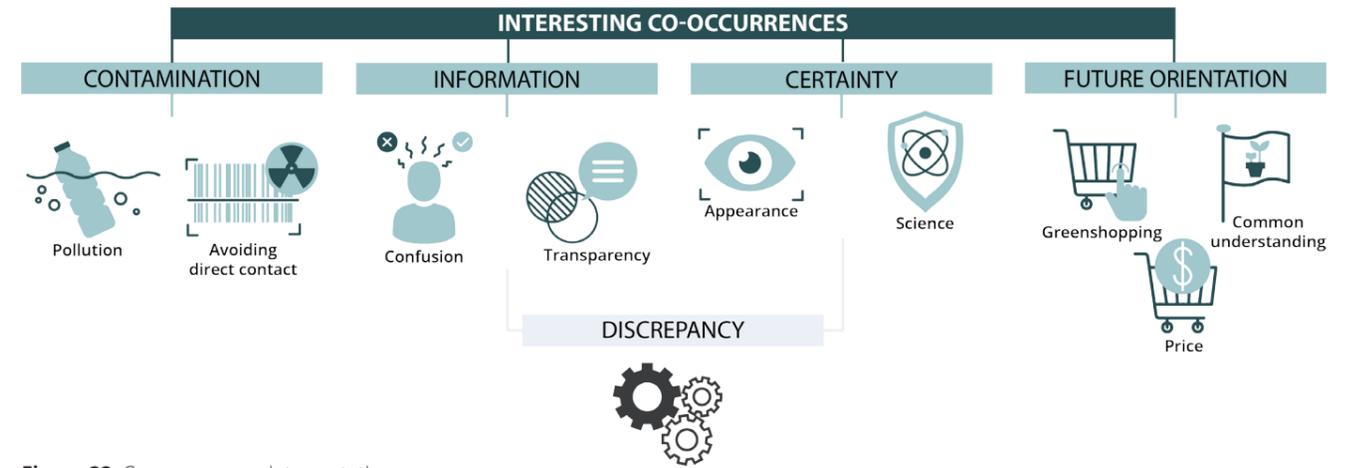

Figure 22: Co-occurrences interpretations.

4.9 BACK TO THE THEMATIC MAP

4.9.1 EFFECTS OF ALL RESULTS

In chapter 4.6 till 4.8 the interviews have been analysed on several aspects. Combining all the different findings gives the following final thematic map of the analysis (See figure 23 on page 54). In this map, the icons (which illustrate certain incidents explained in chapter 4.7 and 4.8) are placed in the theme in which they occur and thus relate with. This makes it possible to interpret the findings of the total analysis.

All combined data can be formulated in one overlapping storyline which shows the essence of the analysis and thereby answers some of the sub-research questions. This storyline is illustrated in figure 24 and can be interpreted as follows:

4.9.2 SUB-RESEARCH QUESTION 1

(1)

"What is peoples' general attitude towards recycling plastics?"

In general people have a strong positive attitude towards recycling in general and recycled ocean plastics. That is also why they feel there is no considerable difference between ocean plastic and land plastic. Both would contribute in creating a sustainable future. Only the question which should be tackled at first still remains unanswered. They do however believe that the oceans should be cleaned from plastic, and reusing these plastics would be a suitable solution to do something useful with the retrieved materials. Such actions are needed to create a more common understanding of why and how people should behave pro-environmental. Therefore a critical new mind-set is needed in which "change" will be the keyword.
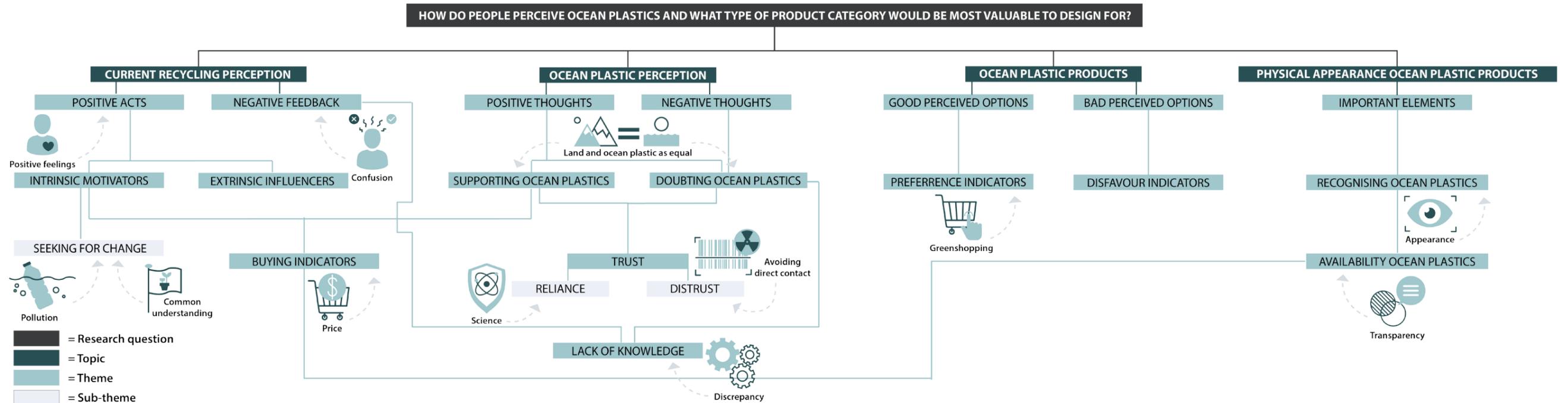
Figure 23: Thematic map highlighting the most important aspects linked to the themes.

4.9.3 SUB-RESEARCH QUESTION 2

(2)

"How do people perceive recycled ocean plastics?"

Currently people still feel somewhat confused in how to behave pro-environmental. They feel a certain inconvenience due to a lack of ease and lack of knowledge (which is caused by hearing different things from different people and not knowing what to believe). This also causes some reserved feelings towards ocean plastic products which make to direct contact with people, after all still less is known about these recycled ocean plastics. Therefore they want to be made aware of the fact that it is made from this material during purchase. However they do trust the recycling process and its supervisors and are positive about its future potentials. This actually creates a discrepancy since people currently lack knowledge about aspects regarding recycling (ocean plastics), yet they feel it will not be harmful.

4.9.4 SUB-RESEARCH QUESTION 4

(4)

"What are peoples' first reactions regarding the recognisability of ocean plastics?"

People want to spread positive pro-environmental intentions and feelings in society and want pro-environmental options to be accessible for easy purchase. However at the moment they are not quite able to distinguish recycled products from other (non-recycled) products and feel this should be openly communicated to them so they can make a conscious purchase decision. In terms of appearance they feel anything is possible with ocean plastics alike virgin plastics, if used for "the right" products. A determining factor for actual ocean plastic purchase would be the price. People express a high willingness to buy pro-environmental and recycled ocean plastic products, however the price should most preferably lie in approximately the same price range as other products from the same product category.
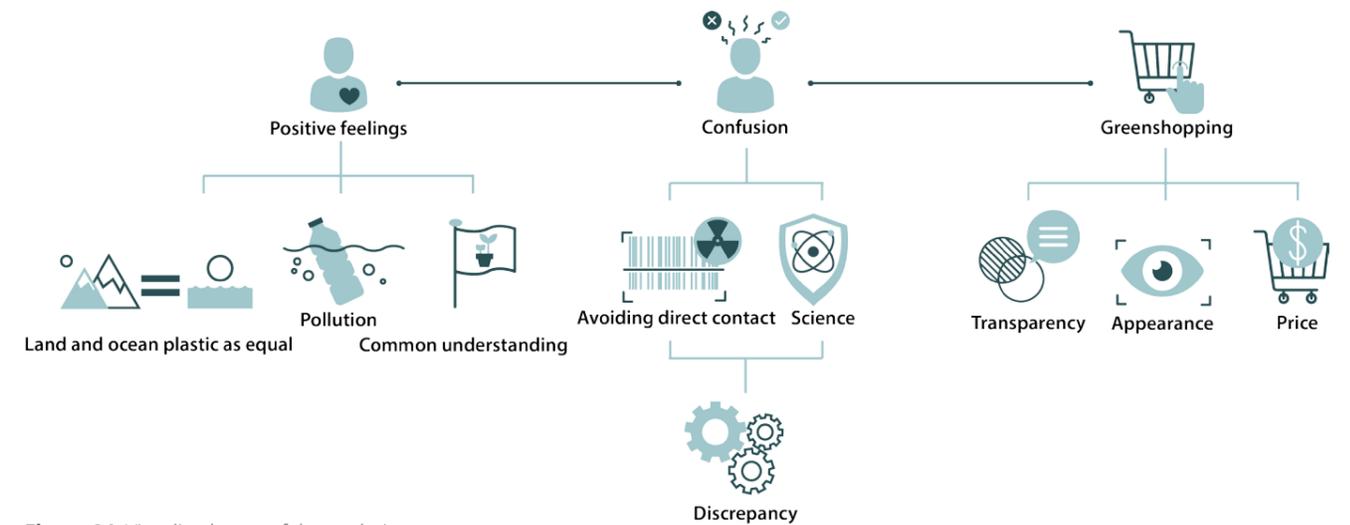
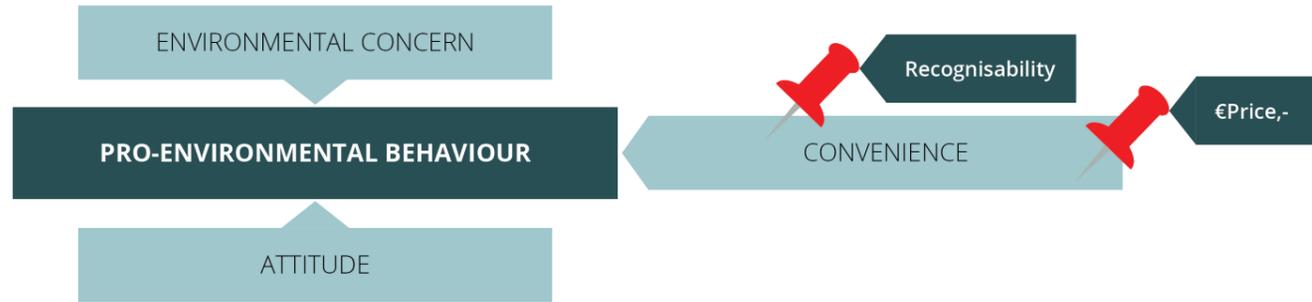**Figure 24:** Visualised story of the analysis.

Figure 25: Revised factors influencing pro-environmental behaviour.

4.9.5 COMPARING THE FINDINGS WITH LITERATURE

In comparing the findings of the thematic analysis with literature, one remarkable difference is immediately noticed. According to Bahrudin et al. (2016), waste retrieved from polluted environments would be perceived as extra pro-environmental. Thus one would expect ocean plastics to be perceived as "better" compared to on-land plastics. However findings show that they are mostly considered as equal. Bahrudin et al. (2016) also mentioned that abundance and proximity are the main drivers for using waste materials in product design. This could indicate that the abundance and proximity of on-land plastics could mediate the effect of plastic from polluted oceans, and therefore be perceived as equal. This however is a study on its own and is therefore not crucial to take along within the project in order to answer the research question.

Recycled ocean plastics are indeed being perceived as pro-environmental and mostly evoke positive feelings (Magnier et al., 2019; Mobley et al., 1995). Furthermore, the fact that ocean plastics are being recycled does not negatively influences the quality perception of the products, which according to Hamzaoui-Essoussi & Linton (2014) could have been so. People believe that the material will be used for "the right" type of product, and therefore will be of good quality. Despite a lack in knowledge

of the recycling process itself, they trust supervising authorities and therefore the quality of the products. This corresponds to Guide and Li (2010), suggesting that lack in knowledge can result in different quality perceptions

When comparing factors influencing pro-environmental behaviour, the research results confirmed the literature. It is indeed largely dependent of one's environmental concern, one's attitude and one's convenience (Fujii, 2006; Nameghi & Shadi, 2013; Keramitsoglou & Tsagarakis, 2013). However the term convenience in here refers to much more than just proximity (distance to for instance trash containers). Important factors which also ease the decision making process (and thus convenience) are the recognisability of ocean plastics and the price of the product (see figure 25). In this sense convenience refers more to one's perceived (behavioural) control (from the Theory of planned behaviour). This theory states that one's behavioural intentions are determined by one's: attitude, subjective norm and perceived (behavioural) control (Glanz et al., 2015).

4.10 OCEAN PLASTIC PRODUCTS (RESULTS OF THE EXPERIMENT IN THE INTERVIEWS)

4.10.1 CO-OCCURRING ELEMENTS OF INTEREST

For the interviews, the product categories from Bahrudin et al. (2016) were retained. In order to find out the arguments behind the product preferences, a co-occurring analysis was again used to make assumptions. The most co-occurring codes with these interesting products where: accessibility large scale, big quantities and easy accessible. Meaning that easy accessible products which are of big quantities and easily obtainable/approachable on the large scale are being preferred. Also interesting is that people preferred long lasting products and products which avoid direct personal contact. The co-occurrences with all product categories can be found in appendix 8.

Based on the co-occurrences a check list has been made. This checklist contains the most occurring and interesting codes of the analysis which are:

- ✓ Accessible on the large scale
- ✓ Big quantities
- ✓ Easy accessible (approachable)
- ✓ Long lasting
- ✓ No direct contact

With this checklist the following is verified:

Accessible on the large scale:
Can you buy it anywhere?

Big quantities:
Is it being produced in large volumes?

Easy accessible (approachable):
Can you easily come in contact with it as a consumer?

Long lasting:
Does it wear out/breaks down quickly?

No direct contact:
Does it make oral contact? If yes > than it is a no go

4.10.2 RATED PREFERENCES

From the data obtained in the experiment during the interviews, a gradation between the different individual products could be conducted varying from positive to negative ocean plastic feelings. This is illustrated by the colour of the overlying box above the product (see figure 26, page 58). The greener the box, the more positive reactions the products had. Whereas the more red the box is, the more negative reactions the product had. The preference indications per individual product displayed consecutively can be found in appendix 9.

This gradation between the different products was based on first letting the participants group them in one of the three predetermined groups: yes, not sure and no. Based on their arguments why they would put certain products in a certain group a distinction could be made between "good" and "bad" products. Within this good options cluster, some products had to be chosen which were most preferred (interesting). Also people had some second thoughts or other arguments about some of the products which also had to be taken into account (the individual results of this clustering can be found in appendix 10). All these different preference influencers were summed and weighted against the importance of the arguments. This was done by first weighting the predetermined groups (yes, not sure

Figure 26: Preferences products and product categories.

and no). Hereby yes was weighed the highest and no was weighted the lowest since they indicate initial product acceptance. Next the preference groups (interesting and second thought options) were weighted. Between the two groups, "interesting" was weighted higher than the "second though" options since this indicates a higher preference. A more thorough explanation of the weighting can be found in appendix 11. Also the total score for each product category was calculated by adding up the scores of the individual products. This resulted in building materials, packaging and furniture to be rated as highest. The precise scores per product and product category can also be found appendix 11.

Figure 26 shows the colour codes preference scores of the products. Hereby the floor, debit card, lotion, shampoo, soap, phone case and soundproof wall are most preferred by the respondents since they are the greenest. By also grouping the products by product category (also figure 26) it becomes visible that some product categories are "greener" than others, and thus in general preferred over the alternatives. Preferred product categories for ocean plastic are: building materials, packaging and furniture.

4.10.3 BETWEEN AND WITHIN PRODUCT CATEGORIES

Remarkably people did not make a clear distinction between furniture and building materials, as they perceived both as "interior" products in the experiment. In general it is to say that people have the least interest in household objects and clothing since they are the most "red" groups. Between the "others" category there is an obvious difference in preference between direct contact and non-direct contact products. This can be derived from the big difference in colour coding, with the phone case

being very green and the baby toys being very red. Since the category "others" is such a broad category it is difficult to make well-funded assumptions about this product category (Also see paragraph 6.2.1).

4.10.4 SUB-RESEARCH QUESTION 3

Lastly the product categories have been examined using the checklist from paragraph 4.10.1. This can be seen in figure 27 on page 60. Again it shows that building materials, packaging and furniture scores has the best scores. Hence, the last sub-research question can be answered.

"Which product category do people find most interesting for the presence of ocean plastics?"

Combining all data it can be assumed that people have positive feelings about using recycled ocean plastic products for building materials, packaging and furniture. However when choosing the products for the building materials category used in the interviews, only more textile products have been selected. Though building materials used for internal and external construction work are also part of this product category and are also implemented in the building material product category of Bahrudin et al. (2016). Think of cladding panels, pipes and gutters, shuttering, ceiling panels, etc. These however are not really consumer products, since they are often being used and selected by the concerned organisations. This makes it difficult to find consumers' perceptions about these building materials since (most) people do not buy such "products" for individual use. Therefore using the product categories; packaging and furniture would be of most value when examining consumers' perceptions of recycled ocean plastic products.

It is not possible to test all products for the determined product categories. This is why for each of the two product categories (packaging and furniture) the product with the highest individual score is chosen to use for the quantitative study. For the packaging this is the bottle of dishwashing liquid, and for the furniture this is the chair. For further explanation see paragraph 5.2.2.
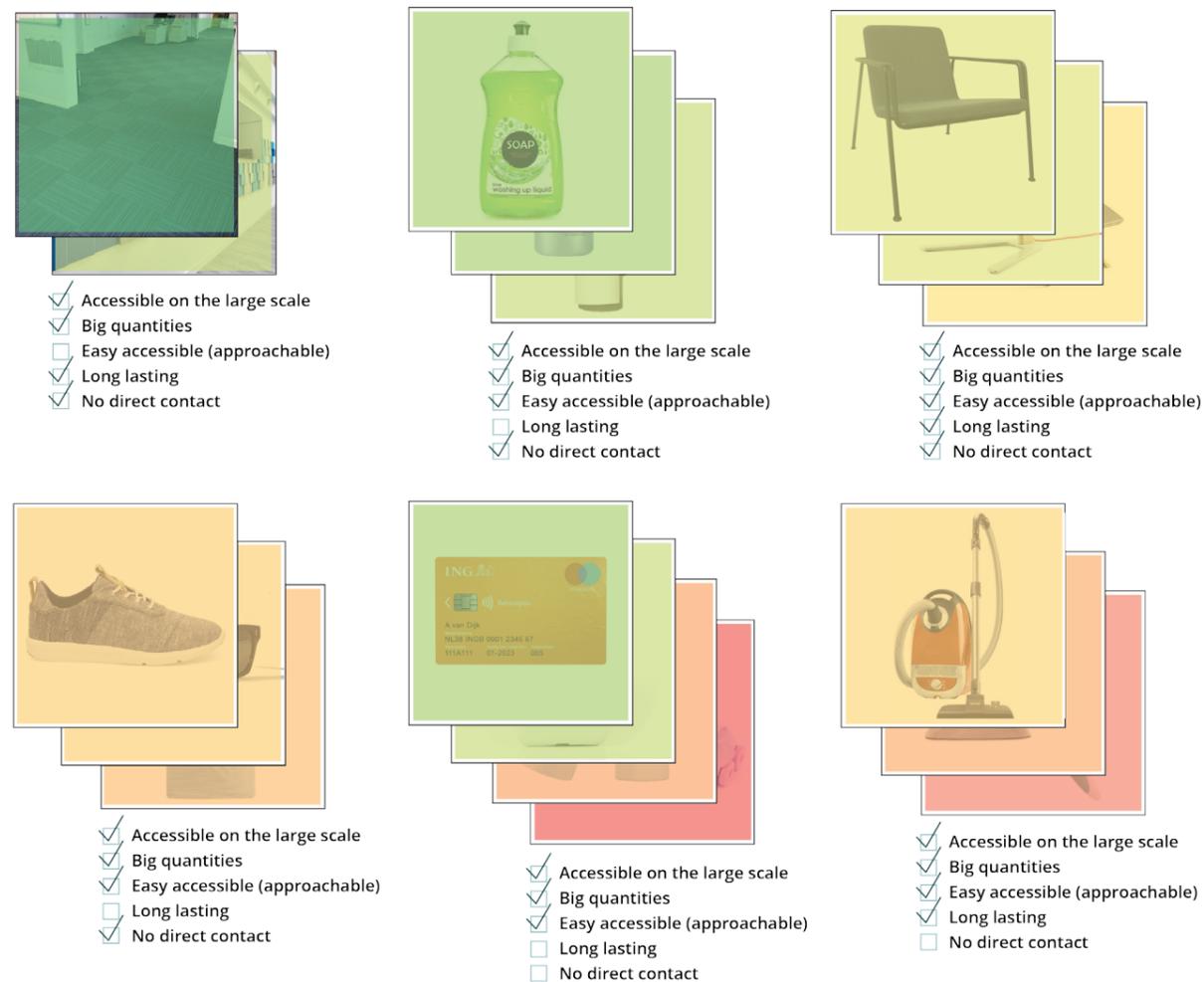
✓ Accessible on the large scale
✓ Big quantities
☐ Easy accessible (approachable)
✓ Long lasting
✓ No direct contact

✓ Accessible on the large scale
✓ Big quantities
✓ Easy accessible (approachable)
☐ Long lasting
✓ No direct contact

✓ Accessible on the large scale
✓ Big quantities
✓ Easy accessible (approachable)
✓ Long lasting
✓ No direct contact

✓ Accessible on the large scale
✓ Big quantities
✓ Easy accessible (approachable)
✓ Long lasting
☐ No direct contact

✓ Accessible on the large scale
✓ Big quantities
✓ Easy accessible (approachable)
✓ Long lasting
☐ No direct contact

✓ Accessible on the large scale
✓ Big quantities
✓ Easy accessible (approachable)
✓ Long lasting
☐ No direct contact

Figure 27: Preferences products and product categories with checklist.

4.11 ANSWERING THE RESEARCH QUESTION OF THE QUALITATIVE STUDY

Main research question of the qualitative study:

"How do people perceive ocean plastics and what type of product category would be most valuable to design for?"

People's general perception of ocean plastic products is positive. Cleaning up the oceans is a must and giving this retrieved material an all new purpose is useful. They feel that quality products can be made from ocean plastic and that it will be safe. This is due to faith in supervising organisations.

They do however have some reservations regarding products which make to direct contact with people (oral contact). Nevertheless people see future potential in ocean plastic products. Especially in products which are easy accessible, being produced on a large scale, approachable and long lasting. The most suitable product categories to fulfil all these wishes are packaging and furniture. The product representing these product categories are a bottle of dishwashing liquid and a chair.

QUALITATIVE RESEARCH

QUALITATIVE STUDY

In this study a thematic analysis is being done to obtain qualitative data. This method identifies topics that are integrated in themes in order to address the research question. The variables which were chosen to be examined (based on chapter 3) were perception, attitude and recognisability of ocean plastics. The products will be clustered by six product categories as explained by Bahrudin et al. (2016). A thematic map is produced by consolidating (co-)occurring stories of themes.

RESULTS FROM THE THEMATIC ANALYSIS

In general people have a positive recycling attitude and encourage pro-environmental alternatives in society. However they still need help in how to perform more pro-environmental behaviour since currently they feel confused or inconvenience in performing such actions. Open communication to distinguish recyled (ocean) plastic products from other (non-recycled) products allow them to make conscious purchase decisions. Only then they can fully support the pro-environmental mind-set and collectively "do good". Ocean plastic is being perceived as a pro-environmental initiative since it cleans up the ocean. This is also why people are positive about possible future ocean plastic products. People believe that when ocean plastic are being used for product this will be of no harm since supervising organisations are in control and suitable products will be made with it.

COMPARISSON OF THE THEMATIC ANALYSIS WITH LLITERATURE

When comparing recycled on-land plastic products with recycled ocean plastic products people do not feel more positive about one of the two, and encourage both. This is in contrast to Bahrudin et al. (2016) where was stated that recycling materials from polluted areas has a more positive pro-environmental effect. People trust authorities in terms of safety and quality and believe in finding an appropriate match between product and product properties, even though they have a significant lack of knowledge to be able to form a grounded opinion about this.

An important factor in the decision-making process of ocean plastics is the price, which according to people may not differ too much in comparison with the offered virgin plastic products. Also the recognisability of the ocean plastic material is of importance during purchase. People want to recognise ocean plastic in order to base their purchase decision on that.

REQUIREMENTS FOR OCEAN PLASTIC PRODUCTS

People want products which are mainly easy accessible, that are being produced (used) in big quantities and avoid direct personal contact. Two product categories (packaging and furniture products) would be of most value to design for when examining consumers' perceptions of ocean plastic products. For these two product categories the highest individual product was chosen for the quantitative study. These are a bottle of dishwashing liquid and a chair.

5. QUANTITATIVE RESEARCH

This chapter tells about the quantitative part of the recycled ocean plastic product study. With this quantitative study various designs of the bottle of dishwashing liquid and chair are being tested tested on cognitive, affective and behavioural responses. This chapter presents the iterations on the dependent and independent variables as well as the results of the quantitative study (an online questionnaire).

IN THIS CHAPTER:

5. QUANTITATIVE RESEARCH

5.1 THE ESSENCE OF QUANTITATIVE RESEARCH

5.1.1 RECAP RESEARCH QUESTIONS THESIS

This quantitative study is needed to answer the research question and sub-research questions of the project. All actions are taken with keeping these questions in mind. As a small reminder you can find the concerning research questions below:

Main research question thesis:

"How to design ocean plastic products in order to create consumer enhancement?"

Sub-research questions thesis:

(1)
"Which type of product is suitable for ocean plastics?"

(2)
"To what extend should ocean plastic be reflected in the visual appearance of a product?"

5.1.2 IMPORTANT ELEMENTS IN A QUANTITATIVE STUDY

Quantitative research is a systematic investigation of certain phenomena by gathering quantifiable data. With this data a statistical analysis can be performed. It gathers information from existing and/or potential customers by (in this case) using an online questionnaire. In quantitative research some elements are of great importance and hence are explained in advance.

VARIABLES

During a quantitative study you are testing variables. There are two main types of variables, namely: independent and dependent variables. Independent variables explain a presumed cause of any change in the dependent variables (Hair et al., 2010). Independent variables will not be changed by the dependent variables. An example of such an independent variable is age. Dependent variables explain a presumed effect, response or change in the independent variables (Hair et al., 2010). It is a variable which depends on other factors. An example of such a dependent variable is a test score. This score depends on for instance how much you studied, slept, etc. In general it is to say that:

(Independent variable) causes a change in (Dependent variable)

For example: (Hours studied) causes a change in (Gained test score).

In quantitative study you seek for a significant relation between variables, indicating that the variables effect one another. A relation between variables is significant if the p-value listed in the output is smaller than 0.05 (Creusen, 2013).

SCALES

There are four types of scales: nominal, ordinal , interval and ratio. Nominal scales assign numbers as a way to identify things. They can only provide the number of occurrence in each class or category of the variable (Hair et al., 2010). For example when representing gender, males and females are often linked to numbers (e.g. 1=male and 2=female). With these numbers you can only calculate the amount of males and females. It does not imply an amount of an attribute or characteristic.

Ordinal scales measure a level of for example an attribute or characteristic. Variables can then be ordered and ranked according to the amount of for example the attribute (Hair et al., 2010). They indicate a relative position in an ordered series. For example if two products are being tested on the level of satisfaction (with 1 being not at all satisfied and 7 being completely satisfied) and product A scores a 3, product B a 6 and product C a 7, the order of satisfaction between the three products becomes clear.

Interval and ratio scales provide the highest level of measurement precision (Hair et al., 2010). They measure differences between points on a specific part of a scale. When again using the three different products as an example, you could see that the intervals between de products differ. The difference between product B and C (7 – 6 = 1) is smaller than the difference between product A and B (6 – 3 = 3). The difference between interval and ratio sales is that interval scales use arbitrary zero points, whereas ratio scales use an absolute zero point.

5.2 DESIGN DIRECTION

5.2.1 DEEPER INTO THE CURRENT OCEAN PLASTIC MARKET

In chapter 1.2 the current ocean plastic market was briefly being discussed. As mentioned, there is a quite diverse spectrum of different types of products. In order to map all these different products, and therefore get a better understanding of what is currently happening with the designs of ocean plastic products, a grid has been composed. On the x-axis the typicality of the designs has been plotted (also referred to as shape typicality). On the y-axis the ocean plastic appearance has been plotted (also referred to as pattern/texture recognisability). In this study, shape typicality is being defined as the degree to which the product is representative of its product category in terms of shape (with typical being a good representitive of the product category and atypical being being a divergent product for its product category) (Blijlevens et al., 2012).

When looking at all ocean plastic products which are currently on the market, distinctions can be made in terms of divergent designs (typical or atypical shapes of the products) and divergent appearance (in terms of how well the recognisability of the used material is being shown in terms of patterns and/or textures). When looking at the grid in figure 28 (page 66), you can see some remarkable things. Most ocean plastic products are placed in the upper left section of the grid (section A). This section contains products which have typical shape and a typical pattern/texture. In general this could be interpreted as ocean plastic products looking like "regular" products. The upper right of the grid is quite empty, his indicates that there are few ocean plastic products which have an atypical shape and a typical pattern/texture. On
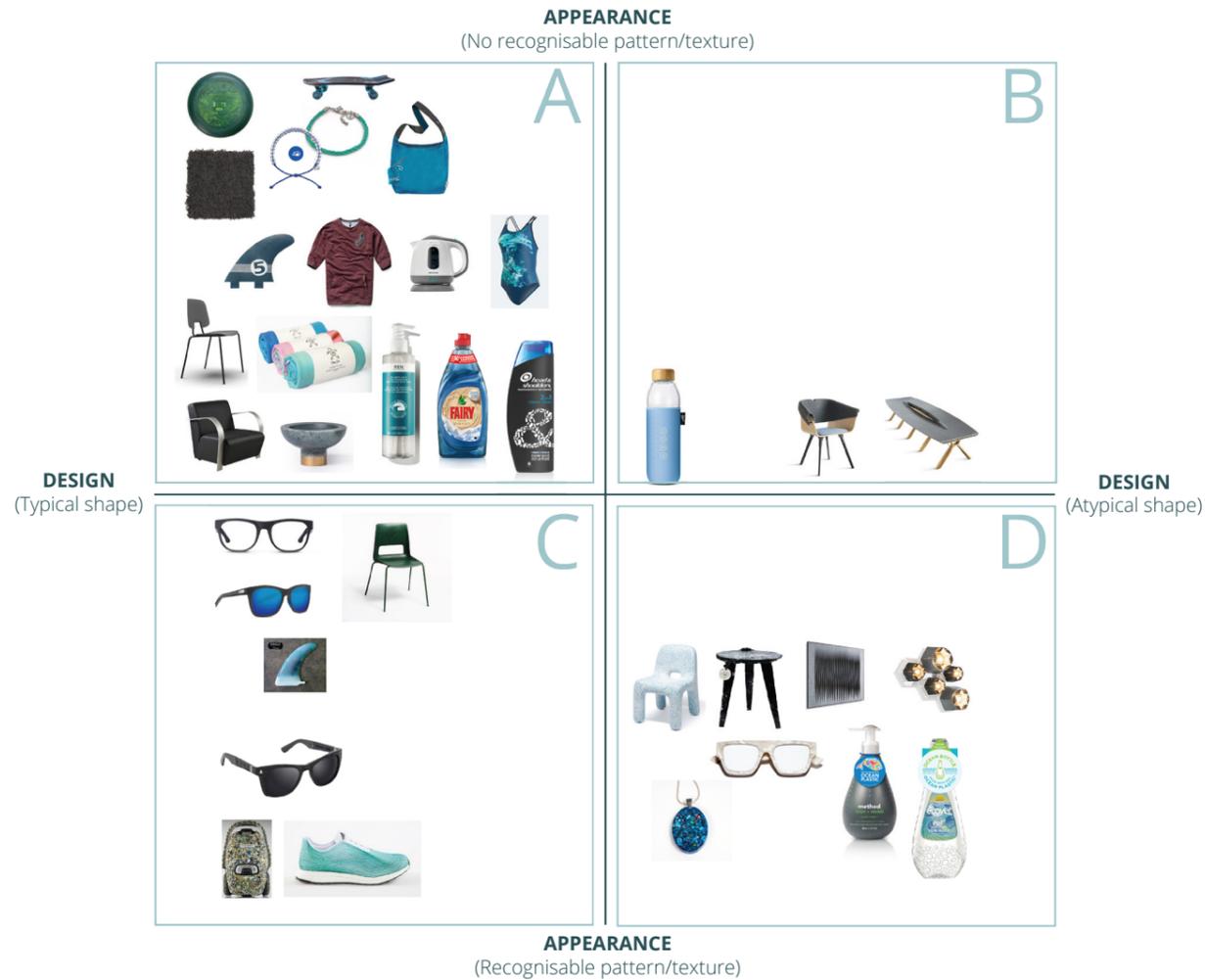
Figure 28: Ocean plastic products.

the lower half of the grid also some products are placed (section C and D). These two sections contain products which make use of more atypical patterns/textures but however differ in terms of shape typicality (with section C having more typical shapes and section D having more atypical shapes).

Different designs (shapes) communicate different things to people. Perceptions of a product may differ depending on the typical shapes of designs. Atypical shapes could evoke more premium perceptions (Mugge et al., 2014) to which the question arises if ocean plastic products should look more premium than "regular" products in order to gain consumer enhancement or not, or whether it should express accessibility and therefore use more typical designs.

Past research suggests people to prefer typical products since this already matches with their knowledge (Veryzer & Hutchinson, 1998), yet people find atypical products more attractive than highly typical products (Schoormans & Robben, 1997). This indicates that a lot is possible in terms of shape typicality in this new ocean plastic market.

The pattern/texture typicality relates to the recognisability of ocean plastics. Depending on the product category the importance of recognisability may differ (Magnier et al., 2019), hence it is interesting to see how different forms of recognisability would influence a product/product category. The recognisability of ocean plastics could influence how people perceive the product,

such as the expensiveness of a product (since pro-environmental products are mostly associated with higher product expensiveness). But also which emotions people feel regarding the product. These responses could for instance influence one's purchase intention for the recycled ocean plastic products.

Thus different combinations between shape and pattern/texture typicality in product design could largely affect how people respond to ocean plastic products. In order to know how to design ocean plastic products which would be enhanced by consumers, different conditions of both shape typicality and pattern/texture recognisability need to be investigated.

5.2.2 THE CHOSEN PRODUCTS

As mentioned in paragraph 4.10.4 the results of the qualitative study show that the two most valuable product categories to design for were packaging and furniture. Instead of just picking one of those two product categories it can be useful to use them both for the quantitative study. This way possible similarities or differences can be found which can result in more diverse and rich results.

Both two product categories contained three different products representing the category. For the packaging these were a bottle of dishwashing liquid, shampoo and body lotion. The individual scores of the different packages were quite equal, with de bottle of dishwashing liquid and the shampoo having the same score (see appendix 11). The bottle of dishwashing is chosen for the quantitative study for the folliwng reason; an assumption has been made regarding brand preference. It is assumed that people feel less direct connection with the brand of

a bottle of dishwashing liquid compared to a bottle of shampoo. There is more variation in the offers of shampoo than dishwashing liquids, implying that shampoo is more of a luxury product compared to dishwashing liquid which is more of a necessary good. This choice to go for the bottle of dishwashing liquid should hence limit brand preference biases.

The furniture category contained a chair, a lamp and a table. The table was rated as lower compared to the chair and the lamp, which were quite evenly ranked (see appendix 11). Yet the chair is chosen for the quantitative study. This is since in general people more often make contact with different kinds of chairs than with lamps. With this in mind it makes more sense to test consumers' perceptions with a chair since it evokes more meaningful interactions which could give an extra dimension to the study.

5.2.3 RESEARCH QUESTIONS

Based on the analysed current ocean plastic market (paragraph 5.2.1) some elements seem to play an important role in the offers of ocean plastic products. These are the shape typicality of the designs and the recognisability of ocean plastic in the form of a pattern or texture, which then together form the visual appearance of an ocean plastic product. Also the type of product could have an effect on these ocean plastic perceptions. These different factors influencing the ocean plastic product perception can be seen as the substantiation of the research questions of the quantitative study, which are as follows:

(1)

"How does shape typicality influences the perception of ocean plastic products?"

(2)

"How does the recognisability of an oceanic pattern/texture influences the perception of ocean plastic products?"

(3)

What is the effect of different products on ocean plastic product perception?

Visual appearance can evoke both cognitive (product perceptions) and affective responses (emotions) which together result in certain behavioural responses (whether or not to approach the product) (Bloch, 1995; Crilly, 2004). In this study these cognitive and affective responses are being examined in whether these factors result in a higher *purchase intention* (behavioural response). Besides this, also some other responses will be assessed in order to test purchase intention. These are perceptual responses and one's personal identity. Lastly some individual variables will be included. The overall aim here is to asses these different responses regarding ocean plastic products in order to understand consumer's ocean plastic adoption.

5.2.4 DETERMINING THE RESEARCH VARIABLES

COGNIITIVE RESPONSES

Product perceptions which are useful to examine for recycled ocean plastic products are *ocean evocation,* whether the product evokes *environmental benefits* and the *perceived expensiveness*. The amount of oceanic feelings a product evokes could indicate how much the fact that a product is made from recycled ocean plastic is being reflected in the design. The evoked oceanic feeling is an important variable to test if the intended ocean perception which the product wanted to convey is being conceived by consumers.

Another interesting variable would be the perceived environmental benefits the ocean plastic products convey. Environmental motives usually are not main purchase drivers, however making the environmental benefits more recognisable could increase consumer adoption (Mugge et al., 2017). This would mean that when the evaluation of environmental benefits is high, the purchase intention should increase.

The perceived expensiveness of a product could also be an interesting factor when testing purchase intention. The features influencing the perceived expensiveness of a product are mostly extrinsic attributes, which is what makes it relevant in this study examining visual appearance (Monnot et al., 2015). For instance more sophisticated designs can be associated with a higher perceived price (Orth et al, 2010). The perceived expensiveness then tells us something about how sophisticated people find ocean plastic products. Also the perceived expensiveness can have an effect on consumer's purchase intention, since this economic features correspond to a set of beliefs which influence consumer behaviour towards a product (Monnot et al., 2010).

AFFECTIVE RESPONSES

Affective product responses are important determinants for people's sustainable behaviours, with in particular one's purchase intention (Koenig-Lewis et al., 2014). Therefore affective responses are also relevant for behaviours regarding ocean plastic products. Examples of such affective responses are emotions. Studies show that *negative emotions* have a significant effect on pro-environmental behaviour (Koenig-Lewis et al., 2014). Negative emotions such as worry and fear have a negative effect on benefit perceptions while increasing the risk perception (Finucane et al., 2000). As a consequence,

consumers focus on the perceived risk which lowers their purchase intention (Chaudhuri et al., 2010). Emotions can play an important role when evaluating risks versus benefits (Lee, Scheufele, & Lewenstein, 2005). Especially where knowledge levels are low, which seems to be the case for ocean plastic products (chapter 4.6 and 4.9.).

On the contrary; if there are stronger *positive emotions*, the chance of committing pro-environmental behaviour increases (Koenig-Lewis et al., 2014). Pro-environmental products promise consumers greater benefits and therefore evoke more positive feelings. In order to test the effect of positive and negative emotions on purchase intention five items can be included for positive emotions (happy, enthusiastic, optimistic, proud, content), and two items for negative emotions (nervous, worried).

Another element which could be interpreted as an affective response is one's *anticipated conscience.* Anticipated conscience is consumer's expectations on how the product will make him/her feel (Magnier et al., 2019). These expectations can be related to adoption of products made from ocean plastic, and are therefore important to take into account when assessing evoked purchase intention of ocean plastic products.

PERCEPTUAL RESPONSES

Research demonstrates that a product's visual appearance also influences one's perceived product quality (Mugge et al., 2014). This can easily be explained by the halo effect indicating that an attractive product appearance often evokes other positive emotions, such as higher perceived product quality (Page & Herr, 2002). Another influencer for the quality perception of products is the perceived novelty. It is crucial to find a balance between

novelty of recognisability (which in this case is shape typicality/categorisation of the product) and a products' appearance (in this case how ocean plastic is being reflected in the design) (Mugge & Schoormans, 2012). Stone-Romero et al. (1997) developed four dimensions to measure perceived product quality which also focus on appearance. These are flawlessness, *durability, attractiveness* and *distinctiveness*. The last three dimensions relate to recycled ocean plastic products. Durability relates to the fact that it is made from recycled material, which could be influencing the perception of quality since recycled plastic can be perceived inferior compared to virgin plastics (Hamzaoui-Essoussi & Linton, 2014). Distinctiveness and attractiveness express the relation between the shape typicality and the presence of patterns/textures on the total appearance perceptions. These quality dimensions are indicators for one's perceptive responses.

PERSONAL IDENTITY

Ocean plastic products can be used as a way to communicate one's values. In this study this is expressed as *personal identity*. It is the extent to which individuals feel that using ocean plastic products reflects a positive image of themselves (Griskevicius et al., 2010). A consumers' implicit self-theory about him/her self is an important determinant of how that consumer responds to a product (Park & John, 2010).Therefore this could be an important variable in predicting consumer's responses and behaviours towards ocean plastic products.

INDIVIDUAL VARIABLES

Other variables which are interesting to test but not directly linked to products are one's *environmental concern* and one's *sensitivity to design*. These variables affect how people respond in general and give a broader overview of the personal involvement

of the participants. Environmental concern represents one's individual general perspective towards the environment and one's concern about this. Environmental concern directly and positively influences pro-environmental purchase behaviour. This suggests that consumers who have a strong environmental concern may be interested in purchasing products that reflect that concern (Kim & Choi, 2005).

Lastly one's sensitivity to design could be interesting to test. Sensitivity to design here refers to that people are able to see the product in its context which then creates a certain value. Kristensen et al. (2012) developed a scale measuring this sensitivity to design using three sub-elements (value, acumen, response). It attempts to explain and predict individual differences of consumer choices. These different individual choices can be taken into account when analysing ocean plastic product responses of consumers.

VARIABLES PER RESEARCH QUESTION

The research questions can be answered by analysing the previous discussed test variables. These variables are summarised as follows: distinctiveness, durability, attractiveness, oceanic feelings, perceived environmental benefits, perceived expensiveness, anticipated conscience, positive emotions, negative emotions, personal identity, purchase intention, *awareness of ocean plastic products, environmental concern and one's sensitivity to design.

* In the questionnaire participants are asked whether they already knew that some companies sell products which are made from ocean plastic. This was done in order to get an idea of how familiar they were with the subject (ocean plastic products).

5.3 PRE-TESTS SET-UP SHAPES & PATTERNS/ TEXTURES

As stated in paragraph 5.2.1 and 5.2.2 different combinations between shapes and patterns/ textures in product design could largely affect how people respond to ocean plastic products. This means that there are 2 variables which need to be defined, namely: shape typicality and pattern/texture recognisability. Having 2 stimuli for both typicality (typical vs. atypical) and recognisability (recognisable vs. not recognisable) results in a 2X2 study. By doing this for both the bottle of dishwashing liquid and the chair, results in a 2X2X2 study (see figure 29).

First the shape study of both the bottle of dishwashing liquid and the chair will be explained. Afterwards the pattern/texture recognisability will be explained. The chosen stimuli are then tested in a pre-test which compares the differences in means from the stimuli. The results of the pre-test will be used in the 2X2X2 study.

5.3.1 BOTTLE OF DISHWASHING LIQUID

SHAPE

In order to find a typical and atypical bottle of dishwashing liquid an explorative study of online offered bottles was done. A selection of the different types of bottles found can be seen in figure 30. During this selection process variance was of big importance since just the few bottles should be able to represent the diversity of all different types of bottles. In this figure some of the found bottles are placed on the same grid introduced in paragraph 5.2.1, using shape typicality and pattern recognisability on the x-axis and y-axis. This means that section E contains the more typical designs
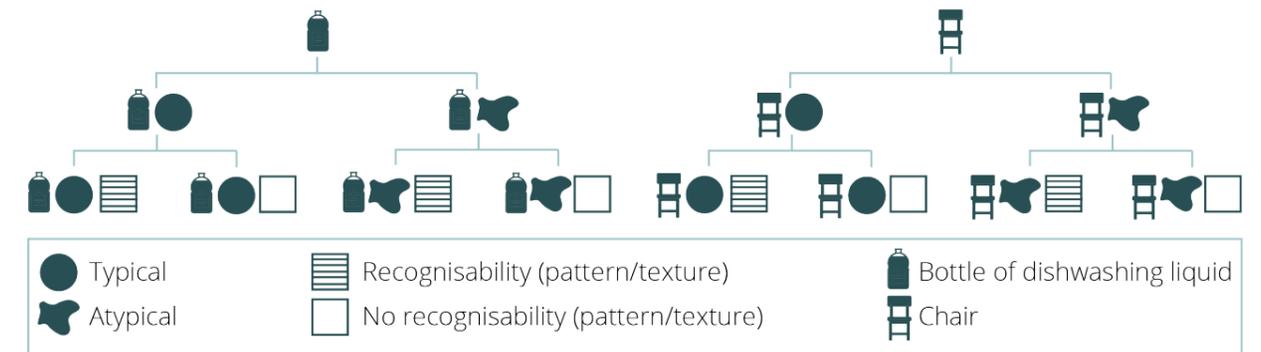

Figure 29: Set-up of the study.

Figure 30: Typicality dishwashing bottles.

and section F contains the more atypical designs. In the grid, some bottles are pinned by either a light blue or a dark blue pin. The light blue pin shows the existing ocean plastic bottles, whereas the dark bluepin shows the bottle which contains an eco-

friendly dishwashing liquid. This is shown to explore the extra dimension of pro-environamentalness of the bottles. It is interesting to see that the ocean plastic bottles here are either very typical (section A) or very atypical (section D).
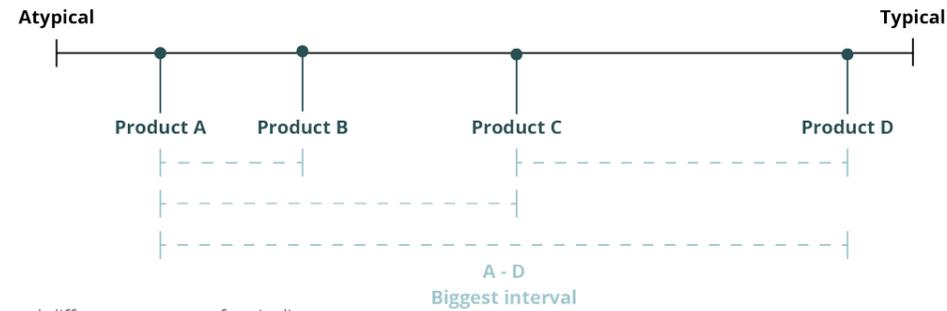
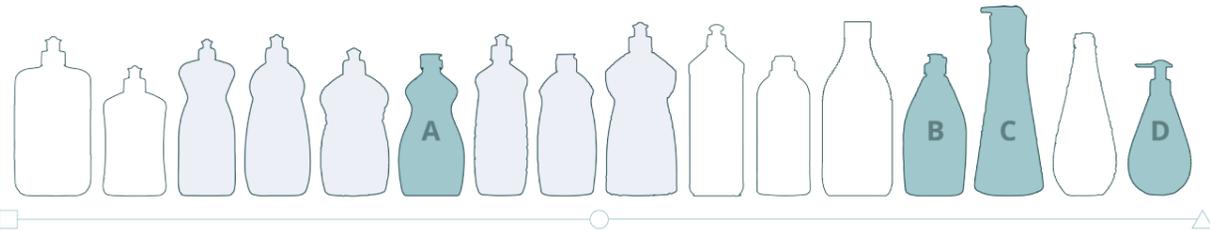**Figure 31:** Interval difference means of typicality.

Figure 32: Finding a typical shape.

Figure 33: Four used bottles to define typicality.

In order to find the biggest difference in typicality variance, two typical and two atypical shapes are being tested during the pre-test. Hereby is searched for the biggest difference in means (see figure 31). For the atypical shapes, a bottle from section B and a bottle from section D are being selected. For the typical shapes, only one bottle (from section A) is selected. In order to find the second typical bottle an extra shape study is being conducted since the remaining bottles is section E are not as typical as they could be and therefore are no good stimuli.

In order to find another typical bottle some exploration has been done in supermarkets. All offered dishwashing liquids have been analysed based on their shapes. In figure 32 these bottles are listed based on their shapes. Hereby they vary from

square to round to triangular shapes. The bottles B, C and D have already been selected based on the previous exploration (figure 30). Since most of the other bottles are curved, a curved bottle was most likely a good option for a typical bottle. Within these seven curved bottles the middle bottle was being selected in order to deliver the most typical curved bottle. This is bottle A, shown in figure 32.

All four bottles have been edited so they all have somewhat the same appearance. This is done in order to make them comparable with each other so a grounded distinction can be made between the different bottles. All bottles are displayed transparent and with having the same cap. The four bottles used in the pre-test are shown in figure 33. They are recpectively (from left to right) labelled: pyramid, drop, lady and dreft.

PATTERN

The y-axis of figure 30 (page 71) represents the pattern typicality. In section G, no pattern regarding ocean plastic is found on the bottles. Section H offers different types of patterns. Section C uses ocean patterns in the form of an image of the ocean, whereas section D uses patterns in the design of the bottles itself. For this study it is chosen to implement (oceanic) patterns on the design itself since this aims at creating a more holistic design.

In order to evoke oceanic feelings, patterns related to the ocean could be implemented in the designs. For this, oceanic patterns have been explored by looking at for instance logo's, curtains, etc. Hereby eight different oceanic patterns have arisen. These are shown in figure 34 on the grid. Section C shows more structured patterns whereas section D is more random. Also section A makes a more direct link to the sea (water and fish) whereas section B is more abstract (shells, stones and suction cups).
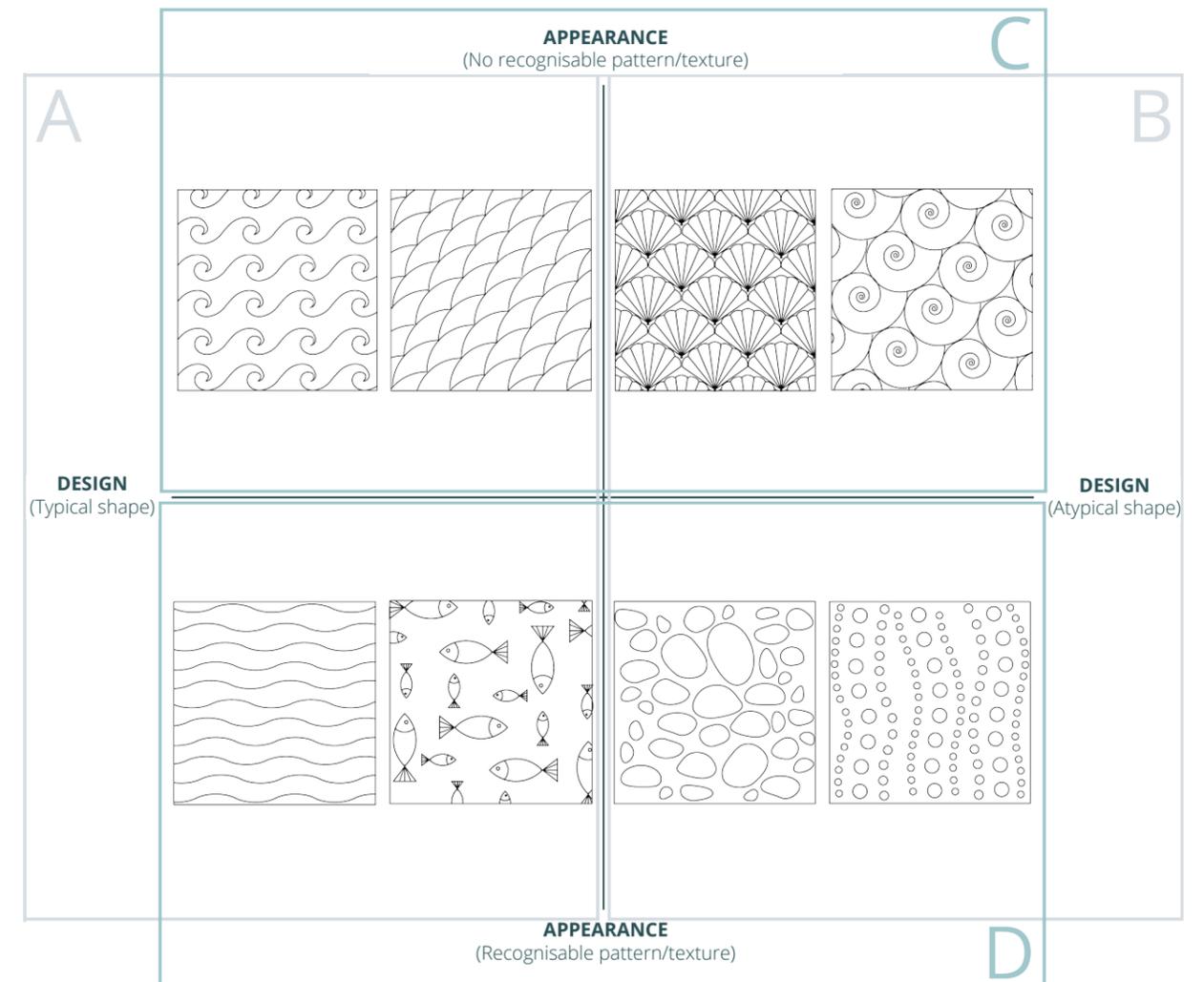

Figure 34: Patterns bottles.

5.3.1 CHAIR

SHAPE

In order to find a typical and atypical chair an online explorative study was done. A selection of the different chairs found can be seen in figure 35. During this selection process eco-materials were of big importance since there is a lot happening there in terms of textures and fabrics. In this figure some of the found chairs are again placed on the grid which uses shape typicality and texture recognisability on the x-axis and y-axis. This means that section E contains the more typical shaped chairs and section F contains the more atypical shaped chairs. In the grid, the chairs are pinned by either a light blue or a dark blue pin. The light blue pin shows that the

chair is made from ocean plastic, whereas the dark blue pin shows chairs which are made from other eco-friendly materials (this also includes "regular" plastic recycling). It is interesting to see that there are already quite some variations in terms of shape and texture typicality of ocean plastic chairs. Again, most of them are either very typical (section A) or very atypical (section D).

Again two typical and two atypical shapes are being tested during the pre-test. Hereby is searched for the biggest difference in means. For the atypical shapes, both chairs from section G are being selected. The chairs in section D are to divergent in terms of utility compared to the other chairs (a child's chair and a
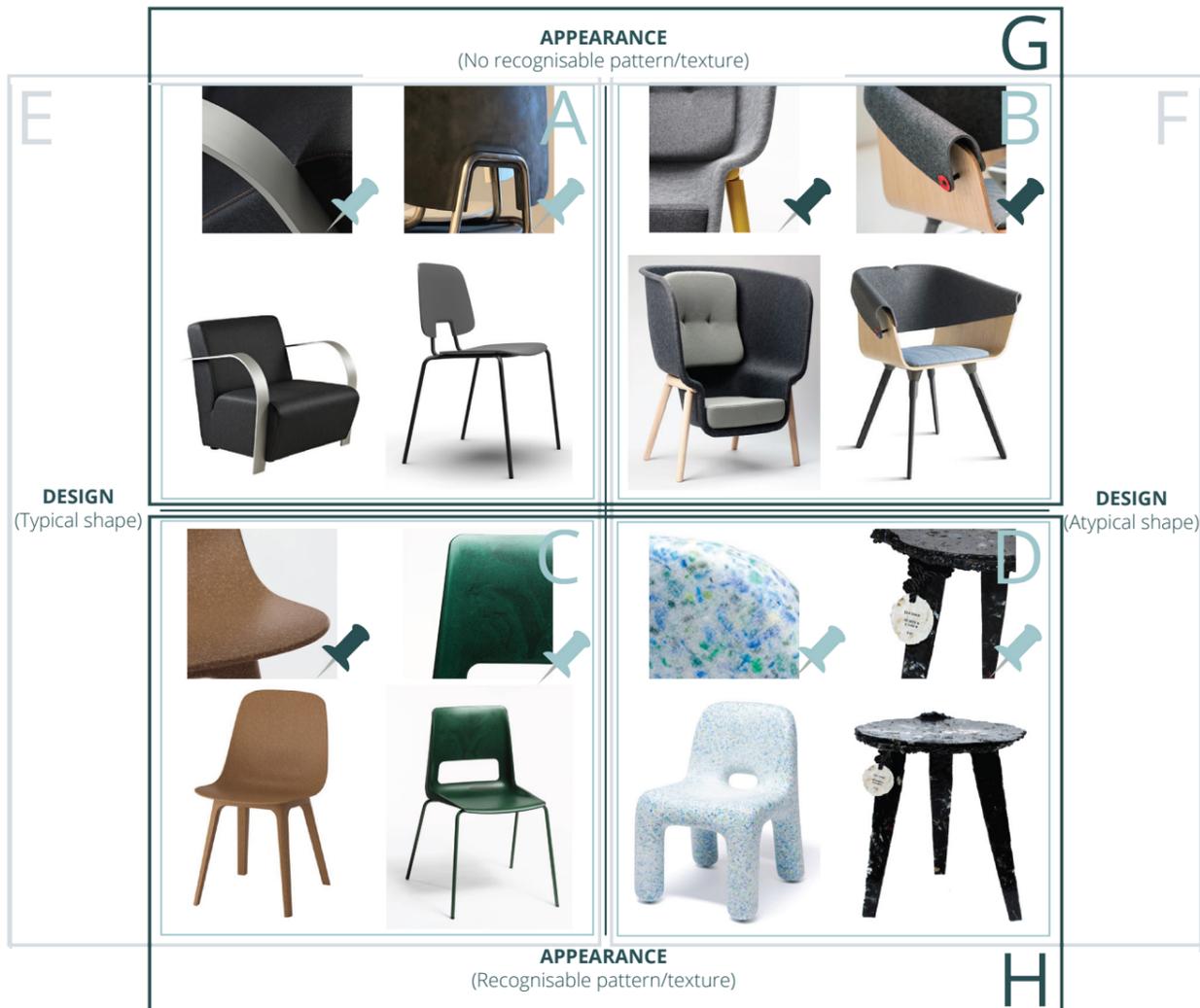
Figure 36: Finding a typical shape.

Figure 37: Four used chairs to define typicality.

stool), which makes it difficult to run a trustworthy analysis with them. For the typical shaped chairs an extra shape study is being conducted since the chairs in section E are not as typical as they could be and therefore will be no good stimuli.

In order to find typical chairs again an online exploration has been done. This time the focus was on finding a typical plastic chair, and thus it was not just targeting eco-chairs. Also important was that the chairs were made of plastic. Of course there are multiple typical chairs made from for instance wood. However it is chosen to explicitly look at plastic chairs since there would be a product-material fit which makes most sense. The selected chairs are shown in figure 36, where they are listed based on their shapes. Hereby they vary from round to square shapes. In order to cover all possible typical chairs, a round and a square chair were desired. The most rounded chair however already was slightly atypical. Therefore the two chosen typical plastic chairs are option A and B (see figure 36).

All four chairs have been made black and white in order to make them more comparable with each other and not be distracted by differing colours. The four chairs used in the pre-test are shown in figure 37. They are respectively labelled: shell, whale, round and square.

TEXTURES

The y-axis of figure 35 represents the texture recognisability. In section G, no texture regarding ocean plastic is found on the chairs. This is because the plastic has been processed into thin threads resulting in a different feeling (fabric and felt). Section H offers different types of textures which on different levels could refer to being recycled. For this study it is chosen to use the more direct way of showing that a chair is made from plastic (thus hard plastic instead of fabric). Hereby the texture has a direct influence on the design itself. This is also chosen in order to stay in line with the decision of the patterns of the bottles of dishwashing liquid to be more directly merged into the design.
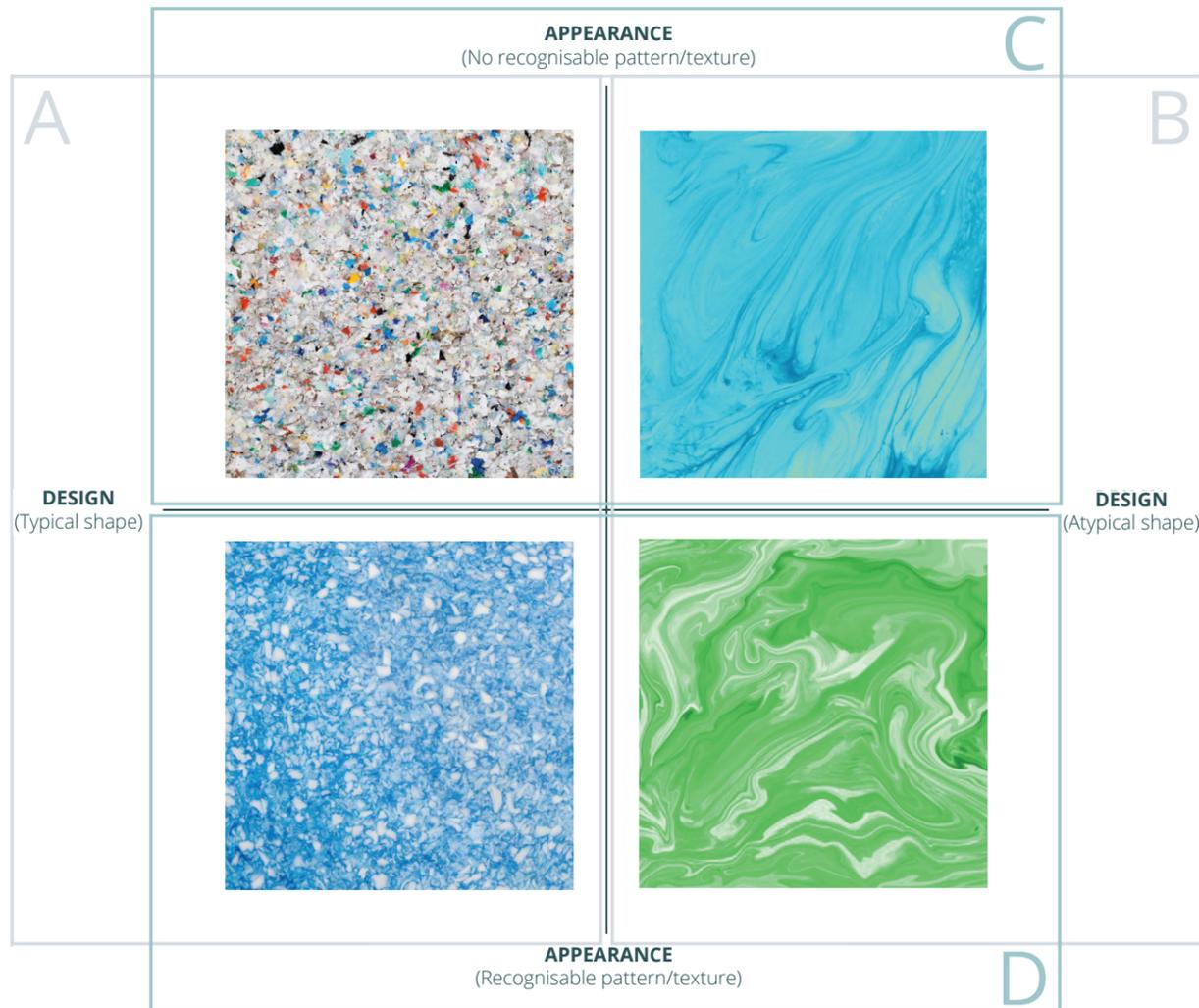

Figure 35: Typicality pro-environmental chairs.

APPEARANCE
(No recognisable pattern/texture)

A   C   B

DESIGN
(Typical shape)

DESIGN
(Atypical shape)

APPEARANCE
(Recognisable pattern/texture)

D

Figure 38: Textures.

There are two types of textures in section H, namely: shredded and more fused together plastic. Both could indicate recycled ocean plastic. Also colours play an important factor here. People might associate the ocean with the colour blue; while plastic could in fact be any colour. Therefore four different oceanic textures have been chosen. These are shown in figure 38 on the grid. Section A here makes a more direct link to recycled plastic (shredded pieces) whereas section B is more abstract (fused together). Section D puts tot the test colour associations regarding ocean plastic.

5.4 RESULTS PRE-TEST PATTERNS/TEXTURES & SHAPES

5.4.1. RESULTS PATTERNS/TEXTURES

In order to check which level of recognisability of a pattern would be best suited for conveying a recycled ocean plastic feeling, a one-sample t-test has been performed using the patterns for both the bottle of dishwashing soap and the chair as variables. The pre-test analysed how much oceanic feelings the patterns/textures evoked (ocean evocation), how much the patterns/textures fit to packaging/furniture made from recycled ocean plastic (recycled ocean

plastic evocation), how much the patterns/textures fit on a bottle of dishwashing liquid/chair (fit with product category), and how attractive the pattern was being perceived (attractiveness). The questions of the pre-test can be found in appendix 12.

PROCEDURE AND MEASURES

Thirty-two respondents (Mage=21.84 years, SD=1.86, Female=50%) participated in this online study. All participants were asked to rate the ocean evocation, recycled ocean plastic evocation, fit with product category and the attractiveness for 12 different patterns/textures (5.3.1 and 5.3.2: 8 patterns related to a bottle of dishwashing liquid, and 4 textures related to a chair). All 12 patterns/textures were shown to the participants.

The measurements where rated on a 7-point Likert scale rating from strongly disagree to strongly agree. Due to this 7-point scale, the test value of the experiment is 4. This means that the means of the variables are being compared to 4, since 4 is the middle of the 7-point scale and thus a neutral answer. Everything which is rated below 4 is being perceived as a "low" score, and everything rated

above 4 is perceived as a "high" score. For the pre-test of the patterns an as high as possible rate for all four test variables (ocean evocation, recycled ocean plastic evocation, fit with product category and the attractiveness) is desired. However the ocean evocation and the attractiveness weight more than the recycled ocean plastic evocation and the fit with the product category since these are of higher importance in determining whether the product communicates that it is made from ocean plastic and provokes consumer enhancement (this weight difference per variable can be found in appendix 13).

RESULTS PATTERNS BOTTLES

When analysing the different means of the different patterns, the best two (if applicable) per tested variable are highlighted in blue. These two have the highest means and are significant (in respect to the test-value of 4). The best option per test variable is marked in bold. This is done to get a better understanding of the best rated option(s) per tested variable. Figure 40 shows the total combined means per pattern for all four tested variables.
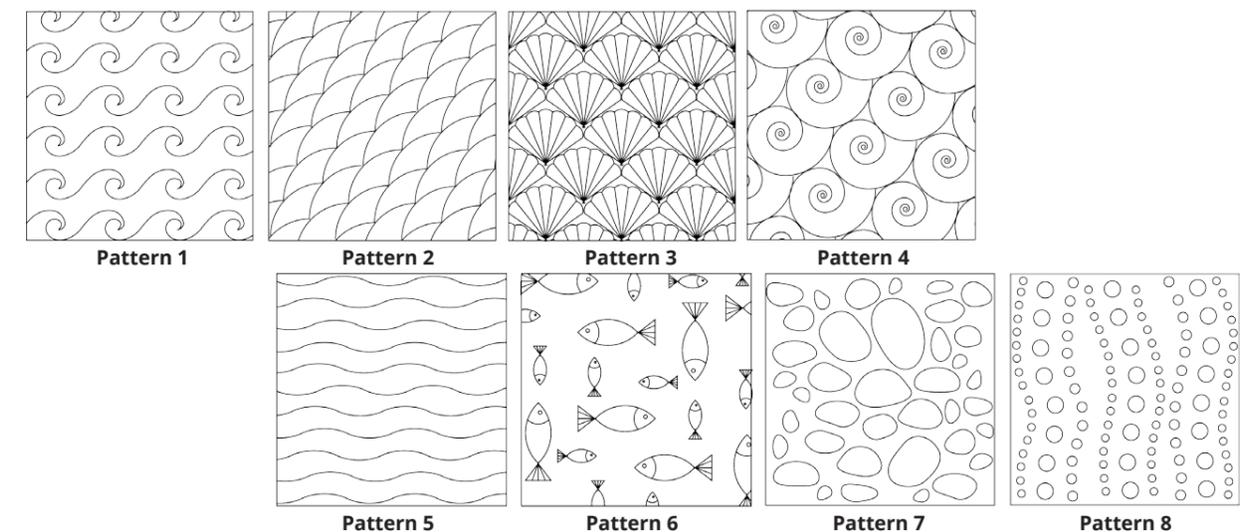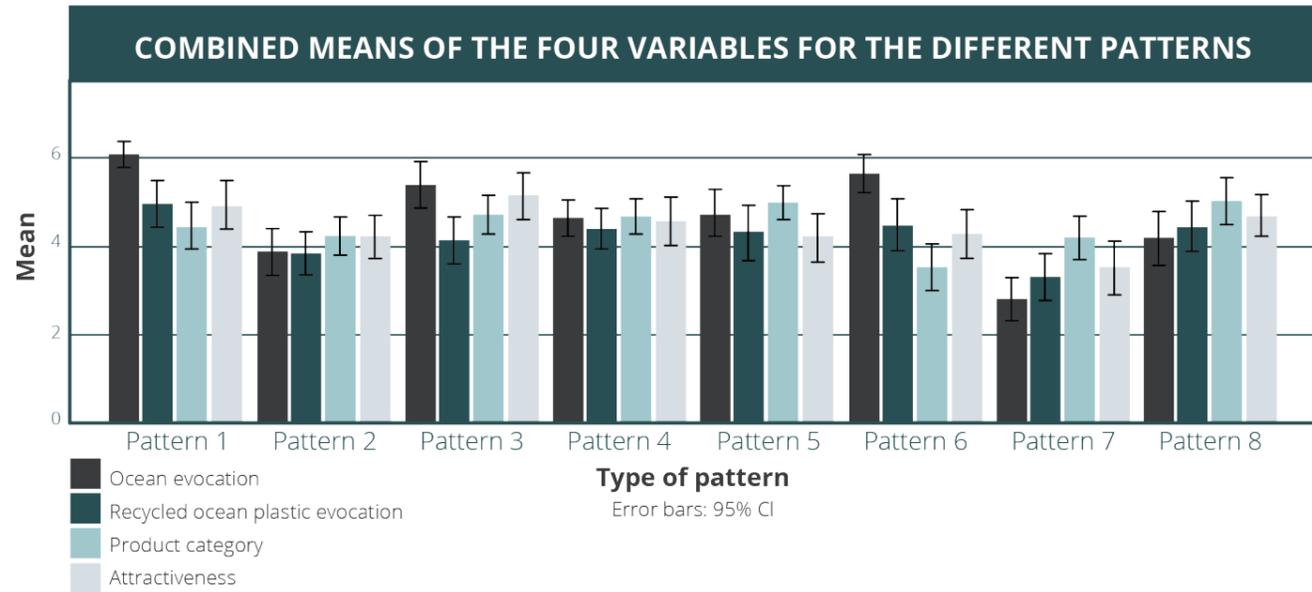

| Pattern 1 | Pattern 2 | Pattern 3 | Pattern 4 |

| Pattern 5 | Pattern 6 | Pattern 7 | Pattern 8 |

Figure 39: Patterns.

COMBINED MEANS OF THE FOUR VARIABLES FOR THE DIFFERENT PATTERNS

Figure 40: Combined means of the patterns.

Bottle - Ocean evocation	Bottle - Fit with product category
MPattern1 = 6.06; t(31) = 13.295; p<0.001	MPattern1 = 4.44; t(31) = 1.752; p<0.05
MPattern2 = 3.84; t(31) = -0.624; p>0.05 *Insignificant	MPattern2 = 4.22; t(31) = 1.000; p>0.05 *Insignificant
MPattern3 = 5.38; t(31) = 5.351; p<0.001	MPattern3 = 4.69; t(31) = 3.232; p<0.05
MPattern4 = 4.63; t(31) = 2.985; p<0.05	MPattern4 = 4.66; t(31) = 3.388; p<0.05
MPattern5 = 4.72; t(31) = 2.777; p<0.05	MPattern5 = 4.97; t(31) = 5.314; p<0.001
MPattern6 = 5.63; t(31) = 7.945; p<0.001	MPattern6 = 3.50; t(31) = -1.882; p>0.05 *Insignificant
MPattern7 = 2.78; t(31) = -5.154; p<0.001	MPattern7 = 4.19; t(31) = 0.770; p>0.05 *Insignificant
MPattern8 = 4.16; t(31) = 0.536; p>0.05 *Insignificant	**MPattern8 = 5.00; t(31) = 3.764; p=0.001**

Bottle - Recycled ocean plastic evocation	Bottle - Attractiveness
MPattern1 = 4.94; t(31) = 3.532; p=0.001	MPattern1 = 4.91; t(31) = 3.394; p<0.05
MPattern2 = 3.81; t(31) = -0.783; p>0.05 *Insignificant	MPattern2 = 4.19; t(31) = 0.783; p>0.05 *Insignificant
MPattern3 = 4.13; t(31) = 0.510; p>0.05 *Insignificant	**MPattern3 = 5.13; t(31) = 4.313; p<0.001**
MPattern4 = 4.38; t(31) = 1.679; p<0.05 *Insignificant	MPattern4 = 4.56; t(31) = 2.150; p<0.05
MPattern5 = 4.31; t(31) = 1.032; p>0.05 *Insignificant	MPattern5 = 4.19; t(31) = 0.701; p>0.05 *Insignificant
MPattern6 = 4.47; t(31) = 1.672; p>0.05 *Insignificant	MPattern6 = 4.25; t(31) = 0.955; p>0.05 *Insignificant
MPattern7 = 3.28; t(31) = -2.697; p<0.05	MPattern7 = 3.50; t(31) = -1.679; p>0.05 *Insignificant
MPattern8 = 4.44; t(31) = 1.582; p>0.05 *Insignificant	MPattern8 = 4.66; t(31) = 2.833; p<0.05

> The measurements and descriptives of the pattern and texture pre-test can be found in appendix 14.

Unless suggested otherwise, assumptions of normality and homogeneity of variance were met for the t-test performed in this pre-test. In order to find a best suitable pattern the following three items were examined:

1. The significance of the means.

To see if there is a significant difference between the test variable of 4 and the total mean of the individual patterns per variable. A significant mean difference with test variable 4 should indicate that people are not having neutral feelings and therefore the response is more meaningful (since "4" indicates that people are having neutral feelings).

2. The means below 4.

Patterns which have means lower than 4 per variable are being excluded during the selection process. This indicated that the pattern is rated as "low" and is therefore not evoking the desired feelings which are being tested per variable. Even the means which are statistically different (significant) but lower than four are excluded, simply because they become irrelevant for the study.

3. Summed mean.

The summed means of the four variables (ocean evocation, recycled ocean plastic evocation, fit with product category and the attractiveness) per pattern. All means per pattern have been added up to see which pattern has the highest total score (see appendix 13). This is done because it was desired that the pattern should score high on all four test variables.

The results of the three criteria can be found in appendix 13, and the preference sequence of the patterns is shown in figure 41. The analysis showed that the more "obvious" recognisable ocean pattern (pattern 1) was rated highly for conveying oceanic feelings, ocean plastic recyclability and attractiveness. Only for the fit with the product category pattern 1 did not show the highest score compared to the other patterns, yet it is still significant. Besides, pattern 1 was the only pattern which was significant at all times, indicating that the participants were all in agreement with each other. Also it had the highest total mean of the patterns and no individual mean per variable was lower than 4. This resulted in choosing this pattern (pattern 1) for the ocean plastic study.
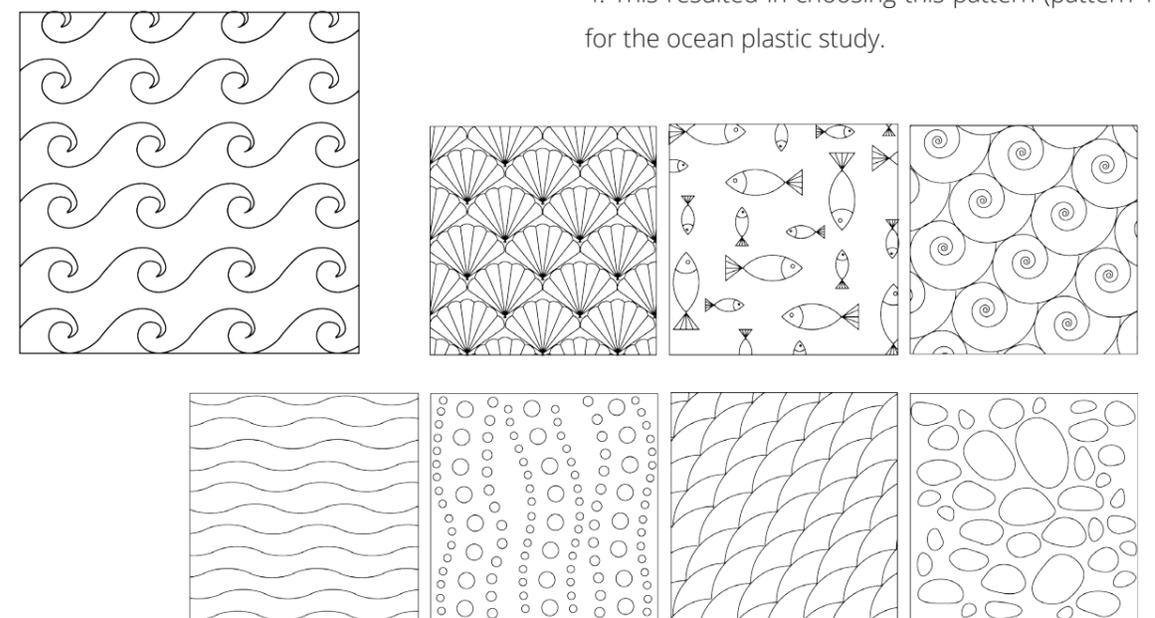

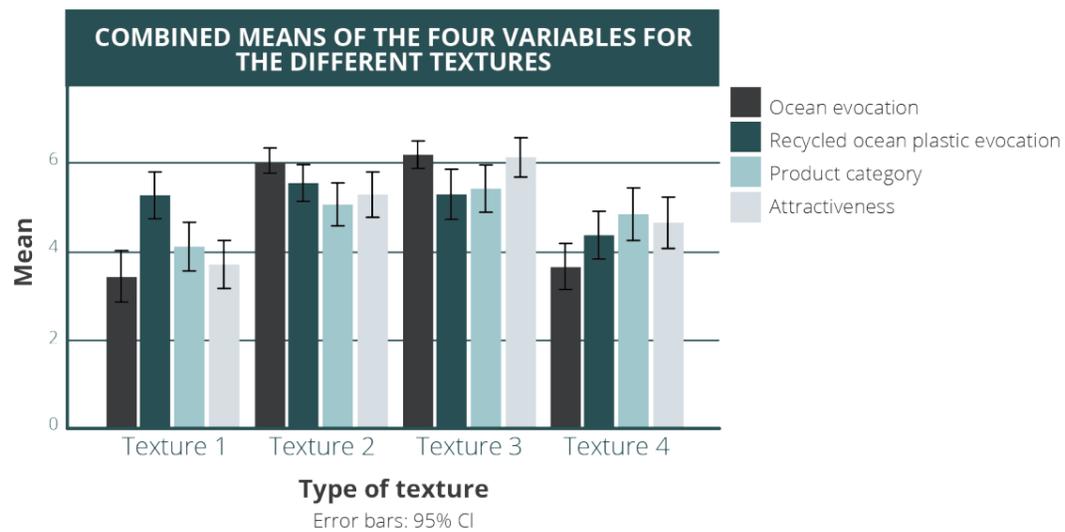**Figure 41:** Patterns bottle arranged from highest total to lowest total score.

COMBINED MEANS OF THE FOUR VARIABLES FOR THE DIFFERENT TEXTURES

- Ocean evocation
- Recycled ocean plastic evocation
- Product category
- Attractiveness

Type of texture
Error bars: 95% CI

Figure 42: Combined means of the textures.

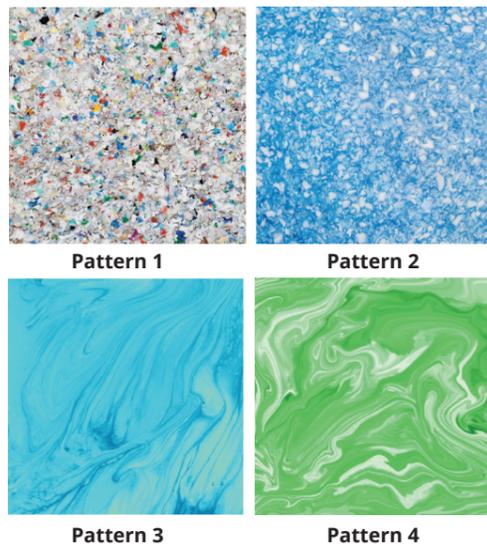**Pattern 1**   **Pattern 2**

Pattern 3   **Pattern 4**

Figure 43: Textures.

RESULTS TEXTURES CHAIRS

Here again, the best two are highlighted in blue and the best option (being the highest and most significant) is marked in bold. Figure 42 shows the total combined means per texture for all four tested variables.

Unless suggested otherwise, assumptions of normality and homogeneity of variance were met for the t-test performed in this pre-test. Again in order to find a best suitable texture, the textures were examined on the previously discussed thee items:

Chair - Ocean evocation
MPattern1 = 3.41; t(31) = -2.149; p<0.05
MPattern2 = 5.97; t(31) = 15.053; p<0.001
MPattern3 = 6.13; t(31) = 13.806; p<0.001
MPattern4 = 3.59; t(31) = -1.603; p>0.05 *Insignificant

Chair - Recycled ocean plastic evocation
MPattern1 = 5.19; t(31) = 4.574; p<0.001
MPattern2 = 5.47; t(31) = 7.317; p<0.001
MPattern3 = 5.22; t(31) = 4.306; p<0.001
MPattern4 = 4.31; t(31) = 1.204; p>0.05 *Insignificant

Chair - Fit with product category
MPattern1 = 4.06; t(31) = 0.226; p>0.05 *Insignificant
MPattern2 = 5.00; t(31) = 4.209; p<0.001
MPattern3 = 5.34; t(31) = 5.162; p<0.001
MPattern4 = 4.78; t(31) = 2.726; p<0.05

Chair - Attractiveness
MPattern1 = 3.66; t(31) = -1.283; p>0.05 *Insignificant
MPattern2 = 5.22; t(31) = 4.978; p<0.001
MPattern3 = 6.06; t(31) = 9.907; p<0.001
MPattern4 = 4.59; t(31) = 2.094; p<0.05

> The measurements and descriptives of the pattern and texture pre-test can be found in appendix 14.

the significance of the means, the means below 4, and the summed means of the four variables per texture.

The results of the three criteria can be found in appendix 13, and the preference sequence of the textures is shown in figure 44. The analysis showed that the more "abstract" recognisable ocean pattern (pattern 3) was rated as best for conveying oceanic feelings, being the best fit for the product category and was found attractive. For the recyled ocean plastic evocation this pattern took second place, yet being strongly significant. In general patterns 2 and 3 both were rated very positive since they both had significant means at all times and no means below 4. However pattern 3 had higher total mean. This resulted in choosing this pattern for the ocean plastic ocean plastic study.

5.4.2. RESULTS SHAPES

In order to check whether the manipulated atypical appearance of the chairs and bottles of dishwashing soap were perceived as significantly more atypical as the typical appearance, an independent samples t-test has been performed using the typicality of the shape/design as the dependent variable which compared the different chairs with each other. For both the bottle and the chair four options were chosen (as discussed in 5.3.1 and 5.3.2). Within these four options, two were typical and two were atypical. The questions of the pre-test can be found in appendix 15.

PROCEDURE AND MEASURES

Seventy-five respondents (Mage=23.65 years, SD=4.01, Female=53.3%) participated in this online study. All participant were asked to rate the typicality of one of the different chairs and one of the different
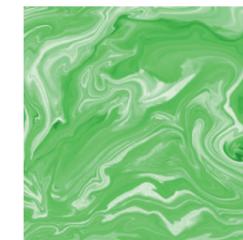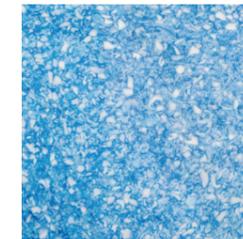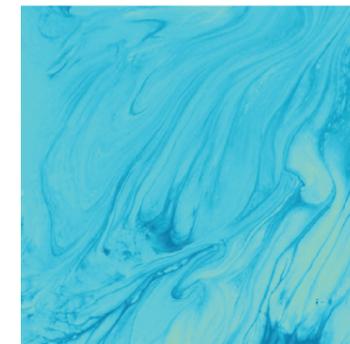

Figure 44: Patterns chair arranged from highest total score to least total mean

bottles of dishwashing soap on a Likert scale, rating from completely atypical to completely typical. During the questionnaire two products were shown to the participants of which they needed to rate the typicality, one bottle and one chair. They were asked to rate only one condition per product category in order to not influence one's perception on typicality. This pre-test with a total of four products per product category was done in order to find the biggest difference in means between atypical and typical shapes for the concerned products.

RESULTS BOTTLE

In order to check the relation between the two atypical and typical bottles, an independent samples t-test has been performed. According to the Levene's test both in the atypical group of bottles (pyramid and drop bottle) and the typical group of bottles (dreft and lady bottle), equal variances can be assumed. However both groups show no significant difference within the groups, implaying that there is no significant difference between the two typical and the two atypical bottles. Therefore either one of the two typical bottles in combination with one of the two atypical bottles "could in fact" be used to test the combination between typicality in the ocean plastic study. Yet the differences between the combinations should be significant, and the biggest

difference in means between the typical and atypical bottles is desired in order to most effectively test typicality. Therefore another independent samples t-test has been performed testing the strength of the different combinations between the different bottles.

All combinations between a typical and an atypical bottle are significant. Again, assuming that the combination of bottles with the biggest mean difference would have the biggest effect, the combination of the pyramid bottle (as atypical) and the dreft bottle (as typical) is being chosen for the ocean plastic study (figure 45). These mean differences can be seen in figure 46 (mean difference between bottle and dreft is 3.08 on the 7-point scale).

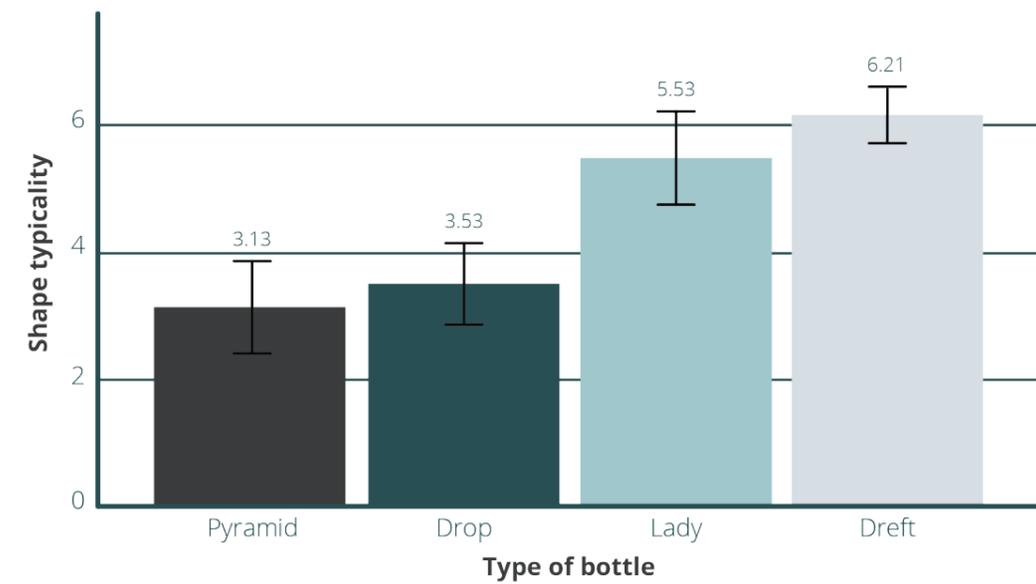### MEANS OF SHAPE TYPICALITY FOR THE DIFFERENT BOTTLES

Figure 46: Means typicality bottles with error bars. Error bars: 95% CI

Levene's test > 0.05 (0.845); Equal variances assumed
Mpyramid = 3.13 vs. Mdrop = 3.53; t(30) = -0.866; p>0.05
>> There is NO significant difference for typicality between pyramid & drop

Levene's test > 0.05 (0.155); Equal variances assumed
Mdreft = 6.21 vs. Mlady = 5.53; t(41) = 1.768; p>0.05
>> There is NO significant difference for typicality between dreft & lady

Levene's test > 0.05 (0.515); Equal variances assumed
Mpyramid = 3.13 vs. Mlady = 5.53; t(32) = -4.881; p<0.001
>> There is a significant difference for typicality between pyramid & lady

Levene's test > 0.05 (0.579); Equal variances assumed
Mpyramid = 3.13 vs. Mdreft = 6.21; t(37) = -8.229; p<0.001
>> There is a significant difference for typicality between pyramid & dreft

Levene's test > 0.05 (0.602); Equal variances assumed
Mdrop = 3.53 vs. Mlady = 5.53; t(34) = -4.262; p<0.001
>> There is a significant difference for typicality between drop & lady

Levene's test > 0.05 (0.374); Equal variances assumed
Mdrop = 3.53 vs. Mdreft = 6.21; t(39) = -7.449; p<0.001
>> There is a significant difference for typicality between drop & dreft

Original model: Dreft dishwashing liquid by P&G

Original model: Foaming hand wash by Method

Original model: Dish Liquid Fresh Citrus and Ginger Scent by Seventh Generation

Original model: Gel hand wash by Method

> The measurements and descriptives regarding the pre-test of the shapes can be found in appendix 14.

Figure 45: Shapes bottles.

RESULTS CHAIR

In order to check the relation between the two atypical and typical chairs, an independent samples t-test has been performed. According to the Levene's test both in the atypical group of chairs (shell and whale chair) and the typical group of chairs (round and square chair) equal variances cannot be assumed. When looking at the t-values both groups show a significant difference within the groups, implying that there is a significant difference between the two typical and the two atypical chairs . This indicates that the typicality of the chairs vary within both the atypical group and the typical group. In order to test the strength of the different combinations between the different chairs, another independent samples t-test has been performed.

The independent samples t-tests show that all combinations between the chairs are significant. Again, assuming that the combination of chairs with the biggest mean difference would have the biggest effect, the combination of the shell chair (as atypical) and the square chair (as typical) is being chosen for the ocean plastic study (figure 47). These mean differences can be seen in figure 48 (mean difference between bottle and dreft is 3.80 on the 7-point scale).

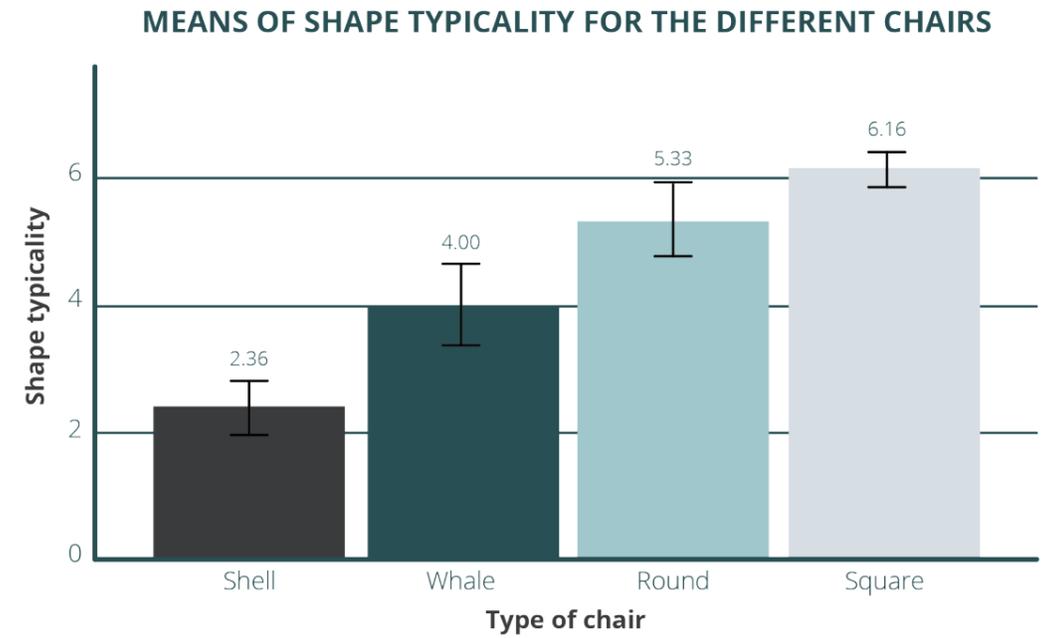### MEANS OF SHAPE TYPICALITY FOR THE DIFFERENT CHAIRS

Figure 48: Means typicality chairs with error bars. Error bars: 95% CI

Levene's test < 0.05 (0.021); Equal variances not assumed
Mshell = 2.36 vs. Mwhale = 4.00; t(32.728) = -4.555; p<0.001
>> There is a significant difference for typicality between shell & whale

Levene's test < 0.05 (0.022); Equal variances not assumed
Mround = 5.33 vs. Msquare = 6.16; t(21.150) = -2.717; p<0.05
>> There is a significant difference for typicality between round & square

Levene's test > 0.05 (0.657); Equal variances assumed
Mshell = 2.36 vs. Mround = 5.33; t(35) = -8.943; p<0.001
>> There is a significant difference for typicality between shell & round

Levene's test < 0.05 (0.043); Equal variances not assumed
Mshell = 2.36 vs. Msquare = 6.16; t(35.934) = -15.438; p<0.001
>> There is a significant difference for typicality between shell & square

Levene's test > 0.05 (0.100); Equal variances assumed
 Mwhale = 4.00 vs. Mround = 5.33; t(32) = -3.243; p<0.05
>> There is a significant difference for typicality between whale & round

Levene's test < 0.001 (0.000); Equal variances not assumed
Mwhale = 4.00 vs. Msquare = 6.16; t(25.478) = -6.603; p<0.001
>> There is a significant difference for typicality between whale & square

Original model: Vitra HAL Tube Chair by Jasper Morrison (2010)

Original model: De Vorm Pod PET Felt Chair by Benjamin Hubert (2011)

Original model: Vitra Side Chair DSX by Charles & Ray Eames (1950)

Original model: Vepa Whale Tail Chair by Plastic Whale

> The measurements and descriptives regarding the pre-test of the shapes can be found in appendix 14.

Figure 47: Chairs.

5.5 STUDY OCEAN PLASTIC PRODUCTS

5.5.1 STUDY DESIGN

The aim of this study is to examine the influence of shape typicality and pattern/texture recognisability across different type of product categories on several perceptual, cognitive, affective and behavioural variables. The study consists of a 2 (product: bottle vs. chair) x2 (shape typicality: typical vs. atypical) x2 (pattern/texture recognisability: present vs. absent) mixed design. The independent variables shape typicality and pattern/texture recognisability were measured between-subjects. The type of product are measured within-subjects. The respondents were randomly assigned to one of the two shape typicality conditions for the products. Hereby they were asked to reflect on both the different products (so one bottle and one chair). In both conditions the respondents had to reflect on the product where either a pattern/texture was or was not present. This means that the participants were asked to reflect on a bottle and chair with either a typical or an atypical shape and with or without a pattern. The participants were only asked to reflect on one of the same sets of conditions for both a bottle and a chair to exclude biases (see figure 49).
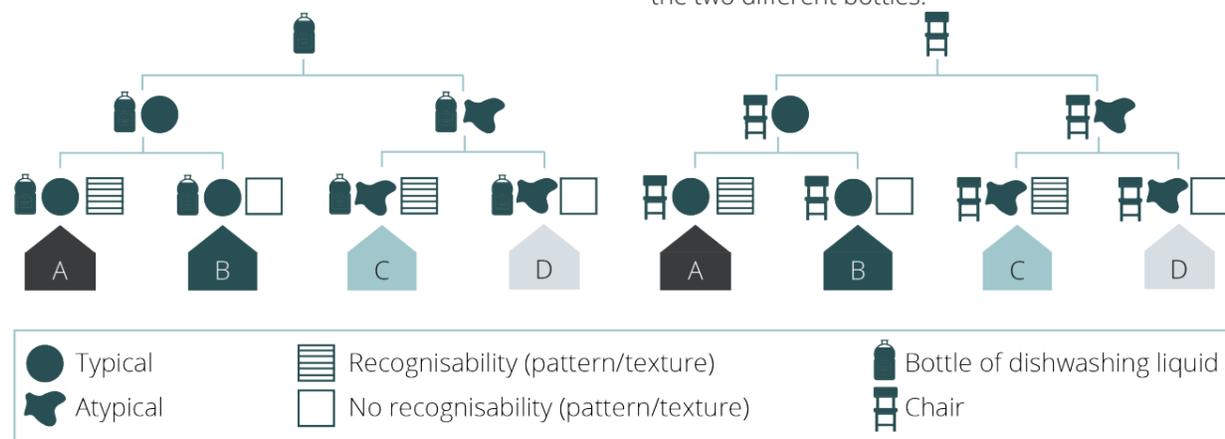
5.5.2 STIMULI

Based on the qualitative study which is explained in chapter 4, two product categories were chosen. These were packaging and furniture. The products representing the product category are a bottle of dishwashing liquid and a chair. The two bottles of dishwashing liquid chosen to test the shape typicality with are discussed in paragraph 5.3.1, and the two chairs chosen to test the shape typicality with are discussed in paragraph 5.3.2. The chosen pattern (regarding the bottles of dishwashing liquid) and the chosen texture (regarding de chairs) are also discussed in paragraph 5.3.1 and 5.3.2. These chosen products and pattern/texture were shown in figure 41, 44, 45 and 47.

For the bottle of dishwashing liquid a new label is designed with a non-existent brand: Lixy. This is done on order to avoid prior knowledge biases regarding familiarity with the brand. The combination of shape and pattern typicality resulted in a total of four different conditions for the bottles of dishwashing liquid. These four conditions are shown in figure 50. Herby the all bottles are displayed transparent and with having the same cap. The pattern is added at the bottom of all of the bottles in order to do not distract too much in respect to the shape of the bottles themselves and to be consistent between the two different bottles.

Since the chairs did not have a brand tag on them, no non-existent brand name was needed to be added on the stimuli. Yet the participants were asked to reflect on the designs of the chairs as if it was an office chair. This was done in order to create a more objective response which is more focussing on the design of the chair itself (since it is placed in an office) than whether the chair would fit in their homes. The combination of shape and

texture typicality resulted in a total of four different conditions for the chairs. These four conditions are shown in figure 51 (page 88). Hereby the textures of the chairs without the ocean plastic texture are made alike as much as possible in order to make all stimuli as comparable as possible. The original products for both the bottles of dishwashing liquid and the chairs can be found in appendix 16.

Figure 50: Conditions bottles of dishwashing liquid. (Free3D, 2019; Method, 2020)

Figure 49: Set-up of the study with combined stimuli.

Figure 51: Conditions chairs. (Vitra, 2020; Hubert, 2011)

5.5.3 PROCEDURE AND MEASURES

One hundred and seventy-two Dutch respondents (Mage=52.34 years, SD=14.25, Male 52.9%) participated in this online study. Participants were obtained through the panel from the IDE faculty of the Delft University of Technology. During the questionnaire the following question were asked to the respondents regarding the two products (bottle and chair):

- Their thoughts about the distinctiveness, durability and attractiveness of the products;
- The oceanic feelings the product evoked, the environmental benefits and the perceived expensiveness of the product.;
- The anticipated conscience the product evoked,, followed by the evoked positive and negative emotions and how the product related to their personal identity;

- Their purchase intention;

Questions regarding their personal perspectives which were not related to the perviously shown products, were asked afterwards. These questions related to their awareness of ocean plastic products, their environmental concern and their sensitivity to design. The full list of the statements asked in the questionnaire can be found in appendix 17.

The independent variables were measured on 7-point Likert scales ranging from strongly disagree to strongly agree. These measurements and their descriptive statistics are summarized in appendix 18).

5.5.4 ANALYSIS

Mixed repeated measures analyses of variance (ANOVA) were performed to measure the influence of shape typicality, pattern/texture recognisability and the product categories on several perceptual, cognitive, affective and behavioural variables. The perceptual(distinctiveness,durability,attractiveness), cognitive (oceanic feelings, environmental benefits and perceived expensiveness), affective (anticipated conscience, positive emotions, negative emotions) and behavioural responses (personal identity and purchase intention) were therefore selected as dependent variables. The type of product (bottle and chair) was selected as an independent variable within groups. Lastly the shape typicality and pattern/texture recognisability was selected as an independent variable between groups. The basic assumptions for homogeneity of variance and normality were met.

First the results of the different variables affecting the bottles and chairs independantly will be explained. The results of these two analyses can

be found in appendix 19. This is done in order to give an impression of the different effects per product. Then the mixed repeated measures of the combined products (bottles and chairs) will be explained. This analysis is needed in order to come with more generalised guidelines in how to design ocean plastic products. The results of this analysis can be found in appendix 20. Associated with the three different analyses some interesting correlations are explained. More correlations can be found in appendix 21.

5.5.5 RESULTS BOTTLE

THE INFLUENCE OF TYPICALITY AND RECOGNISABILITY OF A BOTTLE ON DISTINCTIVENESS

The between-subjects analysis showed a significant main effect of typicality on the perception of distinctiveness $(F(168)=25.13; p<0.001)$, with atypicality having a higher perceived distinctiveness than typicality (Matypical=4.45 vs. Mtypical=3.35). Also a significant main effect of recognisability on perceived distinctiveness was found $(F(168)=14.76; p<0.001)$, with the presence of an ocean pattern having a higher perceived distinctiveness than no ocean pattern (Myes=4.32 vs. Mno=3.48).

THE INFLUENCE OF RECOGNISABILITY OF A BOTTLE ON OCEANIC FEELINGS

The between-subjects analysis showed a significant main effect of recognisability on the evoked oceanic feelings $(F(168)=42.33; p<0.001)$, with the presence of an ocean pattern evoking more oceanic feelings than no ocean pattern (Myes=3.36 vs. Mno=2.09).

THE INFLUENCE OF TYPICALITY OF A BOTTLE ON EXPENSIVENESS

The between-subjects analysis showed a significant

main effect of typicality on perceived expensiveness (F(168)=24.03; p<0.001), with atypicality evoking a higher perceived expensiveness than typicality (Matypical=4.58 vs. Mtypical=3.67).

CORRELATIONS BOTTLE

Below the strongest correlations for the tested variables for the bottles of dishwashing liquid are presented. Other correlations can be found in appendix 21.

There is a positive significant correlation between perceived environmental benefits and anticipated conscience (r(172)=0.672, p<0.001). This indicates that the more perceived environmental benefits bottles evoke, the more people would feel good about buying these bottles.

There is a positive significant correlation between positive emotions and anticipated conscience (r(172)=0.688, p<0.001). This indicates that the more positive emotions bottles evoke, the more people would feel good about buying these bottles.

The factors influencing whether people would feel good about buying ocean plastic bottles are: the amount of evoked positive emotions and the perceived environmental benefits of the bottles. In this analysis bottles reflect to the product category: packaging.

5.5.6 RESULTS CHAIR

THE INFLUENCE OF TYPICALITY AND RECOGNISABILITY OF A CHAIR ON DISTINCTIVENESS

The between-subjects analysis showed a significant main effect of typicality on the perception of distinctiveness (F(168)=42.73; p<0.001), with

atypicality evoking a higher perceived distinctiveness than typicality (Matypical=5.44 vs. Mtypical=4.08). Also a significant main effect of recognisability on the perceived distinctiveness was found (F(168)=22.55; p<0.001), with the presence of an ocean plastic texture evoking a higher perceived distinctiveness than no ocean plastic texture (Myes=5.25 vs. Mno=4.26). Lastly, a significant main effect of the typicality and the recognisability on the perception of distinctiveness was found (F(168)=4.54; p<0.05). Hereby the typical chairs with a texture evoke a higher perceived distinctiveness than the typical chairs without a texture (Mtypical_yes=4.79 vs. Mtypical_no=3.36), and the atypical chairs with a texture evoking a higher perceived distinctiveness than the atypical chairs without a texture (Matypical_yes=5.71 vs. Matypical_no=5.16).

THE INFLUENCE OF RECOGNISABILITY OF A CHAIR ON DURABILITY

The between-subjects analysis showed a significant main effect of recognisability on the perceived durability (F(168)=4.38; p<0.05), with the presence of an ocean plastic texture evoking a higher perceived durability than no ocean plastic texture (Myes=5.18 vs. Mno=4.78).

THE INFLUENCE OF TYPICALITY AND RECOGNISABILITY OF A CHAIR ON ATTRACTIVENESS

The between-subjects analysis showed a significant main effect of typicality on the perception of attractiveness (F(168)=6.56; p<0.05), with atypicality evoking a higher perceived attractiveness than typicality (Matypical=4.33 vs. Mtypical=4.92). Also a significant main effect of recognisability on the perceived attractiveness was found (F(168)=9.31; p<0.05), with the presence of an ocean plastic texture evoking a higher perceived attractiveness than no ocean plastic texture (Myes=4.98 vs. Mno=4.28).

THE INFLUENCE OF TYPICALITY AND RECOGNISABILITY OF A CHAIR ON OCEANIC FEELINGS

The between-subjects analysis showed a significant main effect of typicality on the evoked oceanic feelings (F(168)=5.01; p<0.05), with typicality evoking more oceanic feelings than atypicality (Mtypical=2.86 vs. Matypical=2.49). Also a significant main effect of recognisability on the evoked oceanic feelings was found (F(168)=160.33; p<0.001), with the presence of an ocean plastic texture evoking more oceanic feelings than no ocean plastic texture (Myes=3.74 vs. Mno=1.62). Lastly, a significant main effect of the typicality and the recognisability on the evoked oceanic feelings was found (F(168)=11.88; p<0.05). Hereby the typical chairs with an ocean plastic texture evoke more oceanic feelings than the typical chairs without an ocean plastic texture (Mtypical_yes=4.21 vs. Mtypical_no=1.52), and the atypical chairs with an ocean plastic texture evoke more oceanic feelings than the atypical chairs without an ocean plastic texture (Matypical_yes=3.26 vs. Matypical_no=1.72).

THE INFLUENCE OF TYPICALITY OF A CHAIR ON EXPENSIVENESS

The between-subjects analysis showed a significant main effect of typicality on perceived expensiveness (F(168)=24.03; p<0.05), with atypicality evoking a higher perceived expensiveness than typicality (Matypical=4.42 vs. Mtypical=4.00).

THE INFLUENCE OF TYPICALITY OF A CHAIR ON NEGATIVE EMOTIONS

The between-subjects analysis showed a significant main effect of typicality on evoked negative emotions (F(168)=4.59; p<0.05), with atypicality evoking more negative emotions than typicality (Matypical=2.24 vs. Mtypical=1.84).

THE INFLUENCE OF TYPICALITY OF A CHAIR ON PURCHASE INTENTION

The between-subjects analysis showed a significant main effect of typicality on purchase intention (F(168)=14.68; p<0.05), with typicality evoking a higher purchase intention than atypicality (Mtypical=4.75 vs. Matypical=3.97).

CORRELATIONS CHAIR

Below the strongest correlations for the tested variables for the chairs are presented. Other correlations can be found in appendix 21.

There is a positive significant correlation between positive emotions and anticipated conscience (r(172)=0.788, p<0.001). This indicates that the more positive emotions chairs evoke, the more people would feel good about buying these chairs.

There is a positive significant correlation between environmental benefits and anticipated conscience (r(172)=0.730, p<0.001). This indicates that the more perceived environmental benefits chairs evoke, the more people would feel good about buying these chairs.

There is a positive significant correlation between personal identity and anticipated conscience (r(172)=0.708, p<0.001). This indicates that the more chairs reflect a positive image of one self, the more people would feel good about buying these chairs.

There is a positive significant correlation between anticipated conscience and purchase intention (r(172)=0.673, p<0.001). This indicates that the more people would feel good about buying chairs, the more they would be willing to buy these chairs.

The factors influencing whether people would feel good about buying ocean plastic chairs are: the amount of evoked positive emotions, the perceived environmental benefits of the chairs, the more chairs reflect a positive image of one self and their purchase intention. In this analysis chairs reflect to the product category: furniture.

5.5.7 RESULTS COMBINED ANALYSIS

THE INFLUENCE OF PRODUCT, TYPICALITY AND RECOGNISABILITY ON DISTINCTIVENESS

The within-subject analysis showed a significant main effect of the product on the perception of distinctiveness ($F_{(168)}=50.91$; $p<0.001$), with chairs evoking a higher perceived distinctiveness than bottles (Mchair=4.76 vs. Mbottle=3.90).

The between-subjects analysis showed a significant main effect of typicality on the perception of distinctiveness ($F_{(168)}=48.57$; $p<0.001$), with atypicality evoking a higher perceived distinctiveness than typicality (Matypical=4.79 vs. Mtypical=3.71). Also a significant main effect of recognisability on the perception of distinctiveness was found ($F_{(168)}=26.90$; $p<0.001$), with the presence of patterns/textures evoking a higher perceived distinctiveness than the no patterns/textures (Myes=4.78 vs. Mno=3.87).

THE INFLUENCE OF PRODUCT AND RECOGNISABILITY ON DURABILITY

The within-subject analysis showed a significant main effect of the product on durability perceptions ($F_{(168)}=4.98$; $p<0.05$), with chairs evoking a higher perceived durability than bottles (Mchair=4.98 vs. Mbottle=4.77). Also a significant main effect of the product and the recognisability on durability perceptions was found ($F_{(168)}=6.34$; $p<0.05$). Hereby the bottles without a pattern evoke more durability perceptions than the bottles with a pattern (Mbottle_no=4.81 vs. Mbottle_yes=4.73), and the chairs without a texture evoke less durability perceptions than the chairs with a texture Mchair_no=4.78 vs. Mchair_yes=5.18). This interaction effects is shown in figure 52.
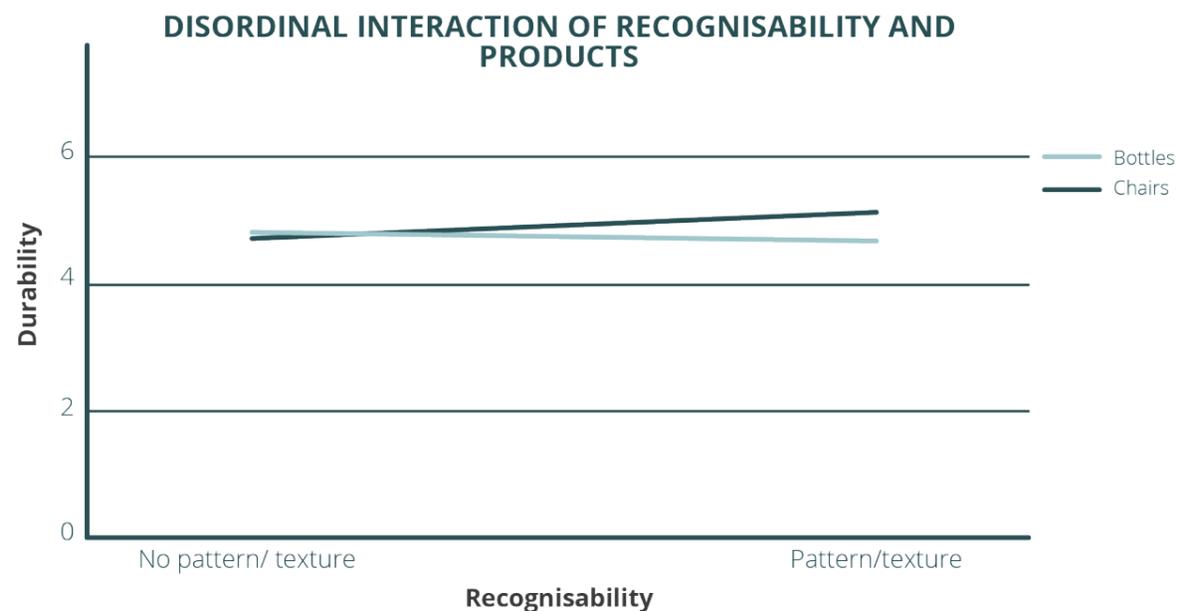

DISORDINAL INTERACTION OF RECOGNISABILITY AND PRODUCTS

Figure 52: Disordinal interaction between recognisability and product.

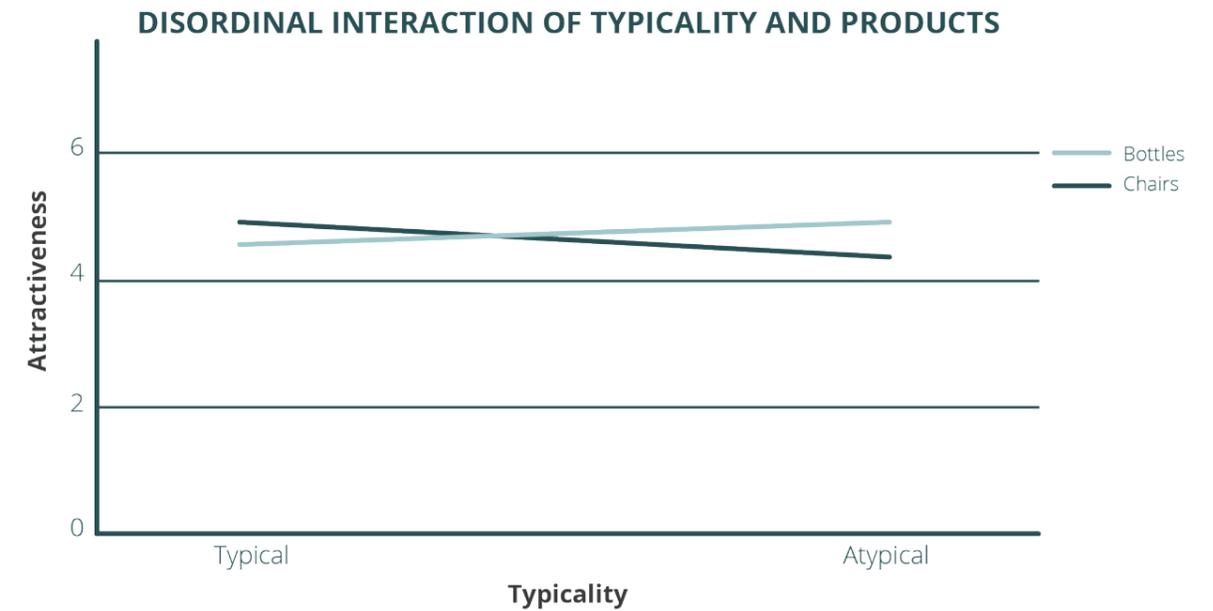**DISORDINAL INTERACTION OF TYPICALITY AND PRODUCTS**

Figure 53: Disordinal interaction between typicality and product.

THE INFLUENCE OF PRODUCT, TYPICALITY AND RECOGNISABILITY ON ATTRACTIVENESS

The within-subject analysis showed a significant main effect of the product and recognisability on the perceived attractiveness ($F_{(168)}=7.37$; $p<0.05$). Hereby the bottles with a pattern evoke more perceptions of attractiveness than the bottles without a pattern (Mbottle_yes=4.75 vs. Mbottle_no=4.70), and the chairs with a texture evoke more perceptions of attractiveness than the chairs without a texture (Mchair_yes=4.98 vs. Mchair_no=4.28).

The between-subject analysis showed a significant main effect of recognisability on the perceived attractiveness ($F_{(168)}=4.13$; $p<0.05$), with patterns/textures being perceived as more attractive than no patterns/textures (Myes=4.86 vs. Mno=4.49). Also a significant effect of the product and typicality on the perceived attractiveness was found ($F_{(168)}=16.07$; $p<0.001$). Hereby the atypical bottles were being perceived as more attractive than the typical bottles (Mbottle_atypical=4.91 vs. Mbottle_typical=4.54), and the atypical chairs were being perceived as less attractive than the typical chairs (Mchair_atypical=4.33 vs. Mchair_typical=4.92). This interaction effects is shown in figure 53.

THE INFLUENCE OF PRODUCT, TYPICALITY AND RECOGNISABILITY ON OCEANIC FEELINGS

The within-subject analysis showed a significant main effect of the product and recognisability on oceanic feelings ($F_{(168)}=20.11$; $p<0.001$). Hereby the bottles with a pattern evoke more oceanic feelings than the bottles without a pattern (Mbottle_yes=3.36 vs. Mbottle_no=2.09), and the chairs with a texture evoke more oceanic feelings than the chairs without a texture (Mchair_yes=3.74 vs. Mchair_no=1.62).

The between-subject analysis showed a significant main effect of typicality on the evoked oceanic feelings ($F_{(168)}=5.54$; $p<0.05$), with typicality evoking more oceanic feelings than atypicality (Mtypical=2.89 vs. Matypical=2.52). Also a significant effect of the recognisability on the evoked oceanic feelings was found ($F_{(168)}=119.60$ $p<0.001$),

with patterns/textures evoking more oceanic feelings than no patterns/textures (Myes=3.55 vs. Mno=1.86). Lastly, a significant effect of the typicality and recognisability on oceanic feelings was found (F(168)=7.20; p<0.05). Hereby the typical products with a pattern/texture evoke more oceanic feelings than the typical products without a pattern/texture (Mtypical_yes=3.94 vs. Mtypical_no=1.83), and the atypical products with a pattern/texture evoke more oceanic feelings than the atypical products without a pattern/texture (Matypical_yes=3.16 vs. Matypical_no=1.88).

THE INFLUENCE OF PRODUCT AND TYPICALITY ON EXPENSIVENESS

The within-subject analysis showed a significant main effect of the product and typicality on the perceived expensiveness (F(168)=4.87; p<0.05). Hereby the atypical bottles were being perceived as more expensive than the typical bottles (Mbottle_atypical=4.58 vs. Mbottle_typical=3.67), and the atypical chairs were being perceived as more expensive than the typical chairs (Mchair_atypical=4.42 vs. Mchair_typical=4.00)

The between-subject analysis showed a significant main effect of typicality on perceived expensiveness (F(168)=18.41; p<0.001), with atypicality being perceived as more expensive than typicality (Matypical=4.50 vs. Mtypical=3.83).

THE INFLUENCE OF PRODUCT AND TYPICALITY ON ANTICIPATED CONSCIENCE

The within-subject analysis showed a significant main effect of the product on anticipated conscience (F(168)=13.67; p<0.001), with bottles evoking a higher anticipated conscience than chairs (Mbottle=5.18 vs. Mchair=4.83).

THE INFLUENCE OF PRODUCT AND TYPICALITY ON PURCHASE INTENTION

The within-subject analysis showed a significant main effect of the product and typicality on purchase intention (F(168)=9.55; p<0.05). Hereby the typical bottles evoke a higher purchase intention than the atypical bottles (Mbottle_typical=4.50 vs. Mbottle_atypical=4.28), and the typical chairs evoke a higher purchase intention than the atypical chairs (Mchair_typical=4.75 vs. Mchair_atypical=3.97).

The between-subject analysis showed a significant main effect of typicality on the purchase intention (F(168)=7.81; p<0.05), with typicality evoking a higher purchase intention than atypicality (Mtypical=4.62 vs. Matypical=4.13).

INTERPRETATIONS OF THE COMBINED ANALYSIS

No within-subjects effects were found for the perceived environmental benefits, positive emotions, negative emotions and one's personal identity. Also no between-subjects effects were found for the perceived durability, environmental benefits, anticipated conscience, positive emotions, negative emotions and one's personal identity. Therefore you could say that the shape typicality and pattern/texture recognisability have no effect on the perceived environmental benefits, positive emotions and one's personal identity. This is for both the independent ANOVA's as the mixed ANOVA. That is why they could be excluded from the analysis regarding the effect of shape typicality and pattern/texture recognisability on the different products. Yet they have been taken into account during the correlation analysis.

In this combined analysis bottles reflect to the product category packaging, and chairs reflect to the product category furniture..

CORRELATIONS COMBINED

Below the strongest correlations for the tested variables for the bottles of dishwashing liquid and chairs combines are presented. Other correlations can be found in appendix 21.

There is a positive significant correlation between positive emotions and anticipated conscience (r(172)=0.794, p<0.001). This indicates that the more positive emotions ocean plastic products evoke, the more people would feel good about buying these products.

There is a positive significant correlation between environmental benefits and anticipated conscience (r(172)=0.753, p<0.001). This indicates that the more perceived environmental benefits ocean plastic products evoke, the more people would feel good about buying these products.

There is a positive significant correlation between personal identity and anticipated conscience (r(172)=0.719, p<0.001). This indicates that the more ocean plastic products reflect a positive image of one self, the more people would feel good about buying these products.

There is a positive significant correlation between purchase intention and anticipated conscience (r(172)=0.719, p<0.001). This indicates that the more people would feel good about buying ocean plastic products, the more they would be willing to buy these products.

There is a positive significant correlation between positive emotions and personal identity (r(172)=0.687, p<0.001). This indicates that the more positive emotions ocean plastic products evoke, the more these products reflect a positive image of one self.

There is a positive significant correlation between positive emotions and purchase intention (r(172)=0.677, p<0.001). This indicates that the more positive emotions ocean plastic products evoke, the more people would be willing to buy these products.

There is a positive significant correlation between perceived environmental benefits and positive emotions (r(172)=0.652, p<0.001). This indicates that the more people find ocean plastic products having environmental benefits, the more positive emotions these products evoke.

There is a positive significant correlation between personal identity and purchase intention (r(172)=0.624, p<0.001). This indicates that the more ocean plastic products reflect a positive image of one self, the more people would be willing to buy these products.

There is a positive significant correlation between perceived environmental benefits and purchase intention (r(172)=0.652, p<0.001). This indicates that the more people find ocean plastic products having environmental benefits, the more people would be willing to buy these products.

There is a positive significant correlation between attractiveness and purchase intention (r(172)=0.572, p<0.001). This indicates that the more people find ocean plastic products attractive, the more people would be willing to buy these products.

INTERPRETATIONS OF THE CORRELATIONS

The factors influencing whether people would feel good about buying ocean plastic products are: the amount of evoked positive emotions, the perceived environmental benefits of the products, the more products reflect a positive image of one self and their purchase intention. Furthermore the factors influencing whether people would be willing to buy

ocean plastic products are: the amount of evoked positive emotions, the perceived environmental benefits of the products, the more products reflect a positive image of one self and the perceived attractiveness of the products. Lastly, the factors influencing whether people evoke more positive emotions for ocean plastic products are: the perceived environmental benefits of the products and the more products reflect a positive image of one self.

VISUALISATION COMBINED ANALYSIS

In figure 54 all interactions are visualised for the combined analysis. It shows the ordinal interactions in solid lines and the disordinal interactions with striped lines.

5.6 ANSWERING THE RESEARCH QUESTIONS OF THE QUANTITATIVE STUDY

5.6.1 RESEARCH QUESTION 1

"How does shape typicality influences the perception of ocean plastic products?"

The results of the mixed analysis showed that the shape typicality of the products have different effects. Typicality has an effect on the perceived distinctiveness, the amount of oceanic feelings evoked, the perceived expensiveness, and purchase intention. Typical products positively influence the evoked oceanic feelings and the purchase intention for the products. Atypical products on the other hand positively influence the perceived distinctiveness and expensiveness of the products. These results are shown in figure 55 on page 98.
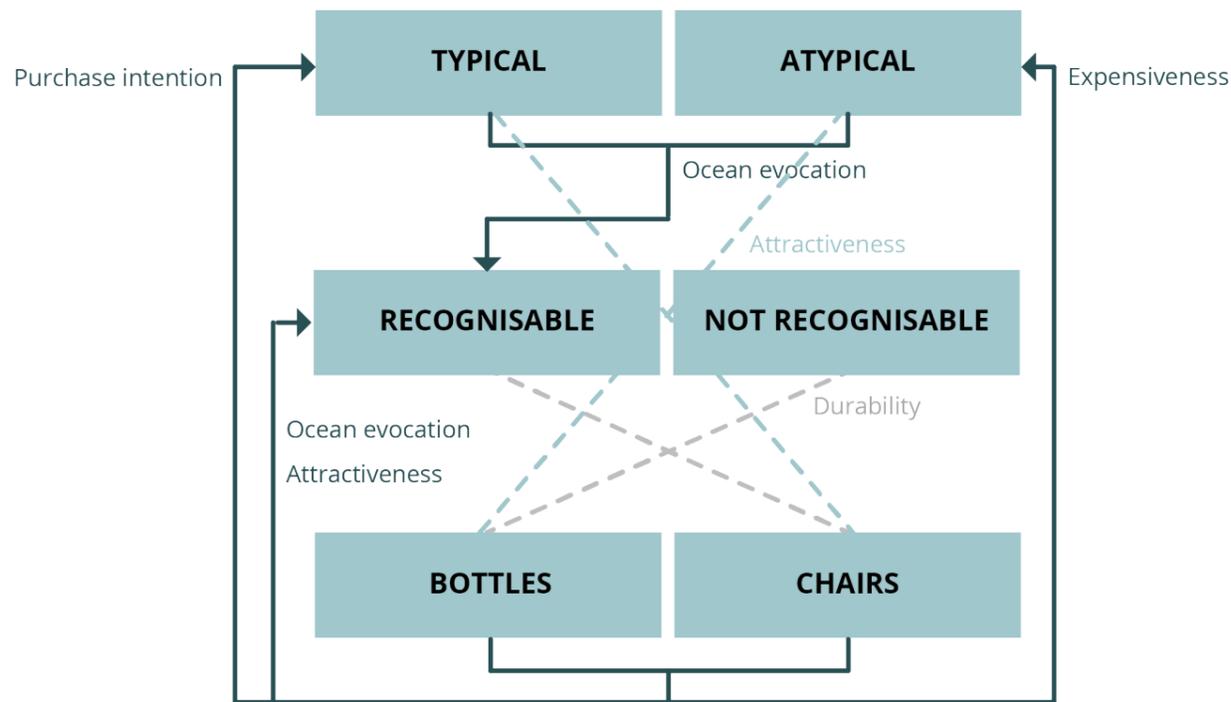
The analysis on the shape typicality of the chairs found some additional effects on attractiveness and negative emotions. Typical chairs are being perceived as more attractive, and atypical chairs evoke more negative emotions.

5.6.2 RESEARCH QUESTION 2

"How does the recognisability of an oceanic pattern/texture influence the perception of ocean plastic products?"

The results of the mixed analysis showed that the pattern/texture recognisability of the ocean plastic products has an effect on the perceived distinctiveness, perceived attractiveness, and the amount of oceanic feelings evoked. The presence of a pattern/texture on ocean plastic products positively influences the perceived distinctiveness, the perceived attractiveness and the amount of oceanic feelings evoked.

The analysis on the texture recognisability of the chairs found some additional effects on the perceived durability. The presence of a texture on a chair is being perceived as more durable. These results are shown in figure 56 on page 98.

5.6.3 RESEARCH QUESTION 3

"What is the effect of different products on ocean plastic product perception?"

The results of the mixed analysis showed that the type of ocean plastic product has an effect on the perceived distinctiveness, durability and anticipated conscience. Chairs are generally being perceived more distinctive and durable, whereas bottles of dishwashing liquid positively influence the

anticipated conscience. These results are shown in figure 57 on page 98.

5.6.4 INTERACTIONS

TYPICALITY & RECOGNISABILITY

The results of the mixed analysis showed that the shape typicality and pattern/texture recognisability influence the perceived oceanic feelings. The typical and atypical products with an ocean plastic pattern/texture evoke more oceanic feelings than the typical and atypical products without an ocean plastic pattern/texture.

The analysis on the shape typicality and the texture recognisability of the chairs found some additional effect on the perceived distinctiveness. The typical chairs with an ocean plastic texture evoke more distinctive feelings than the typical chairs without an ocean plastic texture, and the atypical chairs with an ocean plastic texture evoke more distinctive feelings than the atypical chairs without an ocean plastic texture.

TYPICALITY & PRODUCT

The results of the mixed analysis showed that the shape typicality and the type of product influence the perceived attractiveness, the perceived expensiveness and one's purchase intention. The atypical bottles and chairs are being perceived as more expensive than the typical bottles and chairs. Also, the typical bottles and chairs evoke a higher purchase intention than the atypical bottles and chairs. Lastly, a disordinal interaction was found where the atypical bottles are being perceived as more attractive than the typical bottles, yet the atypical chairs are being perceived as less attractive than the typical chairs.
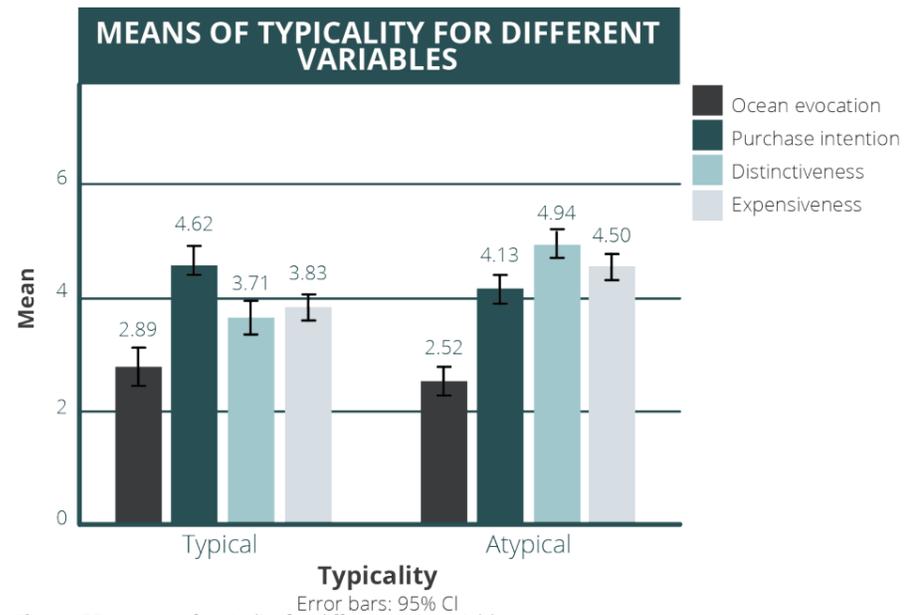

Figure 54: All interactions.

MEANS OF TYPICALITY FOR DIFFERENT VARIABLES

Legend:
- Ocean evocation
- Purchase intention
- Distinctiveness
- Expensiveness

Error bars: 95% CI
Figure 55: Means of typicality for different test variables.

MEANS OF RECOGNISABILITY FOR DIFFERENT VARIABLES

Legend:
- Distinctiveness
- Attractiveness
- Ocean evocation
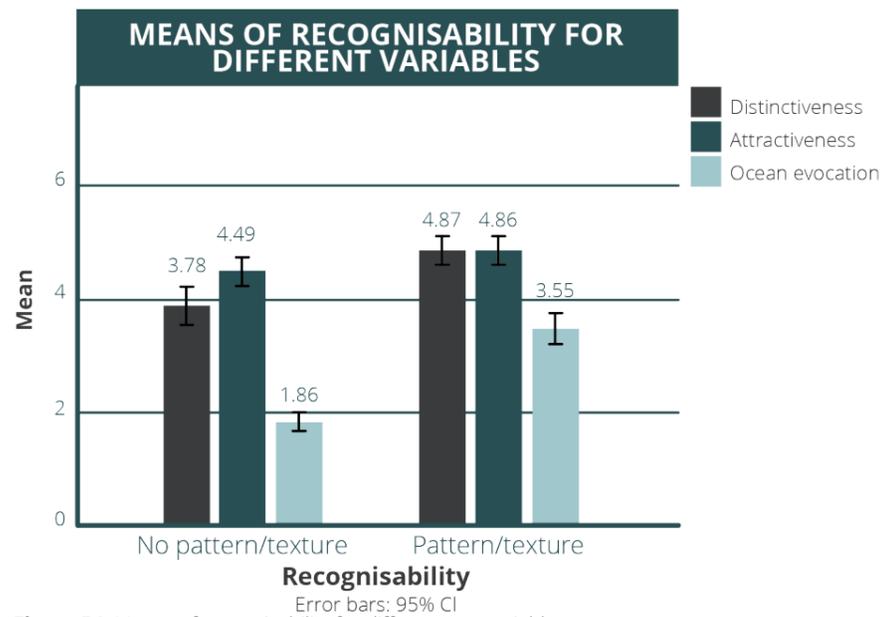
Error bars: 95% CI
Figure 56: Means of recognisability for different test variables.

MEANS OF PRODUCTS FOR DIFFERENT VARIABLES

Legend:
- Distinctiveness
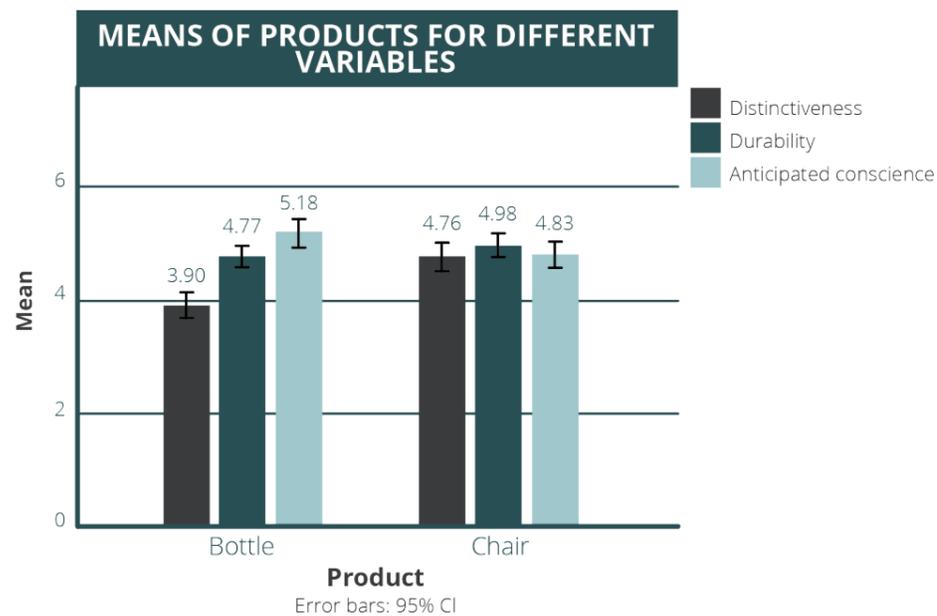- Durability
- Anticipated conscience

Error bars: 95% CI
Figure 57: Means of type of product for different test variables.

RECOGNISABILITY & PRODUCT

Furthermore, the results of the mixed analysis showed that the pattern/texture recognisability and the type of product influence the perceived durability, the perceived attractiveness and the mount of oceanic feelings evoked. The bottles and chairs with an ocean plastic pattern/texture are being perceived as more attractive and evoke more oceanic feelings than the bottles and chairs without an ocean plastic pattern/texture. Lastly, a disordinal interaction was found where the bottles without an ocean plastic pattern/texture evoked a higher perception of durability than the bottles with an ocean plastic pattern/texture, yet the chairs without an ocean plastic pattern/texture evoked a lower perception of durability than the chairs with an ocean plastic pattern/texture.

5.6.5 COMPARING THE FINDING WITH LITERATURE

The data regarding the perceived expensiveness of products seems to be in line with Orth et al. (2010), stating that sophisticated designs can be associated with a higher perceived price. Atypical products in this study show a higher perceived expensiveness than typical products. In addition, no significant correlation between perceived expensiveness and purchase intention was found, which might be suspected according to Monnot et al. (2010).

An interesting finding of the correlation analysis is that the factors that do influence purchase intention for ocean plastic products are: positive emotions, perceived environmental benefits, anticipated conscience and the attractiveness. This would mean that in order to make people want to buy ocean plastic products it is important to trigger positive emotions, show the perceived environmental benefits, fit with one's positive self-image and create attractiveness. Yet no effects were found during the mixed repeated measures analysis for the perceived environmental benefits and the evoked positive emotions. Therefore you could say that the shape typicality and pattern/texture recognisability have no effect on the perceived environmental benefits and evoked positive emotions of ocean plastic products. However they do positively influence purchase intention. This could be explained by the fact that the respondent were informed about that the products they were given were made from recycled ocean plastic, regardless of the condition (e.g. typical with a pattern, atypical with a pattern, typical without a pattern, etc.). Therefore the information that the products were made from ocean plastic evoked enough perceived environmental benefits and positive emotions in order to not have an effect on the dependent variables. According to Mugge et al. (2017) making the environmental benefits more recognisable could increase consumer adoption. Yet this not seems to be so in this analysis. Regarding the positive emotions, there are multiple studies which confirm that affective (and cognitive) variables are significant predictors of engaging in pro-environmental behaviour (Carrus et al., 2008; Damasio, 1998; Fraj & Martinez, 2006; Meneses, 2010). This could explain the correlation between positive emotions and purchase intention.

Also no effect was found for the respondent's personal identity. Therefore you could say that here the shape typicality and pattern/texture recognisability have no effect on to which extend individuals feel that using ocean plastic products reflects a positive image of themselves (Griskevicius et al., 2010). This could also be due to the given information about that the products were made

out of ocean plastic. Further research regarding the influence of perceived environmental benefits, evoked positive emotions and one's personal identity in relation to product appearance is needed.

Still anticipated conscience and attractiveness of ocean plastic products are important indicators for purchase intention. Anticipated conscience in this study seems to be product (category) dependent. Buying bottles of dishwashing liquid make people feel better than buying chairs. One's anticipated conscience is correlated with the amount of positive emotions evoked, the perceived environmental benefits of the product, the more the product reflects a positive image of one self, and their purchase intention. In order to say something about the product dependency of anticipated conscience, further research on these influencing factors is needed.

Attractiveness in this study expresses the relation between the shape typicality and the presence of patterns/textures on the total appearance perceptions (Stone-Romero et al.,1997). In general it is to say that products with a pattern/texture are being perceived as more attractive. The shape typicality regarding the perceived attractiveness is somewhat different since the atypical bottles are perceived as more attractive whereas the typical chairs are being perceived as more attractive. Between the different product categories chairs are being perceived as more distinctive. This could be due to that there is a bigger diversity in chairs than with bottles of dishwashing liquid. This diversity could perhaps influence the perceived attractiveness for the typical chairs. Another factor could be that people want chairs to be durable and

reliable, and the attractiveness of such products is of secondary importance (Stone-Romero et al., 1997). In general it is crucial to find a balance between novelty of a product appearance and recognisability in order to achieve consumer enhancement (Mugge & Schoormans, 2012). This would, by sticking to the tested variables in this study, indicate that it is needed to find a balance between attractiveness and distinctiveness.

QUANTITATIVE RESEARCH

QUANTITATIVE STUDY

Quantifiable data regarding two different design elements of two types of products representing two product categories (packaging and furniture products) is gathered and statistical analysed for systematic investigation of desired purchase behaviour of existing and/or potential customers using an online questionnaire. These design elements are the shape typicality and pattern/texture recognisability of products. The two types of products are a bottle of dishwashing liquid and a chair. In the study they are used as stimuli resulting in different conditions per product. The bottles/chairs were either typically shaped or atypically shaped, and either had an oceanic pattern or did not have an oceanic pattern. These conditions are determined in a pre-test examining different typical and atypical shapes and different patterns and textures.

ANALYSIS

Visual appearance (and thus the two determined design elements of ocean plastic products) can evoke both cognitive and affective responses which together result in certain behavioural responses. The different stimuli regarding the shape typicality and pattern/texture recognisability are therefore being tested on the different cognitive (perceived environmental benefits, perceived expensiveness, oceanic feelings), affective (positive emotions, negative emotions, anticipated conscience) and behavioural (purchase intention) responses. Furthermore the stimuli are tested on some perceptual responses (durability, attractiveness, distinctiveness), responses regarding one's

positive self-image (personal identity) and some individual variables (environmental concern, sensitivity to design).

INTERPRETATIONS ANALYSIS

For the patterns the more directly linked to the ocean pattern was preferred, whereas for the textures the more indirect link to the ocean was preferred. To abstract patterns/textures did not work for either of the two.

For the mixed analysis (bottles and chairs together), some within-subjects effects were found for the perceived distinctiveness, durability, attractiveness, oceanic feelings, perceived expensiveness, anticipated conscience, and purchase intention. The between-subjects effects were found for the perceived distinctiveness, attractiveness, oceanic feelings, perceived expensiveness and purchase intention. No within-subjects effects were found for the perceived environmental benefits, positive emotions, negative emotions and one's personal identity. Also no between-subjects effects were found for the perceived durability, environmental benefits, anticipated conscience, positive emotions, negative emotions and one's personal identity. The mixed correlation analysis showed some strong correlations for the evoked positive emotions and one's anticipated conscience, the perceived environmental benefits and anticipated conscience, one's personal identity and anticipated conscience, and purchase intention and anticipated conscience.

6.

DISCUSSION

This final chapter shares recommendations regarding designing ocean plastic products. Hereby the research questions of the thesis will be answered. Furthermore it discusses several practical contributions which could apply for such products and limitations of the project. The chapter closes by giving a conclusion of the thesis.

IN THIS CHAPTER:

6.1 Recommendations

6.2 Practical contributions

6.3 Limitations & further research

6. DISCUSSION

6.1 RECOMMENDATIONS

In order to answer the research question of the thesis, first the two sub-research questions will be answered. Based on that, recommendations/guidelines are given regarding the marketing and designs of ocean plastic products.

6.1.1 SUB-RESEARCH QUESTION 1

The first sub-research question of this thesis was the following:

(1)

"Which type of product is suitable for ocean plastics?"

In chapter 4 the product categories of Bahrudin et al. (2016) have been assessed. This assessment was done by preceding a qualitative study, in which important factors for consumer product preferences were determined. The list of aspects which people found most valuable for ocean plastic products is showed below.

- ☑ Accessible on the large scale
- ☑ Big quantities
- ☑ Easy accessible (approachable)
- ☑ Long lasting
- ☑ No direct contact

With this checklist the following is checked:

Accessible on the large scale:

Can you buy it anywhere?

Big quantities:

Is it being produced in large volumes?

Easy accessible (approachable):

Can you easily come in contact with it as a consumer?

Long lasting:

Does it wear out/breaks down quickly?

No direct contact:

Does it make oral contact? If yes > than it is a no go

This list of requirements can be interpreted as follows: people want trustworthy product categories for ocean plastics. The fact that people want ocean plastic products to be accessible, approachable, long lasting and in large volumes, shows that people are more willing to rely on big suppliers. As concluded from the qualitative study people trust supervising organisations in making qualitative products. Big suppliers, when producing ocean plastic products, then transfer trustworthiness to consumers. The avoidance of direct personal contact products, adds up to this trust perception.

Furthermore, during the qualitative study it was found that people have most positive feelings about using recycled ocean plastics for three different types of product categories. These were building materials, packaging and furniture. However for the building materials it is difficult to find consumers' perceptions about these products since (most)
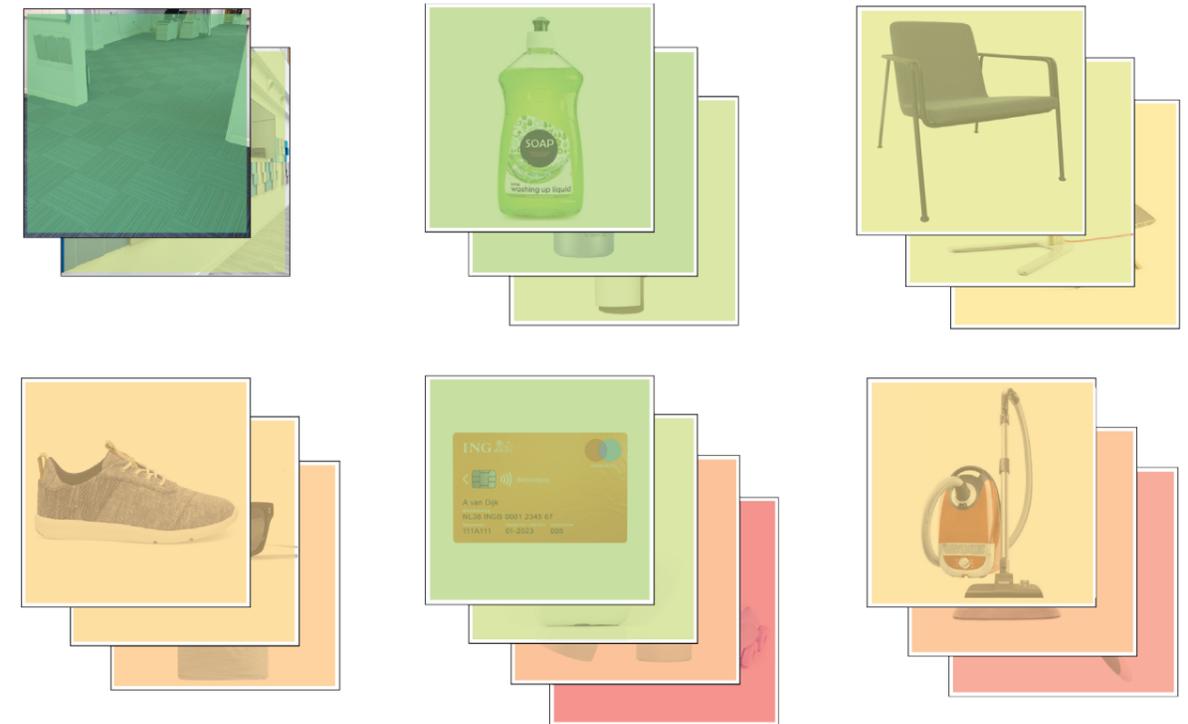

Figure 58: Preferences products and product categories.

people do not buy such "products" for individual use. Therefore the product categories; packaging and furniture would be a better fit in examining consumers' perceptions of recycled ocean plastic products. Yet, this preference for building materials shows that big trustworthy suppliers are indeed of importance in the ocean plastic market.

When looking at the individual scores of the products representing a specific product category, some show bigger differences of preference than others (figure 58). These differences can be seen by the different overlaying colours of the boxes within a product category. This could indicate that even in a same product category crucial differences may occur. In order to prevent this, it is important that the selected product category should in its intirety be homogeneous and constistent interms of products. Else, the total succes rate of the product category is reduced. Also, when choosing a product category, it is crucial to focus on the elements which

are perceived as most valuable by consumers regarding ocean plastic products (the elements in the list mentioned previously), and test if the product categoty meets these elements. Strictly following these requirements in choosing a product category to design for, will most probability result in a higher chance of product enhancement by consumers.

As analysed in this study, packaging and furniture are a good fit in examining consumers' perceptions of recycled ocean plastic products since they life up to most of these requirements. Also it is now possible to make more generalised assumptions on how ocean plastic products should be designed in order to be adopted by consumers which apply for multiple products/product categories. This is very valuable for promoting large scale implementations of ocean plastic products.

6.1.2 SUB-RESEARCH QUESTION 2

The second sub-research question of this thesis was the following:

(2)

"To what extend should ocean plastic be reflected in the visual appearance of a product?"

Important determinants of whether ocean plastic is positively being reflected in the visual appearance of products are: the pattern/texture recognisability, the amount of oceanic feelings evoked and the perceived attractiveness. The pattern/texture recognisability gives a direct link to whether the presence of ocean plastic is being reflected in the design of a product. The amount of oceanic feelings evoked tells something about if this pattern/texture recognisability is being observed and interpreted by consumers. The perceived attractiveness expresses how much a product is being "liked" by consumers. It tells something about the preferences regarding the appearance of the presented products. Therefore it is needed to link this attractiveness to the pattern/texture recognisability and the amount of ocean feelings evoked in order to say how much "ocean plastic" should be reflected in the visual appearance of a product.

There are some important factors which are positively influenced by the recognisability of ocean plastics. The presence of an ocean plastic pattern/texture positively influences the perceived attractiveness and the amount of oceanic feelings evoked. This suggests that patterns/textures evoke more oceanic feelings and are found more attractive. The shape typicality and pattern/texture recognisability influence the perceived oceanic feelings. Both typical and atypical products with oceanic patterns/textures evoke more oceanic

feelings than products without oceanic patterns/textures. Lastly, the pattern/texture recognisability and the type of product influence both the perceived attractiveness and the mount of oceanic feelings evoked. Products with an ocean plastic pattern/texture are being perceived as more attractive and evoke more oceanic feelings than products without an ocean plastic pattern/texture.

These findings suggest that regardless of the shape and type of product, products with an ocean plastic pattern/texture are being perceived as more attractive and evoke more oceanic feelings than products without an ocean plastic pattern/texture. Also in general (nonrelated to the products) oceanic patterns/textures evoke more oceanic feelings and are more attractive. Therefore you could say that the presence of an oceanic pattern/texture positively influences how a product is being perceived (in terms of attractiveness and the amount of oceanic feelings evoked), and reflecting ocean plastics in the visual appearance of a product is a valuable strategy in promoting ocean plastic products.

6.1.3 THE RESEARCH QUESTION

Main research question of this thesis was the following:

"How to design ocean plastic products in order to create consumer enhancement?"

OCEAN PLASTIC PERCEPTIONS

In general people have a strong positive attitude towards recycled ocean plastics. They seek to create a more common understanding of why and how people should behave pro-environmental. Therefore a critical new mind-set is needed. Currently people

still feel somewhat confused in how to behave pro-environmental since they lack of knowledge about pro-environmental actions. This also causes reserved feelings towards ocean plastic products which make to direct contact with people. Therefore they want to be made aware of the fact that it is made from this material during purchase, and products which do not make oral contact are desired. Despite this, they do trust the recycling process and its supervisors and are positive about its future potentials. People want pro-environmental options to be accessible for easy purchase, yet currently they are not quite able to distinguish recycled (ocean plastic) products from other products and feel this should be openly communicated to them. Therefore recognisability of ocean plastic products is crucial. A determining factor for actual ocean plastic purchase would be the price. People express a high willingness to buy pro-environmental or recycled ocean plastic products, however a reasonable price is of high importance. These findings resulted in researching how design elements of ocean plastic products can transmit this ocean plastic perception and make consumers to enhance these products.

OCEAN PLASTIC DESIGNS

Products with an ocean plastic pattern/texture evoke more oceanic feelings. In general the pattern/texture recognisability of the ocean plastic products positively influences the perceived distinctiveness, the perceived attractiveness and the amount of oceanic feelings evoked. Also typicality has an effect on the amount of oceanic feelings evoked and purchase intention. Typicality (in the sense of typical vs. atypical here) evokes more oceanic feelings and positively influence purchase intention.

The effect of the individual ocean plastic products shows that chairs are generally being perceived

more distinctive and durable, whereas bottles of dishwashing liquid positively influence the anticipated conscience. Hereby it is interesting that people find chairs more durable, probably since they last longer than bottles. Yet people will more directly feel positive about buying bottles made from ocean plastic compared to buying chairs made from ocean plastic. This could imply that people are currently feeling more positive about buying less durable products to be made from ocean plastic. This anticipated conscience is correlated with one's purchase intention, which could then mean that people are most likely to buy these less durable products (Magnier et al., 2019).

Shape typicality and the type of product influence the perceived attractiveness, the perceived expensiveness and one's purchase intention. Hereby, a disordinal interaction was found regarding the attractiveness of the typicality and type of products. For the bottles of dishwashing liquid, atypicality is being perceived as more attractive, whereas for the chairs, typicality is being perceived as more attractive. In addition, attractiveness is correlated with one's purchase intention. Yet the typical products evoke a higher purchase intention than the atypical products. Also the atypical products are being perceived as more expensive than the typical products. Findings from the quantitative study showed that people are very price sensitive when it comes to actual purchase of ocean plastics. Therefore letting ocean plastic products be perceived as more expensive could have a negative effect on purchase intention. Also according to Monnot et al. (2010) economic features are important indicators for purchase behaviour, indicating that perceived expensiveness has an effect on purchase intention. This would mean that despite that atypical bottles of dishwashing liquid are perceived as more attractive; people will most

probably buy the dishwashing bottle with the typical shape which is being perceived as less expensive. Thus, in general people are more willing to purchase typical ocean plastic products which are perceived as less expensive.

The pattern/texture recognisability and the type of product influence the perceived durability, the perceived attractiveness and the mount of oceanic feelings evoked. As mentioned before products with an ocean plastic pattern/texture are being perceived as more attractive and evoke more oceanic feelings than products without an ocean plastic pattern/texture. This product attractiveness is correlated with one's purchase intention, meaning that ocean plastic products with a pattern/texture are more likely to be bought. Also a disordinal interaction was found regarding the perceived durability of the pattern/texture recognisability and type of products. For the bottles of dishwashing liquid, the absence of a pattern is being perceived as more durable, whereas for the chairs, the presence of a texture is being perceived as more durable. This could indicate that for more durable products (furniture) the effect of having a pattern/texture influences the perceived total lifespan of a product, whereas for less durable products this would have lesser impact creating an interesting strategy for durable products.

THE FUTURE DESIGNS OF OCEAN PLASTIC PRODUCTS

In general it is allowed to say that it is succeeded to triggering more ocean plastic perceptions through appearance elements and the manipulations work. In fact it is possible to communicate the presence of ocean plastic trough design elements. Products with an ocean plastic pattern/texture evoke more

oceanic feelings and are found attractive. Since attractiveness is correlated with purchase intention, ocean plastic products with patterns/textures are likely to be bough. Also, typical products evoke a higher purchase intention than the atypical products. Furthermore people currently feel more positive about buying less durable products from ocean plastic. For more durable products adding patterns/textures could have a positive effect on the perceived lifespan of a product. Since for durable products attractiveness is of less importance, this increased durability perception could have a positive effect on the willingness to buy (Stone-Romero et al., 1997).

Thus, in order to design ocean plastic products which create consumer enhancement two options are most valuable. People currently have a higher desirability for typical, less durable products with oceanic patterns/textures which increases one's purchase intention for these products. Yet promoting typical, durable products with an oceanic pattern is also of interest. Hereby the recognisability of oceanic patterns/textures has an additional effect which probably increases the purchase intention.

6.2 PRACTICAL CONTRIBUTIONS

This research contributes in finding an appropriate purpose for the (ocean) plastic waste abundance. Currently a lot of plastic waste is being collected, yet a small portion is still reused for new purposes. These results show possibilities possible directions for companies and designers who are willing to enter the recycled ocean plastic market and can help them in making decisions about which products are most suitable to be made from recycled ocean plastic and how to communicate this to consumers.

When defining the products of which to make from recycled ocean plastic it is valuable to take into account the elements which people found most important for ocean plastic products. These are easy accessibility/approachability, large scale volumes, big quantities, long lasting and which do not make to direct personal contact. By following these guidelines the success of the ocean plastic product will most likely increase. Therefore it is useful for companies to reflect on whether the products they produce match up to these wishes before launching the ocean plastic product(s).

People have very positive feelings regarding ocean plastic and are open for the implementations of such. Yet an important element mentioned by them is the price of such products. People are willing to make adjustments on their expenses, however it should be reasonable. Increasing the perceived expensiveness of ocean plastic products would than maybe have a negative effect on purchase intention. Therefore it would be better for companies to promote ocean plastic products which have typical shapes since these evoke a higher purchase intention than typical products and are being perceived as less expensive. Yet when companies want to promote more high-

end ocean plastic products, they could take into account that making them atypical could have a positive effect on the attractiveness and perceived expensiveness.

A general result was that ocean plastic patterns/textures on products positively influence the attractiveness and the evoked oceanic feelings. Therefore, when promoting ocean plastic products it is useful for companies and designers to evoke a high ocean plastic perception by adding patterns/textures on the products. This also increases the attractiveness causing that people would prefer such ocean plastic products.

The anticipated conscience is higher for packaging compared to furniture. This indicates that people feel more positive about buying packaging made from recycled ocean plastic. Anticipated conscience is related to one's purchase intention which tells us that the purchase intention for packaging is currently higher than for furniture. Therefore it would be beneficial for packaging companies to respond to those consumer perceptions by highlighting this anticipated conscience.

For furniture it was found that adding a texture contributes to the perception of durability (compared to packaging). This means that the presence of a texture on furniture positively influences the lifespan perception of a product. Since furniture is generally being perceived as a durable product, influencing this lifespan perception could have positive impact on the purchase intentions of these products. Also found was that adding patterns/textures on products influences the perceived attractiveness. For furniture companies adding a texture on the products would therefore have and additional

positive effect and could thus be an interesting strategy to promote ocean plastic furniture.

In general promoting ocean plastic products can contribute to creating a more common understanding of pro-environmental initiatives/ alternatives. This is something that people long for. Emphasising this by product appearance can ease such acceptations in society since it becomes more easy to understand/transferable. The pattern/ texture recognisability has a positive effect on the amount of evoked oceanic feelings. Therefore using such design elements could in fact be used to easily create a more common understanding regarding pro-environmental products.

6.3 LIMITATIONS & FURTHER RESEARCH

6.3.1 PRODUCT CATEGORY

During the qualitative study some product categories were examined. However the chosen products for the categories were not always ideal. The product category "others" contained to diverse products which led to too much variation within the category. The products selected for this category were chosen since they were already produced from on-land recycled plastic. Therefore it was interesting to see how people would respond to this when using recycled ocean plastic. However now they were actually subdivided into objects which make direct contact and essential non-direct contact objects. This caused the diverse variation. In general it is also not convenient to have a product category called "others". This would in fact already imply that the products in this category do not have a fixed product category they belong to, which could therefore already predict that the variance within the group would be big.

In order to properly define products which could represent a certain product category, a separate study could be held in determining such. This could give a more generalised perception of the product categories. Examples on how to precede this could be to hold a context mapping session about which product categories there are or about which products are representing different product categories.

For the building materials product category also something remarkable occurred. In essence the building materials which were intended by Bahrudin et al. (2016) were for internal and external construction work usage. However in the interviews the focus was more on office interiors. Despite this

difference in interpretation, all the types of materials do not really acquire consumer interaction, since they are not really consumer products. To test the building material category more properly for consumer interaction products like doors, sinks, bathtubs etc. would be more applicable. There is a lot of potential inside this product category since a lot of plastic is used for it but there are still just few pro-environmental alternatives available (Bahrudin et al., 2016). A study on how ocean plastic appearanc affects building materials could be of high interest.

6.3.2 PATTERN/TEXTURE TYPICALITY

Oceanic patterns were difficult to determine as there are no predefined variables for this today. The patterns now were self-obtained via graphically communicative products/services such as textiles and logo's. In order to properly test the effect of the pattern on products, more extensive research about graphical communication is needed. This either reflects to the patterns themselves as how the pattern is implemented in/on the product. For this graphic designers could be indulged in the process.

6.3.3 CONSISTENCY OF PATTERN/ TEXTURE

When selecting the products representing a product category, a decision has been made in order to add a pattern or a texture on the product. This has been chosen based on the more obvious and suitable option. Thus for the bottle being this a pattern, and for the chair being this a texture. However also interesting would be to define one pattern/texture which is applicable on all products categories. Hereby more direct relations regarding the pattern/ texture recognisability influencing typicality and the type of products could be examined. Also colour has not been consistently taken into account while this also can have an effect on ocean plastic product

perceptions. Especially since during the qualitative study there were very diverse options about ocean plastic recognisability regarding colours (e.g. transparent, blue, normal, etc.).

6.3.4 DISTINCTIVENESS

In this study distinctiveness seems to be of importance when analysing the relationships between shape typicality, pattern/texture recognisability and the type of products. Yet no concrete conclusions about this variable are given for the future implementations of ocean plastic products. Distinctiveness here affects the shape typicality, the pattern/texture typicality and the type of product. This means that this is an important variable to asses regarding ocean plastic products. Yet having it an effect on all independent variables, the level of what is meant with "distinctiveness" becomes questionnable Especially with all such "typical" and "atypical" variables. In order to usefully elaborate on distinctiveness for ocean plastic products it would be better to redefine this scale for further research.

6.3.5 MIXED ANALYSIS VS. INDIVIDUAL ANALYSIS

When composing the recommendations, the results of the mixed analysis are mostly used in order to make a prospect about possible ocean plastic product enhancement. Based on this data relations are being defined. This was done in order to be able to give more generalised guidelines about the ocean plastic market. Despite this, a distinction has been made between durable and less durable products. However when drawing these conclusions, the data of the individual products have not directly been taken into account. This possibly could have resulted in more complete recommendations. For further research it is therefore useful to also take this into account.

CONCLUSION

In general people have a strong positive attitude towards recycling. Therefore also people's general perception of ocean plastic products is positive, and they feel there is no considerable difference between ocean plastic and land plastic. Both are perceived as pro-environmental. Yet cleaning up the oceans is a must and giving this retrieved material new purpose is a useful solution for this plastic oceanic waste abundance. Such actions should create a more common understanding of why and how people should behave more pro-environmental, and ocean plastic products would fit in this new worldview.

Currently people still feel somewhat confused in how to behave more pro-environmental. They feel a certain inconvenience due to a lack of ease and lack of knowledge. This is mainly caused by hearing different things from different people and not knowing what to believe. Therefore a critical mind-set is currently still retained. This also causes reserved feelings towards ocean plastic products which make direct (mostly oral) personal contact. Therefore they want to be made aware of the fact that a product is made from ocean plastic during purchase. Yet people feel that quality products can be made from ocean plastic, that it will be safe (since they trust supervising organisations testing and controlling these products), and are positive about its future potentials. This discrepancy is called the knowledge discrepancy, in which people currently lack knowledge about aspects regarding recycling (ocean plastics), nevertheless they feel it will not be harmful.

People want pro-environmental options to be accessible for easy purchase. However at the moment they are not quite able to distinguish recycled products from other (non-recycled) products and feel this should be openly communicated to them so they can make a conscious purchase decision (whether or not to buy the products). Regarding ocean plastic products, people mainly want products that are easy accessible, that are being produced (used) in big quantities, are approachable, long lasting and avoid direct personal contact. In terms of appearance they feel anything is possible with ocean plastics alike virgin plastics, if used for "the right" products. A determining factor for actual ocean plastic purchase would be the price. People express a high willingness to buy ocean plastic products, yet they are really focussed on the price.

The most suitable product categories to fulfil all these wishes are packaging and furniture. These product categories are also very good product categories to properly examine consumers' perceptions of recycled ocean plastic products. By examining two types of product categories it is possible to make more generalised assumptions on how ocean plastic products should be designed in order to be adopted by consumers which apply for multiple products/product categories. This is very valuable for promoting large scale implementations of ocean plastic products. The products representing these product categories (packaging and furniture) in this study are a bottle of dishwashing liquid and a chair.

The products have been examined based on their shape typicality and pattern/texture recognisability. These visual elements can evoke different types of responses regarding ocean plastic products. The findings from the analysis suggest that typical products evoke a higher purchase intention compared to the atypical products. In addition, regardless of the shape and type of product, products with an ocean plastic pattern/texture are being perceived as more attractive and evoke more oceanic feelings than products without an ocean plastic pattern/texture. Therefore you could say that the presence of an oceanic pattern/texture positively influences how a product is being perceived in terms of attractiveness and how much a product conveys that it is being made from recycled ocean plastic. Since attractiveness is correlated with purchase intention, ocean plastic products with patterns/textures are likely to be bought. Hence, using ocean plastics in the visual appearance of a product, is a valuable strategy for promoting ocean plastic products.

In general you could say that triggering more ocean plastic perceptions through appearance elements is successful. In fact it is possible to communicate the presence of ocean plastic in products trough design elements. Products with an ocean plastic pattern/texture evoke more oceanic feelings and are found attractive. In order to design ocean plastic products which create consumer enhancement two possible strategies are possible. This could either be durables or less durable products. People currently have a higher desirability for typical, less durable products with oceanic patterns/textures which stimulates a more instant consumer adoption. Yet promoting typical durable products with an oceanic pattern is also an option since the recognisability of oceanic patterns/textures has an additional effect on the product its perceived durability.

LITERATURE

ATLAS.ti (2014). *Users guide and reference.* Retrieved from: https://atlasti.com/wp-content/uploads/2014/05/atlas-ti-7-co-occurrence-tools1.pdf

Bahrudin, F.I., Aurisicchio, M., & Baxter, W.L. (2016). *Sustainable materials in design projects.* Retrieved from: https://spiral.imperial.ac.uk/handle/10044/1/45862

Baxter, W.L., Aurisicchio, M., & Childs, P. (2017). Contaminated interaction: another barrier to circular material flows. *Journal of Industrial Ecology, 21*(3), 507-516.

Blijlevens, J., Carbon, C. C., Mugge, R., & Schoormans, J. P. (2012). Aesthetic appraisal of product designs: Independent effects of typicality and arousal. *British Journal of Psychology, 103*(1), 44-57.

Bloch, P. H. (1995). Seeking the ideal form: Product design and consumer response. *Journal of marketing, 59*(3), 16-29.

Bradu, C., Orquin, J. L., & Thøgersen, J. (2014). The mediated influence of a traceability label on consumer's willingness to buy the labelled product. *Journal of Business Ethics, 124*(2), 283-295.

Braun, V., & Clarke, V. (2013). Some very important starting information. *Successful qualitative research: A practical guide for beginners* (pp. 3-18). London: SAGE.

Braun, V., & Clarke, V. (2013). Ten fundamentals of qualitative research. *Successful qualitative research: A practical guide for beginners* (pp. 19-41). London: SAGE.

Bryman, A. (2001). *Social Research Methods.* Oxford: Oxford University Press.

Carrus, G., Passafaro, P., & Bonnes, M. (2008). Emotions, habits and rational choices in ecological behaviours: The case of recycling and use of public transportation. *Journal of Environmental Psychology, 28*, 51-62

Chaudhuri, A., Aboulnasr, K., & Ligas, M. (2010). Emotional responses on initial exposure to a hedonic or utilitarian description of a radical innovation. *Journal of Marketing Theory and Practice, 18,* 339-359.

Creusen, M. (2013). *Data analysis with SPSS.* Delft University of Technology.

Crilly, N., Moultrie, J. and Clarkson, P. J. (2004). 'Seeing things: Consumer response to the visual domain in product design'. *Design Studies, 25*(6): 547–577.

Damasio, A. (1998). Emotion and reason in the future of human life. In B. Cartldedge (Ed.), Mind, brain and the environment: *The Linacre lectures 1995-96* (pp. 57-71). New York: Oxford University Press.

Dono, J., Webb, J., & Richardson, B. (2010). The relationship between environmental activism, pro-environmental behaviour and social identity. *Journal of environmental psychology, 30*(2), 178-186.

Félonneau, M. L., & Becker, M. (2008). Pro-environmental attitudes and behavior: Revealing perceived social desirability. *Revue internationale de psychologie sociale, 21*(4), 25-53.

Finucane, M. L., Alhakami, A. S., Slovic, P., & Johnson, S. M. (2000). The affect heuristic in judgements of risks and benefits. *Journal of Behavioral Decision Making, 13*, 1-17.

Fraj, E., & Martinez, E. (2006). Ecological consumer behavior: An empirical analysis. *International Journal of Consumer Studies, 31*, 26-33.

Fujii, S. (2006). Environmental concern, attitude toward frugality, and ease of behavior as determinants of pro-environmental behavior intentions. *Journal of environmental psychology, 26*(4), 262-268.

Ginsberg, A. D. (2014). Design Evolution. In A. Ginsberg, J. Calvert, P. Schyfter, A. Elfick, & D. Endy (Eds.), *Synthetic Aesthetics: Investigating Synthetic Biology's Design on Nature.* United States of America: The MIT Press.

Glanz, K., Rimer, B.K., Viswanath, K. (2015). Theory of Reasoned Action, Theory of Planned Behavior, and the Integrated Behavioral Model. In E. Editor (Ed.), *Health Behavior: Theory, Research, and Practice* (pp. 95-124). Retrieved from https://books.google.nl/books?hl=nl&lr=&id=9BQWCgAAQBAJ&oi=fnd&pg=PA95&dq=theory+of+reasoned+action&ots=edKb8ivTa5&sig=rPjN7XRhRbIGOg62madU78dkKM0#v=onepage&q&f=false

Glaser, B. G., & Strauss, A. L. (2017). *Discovery of grounded theory: Strategies for qualitative research.* Routledge.

Gourmelon, G. (2015). Global plastic production rises, recycling lags. *New Worldwatch Institute analysis explores trends in global plastic consumption and recycling.* Retrieved from http://www. worldwatch. org.

Guagnano, G. A. (2001). Altruism and market-like behavior: An analysis of willingness to pay for recycled paper products. *Population and Environment, 22*(4), 425-438.

Guba, E. G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Communication and Technology Journal, 29*(2), 75-91.

Guide, V. D. R., & Li, J. (2010). The potential for cannibalization of new products sales by remanufactured products. *Decision Sciences, 41*(3), 547-572.

Griskevicius, V., Tybur, J. M., & Van den Bergh, B. (2010). Going green to be seen: status, reputation, and conspicuous conservation. *Journal of personality and social psychology, 98*(3), 392.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. l. (2010). Overview of multivariate methods. *Multivariate data analysis* (7th ed., pp. 1-30). Upper Saddle River, NJ: Prentice Hall.

Hamzaoui Essoussi, L., & Linton, J. D. (2010). New or recycled products: how much are consumers willing to pay?. *Journal of Consumer Marketing, 27*(5), 458-468.

Hamzaoui-Essoussi, L., & Linton, J. D. (2014). Offering branded remanufactured/recycled products: at what price?. *Journal of Remanufacturing, 4*(1), 9.

Hoek, J., Roling, N., & Holdsworth, D. (2013). Ethical claims and labelling: An analysis of consumers' beliefs and choice behaviours. *Journal of Marketing Management, 29*(7-8), 772-792.

Hopewell, J., Dvorak, R., & Kosior, E. (2009). Plastics recycling: challenges and opportunities. P*hilosophical Transactions of the Royal Society B: Biological Sciences, 364*(1526), 2115-2126.

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., ... & Law, K. L. (2015). Plastic waste inputs from land into the ocean. *Science, 347*(6223), 768-771.

Keramitsoglou, K. M., & Tsagarakis, K. P. (2013). Public participation in designing a recycling scheme towards maximum public acceptance. *Resources, Conservation and Recycling, 70*, 55-67.

Kim, Y., & Choi, S. M. (2005). Antecedents of green purchase behavior: An examination of collectivism, environmental concern, and PCE. *ACR North American Advances.*

Koenig-Lewis, N., Palmer, A., Dermody, J., & Urbye, A. (2014). Consumers' evaluations of ecological packaging– Rational and emotional approaches. *Journal of environmental psychology, 37*, 94-105.

Kristensen, T., Gabrielsen, G., & Zaichkowsky, J. L. (2012). How valuable is a well-crafted design and name brand?: Recognition and willingness to pay. *Journal of Consumer Behaviour, 11*(1), 44-55.

Lapadat, J. C., & Lindsay, A. C. (1999). Transcription in Research and Practice: From Standardization of Technique to Interpretive Positionings. *Qualitative Inquiry, 5*(1), 64-86.

Le Guern, C. (2018). *When the mermaids cry: the great plastic tide.* Retrieved from: http://plastic-pollution.org/

Lee, C.-J., Scheufele, D. A., & Lewenstein, B. V. (2005). Public attitudes towards emerging technologies. *Science Communication, 27*, 240-267.

Magnier, L., Mugge, R., & Schoormans, J. (2019). Turning ocean garbage into products–Consumers' evaluations of products made of recycled ocean plastic. *Journal of Cleaner Production, 215*, 84-98.

Meneses, G. D. (2010). Refuting fear in heuristics and in recycling promotion. *Journal of Business Research, 63*, 104-110.

Miles, M.B., Huberman, A.M., & Saldaña, J. (2013). Research design and management. *Qualitative data analysis: A methods sourcebook* (3rd ed pp 17-54). Thousand Oaks: CA SAGE.

Mobley, A. S., Painter, T. S., Untch, E. M., & Rao Unnava, H. (1995). Consumer evaluation of recycled products. *Psychology & Marketing, 12*(3), 165-176.

Monnot, E., Parguel, B., & Reniou, F. (2015). Consumer responses to elimination of overpackaging on private label products. *International Journal of Retail & Distribution Management, 43*(4/5), 329-349.

Mugge, R., Jockin, B., & Bocken, N. (2017). How to sell refurbished smartphones? An investigation of different customer groups and appropriate incentives. *Journal of cleaner production, 147*, 284-296.

Mugge, R., Massink, T., Hultink, E. J., & van den Berg-Weitzel, L. (2014). Designing a premium package: Some guidelines for designers and marketers. *The Design Journal, 17*(4), 583-605.

Mugge, R., & Schoormans, J. P. (2012). Newer is better! The influence of a novel appearance on the perceived performance quality of products. *Journal of Engineering Design, 23*(6), 469-484.

Nameghi, E. N., & Shadi, M. A. (2013). Affective and cognitive: Consumers attitude toward practicing green (re ducing, recycling & reusing). *International Journal of Marketing Studies, 5*(1), 157.

NOS. (2018). C*hina wil ons plastic afval niet meer recyclen, dus verbranden we 't maar.* Retrieved from: https://nos.nl/artikel/2211057-china-wil-ons-plastic-afval-niet-meer-recyclen-dus-verbranden-we-t-maar.html

Orth, U. R., Campana, D., & Malkewitz, K. (2010). Formation of consumer price expectation based on package design: attractive and quality routes. *Journal of Marketing Theory and Practice, 18*(1), 23-40.

Page, C. and Herr, P. M. (2002). 'An investigation of the processes by which product design and brand strength interact to determine initial affect and quality judgments'. *Journal of Consumer Psychology, 12*(2): 133–147.

Park, J. K., & John, D. R. (2010). Got to get you into my life: Do brand personalities rub off on consumers?. *Journal of consumer research, 37*(4), 655-669.

Parsons, T. (2009). *Thinking: Objects Contemporary approaches to product design.* Switzerland: AVA Publishing SA.

Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.

Patton, M.Q. (2002). Qualitative interviewing. *Qualitative research & evaluation methods* (3rd ed pp 339-418). Thousand Oaks: CA SAGE.

Pickett-Baker, J., & Ozaki, R. (2008). Pro-environmental products: marketing influence on consumer purchase decision. *Journal of consumer marketing, 25*(5), 281-293.

Ravitch, S.M, & Mittenfeller, C.N. (2015). Validity process strategies and considerations. *Qualitative research: Bridging the conceptual theoretical and methodological* (pp 185-213). London: SAGE.

Riessman, C. K. (1993). *Narrative Analysis.* Newbury Park, CA: Sage.

Saldaña, J. (2015). *The coding manual for qualitative researchers.* Sage.

Schoormans, J. P., & Robben, H. S. (1997). The effect of new package design on product attention, categorization and evaluation. *Journal of economic psychology, 18*(2-3), 271-287.

Spencer, L., Ritchie, J., Ormston, R., O'Connor, W., & Bernard, M. (2014). Analysis principles and processes. *Qualitative research practice: A guide for social science students and researchers* (2nd ed pp 269-293). London: SAGE.

Stone-Romero, E. F., Stone, D. L., & Grewal, D. (1997). Development of a multidimensional measure of perceived product quality. *Journal of quality management, 2*(1), 87-111.

Sweeney, J. C., & Soutar, G. N. (2001). Consumer perceived value: The development of a multiple item scale. *Journal of retailing, 77*(2), 203-220.

Veryzer Jr, R. W., & Hutchinson, J. W. (1998). The influence of unity and prototypicality on aesthetic responses to new product designs. *Journal of consumer research, 24*(4), 374-394.

Walsh, G., Shiu, E., & Hassan, L. M. (2014). Replicating, validating, and reducing the length of the consumer perceived value scale. *Journal of Business Research, 67*(3), 260-267.

Zeithaml, Valarie A. (1988). "Consumer Perceptions of Price, Quality and Value: A Means-End Model and Synthesis of Evidence," *Journal of Marketing, 52*(July), 2–22.

FIGURES

Free3D. (2019). *Empty Dishwashing Bottle 3d model* [Photograph]. Free3D. Retrieved from: https://free3d.com/3d-model/empty-dishwashing-bottle-6514.html

Hubert, B. (2011). *Benjamin hubert: pod chair for de vorm* [Photograph]. Designboom. Retrieved from: https://www.designboom.com/design/benjamin-hubert-pod-chair-for-de-vorm/

Method. (2020). *Foaming hand wash* [Photograph]. Method. Retrieved from: https://methodhome.com/products/foaming-hand-wash-sweet-water/

Vitra. (2020). *Vitra HAL Tube Chair, Basic Dark* [Photograph]. John Lewis plc. Retrieved from: https://www.johnlewis.com/vitra-hal-tube-chair/basic-dark/p1713869

THE FUTURE DESIGNS OF OCEAN PLASTIC PRODUCTS

MASTER THESIS

BY FRANCESCA ZUURHOUT